

**1 SCOPE**

- a. This specification covers resin systems primarily used for sealing and potting aluminum flame sprayed coatings for use with structural plastic parts.
- b. This specification requires Qualified Products.

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Authorizing Signatures on File

RESIN, SEALING AND POTTING, FOR  
FLAME SPRAY APPLICATION

**BMS**  
8-207F

**BOEING MATERIAL SPECIFICATION**

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## 2 CLASSIFICATION

This specification consists of the following Types and Classes.

### 2.1 TYPE

The type designates the resin system usage.

- Type I – Sealer Resin for Flame Spray Coatings
- Type II – Potting Resin for Correction of Flame Spray Coatings

### 2.2 CLASS

The class designates the end use of the flame sprayed coating with which the resin is used.

- Class 1 – For 250 F curing parts.
- Class 2 – For 350 F curing parts.

## 3 REFERENCES

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

- ASTM D 695 – Standard Test Method for Apparent Shear Strength of Single-Lap-Joint Adhesively Bonded and Metal Specimens by Tension Loading (Metal-to-Metal)
- ASTM D 792 – Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement
- ASTM D 1002 – Strength Properties of Adhesives in Shear by Tension Loading
- BSS7061 – Requirements for Time and Temperature Recorders used with Time and Temperature Sensitive (TATS) Materials.
- D6-53356 – Requirements for Process Control Documents for Suppliers of Non-Metallic Raw Materials
- OSHA 1910.1200 – Hazard Communication Standard

## 4 DEFINITIONS

Not applicable to this specification.

## 5 MATERIAL REQUIREMENTS

### 5.1 APPEARANCE

Each component shall be homogeneous material, and shall be free from foreign material, lumps and coarse particles.

### 5.2 STABILITY OR STORAGE LIFE

Each component shall be stable at 40 to 80 F for a minimum of one year. The stability or storage life shall be determined from date of receipt by procuring facility.

### 5.3 BLENDING

The manufacturer shall furnish information on the proper blending proportions of base resin and hardener or curing agent with qualification samples. The amount of hardener or curing agent shall be expressed in terms of parts by weight of base resin. Base resin and hardener shall blend readily to provide a uniform product with 2 to 3 minutes of hand mixing.

### 5.4 PHYSICAL AND MECHANICAL PROPERTIES

Each resin system shall meet the physical and mechanical property requirements listed in Table I when tested in accordance with Section 8 of this specification. Test a minimum of three specimens in each case. Tests shall be performed at  $75 \pm 5$  F unless otherwise specified.

**TABLE I PHYSICAL AND MECHANICAL PROPERTIES**

PROPERTY	TYPE I CLASS 1	TYPE I CLASS 2	TYPE II CLASS 1	TYPE II CLASS 2
Gel Time, Minutes – Minimum at $77 \pm 2$ F	20	20	30	30
Flow, Inches, Maximum				
at $77 \pm 2$ F	---	---	2.5	2.5
at $125 \pm 5$ F	---	---	2.5	2.5
Viscosity, CPS, Maximum Average <b>FL 1</b>	25,000	25,000	---	---
Density, Grams/cc, Maximum Average	1.3	1.3	1.6	1.6
Compressive Strength, PSI, Minimum Average	4,500	4,500	8,000	8,000
Compressive Modulus, PSI, Minimum Average	125,000	125,000	225,000	225,000
Tensile Shear, PSI, Minimum Average	800	800	1,000	1,000
Handling Properties	---	---	Satisfactory	Satisfactory
Immersion Fluids	Percent Weight Gain – Maximum Average			
MIL-S-3136, Type III Test Fluid	1.0	1.0	1.0	1.0
MIL-H-5606, Hydraulic Fluid	1.5	1.5	1.5	1.5
BMS3-11, Hydraulic Fluid	3.5	3.5	3.5	3.5
Distilled Water	2.0	2.0	2.5	2.5

**FL 1** Not applicable to Type I, Class 1.

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**QUALIFICATION**

- a. Suppliers seeking qualification to this specification shall comply with the requirements in this section.
- b. Prior to submitting a material for qualification to this specification, the material supplier shall provide a Material Safety Data Sheet and, if requested, a 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.
- c. Production material shall be capable of meeting all qualification requirements.

6.1

REQUEST FOR QUALIFICATION

Direct all requests for qualification to a Supply Management & Procurement (SM&P) organization of The Boeing Company. SM&P coordinates all communication between material suppliers and the appropriate Boeing department.

