

1 SCOPE

- a. This specification establishes the requirements for normal-propyl bromide (nPB) based vapor degreasing grade solvents.

WARNING

WARNINGS may be included throughout this specification. Do not take these WARNINGS to be all inclusive, nor to completely describe hazards or precautionary measures applicable to specific procedures or operating environments.

Non-Boeing personnel must refer to their employer's safety instructions for information concerning hazards which may occur during operations described in this specification.

- b. This specification requires qualified products.

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2 CLASSIFICATION

This specification consists of the following types:

Type I – General use. Not for use in oxygen applications or applications where parts have been primed, top coated, or sealant has been applied to the parts.

Type II – Qualified for Type I including parts that have been primed, top coated.

3 REFERENCES

The issue of the following references in effect on the date of invitation for bid forms a part of this specification to the extent indicated herein.

- AS13591 – Cleaning Methods and Procedures for Breathing Oxygen Equipment
- ASTM B 117 – Standard Practice for Operating Salt Spray (FOG) Apparatus
- ASTM D 1078 – Test Method for Distillation Range of Volatile Organic Liquids
- ASTM D 1654 – Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments
- ASTM D 2108 – Standard Test Method for Color of Halogenated Organic Solvents and Their Admixtures (Platinum–Cobalt Scale)
- ASTM D 2109 – Standard Test Methods for Nonvolatile Matter in Halogenated Organic Solvents and Their Admixtures
- ASTM D 2111 – Standard Test Methods for Nonvolatile Matter in Halogenated Organic Solvents and Their Admixtures
- ASTM D 2942 – Standard Test Method for Aldehydes in Styrene Monomer
- ASTM D 2943 – Standard Test Method for Aluminum Scratch of 1,1,1–Trichloroethane to Determine Stability
- ASTM D 2989 – Standard Test Method for Acidity–Alkalinity of Halogenated Organic Solvents and Their Admixtures
- ASTM D 3401 – Standard Test Methods for Water in Halogenated Organic Solvents and Their Admixtures
- ASTM D 3741 – Standard Test Methods for Appearance of Admixtures Containing Halogenated Organic Solvents

3 REFERENCES (Continued)

- ASTM D 4755 – Standard Test Method for Free Halogens in Halogenated Organic Solvents and Their Admixtures
- ASTM F 483 – Standard Test Method for Total Immersion Corrosion Test for Aircraft Maintenance Chemicals
- ASTM F 502 – Standard Test Method for Effects of Cleaning and Chemical Maintenance Materials on Painted Aircraft Surfaces
- ASTM F 519 – Standard Test Method for Mechanical Hydrogen Embrittlement Evaluation of Plating Processes and Service Environments
- ASTM F 945 – Standard Test Method for Stress–Corrosion of Titanium Alloys by Aircraft Engine Cleaning Materials
- ASTM F 1110 – Standards Test Method for Sandwich Corrosion Test
- BAC5019 – Chromic Acid Anodizing
- BAC5555 – Phosphoric Acid Anodizing of Aluminum for Structural Bonding
- BAC5616 – Heat Treatment of Nickel–Base and Cobalt–Base Alloys
- BAC5617 – Heat Treatment of Alloy Steels
- BAC5619 – Heat Treatment of Corrosion Resistant Steel
- BAC5632 – Boric Acid – Sulfuric Acid Anodizing
- BAC5701 – Cadmium Plating
- BAC5718 – Low Hydrogen Embrittlement Cadmium Plating
- BAC5719 – Chemical Conversion Coatings for Aluminum and Aluminum Alloys
- BAC5736 – Application of Chemical and Solvent Resistant Finishes
- BAC5750 – Solvent Cleaning
- BAC5795 – Application of Zinc Chromate Primer by Dipping
- BAC5797 – Coating Systems, for Corrosion Prone Areas, Application of
- BAC5804 – Low Hydrogen Embrittlement Cadmium–Titanium Alloy Plating
- BAC5845 – Application of Polyurethane Enamel
- BAC5851 – Application of Thermal Spray Coating
- BAC5882 – Application of Urethane Compatible Primer
- BMS4–4 – Honeycomb Core 5052 Aluminum Alloy
- BMS5–101 – Structural Adhesives for 180 F Service Applications
- BMS10–11 – Chemical and Solvent Resistant Finish
- BSS7219 – Intergranular Attack, Test Method
- BSS7225 – Adhesion, Tape Test
- MIL–A–8625 – Anodic Coatings for Aluminum and Aluminum Alloys
- OSHA 1910.1200 – Hazard Communication Standard

4 DEFINITIONS

Not applicable to this specification.

5 MATERIAL REQUIREMENTS

When tested in accordance with Section 8, the materials shall conform to the requirements given in Table I through Table VII.

