de Havilland Inc.

Material Specification

TITLE:	**PLASTIC SHEET, RIGID, MODIFIED ABS, THERMOFORMABLE**
SPECIFICATION NUMBER:	**DHMS P 1.33**
ISSUE:	**B**
AMENDMENT:	**---**
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PAGE:	**1 of 10**

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REVISION RECORD

Issue	Page	Description and Reason for Change
A		This is a complete revised issue. Detail changes have not been noted.
Amd. 1		This specification is hereby cancelled.
B	All	This specification has been reinstated at this issue.

1 SCOPE

This specification covers the requirements for two types and three classes of rigid plastic (modified ABS) sheet, suitable for thermoforming into contoured shapes.

1.1 Classification

Plastic sheet supplied to this specification shall be one of the following types and classes, as specified on the purchase order.

1.1.1 Types

Type 1 - Self- Extinguishing

Type 2 - Self Extinguishing and Low Smoke Emissive

1.1.2 Classes

Class 1 - Haircell Finish One Side/Smooth Finish on the other

Class 2 - Haircell Finish Both Sides

Class 3 - Smooth Finish Both Sides

2 APPLICABLE DOCUMENTS

The following documents, of the issue in effect on the date of invitation to bid (except as noted on an individual basis), form a part of this specification to the extent specified herein. In the event of conflicting requirements between this and the documents listed below, the requirements of this specification shall take precedence.

2.1 Federal Standards

Fed. Test Method Std. No. 191	-	Textile Test Methods

2.2 National Bureau of Standards

NBS Technical Note 708 Appendix II	-	Test Method for Measuring the Smoke Generation Characteristics of Solid Material, dated September, 1971

2.3 American Society for Testing and Materials

ASTM D-256	-	Impact Resistance of Plastics
ASTM D-638	-	Tensile Properties of Plastics
ASTM D-648	-	Deflection Temperature of Plastics Under Load
ASTM D-790	-	Flexural Properties of Plastics

2.4 Federal Aviation Administration

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

Amd. 25-86

3 REQUIREMENTS

3.1 Physical Properties

The plastic sheet shall conform to the physical properties specified in **Table 1**.

Table 1: Physical Properties of Plastic Sheet

Property	Test Method	Type 1	Type 2
Tensile Strength (psi) min	ASTM D-638	4500	4000
Flexural Strength (psi) min	ASTM D-790	7000	7000
Flexural Modulus (psi x 10^5) min	ASTM D-790	2.5	2.0
IZOD Impact (ft-lb/ in) min at 70^{o}F	ASTM D-256	6.0	6.5
Deflection Temperature (^{o}F) min at 264 psi	ASTM D-648	140	160
Flammability	FAR 25.853(a), APP. F, PART I (a)(1)(i) Amd. 25-86		

3.2 Workmanship

The finish sheets shall be free from surface blisters, waviness, visual bubbles, foreign inclusions and scratches which may make definite indentations in the surface. The sheets shall be uniform, flat and free from internal and external imperfections that would be detrimental to appearance, fabrication and performance.

3.3 Tolerance

The sheet size and thickness shall be as specified on the purchase order. Length and width shall be within ± 1/4 inch and thickness shall be within ± 10 percent of specified dimensions.

3.4 Colour

The plastic sheet shall have an even colour density and shall match the Master Standard (See **Para. 3.4.1**), when tested per **Para. 4.1**.

3.4.1 For qualification purposes, the vendor shall submit five 6.5" x 10.5" samples of the initial batch of material supplied to this specification for approval of colour and texture. One sample will be designated as the Master Standard; the remaining four samples will be used as Working Standards. De Havilland Inc. (DHI) will assign a DHI Standard Number to these samples.

3.4.2 Where the drawing or purchase order calls for a specific colour, the colour shall be cross-referenced by the colour dash number to the applicable DS 82 code number and DHMS P1.33 type number, as indicated in **Table 2**. The colour dash number is also cross-referenced with the manufacturer's product identification and colour number listed in the Qualified Products List of this specification.

Table 2: Colour Code

Colour Dash Number	Colour	DHMS P1.33 Type Number	DS82 Code Number (Reference Only)
- 1A	Brown (Umber)	Type 1	DS82-07-100-011
- 1C	Brown (Falmouth)	Type 1	DS82-07-100-100

3.5 Colourfastness

When tested per **Para. 4.2**, the colour shall remain fast for 50 hours. Subsequent to the test, the sample shall be compared to the Master Standard (See **Para. 3.4.1**) and shall be subject to de Havilland's review.

3.6 Surface Finish

The surface finish of the plastic sheet shall conform to Class 1, Class 2 or Class 3, as specified in **Para. 1.1**.

3.7 Machinability

At room temperature, the plastic sheet material shall not split, crack or chip when punched in thickness of 0.125" or less, or when drilled or sawed in any thickness.

3.8 Flammability

The plastic sheet shall be self-extinguishing when tested per **Table 1**.

3.9 Smoke Emission (Applicable to Type 2 Only)

When tested per **Para. 4.3**, the smoke density raring (of each individual sample) shall not be greater than 50 within 4 minutes.

4 TEST METHODS

Samples of plastic sheet material shall be tested per **Table 1**, or subsequent paragraphs, as applicable.