The following information shall be supplied in the request for qualification:

- a. The name of the supplier company and plant location.
- b. Supplier product designation for the candidate resin.
- c. BMS8-207 Classification (Type and Class) in accordance with the latest revision of this specification.
- d. Identification of the test facility (supplier or test laboratory) including location, test apparatus, and designated company official(s) or representative(s) responsible for the qualification program.
- e. For new material system, a certified test report that demonstrates the ability of the candidate resin to meet the requirements of this specification. Specific test requirements should be coordinated with Boeing Engineering.
- f. Description of facilities and equipment to be used to produce materials in accordance with this specification.

6.2

PREQUALIFICATION TESTING

As deemed necessary by The Boeing Company, the supplier shall submit production batch(es) of the candidate material for preliminary evaluation of material performance and part producibility to verify supplier-submitted test reports and to grant approval for full qualification testing.

6.3 PROCESS CONTROL DOCUMENT (PCD)

- a. Supplier shall submit a Process Control Document (PCD) for Boeing to review prior to qualification audits of production material.
- b. The PCD shall identify baseline chemical constituents, in-process test procedures and requirements, and manufacturing processes in accordance with D6-53356. Rationale for the formulation and process parameters shall be supported by historical data and by statistically designed or other types of experimentation.
- c. The PCD shall document and approve a reduced testing program in accordance with Section 7.1.1.

6.4 QUALIFICATION AUDIT

- a. The supplier shall submit to an audit of their production manufacturing operations, Quality Assurance system, raw materials traceability, process records, test procedures, test results, and quality assurance records.
- b. Qualification audits shall be conducted during the manufacture of the qualification batches in accordance with D6-53356.
- c. The Boeing Company reserves the right to perform an on-site audit of the manufacturing of any resin production order subsequent to qualification.

6.5 QUALIFICATION TESTING

6.5.1 MATERIAL QUANTITY

A minimum of one batch of each candidate resin material (for each Type and Class) shall be tested. Qualification samples shall consist of 1 gallon of the candidate base resin and an appropriate amount of the candidate hardener or curing agent.

6.5.2 TEST MATRIX

Testing of the qualification batches shall consist of the following:

- a. Physical and mechanical property testing in accordance with Section 8.
- b. Manufacturing evaluations.
- c. When deemed necessary by The Boeing Company, additional tests, such as morphology, porosity, as well as cure and processing characteristics may be required.
- d. Materials submitted for qualification shall be tested against the requirements of this specification both as-received and after exposure to the maximum storage and mechanical life periods and shall also be evaluated for manufacturing suitability.

6.5.3 RESPONSIBILITY FOR TESTING

- a. Physical, mechanical, and chemical property tests shall be performed by the supplier and The Boeing Company.
- b. Manufacturing evaluations shall be performed by The Boeing Company.
- c. At the discretion of The Boeing Company, any required additional tests may be performed jointly by The Boeing Company and the supplier.

#### 6.5.4 TESTING LABORATORY

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 all test facilities and test procedures.

#### 6.5.5 TEST DATA REPORTS

- a. When requested by The Boeing Company Materiel Department, the supplier shall submit two copies of test data including individual specimen values, show the candidate material meets all the requirements of this specification for the Type and Class.
- b. All qualification tests may be repeated at any time by The Boeing Company and the material shall be capable of meeting all qualification requirements.

#### 6.6 QUALIFICATION APPROVAL

- a. Qualification approval of the candidate material shall be granted subject to the requirements of Sections 6.6.1 and 6.6.2.
- b. Qualified products are listed in the Qualified Products List.
  - (1) Classification of the material.
  - (2) Supplier name and manufacturing plant address.
  - (3) Supplier product designation.
  - (4) Qualifying Boeing Division.
  - (5) Product approval date.
- c. No changes in approved product formulation, raw materials, basic methods of manufacture, or plant site for material qualified to this specification 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.

#### 6.6.1 PRODUCT APPROVAL

- a. After review of the supplier data and completion of the Boeing tests, the supplier will be advised of qualification status in writing. Product approval requires successful completion of all qualification tests required in Section 6.5.
- b. Product approval shall be for the candidate resin and the specific manufacturing process associated with the manufacture of the resin which shall include raw materials, equipment, facilities and procedures used as documented in the supplier PCD.

6.6.2 PROCESS CONTROL DOCUMENT (PCD) APPROVAL

- a. The PCD shall be approved in writing by The Boeing Company after the successful resolution of all comments.
- b. The PCD shall be approved concurrently with the approval of the candidate material.
- c. The supplier shall maintain the Boeing approved PCD to the current specification revision.

