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Material Specification

TITLE:	**ROOM TEMPERATURE CURING ADHESIVE POLYCHLOROPRENE RUBBER BASED**
SPECIFICATION NUMBER:	**DHMS A 6.11**
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ROOM TEMPERATURE CURING ADHESIVE POLYCHLOROPRENE RUBBER BASED	

REVISION RECORD

Issue	Page	Description and Reason for Change
A		This is a complete revised issue. Detail changes have not been noted
Amd. 1	3	Bonding process for peel test specimen modified.
B	QPL	Added EC 1357. Updated overall format.
Amd. 1	QPL	Clarify product designation EC 1357 Neutral colour
Amd. 2	7	Remove the requirement of marking date of mixing and container date
C	2	Section 2.3, added ref. to ASTM D903.
	3	Table 1, added ref. to ASTM D309.
	QPL	Added a note to allow materials to be procured to 3M C of C.
		Purchaser is required to perform receipt testing as per Table 2 of this specification.
D		This is a complete revised issue. Detail changes have not been noted.

1. SCOPE

This specification covers the requirements for room temperature curing, one component, polychloroprene rubber (CR) based contact cements for bonding thermoplastic and elastomeric materials.

1.1 Classification

The adhesives shall be supplied in one of the following types and classes:

Types:

Type I For bonding Neoprene (CR) and Butyl rubber to metal, wood and some plastics (e.g. unstressed polycarbonate and acrylic)

Type II Similar to Type I but with longer range, lower solids content and greater range of adherends, including metal, wood, PVC, rubberized nylon, laminates and fabric backings (carpets)

Classes:

Class 1 For brush application

Class 2 For brush or spray application

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 requirement listed below, the requirement of this specification shall govern. Where a specific issue of a document is not stated, the current issue shall be used.

2.1. Military Specifications

MIL-C-5541 Chemical Conversion Coating for Aluminum Alloys

MIL-C-23377 Primer Coatings: Epoxy Polyamide, Chemical and Solvent Resistant

MIL-R-6855 Rubber, Synthetic, Sheets, Strips, Molded or Extruded Shapes

2.2. Federal Specification

MMM-A-121 Adhesive, Bonding Vulcanized Synthetic Rubber to Steel

2.3. American Society for Testing and Materials

ASTM D903 Peel or Stripping Strength of Adhesive Bonds

ASTM D1002 Strength Properties of Adhesive in Shear by Tension Loading

2.4. De Havilland Specification and Standards

DHMS C4.01 Fluid Resistant Epoxy Primer

DHLP 3051 180 Degree Peel Test

3. REQUIREMENTS

3.1. General

The Type I and Type II adhesives noted shall meet the requirements specified in MMM-A-121 and comply with those specified in **Table 1**.

3.1.1. Material: The basic ingredient used in the manufacture of the adhesives shall be synthetic rubber of the polychloroprene type. The cure of the adhesives shall result from the evaporation of carrier solvents and subsequent crystallization if the elastomer component. It shall be possible to reactivate the adhesive by the application of the appropriate solvent (e.g. toluene).

3.2. Physical Properties

3.2.1 Colour: Unless otherwise specified, the adhesive shall be the characteristic yellow colour furnished by the manufacturer.

3.2.2 Appearance: The adhesive shall be of uniform blend and shall be free of skins, lumps, and jelled or coarse particles. There shall be no separation of ingredients which cannot be readily dispersed by mechanical agitation or by hand mixing.

3.2.3 Non-volatile Content: The minimum percent non-volatile content of the Type I and Type II adhesive blends, when tested as specified in **Para.4.1**, shall be 26% and 16% respectively.

3.2.4 Curing Time: The adhesives shall display the properties shown in **Table 1** when cured for 48 hours at 25o ± 2o C and 50 ± 10% relative humidity.

Table 1

Properties*	Test Method	Requirements
180 degree peel strength (lb/in)	DHLP 3051 or ASTM D903	10 minimum

* Test temperature of 25˚ ± 2˚ C.

3.2.5 Peel Strength: The cured adhesives shall be tested and shall have the peel strength as shown in **Table 1**. Test specimens shall be prepared as described in para. **Para.4.2**.

3.2.6 Storage Life: The storage life of the adhesives shall be a minimum of 15 months from the date of manufacture, when stored at a temperature of 16˚ - 26˚C (60˚ - 80˚F).

3.2.7 Workmanship: Workmanship shall be in accordance with high grade practice for this type of material. It shall be suitable for its intended purpose and free of defects which may affect its performance.

4. TEST METHOD

Note: Prior to sampling preparation, thoroughly mix the adhesive to ensure the homogeneity of the test sample and to exclude lumps etc.