5.1 MATERIAL PROPERTIES – TYPE I QUALIFICATIONS

5.1.1 SOLVENT CONTROL

TABLE I SOLVENT CONTROL

ITEM	TEST	REQUIREMENT	TEST METHOD
1	Specific gravity @ 25 C	1.31 ± 0.01	ASTM D 2111
2	Initial boiling	70.0, C min	ASTM D 1078
3	Acidity (as HCl)	0.0010, weight %, max	ASTM D 2989
4	Alkalinity (as NaOH)	0.020, weight %, max	ASTM D 2989
5	Water, weight	0.020, weight %, max	ASTM D 3401
6	Appearance	Clear and free from suspended matter	ASTM D 3741
7	Color	25, APHA, max	ASTM D 2108
8	Free halogen	Negative – Passes test	ASTM D 4755
9	Nonvolatile residue	0.0010, weight %, max	ASTM D 2109
10	Acid acceptance (as NaOH)	0.19, weight %, min	ASTM D 2942
11	Aluminum corrosion at reflux	No evidence of tarnish or corrosion when compared with a similar untested strip	ASTM D 2943
12	<i>n</i> -propyl bromide	Greater than 90 weight %	Gas Chromatograph
13	<i>iso</i> -propyl bromide	0.05, weight %, max	Gas Chromatograph

5.1.2

ENVIROMENTAL EXPOSURE

TABLE II ENVIROMENTAL EXPOSURE

ITEM	TEST	REQUIREMENT	TEST METHOD
1	Immersion corrosion test	The average weight loss of the test specimens shall not exceed the values as listed in Table III for a minimum exposure of 24 hours.	Section 8.2.1.1
2	Intergranular Attack	The vapor degreasing solution shall not cause intergranular attack or end grain pitting that exceeds the values listed in Table IV for a minimum exposure of 24 hours.	Section 8.2.1.2
3	Hydrogen embrittlement	The static loading of the ASTM F 519 Type 1a.2 tensile specimen to 75 ± 2 percent of the established notch ultimate tensile strength shall achieve a minimum of 200 hours of continuous loading.	Section 8.2.1.3
4	Stress corrosion cracking of titanium	When exposed to the vapor degreasing solution, no cracking of the substrate shall be allowed.	Section 8.2.1.4
5	Sandwich corrosion testing	<p>a. Leaching or lightening of the chromate sealed anodize coating shall not be a cause for rejection.</p> <p>b. Deposits or residue from the material being tested that is not products of corrosion of the test panel surface shall not be cause for rejection.</p> <p>c. Panels with very light darkening or staining, which have no obvious metal attack or pitting, may be swabbed (cotton-tipped swabs or cotton gauze) with a 0.26 ± 0.02 mole/liter sulfuric acid solution and re-examined. If the coloration is substantially removed and there is no evidence of metal attack or pitting, the condition shall not be cause for rejection. (The 0.26 mole/liter sulfuric acid solution can be prepared by adding 1.5 ml of concentrated sulfuric acid (S.G. = 1.84) to 100 ml of distilled or deionized water.</p> <p>d. 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.</p> <p>e. Any corrosion in excess of that shown by the control group shall be cause for rejection.</p>	Section 8.2.1.5

5.1.2 ENVIROMENTAL EXPOSURE (Continued)

TABLE III IMMERSION WEIGHT LOSS

a.	Aluminum	± 10 mg
b.	Cadmium plated steel	± 10 mg
c.	Bare steel	± 30 mg
d.	Titanium	± 10 mg
e.	Magnesium	± 20 mg
f.	Copper alloys	± 10 mg
g.	Nickel based alloys	± 10 mg
h.	Thermal spray coating	± 5 mg
i.	CRES	± 10 mg

TABLE IV IGA/EGP

	ALLOY	IGA (inch)	EGP (inch)
a.	Aluminum	0.0002	0.0005
b.	Bare steel		
c.	Titanium		
d.	Magnesium		
e.	CRES 15-5PH Steel		
f.	Copper based alloys		
g.	Nickel based alloys		

5.1.3 INORGANIC COATING DEGRADATION

TABLE V INORGANIC COATING DEGRADATION

ITEM	TEST	REQUIREMENT	TEST METHOD
1	Salt spray corrosion of vapor degreased chemical conversion coated aluminum	5 pits or less per 30 inches squared	Section 8.2.2.1
2	Salt spray corrosion of vapor degreased anodized aluminum alloys	5 pits or less per 30 inches squared	Section 8.2.2.2.1 Section 8.2.2.2.2 Section 8.2.2.2.3
3	Salt spray corrosion of vapor degreased cadmium plated parts	5 pits or less per 30 inches squared	Section 8.2.2.3.1 Section 8.2.2.3.2 Section 8.2.2.3.3

5.1.4 HONEYCOMB CORE DEGREASING

TABLE VI HONEYCOMB CORE DEGREASING

ITEM	TEST	REQUIREMENT	TEST METHOD
1	Flatwise Tensile	BMS4-4	Section 8.2.3.1
2	Metal-to-Metal Climbing drum peel (75 ± 5 F)	45 lb-in/in for 0.005 inch thick adhesive film FL 1 55 lb-in/in for 0.010 inch thick adhesive film FL 1	Section 8.2.3.2
3	Environmental peel (65 to 90)	Minimum average of 50 inch lb/3 inch.	Section 8.2.3.3
4	Environmental peel (Peel at 65 to 90F, 60 day exposure to 140 ± 5 F, 100% RH)	a. 0.060 times the result for high bond durability core (Class ND). b. 0.080 times the result for phosphoric acid anodize core (Class NPA).	Section 8.2.3.3
5	Foil wedge crack (Initial)	1.4 inches or less crack length.	Section 8.2.3.4
6	Foil wedge crack (Expose 24hr at 140 ± 5 F, 100% RH)	a. 2.4 inches or less crack length for high bond durability core (Class ND) b. 1.75 inch or less crack length for phosphoric anodized core (Class NPA).	Section 8.2.3.4
7	Double cantilever beam a. G _{1A} b. G _{1SCC}	6 lb/inch 3.5 lb/inch FL 2 FL 3	Section 8.2.3.5

FL 1 Determination of calculated minimum value: $X_{min} = X_q - 3.981 S_q$, where X_q and S_q are the qualification mean and the standard deviation, respectively, of all the individual measurements of a particular set of test parameters.

