BOMBARDIER

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Material Specification

TITLE:	**MODIFIED EPOXY, HIGH STRENGTH, STRUCTURAL FILM ADHESIVE SYSTEM**
SPECIFICATION NUMBER:	**DHMS A 6.03**
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AMENDMENT:	**--**
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Prepared by: Approved by:

SIGNED ORIGINAL ON FILE

Hai Yen Tran
Materials Technology

Leonard John
Materials Technology

MODIFIED EPOXY, HIGH STRENGTH, STRUCTURAL FILM ADHESIVE SYSTEM

REVISION RECORD

Issue	Page		Description and Reason for Change
A	2	1.1-	removed references to knit fabric and nylon carrier.
Amd.6		Table 2,	Note - changed coded DHMS A6.03-B1 from .045" PSF to .030" PSF.
		Table 2	- removed nylon and knit fabric from carrier material description.
	4	3.2.1.2	changed "date of shipment from the manufacturer's facility" to "date of receipt at the purchaser's facility". Added "when tested with an accepted batch of film adhesive"
		3.2.2.1	removed reference to nylon knit carrier.
		3.2.2.4	removed reference to nylon knit fabric carrier.
	5	3.2.2.9	Volatile content changed to "1.00% by weight" from "1.25%".
		3.2.2.10	added "and not greater than 10^{o} F per minute".
		3.2.2.13	added "when tested with an accepted batch of liquid adhesive primer".
		Table 3	changed minimum requirements for tensile tests 1 and 2 from 4,200 psi (average) to 4,375 psi and from 3,700 psi (individual) to 4200 psi.
	6	Table 3	changed minimum requirements for tensile tests 8, 10 and 11 from 4,200 list average to 4,375 psi and from 3,700 psi (individual) to 4,200 psi. Changed DHMS A6.03C and C1 to .06 PSF, DHMS A6.03D and D1 to .085 PSF.
	24	10.1.2	added "and primer".
		10.1.4	added "Each shipment shall contain a copy of the Material Safety Data Sheet".
	25	11.0	Health and Safety requirements added.
	26		Qualified Product List - Note 1 added.
Amd.7	26		Qualified Products List - Note 2 added.
Amd.8	5		Para. 3.2.2.8 - changed cure pressure from not greater than 75 psi to 35 ± 5 psi

	9	Para. 5.4 - changed from at a differential pressure of 40-45 psi to at a pressure of 35 ±5 psi
	11	Para. 6.3.2.1 - ASTM D1002 added.
B		This is complete revised issue. Detail changes have not been noted.
Amd.1	5	Table 3 changed.
	13	Para.6.4.1.2 - reference to Weight Test paragraph changed.
	17	Table 5 changed: references to paragraphs corrected.
C	All	This is complete revised issue. Detail changes have not been noted.
D	2	Table 1 updated to include water based primer A6.03-2.
	3	Add section of requirement for water based primer A6.03-2.
	9	Para. 4.2.1 specified bare aluminum can be used as long as mode of failure is 100% cohesive.
	17	Table 6 updated to include sampling for primer.
	18	Added identification requirements for water based primer.
	19	Added Cytec Fiberite product BR6747-1, water based primer to QPL.
		Updated Cytec name to Cytec Fiberite Inc.
E		This is a complete revised issue.
		Standardized Room temperature as $75^{o}F \pm 5^{o}F$
	5	3.4 conditoning of specimen Was: 40 hrs, Now: 24 hrs
	17	Clarified Purchaser acceptance test requirement

1 SCOPE

This specification establishes the requirements for 250°F cure structural adhesive for metal to metal, and metal to honeycomb bonding of primary and secondary structural airframe parts. The bonded structural parts will be exposed to temperatures within the range of -67° to +250°F.

1.1 Classification

The liquid adhesive-primer system covered by this specification shall be furnished in one of the following , as specified by the procurement document. See **Table 1** and **Table 2**.

Table 1: Liquid Adhesive Primer

Primer	Primer Colour	% Solids By Weight	Viscosity 74° ± 3°F	Designation
Solvent based	Yellow	9% - 12%	17 ± 3 seconds	DHMS A6.03-1
Water based	Yellow	18%-22%	N/A	DHMS A6.03-2

Table 2: Adhesive Film

Film Weight lb/ft^2 (psf)	Film thickness Nominal	Carrier
0.030 nom.	0.005" nom.	Random Polyester Mat
0.045 nom.	0.007" nom.	
0.060 nom.	0.010" nom.	
0.085 nom.	0.015" nom.	

2 APPLICABLE DOCUMENTS

The following documents form a part of this specification to the extent specified herein. In the event of conflicting requirements between this and the specifications listed below, the requirements of this specification shall govern. Where a specific issue of a document is not specified, the current issue shall be used.

2.1 Government Specifications

QQ-A-250/5 - Aluminum Alloy, 2024 Clad, Plate and Sheet

2.2 Military Specifications

MIL-C-7438 - Core Material, Aluminum, for Sandwich Construction

MIL-H-5606 - Hydraulic Fluid, Petroleum Base, Aircraft

MIL-J-5624 - Jet Fuel, Grades JP-3, JP-4

MIL-S-3136 - Standard Test Fluids - Hydrocarbon

2.3 American Society for Testing and Materials

ASTM C297 - Tension Test of Flat Sandwich Constructions in Flatwise Plane

ASTM D1002 - Strength Properties of Adhesives in Shear by Tension Loading (Metal to Metal)

ASTM D1489 - Standard Test Method for Nonvolatile Content of Aqueous Adhesives

ASTM D1781 - Climbing Drum Peel Test for Adhesives

ASTM E29 - Recommended Practices for Designating Significant Places in Specified Limiting Values

2.4 Other Specifications

BMS 3-11 - Hydraulic Fluid, Fire Resistant

3 REQUIREMENTS

3.1 Materials

3.1.1 Liquid Adhesive Primer

Primer A6.03-1

The liquid adhesive primer covered by this specification shall be a thermosetting, modified epoxy phenolic base in a blend of organic solvents that can be sprayed uniformly with standard shop spray equipment. The resulting dry film, after a single cross-coating, when bonded with the adhesive film specified herein, shall produce the bond values noted in this document. See **Table 3**. It shall mix readily to form a homogeneous mixture suitable for spraying, with or without a thinner. The shop life of the adhesive primer shall be not less than 5 days at 90°F with a relative humidity not greater than 60%.

The storage life of the liquid adhesive primer shall be a minimum of 270 days from the date of manufacture, when stored at a temperature of 0°F or below.

