# de Havilland Inc.

# Material Specification

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| **TITLE:** | **GLASS FABRIC FIRE RESISTANT PHENOLIC RESIN IMPREGNATED FOR INTERIOR SANDWICH AND LAMINATE PANELS (1990 FLAMMABILITY RULE)** |
| **SPECIFICATION NUMBER:** | **DHMS P 1.61** |
| **ISSUE:** | **ORIGINAL** |
| **AMENDMENT:** | **---** |
| **DATE:** | **JULY 9, 1997** |
| **PAGE:** | **1 of 21** |



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## 1 SCOPE

This specification establishes the requirements for a 280˚F cure phenolic resin impregnated, glass fabric, supplied in a "B" stage condition, suitable for vacuum or autoclave pressure laminating of interior composite panels.

### 1.1 Classification

The materials supplied to this specification shall be one of the following types:

**TABLE 1.**

| TYPE | STYLE | RESIN CONTENT | CURED PLY THICKNESS NOMINAL |
|---|---|---|---|
| 1 | 181, 1581, 7781 | 44 ± 3 % | 0.010"± 0.001" |
| 2 | 120 | 44 ± 3 % | 0.008"± 0.001" |
| 3 | 108 or 1080 | 44 ± 3 % | 0.002"± 0.001" |

## 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 U.S. Government Specifications

2.1.1 Federal Aviation Administration

FAR 25.853(a), APP. F, PART I(1)(i) - Flammability Requirements
Amd.25-86

FAR 25.855(b), APP. F, PART I(2)(ii) - Flammability Requirements
Amd.25-86

FAR 25.853(d), APP. F, PART IV & V - Flammability Requirements
Amd.25-86

Advisory Circular No: 21 - 26 - Quality Control for the Manufacture of Composite Structures

2.1.2 Military Specifications

MIL-C-9084 - Cloth, Glass, Finished, for Resin Laminates

MIL-Y-1140 - Yarn, Cord, Sleeving, Cloth, and Tape-Glass

2.1.3 American National Standard Institute

ANSI B46.1-78 - Surface Texture

**2.2 American Society for Testing & Materials**

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

ASTM 3410 - Compressive Properties of Unidirectional or Crossply Fiber - Resin Composites

ASTM D790 - Flexural Properties of Plastics

ASTM D1781 - Climbing Drum Peel Test for Adhesives

ASTM D2344 - Apparent Horizontal Shear Strength of Reinforced Plastics by Short Beam Method

ASTM D3039 - Tensile Properties of Oriented Fiber Composites

ASTM E906 - Heat Release and Test Apparatus

ASTM F814-83 - Specific Optical Density of Smoke Generated by Solid Materials for Aerospace Applications.

**2.3 de Havilland Specifications & Standards**

DHMS P1.26 - Core, Honeycomb, Fibrous Aramid Base, Phenolic Coated

DHMS A6.09 - High Temperature Epoxy Adhesive/Liquid Shim Material

DSC 234 - Composite Manufacture Expendable Materials

**2.4 Boeing Specification Support Standards**

BSS 7239 - Toxic Gas Generation by Materials on Combustion, Test Method For

## 3 REQUIREMENTS

Prior to procurement, for applications requiring OSU heat release and NBS smoke density attributes, materials shall demonstrate compliance to FAR 25.853(d), APP. F, PART IV & V, Amd.25-86. This compliance data shall be consistent with similar data from previously procured materials.

### 3.1 Fabric

The glass fabric, Type 1 and Type 2, shall meet the requirements of MIL-C-9084, Type III, VIII, VIII A or VIII B (commercial designation style #120,#181, #1581 or #7781) and Type 3 shall meet the requirements of MIL-Y-1140.

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

3.1.2 Fabric Weight - The basic weight of the fabric shall meet the requirements given in **Table 2**. For acceptance test, the weight of the fabric shall be determined in accordance with **Para.3.4.5**.