FL 2 G_{1SCC} after 5 weeks exposure to 140 ± 5 F, 95 to 100 percent relative humidity.

FL 3 After 15 weeks exposure to 140 ± 5 F, 95 to 100 percent relative humidity, each specimen shall have G_{1SCC} equal to or exceeding 70 percent of the G_{1SCC} for that specimen after 5 weeks exposure.

5.2

PAINT DEGRADATION – TYPE II QUALIFICATIONS

TABLE VII PAINT DEGRADATION – TYPE II QUALIFICATIONS

ITEM	TEST	REQUIREMENT	TEST METHOD
1	Paint adhesion	a. Wet and dry adhesion of chemical conversion coated and painted specimens. Minimum rating of 8 is required.	Section 8.2.2.1
		b. Wet and dry adhesion of anodized and painted specimens. Minimum rating of 8 is required.	Section 8.2.2.2
		c. Wet and dry adhesion of cadmium plated and painted specimens. Minimum rating of 8 is required.	Section 8.2.2.3
2	Paint softening (Conventional Paint Systems)	The candidate vapor degreasing solution shall not produce a decrease in film hardness greater than two pencils or result in any discoloration or staining.	Section 8.2.4.1
3	Paint softening (Low VOC Paint Systems)	The candidate vapor degreasing solution shall not produce a decrease in film hardness greater than two pencils or result in any discoloration or staining.	Section 8.2.4.2
4	"X" Scribe salt spray corrosion	A minimum rating of 7 is required.	Section 8.2.2.2.1 Section 8.2.2.2.2 Section 8.2.2.2.3 Section 8.2.2.3.1 Section 8.2.2.3.2 Section 8.2.2.3.3

6

QUALIFICATION

Vapor degreasing solutions, normal-propyl bromide (nPB), shall meet all the qualification requirements for the intended use as contained in this specification prior to introduction into a production environment.

6.1

REQUESTS

All requests for vapor degreasing qualifications shall be directed to the Supplier Management and Procurement (SM&P) department of The Boeing Company. The submitted material shall be forwarded to the applicable Engineering department for evaluation. After receiving written authorization from GP, the manufacturer shall submit data for subsequent qualification. Should the manufacturer elect to have the testing conducted at The Boeing Company, it shall be responsible to pay all the cost associated with the qualification of the candidate vapor degreaser.

6.2 SAMPLES AND VENDOR TESTING

- a. Qualification test reports shall include actual raw data obtain from the associated testing of the candidate vapor degreasing material.
- b. The test report shall provide evidence that the material tested conforms to this specification.
- c. All suppliers shall have test facilities required to complete the tests in accordance with this specification or use certified commercial test laboratories with the capability to test in accordance with this specification
- d. Suppliers seeking qualification to this specification shall agree to the following:
 - (1) If deemed necessary by The Boeing Company, the supplier shall submit to an audit of their product manufacturing facility, raw material tracability, process records, test procedures, Quality Assurance techniques, and records.
 - (2) No changes in approved product formulations, raw materials, basic methods of manufacture, or plant site shall be made without notification and prior approval in writing form The Boeing Company. Requalification of the revised material shall be required and a revised supplier designation shall be requested.
 - (3) The Boeing Company shall have the right to audit the production facility subsequent to the qualification of the vapor degreasing material.
 - (4) Prior to submitting a material for qualification to this specification, the material supplier shall provide a Material Safety Data Sheet and chemical formulation for the candidate material. Agreements for non-disclosure and control of proprietary information shall be considered and executed as appropriate. The information provided shall be submitted to the appropriate Boeing Safety, Health, and Environmental Affairs organizations to perform a health hazard evaluation. These organizations determine whether the information is adequate, or whether additional information is necessary, to identify and document appropriate precautions for the material's use.

6.3 QUALIFICATION APPROVAL

- a. The Boeing Company reserves the right to conduct an evaluation of the material prior to granting qualification approval.
- b. Written approval will be granted when the supplier of the material submitted for qualification has met the requirements of this specification. Once the requirements to this specification have been satisfied the material will be listed in the QPL provide that the following conditions are satisfied:
 - (1) The supplier has complied with the qualification procedures of the specification.
 - (2) The submitted material conforms to the requirements of this specification.

7 QUALITY CONTROL

All materials covered under this specification shall be subjected to both supplier and purchaser inspection to determine compliance to the requirements of this specification.

