DE HAVILLAND AIRCRAFT OF CANADA LIMITED

De Havilland

Material Specification

TITLE:	**HIGH ADHESION SEALING COMPOUND FOR INTEGRAL FUEL TANKS**
SPECIFICATION NUMBER:	**DHMS S3.07**
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HIGH ADHESION SEALING COMPOUNDS FOR INTERGRAL FUEL TANKS

REVISION RECORD

Issue	Page	Description and Reason for Change
A		This is a new specification
Amd.1	3	Para. 3.1.1 - Storage life of pre-mixed frozen sealant added
	7	Para. 6.1 - Supplier to ensure pre-mixed frozen sealants be maintained at a temperature of below -40^{o} F during transit
B		This a complete revised issue. Updated over all format. Updated Qualification sections.
C		This is a complete revised issue. Para. 8, Revised Health and Safety section. Para 8.1 Added environmental section, standardize with other specification Updated company name to De Havilland Aircraft of Canada Limited. QPL, added note regarding OPE free batch/lot identification with suffix F

1 SCOPE

This specification covers the requirements for high adhesion, two component synthetic rubber compounds for sealing and repairing integral fuel tanks and fuel cell cavities.

1.1 Classification

1.1.1 The sealing compound shall be supplied in one of the following classes

Class A	- Sealing material, suitable for brush application
Class B	- Sealing material, suitable for application by extrusion gun and spatula
Class C	- Sealing material, suitable for faying surface sealing

Dash numbers shall be used to designate the minimum application time in hours.

1.1.2 The sealing compound shall be supplied as a manganese cured sealing material.

2 APPLICABLE DOCUMENTS

The following document shall form the specification of the sealant defined herein.

2.1 U.S. Government Specifications

2.1.1 Military Specification

AMS-S-8802	- Sealing Compound, Temperature - Resistant, Integral Fuel Tanks and Fuel Cell Cavities, High Adhesion
MIL-C-5541	-Chemical Conversion Coatings on Aluminum and Aluminum Alloys

2.1.2 de Havilland Specification

DHMS S5.01	-Slow Evaporating, Manual wipe, Degreasing & Cleaning Compounds

2.1.3 Boeing Material Specification

BMS 3-11G	- Hydraulic Fluid, Fire Resistant.

2.1.4 Learjet Engineering Specification

LES 139 BV	- Sealing Integral Fuel Tanks, Pressure Cabin and Firewall.

3 REQUIREMENTS

3.1 General

The sealing compounds noted shall meet all the requirements specified in Tables 1 & 2.

Table 1: Physical Properties of Sealant

Property		Requirement
COLOUR (base)		White
(accelerator)		Black
(mixed)		Grey
HARDNESS, Shore A (min.)		35
SPECIFIC GRAVITY(max.)		1.65
VISCOSITY OF BASE (poises)	Class A	100-500
	Class B	9000 - 14000
	Class C	1000 - 4000
FLOW (inches)	Class B	0.1-0.75
	Class C	0.01(min.)
NON VOLATILE CONTENT	Class A	84
(minimum), %	Class B	92
	Class C	92

3.1.1 Storage Life - The storage life of the unmixed sealant shall be a minimum of 9 months from the date of manufacture, when stored in the original, unopened containers between 40 ^{o}F and 80 ^{o}F. The storage life of the pre-mixed frozen sealant shall be 30 days from the date of mixing when stored at a temperature of -40 ^{o}F.

3.1.2 Resistance to Fire Resistant Hydraulic Fluid

The cured sealant shall retain the minimum hardness of 25 Shore A, after a 24 hour immersion in fire resistant hydraulic fluid to BMS 3-11G Type IV, Class I, Grade A at 140 ^{o}F.

3.1.3 **Squeeze Out Life (Class C only)**

3.1.3.1 Three faying surface seal samples (can also be used for cure time test) shall be prepared as per Figure 1.

3.1.3.2 Clean the panels by thoroughly wiping with Methyl Ethyl Ketone (MEK) or DHMS S5.01, Class 2 solvent. Measure/record the thickness of each panel between the holes, as shown in Figure 1.

