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de Havilland

Material Specification

TITLE:	**POLYURETHANE MOULDING MATERIALS**
SPECIFICATION NUMBER:	**DHMS P 1.23**
ISSUE:	**D**
AMENDMENT:	**1**
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PAGE:	**1 of 9**

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REVISION RECORD

Issue	Page	Description and Reason for Change
A Amd.2	6 7	Para. 7.3.1. and 8.0 were added. Type 3 moulding material was added to the Qualified Product List.
B		This is a complete revised issue. Detail changes have not been noted.
Amd.1	7	QPL: supplier's address has been changed.
C	 QPL	This is a complete revised issue. Detail changes have not been noted. Added Prothane #120 to Type 4.
Amd.1	3 QPL	4.1.8 updated criteria for finishing. Prothane address changed.
Amd.2	QPL	Prothane Was: "Ltd." Now: "Inc"
D	4	This is a complete revised issue. Table 2: removed viscosity, added finish testing for batch acceptance test. Added Materials Qualification Requirements, Quality Assurance Requirements sections.
Amd.1	9	"Prothane 337 Natural" changed to "Prothane 337 LF"

1. SCOPE

This specification covers the requirements for manufactured products (including bar and sheet stock) and casting resin systems based on liquid polyether type urethane polymers.

2. Classification

The resin shall be furnished either unfilled or filled. The filled grade shall contain 2 parts molybdenum disulphide per 100 parts resin by weight.

Types:
Type 1 Hardness Shore A 45-55
Type 2 Hardness Shore A 75-85
Type 3 Hardness Shore A 85-95
Type 4 Hardness Shore D 60-65
Type 5 Hardness Shore D 65-70

3. APPLICABLE DOCUMENTS

The following specification shall form part of this document to the extent defined herein. In the event of conflicting requirements between this and the specification listed below, the requirements of this specification shall govern.

Federal Test Method standard No. 406 Plastics: Methods of Testing

4. REQUIREMENTS

4.1. Properties of Liquid Phase

4.1.1. Material - Materials used in the manufacture of the resin system shall be of the highest quality and suitable for the intended purpose. The resin shall be of the polyether urethane type

4.1.2 Components - The resin system shall be a two-component type consisting of a polymer base component and a catalyst. The components shall be in a kit form. The catalyst should not be batch oriented to the polymer base component.

4.1.3 Storage Life - The polymer base component and the catalyst, when stored in separate, tightly closed containers for a period of 12 months minimum from day of manufacture, at a temperature of 65˚F to 90˚F, shall be capable of meeting the requirements of this specification.

4.1.4 Working Characteristics - The resin system shall be capable of being mixed to a smooth, homogeneous, air and lump free consistency, suitable for pressure or free moulding parts, bar or sheet stock material.

4.1.5 Viscosity - The viscosity of the catalyzed resin, after thoroughly mixing to obtain a homogeneous, air free mix, shall be such that it is capable of being poured or compression moulded to produce a finished product that is void free, has a uniform, smooth finish, and meets the dimensional requirements of the drawing.

4.1.6 Curing Time - The catalyzed resin shall cure to a handling consistency within 12 hours and fully cure within 7 days at a temperature of 75˚ ± 5˚F.

4.1.7 Hardness - The cured, moulded parts shall have a uniform hardness when tested in accordance with Federal Test Method 406, Method 1082. The hardness shall meet the requirements given in **Table 1**.

4.1.8 Finish - Moulded or cast parts, bar and sheet stock shall have a uniform even colour and a smooth surface that is free of holes, bubbles, inclusions, and indentations. Parts, sheet and bar stock shall be as dimensioned on the drawing and/or purchase order.

Moulded or cast parts, bar, block, sheet stock shall be visually inspected for bubbles and surface blisters as follow:

(a) Bubbles 1 mm (0.04 in.) or less in diameter shall be ignored.
(b) A group of bubbles where the diameter of the group is less than 2.5 mm (0.1 in.) shall be considered as a single defect.

Table 1:

Identification	Hardness
DHMS P1.23, Type 1	Shore A 45-55
DHMS P1.23, Type 2	Shore A 75-85
DHMS P1.23, Type 3	Shore A 85-95
DHMS P1.23, Type 4	Shore D 60-65
DHMS P1.23, Type 5	Shore D 65-70

NOTE: For molybdenum disulphide impregnated material, add letter 'A' after type number, e.g. DHMS P1.23, Type 5A.

5. MATERIAL QUALIFICATION REQUIREMENTS

5.1 Requests for Qualification

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

All material qualification shall be site specific.

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

5.2 Qualification testing

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

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

5.3 Qualification by similarity

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

5.4 Process Control Document

5.4.1 The manufacturer shall develop and maintain a Process Control Document (PCD).

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 any Bombardier Aerospace auditors when requested.

5.5 Qualification Approval

5.5.1 Upon review of supplier's data, PCD and de Havilland tests, the supplier will be advised either of product qualification or reasons for 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 Manufacture/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 2.**

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 2**. 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

The purchaser is required to perform of all sampling, inspection and testing of each batch/lot as specified in **Table 2.**

Table 2: Qualification and Batch Acceptance Tests

Properties	Paragraph	Qualification (Manufacturer/Supplier)	Acceptance (Manufacturer/Supplier/ Purchaser/User)
Viscosity	**Para.4.1.5**	X	
Hardness	**Para.4.1.7**	X	X
Finish	**Para.4.1.8**	X	X

6.3 Definitions

Batch is defined as the end product of all the raw materials mixed and/or manufactured at the same time and place

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

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 issuance of a Purchase Order.

7.2 Procurement Documents

Procurement documents shall specify the following:
- Title, Number, Issue and Amendment Number of this Specification
- Manufacturer's Name and Product Identification (Trade Name or Code No.)
- Total Quantity

8. PREPARATION FOR DELIVERY

8.1 Preservation and Packing

The polyurethane system shall be packed in such a manner as to assure that, during shipment and storage, the product will be protected against damage from exposure to hazards which would affect adversely the property conformance to **Section 4** of this specification.

8.2 Marking

Each Shipment shall be legibly marked with the following information:

- A Polyurethane Product (Conforms to DHMS P1.23)
- Manufacturer's Name and Product Identification (Trade Name or Code Number)
- Quantity
- Date of Manufacture
- Batch Number

8.3 Shipping Documentation

Shipping document shall show:

- The Purchase Order Number
- Specification Number
- Quantity
- Batch Number
- Each shipment shall contain a copy of 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	Materials Safety Data Sheet No.	Product Qualification Sheet no.	Date of Product's Approval
	Type 1			
Prothane Inc. 8219 Esquesing Line Milton, Ontario L9T 2X9	Prothane Urethane-2 Moulding Compound (Prothane 337 LF)	1171	PQS #4	Feb 6, 2015
	Type 2			
Prothane Inc.	Prothane Urethane Moulding Compound (Prothane 153)	1171	PQS #2	May 4, 1983
	Type 3			
Prothane Inc.	Prothane Urethane Moulding compound (Prothane 312)	1171		
	Type 4			
	Prothane Urethane Moulding compound (Prothane 120)	1171		
	Type 5			
Prothane Inc.	Prothane Urethane Moulding Compound (Prothane 129)	1171	PQS #3	May 4, 1983