1 SCOPE

a. This specification establishes the requirements and tests for vendor qualification and purchaser inspection of structural film adhesives suitable for use in bonding and stabilization operations in the fabrication of low–temperature (250 F), autoclave–cured, fiberglass epoxy, aramid fabric/epoxy, and aramid fabric/graphite–epoxy structural parts.

b. 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)

LIST OF FIGURES

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2 CLASSIFICATION

2.1 TYPES

Type 1 – Reserved for future use.

Type 2 – Adhesive in film form, also for use as a surfacer – Inactive for new design.

Type 3 – Reserved for future use.

Type 4 – Adhesive in film form. Not for use as a surfacer.

2.2 CLASSES

If no Class designation is indicated on the Engineering drawing, then any Class may be used. Class designations for Type 2 and Type 4 shall be by Roman numeral to designate degree of tack and by letter to designate allowed handling and mechanical life and storage temperature.

Class I adhesives have a high degree of tack.

Class II adhesives have a low degree of tack.

Class A adhesives shall have 5 days handling and mechanical life at 90 F or below and storage life of 90 days when stored at zero F or below.

Class B adhesives shall have 5 days handling and mechanical life at 90 F or below and storage life of 180 days when stored at zero F or below.

Class C adhesives shall have 10 days handling and mechanical life at 90 F or below and storage life of 180 days when stored at zero F or below.

Class D adhesives shall have 10 days handling and mechanical life at 90 F or below and storage life of 1 year when stored at zero F or below.

Class E adhesives shall have 20 days handling and mechanical life at 90 F or below and storage life of 1 year when stored at zero F or below.

2.3 GRADES

Nominal weight requirements for each grade are as follows:

TABLE I ADHESIVE GRADE REQUIREMENTS

GRADE	NOMINAL FILM WEIGHT (lb/ft^2)	NOMINAL FILM THICKNESS (INCHES) **FL 1**
5	0.030	0.005
7	0.045	0.007
10	0.060	0.010
15	0.085	0.015

FL 1 Nominal film thickness listed for reference only.

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 1781	–	Method for Climbing Drum Peel Test for Adhesives
BAC5317–2	–	Manufacture of Low Temperature Autoclave Cured Epoxy Structural Parts
BAC5317–5	–	Manufacture of Advanced Composite Structural Parts, 250 F Cure
BAC5514	–	Common Bonding Requirements for Structural Adhesives
BAC5514–589	–	Application of Corrosion Inhibiting Adhesive Primer
BAC5555	–	Phosphoric Acid Anodizing of Aluminum for Structural Bonding
BSS7061	–	Requirement for Time and Temperature Recorders used with Time and Temperature Sensitive (TATS) Materials
BSS7101	–	Requirements for PCD System for Suppliers of BMS Materials
BSS7201	–	Fatigue, Lap, Adhesive Bond
BSS7202	–	Shear, Lap, Adhesive Bond
BSS7204	–	Creep, Lap, Adhesive Bonded
BSS7205	–	Tension, Flatwise, Adhesive Bonded
BSS7206	–	Peel, Metal–to–Metal, Adhesive Bonded
BSS7210	–	Environmental Exposure, Salt Spray
BSS7211	–	Environmental Exposure, High Humidity
BSS7212	–	Environmental Exposure Fluids
BSS7286	–	SPC of Designated Engineering Characteristics
D1–4426	–	Approved Process Sources
OSHA 1910.1200	–	Hazard Communication Standard

4 DEFINITIONS

The following definitions apply to all materials covered by 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 adhesive manufactured under controlled conditions during a single manufacturing run.

Date of Manufacture (DOM) – The date that all filming operations on a batch of film adhesive or 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.

Handling Life – The total out–of–refrigeration time from DOM to final vacuum bagging at a purchaser.

Key Characteristic (KC) – A feature whose variation has a substantial impact on the fit, performance, service life, or manufacturability of the product from the standpoint of the customer.

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 adhesive from one adhesive batch received on one shipment.