**7 QUALITY CONTROL**

7.1 SUPPLIER QUALITY CONTROL

- a. A manufacturer shall not begin to supply materials to this specification until they have received written notice that the qualification sample submitted by them has been approved.
- b. Each production shipment of qualified material from outside The Boeing Company shall be accompanied by a test report (giving actual test data of mixed materials obtained from the batch(es) contained in that production shipment) showing conformance with the following test requirements:
  - (1) Viscosity (Type I only)
  - (2) Flow (Type II only)
  - (3) Gel Time (Types I and II)
  - (4) Density (Types I and II)
  - (5) Compressive Strength (Types I and II)

7.1.1 SUPPLIER REDUCED TESTING

- a. In lieu of performing the tests listed in Section 7.1, a supplier may request reduced testing. Requests for reduced testing plans shall be directed to a Materiel Department of The Boeing Company.
- b. Reduced testing plans may be based on historical data, calculated capability of the key characteristics (KCs) and performance of key process parameters (KPPs). Reduced testing plans shall be referenced in the PCD and shall be approved by The Boeing Company.
- 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 (for example, specification provision Section 7.1x. or PCD provision). The test report must be easily understood and certify that the material meets the requirements of the BMS

7.2 PURCHASER QUALITY CONTROL

Purchaser Quality Assurance shall review all supplier test data submitted with shipment and perform any additional inspection or testing necessary to assure that the production material meets all requirements specified herein.



## 7.2.1 PURCHASER REDUCED TESTING

When consistent conformance to the 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.

## 8 MATERIAL TEST METHODS

The test methods described below shall be used. Request for use of an equivalent test method shall be directed to a Supply Management & Procurement (SM&P) department of The Boeing Company. Requests for deviation in test methods must include data demonstrating that the alternate method is statistically equivalent to the specification method. Use of the equivalent test methods shall be referenced in the PCD and shall be approved by the responsible Boeing Engineering Group(s).

### 8.1 PREPARATION OF TEST SPECIMENS

Materials from which specimens are to be made shall be blended and cured according to Table II.

**TABLE II BLEND AND CURE SCHEDULE FOR BMS8-207 COMPOUNDS**

MATERIAL	BASE RESIN		CATALYST		CURE CYCLE SUFFICIENT FOR HANDLING, DRILLING, SANDING
	SUPPLIER NO.	PARTS BY WEIGHT (NOMINAL)	SUPPLIER NO.	PARTS BY WEIGHT (NOMINAL)	
Type I, Class 1	3M EC 1838 A	50	3M EC 1838 B	50	2 Hrs. Minimum at 115 ± 10 F
	Cytec Fiberite MXR 7774 A	100	Cytec Fiberite MXR 7774 B	47	2 Hrs. Minimum at 130 ± 10 F
Type I, Class 2	Fiber-Resin FR-40 or EY-0540 A	100	Fiber Resin 5413 C or EY-0043 B	15	12 Hrs. Minimum at 75 ± 10 F Alt.- 1 Hr. Minimum at 160 ± 10 F
Type II, Class 2	Fiber-Resin FR 8840 A or EY-1540 A	100	Fiber-Resin FR 8840 B or EY-1540 B	15 to 20	24 Hrs. Minimum at 75 ± 10 F Plus 1 Hr. Minimum at 300 to 350 F
	Furane Products Co. Epocast 1613 A	100	Furane Products Co. Epocast 1613 B	20	24 Hrs. Minimum at 70 ± 10 F Plus 1 Hr. Minimum at 300 to 350 F

8.2

GEL TIME

- a. Condition material components to a temperature of  $77 \pm 2$  F.
- b. Blend the components in accordance with Table II, except that the blending operation shall be discontinued as soon as a uniform mixture is obtained.
- c. Measure gel time with a Sunshine Gel Time Meter using the following meter specifications (all dimensions nominal):

Contact Gap	– 0.375 inch
Rod Size	– 0.25 inch diameter by 6.0 inches
Torsion Spring Diameter	– 0.010 inch
Torsion Spring Length Between Clamps	– 1.105 inch

Alternate methods of determining gel time may be used with divisional engineering approval.

- d. Fill a 100 ml glass beaker to a depth of 1.25 inches (nominal) with the thoroughly blended compound.

**NOTE:** Record the exact time of completion of the blending. Keep beaker from turning during test.

- e. Insert one end of the 6 inch long, 0.25 inch diameter, glass rod into the compound to a depth of approximately 1 inch, at the approximate center of the beaker. Connect the other end of the glass rod to the Gel Meter and immediately start the motor.
- f. Close the test switch, which starts the timer, as soon as the spindle is rotating smoothly.

