1 SCOPE

a. This specification covers room temperature curing two–part epoxy adhesives for general purpose usage where high shear and/or compression strength is required.

b. This specification requires qualified products.

1.1 CONTENTS

Will be added prior to release.

2 CLASSIFICATION

The materials covered by this specification are classified as to Type, Class and Grade.

2.1 TYPE

The Type designates range of usage temperature.

Type I	–	From –67 to 180 F
Type II	–	From –67 to 300 F

2.2 CLASS

The Class defines the peel strength level.

Class 1	–	High peel strength
Class 2	–	Low peel strength

2.3 GRADE

The Grade designates whether bond line thickness control ingredients have been incorporated into the adhesive.

Grade A	–	Without bond line thickness control ingredients
Grade B	–	With bond line thickness control ingredients

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 indicated herein.

ASTM D 695	–	Compressive Properties of Rigid Plastics
ASTM D 2471	–	Gel Time and Peak Exothermic Temperature of Reacting Thermosetting Resins
BAC5514	–	Common Bonding Requirements for Structural Adhesive
BAC5555	–	Phosphoric Acid Anodizing of Aluminum for Structural Bonding
BAC5765	–	Cleaning and Deoxidizing Aluminum Alloys
BMS5–89	–	Corrosion Inhibiting Adhesive Primer
MMM–A–132	–	Adhesives, Heat Resistant, Airframe Structural, Metal to Metal

4 DEFINITIONS

A batch of adhesive is defined as a homogenous quantity of material manufactured at one time or representing a blend of several manufactured units of the same formulation.

5 MATERIAL REQUIREMENTS

5.1 GENERAL

a. Materials shall be uniform, contain no lumps or unmixed ingredients, and to be free from foreign materials.

b. Each of the two parts of the adhesive shall be capable of being easily mixed using either mechanical or manual methods.

c. The two parts of the adhesive shall be capable of being easily blended to form a homogeneous adhesive of uniform consistency and color.

5.2 COLOR OF ADHESIVES

a. The base resin and hardener shall be of different colors to show that complete mixing is achieved when a uniform color results.

b. Mixed adhesives shall have the following colors:

Type I	Class 1	Grade A – Blue
Type I	Class 1	Grade B – Raspberry
Type II	Class 2	Grade A – Gray

5.3 PHYSICAL PROPERTIES

The adhesives shall meet the requirements of Table I.

5.4 STORAGE AND SHELF LIFE

The adhesives shall meet the requirements of tests shown in Table I when stored in original unopened containers for the following periods of time:

TYPE	SUPPLIER PRODUCT DESIGNATION	STORAGE LIFE **FL 1**	STORAGE TEMP
I	All	1 Year	77 F or Below
II	EA934NA	1 Year 90 Days	40 F or Below 77 F or Below
II	EA9394	1 Year	77 F or Below
II	EA9394S	1 Year	77 F or Below

FL 1 From Date of Shipment

6 QUALIFICATION

a. All requests for qualification shall be directed to a Materiel Department of the Boeing Company which will request data and samples when desired for qualification purposes. Materiel will forward the request to the appropriate Engineering Department for evaluation. After receiving written authorization from Materiel, the manufacturer shall submit the data and samples required for qualification purposes.

b. Qualification will require submittal of general information and test data indicating complete comformance with the requirements of this specification.

c. Two–part epoxy adhesives previously qualified to MMM–A–132, need only be tested for immersion in BMS3–11 hydraulic fluid and MIL–L–23699 Lubricating Oil. Copies of the MMM–A–132 qualification report and results of the above immersion tests are required for qualification to this specification.

d. No changes in approved product formulation, critical raw material, basic methods of manufacture, or plant site shall be made without notification and prior approval in writing. Requalification of the revised material may be required and a revised supplier designation may be requested. Qualified products will be listed in the QPL.

7 QUALITY CONTROL

7.1 SUPPLIER QUALITY CONTROL

Suppliers shall furnish actual test data showing comformance to Table II for each batch of material, and shall identify such data with the specification revision letter in effect.

7.2 PURCHASER QUALITY CONTROL

a. Purchaser Quality Control 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 the requirements specified herein.

7.2 PURCHASER QUALITY CONTROL (Continued)

b. When consistent performance to specification acceptance (receiving) requirements has been demonstrated, Quality Control may implement reduced testing in accordance with a suitable sampling plan. Authorization of a reduced testing plan shall be on a Boeing Company basis and shall be documented on Boeing Company documentation for evaluation. After receiving written authorization for material (for example, Receiving Inspection Plan, block memo, etc.) the manufacturer shall submit the data and samples required for qualification purposes.