Lot Size – The total number of units in any one lot irrespective of the volume of the container or length of roll.

Mechanical Life – The total out–of–refrigeration time from DOM to the start of cure at a purchaser.

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.

Re–packager – An intermediate between the supplier and the purchaser who handles, re–packages, stores, and allocates material.

4 DEFINITIONS (Continued)

Statistical Process Control (SPC) – A systematic method of tracking, predicting and minimizing variation over time. It shall include tools to monitor the stability of a process over time, and have means to establish the ability of the process to conform to applicable tolerance limits. This involves the use of control charts and capability indices.

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.

Supplier Out–time – The time that a material is exposed to temperatures above 0 F and below 90 F at the supplier's manufacturing facility prior to shipping.

Unit – The smallest, single portion of adhesive received in any one lot; such as a single roll of adhesive.

5 MATERIAL REQUIREMENTS

All adhesive materials shall be thermosetting and capable of being cured at 225 to 250 F within 90 minutes. They shall be of uniform quality and visibly free, without magnification, of foreign materials.

5.1 PROPERTIES

5.1.1 PROPERTIES OF TYPE 2 BONDED SPECIMENS

a. All metal–bonded specimens shall be surface treated in accordance with BAC5555, primed with BMS5–89 in accordance with BAC5514–589, and bonded in accordance with BAC5514. Construction materials for test specimens shall be as specified in Table IV. Requirements for fiberglass substrates are specified in Section 8.1.

b. Requirements are given in Table II and Table III. The calculated minimum average value, or minimum individual value for each test shall equal or exceed the minimum requirement.

5.1.1 PROPERTIES OF TYPE 2 BONDED SPECIMENS (Continued)

TABLE II MINIMUM PROPERTIES OF TYPE 2 METAL–TO–METAL ADHERENDS FL 3

TEST **FL 5**	TEST TEMPERATURE (F)	NUMBER OF SPECIMENS REQUIRED		MINIMUM VALUE	BSS TEST METHOD REFERENCE
		PER BATCH **FL 1**	TOTAL		
Shear Class IA, Class IIA, all Grades Class IIB, all Grades Class IIC, Grade 5 Class IIC, Grades 7, 10, and 15 Class IE, Class IIE, all Grades	75 ± 5 F	10	30	**FL 2** 4200 PSI 3800 PSI 4200 PSI 4900 PSI 4200 PSI	BSS7202, Specimen Type I
Shear	–67 ± 2	5	15	3700 PSI **FL 4**	BSS7202, Specimen Type I
Shear	250 ± 5	5	15	600 PSI **FL 4**	BSS7202, Specimen Type I
Fatigue	75 ± 5	3	9	10^7 CYCLES AT 1200 PSI	BSS7201 Test Method, BSS7202, Specimen Type I–a
Creep–Rupture–Deformation under 1600 ± 25 psi stress for 192 hours ± 1	75 ± 5	5	15	0.015 inch maximum	BSS7204, Specimen Type I
Creep–Rupture–Deformation under 1600 ± 25 psi stress for 192 hours ± 1	180 ± 5	5	15	0.015 inch maximum	BSS7204, Specimen Type I
Shear after 30 days minimum under 100 percent RH at 120 ± 5	75 ± 5	5	15	3400 PSI **FL 4**	BSS7211, BSS7202, Specimen Type I
Shear after 30 days minimum salt spray exposure at 95 ± 5	75 ± 5	5	15	3500 PSI **FL 4**	BSS7210, BSS7202, Specimen Type I
Shear after 7 days minimum immersion in JP–4 fuel (MIL–J–5624) at 75 ± 5	75 ± 5	5	15	3800 PSI **FL 4**	BSS7212, BSS7202, Specimen Type I
Shear after 7 days minimum immersion in JP–4 fuel (TT–S–735) at 75 ± 5	75 ± 5	5	15	3700 PSI **FL 4**	BSS7212, BSS7202, Specimen Type I
Shear after 7 days minimum immersion in Type 3 hydraulic fluid (BMS3–11) at 150 ± 5	75 ± 5	5	15	3800 PSI **FL 4**	BSS7212, BSS7202, Specimen Type I
Metal–to–Metal Climbing Drum Peel	75 ± 5	5	15	44 IN–LB/IN **FL 4**	BSS7206 (0.020 peeling sheet, 0.040 backing sheet)

FL 1 Per batch for three batches for qualification.