7.1 SUPPLIER QUALITY CONTROL

- a. Suppliers shall not supply material to this specification until they have received written notice from the applicable SM&P organization of The Boeing Company stating that the material submitted for qualification has met all the requirements as defined in this specification. Furthermore, the material submitted must also be listed on the QPL to this specification.
- b. Each production shipment shall be accompanied by a chemical test report and the applicable Material Safety Data Sheet (MSDS). The test report shall include the following data:
 - (1) Specific Gravity
 - (2) Water weight
 - (3) Appearance
 - (4) Color
 - (5) Nonvolatile Residue
 - (6) Acid Acceptance
 - (7) n-Propyl Bromide concentration
 - (8) iso-Propyl Bromide concentration

7.2 PURCHASER QUALITY CONTROL

Purchaser Quality Assurance shall review all supplier test data submitted with each shipment and perform any additional tests deemed necessary to assure that the production material meets all the requirements of this specification.

8 MATERIAL TEST METHODS

8.1 GENERAL



This specification involves the use of chemical substances which are hazardous. Boeing personnel shall refer to the work area Hazard Communication Handbook for health effect and control measure information contained in the HazCom Info Sheets and Material Safety Data Sheets. For disposition of hazardous waste materials, consult site environmental engineers for proper disposal methods.

Non-Boeing personnel should refer to manufacturer's Material Safety Data Sheet(s) and their employer's safety instructions.

8.1.1 CLEANING OF TEST PANELS

Solvent clean in accordance with BAC5750.

8.1.2 CURE CONDITIONS

Unless otherwise specified, the primers and topcoats shall be cured 7 days at 75 ± 5 F and 30 to 60 percent relative humidity prior to testing to the requirements of this specification.

8.1.3 STANDARD TEST CONDITIONS

Standard laboratory test conditions shall be 77 ± 5 F and 50 ± 5 percent relative humidity. Except as otherwise specified herein, all specimen shall be tested under these conditions.

8.1.4 VAPOR DEGREASING CYCLE

The degreasing time unless otherwise stated is 15 minutes (approximate) per cycle.

8.2 TEST METHODS

8.2.1 ENVIRONMENTAL EXPOSURE

8.2.1.1 Immersion Corrosion Test

8.2.1.1.1 Test Specimens

The following panel types and finishes are required for immersion corrosion tests. All panels shall be (a nominal) one inches wide, two inches long and 0.06 inch thick; except that, the thickness of the specimens may be up to 0.250 inches in thickness. A minimum of three panels for each of the following substrates shall be required for this test.

- a. Clad 2024-T3 or T4 aluminum alloy in accordance with AMS-QQ-A-250/5.
- b. Bare 2024-T3 aluminum alloy in accordance with AMS-QQ-A-250/4, conversion coated in accordance with BAC5719, Type I, Class A, or MIL-C-5541, Class 1A.
- c. Bare 2024-T3 aluminum alloy in accordance with AMS-QQ-A-250/4, anodized in accordance with BAC5019, Class 3, or MIL-A-8625, Type I, Class 1.
- d. Bare 7075-T6 aluminum alloy in accordance with AMS-QQ-A-250/12, anodized in accordance with BAC5019, Class 3, or MIL-A-8625, Type I, Class 1.
- e. Bare 4130 low alloy steel in accordance with AMS 6351 (optional AMS 6350), heat treated to 180 to 200 ksi in accordance with BAC5617, cadmium-titanium plated in accordance with BAC5804, with a post plate chromate treatment.
- f. Bare 4130 low alloy steel in accordance with AMS 6351 (optional AMS 6350), heat treated to 180 to 200 ksi in accordance with BAC5617, cadmium plated in accordance with BAC5701, Type II, Class 1 or in accordance with AMS-QQ-P-416, Type II, Class 1.
- g. Bare 4130 low alloy steel in accordance with AMS 6351 (optional AMS 6350), heat treated to 180 to 200 ksi in accordance with BAC5617.
- h. Titanium 6Al-4V in accordance with AMS-T-9046, Type II, Comp C.
- i. Bare AZ310B magnesium alloy in accordance with AMS 4375, with AMS-M-3171, Type III dichromate treatment.
- j. Copper based alloy conforming to AMS 4533 (copper beryllium) in the TF00 condition.
- k. Copper based alloy conforming to AMS 4640 (aluminum bronze).
- l. Nickel based alloy conforming to AMS 5596 (Nickel based 718) heat treated to 180 to 200 ksi in accordance with BAC5616.
- m. Low alloy steel conforming to BMS7-26 (4340M), heat treated to 270 to 300 ksi in accordance with BAC5617, with BMS10-67, Type I applied in accordance with BAC5851, Class 2.
- n. CRES 15-5 PH steel in accordance with BMS7-240, heat treated to 180 to 200 ksi in accordance with BAC5619.

8.2.1.1.2 Test Procedure

The specimen shall be prepared and tested in accordance with ASTM F 483 with a 24 hour immersion.

