BOMBARDIER

de Havilland
Material Specification

TITLE:	**ALUMINIZED GLASS FABRIC UNIMPREGNATED AND PREIMPREGNATED WITH EPOXY RESIN 250°F AND 350°F CURE**
SPECIFICATION NUMBER:	**DHMS P 1.38**
ISSUE:	**G**
AMENDMENT:	**1**
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PAGE:	**1 of 18**

Prepared by: Approved by:

SIGNED ORIGINAL ON FILE

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REVISION RECORD

Issue	Page	Description and Reason for Change
B	4	Para. 3.1.3 - Aluminum content revised.
Amd. 6		
	7	Table 2 - Aluminum content revised.
	16	Para. 7.3.3 added.
		Para. 8.0 - Revised - Health and Safety Data.
	17	QPL-IPCO added to QPL as a distributor for Hexcel in Republic of Korea.
Amd. 7	4	Para. 3.1.3 - Aluminum Content tested in accordance with para. 4.6.
	7-10	Removed manufacturing procedure for flexural test specimens and renumbered section 4.
Amd. 8	5	Working life specification changed: 10 days for type 2 and 3 and 7 days for type 3.
		Para. 3.2.1.8 revised.
Amd. 9	17	QPL-Gel time for Hexcel material TEF 7/F159 changed: Gel Time 6-18 minutes.
		Manufacturer's name changed from SP Systems to Culver City Composites.
C	All	This is the new issue. Detailed changes have not been noticed.
D		This is a complete revised issue. Detail changes have not been noted.
Amd.1	5-6	Resin Content test method has been changed.
	16	QPL has been corrected.
Amd. 2	16	QPL: Product designation has been changed.
Amd. 3	16	QPL: Product designation has been changed.
Amd. 4	16	QPL: Added J.D.Lincoln product L-730-M30,type 2

REVISION RECORD

Issue	Page	Description and Reason for Change
E	7	Replaced Al foil with 2 plies of perforated release film for Resin Flow Test of Type 3.
	QPL	Added JD Lincoln to Type 3.
Amd. 1	QPL	Corrected Hexcel Corp. address for type 1, type 2 and type 3
Adm. 2	QPL	Removed Culver City,Rodeo, CA, this facility is closed.
F	7,8	Updated Resin Content, Resin Flow testing.
	14	Added PCD requirement.
	QPL	Gel time for J. D.lincoln Type 3 Was 0.5 - 4.5 minute, Now: 1-5 minute
G		This is a complete revised issue.
	7	Reword Tack test
	8	Temperature and Humidity for testing changed to 70˚F ± 10˚F maximum 60%.
	8,9	Updated layout standardize with other specifications.
		Added additional sources for expendable materials to DSC 234
	12,13	Updated sections 5,6,7,8 standardize with other specifications.
	14	Table 5 , clarified Acceptance testing for Supplier,User.
	QPL	Addd Cytec Winona site for Type 2, Type 3
Amd. 1	16	8.2.2 Revised, standardize with other specifications.

ALUMINIZED GLASS FABRIC UNIMPREGNATED AND PREIMPREGNATED WITH EPOXY RESIN 250° F AND 350° F CURE

1 SCOPE

This specification establishes the material requirements for aluminum coated, glass fibre fabric to be used for dispersing static electricity and for providing lighting strike protection to composite parts.

1.1 Classification

Types - Type designation is based on layup and cure cycle.

Type 1 - Aluminized, glass fabric suitable for fabrication with epoxy resin, with or without an elevated temperature cure.

Type 2 - Epoxy resin, preimpregnated, 250° F cure, aluminized glass fabric suitable for vacuum or autoclave cure.

Type 3 - Epoxy resin, preimpregnated, 350° F cure, aluminized glass fabric, suitable for autoclave cure.

Grade - Grade designation is based on qualification test waveforms, as defined in MIL-STD-1757.

Grade B - Capable of providing lightning protection in the zones.

2 APPLICABLE DOCUMENTS

The following documents form a part of this specification to the extent defined 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 U.S. Government Specifications

MIL-R-9300	-	Resin Epoxy, Low Pressure, Laminating
MIL-STD-1757	-	Lightning Qualification Test Techniques for Aerospace Vehicles and Hardware
FED-STD-191	-	Textile Test Methods.