After air drying for a minimum of 30 minutes, it shall be capable of being heat cured at 250°F ± 10°F for not more than 60 minutes.

Primed, wrapped details shall be capable of being stored for a minimum of 30 days at 75°F ± 10°F and 25% to 60% relative humidity with no loss of physical properties, as noted in **Table 3**.

Primer A6.03-2

The liquid adhesive primer covered by this specification shall be a 100% water based, zero VOC, thermosetting, modified epoxy material that can be sprayed uniformly using simple processing with HVLP or standard air atomizing spray equipment. The primer shall be applied and cured according to the manufacturer's instructions. The cured primer when bonded with the adhesive film specified herein, shall produce the bond values noted in this document. See **Table 3** . The shop life of the adhesive primer shall be not less than 30 days at 90°F with a relative humidity not greater than 60%.

The storage life of the water based adhesive primer shall be 12 months from date of manufacture, when store at 40-55F. DO NOT ALLOW THE PRIMER TO FREEZE, STORE ABOVE 32F.

After air drying for a minimum of 30 minutes at relative humidity of less than 55%, it shall be capable of being heat cured at 250°F ± 10°F for not more than 60 minutes.

Primed, wrapped details shall be capable of being stored for a minimum of 6 months at 75°F ± 10°F and 25% to 60% relative humidity with no loss of physical properties, as noted in **Table 3**

3.1.2 Adhesive Film -

The adhesive film covered by this specification shall be a thermosetting, modified epoxy, supported by a random polyester mat carrier.

The adhesive film shall be of uniform quality and free from foreign materials or inclusions.

It shall be supplied in the form of a thin, uniform supported film adhesive of a thickness as noted in **Table 2**. The random polyester mat carrier shall be uniformly impregnated with the modified epoxy resin system.

The adhesive film and the cured adhesive primer shall be mutually compatible.

The adhesive film shall be capable of being readily applied to the cured adhesive primed surfaces of metal at a room temperature of 60°F - 90°F, with a relative humidity not greater than 60%.

3.2 Film Adhesive Defects

Film adhesive may not contain defects in excess of the following limits: defects in excess of one in any 5 linear yards of materials or totalling more than 5% of the area of the complete roll. Defects shall be flagged by placing a strip of polyethylene backing, or other identifying material, at the location of the defect and extending it out one or both ends of the roll. Additional material may be added to the roll to compensate for all defect areas occurring in the roll or supplier will deduct the defect length from the roll length sold to the customer. Compensating material shall be the full roll width for each length of affected area. Alternatively, the purchase liability shall be reduced equal to the amount of compensating material otherwise due.

3.3 Physical Properties and Test Methods of Uncured Adhesive and Adhesive Primer

Tests shall be performed on the product as received, after warming to above the dew point prior to sampling and in accordance with the test methods specified herein.

3.3.1 Storage Life - The storage life of the adhesive shall be a minimum of 180 days from the date of shipment, 210 days from the date of manufacture, when stored at a temperature of 0˚F or below.

3.3.2 Working Life - The product shall meet the requirements of this specification when tested after exposure to a temperature not greater than 77˚F, with a relative humidity not greater than 60%, for a continuous period of up to 10 days.

3.3.3 Primer Solids Test - The specimen from which the percent solids in the liquid adhesive primer is to be determined shall weigh approximately 10 grams.

Two specimens shall be taken from the batch. The percent of solids shall be determined either as specified in ASTM D-1489 or any other approved equivalent method. The solid content shall meet the requirement noted in **Table 1**.

3.3.4 Adhesive Volatile Content -Three 4 x 4 inch specimens of the uncured material shall be weighed individually on an analytical balance to the nearest 10 mg, placed in an air circulating type oven at 260 ± 10 ˚F for 15 minutes, removed from oven, and placed in a desiccator. The specimens shall then be cooled to room temperature, reweighed, and the volatile content calculated as follows:

$$\text{Volatile Content, \% by weight} = \frac{W0 - W1}{W0} \times 100$$

W0 = Initial Sample Weight

W1 = Weight after Heating Cycle

The volatile content, by weight, shall not be greater than 1%.

3.3.5 Tack - The product shall exhibit a degree of tackiness for 10 days at a temperature of 75°F ± 5°F, with a relative humidity not greater than 60%.

3.3.6 Colour - Unless otherwise specified, the colour shall be natural, uniform colour of the resin system.

3.3.7 Shrinkage of Film Adhesive - shall not be more than 3% in either direction when exposed for 24 hours at 75°F ± 5°F in a horizontal position.

3.3.8 Adhesive Weight -Three 6 x 6 inches specimens shall be cut from the roll, so that one sample comes from the centre of the width and the other two from the edges. Determine the area to the nearest 0.1 square inch.

Remove the separator sheets from the adhesive film. The film shall be individually weighed on an analytical balance to the nearest 10 mg. Report average weight to the nearest 0.001 lb/ft^2.

3.4 Mechanical Properties of Bonded Specimens

Fabricate test panels in accordance with **Section 4**. Specimens tested at room temperature shall be conditioned for a minimum of 24 hours at 75 ± 5˚F and 50 ± 5% relative humidity immediately prior to testing.

The combination of the liquid adhesive primer and adhesive film shall be capable of being used to make up metal to metal lap shear, flatwise tension, and climbing drum peel test specimens which will have mechanical properties exceeding the minimum values listed in **Table 3**, and **Table 4** when tested as noted in **Section 4**.

Table 3: Properties of Metal to Metal Specimens

Test	Minimum Requirements	
	Average	Individual
1. Tensile Shear at 75°F ± 5°F	4 375 psi	4 200 psi
2. Tensile Shear at -67°F ± 5°F	4 375 psi	4 200 psi
3. Tensile Shear at 180°F ± 5°F	3 100 psi	2 800 psi
4. Tensile Shear at 250°F ± 5°F	650 psi	600 psi