8.2.1.2 Intergranular Attack

8.2.1.2.1 Test Specimens

The following panel types and finishes are required for intergranular attack tests. All panels shall be (a nominal) one inches wide, two inches long and 0.06 inch thick; except that, the thickness of the specimens may be up to 0.250 inches in thickness. One panel shall be required for each of the following substrates:

- a. Bare 7075-T6511 aluminum alloy in accordance with AMS-QQ-A-250/12.
- b. Bare 4130 low alloy steel in accordance with AMS 6351 (optional AMS 6350), heat treated to 180 to 200 ksi in accordance with BAC5617.
- c. Titanium 6Al-4V in accordance with AMS-T-9046, Type II, Comp C.
- d. Bare AZ310B magnesium alloy in accordance with AMS 4375.
- e. CRES 15-5 PH steel in accordance with BMS7-240, heat treated to 180 to 200 ksi in accordance with BAC5619.
- f. Copper based alloy conforming to AMS 4533 (copper beryllium) in the TF00 condition.
- g. Nickel based alloy conforming to AMS 5596 (Nickel based 718) heat treated to 180 to 200 ksi in accordance with BAC5616.

8.2.1.2.2 Test Procedure

The Intergranular Attack (IGA) and End Grain Pitting (EGP) testing shall be prepared and tested in accordance with BSS7219 with a 24 hour immersion.

8.2.1.3 Hydrogen embrittlement

Vapor degreasing solution shall not cause hydrogen embrittlement damage to both plated and unplated steel parts. AMS 4340 notched round bar tensile specimens in accordance with ASTM F 519, Type 1a.2 shall be used for testing the vapor degreasing solution.

- a. Perform hydrogen embrittlement testing on unplated notched tensile bars in accordance with ASTM F 519 to qualify the vapor degreasing solution for use on ferrous alloys heat treated above 180 ksi.
- b. Perform hydrogen embrittlement testing on notched tensile bars that have been low embrittlement cadmium plated in accordance with ASTM F 519 to qualify the vapor degreasing solution for use on plated ferrous alloys heat treated above 180 ksi.

8.2.1.4 Stress Corrosion Cracking of Titanium

Vapor degreasing solution shall not cause stress corrosion cracking in titanium based alloys when tested in accordance with ASTM F 945, Method A.

8.2.1.5 Sandwich Corrosion Testing

Specimen preparation, testing, and inspection shall be in accordance with ASTM F 1110 using the following materials and with the following exceptions:

- a. Reagents and materials exceptions:
 - (1) Clad 7075-T6 aluminum alloy in accordance with AMS-QQ-A-250/13.
 - (2) Bare 7075-T6 aluminum alloy in accordance with AMS-QQ-A-250/12, anodized in accordance with BAC5019, Class 3, or MIL-A-8625, Type I, Class 1.
 - (3) Distilled or deionized water may be used in place of ASTM F 1193, 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.
- b. 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 one piece of tape (maximum width of 0.75 inch) on each of two opposite edges.

8.2.2 INORGANIC COATING DEGRADATION

8.2.2.1 Vapor Degreasing Chemical Conversion Coated Aluminum and Paint Adhesion

Test Procedure.

- a. Conversion coat bare 2024-T3 panels in accordance with BAC5719, Type I, Class A, C, and D
- b. Conversion coat clad 2024-T3 panels in accordance with BAC5719, Type I, Class A, C and D
- c. Conversion coat clad 7075-T6 panels in accordance with BAC5719, Type I, Class A, C and D
- d. Conversion coat bare 6061-T6 panels in accordance with BAC5719, Type I, Class A, C and D
- e. Conversion coat bare 2024-T3 panels in accordance with BAC5719, Type I, Class B
- f. Conversion coat clad 2024-T3 panels in accordance with BAC5719, Type I, Class B
- g. Conversion coat clad 7075-T6 panels in accordance with BAC5719, Type I, Class B
- h. Conversion coat bare 6061-T6 panels in accordance with BAC5719, Type I, Class B
- i. Age for a minimum of 48 hours
- j. Vapor degrease the panels in the selected solvent

8.2.2.1 Vapor Degreasing Chemical Conversation Coated Aluminum (Continued)

- k. For two panels for each class perform the following:
 - (1) Perform Salt Spray Testing in accordance with ASTM B 117 for 168 hours minimum for Class A, C, and D except that the test specimens shall be inclined 6 degrees from vertical.
 - (2) Perform Salt Spray Testing in accordance with ASTM B 117 for 48 hours minimum for Class B except that the test specimens shall be inclined 6 degrees from vertical.
- l. Apply the following coating systems (two panels per coating system):
 - (1) BMS10–11, Type I in accordance with BAC5736;
 - (2) BMS10–11, Type I plus BMS10–11, Type II in accordance with BAC5736;
 - (3) BMS10–11, Type I in accordance with BAC5736, plus BMS10–60, Type I in accordance with BAC5845;
 - (4) BMS10–79, Type III primer applied in accordance with BAC5882 plus BMS10–60, Type II enamel in accordance with BAC5845.
- m. Vapor degrease the panels in the selected solvent
- n. Perform dry adhesion in accordance with BSS7225, Type I, Class 5
- o. Perform wet Adhesion in accordance with BSS7225 Type III, Class 5, seven (7) days, room temperatutre, water immersion.

8.2.2.2 Vapor Degreasing Anodized Aluminum Alloys

Materials.

Three 3 x 10 x 0.040 inch nominal specimens will be used for each aluminum alloy and/or coating combination.

