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de Havilland

Material Specification

TITLE:	**SILICONE ADHESIVE TWO PART**
SPECIFICATION NUMBER:	**DHMS A 6.13**
ISSUE:	**C**
AMENDMENT:	**3**
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SILICONE ADHESIVE TWO PART	

REVISION RECORD

Issue	Page	Description and Reason for Change
A		This is a complete revised issue. Detail changes have not been noted.
B		This is a complete revised issue. Detail changes have not been noted.
Adm 1	2	Para.3.1.4 corrected storage life requirement. Was "6 months from date of manufacture", Now "6 months from date of shipment".
C		This is a complete revised issue
	4	Section 5, updated material Qualification Requirement
	5	Section 6, Updated Quality Assurance Requirement
	5	Table 1, clarified batch acceptance testing requirement for Manufacture and User.
Amd 1		Details changes have not been noted.
Amd. 2	2	Deleted reference to Mil specs, deHavilland specs Added ASTM D2196
	4	Para. 4.1 Revised the adhesive thickness requirement . Reference to ASTM D903 for 180 degree peel test. Para. 4.3 Replace DHLP reference with ASTM D2196
	6	Para. 5.5.2 Reword the paragraph
Amd. 3	3	Para. 3.1.4, 3.1.5 Updated storage life requirement for base component and catalyst. Para. 3.1.5 minor change in wording.

1. SCOPE

This specification covers the requirements for silicone adhesive, room temperature curing, two components, for bonding silicone rubber to itself and to aluminum without the use of heat and pressure.

2. APPLICABLE DOCUMENTS

The following document shall form part of this specification of the adhesive defined 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 stated, the current issue shall be used.

2.1. American Society for Testing and Materials

ASTM D903	Peel or Stripping Strength of Adhesive Bonds
ASTM D2196	Rheology Properties of Non-Newtonian Materials by Rotational (Brookfield) Viscometer.

3. REQUIREMENTS

3.1. Properties of Liquid Phase

3.1.1 Material: Materials used in the manufacture of this product shall be of the highest quality and suitable for the intended purpose.

3.1.2 Components: The adhesive shall be a two-component system consisting of a base component and a catalyst. The components shall be packaged in separate containers. The catalyst shall not be batch oriented to the polymer base component.

3.1.3 Mixing Ratio: The adhesive, when mixed according to the manufacturer's recommended mixing ratio, shall conform to the requirements of this specification.

3.1.4 Storage Life: The storage life of the base component and the catalyst shall be 24 months and 36 months respectively from the date of manufacturer, when stored in separate, tightly closed containers and away from sunlight at temperature of 16˚ to 26˚ C (62 to 81˚F).

3.1.5 Pot Life: The adhesive when mixed, shall be usable for up to 3 months, providing the bottle is tightly capped between uses and stored at room temperature.

3.1.6 Working Characteristics: The adhesive components, at any production volume shall be capable of being hand mixed to a smooth, homogeneous, lump free consistency suitable for hand application by brush. The components shall not separate in any way within the specified pot life.

3.1.7 Solids Content: The base component shall have a solids content of 54-56% when stored in a tightly closed container.

3.1.8 Viscosity: The viscosity of the base component shall be 1000-5000 cps when tested at 23˚ ± 2˚C (76 ±4˚F).

3.2. Properties of Solid Phase

3.2.1 Curing Time: The mixed adhesive in a sandwich assembly shall cure to handle consistently within 24 hours at room temperature.

3.2.2 180° Peel Strength: The average peel strength of three specimens, prepared and tested per **Para.4.1** shall be 3 lb/inch minimum when tested at room temperature.

4. TEST PANEL FABRICATION

4.1. 180˚ Peel Strength

Prepare a 6" x 9" test panel of 2024 clad 0.032" thick aluminum, or 0.060" thick stainless steel Type 302. Obtain three 1" x 12" strips of Mylar film. Apply a thin, uniform coat (0.002 ± 0.0002") of uncatalysed adhesive (base component) to one side of Mylar film using Mayer rods or bristle brush. Allow the adhesive to dry for 10 minutes at 23˚ ± 2˚C (76˚ ± 4˚ F) and 50 ± 5% R.H. Hang film in a forced air oven and dry for 10 minutes at 150˚ ± 3˚C (317˚ ± 6˚ F), and check for residual tack. Place the prepared test panel on a hot plate at 55˚ ± 5˚ C (135˚ ± 8˚ F). Assemble the film to be bonded in the correct alignment and roll down with a rubber or stitch roller, ensure all air bubbles are removed. Remove the panel from the hot plate and let tape remain on panels for 20 ± 5 minutes at Room Temperature before testing.
Perform 180 degree peel test per ASTM D903 or equivalent using speed of 12 in/min. Record the load required to peel back the substrate in pounds per inch width, (piw), and the mode of failure.