**TABLE 2. Unimpregnated Fabric**

| Type | Style | Construction Ends/Inch (Denier) | Weave | Basic Weight oz/ sq.yd. |
|---|---|---|---|---|
| 1 | 181, 1581, 7781 | 56 x 53 | 5-counter 8 Harness Satin | 8.65 ± 0.5 |
| 2 | 120 | 59 x 57 | 4-counter (crow-foot) Satin | 3.07 ± 0.5 |
| 3 | 108 or 1080 | 60 x 47 | Plain | 1.5 ± 0.3 |

### 3.2 Preimpregnated, Glass Fiber Fabric

The product shall be one of the fabrics noted in **Table 2** of this specification, impregnated with a phenolic 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 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 product shall be a minimum of 180 days from the date of receipt, up to 270 days from the date of manufacture, when stored at a temperature of $0^{o}$F or below, or 90 days when stored at a temperature of $40^{o}$ to $50^{o}$F in the original packaging.

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.

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 - Three 4 inch x 4 inch specimens of the uncured material shall be weighed individually on an analytical balance to the nearest 0.001 gram and placed in an air circulating

type oven at 280˚F ± 10˚F for 15 minutes. The specimens shall be removed from the oven, placed in a desiccator, cooled to room temperature and reweighed, in order to calculate the volatile content 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 10% .

3.4.5 Resin Content By Weight

Three specimens approximately 4 square inches each, shall be cut from the roll so that one sample comes from the center 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 weighted on an analytical balance and weights recorded to the nearest 0.001 gram. Extract the threee samples in separate beakers containing 500 ml of Methyl Ethyl Ketone, Acetone or Methylene Chloride for at least 5 minutes. Decant the solvent, being careful to retain all fibers and relace with clean solvent. Continue to extract and decant the sample for a minimum of 3 extractions. Dry the fibers at 200˚F ± 10˚F for 15 minutes. The specimens shall then be cooled to room temperature, reweighed, and the resin content weight calculated as follows:

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

*W1* = Original Weight

*W2* = Weight After Extraction

The resin content shall be as specified in **Table 1**.

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 0.001 gram. The specimens shall be positioned between 0.0015" aluminum foil which is coated with release agent and placed individually in a press, preheated to 280˚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 0.001 gram and the percent flow calculated.

The resin flow shall be as specified 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" square, shall be cut from the uncured material. A hot plate shall be preheated to 280˚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 280˚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 for 10 days at a temperature of 77˚F, with a humidity not greater than 70%. 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 - For all products, the material shall be supplied in the natural colour of the resin fiber system.

3.4.10 Marking - The warp direction of the woven impregnated fabric shall be marked in a manner that is acceptable to de Havilland Inc.

3.4.11 Dimensions

Width - Unless otherwise specified, the overall width of the product, shall be as specified in the Qualified Products List. Width tolerance shall be +0.50 inch to -0.25 inch.

Length - Unless otherwise specified, the overall length of the product, shall be 25 ± 1 yard, 50, 100 or 150 yards ± 5 yards.

3.4.12 Workmanship - The impregnated fabric shall be evenly impregnated, uniform in quality and free from gaps, holes, resin pockets, areas lacking resin, excess resin, patches and other similar defects which would render the product unsuitable for its intended purpose.

3.4.13 Bias or Bowed Filling - The filling strands of fabric shall not be distorted from the horizontal by more than 5" for 50" widths.

### 3.5 Properties of and Test Methods of Cured Impregnated Fabric

3.5.1 Flammability

Fabricate one sandwich panel in accordance with **Para.4.3** and one laminate panel in accordance with **Para.4.2**. Completed test panels shall be tested in accordance with and meet the requirements of FAR 25.853(a), APP. F, PART I (1)(i) Amd.25-86 and FAR 25.853(b), APP. F, PART I (2)(ii) Amd.25-86.

3.5.1.1 Heat Release Properties

Test panels shall be manufactured in accordance with **Para.4.2** and **Para.4.3**. Completed test panels shall be tested in accordance with FAR 25.853(d), APP. F, PART IV Amd. 25-86. Tested panels shall exhibit a 2 minute total heat release of less than 50 kilowatt-minutes/$m^2$ and a peak heat release rate of 50 kilowatts/$m^2$.