2.2 American Society for Testing and Materials

ASTM C613	-	Resin Content of Carbon and Graphite Prepregs by Solvent Extraction.
ASTM D790	-	Flexural Properties of Plastics
ASTM D3039	-	Tensile Properties of Oriented Fiber Composites

2.3 de Havilland Specifications & Standards

DSC 234	-	Composite Manufacture Expendable Materials

3 REQUIREMENTS

3.1 Fabric

Aluminized glass fabric shall consist of E-glass continuous fibers that are half coated with pure aluminum and woven in a fabric with conductivity in both directions. The construction weave and weight shall be as described in **Table 1**.

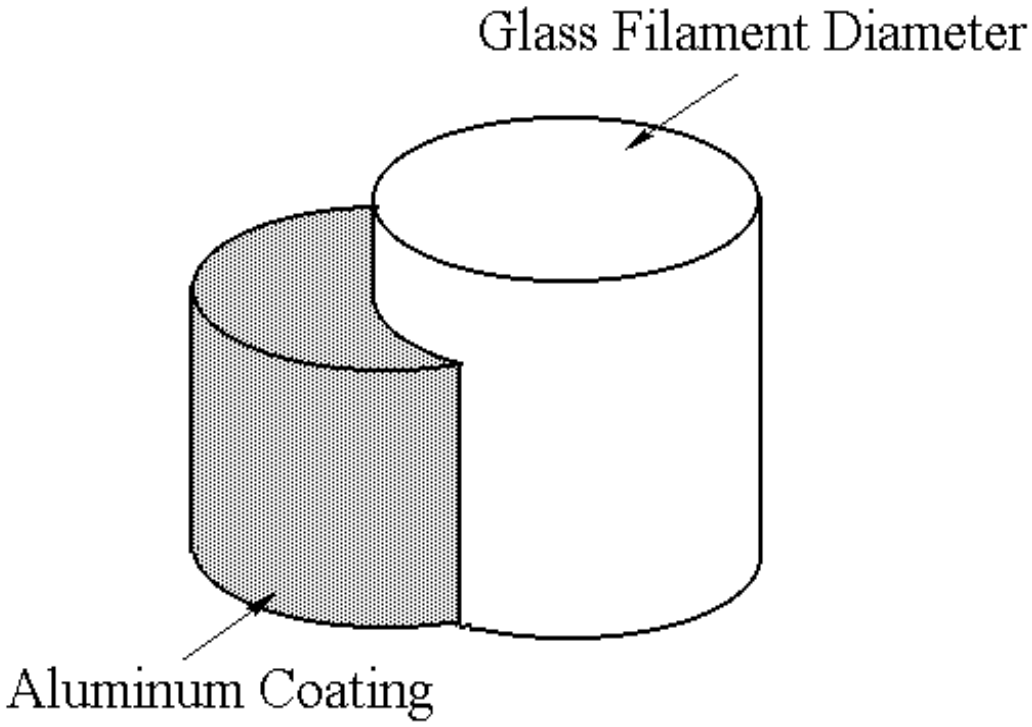
TABLE 1.

Grade	Weave	Construction ends/inch	Weight oz / sq.yd
B	5 Harness Satin	32 x 30	7.39 - 9.26

3.1.1 Quality - The product shall be uniform in quality and condition and free from foreign materials and internal and external imperfections detrimental to fabrication, appearance or performance of parts.

3.1.2 Static Electricity Protection - All grades of aluminized fabric shall be capable of effectively dissipating static electricity.

3.1.3 Lightning Strike Protection - The aluminized fabric shall be capable of providing lightning protection when subjected to the qualification test wave forms and techniques specified in MIL-STD-1757.



3.1.4 Finish (Type 1 Only) - The fabric finish used in a qualified system shall be listed with that material on the Qualified Products List of this specification. The fabric finish is considered an integral part of a qualified system and a change of finish requires requalification of the material.

3.1.5 Aluminum Content - Type 1 - Three samples of the material to be qualified, approximately 4 - 6 in^2, shall be weighed and treated with 50% hydrochloric acid to react with the aluminum. After the effervescence ceased, the fabric shall be rinsed with water and, finally, with acetone, to promote drying. All samples shall be dried in an oven at 140 ˚F (60 ˚C) for 1 hour and allowed to cool for 1/2 hour in a desiccator, prior to weighing. The aluminum content shall be calculated as follows:

$$\text{Aluminum Content, \% by Weight} = \frac{W1 - W2}{W1} \times 100$$

W1 = Original Weight

W2 = Weight After Reaction

Type 2 and 3 - The resin from the Grade and Type of prepreg to be qualified shall be removed by Soxhlet extraction with acetone on 3 samples approximately 4 - 6 in^2. After extraction, the resin free fabric shall be dried and used to establish the aluminum content, using the method described for Type 1.