FL 2 Determination of Calculated Minimum Value: $X_{min} = X_q - 3.064\ S_q$, where X_q and S_q are the qualification mean and qualification standard deviation of all the individual measurements from all the batches of a particular grade, respectively.

FL 3 Adherends shall be primed with BMS5–89 primer in accordance with BAC5514–589.

FL 4 Minimum average requirement.

FL 5 Tests apply to all classes and all grades, except as noted.

5.1.1 PROPERTIES OF TYPE 2 BONDED SPECIMENS (Continued)

TABLE III TYPE 2 BONDED SPECIMEN REQUIREMENTS – BMS8–79 SUBSTRATE

TEST	CLASS	TEST TEMPERATURE (F)	NUMBER OF SPECIMENS REQUIRED		MINIMUM AVERAGE		MINIMUM INDIVIDUAL		TEST METHOD SECTION
			PER BATCH	TOTAL	GR 5, GR 7	GR 10, GR 15	GR 5, GR 7	GR 10, GR 15	
Single Lap Shear **FL 1**	IA, IIA, IIB, IIC, IE, IIE	75 ± 10	10	30	3200 psi	3200 psi	2900 psi	2900 psi	8.1
Honeycomb Peel **FL 1**	IA, IIA, IIB, IIC	75 ± 10	10	30	35 in–lb/ 3 inch width	35 in–lb/ 3 inch width	30 in–lb/ 3 inch width	30 in–lb/ 3 inch width	8.2
Honeycomb Peel **FL 1**	IE, IIE	75 ± 10	10	30	35 in–lb/ 3 inch width	55 in–lb/ 3 inch width	30 in–lb/ 3 inch width	50 in–lb/ 3 inch width	8.2
Single Lap Shear after prebond exposure **FL 2**	IE, IIE	75 ± 10	10	30	3200 psi	3200 psi	2900 psi	2900 psi	8.1
Honeycomb Peel after prebond exposure **FL 2**	IE, IIE	75 ± 10	10	30	35 in–lb/ 3 inch width	55 in–lb/ 3 inch width	30 in–lb/ 3 inch width	50 in–lb/ 3 inch width	8.2

FL 1 Supplier and purchaser quality control test

FL 2 Prebond exposure of the adhesive film prior to layup to 90 ± 5 F, 65 percent RH prior to bonding for the handling and mechanical duration in accordance with the class designation.

TABLE IV TYPE 2 TEST SPECIMEN MATERIALS

TEST SPECIMEN	MATERIALS OF CONSTRUCTION
Lap Shear	2024–T3 bare, each adherend 0.063 inch thick
Metal–to–Metal Peel	2024–T3 clad, 0.020 inch–thick peeling sheet 0.040 inch–thick backing sheet
Fiberglass Substrate Single Lap Shear	BMS8–79, Style 1581, 7781, 120, or 220
Fiberglass Honeycomb Peel	BMS8–79, Style 1581, 7781, 120, or 220 BMS8–124, Type 1, Class I, Grade 8, 0.5 inch thick

5.1.2 PROPERTIES OF TYPE 4 BONDED SPECIMENS

Type 4 bonded specimens shall meet all the requirements of Table V and Table VI.