Table 3: Properties of Metal to Metal Specimens

Test	Minimum Requirements	
	Average	Individual
5. Tensile Shear at 75°F ± 5°F after 30 days with 100% RH at 120°F ± 5°F	4 375 psi	4 200 psi
6. Tensile Shear at 75°F ± 5°F after 30 days Salt Spray Exposure at 95°F ± 5°F	4 200 psi	3 700 psi
7. Tensile Shear at 75°F ± 5°F after 7 day's immersion in JP4 Fuel (MIL-J-5624) at 75°F ± 5°F	4 375 psi	4 200 psi
8. Tensile Shear at 75°F ± 5°F after 7 day's immersion in Type 3 Hydrocarbon Fluid (MIL-S-3136) at 75°F ± 5°F	4 375 psi	4 200 psi
9. Tensile Shear at 75°F ± 5°F after 7 day's immersion in Type III Hydraulic fluid (BMS 3-11) at 150°F ± 5°F	4375 psi	4200 psi
10. Metal to Metal Climbing Drum Peel at 75°F ± 5°F	60 lbs-in./in. (0.045-0.085 psf) 50 lbs-in/in. (0.030 psf)	55 lbs-in/in. (0.045- 0.085 psf) 45 lbs-in/in. (0.030 psf)

Table 4: Properties of Metal to Honeycomb Specimens

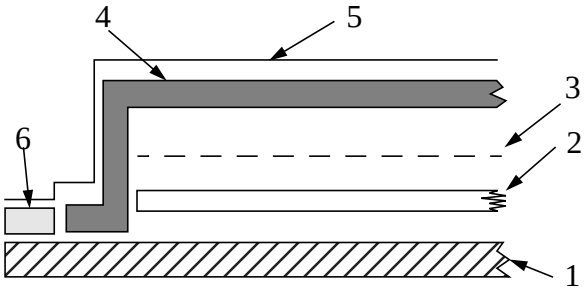
Test	Minimum Requirements	
	Average	Individual
11. Flatwise Tensile at 75°F ± 5°F (0.06 psf)	900 psi	800 psi
12. Flatwise Tensile at 75°F ± 5°F (0.085 psf)	1 100 psi	1 000 psi
13. Flatwise Tensile at 250°F ± 5°F (0.06 psf) and (0.085 psf)	50 psi	50 psi
14. Metal to Metal Honeycomb Core Climbing Drum Peel at 75°F ± 5°F	50 lbs-in./3 in. width (0.06 psf) 80 lbs-in./3 in. width (0.085 psf)	45 lbs-in./3 in. width (0.060 psf) 75 lbs-in./3 in. width (0.085 psf)

4 TEST PANEL FABRICATION AND TEST PROCEDURES

4.1 General

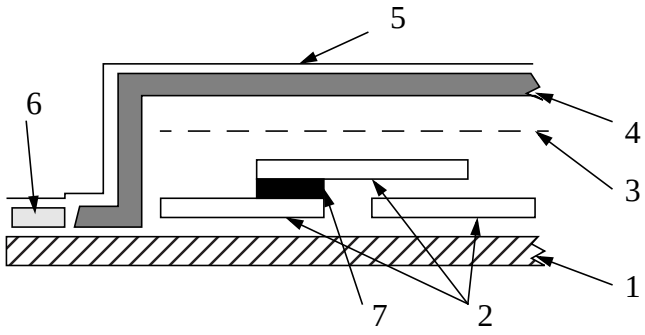
4.1.1 Test panel assemblies consist of two standard panel blanks: Phosphoric Acid Anodized surface treated,

primed with DHMS A6.03-1 adhesive primer (primer thickness range shall be 0.00015 to 0.0004 inches) and adhesively bonded together. Test panel is applicable to each grade of DHMS A6.03. Panels shall be vacuum bagged per **Figure 1** or **Figure 2** and cured per **Figure 3**.



1. Tool (coated with mould release Frekote 44NC or 700NC) Use DSC 234 expendable materials
2. PART
3. Perforated Release Film A4000P3
4. Airweave SS-FR Breather
5. Nylon Vacuum Bag
6. GS 43 MR Vacuum Sealant Tape

FIGURE 1. Bagging Procedure



1. Tool (coated with mould release Frekote 44NC or 700NC)
2. Lap Shear Panels and Packer Plate (same thickness as lap shear panels)
3. Perforated Release Film A4000P3
4. Airweave SS-FR Breather
5. Nylon Vacuum Bag, Ipplon DP1000
6. GS 43 MR Vacuum Sealant Tape
7. Adhesive

FIGURE 2. Bagging Procedure for Lap Shear Panels

APPROVED EXPENDABLE MATERIALS TO DSC 234

Vacuum bag, Ipplon DP1000	(DSC 234-1-54)	Airtech International Inc.,
Perforated Release Film A4000P3	(DSC 234-5-48)	"
Airweave SS-FR Breather	(DSC 234-11)	"
Vacuum Sealant Tape, GS 43 MR	(DSC 234-17-1)	"
Mould Release, Frekote 44NC or 700NC	(DSC 234-13)	Henkel

NOTE: Additional sources are listed in DSC 234.

