BOMBARDIER

de Havilland

Material Specification

TITLE:	**GLASS FIBER, 350^{O}F CURE, EPOXY RESIN IMPREGNATED (FOR EXTERIOR APPLICATION)**
SPECIFICATION NUMBER:	**DHMS P 1.41**
ISSUE:	**G**
AMENDMENT:	**2**
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PAGE:	**1 of 18**

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GLASS FIBER , 350°F CURE, EPOXY RESIN IMPREGNATED (FOR EXTERIOR APPLICATION)

REVISION RECORD

Issue	Page	Description and Reason for Change
B	12	Para. 7.3.3 was added regarding MSDS.
Amd. 3	13	Para 8.0 was revised regarding MSDS.
Amd. 4	12	Para 7.2.4 deleted.
C		Complete update to the specification Cytec supplier is added to the QPL.
D		This is a complete revised issue. Detail changes have not been noted.
D	4	Para. 3.2.13 updated.
Amd. 1	10	Figure 4 updated, cure pressure changed from 35 ± 5 psi to 45 ± 5 psi.
Amd. 2	6	Figure 1 has been corrected.
Amd. 3	16	QPL: JD Lincoln is added to the QPL.
	5	Para. 3.3.4 has been deleted.
	8	Table 3 has been updated.
Amd. 4	16	QPL: Addressed have been added for Culver City Composites.
	17	Page count change.
E		This is a complete revised issue. Major changes are: Storage Life: Standardized with other prepreg specifications Resin Content method: Standardized Resin Flow: Clarified ply lay up to be cross plied Flexural Strength test: dimension changed to 3" x 1", l/d=16:1 QPL: CE 9010A/7781 has been requalified under new manufacturer address. Product designation changed. Removed Inactive Fiberite product MXB 7880/7781.

REVISION RECORD

Issue	Page	Description and Reason for Change
E Amd. 1	11	Cure pressure changed to 35 ± 5 psi to standardize with other prepreg specifications
Amd. 2	17	Resin flow of product Cycom 985/7781 changed from 17-22% to 17-30%
Amd. 3	6	Specified Flex test with support span of 2", load span of 0.67". Test with load applied at tool side (smooth side) of the specimen.
F		This is a complete revised issue. Detail changes have not been noted Resin Content , Gel , Flow test methods updated to standardize with other prepreg specs. Added PCD requirements
G		This is a complete revised issue.
	2	Revised reference MIL-C9084 to AMS-9084
	5	Reword tack test
	6	Conditioning of test specimens, Was: 40hrs, IS: 24 hrs minimum. Revised Max humidity is 60% Clarified Flex test is 4 point bend.
	12	Update section 5 and 6 , Qualifiaction requirements
	14	Clarify batch acceptance testing for Manufacturer and User.
	16	Storage and shipping temperature : Was : "below 0 F", Is: "below 10 F"
	18, QPL	Removed Cytec's products: Cycom 9010A/7781, Cycom 985-7781. Products discontinued. Added Cytec Industries Winona.
Amd. 1	16	8.2 Revised, standardize with other specifications.
Amd.2	18	QPL Cytec Costa Mesa site obsolete Cytec Industries name change to Cytec Solvay Group Added Product AX-3220FR-7781-50" RC40 to QPL

1 SCOPE

This specification establishes the requirements for a 350°F cure epoxy resin impregnated, glass fabric, supplied in a "B" stage condition, suitable for autoclave pressure laminating of exterior composite panels.

1.1 Classification

The preimpregnated glass fiber shall be supplied in one of the following types:

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Table 1: Classification

Type	Style	Resin Content	Cured Ply Thickness (Nominal)
1	181, 1581, 7781	37 - 43%	0.010"

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 specification 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 US Government Specifications

AMS-C-9084 - Glass Fabric finished for Resin Laminates

AMS 3906 - Glass Non woven Fiber Tape and Flat Sheet

2.2 American Society for Testing Materials

ASTM D3039 - Tensile Properties of Plastics

ASTM D3410 - Compressive Properties of Rigid Plastics

ASTM D790 - Flexural Properties of Plastics

ASTM D2584 - Ignition Loss of Cured Reinforced Resins

2.3 American National Standard Institute

ANSI B46.1-78 - Surface Texture

3 REQUIREMENTS

3.1 Fabric

The glass fiber fabric, Type 1, shall meet the requirements of AMS-C-9084, Class 2, Type VIII, VIIIA and VIIIB (commercial designation style #181, #1581 and #7781) See **Table 2** for the make-up of fabric.