Alternatively, the supplier can report the percent aluminum content value from fabric supplier certification. Certificate of conformance from fabric supplier is required with all shipment of prepreg.

3.1.6 Examination of Fabric - Each roll of aluminized glass fabric shall be unrolled so that at least six yards may be visually inspected for defects.

3.2 Preimpregnated Fabric

This product shall be the Type 1 fabric, impregnated with an epoxy resin system, supplied in the B stage condition, and shall be formulated to meet the requirements specified herein.

3.3 Defects

Materials may not contain defects in excess of the following limits: defects in excess of one in any 5 linear yards of material or totalling more then 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. Compensation for defective material may be calculated on an equivalent weight basis, at the supplier's option.

3.4 Physical Properties and test method of Uncured Impregnated Fabric

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.

3.4.1 Storage Life - The storage life of the prepreg shall be a minimum of 180 days from date of shipment, 210 days from the date of manufacture, when stored at a temperature of 10˚ F or below.

3.4.2 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 humidity not greater than 70%, for a continuous period of up to 10 days for Type 2 , and 7 days for Type 3.

3.4.3 Formability - Formability is defined as the ability of the product to be deformed or contoured over a mould and be cured in that position. The product shall be formable over, or into, a 0.15 inch minimum radius and remain in position throughout fabrication. Heat may be applied locally to aid in achieving this requirement.

3.4.4 Volatile Content - Type 2 - Three, 4 x 4 inch specimens of the uncured material shall be weighed individually on an analytical balance to the nearest 10 mg and 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:

$$\text{Volatile Content, \% by weight} = \frac{W1 - W2}{W1} \times 100$$

W1 = Original Weight

W2 = Weight After Heating Cycle

Type 3 - Three, 4 x 4 inch specimens of the uncured material shall be weighed individually on an analytical balance to the nearest 10 mg and placed in an air circulating type oven at 325 ± 10 ˚F for 15 minutes, removed from the oven and placed in a desiccator. The specimens shall then be cooled to room temperature, reweighed, and the volatile content calculated as follows:

$$\text{Volatile Content, \% by weight} = \frac{W1 - W2}{W1} \times 100$$

W1 = Original Weight

W2 = Weight After Heating Cycle

The Volatile Content, by weight shall not be greater than 2 % for both Type 2 and Type 3.

3.4.5 Resin Content by Weight - The resin content by weight shall be calculated and recorded and shall meet the requirements of **Table 2**. Three specimens approximately 4 square inches each, shall be cut from the roll so that one sample comes from the centre of the width and the other two from the edges.

Note: volatile content must be performed on different samples.

The three samples shall be individually weighed on an analytical balance and weights recorded to the nearest 10 mg. Completely submerge the three samples in separate beakers containing a minimum of 50 ml Methyl Ethyl Ketone, Acetone, or Methylene Chloride for at least 5 minutes. Decant the solvent, being careful to retain all fibers and replace with clean solvent. Continue to extract and decant the sample for a minimum of 3 extractions, until all traces of resin have been removed. Dry the fibers at $210^{o} \pm 10^{o}$ F for 15 minutes. The specimens shall then be cooled to room

temperature in a desiccator, reweighed, and the resin content /fabric weight calculated as follows:

Resin Content, % by weight = $\frac{W1 - W2}{W1} \times 100$

W1 = Original Weight

W2 = Weight After Extraction

3.4.5.1 Resin Flow by Weight - Type 2 - Three specimens, each 4 x 4 inch x 4 plies, of the uncured material shall be weighed on an analytical balance to the nearest 10 mg. The specimens shall be positioned between aluminum foil (maximum thickness 0.020") coated with release agent and placed individually in a press, preheated to 260˚F ± 10˚F at 50 psi ± 5 psi pressure and cured for 15 minutes. The foil shall be removed, the flash broken off, each specimen individually reweighed to the nearest 10 mg and the percent flow calculated.

3.4.5.2 Type 3 - Three specimens, each 4 x4 inch x 4 plies, of the uncured material shall be weighed on an analytical balance to the nearest 10 mg. The specimens shall be positioned between aluminum foil (maximum thickness 0.020") coated with release agent and placed individually in a press preheated to 325 ± 10 ˚F at 50 ± 5 psi pressure and cured for 15 minutes. The foil shall be removed, the flash broken off, each specimen individually reweighed to the nearest 10 mg and the percent flow calculated.

