BOMBARDIER

de Havilland
Material Specification

TITLE:	**FLUID RESISTANT, EPOXY PRIMER**
SPECIFICATION NUMBER:	**DHMS C 4.01**
ISSUE:	**P**
AMENDMENT:	**--**
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PAGE:	**1 of 14**

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REVISION RECORD

Issue	Page	Description and Reason for Change
G		This is a revised issue. Detail changes have not been noted.
H		This is a revised issue. Detail changes have not been noted. New suppliers for overseas partners are added.
Amd. 1	14	Product identification corrected.
J		This is a revised issue. Detail changes have not been noted. Revised manufacturer’s address.
K		Specification revised with the following changes:
	6	Added panel D to table 3.
	8	Specified in the footnote of Table 4 “For the Impact Resistance test, it is acceptable to use test panel D as an alternative”.
Amd. 1	12	Product identification corrected: was "SB43 thinner"; now "SB42 thinner".
L		This is a revised issue. Detail changes have not been noted.
	6	Table 3: Panel C, Was: " clean with DHMS S5.02" Now: "clean with DHMS S5.01".
Amd. 1		QPL: Trebor name changed to Tristar Coating Ltd.
Amd. 2	11, 12	QPL: Updated product designation as Slow and Medium Reducer.
Amd. 3		Table 2: Test fluid changed, Was "TT-S-735 Type VIII" Now: "Jet A-1".

REVISION RECORD

Issue	Page	Description and Reason for Change
M		This is a revised issue. Detail changes have not been noted. Added information for Grade C: Fineness Grind, drying time, colour, gloss, shelf life extension.
	QPL	Added DEFT Inc. manufacturer of Type 3 Grade C.
Amd. 1	2	Grade C Was: Low VOC (250 g/L max), Now: Low VOC (350g/L max)
	3	3.1.4 Clarified 24 months from date of manufacture.
N		This is a revised issue. Detail changes have not been noted. Clarified acceptance testing requires for supplier and purchaser, standardize with BA specifications with . Revised section 6, Table 4.
Amd. 1	9	Table 4, removed non-volatiles Content testing for Purchaser. Removed shelf life extension testing column Updated column titles. Repaginated .
Amd. 2	12	QPL, Replaced Akzo Nobel product Was: 463-6-33 base, X457 catalyst Now: Aerowave 2001, 6005 curing solution
Amd. 3	12	QPL, Added Akzo Nobel product 10P4-2NF to Type 2.

REVISION RECORD

Issue	Page	Description and Reason for Change
P		This is a revised issue.
	3	3.1.2 Added three component system
	3	3.1.4 Specifies 24 months shelf life for grade A&B and 9 months for Grade C
	4	3.1.5 Reworded
	4	3.2.3 Added DI Water as thinner for Grade C.
	4	Table 1. Changed drying time for Grade C Was: "Min" Now: " Max".
	5	3.3.5 Changed Gloss unit of Grade C , Was: "7 units" Now: "20 units"
	5	Table 2, Test temperature changed for hydraulic fluid. Was 160F, Now: Ambient.
	9	Table 4, Removed Low Temperature Flex from Acceptance test.
		Note 1. Specifies testing on a single panel is acceptable.
		Note 2. Specifies only test Panel B.
	13	QPL, MAPAERO product P60-LC/P60-A now qualified to Type 2 Grade C

1 SCOPE

This specification establishes the requirements for fluid resistant epoxy primer under Bombardier Aerospace Toronto site designation F19.

1.1 Classification

This primer shall be one of the following types, classes and grades:

Types

Type 2 - Chromated epoxy primer
Type 3 - Non-chromated epoxy primer for use on nonmetallic and composites substrates

Grades

Grade A - High VOC, conventional primer
Grade B - Low VOC (380 g/L max.), high solids primer
Grade C - Low VOC (350 g/L max.), water based primer

2 APPLICABLE DOCUMENTS

The following documents form part of this specification, to the extent defined herein. In the event of conflicting requirements between this specification and those 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 U.S. Government Specifications

QQ-A-250/4	-	Aluminum Alloy 2024, Plate and Sheet
QQ-A-250/5	-	Aluminum Alloy, Alclad 2024, Plate and Sheet
MIL-C-5541	-	Chemical Conversion Coatings for Aluminum Alloys
MIL-L-23699	-	Lubricating Oil, Aircraft Turbine Engine, Synthetic Base, NATO Code Number 0-156

2.2 Federal Specification

Federal Test Method Standard No. 141	-	Paint, Varnish, Lacquer and Related Materials and Methods of Inspection Testing
Federal Test Method Standard No. 791	-	Lubricants, Liquid Fuels, and Related Products, Methods and Testing
TT-S-735	-	Standard Test Fluid Hydrocarbon
Federal Airworthiness Regulations 25.853	-	Fire Protection - Compartment Interiors

2.3 American Society for Testing & Materials

ASTM B117 - Salt Spray (Fog) Testing

ASTM D522 - Mandrel Bend Test of Attached Organic Coatings

ASTM D523 - Specular Gloss

ASTM D1002 - Apparent Shear Strength of Single-Lap-Joint Adhesively Bonded Metal Specimens by Tension Loading

ASTM D1200 - Viscosity of Paints, Varnishes and Lacquers by Ford Viscosity Cup

ASTM D1210 - Fineness of Dispersion of Pigment-Vehicle Systems

ASTM D1400 - Dry Film Thickness of Non-conductive Coating, Applied to Non-Ferrous Metal Base

ASTM D2369 - Volatile Content of Coatings

ASTM D2794 - Resistance of Organic Coatings to the Effect of Rapid Deformation (Impact)