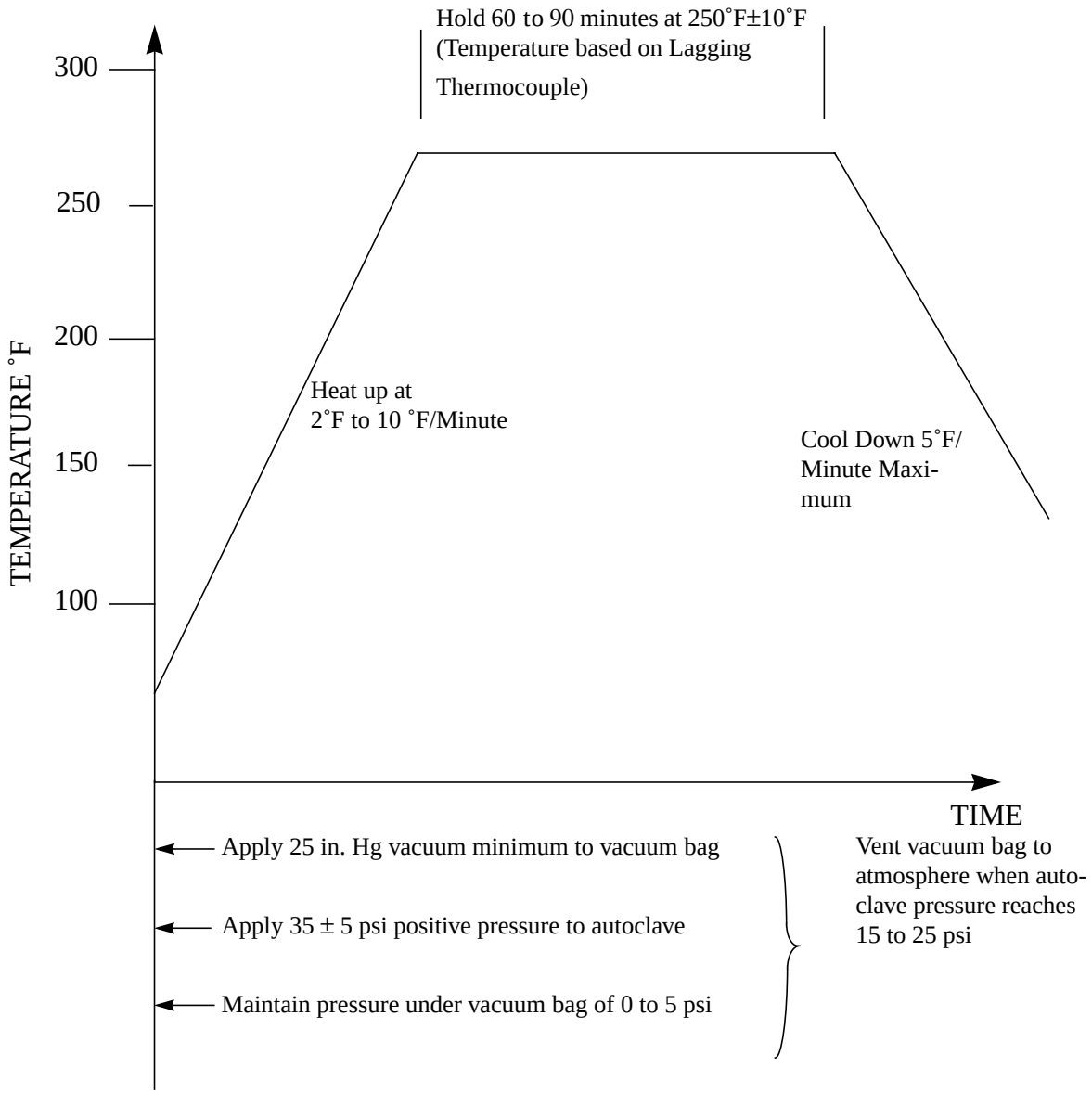


FIGURE 3. Cure Cycle

4.1.2 The curing temperature of the adhesive bond line shall be measured with a fine wire thermocouple, #30 maximum.Using tape (Do not use silicone tape) secure the bare ends of the thermocouple wires to the assembly at the glue line. On honeycomb panels, thermocouples shall be placed on both upper and lower glue lines.

4.1.3 After bonding, the test panels shall be cut into specimens for testing in accordance with the provisions of applicable tests. Panels shall not be cut into specimens until at least 24 hours after bonding. All cuts shall be accomplished so as to avoid overheating and/or mechanical damage to the bond. Use of lubricants or liquid coolants during cutting is prohibited. Unless otherwise specified by the referencing specification, the test panels and/or specimens shall not be subjected to any environmental exposure prior to testing other than to be stabilized at a temperature of 75˚F ± 5˚F and 50% ± 5% relative humidity for at least 1 hour before testing and during testing.

For enironmental exposure testing, test the specimens at room temperature immediately after conditioned.

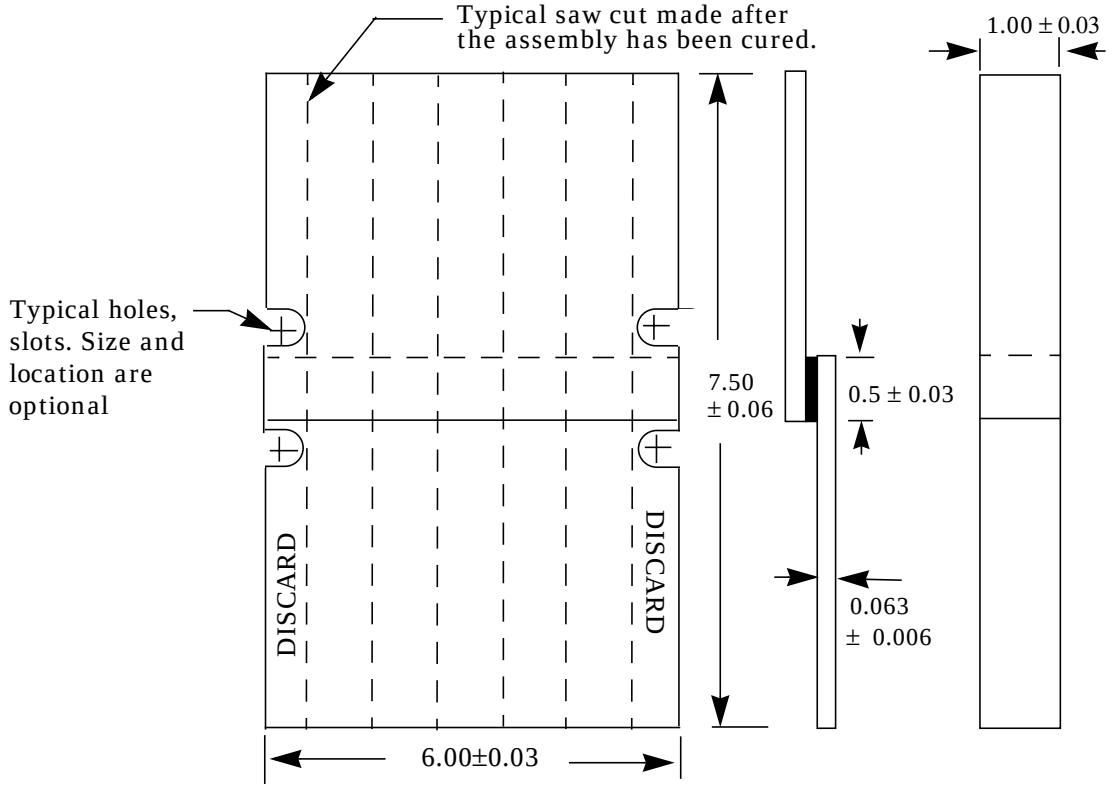
4.2 Lap Bond Shear Test Specimen

4.2.1 Test Panel: Unless otherwise specified, the material and thickness for blanks and packer plate shall be 0.063 inch thick 2024 T3 Clad or bare aluminum alloy in accordance with QQ-A-250/5 (if bare aluminum is used, the mode of failure must be 100% cohesive). The blanks shall be flat within 0.010 inch. The bond surface of blanks shall be free of corrosion, burrs, or other surface irregularities, and shall have a surface finish of 125 RHR maximum. The two test panel blanks shall be bonded as per **Figure 4** or **Figure 5**.