4.1 Colour

Comparison shall be made by placing the sample side by side with the Master Standard (see **Para. 3.4.1**) in a Macbeth industrial colour matching unit, or equivalent. The direction of illumination shall be normal to the surfaces being compared. Both "North Sky Daylight"(7500 K) and "Horizon Sunlight" (2300 K) shall be used to compare colour.

4.2 Colourfastness

A sample of plastic sheet shall be exposed to 50 standard fading hours in a single arc Fadeometer, in accordance with Federal Test Method Standard No. 191, Method 5660. The sample shall then be compared with the Master Standard per **Para. 4.1**.

4.3 Smoke Emission (Applicable to Type 2 Only)

4.3.1 At least three specimens, with the results averaged, shall be tested in accordance with NBS Technical Note 708, Appendix II.

4.3.2 The test specimens shall be conditioned prior to testing at $21 \pm 3^{o}C$ and $50 \pm 5\%$ relative humidity until moisture equilibrium is reached, or for 24 hours. Only one specimen at a time shall be removed from the conditioning environment immediately before subjecting it to the test.

Note: Conditioning per NBS Technical Note 708 shall not be used.

4.3.3 Each test shall be conducted with the material in the flaming or non-flaming condition, whichever produces the greatest amount of smoke.

5 QUALITY ASSURANCE

5.1 Qualification

5.1.1 A supplier is responsible for the performance of all qualification testing, as specified in **Table 3** of this specification. A three lots/batches qualification is required.

5.1.2 A supplier desiring qualification shall submit to Quality Assurance and Materials Technology of de Havilland Inc., one copy of a report showing actual qualification test data and a sufficient quantity of material for evaluation tests.

As noted in **Para. 3.4.1**, samples from each new combination of materials (resulting in a new colour, texture or other appearance factor), shall be submitted to de Havilland Inc. for approval of appearance, colour and/or texture, prior to furnishing materials to this specification.

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

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 of de Havilland Inc.

5.1.5 Requalification of the product may be requested by the purchaser for 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. 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 The Quality Assurance Department of de Havilland Inc. shall determine the frequency of acceptance tests.

5.3.2 Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all acceptance tests, as specified in **Table 3**.

5.3.3 The supplier, performing acceptance tests shall furnish, with each lot of product, one copy of an Acceptance Test Report showing actual test data conformance to the acceptance tests specified in **Table 3**. The report shall include the supplier's lot or batch identification.

5.3.4 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.

5.4 Definitions

5.4.1 Batch - is defined as the end product of all the raw materials mixed and/or manufactured at the same time and place. The weight or volume may vary, depending upon the capacity of the manufacturer's facility.

5.4.2 Lot - is defined as the total quantity of product in a shipment taken from the same batch.

Table 3: Qualification and Acceptance Tests

Test	Reference	Qualification	Acceptance
Tensile Strength	Table 1	x	
Flexural Strength	Table 1	x	
Flexural Modulus	Table 1	x	
IZOD Impact	Table 1	x	
Deflection Temperature	Table 1	x	
Workmanship	Para. 3.2	x	
Tolerance (Size and Thickness)	Para. 3.3	x	
Colour	Para. 3.4	x	x
Colour Samples	Para. 3.4.1	x	
Colourfastness	Para. 3.5	x	
Surface Finish	Para. 3.6	x	
Machinability	Para. 3.7	x	
Flammability	Para. 3.8	x	x
Smoke Emission (Type 2 only)	Para. 3.9	x	x

6 ORDERING DATA

6.1 Prerequisite

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

6.1.2 Prior to the shipment of material, a 6.5" x 10.5" sample, taken from the lot of material to be shipped, shall be forwarded to de Havilland for lot approval.

6.2 Procurement Documents

6.2.1 Procurement documents shall specify the following:

- Title, Number, Issue and Amendment Number of this specification.
- Type, Class and Colour
- Size and Thickness
- Total Quantity
- Manufacturer's Product Identification
- Acceptance Tests Report (When required)

7 PREPARATION POR DELIVERY

7.1 Preservation and Packing

The plastic sheets shall be packaged in such a manner as to ensure that, during shipment and storage, the product will be protected against damage from exposure to hazards which would adversely affect the property conformance to specification requirements.

7.2 Marking

Each package shall be permanently and legibly marked with the following information:

- Plastic Sheet, Rigid, Modified ABS, Thermoformable
- DHMS P1.33 and Issue
- de Havilland Purchase Order Number
- Type, Class and Colour
- Size and Thickness
- Manufacturer's Name and Product Identification
- Quantity
- Batch or Lot Number

7.3 Shipping Documentation

The shipping document shall include:

- de Havilland Purchase Order Number
- DHMS P1.33 and Issue
- Type, Class and Colour
- Batch or Lot Number
- Number of Packages in Shipment
- Total Quantity
- Acceptance Test Report (when requested)

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.

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
Type 1	**Boltaron 6800**	N/A		
Empire Plastics Inc. One General Street, Newcomerstown, Ohio 43832 (614) 498-8304	**Class 1** Colour -1A Umber (L3124) -1C Falmouth (5679)		PQS #1	Dec. 20, 1984
	Class 3 Colour -1B Olive Green (LX5882)		PQS #2	Dec. 20, 1984