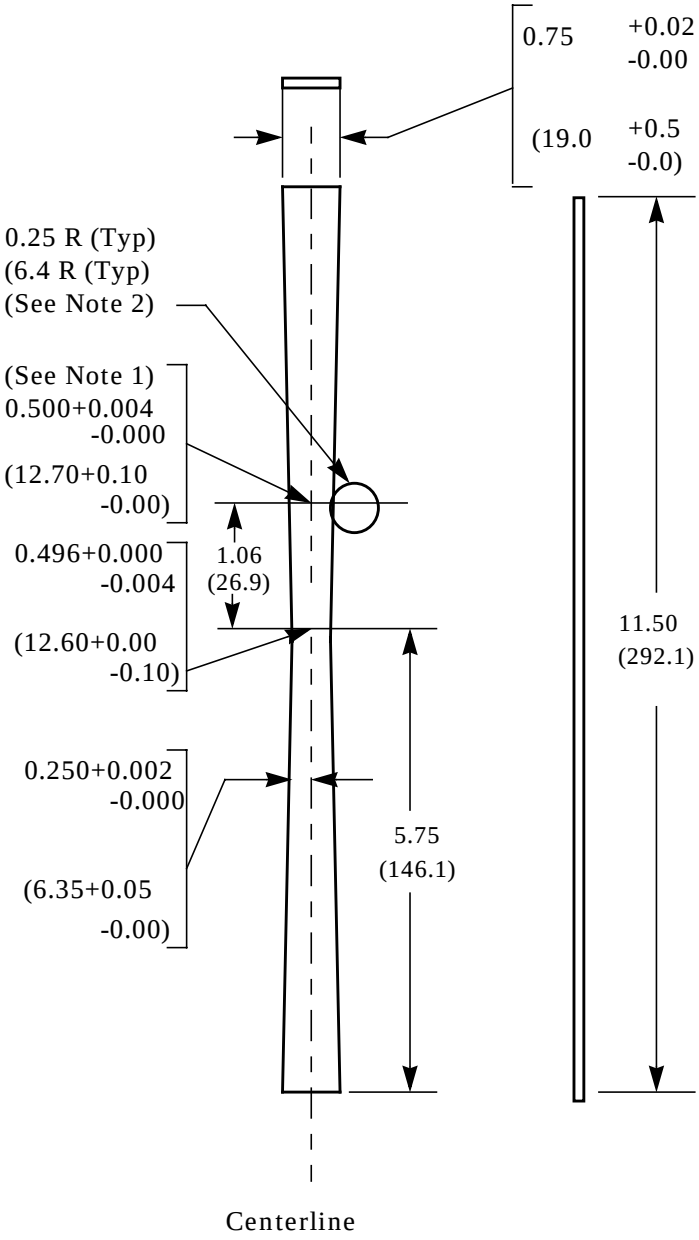
3.5.1.2 Smoke Density

Test panels shall be manufactured in accordance with **Para.4.2** and **Para.4.3**. Completed test panels shall be tested in accordance with FAR 25.853(d), APP. F, PART V Amd. 25-86. Tested panels shall exhibit a specific optical density of less than 100 Ds.

### 3.6 Laminate Mechanical Properties

Fabricate test panes in accordance with **Section 4**. Specimens tested at room temperature shall be conditioned for 40 hours at 70 ± 5˚F and 50 ± 5% relative humidity immediately prior to the test.

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 except that the specimens shall conform to **Figure 1**.




Dimensions are in inches (millimeters)

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 Strength Specimen**

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, 4" warp by 1" fill, with the long dimension parallel to the warp

direction shall be tested in accordance with ASTM D790, Method II, 4 pt. bend, Procedure A, L/d=32 and test with a crosshead speed of 0.06"/minute.

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.

