1 SCOPE

a. This specification establishes the product qualification and purchaser inspection requirements for primer that is:

(1) Suitable for structural bonding of metal-to-metal and honeycomb sandwich when used with moderate temperature curing adhesives.

(2) Resistant to corrosive environments when used as a protective finish on exposed surface areas of bonded assemblies.

(3) Receptive to paint finishes.

b. The material is to be used for metal-to-metal and honeycomb sandwich construction with a moderate temperature curing adhesive bonded in accordance with BAC5514-5101.

c. This specification requires qualified products.

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.

1.1 CONTENTS

1.1 CONTENTS (Continued)

1.1 CONTENTS (Continued)

LIST OF TABLES

2 CLASSIFICATION

This specification consists of the following Types and Grades.

2.1 TYPES

Type I designates a solvent-based, heat-cured primer.

Type II designates a zero volatile organic compound (VOC) one component primer.

Type III designates a low volatile organic compound (VOC) one component primer.

NOTE: If no type is indicated on the engineering drawing either Type I, Type II or Type III may be used.

2.2 GRADES (TYPE I ONLY)

a. Grade A designates low solids content, one- or two-component primer.

b. Grade B designates high solids content, one- or two-component primer.

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.

ASTM D 522 - Standard Test Methods for Mandrel Bend Test of Attached Organic Coatings
ASTM D 1084 - Standard Test Methods for Viscosity of Adhesives
ASTM D 1475 - Standard Test Method for Density of Liquid Coatings, Inks, and Related Products
ASTM D 1875 - Standard Test Method for Density of Adhesives in Fluid Form
ASTM D 2556 - Standard Test Method for Apparent Viscosity of Adhesives Having Shear-Rate-Dependent Flow Properties
BAC5514-589 - Application of Corrosion Inhibiting Adhesive Primer
BAC5514-5101 - Structural Bonding for 180 F Service Applications (BMS5-101)
BAC5555 - Phosphoric Acid Anodizing of Aluminum for Structural Bonding

3 REFERENCES (Continued)

BAC5845	-	Application of Polyurethane Enamel
BAC5882	-	Application of Urethane Compatible Primer
BMS5-101	-	Structural Adhesives for 180 F Service Applications
BSS7061	-	Time and Temperature Recording Requirements
BSS7234	-	Viscosity, Zahn
BSS7249	-	Salt Spray (Fog) Testing
BSS7257	-	Peel Test, Sealant
BSS7263	-	Hardness Test, Pencil Method
BSS7286	-	Statistical Process Control of Designated Engineering Characteristics
D1-4426	-	Approved Process Sources
BSS7101	-	Requirement for the Process Control Document (PCD) System for Suppliers of Raw Materials to Boeing Material Specifications
29CFR 1910.1200	-	Hazard Communication Standard

4 DEFINITIONS

The following definitions apply to terms that are uncommon or have special meaning as used in this specification:

Auxiliary storage facility - A facility external to the supplier's manufacturing location where material is stored under the control of the supplier.

Batch - A homogeneous amount of finished primer manufactured under controlled conditions during a single manufacturing run.

Date of Manufacture (DOM) - The date that all mixing operations on a batch of primer have been completed.

Date of Shipment (DOS) - The date that a lot of material has been shipped from the supplier's manufacturing location, an authorized distributor, an authorized re-packager, or an authorized auxiliary storage location to the purchaser, whichever occurs later.

Distributor - An intermediate between the supplier and the purchaser who handles, stores, and allocates material without compromising the individual unit packaging.

Key Characteristic (KC) - Measurements taken from the final product that are representative of a stable production process, and that relate to the customer's specified engineering properties of the product.

Key Process Parameter (KPP) - A process input that is controllable and that has a statistical correlation with the variation in a key characteristic. Key process parameters are most effectively determined by the supplier through the use of designed experiments.

Lot - All the primer from one primer batch received in one shipment.

Lot Size - The total number of units in any one lot regardless of container size.

Process Control Document (PCD) - A document that describes the qualified materials, manufacturing processes, in-process testing, and alternate test methods used to document, and control variation of a supplier's product.

Supplier Inventory Life (SIL) - The length of time that occurs between Date of Manufacture and Date of Shipment. Supplier Inventory Life begins on DOM and ends on DOS from the supplier's manufacturing location, an authorized distributor, an authorized re-packager, or an authorized auxiliary storage location.

4 DEFINITIONS (Continued)

Solvent Resistant - Capable of being wiped without damage or removal of the baked primer.

Supplier Out-time - The time that single component Ty I primer is exposed to temperatures above 0 F and below 90 F, 2 component Ty I primer is exposed to temperatures above 40 F and below 90 F, and Ty II and III primers are exposed to temperatures above 55 F and below 90 F at the supplier's manufacturing facility prior to shipping.