The resin flow shall be as stated on the Qualified Products List of this specification.

3.4.6 Gel Time - Type 2 - Three specimens of the product shall be cut from the material to be qualified, each specimen being approximately 1/4" square. After preheating a hot plate to 260 ± 10 ˚F, a micro cover glass is placed on the hot plate, allowing 20 seconds for it to reach temperature equilibrium. One specimen is positioned at the center of the micro cover glass and, simultaneously, timing is commenced. Within 5 seconds, a second micro cover glass is placed over the specimen. After the resin softens, and during the first 30 seconds, the top micro cover glass shall be probed and a drop of resin isolated. The fluidity and colour of the isolated resin drip is observed periodically (continuously as the end point approaches). The lateral (spreading) movement of the resin, upon probing, will decrease or regress and the colour shade will change as the gel point approaches. The timer shall be stopped at the first indication of resin immobility and the lapsed time recorded to the nearest minute. Repeat the test for second and third specimens. Average of the three specimens shall be noted for the test.

Type 3 - Three specimens of the product shall be cut from the material to be qualified, each specimen being approximately 1/4" square. After preheating a hot plate to 325 ± 10 ˚F, a micro cover glass is placed on the hot plate, allowing 20 seconds for it to reach temperature equilibrium. One specimen is positioned at the center of the micro cover glass and, simultaneously, timing is commenced. Within 5 seconds, a second micro cover glass is placed over the specimen. After the resin softens, and during the first 30 seconds, the top micro cover glass shall be probed and a drop of resin isolated. The fluidity and colour of the isolated resin drip is observed periodically (continuously as the end point approaches). The lateral (spreading) movement of the resin, upon probing, will decrease or regress and the colour shade will change as the gel point approaches. The timer shall be stopped at the first indication of resin immobility and the lapsed time recorded to

the nearest minute. Repeat the test for second and third specimens. Average of the three specimens shall be noted for the test.

3.4.7 Tack - The product shall exhibit a degree of tackiness to enable easy handling during normal fabrication processes at a temperature range of 65- 77˚F, with a humidity not greater than 70% anytime during the defined shelf life. Both sides of the fabric shall exhibit a degree of tackiness so that the fabric, when folded 180˚, will adhere lightly to itself. It shall also be capable of being removed, after light hand pressure during lay-up, without disturbing the previously positioned mating ply.

3.4.8 Marking - The warp direction of the woven impregnated fabric shall be marked in manner that is acceptable to Materials Technology,de Havilland.

3.4.9 Dimensions -

Width - Unless otherwise specified, the overall width of the product, as supplied, shall be 38", inclusive of the selvedge, if applicable. Width tolerance shall be ± 0.50 inches.

Length - Unless otherwise specified, the overall length of the product, as supplied, shall be 25 ± 10, 50 ± 10 or 100 ± 10 yards.

3.4.10 Workmanship - The impregnated, aluminum coated glass fiber fabric shall be evenly impregnated, uniform in quality, and free from holes, resin pockets, areas lacking resin, excess resin, patches and other similar defects which will render the product unsuitable for its intended purpose.

3.4.11 Bias or Bowed Filling - The filling stands shall not be distorted from the horizontal by more than 3" in 38" width and proportionately for all other widths.

TABLE 2. PROPERTIES OF UNCURED IMPREGNATED FABRIC

Test	Reference	Type 1	Type 2	Type 3
		Grade B	Grade B	Grade B
Volatiles % Max.	Para.3.4.4	-	2% max	2% max
Resin Content %	Para.3.4.5	-	50 ± 3	50 ± 3
Resin Flow %	Para.3.4.5.1	-As shown on Qualified Products List		
Gel Time	Para.3.4.6	-As shown on Qualified Products List		
Aluminum Content % by Weight	Para.3.1.5	30.5 - 43.3	30.5 - 43.3**	30.5 - 43.3**
** After Soxhlet extraction with acetone.				

3.5 Mechanical Properties and Test Method of Cured Impregnated Fabric

3.5.1 Unless otherwise specified, tests shall be conducted at 70˚F ± 10˚F and a relative humidity of maximum 60%. Specimens tested at room temperature shall be conditioned for a minimum of 24 hours at 70 ± 10˚F and maximum 60% relative humidity immediately prior to the test At least five specimens shall be used per test except for flammability test which requires a minimum of three specimens, and the results averaged. No individual value shall be less than 90% of the value specified; this shall not apply to flammability tests.