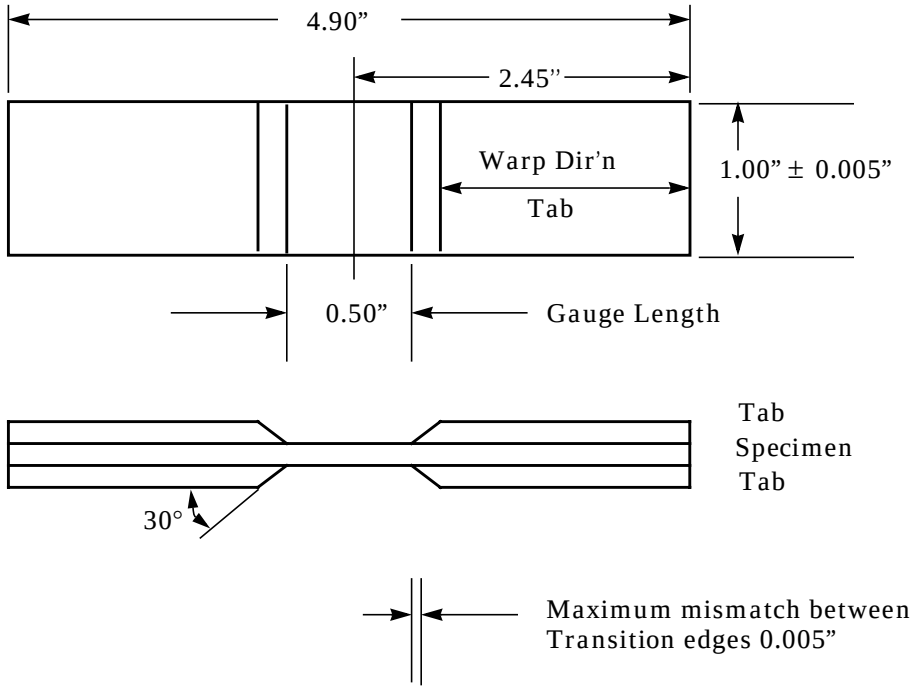



**FIGURE 2. Compressive Test Specimen**

**Notes**:

1. Specimen thickness for Type 2 shall be 10 plies.
2. Tabs to be manufactured from 10 plies DHMS P1.22 Type 1 and cured at 260˚F ± 10˚F, 35 ± 5 psi for one hour.
3. Use Frekote 44NC or 700NC on caul plate (0.032 - 0.060 thick) on upper surface. Do not use Tooltec.
4. Tab face which is to be bonded to specimen shall be cured with peel ply to DSC-234-12 to provide suitable bond surface.
5. Tab thickness is 0.100 ± 0.010" but all 4 tabs on a specimen must be within 0.002" of each other.
6. Maximum mismatch between tab transition edges is 0.005".
7. Tab layup may be done as panels and cut to size; no tab may be cut from material within 0.5 inch of the edge of the panel. Bond surface is surface which was cured with peel ply on it.
8. 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 layup. Peel ply must be removed from tab before

bonding commences. Clean bond surfaces with MEK and wipe surface before MEK evaporates prior to bonding.

9. 125√ edge finish is required in accordance with ANSI B46.1-78.

3.6.4 Horizontal Shear Strength Test - The Horizontal Shear strength shall be calculated and recorded and shall be not less than the value given in **Table 3**. Five test specimens 1.125" long (parallel to fill) by 0.25" wide (parallel to warp) shall be tested in according to ASTM D2344 with a span/ thickness ratio of 4 and a crosshead speed of 0.06"/minute.

**TABLE 3. Laminate Mechanical Properties**

| | Requirements For Vacuum Cure | | |
|---|---|---|---|
| **Test** | **Reference** | **Type 1** | |
| Tensile Strength | **Para.3.6.1** | 50 ksi min. | |
| Tensile Modulus | **Para.3.6.1** | 44.4 Msi min. | |
| Flexural Strength | **Para.3.6.2** | 75 ksi min. | |
| Flexural Modulus | **Para.3.6.2** | 5.5 Msi min. | |
| Compressive Strength | **Para.3.6.3** | 40 ksi min. | |
| | For 35 ± 5 psi cure | | |
| Horizontal Shear Strength | **Para.3.6.4** | 5.0 ksi min. | |
| O S U Heat Release | FAR 25.853(d), APP. F, PART IV Amd. 25-86 Amd.25-66 | 2 min. Total max. | Peak max. |
| | | 50 kw-min/$m^2$ | 50 kw/$m^2$ |
| N B S Smoke Density | FAR 25.853(d), APP. F, PART V Amd. 25-86 | 100 Ds max. | |

## 3.7 Sandwich Mechanical Properties

Fabricate test panels in accordance with **Figure 3**. The sandwich panels shall be vacuum bagged per **Figure 4** and cured per **Figure 5**.

3.7.1 Flatwise Tensile - Five specimens, each 2" x 2" shall be tested in accordance with ASTM C297. The individual and average values shall meet the requirements given in **Table 4**.

3.7.2 Peel Torque - Twenty specimens (5 specimens for each of the 4 orientations), 3 inches by 12 inches, shall be tested in accordance with ASTM D1781. The individual and average values shall meet the requirements given in **Table 4**.