Unit - The smallest single portion of primer received in any one lot, such as a container of Type I primer.

5 MATERIAL REQUIREMENTS

5.1 BAKED PRIMER AND LIQUID PRIMER PROPERTY REQUIREMENTS

The baked primer shall pass Tests 1 through 12 of Table I. The liquid primer shall pass Tests 1 through 4 of Table II.

TABLE I - REQUIREMENTS FOR BAKED PRIMER FILM

TEST	TEST DESCRIPTION	SUBSTRATE MATERIAL FL 5	SAMPLE SIZE PER QUALIFICATION BATCH	REQUIREMENTS	TEST METHOD SECTION(S)
1	Fluid Resistance - 7 day soak (1) Deionized, Demineralized or Distilled water (2) BMS3-11 FL 2 (3) MIL-PRF-5606 Fluid (4) MIL-PRF-7808 (5) TT-S-735, Type III	2024 T3 bare, 0.020 inch thick by 4 by 6 inch	15 (5 test fluids, 3 tests per fluid)	Fluid Resistance: No film failure (blistering, softening, cracking, peeling). Adhesion: No loss of adhesion. Pencil Hardness FL 4: A maximum reduction of two units pencil hardness (Required on distilled water and BMS3-11 fluid only).	8.2.10 8.2.2 8.2.8
2	Metal Anchorage	2024 T3 bare and clad, 0.020 inch thick by 4 by 6 inch	6 (2 metals, 3 tests per metal)	No cracking, flaking or loss of adhesion.	8.2.6
3	Impact Resistance	2024 T3 bare and clad, 0.020 inch thick by 4 by 6 inch	6 (2 metals, 3 tests per metal)	Impact: No cracking or loss of adhesion at 40 in-lbs. (face or reverse side. Adhesion: No loss of adhesion.	8.2.7 8.2.2

5.1 BAKED PRIMER AND LIQUID PRIMER PROPERTY REQUIREMENTS (Continued)

TABLE I - REQUIREMENTS FOR BAKED PRIMER FILM (Continued)

TEST	TEST DESCRIPTION	SUBSTRATE MATERIAL FL 5	SAMPLE SIZE PER QUALIFICATION BATCH	REQUIREMENTS	TEST METHOD SECTION(S)
4	Low Temperature Shock	2024 T3 bare and clad, 0.020 inch thick by 4 by 6 inch	6 (2 metals, 3 tests per metal)	Low Temp. Shock: No film failure after 160 ± 5 F to -65 ± 5 F cycle. Adhesion: No loss of adhesion.	8.2.4 8.2.2
5	Pencil Hardness	2024 T3 bare 0.020 inch thick by 4 by 6 inch	3	Pencil Hardness: 4H minimum	8.2.8
6	Salt Spray Corrosion	2024 T3 bare and clad, 0.063 inch thick by 4 by 6 inch	6 (2 metals, 3 tests per metal)	Salt Spray Corrosion: No film or substrate degradation more than 0.125 inch beyond scribe mark after 40 day salt spray. Adhesion: No loss of adhesion.	8.2.1 8.2.2
7	Filiform Corrosion	2024 T3 bare and clad, 0.040 inch thick by 4 by 6 inch	6 (2 metals, 3 tests per metal)	Filiform Corrosion: No blisters, corrosion or loss of adhesion 0.125 inch beyond scribe after 30 days exposure. Adhesion: No loss of adhesion.	8.2.1 8.2.2
8	Humidity Resistance	2024 T3 bare and clad, 0.020 inch thick by 4 by 6 inch	6 (2 metals, 3 tests per metal)	Humidity Resistance: No film failure or loss of adhesion after 30 days at 100 percent R.H. at 120 ± 5 F. Adhesion: No loss of adhesion.	8.2.9 8.2.2
9	Heat Resistance	2024 T3 bare and clad, 0.040 inch thick by 4 by 6 inch	6 (2 metals, 3 tests per metal)	Heat Resistance: No film failure after 70 hours at 350 ± 5 F. FL 1 Adhesion: No loss of adhesion.	8.2.5 8.2.2

5.1 BAKED PRIMER AND LIQUID PRIMER PROPERTY REQUIREMENTS (Continued)

TABLE I - REQUIREMENTS FOR BAKED PRIMER FILM (Continued)