TABLE V TYPE 4 BONDED SPECIMEN REQUIREMENTS – BMS8–79 SUBSTRATE

TEST	SPECIMEN EXPOSURE PRIOR TO TEST	TEST TEMPERA–TURE (F)	NUMBER OF SPECIMENS REQUIRED		MINIMUM AVERAGE PSI		MINIMUM INDIVIDUAL		TEST METHOD SECTION
			PER BATCH	TOTAL	GR 5	GR 10	GR 5	GR 10	
Single Lap Shear (psi)	No exposure	–65 ± 5 75 ± 10 **FL 1** 180 ± 5	5 10 5	15 30 15	2900 3300 2600	2600 3300 2450	**FL 2** 3100 **FL 4** **FL 2**	**FL 2** 3000 **FL 4** **FL 2**	8.1
	1000 ± 24 hours at 160 ± 5 F, 100 percent RH	75 ± 10	5	15	1900	1800	**FL 2**	**FL 2**	8.1
Honeycomb Flatwise Tensile (psi)	No exposure	–65 ± 5 75 ± 10 180 ± 5	5 10 5	15 30 15	500 500 200	560 1100 470	**FL 2**	**FL 2**	8.3
Honeycomb Peel	No exposure	75 ± 10 **FL 1**	10	30	35 in–lb/ 3 inch width	55 in–lb/ 3 inch width	30 in–lb/ 3 inch width **FL 4**	50 in–lb/ 3 inch width **FL 4**	8.2
Single Lap Shear	Prebond exposure **FL 3**	180 ± 5	5	15	2600 psi	2450 psi	**FL 2**	**FL 2**	8.1
Honeycomb Peel	Prebond exposure **FL 3**	75 ± 10	5	15	30 in–lb/ 3 inch width	50 in–lb/ 3 inch width	**FL 2**	**FL 2**	8.2

FL 1 Supplier and purchaser quality control test.

FL 2 No minimum individual requirement.

FL 3 Prebond exposure of the adhesive film prior to layup to 90 ± 5 F, 65 ± 5 percent RH prior to bonding for the handling and mechanical duration in accordance with the class designation.

FL 4 Determination of Calculated Minimum Value: $X_{min} = X_q – 3.064\ Sq$ where X_q and S_q are the qualification mean and qualification standard deviation of all the individual measurements from all the batches of a particular grade.

TABLE VI TYPE 4 BONDED SPECIMEN REQUIREMENTS – BMS8–168 SUBSTRATE

TEST	SPECIMEN EXPOSURE PRIOR TO TEST	TEST TEMPERATURE (F)	NUMBER OF SPECIMENS REQUIRED		MINIMUM VALUE PSI **FL 1**		TEST METHOD SECTION
			PER BATCH	TOTAL	GR 5	GR 10	
Single Lap Shear	No exposure	75 ± 10	5	15	4300	4500	8.1
Honeycomb Flatwise Tensile	No exposure	75 ± 10	5	15	450	1100	8.3

FL 1 Minimum average requirement

5.1.3 FILM WEIGHT REQUIREMENTS

Type 2 and 4 adhesives shall have a film weight within ± 0.005 lb/ft^2 of the nominal value for the grade. Film weight is a Key Characteristic (KC) and requires Statistical Process Control (SPC) in accordance with Section 7.1.1.

5.1.4 TACK REQUIREMENTS

A tack evaluation will be conducted during the qualification. Shop trials will be conducted to determine that Class I products have appropriate tack for high tack applications such as first ply adhesion on vertical surfaces and core tacking.

5.2 STORAGE LIFE

BMS5–129 adhesives shall retain their ability to meet the requirements of Section 5.1.1 for a minimum period of 90 days for Type 2 Classes IA and IIA, 180 days for Type 2 Classes IIB and IIC and 1 year for Type 2 Classes IE and IIE and Type 4 (Classes IID and IIE) from the date of shipment from the manufacturer's facility, provided:

a. The adhesives shall remain in sealed containers or airtight wrappers except for opening to obtain samples for acceptance tests. When obtaining samples, warm the material to a temperature such that there is no moisture condensation on the outside of the wrapper prior to opening the package.

b. The temperature of the adhesive during shipment shall be in accordance with Section 10.3.

c. The temperature of the adhesive shall be at zero F or below during storage.