**TABLE 4. Honeycomb Sandwich Panel Tests**

| Test | Reference | Requirements Type 1 | |
|---|---|---|---|
| Flatwise Tensile Strength | Para.3.7.1 | 250 psi min. | |
| Peel Torque * | Para.3.7.2 ASTM D1781 | 10 in.lb./3 in. width min. | |
| O. S. U. Heat Release | FAR 25.853(d), APP. F, PART IV Amd. 25-86 | 2 min. Total max. | Peak max. |
| | | 50 kw-min/$m^2$ | 50 kw/$m^2$ |
| Smoke Density | FAR 25.853(d), APP. F, PART V Amd. 25-86 | 100 Ds max. | |

* Peel strength testing shall be performed on both toolside and bagside surfaces, tested parallel and transverse to the warp direction.

## 4 TEST PANEL FABRICATION AND TEST METHODS

### 4.1 General

Unless otherwise specified, tests shall be conducted at 70 ± 5˚F and a relative humidity of 50 ± 5%. 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 test value shall be less than 90% of the value specified; this shall not apply to flammability tests. All test pieces shall be cut with the longer dimension parallel to the warp direction of the applicable test panel, unless noted otherwise.

### 4.2 Laminate Specimen

Test laminate 18" warp x 12" fill shall lay up with number of plies specified in Table 5 with the long dimension parallel to the fiber direction or warp direction. Laminate shall be vacuum bagged per the applicable Figure 4 and cured per Figure 5. The tolerance for lay up shall be ± 5˚. The tolerance for cutting the cured test specimens shall be within ± 1˚ of the warp or fibre direction. Test pieces shall be finished at the cut edges by wet sanding to a smooth finish, free from fuzz or loose fibres.

**TABLE 5.**

| Test Specimen | # Plies |
|---|---|
| Flexural | 10 |
| Horizontal Shear | 10 |
| Tensile | 10 |
| Compression | 10 |

4.2.1 For Flammability - Panel size shall be 20" x 24", the construction are shown as per **Para.4.2.2**.

For Heat Release and Smoke Density tests - Panel size shall be 14" x 20", the constructions are shown as per **Para.4.2.2**.

4.2.2 Laminate Panel Construction for Heat Release and Smoke Density Tests

_____ DHMS P1.61 Type 1
_____ DHMS P1.61 Type 1
_____ DHMS P1.61 Type 1

**( Toolside - Test this side for Heat Release and Smoke Density )**
**Specimen 3**

_____ DHMS P1.61 Type 1
_____ DHMS P1.61 Type 1

**( Toolside - Test this side for Heat Release and Smoke Density )**
**Specimen 4**

All tests shall be conducted in accordance with the methods listed in **Table 3**.

**4.3 Sandwich Panels**

The test panel 32" warp x 36" fill shall be laid up according to **Figure 3**, vacuum bag per **Figure 4** and cure per **Figure 5**.

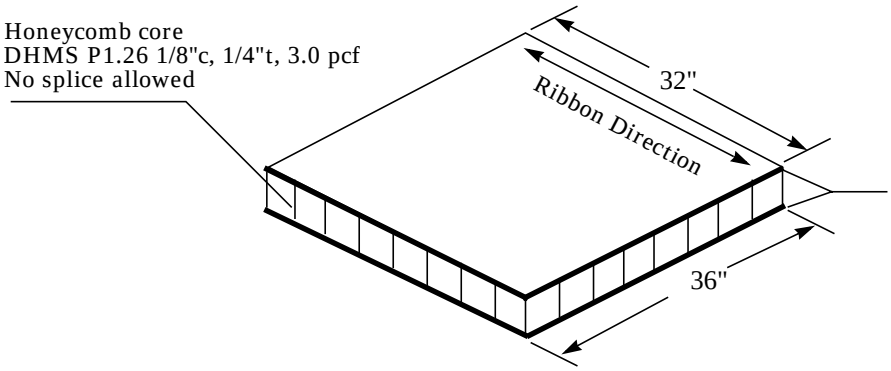



**FIGURE 3. Sandwich Test Panel**

4.3.1 For Flammability - Panel size shall be 24" x 36", the constructions are shown as per **Para.4.3.2**.

For Heat Release and Smoke Density Tests - Panel size shall be 14" x 20", the constructions are shown as per **Para.4.3.2** for each specimen listed.