3.1.3.3 Mix the sealant in accordance with the manufacturer's instructions (add 10 parts by weight of base compound to 1 part by weight of accelerator). Apply 0.02 inch thickness of the mixed sealant to three of the panels as shown in Figure 1 (care should be taken to avoid excess sealant into the holes).

3.1.3.4 Assemble by inserting seven NAS 1303-2 bolts through the holes in each of the sealant covered panel, then place the mating surface of the uncoated panel over the bolts onto the sealant coated panel.

3.1.3.5 Insert flat washers and MS 21042-3 nuts over the threaded portion of the bolts and slowly torque (as evenly as possible) to produce a sealant thickness of 0.010 - 0.015 inch (check with a micrometer).

3.1.3.6 Allow the test panels to stand at standard conditions as per MIL-S-8802 E, for 80 hours (specified squeeze out time).

3.1.3.7 Torque each nut (only once) to 30 in/lb and hold the torque wrench at 30 in/lb for 4-6 seconds.

3.1.3.8 Remeasure panel thickness at 30-35 minutes after the torquing operation and calculate the sealant thickness. The maximum allowable residual sealant thickness shall be 0.004 inch.

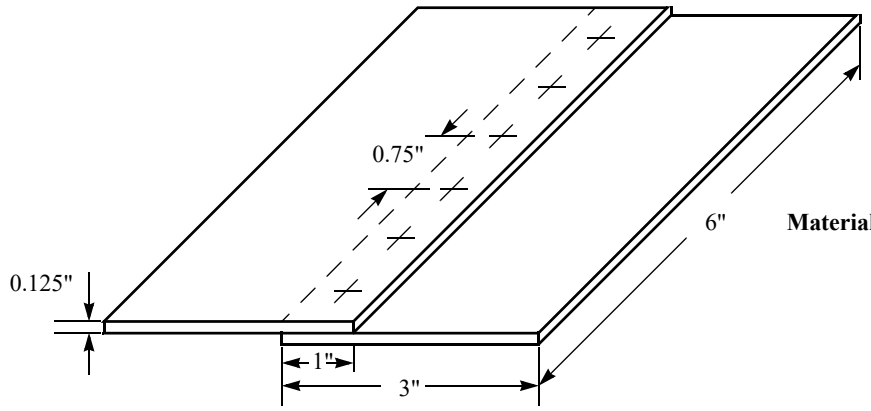

FIGURE 1. Test Panel Configuration for Squeeze Out Life

4 MATERIAL QUALIFICATION REQUIREMENTS

4.1 Request For Qualification

All requests for qualification to this specification shall be addressed to De Havilland 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.

4.2 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.

4.2.1 A sample shall be submitted for testing at the discretion of De Havilland Materials Technology for evaluation.

4.3 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.

4.4 Process Control Document

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

4.4.2 When qualification has been granted, the PCD shall be signed by the supplier and De Havilland Materials Technology Engineering and shall not be changed without prior written approval.

4.4.3 The PCD and all production data shall be available to any De Havilland auditors when requested.

4.5 Qualification

4.5.1 Upon review of supplier's data, PCD and De Havilland tests, the supplier will be advised either of product qualification or reasons for disqualification.Products that are qualified will be listed in the Qualified Products List of this specification.

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

4.5.3 Re-qualification of the product may be requested by the De Havilland Materials Technology if there any changes in the method of manufacture and/or formulation.

5 QUALITY ASSURANCE REQUIREMENTS

5.1 Manufacturer Batch/Lot Acceptance Tests

5.1.1 The manufacturer/supplier is responsible for the performance of all sampling, inspection and testing of each batch/lot as specified in **Table 2.**

5.1.2 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.

5.1.3 De Havilland 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.

5.1.4 The manufacturer/supplier shall certify with a Certificate Conformance that each batch of each shipment meets the requirements of this specification.