Table 2: Fabric Properties

Type	Style	Construction Ends/Inch	Weave	Basic Weight oz/sq.yd.	Thickness(Nom)
1	181, 1581 or 7781	56 x 53	5-counter 8 Harness Satin	8.65 ± 0.5	0.010" ± 0.002

3.1.1 Ends - The fabric shall not contain any unspliced yarns or tow ends.

3.1.2 Fabric, Unimpregnated Weight - The basic weight of the fabric shall meet the requirements given in **Table 2**.

3.2 Preimpregnated, Fiberglass Fiber Fabric

The product shall be the fabric noted in **Para.3.1** of this specification, 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 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.

3.4 Physical Properties of Uncured Impregnated Fabric

Tests shall be performed on the product as received, after warming to above 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 the date of shipment, 270 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 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 7 days.

3.4.3 Formability - Desirable 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 - Three, 4 inch 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 circulate type oven at 325°F±10°F for 15 minutes.

Remove specimens from the oven and placed in a dessicator. 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%.

3.4.5 Resin Content by Weight - The resin content by weight shall be calculated and recorded and shall meet the requirements of **Table 1**. Three specimens approximately 4 X 4 inch 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 mininum 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 trace of resin has been removed. Dry the fibers at 210° ± 10° 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:

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

W1 = Original Weight

W2 = Weight After Extraction

Alternatively, Three specimens, approximately 5 grams each, can be tested to the requirements of ASTM D2584.

3.4.6 Resin Flow by Weight - Three specimens, each 4 inches x 4 inches 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 that preheated to 325°F±10°F, and cured for 15 minutes at 50 psi± 5 psi. 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.

3.4.7 Gel Time

3.4.7.1 Method 1

Three specimens, each being approximately 1/4" X 1/4", shall be cut from the uncured material. A hot plate shall be preheated to 325°F ± 10°F unless otherwise specified and a micro cover glass placed on the hot plate, allowing a minimum of 20 seconds for it to reach equilibrium. One specimen shall be placed at the centre of the micro cover glass and timing shall be commenced. Within 5 seconds, a second micro cover glass shall be placed over the specimen. When the resin softens during the first 30 seconds, the top micro cover glass shall be probed to isolate a drop of resin. The fluidity and colour of the isolated drop shall be observed periodically at first, and continuously as the end point approaches. The lateral spreading movement of the resin, upon probing, will decrease and the colour will change as the gel point approaches. The timer shall be stopped at the first indication of resin immobility and the elapsed time to the nearest minute shall be recorded.

3.4.7.2 Method 2

Apparatus:

1 Fisher-Johns melting point apparatus

2 Thickness No. 2 18 mm cover glasses

3 Timer or stopwatch

4 Wooden picks or equivalent.

Procedure:

1 Preset the Fisher-Johns melting point apparatus to read 325°F ± 10°F of the specified temperature.

2 Insert a 1/4" x 1/4" sample between 2 cover glasses and place on the Fisher-Johns apparatus.

3 Start the timer and probe the specimen with a wooden pick.

4 When resin gels (this is usually evident when no resin movement is seen when moderate pressure is applied to the specimen), stop the timer and report the gel time to the nearest 0.1 minute.

The product shall have a gel time as shown on the Qualified Products List of this specification unless otherwise specified.

3.4.8 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

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

3.4.10 Marking - The warp direction of the fabric shall be indicated on the material in a manner agreed to by Materials Technology ,de Havilland .

3.4.11 Workmanship - The impregnated 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.

3.4.12 Bias or Bowed Piling -The filling strands shall be distorted from the horizontal by no more than 3" in 28" widths and proportionately for all other widths.

3.4.13 Dimensions

Width: - Unless otherwise specified, the overall width of the product, as supplied, shall be 38" or 50", inclusive of the selvedge, if applicable. Width tolerance shall be ±1".

Length: - Unless otherwise specified, the overall length of the product, as supplied, shall be 25 ±1, 50 ± 10, 100 ± 10 or 150 ± 10 yards.