**NOTE:** Record the exact time of starting the timer.

- g. When the gel point is reached, the pronounced increase in the viscosity of the compound will stop the spindle rotation causing the actuating switch to stop the spindle motor and the timer and actuate the visible and audible signals.
- h. Record the Total Elapsed Time from the completion of the blending to the stopping of the timer as the Gel Time.

8.3

FLOW

a. Flow at  $77 \pm 2$  F.

- (1) Combine a total of 100 grams (nominal) of blended compound (resin plus hardener). Hand mix for 2 to 3 minutes at  $77 \pm 2$  F, and allow to stand for 2 minutes (nominal).
- (2) With the test fixture in the horizontal position, insert the mixed compound so that the recess is filled flush with the surface of the fixture (see Figure 1).
- (3) Immediately place the fixture in a vertical position and push out the compound with a plunger. The fixture shall remain in this position for 30 minutes (nominal) at  $77 \pm 2$  F.
- (4) At the end of the 30 minute period, measure the maximum movement, in inches, of the compound from the lip of the recess to the final position. If the lowest point is not in contact with the surface of the fixture, the horizontal projection of the point onto the plane of the fixture shall be measured. The test fixture may be coated with a parting agent to aid in removal of the cured compound.

b. Flow at  $125 \pm 5$  F.

The test method outlined in Section 8.3a. shall be followed with the exception that during the 30 minute (nominal) test period the fixture shall be in a circulating air oven at  $125 \pm 5$  F.

### 8.3 FLOW (Continued)

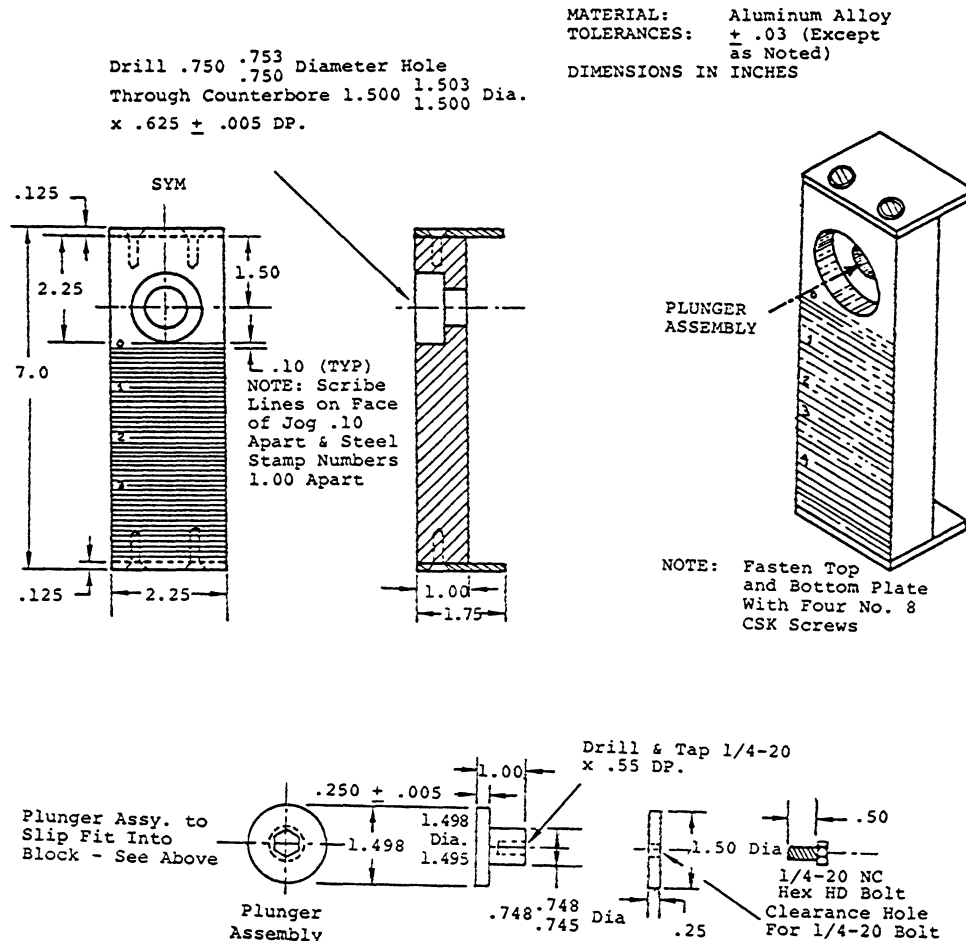


FIGURE 1 FLOW TEST JIG

### 8.4 VISCOSITY

- Viscosity determination shall be made on freshly mixed compound with a Brookfield viscometer, using a number 6 spindle operating at 20 RPM (nominal).
- The compound and the viscometer shall be at a uniform temperature of  $75 \pm 5$  F during the test. The compound shall be stirred with a spatula immediately before testing.
- Readings shall be taken when the indicator first assumes a steady position, or 1 minute maximum, after release of the clutch.
- Record an average of three readings, in centipoises, from each specimen.