TEST	TEST DESCRIPTION	SUBSTRATE MATERIAL FL 5	SAMPLE SIZE PER QUALIFICATION BATCH	REQUIREMENTS	TEST METHOD SECTION(S)
10	Compatibility with BMS10-11, Type I FL 3 (Test 1 - distilled water only). Test 2, 3, and 4.	2024 T3 bare, 0.020 inch thick by 4 by 6 inch	1	See Requirements defined for Test 1 - distilled water Test 2, 3, and 4.	- - -
11	Compatibility with BMS10-79, Type III FL 3 (Test 1 - distilled water only). Test 2, 3 and 4	2024 T3 bare, 0.020 inch thick by 4 by 6 inch	1	See Requirements defined for Test 1 - distilled water Test 2, 3, and 4	- - -
12	Compatibility with BMS5-95, BMS5-45, BMS5-142 Sealants (1) RT (2) NaCl (3) TT-S-735, Type III	2024 T3 bare, 0.040 inch thick by 6 by 2.9 inch	18 (3 test conditions, 3 sealants, 2 tests per condition)	10 lb/in. min. average value. 7.5 lb/in min individual value. No evidence of adhesive failure between primer and sealant.	8.2.3

FL 1 Slight discoloration is permitted.

FL 2 A reduction to 7H pencil hardness is acceptable when the original hardness is listed as 9H+.

FL 3 The bond primer shall not detract from the appearance or surface texture of the paint specimens.

FL 4 Soak in BMS3-11 fluid for qualification is 30 days. Soak in BMS3-11 for Receiving Inspection is 7 days. The pencil hardness test shall be conducted within 10 minutes after the specimens are removed from exposure.

FL 5 All specimen dimensions are nominal.

TABLE II - REQUIREMENTS FOR LIQUID PRIMER

TEST	TEST DESCRIPTION	SAMPLE SIZE PER QUALIFICATION BATCH OR QUALITY CONTROL UNIT	REQUIREMENTS	TEST METHOD SECTION(S)
1	Appearance	- - -	Free of foreign contaminants. No evidence of gelling or agglomeration of constituents	None
2	Viscosity	3	Listed in QPL	8.2.11
3	Weight per Gallon	3	Listed in QPL	8.2.12
4	Non-Volatile and Quantitative Inhibitor Analysis FL 1	3	Listed in QPL	8.2.13

FL 1 Key Characteristic (KC) - SPC required.

5.2 COMPATIBILITY REQUIREMENTS

5.2.1 COMPATIBILITY WITH ADHESIVES

a. The material shall function as an adhesive primer when used with BMS5-101 adhesive and shall meet all the mechanical property requirements listed for the adhesive in BMS5-101.

b. Type I, II, and III materials shall be suitable for application in thickness of 0.00015 to 0.00040 inch.

5.2.2 COMPATIBILITY WITH PAINT FINISHES

The material shall pass Test 1 of Table I when topcoated with:

a. BMS10-11, Type I primer (Test 10)

b. BMS10-79, Type III primer (Test 11)

5.2.3 COMPATIBILITY WITH SEALANTS

The material shall pass Test 12 of Table I.

5.3 STABILITY REQUIREMENTS

5.3.1 POT LIFE

a. Type I, Grade A primer shall meet the requirements of Section 5.2 and Section 5.1 after aging a minimum of 4 days at 65 to 90 F.

b. Type I, Grade B primer shall meet the requirements of Section 5.2 and Section 5.1 after aging a minimum of 16 hours at 65 to 90 F.

c. Type II primer shall meet the requirements of Section 5.2 and Section 5.1 after aging a minimum of 30 days at 65 to 90 F.

d. Type III primer shall meet the requirements of Section 5.1 and Section 5.2 after aging a minimum of 7 days at 65 to 90 F.

5.3.2 STORAGE LIFE

a. One component Type I Primer - When shipped at or below 10 F and stored at 0 F or below, the primer shall meet the requirements of Section 5.3.1 for a minimum of 9 months from date of shipment.

b. Two Component Type I Primer - When shipped and stored at 40 F or below, the primer shall meet the requirements of Section 5.2 and Section 5.1 for a minimum of 9 months from the date of shipment. If all storage and shipment is at temperatures between 41 and 90 F, storage life is 6 months for Grade A and 3 months for Grade B.

c. Type II and III Primer - When shipped and stored at 35 to 55 F, the primer shall meet the requirements of Section 5.2 and Section 5.1 for a minimum of 12 months from date of shipment.

d. When specified on the purchase order, Type II and Type III material may be shipped at temperatures between 55 and 90 F as necessary to allow for expedited shipment of the material. The following conditions are required for shipment between 55 and 90 F.

5.3.2 STORAGE LIFE (Continued)

(1) Continuous temperature recorders accompany the shipment in accordance with Section 10.f.

(2) The time above 55 F is subtracted from the out-time specified in BAC5514-589 of the shipment.