Unless otherwise specified, all test pieces shall be cut with the longer dimension parallel to the warp direction fo the the fabric

3.5.2 Ply Thickness - Measure the cured laminates prepared for mechanical testing using a micrometer. Do not measure thickness across the laminate edge area where edge bleeding, edge damming will affect laminate thickness. Report thickness as the average of at least 10 determinations uniformly dispersed over the laminate surface. The average ply thickness for each ply must meet the requirements of **Table 3**.

3.5.2.1 Tensile Test

The ultimate tensile strength and the tensile modulus 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 D3039 with a cross head speed of 0.05"/min.

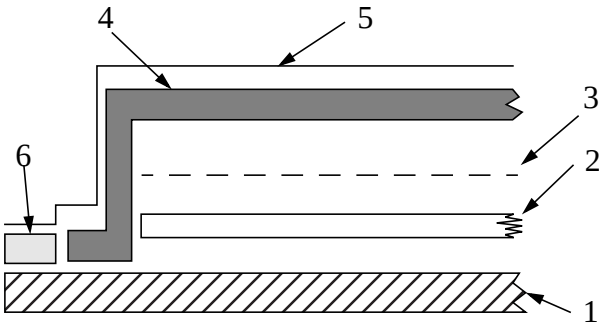
TABLE 3. LAMINATE PHYSICAL PROPERTIES

Test	Reference	Type 1	Type 2	Type 3
		Grade B	Grade B	Grade B
Ultimate Tensile Strength, psi min	ASTM D638	18,000	18,000	12,000
Tensile Modulus, psi min	ASTM D638	-	1.75×10^6	1.5×10^6
Cured Thickness, inches	**Para.3.5.2**	-	0.008 - 0.010	0.008 - 0.010

4 TEST PANEL FABRICATION

4.1 Laminate Specimen

A 10 plies test laminate shall be lay up with the long dimension parallel to the warp direction of the fabric. Laminate shall be vacuum bagged per **Figure 1** and cured per **Figure 2** for Type 2 and **Figure 3** for Type 3.



Use DSC 234 expendable materials

1. Tool (coated with mould release Frekote 44 NC or 700NC)
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 for Types 2 &3 Laminates

APPROVED EXPENDABLE MATERIALS TO DSC 234

Wrightlon 8400	(DSC 234-2-54)	Airtech International Inc., 2542 East Del Amo Blvd.,
Perforated Release Film A4000P3	(DSC 234-5-48)	
Airweave SS-FR Breather	(DSC 234-11)	
Mould Release, Frekote 44NC or 700NC	(DSC 234-13-3/4)	Frekote Inc., 170 W. Spanish River Blvd.,
Vacuum Sealant Tape, GS 43 MR	(DSC 234-17-1)	Boca Raton, FL 33431 (305) 395-3082

Note: Additional sources are listed in DSC 234.