4.1. Nonvolatile Content

Five to ten grams of the adhesive compound shall be poured into a preweighed dish, approximately 8 centimeters in diameter. A tight fitting preweighed cover shall immediately be placed over the dish and the weight determined to the nearest milligram. The cover shall then be removed and the dish heated for 24 ± 1 hours at 70˚ ± 1˚ C (158˚ ± 2˚ F). At the conclusion of the heated period, the dish shall be transferred to a desiccator, cooled to room temperature and the cover replaced. The final weight shall be determined to the nearest milligram and the percent nonvolatile content calculated as follows:

$$\%\ \text{Non} - \text{volatile} = \frac{\text{Final Weight} - (\text{Weight of Dish} + \text{Cover})}{\text{Initial Weight} - (\text{Weight of Dish} + \text{Cover})}\ \text{x}\ 100\%$$

4.2. Peel Test

A minimum of three specimens shall be prepared as outlined in either Method A or Method B, as follows:

Method A

1. Apply a chemical conversion film per MIL-C-5541 to a 2024 T3 Clad aluminum panel, 8" x 6" x 0.06".

2. Prime the test panel with DHMS C4.01, Type 2 Chromated epoxy-polyamide primer (MIL-C-23377) and allow to cure per manufacturer's instructions.

3. Cut three (3) sections, 8" x 1", of MIL-R-6855, Class 2, 50-60 durometer, neoprene rubber sheet (0.06"T). Lightly abrade the bonding surfaces with 180 grit paper and solvent wipe with MEK, IPA or suitable solvent.

4. Apply/brush a light coat of adhesive to both the primed and rubber bonding surfaces, making as few strokes as possible. Allow a 1" length of the 8" dimension of the elastomer to remain uncoated (tab length). Allow the adhesive to air dry for a minimum of one hour.

5. Re-activate the dry adhesive coating of the neoprene rubber by solvent wiping with a clean cloth dampened with toluene, and immediately join the mating surfaces together and apply pressure to the bonded rubber by means of a 1" paint roller. Allow the specimens to cure at room temperature (65 to 85˚F) under a 1-2 pound weight.

6. Remove the weight after 24 hours and attach the tab end of the rubber strip to test fixture and conduct the peel strength test per **Table 1**.

7. Average the peel loads and record as the peel load per inch width.

Method B

1. Solvent wipe a 20 gauge CR Steel panel with lint free cloth soaked in MEK, IPA or suitable solvent.

2. Brush/apply three coats of adhesive to 6 inches of an 8 inch length of 1 inch wide No.10 cotton duck and two coats to the Steel panel, allowing 10 minutes interval

between coats and 5 minutes after the final coat. Note that Class 2 adhesives will require the application of a heavier coat to allow for the lower viscosity/lower solids content of the material.

3. Position the bonding surface of the cotton duck over the CR steel panel and using a 2 pound roller, apply firm manual pressure while rolling 5 times over the bond length. No pressure is required during adhesive cure.

4. On completion of cure, conduct peel test as described in Method A, para 6 & 7.

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.

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 of Materials Technology.

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 de Havilland tests, the supplier will be advised either of product qualification or reasons for disqualification.

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)
MMM-A-121	**Para.3.1**	x	
Non-volatile Content	**Para.3.2.3**	x	
Curing Time	**Para.3.2.4**	x	
Peel Strength	**Para.3.2.5**	x	x[1]
Storage Life	**Para.3.2.6**	x	
Workmanship	**Para.3.2.7**	x	

1. For Purchaser/User, Method A, shall be used.

6.3 Definitions

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. 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 tested on the 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
- Size of Container (Imperial or U.S. measure)
- Total Quantity (Imperial or U.S. measure)
- Acceptance Test Report/Supplier C of C.

8. PREPARATION FOR DELIVERY

8.1 Preservation and Packing

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 Marking

Each container shall be legibly marked with the follow information:

- Adhesive, Polychloroprene Rubber Base
- DHMS A6.11, Type I or Type II, Class 1 or Class 2
- Manufacturer’s Name and Product Identification
- Date of Manufacture

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

8.3 Shipping Documentation

The shipping document shall show:

- de Havilland Purchase Order No.
- DHMS A6.11, Type I or Type II, Class 1 or Class 2
- Number of Containers
- Batch Number
- Total Quantity (Imperial or U.S. measure)
- Acceptance Test Reports/Supplier C of C

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 change in the formulation of the material requires resubmission 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 I **Class I**			
Adhesives, Coatings & Sealers Division/3M 223-1N, 3M Center, St. Paul, MN 55144, USA (612) 733-1110	EC 1300	2009	PQS #1	Sept. 30, 1996
	Class 2			
Adhesives, Coatings & Sealers Division/3M 223-1N, 3M Center, St. Paul, MN 55144, USA (612) 733-1110	EC 1300L	2016	PQS #2	Sept. 30, 1996
	Type II **Class 1**			
Adhesives, Coatings & Sealers Division/3M 223-1N, 3M Center, St. Paul, MN 55144, USA (612) 733-1110	EC 1357 – Neutral Colour EC 1357	2015	PQS #3	Sept. 30, 1996

NOTE

MATERIALS CAN ALSO BE PROCURED CERTIFIED TO 3M'S C OF C.

PURCHASER TO PERFORM ACCEPTANCE TESTING AS PER TABLE 2.