6 QUALIFICATION

6.1 REQUESTS

a. Direct all requests for qualification to a Supplier Management (SM) organization of The Boeing Company. SM coordinates all communication between material suppliers and the appropriate Boeing departments.

b. Prior to submitting a material for qualification to this specification, the material supplier shall provide a Material Safety Data Sheet (MSDS) for the candidate material. Prior to completing qualification, the material supplier shall provide the detailed chemical formulation, percent composition, and CAS (Chemical Abstract Service) numbers 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 Environmental, Health, and Safety (EHS) organizations to perform a health hazard evaluation. These organizations determine whether the information as supplied is adequate (or alternatively, whether additional information is necessary) to identify and document appropriate precautions for the material's use.

6.2 SAMPLES AND TEST REPORTS - VENDOR QUALIFICATION

a. Qualification samples submitted for approval shall be accompanied by a test report giving actual data for a minimum of three batches in accordance with Type and Grade for all tests in Section 5.

Both individual specimen values and average values for each test shall be reported. Each value reported shall be shown as being for an individually numbered specimen, the numbering of which shall be coded in the report in such a manner as to definitely establish the particular test assembly from which the specimen was cut and the particular batch with which the test assembly was bonded, together with the date of bonding. Coded identification of the component batches shall include the respective dates of manufacture and sizes of batches. Dates on which the different tests were performed shall be shown in the test report.

b. The material supplier shall have facilities capable of testing in accordance with this specification, or the supplier shall identify a testing facility. Boeing Engineering and Quality Assurance shall verify the adequacy of test facilities and test procedures.

c. Qualification samples shall be submitted from each of three production batches for each candidate Type and Grade.

d. Qualified Products are listed in the Qualified Products List.

e. Production materials shall be capable of meeting all qualification requirements.

6.2 SAMPLES AND TEST REPORTS - VENDOR QUALIFICATION (Continued)

f. No changes in approved product formulation, raw materials, basic methods of manufacture, test methods, supplier inventory life, manufacturing plant site, authorized distributors, authorized re-packagers, or auxiliary storage locations shall be made without notification and prior approval in writing from The Boeing Company. It may be necessary to requalify material manufactured with the proposed change, and a revised product designation may be required.

g. The Supplier shall maintain a revision controlled list of all authorized distributors, re-packagers, and auxiliary material storage locations (foreign and domestic) for their qualified products. This list shall be either documented as part of the PCD or referenced within the PCD, and shall be made available to purchasers upon request.

h. The Supplier shall have a process for granting and maintaining authorized distributor, re-packager, or auxiliary storage location status documented or referenced in their PCD. This process shall include documentation of all time and temperature exposures during shipping between and storage at authorized distributors, re-packagers, or auxiliary storage locations. In addition, the process shall include a method to ensure that supplier inventory life is not exceeded when the material is handled by an authorized distributor, re-packager, or auxiliary storage location prior to shipment to a purchaser.

i. All qualification data, production records, and test data shall be kept on file for a minimum of seven years and shall be readily available for review.

j. Supplier Inventory Life for each type and class of material shall be established by the Supplier and documented in their PCD.

k. Supplier out-time for each type and class of material shall be established by the supplier based on supporting data and documented in their PCD.

6.3 PROCESS CONTROL DOCUMENT

a. Supplier shall submit a Process Control Document (PCD) for Boeing review and approval prior to qualification audits of production material.

b. The PCD shall document baseline raw material constituents, in-process test procedures and requirements, manufacturing procedures, alternate test methods, and procedures for dealing with issues of non-conformance in accordance with BSS7101. Rationale for the formulation and process parameters shall be supported by historical data and experimentation.

c. The PCD shall document a statistical process control (SPC) program as specified in Section 7.1.1.

6.4 QUALIFICATION AUDIT

a. Supplier shall submit to an audit of its manufacturing operations, quality control system, raw materials accountability system, product traceability, process records, test results, and quality assurance records.

b. Qualification audits shall be conducted during the manufacture of the qualification batches in accordance with BSS7101.

c. The Boeing Company reserves the right to perform an on-site audit of the manufacturing of any production order after qualification.

7 QUALITY CONTROL

7.1 SUPPLIER QUALITY CONTROL

a. The supplier shall verify that each production batch has been manufactured in accordance with an approved PCD. Verify that each lot of primer is shipped within the supplier inventory life documented in the PCD. If a lot of material will be handled by an authorized distributor, re-packager, or auxiliary storage facility ensure that sufficient Supplier Inventory Life is retained until DOS.

b. Supplier shall test each production batch in accordance with the requirements of Section 7.3 unless a reduced testing plan has been approved in accordance with Section 7.1.2. Each shipment shall be accompanied by a test report providing the results of such testing.