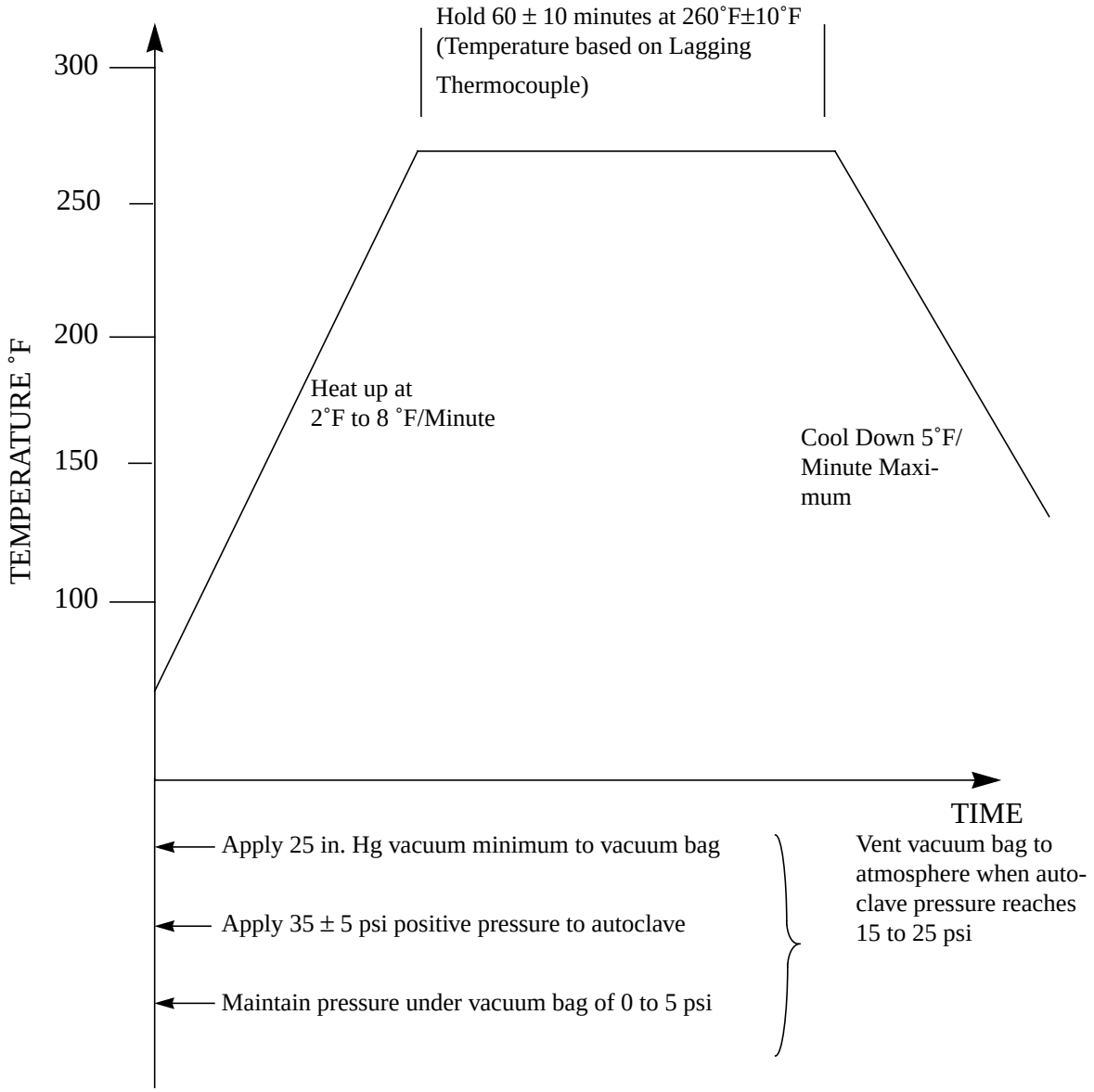


FIGURE 2. Cure Cycle for Type 2

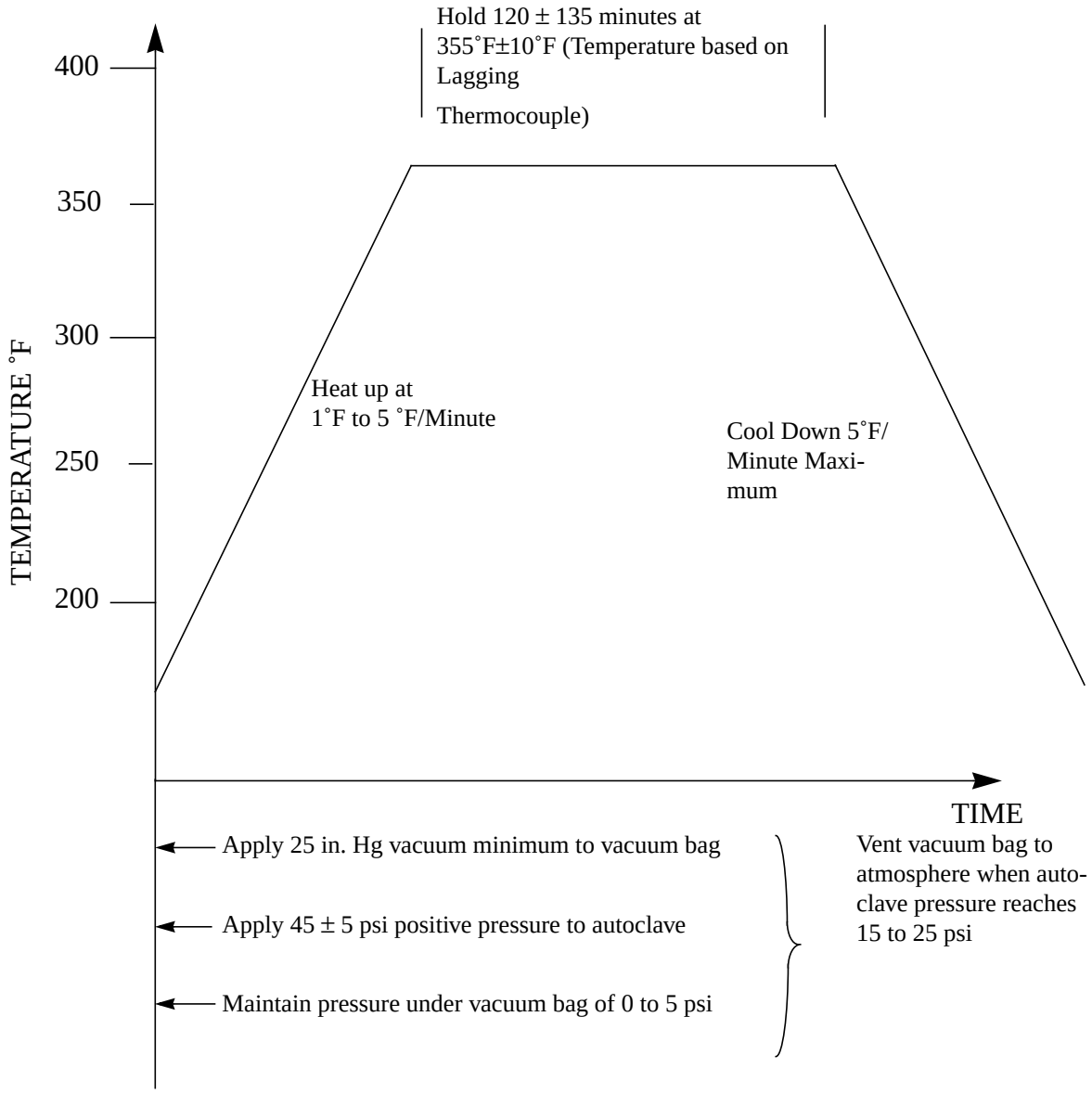


FIGURE 3. Cure Cycle for Type 3

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 aerospace specifications 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).

5.4.2 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.

5.4.3 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.

5.4.4 The PCD and all production data shall be available to 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 not qualifying the product.Products that are qualified will be listed in the Qualified Products List of this specification.

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

5.6 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/Supplier 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 4** and **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 4** and **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/User Batch/Lot acceptance tests

6.2.1 The purchaser/user is required to perform of all sampling, inspection and testing of each batch/lot as specified in Table 4 and **Table 5.**

TABLE 4. Qualification and Batch Acceptance Tests on Type 1 Material

Property	Reference	Qualification	Acceptance (Supplier)
Aluminum Content	**Para.3.1.5**	x	x
Tensile Strength	**Table 3**	x	
Overall Examination	**Para.3.1.6**	x	x

TABLE 5. Qualification and Batch Acceptance Tests on Types 2&3 Material