3.5 Properties and Test Methods of Cured Impregnated Fabric

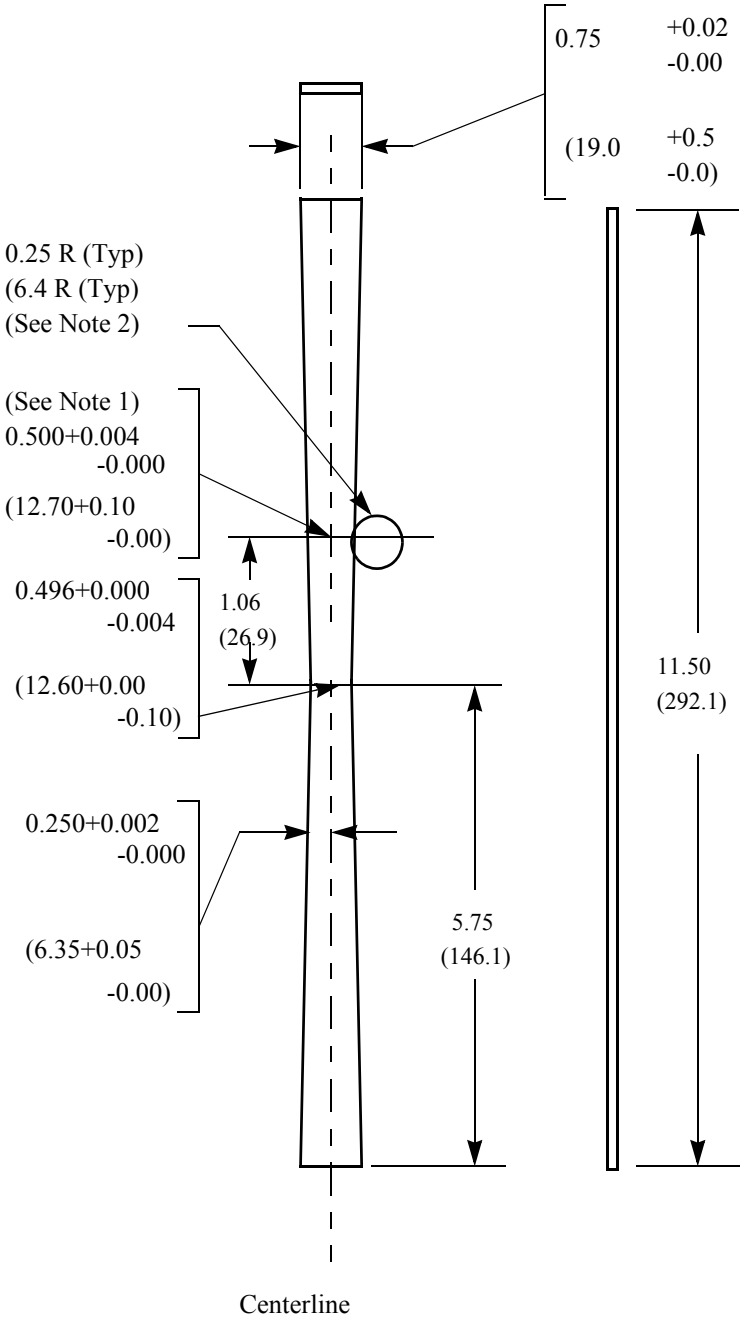
Unless otherwise specified, tests shall be conducted at 70°F ± 10°F and a relative humidity of maximum 60%. Specimens tested at room temperature shall be conditioned for a minimum of 24 hours at 70 ± 10°F and maximum 60% relative humidity immediately prior to the test At least five specimens shall be used per test , and the results averaged. All test pieces shall be cut with the longer dimension parallel to the warp direction of the fabric unless noted otherwise.

3.6 Laminate Mechanical Properties

3.6.1 Tensile Tests - 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 0.15"/min except that the specimens shall conform to **Figure 1**.

3.6.2 Flexural Tests - The flexural strength (modulus of rupture) and flexural modulus (tangent modulus of elasticity) shall be calculated and recorded and shall be not less than the values given in **Table 3**. Five flexural specimens, 3" warp x 1" fill, with the long dimension parallel to the warp direction shall be tested in accordance with ASTM D790, Method II,or ASTM D 6272, 4 pt. bend, and test with a cross head speed of 0.06"/minute, support span of 2", load span of 0.67". Test with load applied at tool side (smooth side) of the specimen.