5.3 HANDLING AND MECHANICAL LIFE

BMS5–129 Type 2 adhesives shall meet the prebond exposure requirements of Table III. BMS5–129 Type 4 adhesives shall meet the prebond exposure requirements of Table V. BMS5–129 adhesive have handling and mechanical life capability in accordance with Table VII.

TABLE VII BMS5–129 HANDLING AND MECHANICAL LIFE CAPABILITY

CLASS	HANDLING AND MECHANICAL LIFE AT 90 F OR BELOW
IA, IIA, IIB	5 days
IIC, IID	10 days
IE, IIE	20 days

6 QUALIFICATION

Products qualifying to this specification shall meet all requirements given in Section 6.

6.1 REQUESTS

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

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.

6.2 SAMPLES AND TEST REPORTS

a. Qualification samples submitted for approval to Type 2 shall be accompanied by a test report giving actual data for a minimum of three batches per grade and class, for all tests of Table II and Table III.

   Qualification samples submittal for approval to Type 4 shall be accompanied by a test report giving actual data for a minimum of three batches per grade and class, for all tests of Table V and Table VI.

   The individual specimen 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 (defined in Section 4) of adhesive with which the test assembly was bonded, together with the date of bonding. Coded identification of the adhesive batches shall include the respective dates of manufacture and batch sizes. 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 such a testing facility. Boeing Engineering and Quality Assurance shall verify the adequacy of all test facilities and test procedures.

c. Qualification samples shall be submitted from each of three production batches for each candidate grade.

d. The Boeing Company has the right to conduct any tests deemed necessary prior to qualification, including a manufacturing feasibility test.

e. Qualified products are listed in the Qualified Products List.

f. An adhesive shall be approved only for the formulation on which the qualification tests are made.

6.2 SAMPLES AND TEST REPORTS (Continued)

g. 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 location for a 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.

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

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.

d. 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.

e. 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.

f. 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.

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

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

6.4 QUALIFICATION AUDIT

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

b. When deemed necessary, 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. Verify that each batch of adhesive has been manufactured in accordance with an approved PCD. Verify that each lot of adhesive is shipped within the Supplier Inventory Life documented in the PCD. If a lot of adhesive will be handled by an authorized distributor, re–packager, or auxiliary storage facility, ensure that sufficient Supplier Inventory Life is retained until DOS.

b. Suppliers shall certify that each production shipment meets the requirements of this specification, and is chemically and physically equivalent to the supplier's material originally qualified.

c. Suppliers shall test each production batch in accordance with the requirements of Table VIII. Sampling, acceptance and rejection criteria for Type 2 and 4 adhesives are specified in Section 7.3. Each shipment shall be accompanied by a test report providing the results of such testing.

d. All areas of Type 2 and Type 4 film adhesive that are not suitable for structural adhesive bonding shall be legibly marked by the supplier and deducted from the roll yardage.

e. The supplier shall verify that each batch has been manufactured in accordance with their approved PCD.

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 are average values only.

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

7.1.1.1 Key Process Parameters (KPP)

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.

7.1.1.2 Analysis and Review of KCs and KPPs (Continued)

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 SM&P 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.

7.2 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.

b. Verify that all records of shipping and storage times and temperature have been received with each shipment, and that the material meets the shipping requirements of Section 10.3 from the date the material was shipped from the supplier's manufacturing facility.

c. The acceptance tests of Table VIII are mandatory on each sample of each lot of Type 2 and Type 4 adhesive upon receipt unless purchaser testing requirements have been eliminated for that product in accordance with Section 7.2e.

d. Sampling, acceptance, and rejection criteria for Type 2 and Type 4 adhesives are specified in Section 7.3.

e. When a supplier has demonstrated consistent conformance to required testing in accordance with Section 7.1, Boeing SM&P 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.

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

g. Each unit of adhesive shall be checked for compliance with the identification requirements of Section 9. All packages incorrectly identified shall not be released for storage or production until the correct information has been marked on the package, as required by Section 9.

h. 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.

i. Lot numbers shall be established at the time of receipt and marked on each unit of adhesive received in the lot.