4.2.2 Test Specimens - The test panel assembly shall be cut to provide five test specimens, each 1.00±0.03 inch wide,7.50±0.06 inch long (**Figure 4**) or 1.00 ± 0.03 inch wide, 7.00 ± 0.03 inch long (**Figure 5**).

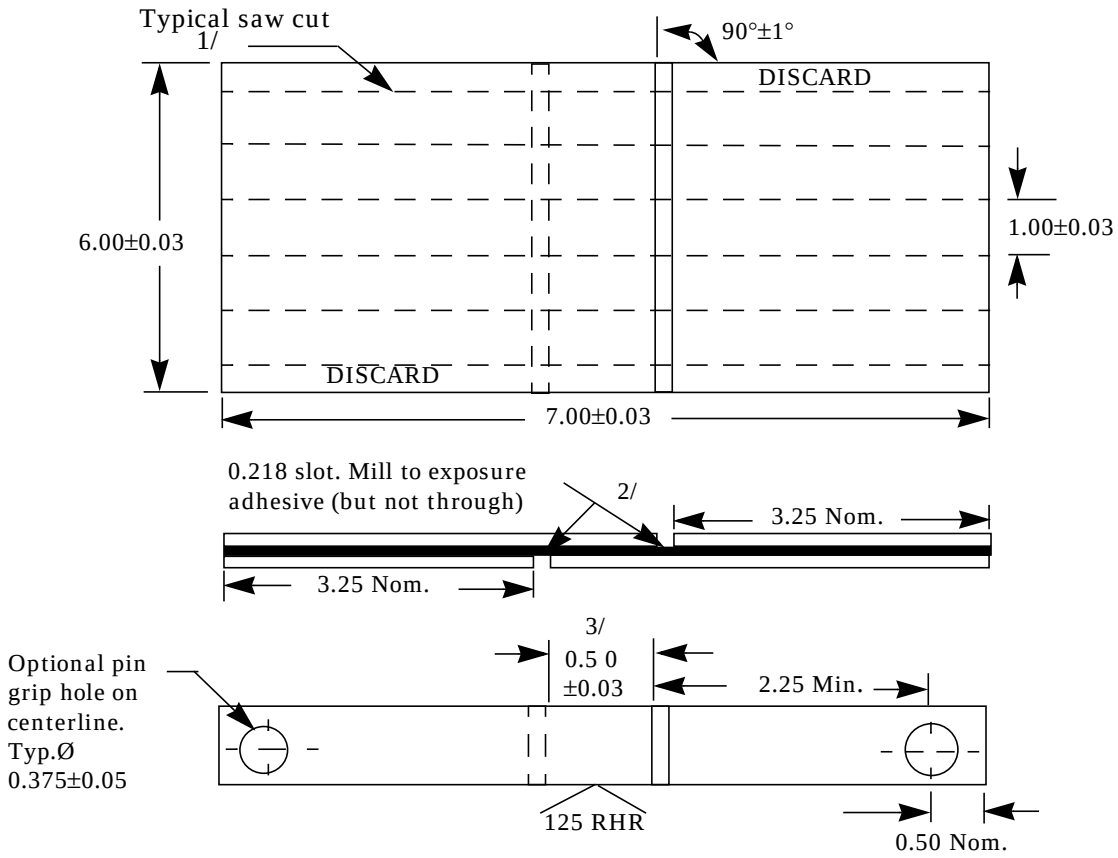
4.2.3 Test Procedure - The ultimate tensile lap shear strength of each specimen shall be calculated and recorded and shall be not less than values given in **Table 3**. Five tensile test specimens shall be tested in accordance with ASTM D1002. At the start of the test, each lap bond shear test specimen shall be positioned such that the inner edge of each grip shall be 2.00 ± 0.25 inches from the nearest edge of the lap joint. Each lap bond shear test specimen shall be loaded in tension at a crosshead speed of 0.05 ± 0.01 inch per minute until the maximum loading is reached and the bond is broken. The maximum stress sustained by the specimen shall be expressed in pounds per square inch of bonded area. The area used for this calculation shall be the actual measured area of the overlap of the test specimen. The areas shall be computed to the nearest 0.01 square inch and the tensile shear values obtained shall be rounded to the nearest 10 psi in accordance with ASTM E29.

Reporting: record materials Batch/lot number, class and type of adhesive, testing conditions, type of failure (cohesive, adhesive break and run) and the tensile shear strength of each sample.



All dimensions in inches

FIGURE 4. Lap Bond Shear Test Panel and Specimens



All dimensions in inches

1/ Typical cut width should be 1.06 inches minimum to provide excess for milling the edges to the finish requirement of 125 RHR maximum.
2/ Specimens cut deeper than 0.002 inch into the substrate test panel blank shall be discarded.
3/ Bond overlap length. The notch edges shall be parallel within 0.005 inch.

FIGURE 5. Wide Area Lap Bond Shear Test Panel and Specimens

4.3 Metal to Metal Peel Torque

4.3.1 Test Panel: Unless otherwise specified, the material and thickness of blanks shall be as specified in **Figure 6**, 2024 T3 Clad aluminum alloy in accordance with QQ-A-250/5 . The blanks shall be flat within 0.010 inch. The bond surface of blanks shall be free of corrosion, burrs, or other surface irregularities and shall have a surface finish of 125 RHR maximum. The two test panel blanks shall be bonded as per **Figure 6**.

4.3.2 Test Specimens - The test panel assembly shall be cut to provide five test specimens, each 1.00 ± 0.03 inch wide, 14.0 ± 0.03 inch long (**Figure 6**).

4.3.3 Test Procedure - The peel torque of each specimen shall be calculated and recorded, and shall be not less than values given in **Table 3**. Five peel test specimens shall be tested in accordance with ASTM D1781 with cross head speed of 3.00 ± 0.03 inches per minute. The Peel value shall be calculated as follows:

$$P = (R_o - R_i)(L - C)$$

Where:

P= Peel strength in pound-inches per inch of specimen width

R_o= Radius of the flange, to the center of the strap

R_i= Radius of the drum

L= Average load, taken from the autographic recording to 5 inches of peeling, after the first 2 inches of facing have been peeled.

C= Correction for the load in pounds required to overcome the weight of the drum. Determine by placing a strip of the fabric of negligible stiffness in place of the specimen, and measure the load required to roll the drum upward. Make the measurement with the backup plate and clamp in place.

Reporting: record materials Batch/lot number, class and type of adhesive, testing conditions, type of failure (cohesive, adhesive break and run) and the peel strength of each sample.