3.6.3 Compressive Tests - The ultimate compressive strength of each specimen shall be not less than the value given in **Table 3**. Five specimens conform to **Figure 2** shall be tested in accordance with ASTM D3410.



Dimensions are in inches (milli meters)

Notes:
1. The width outward from 0.496 (12.60) shall be increased gradually and equally on each side up to 0.500 (12.70) so that no abrupt change in dimensions results.

2. Transition from straight sided center section to tapered section shall be smoothly joined in the area of the 0.250 (6.35) rad.

3. Test at crosshead speed of 0.15”/min.

FIGURE 1. Tensile Test Specimen

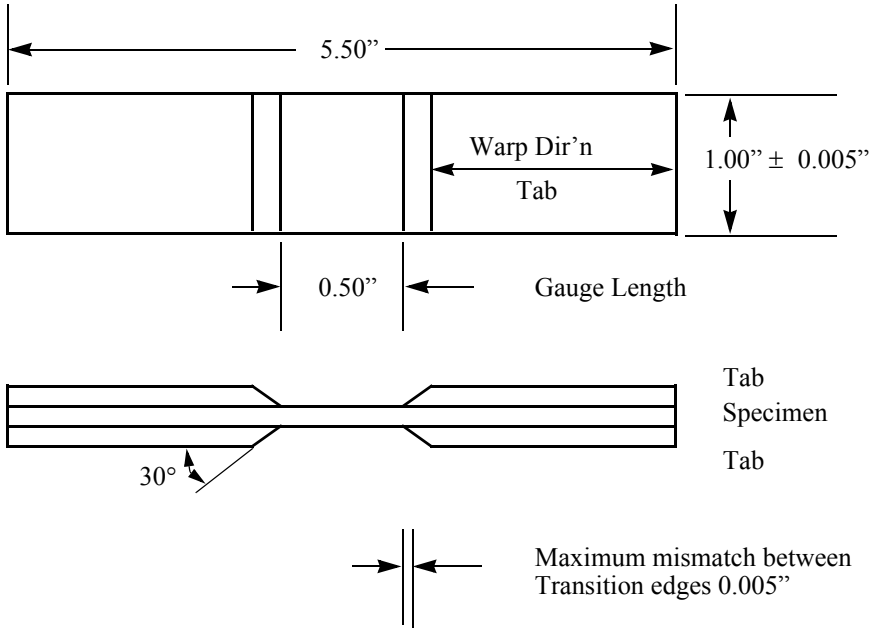


FIGURE 2. Compressive Test Specimen

Notes:

1. Specimen thickness for Type 1 shall be ten plies
2. Warp direction shall be ± 1° for specimen and tab lay up.
3. Tabs to be manufactured from 10 plies DHMS P1.41 type glass fabric and cured at 355°F +10°F, 35 ± 5 psi for 120-135 minutes.
4. Use Frekote 44NC or 700NC mould release agent on caul plate (0.032-0.06 thick) on upper surface. Do not use Tooltec.
5. Tab face which is to bonded to specimen shall be cured with peel ply to DSC-234-12 to provide adequate bond surface.
6. Tab thickness is 0.100-0.010" but all 4 tabs on a specimen must be within 0.002" of each other.
7. Maximum mismatch between tab transition edges is 0.005".
8. Tab lay up may be done in panels and cut to size; no tab may be cut from material within 1/2 inch of the edge of the panel. Bond surface is surface which was cured with peel ply on it.
9. Bond tabs to specimen using 3M, 2 part adhesive EC 2216 or DHMS A6.09 liquid shim. Lightly abrade specimen surface (320 grit abrasive) only where tabs are to be bonded on. Use a fixture to maintain warp direction of tab during lay up. Peel ply must be removed from tab before bonding commences. Wipe bond surfaces with MEK immediately before bonding.
10. ?125 edge finish is required in accordance with ANSI B46.1-78

Table 3: Laminate Mechanical Properties

Test	Reference	Min. Average Requirement
Tensile Strength, psi min.	ASTM D3039	40,000
Tensile Modulus, psi min.	ASTM D3039	2.8×10^6
Flexural Strength, psi min.	ASTM D790	60,000
Flexural Modulus, psi min.	ASTM D790	3.0×10^6
Compressive Strength, psi min.	ASTM D3410	45,000