- a. 7075–T6 aluminum
- b. Bare 2024–T3 Aluminum

8.2.2.2.1 Test Procedure For Chromic Acid Anodizing:

For Chromic Acid Anodizing:

- a. Anodize bare 2024–T3 panels in accordance with BAC5019, Class 3.
- b. Anodize 7075–T6 panels in accordance with BAC5019, Class 3.
- c. Vapor degrease the panels in the selected solvent
- d. For one set of three perform Salt Spray Testing in accordance with ASTM B 117 for 168 hours minimum except that the test specimens shall be inclined 6 degrees from vertical.

8.2.2.2.1 Test Procedure For Chromic Acid Anodizing: (Continued)

- e. Apply the following coating systems (three panels per coating system):
 - (1) BMS10–11, Type I in accordance with BAC5736;
 - (2) BMS10–11, Type I plus BMS10–11, Type II in accordance with BAC5736;
 - (3) BMS10–79, Type II in accordance with BAC5882;
 - (4) BMS10–79, Type III in accordance with BAC5882;
 - (5) BMS10–11, Type I in accordance with BAC5736, plus BMS10–60, Type I in accordance with BAC5845;
 - (6) BMS10–79, Type III primer applied in accordance with BAC5882 plus BMS10–60, Type II enamel in accordance with BAC5845;
 - (7) BMS10–20, Type II in accordance with BAC5793.
- f. Vapor degrease the panels in the selected solvent
- g. Perform dry adhesion in accordance with BSS7225, Type I, Class 5.
- h. Perform wet adhesion in accordance with BSS7225, Type III, Class 5, seven (7) days, room temperature, water immersion.
- i. Perform corrosion test in accordance with ASTM D 1654 "X" Scribe (ASTM B 117, except that the test specimens shall be inclined 6 degrees from vertical, 3000 hours, Procedure A, Method 1).

8.2.2.2.2 Test Procedure For Boric Acid – Sulfuric Acid Anodizing:

- a. Anodize bare 2024–T3 panels in accordance with BAC5632, Class 1.
- b. Anodize 7075–T6 in accordance with BAC5632, Class 1.
- c. Vapor degrease the panels in the selected solvent
- d. For one set of three perform Salt Spray Testing in accordance with ASTM B 117 for 168 hours minimum except that the test specimens shall be inclined 6 degrees from vertical.
- e. Apply the following coating systems (three panels per coating system):
 - (1) BMS10–11, Type I in accordance with BAC5736;
 - (2) BMS10–11, Type I plus BMS10–11, Type II in accordance with BAC5736;
 - (3) BMS10–79, Type II in accordance with BAC5882;
 - (4) BMS10–79, Type III in accordance with BAC5882;
 - (5) BMS10–11, Type I in accordance with BAC5736 plus BMS10–60, Type I in accordance with BAC5845;
 - (6) BMS10–79, Type III primer applied in accordance with BAC5882 plus BMS10–60, Type II enamel in accordance with BAC5845;

8.2.2.2.2 Test Procedure For Boric Acid – Sulfuric Acid Anodizing: (Continued)

- (7) BMS10–20, Type II in accordance with BAC5793.
- f. Vapor degrease the panels in the selected solvent
- g. Perform dry adhesion in accordance with BSS7225, Type I, Class 5.
- h. Perform wet adhesion in accordance with BSS7225, Type III, Class 5, seven (7) days, room temperature, water immersion.
- i. Perform corrosion test in accordance with ASTM D 1654 “X” Scribe (ASTM B 117, except that the test specimens shall be inclined 6 degrees from vertical, 3000 hours, Procedure A, Method 1).

8.2.2.2.3 Test Procedure For Phosphoric Acid Anodizing:

- a. Anodize bare 2024–T3 in accordance with BAC5555.
- b. Anodize bare 7075–T6 panels in accordance with BAC5555.
- c. Vapor degrease the panels in the selected solvent
- d. Apply the following coating systems (three panels per coating system):
 - (1) BMS10–11, Type I in accordance with BAC5736;
 - (2) BMS10–11, Type I plus BMS10–11, Type II in accordance with BAC5736;
 - (3) BMS10–79, Type II in accordance with BAC5882;
 - (4) BMS10–79, Type III in accordance with BAC5882;
 - (5) BMS10–11, Type I in accordance with BAC5736 plus BMS10–60, Type I in accordance with BAC5845;
 - (6) BMS10–79, Type III primer applied in accordance with BAC5882 plus BMS10–60, Type II enamel in accordance with BAC5845;
 - (7) BMS10–20, Type II in accordance with BAC5793.
- e. Vapor degrease the panels in the selected solvent
- f. Perform dry adhesion in accordance with BSS7225, Type I, Class 5.
- g. Perform wet adhesion in accordance with BSS7225, Type III, Class 5, seven (7) days, room temperature, water immersion.
- h. Perform corrosion test in accordance with ASTM D 1654 “X” Scribe (ASTM B 117, except that the test specimens shall be inclined 6 degrees from vertical, 3000 hours, Procedure A, Method 1).