TABLE I PHYSICAL PROPERTY REQUIREMENTS

PROPERTY	TYPE 1 **FL 1**				TYPE II **FL 1**				SECTION FOR TEST METHOD
	CLASS 1		CLASS 2		CLASS 1		CLASS 2		
	MIN. AVG	MIN. INDIV	MIN. AVG	MIN. INDIV	MIN. AVG	MIN. INDIV	MIN. AVG	MIN. INDIV	
Lap Shear Strength, psi									8.1
A. at 75 ± 5 F	4000	3800	4000	3800	2500	2250	2500	2250	
B. at 180 ± 5 F	1000	750	1000	750	2000	1800	2000	1800	
C. at 300 ± 5 F	– – –	– – –	– – –	– – –	1000	750	1000	750	
D. at –67 ± 5 F	3500	3300	3500	3300	2250	2000	2250	2000	
E. at 75 ± 5 F after 30 day salt	3600	3400	3600	3400	2250	2000	2250	2000	
F. at 75 ± 5 F after 30 day at 120 F /100 percent R.H.	3600	3400	3600	3400	2250	2000	2250	2000	
G. at 75 ± 5 F after 30 day soak in distilled water	3600	3400	3600	3400	2250	2000	2250	2000	
H. at 75 ± 5 F after 7 day soak in: 1–hydraulic fluid, petroleum base in accordance with MIL–H–5606									
2–hydraulic fluid, synthetic base, fire resistant in accordance with BMS3–11 Type II									
3–JP4 Engine Fuel in accordance with MIL–T–5624									
4–lubricating oil synthetic base in accordance with MIL–L23699									
T–Peel, lbs/inch	35	30	– – –	– – –	15	10	– – –	– – –	8.1
Pot–Life, minutes, min. avg.	30								8.2
Compressive Strength, psi, minimum average	– – –		– – –		– – –		– – – 15,000		8.3

FL 1 Property requirements are the same for Grades A and B.

7.2 PURCHASER QUALITY CONTROL (Continued)

TABLE II SUPPLIER QUALITY CONTROL REQUIREMENTS

TYPE I		TYPE II	
CLASS 1	CLASS 2	CLASS 1	CLASS 2
Pot Life – Table I	Pot Life – Table I	Pot Life – Table I Lap Shear at 300 F – Table I	Pot Life – Table I Lap Shear at 300 F – Table I
T–Peel – Table I		T–Peel – Table I	Compression – Table I

8 MATERIAL TEST METHODS

8.1 LAP SHEAR AND T–PEEL

a. Use aluminum alloy panels as described in MMM–A–132 for all tests.

b. Five specimens are required for each property test.

c. Prepare test panels for bonding by surface treatment in accordance with one of the following methods:

(1) Clean in accordance with BAC5514, Solution 1.

(2) Clean in accordance with BAC5555.

(3) Clean in accordance with BAC5765 then prime in accordance with BMS5–89.

d. Mix thoroughly a suitable quantity of test adhesive using the proportions of hardener and base resin given in the QPL.

e. Apply the uniform coating of mixed adhesive to all faying surfaces of the test panels. For Grade A materials, control bondline thickness between 0.003 and 0.010 inch with shims or fine inert threads in the discard potions of the bonded specimens. Grade B adhesives contain bondline thickness control ingredients. Do not use shims or threads when testing Grade B materials.

f. Assemble the test panels and apply 5 to 10 psi contact pressure to insure uniform adhesive squeezeout and the removal of entrapped air.

g. Cure at room temperature for 72 hours or at 150 $\pm$ 20 F for 130 $\pm$ 10 minutes before proceeding in accordance with MMM–A–132.

h. Report test values, mode of bond failure, and bondline thickness.

8.2 POT LIFE

Measure the pot life time according to ASTM D 2471 using a 100 gram sample blended for 2 minutes. The mix ratios are given in the QPL.

8.3 COMPRESSIVE STRENGTH

Compressive strength of materials shall be determined according to ASTM D 695 except specimen size shall be 0.5 inch diameter and 0.125 inch long.

NOTE: Vacuum de–aerating of the blended mix prior to application is recommended to minimize voids. (Use 25 inches of mercury until foaming slows down. Release vacuum periodically to collapse excess foam).

9 MATERIAL IDENTIFICATION

Each container shall be durably and legibly marked with the following:

a. BMS5–109 (including latest revision letter), Type, Class, and Grade of adhesive

b. Supplier’s name and product designation

c. Date of manufacture and date of shipment

d. Batch number

e. Quantity

f. Mix ratio per QPL

10 PACKAGING AND MARKING

a. Packing shall be such as to insure safe delivery

b. Mark each container durable and legibly with the following information:

(1) BMS5–109 (including latest revision letter), Type, Class, and Grade of adhesive

(2) Supplier’s name and product designation

(3) Date of manufacture and date of shipment

(4) Batch number

(5) Quantity

(6) Purchase order number

c. Labels shall conform to OSHA 1910.1200, HAZARD COMMUNICATION STANDARD.