4 TEST PANEL FABRICATION

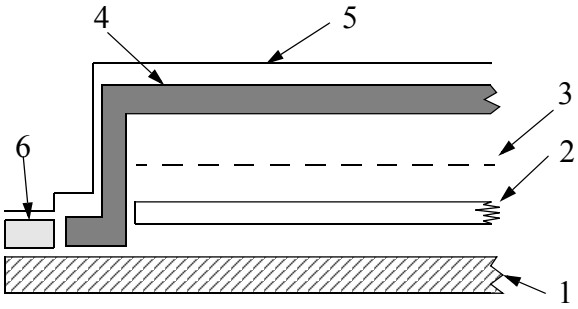
4.1 General

4.2 Laminate Specimen

Test laminate 18" warp x 12" fill shall lay up with number of plies specified in Table 4 with the long dimension parallel to the fiber direction or warp direction. Laminate shall be vacuum bagged per the applicable Figure 3 and cured per Figure 4.

Table 4: # Plies lay up

Test Specimen	# Plies for Type 1
Flexural	10
Tensile	10
Compression	10



Use DSC 234 expendable materials

1. Tool (coated with mould release Frekote 44 NC or 700NC)
2. PART
3. Perforated Release Film
4. Breather/Bleeder fabric
5. Nylon Vacuum Bag
6. GS 43 MR Vacuum Sealant Tape

FIGURE 3. Bagging Procedure for Laminate Panel

APPROVED EXPENDABLE MATERIALS TO DSC 234

Wrightlon 8400	(DSC 234-2-54)	Airtech International Inc., 2542 East Del Amo Blvd., P.O. Box 6207 Carson, CA 90749 (213) 603-9683
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., Boca Raton, FL 33431 (305) 395-3082
Vacuum Sealant Tape, GS 43 MR	(DSC 234-17-1)	

Note: Additional sources are listed in DSC 234.