7.1.1 STATISTICAL PROCESS CONTROL (SPC)

a. The supplier shall establish and maintain procedures and requirements for an SPC system based on Key Characteristics (KC) and Key Process Parameters (KPP) in accordance with the requirements of this specification and BSS7286.

b. KCs are specified in Table I and Table II, and are average values only.

c. The process for selecting and documenting KPPs is described in Section 7.1.1.1.

TABLE III - SUPPLIER AND PURCHASER ACCEPTANCE TESTS

	TEST	REQUIREMENT	TEST REFERENCE	TEST REPLICATES PER UNIT
1.	Lap Shear at 75 ± 5 F (Bond with BMS5-101) FL 1	4375 psi min avg 4200 psi min ind.	Adhesive, BMS5-101, 8.1	1 bond assembly, 5 specimens
2.	Metal-to-Metal Peel at 75 ± 5 F (Bond with BMS5-101)	60 in-lb/in min avg 55 in-lb/in min ind.	Adhesive, BMS5-101, 8.1	1 bond assembly, 5 specimens
3.	Fluid Resistance FL 1 (1) Expose to BMS3-11 for 7 days (2) Expose to distilled H_2O for 7 days	Table I, Test 1	 8.2.2, 8.2.8 8.2.2, 8.2.8	 1 panel 1 panel
4.	Non-Volatile FL 3	Listed in QPL	8.2.13	3 measure-ments
5.	Viscosity FL 2	Listed in QPL	8.2.11	3 measure-ments
6.	Weight per Gallon FL 1, FL 2	Listed in QPL	8.2.12	3 measure-ments
7.	Quantitative Inhibitor Analysis FL 1	Listed in QPL	8.2.13	3 measure-ments
8.	Appearance	Table II, Test 1	None	1 observation

FL 1 Supplier Quality Control Test only.

FL 2 Not required for Type II.

FL 3 Key Characteristic (KC) - SPC required.

7.1.1.1 Key Process Parameters

a. The selection of KPPs shall be primarily the responsibility of the supplier and shall be documented in the PCD.

b. KPPs shall include those parameters which have been demonstrated to have the greatest affect on the KCs and the performance of the adhesive or primer materials.

c. The supplier shall establish the nominal target value and tolerance limits for each KPP. The inspection and SPC method for monitoring each KPP shall be documented in the PCD.

7.1.1.2 Analysis and Review of KCs and KPPs

a. The supplier shall conduct SPC analysis of all KCs and KPPs in accordance with BSS7286.

b. The procedures used to establish and calculate control limits shall be documented in the PCD. A minimum of the most recent and consecutive twenty batches of each Type, Class, Grade, or Style shall be used to establish the control limits.

c. If statistical analysis determines that a KC or KPP is out of control the supplier shall

(1) investigate the cause(s)

(2) eliminate any special causes of variation and re-establish control

d. If a KC is not capable, the supplier shall take corrective action to establish capability in accordance with BSS7286.

7.1.1.3 Reporting of Data

Suppliers shall provide Boeing Supplier Management (SM) summary reports of SPC data including control charts, nominal value, standard deviation, number of batches, and Cpk for each KC. SPC data must be submitted biannually. If the control limits differ from a previous report, suppliers shall report both the previous and the current control limits.

7.1.2 REDUCED TESTING

a. The supplier may establish a reduced testing plan based on the performance of the KPPs.

b. This plan shall be documented as a part of the supplier's PCD or as a part of its quality control plan.

c. If reduced testing is in place so that the reporting of test results is affected, the supplier must submit a certified test report which states the authorization for reduced testing. The test report must be easily understood and certify that the material meets the requirements of the BMS.

7.2 PURCHASER QUALITY CONTROL

a. Check the packaging, marking, and paperwork to ensure compliance with the appropriate sections of this specification and to ensure that the material was purchased from a QPL designated supplier or an authorized distributor, re-packager, or auxiliary storage facility of a QPL designated supplier.

7.2 PURCHASER QUALITY CONTROL (Continued)

b. Verify that all records of shipping and storage times and temperatures have been received with each shipment, and that the material meets the shipping requirements of Section 10 from the date the material was shipped from the supplier's manufacturing facility.

c. Lot numbers shall be established at the time of receival based on the date of material shipment and marked on each unit of primer received in the lot.

d. Purchaser Quality Assurance shall review all supplier test data submitted with the shipment and perform any additional inspection or testing necessary to assure that the production material meets all requirements specified herein. Purchaser shall test one unit of each lot in accordance with Section 7.3.

e. Purchaser shall test each lot of material in accordance with Section 7.3 at the frequency specified in Table IV unless purchaser testing requirements have been eliminated for that product in accordance with Section 7.2.f.

f. When a supplier has demonstrated consistent conformance to required testing in accordance with Section 7.1, Boeing (SM) may remove purchaser testing as a requirement for material procurement from that supplier. Boeing Quality Assurance documentation such as the appropriate D1-4426 Supplier Code will indicate which products are exempt from the purchaser testing requirement.

g. In addition to the tests specifically listed as acceptance tests, any other test described in Section 5 of this specification may be used to ensure that production shipments of adhesive primer conform to the requirements of this specification and are comparable to the material previously qualified.

h. When consistent conformance to specification acceptance (receiving)requirements has been demonstrated, Quality Assurance may implement reduced testing in accordance with a suitable sampling plan. Authorization of a reduced testing plan shall be approved by Boeing Quality Assurance.