7.2 PURCHASER QUALITY CONTROL (Continued)

j. Lot size refers to the total number of units in any one lot, irrespective of the volume of the container or length of the roll.

k. 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 on a Boeing Company division basis, and shall be documented with Boeing documentation.

l. Purchaser Quality Assurance shall verify that each lot of material meets the requirements for temperature during shipment stated in Section 10.3.

(1) The purchaser shall document the procedure used to verify time and temperature exposure during shipment.

(2) If any exposure exceeds the maximum allowed handling and mechanical life conditions stated in Section 5, the material shall be rejected.

(3) Exposures which exceed the required temperature during shipment but are less than the maximum allowed out–time shall be deducted from the allowed out–time for the material in that lot.

(4) If the temperature during shipment cannot be verified, the material shall be rejected.

TABLE VIII SPECIMEN REQUIREMENTS

TEST	NUMBER OF SPECIMENS PER UNIT TO BE TESTED	REQUIREMENT	TEST METHOD SECTION
Fiberglass Substrate Single Lap Shear	5	Table III, Table V	8.1
Fiberglass Honeycomb Peel	3	Table III, Table V	8.2
Film Weight **FL 1**	2	Section 5.1.3	8.4

FL 1 Key Characteristic (KC) – SPC required.

7.3 SAMPLING, ACCEPTANCE AND REJECTION CRITERIA

a. The sampling unit shall be as follows:

(1) Type 2 adhesive – roll

(2) Type 4 adhesive – roll

b. Each sample shall be taken from different units.

c. The number of units of adhesive (sample size) to be tested from each lot under the sampling plan is dependent upon the size of the lot. The sample size shall be as given in Table IX.

7.3 SAMPLING, ACCEPTANCE AND REJECTION CRITERIA (Continued)

d. The lot of adhesive undergoing acceptance testing shall be accepted or rejected as specified below:

(1) Reject the lot of Type 2 adhesive when the grand average of all assemblies or minimum individual value for the sample is less than the quality control requirements of Table III.

(2) Reject the lot of Type 4 adhesive when the grand average of all assemblies or minimum individual value for the sample is less than the quality control requirements of Table V.

(3) Reject the lot when the Type 2 or Type 4 average film weight does not meet the requirements stated in Section 5.1.3.

TABLE IX ACCEPTANCE SAMPLING PLAN

LOT SIZE (UNITS)	UNITS TO BE TESTED **FL 1**
1 to 3	1
4 to 25	4
26 to 50	5
51 to 100	6
101 to 200	7
201 to 300	8
301 to 500	10
over 500	15

FL 1 For each unit tested, prepare and test the number of specimens required by Table VIII.

8 MATERIAL TEST METHODS

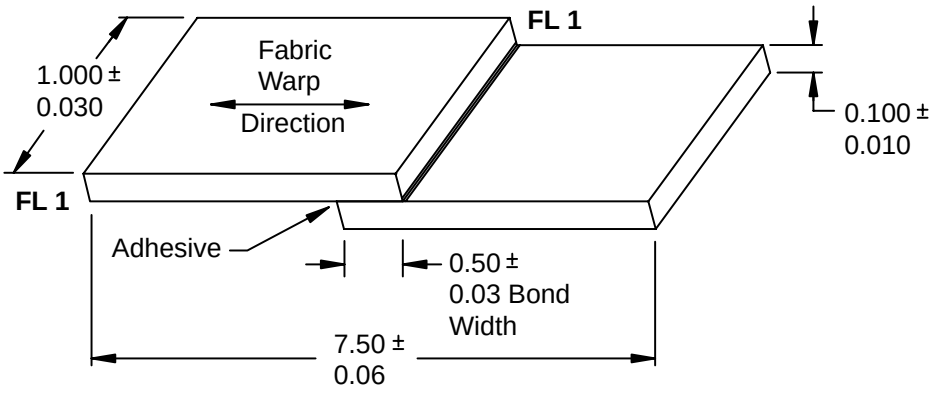
WARNING

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 SINGLE LAP SHEAR TEST – BMS8–79 OR BMS8–168 SUBSTRATE