### 8.5 DENSITY

Density determination shall be made on cured compound. Density shall be determined according to ASTM D 792, Method A. The test shall be performed at  $75 \pm 5$  F.

8.6 COMPRESSIVE STRENGTH AND COMPRESSIVE MODULUS

Determine compressive strength of materials according to ASTM D 695, at  $75 \pm 5$  F. A prism of square cross section 0.5 by 0.5 by 1 inch (nominal) shall be the specimen size.

Calculate compressive modulus by drawing a tangent to the initial linear portion of the stress-strain curve, selecting any point on this straight line, and dividing the compressive stress represented by the corresponding compressive strain. The result shall be expressed in pounds per square inch.

$$\text{Formula : } \frac{\text{Stress}}{\text{Strain}} \div \text{Cross Sectional Area} = E_c, \text{ Modulus of Elasticity}$$

8.7 TENSILE SHEAR STRENGTH

Tensile shear strength test methods and test specimens shall be in accordance with ASTM D 1002 at  $75 \pm 5$  F. Bonding pressure shall be sufficient to obtain a bond line thickness of 0.01 inch (maximum). A minimum of 5 psi pressure is recommended. 2024-T3 clad aluminum alloy, 0.063 inch thick (nominal), shall be used for preparation of the test panel.

8.8 HANDLING PROPERTIES

Combine 100 parts of the base resin with the required amount of hardener as described in Table II. Hand mix for 2 to 3 minutes. Wearing a pair of clean white gloves, roll the mixture between the hands, forming a sphere with a diameter of approximately 2 inches. Compress the sphere between the palms, forming an oblate spheroid with the gloved hands and observe the condition of the potting compound. Report handling properties as satisfactory if the potting compound does not crumble and does not leave excessive residue on the gloves. Report handling properties as not satisfactory if the potting compound cracks and breaks into small pieces and/or clings to the gloves when released from the gloved hands.

8.9 RESISTANCE TO AIRCRAFT FLUIDS AND MOISTURE

- a. Cut specimens of the material 0.5 by 0.5 by 0.5 inch (nominal) from a cast, cured block of material.
- b. Weigh the specimens to the nearest 0.001 gram.
- c. Immerse five specimens in each of the following test fluids for 24 hours (minimum) at  $75 \pm 5$  F.
  - (1) MIL-S-3136 Type III Test Fluid
  - (2) MIL-H-5606 Hydraulic Fluid
  - (3) BMS3-11 Hydraulic Fluid
  - (4) Distilled Water
- d. Following immersion, remove the specimens, and quickly wipe dry with a soft cloth and weigh.
- e. Calculate the percent weight increase from the equation:

$$\frac{\text{Final Weight} - \text{Initial Weight}}{\text{Initial Weight}} (100) = \text{Percent Weight Increase}$$

**9 MATERIAL IDENTIFICATION**

Each container of a component BMS8–207 material shall be legibly and durably marked with the following information:

- a. BMS number, with the latest revision letter, Type and Class
- b. Manufacturer's name and the product designation
- c. Manufacturer's batch or lot number
- d. Blending proportions
- e. Date of manufacture
- f. Purchase order number
- g. Quantity
- h. Recommended storage temperature

**10 PACKAGING AND MARKING**

- a. BMS8–207 shall be furnished in 1 quart kits unless otherwise specified.
- b. Each component of each kit shall be packaged in a clean, air–tight containers of a type that will not contaminate the contents.
- c. Packaging shall be accomplished in such a manner as to assure delivery of material capable of meeting the requirements of this specification.
- d. All labeling shall conform to OSHA 1910.1200.
  - (1) BMS number, with the latest revision letter, Type and Class
  - (2) Manufacturer's name and the product designation
  - (3) Manufacturer's batch or lot number
  - (4) Date of manufacture
  - (5) Purchase Order Number
  - (6) Quantity
  - (7) Recommended storage temperature.

**10.1 SHIPPING**

- a. Ship and store materials between 40 and 80 F.
- b. Include sufficient temperature recorders with each lot shipped to assure all temperature excursions outside the range are recorded.
- c. The use and placement of temperature recorders shall be in accordance with BSS7061.