7.3 SAMPLING, ACCEPTANCE, AND REJECTION CRITERIA

a. For acceptance testing, a unit is one container (normally 5 gallon capacity) of adhesive primer.

b. The units to be tested shall be randomly selected in accordance with Table IV for supplier testing. For purchaser testing randomly select one unit for testing.

c. Remove sufficient material from each of the units selected to perform each of the Tests listed in Table III.

d. Acceptance of each lot is contingent on test values meeting the requirements in Table III.

TABLE IV - SUPPLIER SAMPLING CRITERIA

NUMBER OF UNITS PER BATCH	UNITS TO BE TESTED FL 1
1 to 4	1
5 to 25	4
26 to 50	5
51 to 100	6

7.3 SAMPLING, ACCEPTANCE, AND REJECTION CRITERIA (Continued)

TABLE IV - SUPPLIER SAMPLING CRITERIA (Continued)

NUMBER OF UNITS PER BATCH	UNITS TO BE TESTED FL 1
101 to 200	7
201 to 300	8
301 to 500	10
over 500	15

FL 1 Table III, Tests 1, 2, 3, 5, and 6 - Test one unit per batch.

7.3.1 EVALUATION CRITERIA

a. Method for evaluation of Test 3 in Table III.

(1) Evaluate the Test results by the requirements listed in Test 1 of Table I.

(2) If all panels meet the requirements of Test 1, Table I, accept the lot.

(3) If any panels fail to meet the specified requirements, reject the lot.

b. Method for evaluation of Tests 4 through 7 of Table III.

(1) Perform each Test once on each unit of the sample size specified in Table IV. Perform tests to the replicate requirements of Table III.

(2) Compute the mean for each Test.

(3) Requirements for Tests 4 through 7 of Table III are listed in the QPL.

(4) If the mean is within the range listed in the QPL for each Test, accept the lot.

(5) If the mean is not within the range listed in the QPL, reject the lot.

8 MATERIAL TEST METHODS

WARNING 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 TEST SPECIMENS

a. Fabricate specimens for bonding properties tests to the configurations of the appropriate BSS standards. Panel size requirement shall insure that the required number of specimens for each test is achieved with one panel.

b. Panels for baked film property tests shall be in accordance with Table I.

c. Clean each test panel and anodize in accordance with BAC5555 or an alternate phosphoric acid anodizing (PAA) process approved by Boeing in the PCD.

8.1 TEST SPECIMENS (Continued)

d. Prime all test panels to a dry film thickness of 0.00015 to 0.00040 inches in accordance with BAC5514-589.

(1) Panels for bonding properties tests shall have a dry film thickness as close as possible to the maximum allowed thickness.

(2) Panels for the tests of Table I, shall have a dry film thickness as close as possible to the minimum allowed thickness.

e. Initiate primer cure between 0.5 and 24 hours following application of primer.

f. Bake the primed panels for 60 to 70 minutes at 250 ± 10 F.

g. Measure the cured primer thickness by an Isometer (Model No. 2.082), Permascope, or equivalent, on three randomly selected test panels primed by the same operator within the period of one work shift. This is sufficient to certify the entire prime load. If any of the panels selected fails to fall within the specified thickness range, each panel from the primed load in question shall be tested and discarded if it fails to meet the thickness requirement.

h. For bonding properties test panel assemblies, after the primer thickness has been approved, apply a layer of BMS5-101, Grade 10 film adhesive.

i. Cure the bonding properties test panel assemblies with the applicable section of BAC5514-5101.