The lap shear specimens shall be prepared from BMS8–79 precured laminates fabricated in accordance with BAC5317–2, or BMS8–168 precured laminates fabricated in accordance with BAC5317–5. The fiberglass test panels may use any qualified BMS8–79, Style 7781, Style 1581 or Style 120 or 220 material. The graphite test panels may use any qualified BMS8–168, Type II, Class 2, Style 3K–70–PW material. Laminate thickness shall be 0.100 ± 0.010 inch. The Type 2 and Type 4 adhesive shall be cured for 90 ± 10 minutes at 225 to 250 F at 40 to 50 psi autoclave pressure. Five lap shear specimens in accordance with Figure 1 shall be obtained from each test assembly. Test each specimen by positioning the testing machine so that the inner edge of each grip is 2.00 ± 0.25 inches from the nearest edge of the lap joint. The load speed shall be 0.05 ± 0.01 inches per minute. Measure the actual dimensions of the overlap joint of each specimen and calculate the overlap area to the nearest 0.01 square inch. Record the overlap area and the maximum stress in pounds per square inch of bond area.



All dimensions in inches

FL 1 Cut or mill to RHR 125 maximum

FIGURE 1 SINGLE LAP SHEAR TEST SPECIMEN

8.2 HONEYCOMB PEEL TEST – BMS8–79 SUBSTRATE

Three peel specimens, each 3 by 12 inches, shall be obtained from a test panel, fabricated in accordance with Figure 2 and BAC5317–2, having two plies of BMS8–79, Style 1581 or 7781 or four plies of Style 120 or Style 220 on each face with the test adhesive laid up between the prepreg and BMS8–124, Type 1, Class I, Grade 8.0, 0.5 inch–thick honeycomb core. The skins shall be cocured with the adhesive. The peel strength shall be determined using a climbing drum peel apparatus at a nominal head speed of 1 inch per minute in accordance with ASTM D 1781. A peel curve shall be obtained for each specimen so that the peel strength for each specimen may be computed using the curve average as determined over a 4 inch distance, peeled in the warp direction.

The rewind peel value shall be determined by rewinding the drum with a loose material such as 949 nylon peel ply cloth and recording the average rewind value. This average rewind value shall be subtracted from the average peel value. The resultant value shall be used to determine the reported peel strength as follows:

Peel Strength = (average peel minus drum rewind) (torque arm) = in–lb/3 inch width

Torque Arm = radius of flange minus radius of drum

8.3 FLATWISE TENSILE TEST – BMS8–79 OR BMS8–168 SUBSTRATE

BMS8–79 honeycomb flatwise tensile test assemblies shall be prepared in accordance with Figure 2 and cocured in accordance with BAC5317–2. BMS8–168 honeycomb flatwise tensile test assemblies shall be prepared in accordance with Figure 2 and cocured in accordance with BAC5317–5. The required number of individual test specimens shall be cut from the assembly and tested in accordance with BSS7205.