4.3.2 Sandwich Panel Constructions for Heat Release and Smoke Density Tests

DHMS P1.61 Type 1

DHMS P1.26 1/4"t, 1/8"c, 3.0 pcf

DHMS P1.61 Type 1

DHMS P1.61 Type 1

**Toolside - Test this side for Heat Release and Smoke Density**
**Specimen 1**

DHMS P1.61 Type 1

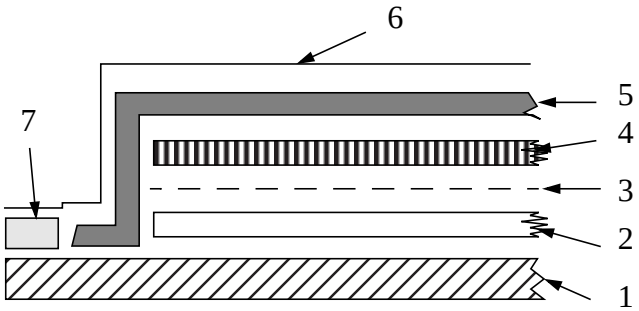
DHMS P1.61 Type 1

DHMS P1.26 1/4"t, 1/8"c, 3.0 pcf

DHMS P1.61 Type 1

DHMS P1.61 Type 1

**Toolside - Test this side for Heat Release and Smoke Density**
**Specimen 2**




Use DSC 234 expendable materials

1. Tool (coated with mould release Frekote 44NC or 700NC)
2. PART
3. A4000 P3 Perforated Release Film
4. Airweave SS-FR Breather
5. Wrightlon 4500 Non-perforated release film
6. Nylon Vacuum Bag
7. GS 43 MR Vacuum Sealant Tape

**FIGURE 4. Bagging Procedure for Laminate and Sandwich Panels**

**APPROVED EXPENDABLE MATERIALS TO DSC 234**

| | | |
|---|---|---|
| Vacuum bag, Ipplon DP1000 | (DSC 234-1-54) | Airtech International Inc., |
| | | 2542 East Del Amo Blvd., |
| Non-perforated Release Film, Wrightlon 4500 | (DSC 234-19) | P.O. Box 6207 |
| | | Carson, CA. 90749 |
| Perforated Release Film A4000P3 | (DSC 234-5-48) | (213) 603-9683 |
| Breather, Airweave SS-FR | (DSC 234-11) | Frekote Inc., |
| | | 170 W. Spanish River Blvd., |
| Mould Release, Frekote 44NC or 700NC | (DSC 234-13) | Boca Raton, FL. 33431 |
| | | (305) 395-3082 |
| Vacuum Sealant Tape, GS-43MR | (DSC 234-17-1) | |