8.2 TEST PROCEDURES

8.2.1 SALT SPRAY AND FILIFORM CORROSION

a. Salt spray tests shall be conducted on scribed panels with BMS5-89 primer only. Exposures shall be conducted in a nominal 5 percent salt spray chamber in accordance with BSS7249 for 40 days ± 1 day. Panel evaluation after salt spray exposures shall include adhesion in accordance with Section 8.2.2.

b. Filiform corrosion tests shall be conducted on BMS5-89 primed panels over coated with BMS10-79, Type II or III in accordance with BAC5882 followed by 4 ± 0.5 mils of BMS10-60, Type II enamel in accordance with BAC5845. The painted panels shall be scribed and exposed to nominal 12 percent normal HCl vapor for 60 ± 5 minutes at 75 ± 5 F, then placed immediately in an 80 ± 5 percent relative humidity environment for 30 days ± 12 hours. Panel evaluation after HCl exposures shall include adhesion in accordance with Section 8.2.2.

c. All panels shall be scribed through the finishes and any clad, to the base metal in two diagonal machined scribe marks extending from corner to corner. The scribe marks shall be 0.03 to 0.06 inch wide.

8.2.2 ADHESION

The panels shall be thoroughly dried by wiping with clean dry cheesecloth. The test shall be conducted at 70 to 80 F. Cut two parallel scratches approximately 1 inch apart, through the coating down to the metal, with a sharp-edge scribe. Apply a strip of 1-inch wide tape, 3M Number 250 (not more than 5 months old from date of manufacture) across the scratches at approximately 90 degrees to the panel area to be tested. The tape shall be pressed down using two passes of a 4.5 ± 0.5 pound rubber-covered roller approximately 3.5 inches in diameter by 1.75 inches in width. The durometer hardness of the roller surface shall be 70 to 80 Shore A. The tape may be pressed down by rolling the tape roll along the strip of applied tape using a firm hand pressure of approximately 4 to 5 pounds. The tape shall be removed in one abrupt motion perpendicular to the panel. The adhesion test shall be completed within 10 minutes after specimens are removed from environmental exposure.

8.2.3 COMPATIBILITY WITH SEALANTS

a. For compatibility with BMS5-95 and BMS5-142, apply BMS5-89 primer only. For compatibility with BMS5-45, apply BMS5-89 and BMS10-20, Type II.

b. After standard sealant cure, one specimen of each sealant type shall be completely immersed for 168 ± 2 hours at 120 ± 5 F in TT-S-735, Type III fluid. One specimen of each sealant type shall also be completely immersed in a 3 percent aqueous sodium chloride solution for 168 ± 2 hours at 120 ± 5 F. All jars shall be sealed with aluminum foil placed inside the lids. At the completion of the immersion period, the jars shall be removed from the heat source and allowed to return to 77 ± 5 F prior to removal of specimens. The test shall be completed within 20 hours after removal of jars from the heat source.

c. Test in accordance with BSS7257.

8.2.4 LOW TEMPERATURE SHOCK

The panels shall be subjected to 24 of the following cycles: 25 ± 1 minute at 150 ± 5 F, then within 5 seconds, 5 ± 1 minutes at -65 ± 5 F. On completion of the last cycle, the panels shall be placed in a cold box maintained at -65 ± 5 F for a minimum of 5 hours. The panels shall be rapidly bent over a nominal 4-inch diameter mandrel which has been conditioned at the same temperature. Panel evaluation after exposure shall include adhesion in accordance with Section 8.2.2.

8.2.5 HEAT RESISTANCE

The panels shall be placed in a mechanical convection oven maintained at 350 ± 10 F for 70 ± 1 hours. The panels shall be removed, cooled to 65 to 90 F and bent rapidly over a nominal 1-inch diameter mandrel. Panel evaluation after exposure shall include adhesion in accordance with Section 8.2.2.

8.2.6 METAL ANCHORAGE

The panels shall be bent through 180 ± 5 degrees over a conical mandrel in accordance with ASTM D 522.

8.2.7 IMPACT

The coated side of the panels shall be subjected to an impact 40 ± 1 inch-pounds using a Gardner 160-inch-pounds capacity impact testing machine. The 1.00 pound falling weight shall be used. The uncoated side of the panel shall be subjected to an impact 40 ± 1 inch-pounds using the same equipment. Apply 3M Number 250 masking tape over the most highly stressed area on the coated side of each impact spot and test in accordance with Section 8.2.2.

8.2.8 PENCIL HARDNESS

The pencil hardness of the primer shall be determined at 75 ± 10 F and 50 ± 10 percent relative humidity in accordance with BSS7263.

8.2.9 HUMIDITY RESISTANCE

The panels shall be placed in a 120 ± 5 F, 100 percent humidity chamber for 30 days. Panel evaluation after humidity exposure shall include adhesion in accordance with Section 8.2.2.

8.2.10 FLUID RESISTANCE

The panels shall be placed immersed in the applicable fluids. Fluids and exposure intervals shall be in accordance with Table I. Panel evaluation after exposure shall include adhesion in accordance with Section 8.2.2.