5.2 Purchaser Batch/Lot acceptance tests

The purchaser/user 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	Acceptance (Supplier/User)
Specific Gravity	AMS-S-8802	x	
Non-Volatile Content	AMS-S-8802	x	
Viscosity	AMS-S-8802	x	
Flow (Class B and C)	AMS-S-8802	x	x
Application Time	AMS-S-8802	x	x
Tack Free	AMS-S-8802	x	x
Standard Cure Rate (Class B)	AMS-S-8802	x	x
Resistance to Thermal Rupture	AMS-S-8802	x	
Low Temperature Flexibility	AMS-S-8802	x	
Peel Strength	AMS-S-8802	x	
Shear Strength (Class C)	AMS-S-8802	x	
Corrosion	AMS-S-8802	x	
Weight loss and Flexibility	AMS-S-8802	x	
Tensile Strength	AMS-S-8802	x	
Elongation	AMS-S-8802	x	
Chalking	AMS-S-8802	x	
Accelerated Storage Stability	AMS-S-8802	x	
Repairability (Class A and B)	AMS-S-8802	x	
Workmanship	AMS-S-8802	x	
Storage Life	AMS-S-8802	x	
Squeeze Out Life (Class C)	AMS-S-8802	x	x
Resistance to Hydraulic Fluid	**Para.3.1.2**	x	

5.3 Definition

5.3.1 Batch - A batch shall be all the product produced in a single production run from the same lot of raw material

under the same fixed conditions and submitted for inspection at one time.

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

6 ORDERING DATA

6.1 Prerequisite

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

6.2 Procurement Documents

Procurement documents should specify the following:

- Title, Number Issue and Amendment Number of this specification
- Type and Size of Cartridges (Imperial or U.S. measure)
- Total quantity (Imperial or U.S. measure)
- Acceptance Test Report.

7 PREPARATION FOR DELIVERY

7.1 Preservation and Packing

The sealant 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 adversely affect the property conformance to Section 3 of this specification.

For pre-mixed frozen sealant, the supplier must ensure that the sealant is maintained at a temperature below -40^{o}F during transit.

7.2 Identification

Each container shall be legibly marked with the following information:

- High Adhesion Sealing Compound For Integral Fuel Tanks
- DHMS S3.07 B2, B4, C 80
- Manufacturer's Name and Product Identification
- Date of Manufacture
- Date of Mixing
- Cartridge Size
- Expiry Date

- Batch Number
- Net Quantity (Imperial or U.S. measure)

7.3 Shipping Documentation

The shipping document shall show:

- Purchase Order No.
- DHMS S3.07, B2, B4, C 80
- Number of Cartridges
- Batch Number
- Total Quantity (Imperial or U.S. measure)
- Certificate of Conformance including Acceptance Test Reports

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

8 HEALTH AND SAFETY DATA

When supplying samples for qualification per Para.4.2, the supplier shall submit a Safety Data Sheet (SDS) complying with Workplace Hazardous Material Information System (WHMIS) 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 (SDS) must then be supplied with a completed EHS-FO-025 "Application To Introduce A New Material" form to the Material Safety Review Committee.

Upon receipt of EHS-FO-025 "Recommendation" form that approves the use of the material, it can then be included on the Qualified Products List.

8.1 Environmental Compliance

Materials and ingredients use in manufacturing the product shall comply to environmental regulations such as REACH, EPA, CEPA. Prohibited substances or restricted from certain uses under an Environmental Regulation shall not be used for the specified prohibited applications.

Supplier shall notify De Havilland Aircraft of Canada Limited, Materials Technology Engineering department if the product contains targeted substances.

QUALIFIED PRODUCTS LIST

MANUFACTURER'S NAME AND ADDRESS	MANUFACTURER'S PRODUCT IDENTIFICATION NO.	DE HAVILLAND QUALIFICATION SHEET NO.	SAFETY DATA SHEET	DATE OF PRODUCT APPROVAL
Manufacturer:				
	Class B	PQS #1		Jan. 2000
PRC DeSoto International	PS 890 B2			
PPG Aerospace				
11601 United Street	Part A		2866	
Mojave, CA 93501	Part B		2867	
Distributors:	P/S 890 B4	PQS#2		Jan. 2000
PPG Canada dba	Part A		2868	
PPG Aerospace	Part B		2869	
-ASC Canada				
5676 Timberlea Blvd.	**Class C**			
Mississauga, Ontario				
L4W 4M6 Tel: (905) 629-7999	P/S 890 C 80	PQS#3		Jan. 2000
	Part A		2672	
	Part B		2673	

As of July 2020, PPG Products will have suffix “F” in their lot number indicating OPPE free. PPG sealants lots without suffix "F" may be used to depletion.