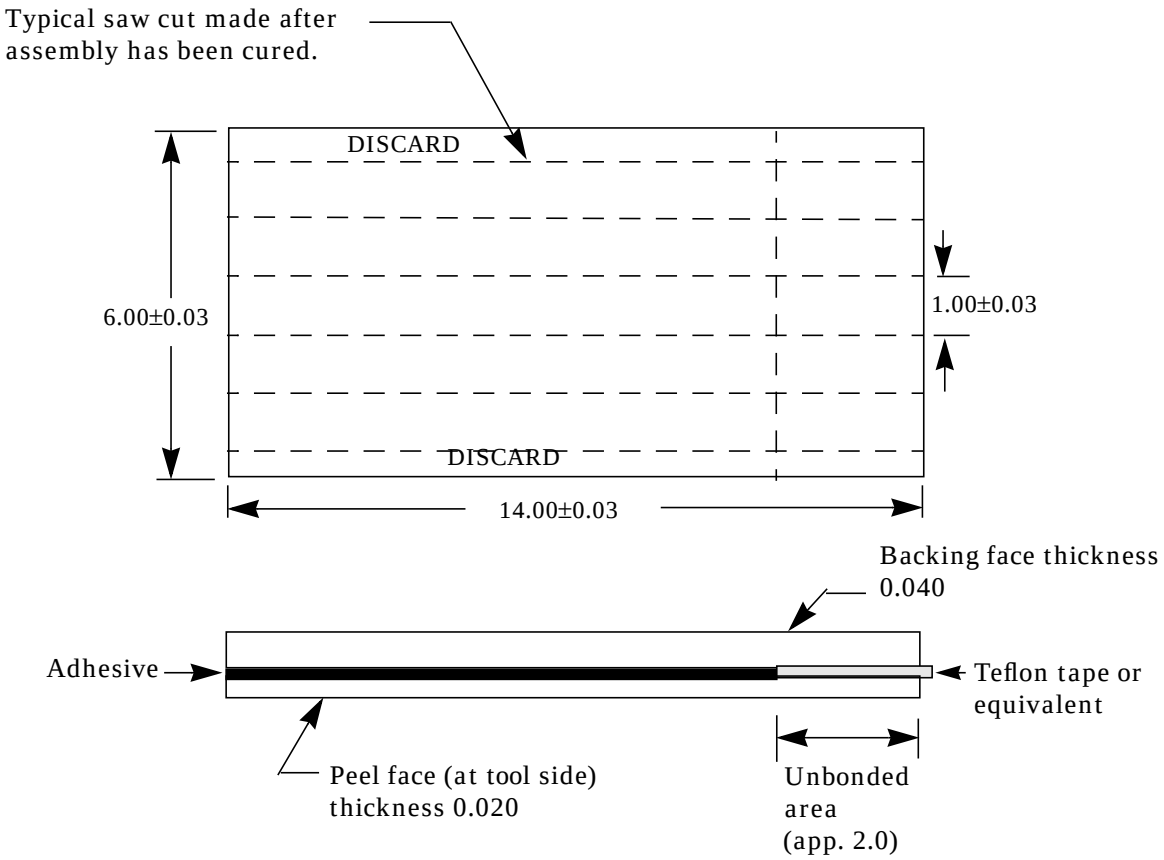
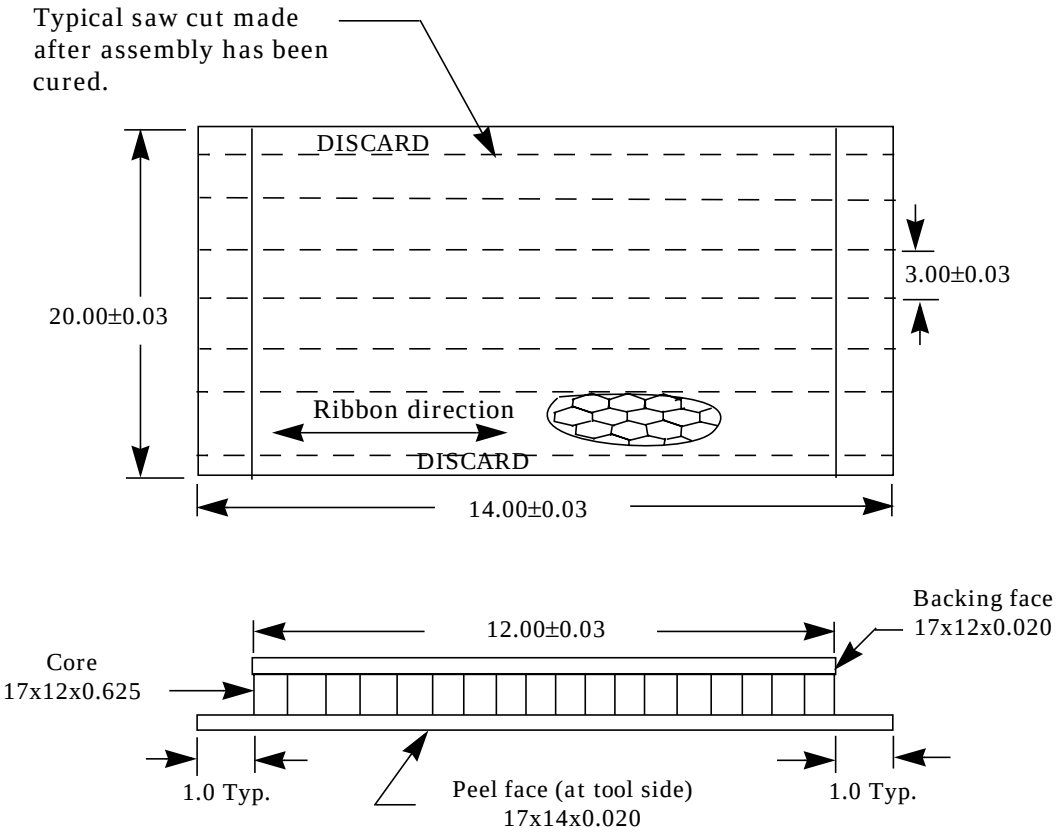


FIGURE 6. Metal to Metal Climbing Drum Peel Test Panel and Specimens

4.4 Metal to Metal Honeycomb Core Peel Torque -

4.4.1 Test Panels- Except as otherwise specified, the material and thickness for blanks shall be 0.020 inches, 2024 T3 clad aluminum alloy in accordance with QQ-A-250/5. The honeycomb core shall be 5052 aluminum (foil thickness 0.040 inches), 1/4 cell size, 7.9 pcf, 0.0625 inches thick and conformed to MIL-C-7438, nonperforated. The honeycomb core shall be vapour degreasing prior to bonding. The panel shall be bonded as followed **Figure 7** with the peel test face against the tool surface.