8.2.2.3 Vapor Degreasing Cadmium Plated Parts

8.2.2.3.1 Cadmium Plating

- a. Cad plate AMS 6351 (optional AMS 6350), low alloy steel, H/T 180–200 ksi in accordance with BAC5701, Type II Class 1.
- b. Vapor degrease the panels in the selected solvent
- c. For one set of three perform Salt Spray Testing in accordance with ASTM B 117 for 96 hours minimum except that the test specimens shall be inclined 6 degrees from vertical.
- d. Apply the following coating systems (three panels per coating system):
 - (1) BMS10–11, Type I in accordance with BAC5736;
 - (2) BMS10–11, Type I plus BMS10–11, Type II in accordance with BAC5736;
 - (3) BMS10–79, Type II in accordance with BAC5882;
 - (4) BMS10–79, Type III in accordance with BAC5882;
 - (5) BMS10–11, Type I in accordance with BAC5736 plus BMS10–60, Type I in accordance with BAC5845;
 - (6) BMS10–79, Type III primer applied in accordance with BAC5882 plus BMS10–60, Type II enamel in accordance with BAC5845;
 - (7) BMS10–20, Type II in accordance with BAC5793.
- e. Vapor degrease the panels in the selected solvent
- f. Perform dry adhesion in accordance with BSS7225, Type I, Class 5.
- g. Perform wet adhesion in accordance with BSS7225, Type III, Class 5, seven (7) days, room temperature, water immersion.
- h. Perform corrosion test in accordance with ASTM D 1654 “X” Scribe (ASTM B 117, except that the test specimens shall be inclined 6 degrees from vertical, 3000 hours, Procedure A, Method 1).

8.2.2.3.2 Low Hydrogen Embrittlement Cadmium Plating

- a. Cad plate AMS 6351 (optional AMS 6350), low alloy steel, H/T 180–200 ksi in accordance with BAC5718.
- b. Vapor degrease the panels in the selected solvent
- c. For one set of three perform Salt Spray Test in accordance with ASTM B 117 for 96 hours minimum except that the test specimens shall be inclined 6 degrees from vertical.
- d. Apply the following coating systems (three panels per coating system):
 - (1) BMS10–11, Type I in accordance with BAC5736;
 - (2) BMS10–11, Type I plus BMS10–11, Type II in accordance with BAC5736;
 - (3) BMS10–79, Type II in accordance with BAC5882;

8.2.2.3.2 Low Hydrogen Embrittlement Cadmium Plating (Continued)

- (4) BMS10-79, Type III in accordance with BAC5882;
 - (5) BMS10-11, Type I in accordance with BAC5736 plus BMS10-60, Type I in accordance with BAC5845;
 - (6) BMS10-79, Type III primer applied in accordance with BAC5882 plus BMS10-60, Type II enamel in accordance with BAC5845;
 - (7) BMS10-20, Type II in accordance with BAC5793.
- e. Vapor degrease the panels in the selected solvent
 - f. Perform dry adhesion in accordance with BSS7225, Type I, Class 5.
 - g. Perform wet adhesion in accordance with BSS7225, Type III, Class 5, seven (7) days, room temperature, water immersion.
 - h. Perform corrosion test in accordance with ASTM D 1654 "X" Scribe (ASTM B 117, except that the test specimens shall be inclined 6 degrees from vertical, 3000 hours, Procedure A, Method 1).

8.2.2.3.3 Low Hydrogen Embrittlement Cadmium – Titanium Alloy Plating

- a. Cad plate AMS 6351 (optional AMS 6350), low alloy steel, H/T 180-200 ksi in accordance with BAC5804
- b. Vapor degrease the panels in the selected solvent
- c. For one set of three perform Salt Spray Testing in accordance with ASTM B 117 for 96 hours minimum except that the test specimens shall be inclined 6 degrees from vertical.
- d. Apply the following coating systems (three panels per coating system):
 - (1) BMS10-11, Type I in accordance with BAC5736;
 - (2) BMS10-11, Type I plus BMS10-11, Type II in accordance with BAC5736;
 - (3) BMS10-79, Type II in accordance with BAC5882;
 - (4) BMS10-79, Type III in accordance with BAC5882;
 - (5) BMS10-11, Type I in accordance with BAC5736 plus BMS10-60, Type I in accordance with BAC5845;
 - (6) BMS10-79, Type III primer applied in accordance with BAC5882 plus BMS10-60, Type II enamel in accordance with BAC5845;
 - (7) BMS10-20, Type II in accordance with BAC5793.
- e. Vapor degrease the panels in the selected solvent
- f. Perform dry adhesion in accordance with BSS7225, Type I, Class 5.
- g. Perform wet adhesion in accordance with BSS7225, Type III, Class 5, seven (7) days, room temperature, water immersion.

8.2.2.3.3 Low Hydrogen Embrittlement Cadmium – Titanium Alloy Plating (Continued)

- h. Perform corrosion test in accordance with ASTM D 1654 "X" Scribe (ASTM B 117, except that the test specimens shall be inclined 6 degrees from vertical, 3000 hours, Procedure A, Method 1)

8.2.3 HONEYCOMB CORE DEGREASING

The following contaminants shall be used for this test:

- a. Boelube 70106 Lubricant
- b. Hoecut 795B Coolant
- c. Mystic JT-6 High Temperature Grease

After applying the contaminant to core specimen, vapor degrease for 20 minutes (10 minute liquid immersion and 10 minute vapor immersion) and then perform the mechanical tests.