8.2.11 VISCOSITY

The viscosity shall be determined at 74 ± 3 F in accordance with BSS7234 or ASTM D 1084 if the Zahn cup method is used. The Zahn cup size to be used is listed in the QPL. If the Brookfield viscosity method is used, perform in accordance with ASTM D 2556.

8.2.12 WEIGHT PER GALLON

The weight per gallon of the primer shall be determined in accordance with ASTM D 1475 or ASTM D 1875.

8.2.13 NON-VOLATILE AND QUANTITATIVE INHIBITOR ANALYSIS

Perform the non-volatile and quantitative inhibitor analysis test in accordance with a Boeing approved alternate method or the following conventional method.

a. Tare three ignition-loss crucibles.

b. Add well-mixed bond primer to the crucibles and weigh. The recommended sample size is 1 to 2 milliliters.

c. Dry at 250 ± 5 F to constant weight. Constant weight is determined when successive weighing at minimum intervals of 30 minutes differs by 1 mg or less.

d. Cool to 65 to 90 F in a desiccator, and compute the percent non-volatile for each of the samples as follows:

$$\text{Percent Non} - \text{Volatiles} =$$

$$(\text{Weight of Non} - \text{Volatile residue/weight of the liquid sample}) \times 100$$

8.2.13 NON-VOLATILE AND QUANTITATIVE INHIBITOR ANALYSIS (Continued)

e. Place the crucibles in a furnace of 1050 F minimum for 60 minutes minimum.

f. Cool to 65 to 90 F in a desiccator, weigh, and compute average weight of samples. Compute percent quantitative inhibitor as follows:

$$\text{Percent Quantitative Inhibitor} = (\text{Weight of inhibitor residue/weight of non} - \text{volatile residue}) \times 100$$

g. Document according to the requirements for a key characteristic per Section 7.1.1.

9 MATERIAL IDENTIFICATION

Each container of the material shall be legibly marked with the following:

a. BMS Specification number (including latest revision letter), Type, Grade

b. Supplier's name, address and product designation

c. Batch number, to be assigned by supplier

d. Lot number, to be assigned by Purchaser Quality Assurance

e. Date of manufacture

f. Storage / shipment requirements (state temperature limitations when refrigeration is required)

g. Container number

h. Name and address of distributor, re-packager, or auxiliary storage facility if applicable.

i. Date of Shipment from supplier, distributor, re-packager, or auxiliary storage facility if applicable, whichever occurred last.

10 PACKAGING, MARKING AND SHIPPING

a. Packaging

(1) One-component materials shall be supplied in any size containers up to 5 gallons.

(2) In the case of two-component primers, preweighed kits shall be supplied with each component packaged separately. The larger component (Part A) shall be supplied in any size up to 5 gallons. The smaller component (Part B) shall be supplied in quantities such that when the total volumes of Parts A and B are mixed together, the mix ratio meets the requirements listed in the QPL.

(3) Each shipping container shall be durably and legibly marked on the outside with the following information:

b. Marking

(1) The BMS number, including the latest revision letter and the appropriate type, Class, Grade or part number.

(2) The supplier's name, address and product designation.

10 PACKAGING, MARKING AND SHIPPING (Continued)

(3) The date of manufacture

(4) The supplier's batch or lot number

(5) The purchase order number

(6) The quantity.

(7) Special storage, shipping or handling requirements.

(8) "Do not freeze" warning label (only applies to Type II and III)

(9) Name and address of distributor, re-packager, or auxiliary storage facility if applicable.

(10) Date of Shipment from supplier, distributor, re-packager, or auxiliary storage facility if applicable, whichever occurred last (required on shipping package only)

c. All labeling shall conform to 29CFR 1910.1200.

d. The temperature of the primer during shipment shall be as specified by Section 5.3.2.

e. Packaging shall be accomplished in such a manner as to assure delivery of material capable of meeting the requirements of this specification.

f. Shipping

(1) Ship and store all primer materials according to the requirements of Section 5.3.2.

(2) Temperature recorders are required with each lot of primer to be shipped from the supplier's manufacturing facility or from a supplier authorized distributor, re-packager, or auxiliary warehouse. Include sufficient temperature recorders with each lot shipped to ensure that all temperature excursions above the ranges noted in Section 5.3.2 and this Section are recorded.

(3) The use and placement of temperature recorders shall be in accordance with BSS7061.

(4) A system for material out-time tracking and control shall be implemented and maintained at all supplier authorized distributors, re-packagers, and auxiliary warehouses. This system must be capable of recording all out-time consumed at each facility for each lot of primer stored or shipped.

(5) During shipment and handling at authorized distributors, re-packagers, or auxiliary storage facilities, the material is allowed to accumulate a total of 16 hours of exposure at temperatures in excess of the requirements in Section 5.3.2, but not exceeding 90 F.