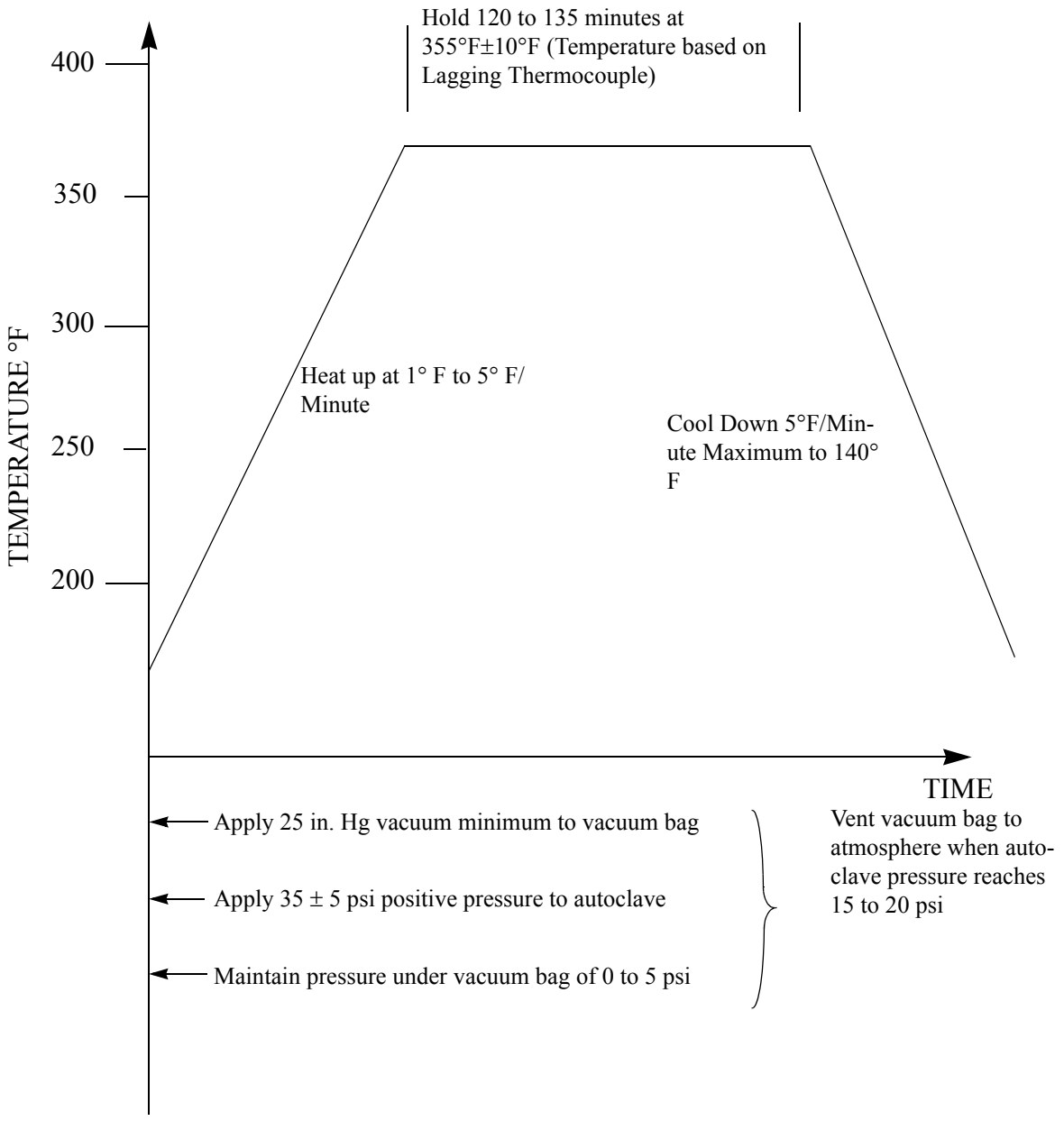


FIGURE 4. Cure Cycle

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.

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/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 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

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

TABLE 5. Qualification and Batch Acceptance Tests

Property	Requirement	Qualification (Supplier)	Acceptance	
			Supplier	Purchaser/User
Fabric Weight	Para.3.1	x	x	
Storage Life	Para.3.4.1	x		
Working Life	Para.3.4.2	x		
Formability	Para.3.4.3	x		
Volatile Content	Para.3.4.4	x	x	
Resin Content	Para.3.4.5	x	x	x
Resin Flow	Para.3.4.6	x	x	x
Gel Time	Para.3.4.7	x	x	x
Tack	Para.3.4.8	x	x	
Colour	Para.3.4.9	x		
Dimensions	Para.3.4.13	x		
Workmanship	Para.3.4.11	x	x	
Bias or Bowed Filling	Para.3.4.12	x		
Cure Cycle	Figure 4	x		
Tensile Strength	Table 3	x		
Tensile Modulus	Table 3	x		
Flexural Strength	Table 3	x	x	x
Flexural Modulus	Table 3	x		
Compressive Strength	Table 3	x		

6.3 Sampling

6.3.1 Sampling Schedule- Sampling shall be in accordance with **Table 6**:

Table 6: Sampling Schedule

Number of Roll 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 in a single production run 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 glass fibre 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, Class of Pre-Impregnated 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:

- Glass fiber fabric, Epoxy Impregnated

- DHMS P1.41, latest Issue & Amendment (Enter Type)
- Manufacturer's Material Designation
- Purchase Order Number
- Lot and Roll Numbers
- Quantity
- Perishable-Store Below 10°F
- Date of Manufacture

8.2 Packaging

8.2.1 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.

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

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

8.2.4 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:

- Glass fiber fabric, Epoxy Impregnated
- DHMS P1.41, latest Issue & Amendment (Enter Type)
- 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.5.1.2**, 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 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.	DE HAVILLAND QUALIFICATION SHEET NO.	MSDS #	DATE OF PRODUCT APPROVAL
Hexcel Corp. Structural Products Div. 10 Trevarno Rd. Livermore, CA 94550	**Type 1** F161-213 Gel Time: 1-7 min. @ 325°F Resin Flow: 15-25%	PQS #1	2109	May, 1982
Cytec Industries Inc. Costa Mesa (Obsolete) Cytec Solvay Group. 501West Third Street Winona,MN 55987	L-556-7781 Gel Time: 2.5 ± 2 mins. @ 350 °F Resin Flow: 9-30%	PQS #5 PQS#7	2653	January 15, 1999 June 26, 2015
Axiom Materials, Inc 2320 Pullman St. Santa Ana, CA 92705	AX-3220FR-7781-50 RC40 Gel Time: 2.5 ± 2 mins. @ 350 °F Resin Flow: 10-30%	PQS#8		Jan 18, 2019