All dimensions in inches

FIGURE 7. Metal to Metal Honeycomb Core Climbing Drum Peel Test Panel and Specimens

4.4.2 Test Specimens- The test panel assembly shall be cut to provide five test specimens, each 3.00 ± 0.03 inch wide, 14.0 ± 0.03 inch long (**Figure 7**).

4.4.3 Test Procedure - The peel torque of each specimen shall be calculated and recorded, and shall be not

less than values given in **Table 3**. Five peel test specimens shall be tested in accordance with ASTM D1781 with cross head speed of 3.00 ± 0.03 inches per minute. The Peel value shall be calculated as follows:

$$P = (R_o - R_i)\ (L-C)$$

Where:

P= Peel strength in pound-inches per inch of specimen width

R_o= Radius of the flange, to the center of the strap

R_i= Radius of the drum

L= Average load, taken from the autographic recording to 5 inches of peeling, after the first 2 inches of facing have been peeled.

C= Correction for the load in pounds required to overcome the weight of the drum. Determine by placing a strip of the fabric of negligible stiffness in place of the specimen, and measure the load required to roll the drum upward. Make the measurement with the backup plate and clamp in place.

Reporting: record materials Batch/lot number, class and type of adhesive, testing conditions, type of failure (cohesive, adhesive break and run) and the peel strength of each sample.

4.5 Flatwise Tensile Strength -

The ultimate Flatwise Tensile Strength of each specimen shall be calculated and recorded and shall be not less than values given in **Table 3**. Five specimens, 2.00 ± 0.30" x 2.00 ± 0.30", shall be cut from the panel in **Figure 7** and tested in accordance with ASTM C297.

Reporting: record materials Batch/lot number, class and type of adhesive, testing conditions, type of failure (cohesive, adhesive break and run) and the tensile strength of each sample.

5 MATERIAL QUALIFICATION REQUIREMENTS

5.1 Request For Qualification

All requests for qualification to this specification shall be addressed to Bombardier Aerospace Materials Technology Engineering department for approval.

All material qualification shall be site specific.

An audit of the manufacturers and/or test facilities by Materials Technology Engineering may be necessary prior to approval.

5.2 Qualification testing

Potential suppliers shall submit a written qualification test report based on 3 batches/lots of materials showing compliance with the requirements contained in section 3. The test report shall contain actual numerical test values, average test results as well as failure modes where applicable.

5.2.1 A sample shall be submitted for testing at the discretion of Bombardier Aerospace Materials Technology for evaluation.

5.3 Qualification by Similarity

Where a product has been qualified to another similar specification, the supplier may submit the qualification data applicable to this specification for consideration. The similar specification may be a government, company, or other specification where the requirements are similar to this specification.

5.4 Process Control Document

5.4.1 The manufacturer shall develop and maintain a Process Control Document (PCD). The PCD shall define the manufacturing and quality control requirements and procedures for assuring consistent, uniform and compliant products. The PCD shall identify baseline chemical constituents, in-process test procedures and requirements, and manufacturing procedures. All specifications and test procedures employed during the process shall also be listed and issue/date controlled.

5.4.2 When qualification has been granted, the PCD shall be signed by the supplier and Bombardier Aerospace Materials Technology Engineering and shall not be changed without prior written approval.

5.4.3 The PCD and all production data shall be available to any Bombardier Aerospace auditors when requested.

5.5 Qualification Approval

5.5.1 Upon review of supplier's data, PCD and de Havilland tests, the supplier will be advised either of product qualification or reasons for disqualification.

5.5.2 Products that are qualified will be listed in the Qualified Products List of this specification.

5.5.3 No changes in the method of manufacture and/or formulation shall be made without notification and prior written approval of Materials Technology Department.

5.5.4 Re-qualification of the product may be requested by the Bombardier Materials Technology if there are any changes in the method of manufacture and/or formulation.

6 QUALITY ASSURANCE REQUIREMENTS

6.1 Manufacturer Batch/Lot Acceptance Tests

6.1.1 The manufacturer/supplier is responsible for the performance of all sampling, inspection and testing of each batch/lot as specified in **Table 5.**

6.1.2 The manufacturer/supplier shall issue with each batch of product one copy of an Acceptance Test Report showing actual test data conformance to the acceptance tests specified in **Table 5**. The report shall include the supplier's batch identification, materials specification and date of testing.

6.1.3 Bombardier Aerospace Materials Technology Engineering reserves the right to perform any or all of the tests set forth in this specification to ensure that the product continues to meet specification requirements. Any product not meeting the requirements of this specification will be returned to the supplier at the supplier's expense.

6.1.4 The manufacturer/supplier shall certify with a Certificate Conformance that each batch of each shipment meets the requirements of this specification.

6.2 Purchaser Batch/Lot acceptance tests

The purchaser is required to perform of all sampling, inspection and testing of each batch/lot as specified in **Table 5.**

For Purchaser performing metal bonding to PPS 36.10, comply to the requirements of PPS 36.10 and DHMS A6.03.

Table 5: Qualification and Acceptance Tests

Test	Reference	Qualification[1] (Supplier)	Acceptance[2] (Supplier & Purchaser
Primer			
Colour	Table 1	x	x
Solids	Para. 3.3.3 & Table 1	x	x
Tensile Shear at 75° ± 5°F	Table 3	x	x
Metal to Metal Climbing Drum Peel at 75° ± 5°F	Table 3	x	x
Adhesive & Primer System			
Storage Life	Para. 3.3.1	x	
Working Life	Para. 3.3.2	x	
Volatile Content	Para. 3.3.4	x	
Tack	Para. 3.3.5	x	
Shrinkage	Para. 3.3.7	x	
Film Weight	Para. 3.3.8 & Table 2	x	x
Tensile Shear at -67° ± 5°F	Para. 4.2 & Table 3	x	
Tensile Shear at 75° ± 5°F	Para. 4.2 & Table 3	x	x
Tensile Shear at 180° ± 5°F	Para. 4.2 & Table 3	x	
Tensile Shear at 250° ± 5°F	Para. 4.2 & Table 3	x	
Tensile Shear at 75° ± 5°F after 30 days with 100% RH at 120° ± 5°F	Table 3	x	
Tensile Shear at 75° ± 5°F after 30 days salt spray at 95° ± 5°F	Table 3	x	
Tensile Shear at 75° ± 5°F after 7 days immersion in JP4 (MIL-J-5624) at 75°± 5°F	Table 3	x	
Tensile Shear at 75° ± 5°F after 7 days immersion in Type 3 Hydrocarbon Fluid (MIL-S-3136) at 75° ± 5°F	Table 3	x	