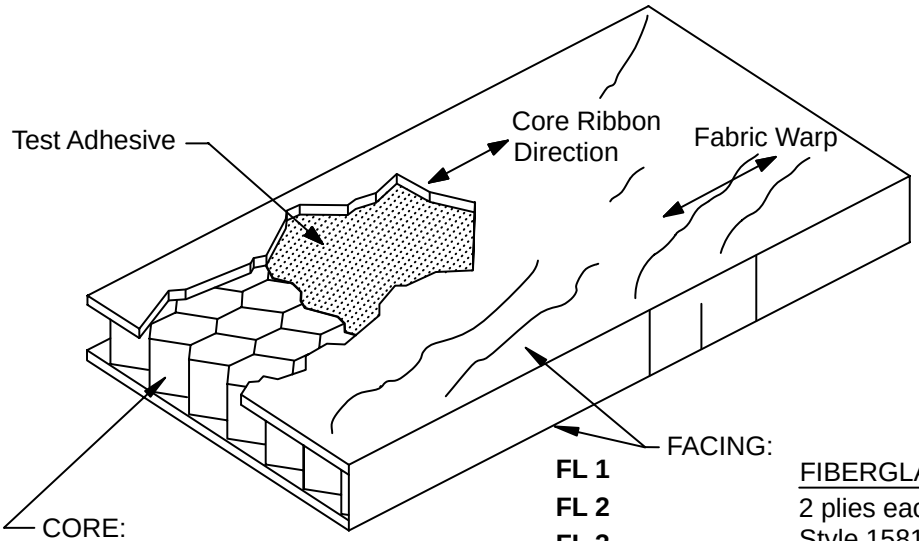


FIGURE 2 SANDWICH PANEL

FL 1 The prepreg shall be oriented so that the warp face of the fabric is against the core on both sides.

FL 2 Honeycomb peel specimens are 12.0 ± 0.1 by 3.0 ± 0.1 inches. The 12 inch dimension shall be parallel to the honeycomb ribbon direction and fabric warp.

FL 3 The surface breather in accordance with BAC5317–2 and BAC5317–5 shall be limited to polyester mat products.

FL 4 After performing the leak test in accordance with BAC5317–2 or BAC5317–5, vent the vacuum bag to release vacuum out of the core. Vent the vacuum bag again as required prior to cure.

8.4 FILM WEIGHT MEASUREMENT

a. Cut two specimens of material across the width of the film. Cut specimens approximately 6 by 6 inches. Determine the area to the nearest 0.1 square inch.

b. Remove separator sheets from the film and weigh film to nearest 0.1 gram.

c. Report average weights to the nearest 0.001 pounds per square foot.

d. Document according to the requirements for a key characteristic as specified in Section 7.1.1.

9 MATERIAL IDENTIFICATION

The container or roll of adhesive shall be legibly identified and labeled with the items of information listed below.

a. BMS5–129 (including the latest revision letter) and Type and Grade and Class of adhesive

b. Supplier's name, address and product designation

c. Supplier's batch number

d. Date of manufacture

e. Unit number of roll

f. Name and address of distributor, re–packager, or auxiliary storage facility if applicable.

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

10 PACKAGING, MARKING, AND SHIPPING

10.1 PACKAGING

a. Each roll of Type 2 and Type 4 adhesive shall be sealed in a clean, defect–free bag. Defects are considered to be visually detectable discontinuities such as holes, cuts, tears, et cetera, which allow free passage of air, moisture or other contaminates. Bags shall either be a minimum of 0.006 inch polyethylene or a Boeing approved alternate.

b. The exterior packaging shall be of such a nature as to prevent physical damage or contamination by foreign substances. Each package shall be suitably insulated and refrigerated, when necessary, to ensure maintenance of the shipping temperature requirements.

10.2 MARKING

Both ends of the exterior (shipping) package of all adhesives covered by this specification shall be legibly marked on the outside with the following information:

a. BMS5–129 (including the latest revision letter) and Type, Grade and Class of adhesive

b. Purchase order number

c. Supplier's name, address, and product designation

d. Supplier's batch number

e. Date of manufacture

f. Name and address of distributor, re–packager, or auxiliary storage facility if applicable

10.2 MARKING (Continued)

g. Date of shipment from supplier, distributor, re–packager, or auxiliary storage facility if applicable, whichever occurred last

h. Quantity in the shipment

i. Quantity in this package

j. Refrigeration requirement (state temperature limitations when refrigeration is required)

k. Labeling shall conform to OSHA 1910.1200, Hazard Communication Standard.

10.3 SHIPPING

a. BMS5–129 shall be shipped at or below 0 F.

b. Temperature recorders are required with each lot of adhesive 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 this Section are recorded.

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

(2) 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 adhesive stored or shipped.

(3) 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 above 0 F and below 90 F for Class C, D, and E adhesives.