Property	Reference	Qualification	Acceptance (Supplier/User)
Storage Life	Para.3.4.1	x	
Working Life	Para.3.4.2	x	
Formability	Para.3.4.3	x	x
Volatile Content	Para.3.4.4	x	
Resin Content	Para.3.4.5	x	x
Resin Flow	Para.3.4.5.1	x	x
Gel Time	Para.3.4.6	x	x
Tack	Para.3.4.7	x	x
Cure Time	Figure 2 & 3	x	
Dimensions	Para.3.4.9	x	
Workmanship	Para.3.4.10	x	x
Bias or Bowed Filling	Para.3.4.11	x	
Tensile Strength	Table 3	x	
Static Dissipation	Para.3.1.2	x	
Lightning Strike	Para.3.1.3	x	
Aluminum Content	Para.3.1.5	x	x

6.2.2 de Havilland 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.

6.3 Sampling

6.3.1 Sampling Schedule - Sampling shall be in accordance with Table 6.

TABLE 6. Sampling Schedule

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

6.3.2 Batch - A batch shall be all the product produced from the same lot of raw materials under the same fixed conditions and submitted for inspection at one time. When more than one lot of aluminized glass fabric is used in production of a batch of prepreg to this specification, acceptance test shall be conducted so as to cover all lots of fabric batches utilized.

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
- Type and Grade of Fabric
- Manufacturer's Material Designation
- Total Quantity

8 PREPARATION FOR DELIVERY

8.1 Identification

8.1.1 Each roll of impregnated fabric shall be identified with a label or marking, securely affixed to the inside of the core or with a removable tag.