Table 5: Qualification and Acceptance Tests

Test	Reference	Qualification[1] (Supplier)	Acceptance[2] (Supplier & Purchaser
Tensile Shear at $75^{o} \pm 5^{o}F$ after 7 days immersion in Type 3 Hydrocarbon Fluid (BMS 3-11) at $150^{o} \pm 5^{o}F$	Table 3	x	
Metal to Metal Climbing Drum Peel at $75^{o} \pm 5^{o}F$	Table 3	x	x
Flatwise Tensile at $75^{o} \pm 5^{o}F$	Table 4	x	
Flatwise Tensile at $250^{o} \pm 5^{o}F$	Table 4	x	
Metal to Metal Honeycomb Climbing Drum Peel at $75^{o} \pm 5^{o}F$	Table 4	x	x[3]

1. For Qualification, ten specimens are required for each batch.

2. Acceptance test required for both supplier and purchaser, five specimens are required for each batch.

3. Only required for purchaser facility that performs sandwich construction bonding.

4. For acceptance test of adhesive and primer system, two tensile and two climbing drum peel test panels (five specimens per panel) are required.

5. For acceptance test of adhesive or primer, one tensile and one climbing drum peel test panels (five specimens per panel) are required.

6.3 Sampling

6.3.1 Sampling Schedule - Sampling shall be in accordance with **Table 6**. For facility manufactures metal bonding assembly to PPS 36.10, comply to the requirement of PPS 36.10.

Table 6: Sampling Schedule

Number of Rolls/Can in Batch	Frequency of Inspection
1 - 10	1 roll/can
11 - 39	2 rolls/cans
40 and more	3 rolls/cans

6.3.2 Batch - A batch shall be all the product produced in a single production run from the same lot of raw materials under the same fixed conditions and submitted for inspection at one time.

6.3.3 Lot - A lot shall consist of all of the adhesive, or adhesive-primer, from one adhesive or adhesive-primer batch received in one shipment.

7 ORDERING DATA

7.1 Prerequisite

Material furnished under this specification for production use shall be qualified and listed on the Qualified Products List prior to issuing of a Purchase Order.

7.2 Procurement Documents

- Procurement documents shall specify the following:
- Title, Number, Issue and Amendment Number of this Specification
- Film Weight or Primer
- Manufacturer's Material Designation
- Total Quantity

8 PREPARATION FOR DELIVERY

8.1 Identification

Each individual roll of tape adhesive shall have a legible identification label or marking securely affixed to the inside of the core. Each individual container of liquid adhesive primer shall have a legible identification label or marking securely affixed to the side of the container. Each of the above identification labels shall show the following listed information:

- Specification Number, Type and Weight of Adhesive or Primer
- Vendor's Name and Address
- Vendor's Batch Number
- Date of Manufacture
- Purchase Order Number (on outside of Individual Roll Containers)
- Unit Number of Container (applicable to Liquid Adhesive Primer only)
- Refrigeration Requirement -
- (i) Adhesive Film, store at 0° F or below
- (ii) Adhesive Primer DHMS A6.03-1, store at 0° F or below.
- (iii) Adhesive Water Based Primer, DHMS A6.03-2, store at 40°-55°F or above 32°F. DO NOT ALLOW PRIMER TO FREEZE !

8.2 Packaging

The film adhesive shall be wound on spools not less than 3 inches in hub diameter and interleaved with a non-adherent film. Winding shall be uniform and shall provide for proper unreeling.

Each roll shall be adequate support at both ends through the center of the core.

Each roll of adhesive shall be protected by a sealed, polyethylene film wrapper.

Liquid adhesive primer shall be packaged in a clean, air-tight, one or five gallon, metal container.

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.

The amount of material from each roll may be adjusted to be compatible with the production cycle of the vendor, except that normal roll length shall be at least 20 yards.

9 HEALTH AND SAFETY DATA

When supplying samples for qualification per **Para.5.1**, the supplier shall submit a Material Safety Data Sheet (MSDS) complying with the "Controlled Products Regulations" of the Hazardous Products Act (also known as W.H.M.I.S. Regulations). The document must state all hazardous ingredients, safe-handling procedures, first-aid measures, fire and explosion data, re-activity data, physical properties, preparation information and procedures for storage and disposal.

This (MSDS) must then be supplied with a completed DH 4339 "Application To Introduce A New Material" form to the Material Safety Committee.

Upon receipt of DH 4340 "Recommendation" form that approves the use of the material, it can then be included on the Qualified Products List.

NOTE: Any changes in the formulation of the material require a re-submission of the Material Safety Data Sheet.

MODIFIED EPOXY, HIGH STRENGTH, STRUCTURAL FILM ADHESIVE SYSTEM

QUALIFIED PRODUCTS LIST

MANUFACTURER'S NAME AND ADDRESS	MANUFACTURER'S PRODUCT IDENTIFICATION NO.	MSDS	DE HAVILLAND QUALIFICATION SHEET NO.	DATE OF PRODUCT APPROVAL
Adhesive Film				
Cytec Fiberite Inc., Bloomingdale Products, Havre de Grace, Maryland 21078.	FM 73M 0.030 psf Mat 0.045 psf 0.060 psf 0.085 psf	0415	PQS #1	May 8, 1978
3M Company, P.O. Box 119, Bristol, PA 19007.	Scotchweld Brand Structural Adhesive AF-163-20ST Mat 0.030 psf 0.060 psf AF-163-3M 0.030 psf Mat	969	 PQS #2, Sheet 2 PQS #2, Sheet 3 PQS #2, Sheet 1	 Feb. 1, 1980
Adhesive Primer A6.03-1				
Cytec Fiberite Inc.	BR 127	0959	PQS #1	May 8, 1978
3M Company	EC 3960	970	PQS #4	Jan. 20, 1981
Water Based Adhesive Primer A6.03-2				
Cytec Fiberite Inc.	BR6747-1	3424	PQS #5	Jan. 22, 2001

Notes:

1. Adhesive film to be used only with the qualified adhesive primer from the same manufacturer.
2. FM-73M shall be supplied with paper backing (of a type that will not absorb and/or retain moisture) on one side and polyethylene backing on the other.