**NOTE**: Additional sources are listed in DSC 234.

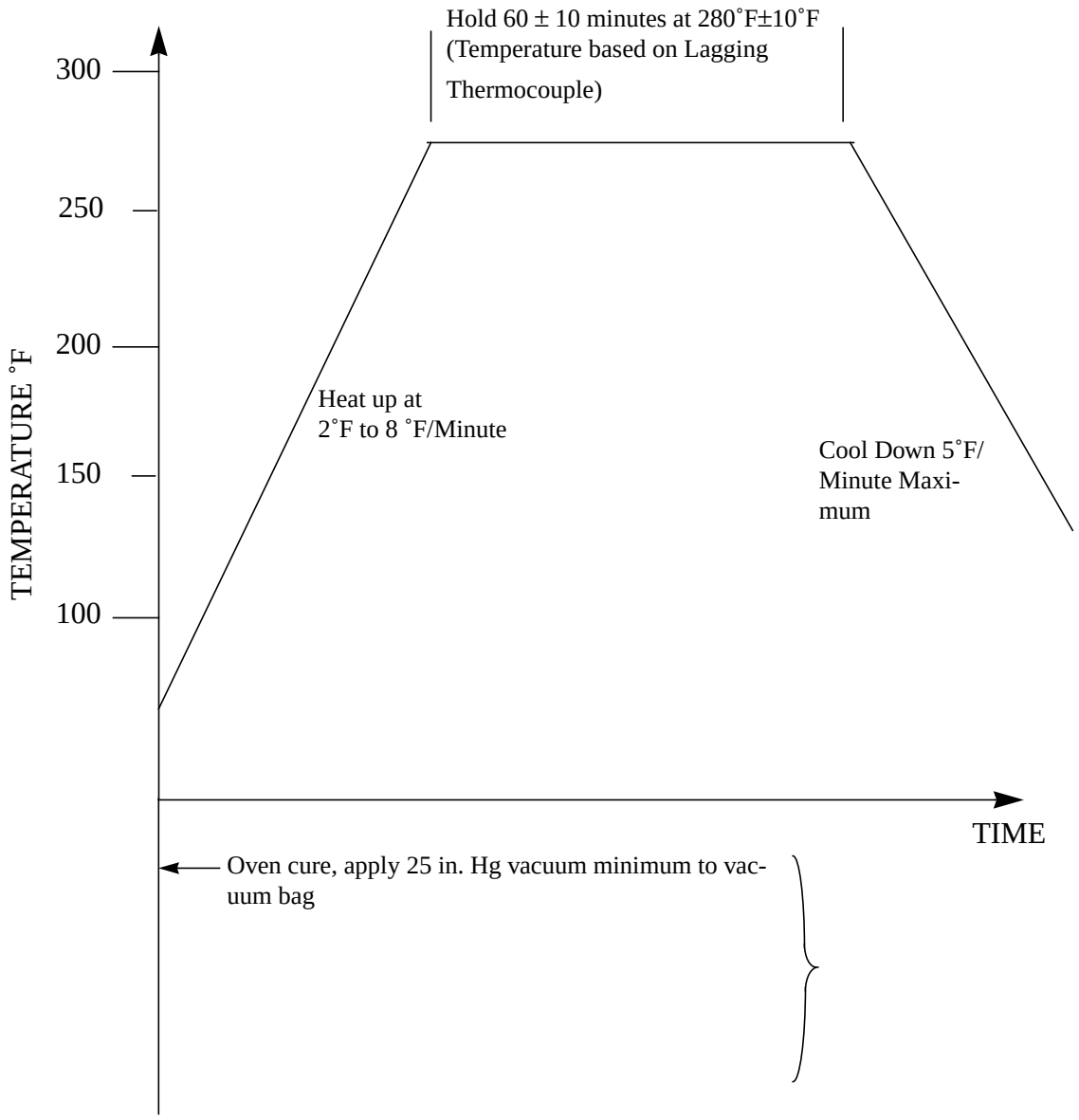



**FIGURE 5. Cure Cycle**

## 5 QUALITY ASSURANCE

### 5.1 Qualification

5.1.1 A supplier is responsible for the performance of all qualification testing, as specified in **Table 6** of this specification. A three lots/batches qualification is required.

5.1.2 A supplier desiring qualification shall submit one copy of a report showing actual qualification test data and a sufficient quantity of product for de Havilland evaluation tests.

**Materials submitted for qualification must demonstrate compliance to FAR 25.853(d) APP. F, Part IV and V Amd. 25-86. Materials to be tested by de Havilland Inc., must exhibit results consistent with those on the suppliers qualification test report of the same material type. The supplier qualification tests and de Havilland Tests shall be conducted at an FAA approved facility. De Havilland tests will be performed at the time of qualification and at any time thereafter, at the discretion of de Havilland Inc. Qualified products will be listed in the Qualified Products List to this specification for each type which qualification is granted.**

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

5.1.4 No changes in the method of manufacture and/or formulation shall be made without notification and prior written approval of Materials Technology and Quality Assurance Departments of de Havilland Inc.

5.1.5 Re-qualification of the product may be requested by the purchaser if there are any changes in the method of manufacture and/or formulation.

### 5.2 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 (Not applicable for flammability testing). The similar specification may be a government, company, or other specification where the requirements are similar to this specification.

### 5.3 Acceptance Tests

5.3.1 Unless otherwise specified in the contract or purchase order, the supplier is responsible for all acceptance tests, as specified in **Table 6** of this specification.

5.3.2 The supplier, performing acceptance tests per **Para.5.3.1** shall furnish with each batch of product one copy of an Acceptance Test Report showing actual test data conformance to the acceptance tests specified in **Table 6**. The report shall include the supplier's batch identification.