8.2.3.1 Flatwise Tensile

Perform flatwise tensile testing in accordance with BMS4-4.

8.2.3.2 Metal-to-Metal Climbing Drum Peel

Perform metal-to-metal climbing drum peel testing in accordance with BMS4-4.

8.2.3.3 Environmental Peel

Perform environmental peel testing in accordance with BMS4-4.

8.2.3.4 Foil Wedge Crack

Perform foil wedge crack testing in accordance with BMS4-4.

8.2.3.5 Double Cantilever Beam

Perform double cantilever beam (DCB) testing in accordance with BMS4-4.

8.2.4 PAINT DEGRADATION – TYPE II QUALIFICATIONS

8.2.4.1 Paint Softening (Conventional Paint Systems)

Materials

For each coating system specified below, a minimum of two (2) 3 x 6 x 0.02 inch nominal specimens shall be tested.

Prepare two specimens using AMS–QQ–A–250/4 Aluminum Alloy bare 2024–T3 or T4 in accordance with ASTM F 502.

Prepare two specimens using AMS–QQ–A–250/4 Aluminum Clad 2024–T3 or T4 in accordance with ASTM F 502.

Prepare two specimens using AMS–QQ–A–250/13 Aluminum Clad 7075–T6 in accordance with ASTM F 502.

Apply the conversion coating in accordance with BAC5719, Type I, Class A. Mix and apply the primer and topcoat in accordance with the material specifications

Test Procedure.

- a. Testing shall be conducted in accordance with ASTM F 502 using the following coating systems:
 - (1) BMS10–11, Type I, Grade A in accordance with BAC5736;
 - (2) BMS10–11, Type I, Grade A plus BMS10–11, Type II, Grade A in accordance with BAC5736;
 - (3) BMS10–79, Type II, Grade A in accordance BAC5882;
 - (4) BMS10–79, Type III, Grade A in accordance BAC5882;
 - (5) BMS10–11, Type I, Grade A in accordance with BAC5736 plus BMS10–60, Type I, Grade A in accordance with BAC5845;
 - (6) BMS10–79, Type III, Grade A primer applied in accordance with BAC5882 plus BMS10–60, Type II, Grade A enamel in accordance with BAC5845.
 - (7) BMS10–79, Type III, Grade A primer applied in accordance with BAC5882, plus BMS10–100 coating in accordance with BAC5795.
 - (8) BMS10–20, Type II, Grade A in accordance with BAC5793
- b. Vapor degrease the panels in the selected solvent
- c. After 24 hours minimum, perform testing per ASTM F 502

8.2.4.2 Paint Softening (Low VOC Paint Systems)

Materials.

For each coating system specified below, a minimum of two (2) 3 x 6 x 0.02 inch nominal specimens shall be tested.

Prepare two specimens using AMS–QQ–A–250/5 Aluminum Alloy bare 2024–T3 or T4 in accordance with ASTM F 502.

Prepare two specimens using AMS–QQ–A–250/5 Aluminum Clad 2024–T3 or T4 in accordance with ASTM F 502.

Prepare two specimens using AMS–QQ–A–250/13 Aluminum Clad 7075–T6 in accordance with ASTM F 502.

Apply the conversion coating in accordance with BAC5719, Type I, Class A. Mix and apply the primer and topcoat in accordance with the material specifications

Test Procedure.

- a. Testing shall be conducted in accordance with ASTM F 502 using the following coating systems:
 - (1) BMS10–11, Type I, Grade E in accordance with BAC5736;
 - (2) BMS10–11, Type I, Grade E plus BMS10–11, Type II, Grade D in accordance with BAC5736;
 - (3) BMS10–79, Type II, Grade D in accordance BAC5882;
 - (4) BMS10–79, Type III, Grade D in accordance BAC5882;
 - (5) BMS10–11, Type I, Grade E in accordance with BAC5736 plus BMS10–60, Type I, Grade D in accordance with BAC5845;
 - (6) BMS10–79, Type III, Grade D primer applied in accordance with BAC5882 plus BMS10–60, Type II, Grade D enamel in accordance with BAC5845.
 - (7) BMS10–79, Type III, Grade D primer applied in accordance with BAC5882, plus BMS10–100 coating in accordance with BAC5795.
 - (8) BMS10–20, Type II, Grade D in accordance with BAC5793
- b. Vapor degrease the panels in the selected solvent
- c. After 24 hours minimum, perform testing per ASTM F 502

9 MATERIAL IDENTIFICATION

Each delivery, including container or bulk shipments, shall be durably, conspicuously, and legibly marked with the following:

- a. BMS11–11 and current revision letter
- b. Manufacturer's name and product designation
- c. Batch and/or lot number

- d. Date of manufacture or repackaging
- e. Quantity
- f. Purchase order number
- g. Special storage or handling requirements

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PACKAGING AND MARKING

- a. Package to protect the container and its contents from damage, losses or contamination during shipment. Durably and legibly mark the package in accordance with Section 9a. through h.
- b. Use only clean containers for storage or shipment of this product.
- c. Labeling shall conform to OSHA 1910.1200
- d. Packaging shall be accomplished in such a manner as to assure delivery of material capable of meeting the requirements of this specification.