8.1.2 The label or removable tag shall use characters of a size such as to be clearly legible and which will not be obliterated by normal handling. Each label or tag shall show the following information:

- Aluminum Coated Glass Fiber Fabric
- DHMS P1.38 (Enter Type and Grade)
- Manufacturer's Material Designation
- Purchase Order Number
- Lot and Roll Numbers
- Quantity
- Perishable - Store Below 10˚F*
- Date of Manufacture

* Applicable only to Types 2 and 3.

8.2 Packaging

8.2.1 Type 1 -

The fabric shall be wound on spools not less than 3 inches in hub diameter. Winding shall be uniform and shall provide for proper unreeling. Fabric ends shall be secure.

Each roll shall be wrapped with a suitable covering to protect the fabric.

The roll shall be packed in an exterior shipping container in a manner to ensure protection from

damage during shipment.

8.2.2 Types 2 and 3 -

The impregnated fiber shall be wound on spools not less than 3 inches in hub diameter and interleaved with a non-adherent film. The non-adherent film must be on the outside to prevent penetration of moisture or loss of impregnating resin solvent.The backing type shall be that is acceptable to Materials Technology.

Winding shall be uniform and shall provide for proper unreeling. Fabric ends shall be secure.

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

Each roll shall be sealed in a bag of suitable non-adherent material to prevent penetration of moisture or loss of impregnating resin solvent.

The roll shall be packed in an exterior shipping container capable of protecting the impregnated materials adequately at 10˚F or lower during shipment and storage.

8.3 Shipping Documentation

8.3.1 Each shipping container shall have the exterior legibly marked with the following information in such a manner that the markings shall not smear or be obliterated during normal handling or use:

- Aluminum Coated Glass Fiber Fabric, Epoxy Impregnated
- DHMS P1.38 (Enter Type and Grade)
- Manufacturer's Material Designation
- Purchase Order Number
- Lot and Roll Numbers
- Quantity
- Perishable - Store Below 10˚F

8.3.2 Containers shall be prepared for shipment in accordance with commercial practice to assure carrier acceptance and safe transportation to the point of delivery.

8.3.3 Each shipment shall contain a copy of the Material Safety Data Sheet.

9 HEALTH AND SAFETY DATA

When supplying samples for qualification per **Para.5.2.1**, 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.

QUALIFIED PRODUCTS LIST

MANUFACTURER'S NAME AND ADDRESS	MANUFACTURER'S PRODUCT IDENTIFICATION NO.	MATERIALS SAFETY DATA SHEET NO.	PRODUCT QUALIFICATION SHEET NO.	DATE OF PRODUCT APPROVAL
	Type 1, Grade B			
Hexcel Corp. 1913 N. King St. Seguin, Texas	TEF 7/F69	N/A	PQS #1	Jan. 11, 1983
	Type 2, Grade B			
Hexcel Corp. 75 North Mines Rd. Livermore,CA (800) 688-7734 Korean Distributor I C P O Seo Kwang Bldg 1361 - 9 Sucho - Dong, Sucho - Ku Seoul, Republic of Korea	TEF 7/F159 Resin Flow 20 ± 10% Gel Time 6 -18 mins.	2084	PQS #2	Dec. 6, 1984 Dec. 21, 1992
Cytec Industries Inc. 851 W. 18th Street Costa Mesa, CA 92627 (949) 650 8106	L-530-M30 Resin Flow 20 ± 10% Gel Time 4-10 mins.	2865	PQS #5	Nov. 12, 1999
Cytec Industries Inc. Winona Division 501 West Third Street Winona, MN 55987			PQS#7	August 14, 2015

ALUMINIZED GLASS FABRIC UNIMPREGNATED AND PREIMPREGNATED WITH EPOXY RESIN 250° F AND 350° F CURE

MANUFACTURER'S NAME AND ADDRESS	MANUFACTURER'S PRODUCT IDENTIFICATION NO.	MATERIALS SAFETY DATA SHEET NO.	PRODUCT QUALIFICATION SHEET NO.	DATE OF PRODUCT APPROVAL
	Type 3, Grade B			
Hexcel Corp. Livermore, CA	TEF 7/F161 Resin Flow 35 ± 10% Gel Time 1-7 mins.	2085	PQS #3	Dec. 6, 1984
Cytec Industries Inc.. Costa Mesa, CA (949) 650-8106	L530HT-M30 % Resin Flow: 20± 10 % Gel Time: 1-5 mins.	2653	PQS #6	October 4, 2001
Cytec Industries Inc. Winona Division 501 West Third Street Winona, MN 55987			PQS#8	August 14, 2015