5.3.3 De Havilland Inc. 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.

**TABLE 6. Qualification and Batch Acceptance Tests**

| Property | Paragraph | Qualification | Acceptance |
|---|---|---|---|
| Fabric Weight | Table 2 | x | |
| | Para.3.1.2 | | x |
| 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 | x |
| Resin Content | Para.3.4.5 | x | x |
| Resin Flow | Para.3.4.6 | x | x |
| Gel Time | Para.3.4.7 | x | x |
| Tack | Para.3.4.8 | x | x |
| Colour | Para.3.4.9 | x | |
| Dimensions | Para.3.4.11 | | x |
| Workmanship | Para.3.4.12 | x | x |
| Bias or Bowed Filling | Para.3.4.13 | x | x |
| Cure Cycle | Figure 5 | x | |
| Flammability | Para.3.5.1 | x | |
| Heat Release | Para.3.5.1.1 | x | |
| Smoke Density | Para.3.5.1.2 | x | |
| Tensile Strength | Para.3.6.1 | x | |
| Tensile Modulus | Para.3.6.1 | x | |
| Flexural Strength | Para.3.6.2 | x | |
| Flexural Modulus | Para.3.6.2 | x | |
| Compressive Strength | Para.3.6.3 | x | |
| Horizontal Shear Strength | Para.3.6.4 | x | |
| Flatwise Tensile | Para.3.7.1 | x | |
| Peel Torque | Para.3.7.2 | x | x** |

** For acceptance, peel testing parallel and transverse to ribbon direction on both tool side and bag side is required.

### 5.4 Sampling

5.4.1 Sampling Schedule - Sampling shall be in accordance with **Table 7**.

**TABLE 7.**

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

5.4.2 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 unimpregnated 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.

## 6 ORDERING DATA

### 6.1 Pre-requisite

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.

### 6.2 Procurement Documents

Procurement documents shall specify the following:

- Title, Number, Issue and Amendment Number of this Specification
- Type of Pre-Impregnated Fabric
- Manufacturer's Material Designation
- Total Quantity

## 7 PREPARATION FOR DELIVERY

### 7.1 Identification

7.1.1 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.

7.1.2 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 Fabric, Phenolic Impregnated
- DHMS P1.61 , 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

**7.2 Packaging**

7.2.1 The impregnated fabric 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. Fabric ends shall be secure.

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

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

**7.3 Shipping Documentation**

7.3.1 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 Fabric, Phenolic Impregnated
- DHMS P1.61, latest Issue & Amendment, Enter Type
- Manufacturer's Material Designation
- Purchase Order Number
- Lot and Roll Numbers
- Quantity
- Perishable - Store Below 10˚F

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

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

## 8 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 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.

**GLASS FABRIC, FIRE RESISTANT PHENOLIC RESIN IMPREGNATED FOR INTERIOR SANDWICH AND LAMINATE PANELS (1990 FLAMMABILITY RULE)**

## QUALIFIED PRODUCTS LIST

| MANUFACTURER'S NAME AND ADDRESS | MANUFACTURER'S PRODUCT IDENTIFICATION NO. | MATERIAL SAFETY DATA SHEET NO. | DE HAVILLAND QUALIFICATION SHEET NO. | DATE OF PRODUCT APPROVAL |
|---|---|---|---|---|
| Cytec Aerospace Limited,<br>Abenbury Way<br>Wrexham<br>Clwyd,<br>LL13 9UZ,<br>U.K<br>(0978) 661971 | Cycom 799/120, 181,1581,7781<br>Resin flow: 22-32%,<br>Gel Time: 2-10 minutes | 1734 | PQS #1 | July 9, 1997 |
| Cytec Engineered Materials Inc.<br>1300 Revolution Street<br>Havre de Grace, MD<br>21078-3899<br>(410) 939-8147 | | | | |

## GLASS FABRIC, FIRE RESISTANT PHENOLIC RESIN IMPREGNATED FOR INTERIOR SANDWICH AND LAMINATE PANELS (1990 FLAMMABILITY RULE)

### REVISION RECORD

| Issue | Page | Description and Reason for Change |
|---|---|---|
| ORG | | This is a new specification. |