4.2. Solids Content

Obtain the tare weight (T) of an aluminum foil dish (diameter 58 mm, depth 18 mm). By means of a spatula, quickly weigh 2.0-3.0 grams of resin solution into dish (WS). Time for addition and weighing is to be less than 45 seconds. Place dish in oven at 150˚ ± 5˚C (317˚ ± 6˚ F) for 45 ± 5 minutes. After allowing dish to cool to Room Temperature, re-weigh (WR).

Calculate% solids to the nearest whole number.

$$\%\,\boldsymbol{Solids} = \frac{\boldsymbol{WR - T}}{\boldsymbol{WS - T}}\ \boldsymbol{x}\ \mathbf{100}$$

4.3 Brookfield Viscosity

The viscosity of the uncatalysed resin (base component) shall be carried out at 23˚ ± 2˚C (76˚ ± 4˚ F) using a Brookfield viscometer with RVF #3 spindle at 20 RPM per ASTM D2196 or equivalent.

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 of the product shall be submitted for evaluation at the discretion of Bombardier Aerospace Materials Technology.

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). 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.

5.4.2 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.

5.4.3 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 Bombardier Materials Technology test results, 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.

5.5.2 No changes in the method of manufacture and/or formulation shall be made without prior written notification to Materials Technology Department.
The Manufacturer shall provide test reports to show that the adhesive conforms to the DHMS A6.13 requirements.

5.5.3 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 1.**

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 1**. 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 Of 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 all sampling, inspection and testing of each batch/lot as specified in **Table 1.**

Table 1. Qualification and Batch Tests

Properties	Paragraph	Qualification (Manufacturer/Supplier)	Acceptance	
			Manufacturer/Supplier	Purchaser/User
Storage Life	**Para.3.1.4**	x		
Pot Life	**Para.3.1.5**	x		
Solids Content	**Para.3.1.7**	x	x	
Viscosity	**Para.3.1.8**	x	x	
Curing Time	**Para.3.2.1**	x		
Peel Strength (Adhesion)	**Para.3.2.2**	x	x	x

6.3 Definition

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

6.3.2 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 DHI Qualified Products List prior to issuing a Purchase Order.

7.2 Procurement Documents

Procurement documents should specify the following:

- Title, Number Issue and Amendment Number of this Specification
- Type and Size of Container (Imperial or U.S. measure)
- Total Quantity (Imperial or U.S. measure)
- Acceptance Test Report.

8. PREPARATION FOR DELIVERY

8.1 Identification

The adhesive 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 3** of this specification.

8.2 Packaging

The adhesive shall be supplied as follows:
- The base shall be supplied in prepackaged 4 oz. glass bottles.
- The catalyst shall be supplied in 3.3 cc glass vials.

8.3 Marking

Each container shall be legibly marked with the following information:

- Adhesive, Silicone (conforms to DHMS A6.13)
- Component 1 (base)
- Component 2 (catalyst)
- Applicable Mixing Ratio
- Manufacturer's Name and Product Identification
- Date of Manufacture
- Batch Number
- Net Quantity or Size (Imperial or U.S. measure)

8.4 Shipping Documentation

The shipping document shall show:

- de Havilland Purchase Order No.
- Specification Number
- Number of Containers, Quantity per Container
- Batch Number
- Total Quantity (Imperial or U.S. measure)
- Acceptance Test Reports

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**, the supplier shall submit a Material Safety Data Sheet as per the Ontario Occupational Health and Safety Act, Workplace Hazardous Materials Information System (WHMIS) Relations, which complies with the Canada Hazardous Products Act, Controlled Products Regulations.

Materials Technology, de Havilland Inc. must ensure that copies are provided to, and approved by, the Materials Safety Committee, Industrial Hygiene and Safety, de Havilland Inc.

These requirements are prerequisites to inclusion of any product on the Qualified Products List. Any changes in the formulation of the material requires resubmission of the Materials Safety Data Sheet.

QUALIFIED PRODUCTS LIST

MANUFACTURER'S NAME AND ADDRESS	MANUFACTURER'S PRODUCT IDENTIFICATION NO.	MATERIAL SAFETY DATASHEET NO.	DE HAVILLAND QUALIFICATION SHEET NO.	DATE OF PRODUCT APPROVAL
Momentive Performance Materials 260 Hudson River Road Waterford, NY 12188 (518) 237-3330	PSA 529/ SRC 18 PSA 529 SRC 18	316 2056	PQS #1	April 21, 1994

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