ASTM D2803 - Filiform Corrosion Resistance of Organic Coatings on Metal

ASTM D3359 - Test Methods For Measuring Adhesion by Tape Test

ASTM D3363 - Test Method For Film Hardness by Pencil Test

2.4 De Havilland Specifications

DHMS A6.12 - High Strength Epoxy Adhesive Two Part

DHMS C4.04 - Enamel, Polyurethane

DHMS P1.24 - Aramid Fiber, High Modulus, 250^{o}F Cure, Epoxy Resin Impregnated

DHMS S5.01 - Slow Evaporating, Manual Wipe, Degreasing and Cleaning Compounds

2.5 Other Companies Standards

BMS 3-11, Type IV, Class I, Grade A - Hydraulic Fluid, Fire Resistant

3 REQUIREMENTS

3.1 Component Requirements

3.1.1 Materials - Materials used in the manufacture of this product shall be of high quality and suitable for the purpose.

3.1.2 Components - The primer shall consist of two components, namely a base component and hardener component, or a three component system consisting of a base component, hardener and thinner (reducer may be used) packaged separately, and supplied in kit form.

3.1.3 Condition in Container - The base component shall be free from lumps, skins, grit and coarse particles and shall show no more settling or caking than can be easily dispersed with a paddle to a smooth, homogeneous condition. The catalyst component shall be clear and clean.

3.1.4 Shelf Life - The previously unopened, packaged product shall meet all the requirements specified herein for a period of at least 24 months for Grade A, B, and at least 9 months for Grade C from the date of manufacture when stored at a temperature of 16 to 30^{o}C.

3.1.5 Non-Volatile Content - The non-volatile content of the base and catalyst/hardener component shall not vary by more than ± 2% from the value established on the material qualification report when tested per ASTM D2369.

3.2 Mixed Material Requirements

3.2.1 Mixing Ratio - The base and catalyst shall be mixed according to the manufacturer's instructions.

3.2.2 Spraying Properties - When the base and catalyst components are mixed according to manufacturer's instructions, the mixed enamel shall exhibit satisfactory spraying characteristics with acceptable leveling properties. The catalysed material shall spray satisfactorily with no sagging, running, or streaking.

3.2.3 Viscosity- The viscosity of the mixed enamel, determined 30 minutes after mixing when tested according to ASTM D1200, shall be such that the enamel can be sprayed with or without the addition of a thinner(or DI water for Grade C system when specified in QPL). The required spraying viscosity shall be not less than 11 seconds in a #4 Ford cup (18 seconds in a #2 Zahn cup).

3.2.4 Fineness of Grind - The fineness of grind of the base component shall be not less than 6 for grade A and B and not less than 5 for grade C when tested according to ASTM D1210.

3.2.5 Pot Life - A sample of catalysed material, reduced if necessary, shall show no lumping, gelling or separation after being stored in a closed container for 8 hours for Grade A at 16 to 30^{o}C, and shall meet all the requirements of this specification.

3.3 Film Properties

3.3.1 Coating Thickness - When applied according to the manufacturer's instructions, the dry film thickness shall be 0.0004 - 0.0006 inch when determined according to ASTM D1400.

3.3.2 Drying Time - The fluid resistant primer shall have drying characteristics under ambient drying conditions (16 to 30^{o}C and 30 to 80% relative humidity) as specified in Table 1.

Table 1: Drying Times For Fluid Resistant Primer

DRYING TIMES[1]	GRADE A	GRADE C
dry to touch	10 minutes max.	2 hours max.
dust free	15 minutes max.	2 hours max.
tack free	45 minutes max.	4 hours max.
dry through	2 hours max.	8 hours max.
recoatable	90 minutes max.	2 hours max.

1. The primer shall also be capable of being force cured at temperatures up to 200^{o} F

3.3.3 Surface Appearance - The dried film shall be free from grit, seeds, craters, blisters or any other surface irregularities.

3.3.4 Colour - The primer shall be chromate green for Type 2 , white for Type 3 Grade A, and blue gray No.35189 to FED-STD 595 for Type 3 Grade C. Upon qualification, the colour shall be established and the colour chip provided.

3.3.5 Gloss - The specular gloss, measured according to ASTM D523, 48 hours after application shall be between 5-15 units. For Type 3, Grade C the gloss shall be 20 units maximum.

3.3.6 Flexibility - The primer shall exhibit no cracking, crazing or loss of adhesion when bent over a 0.25 inch mandrel. Three test panels B per Table 3 shall be tested according to ASTM D522 Method B.

3.3.7 Low Temperature Flexibility - The primer shall exhibit no cracking, crazing or loss of adhesion. Three test panels B per Table 3 shall be tested according to Para. 5.2.

3.3.8 Hardness - The primer shall have a pencil hardness of 2H minimum. Two test panels B per Table 3 shall be tested according to ASTM D3363.

3.3.9 Average Dry Film Weight - The dry film weight of the primer shall not exceed 0.0095 lb/ft^2/mil. Three test panels B per Table 3 shall be tested per Para. 5.3.

3.3.10 Fluid Resistance - When immersed in the fluids per Table 2, the cured primer shall show no blistering, loss of adhesion or other deleterious effects after the specified immersion time. Three test panels B and three test panels C per Table 3 shall be tested for each fluid per ASTM D3359 Method B within 30 minutes from removal from the test fluid. After a recovery period of 24 hours, the primer shall have regained its pretest hardness.

Table 2: Fluid Resistance Test

TEST FLUID	IMMERSION TIME	FLUID TEMPERATURE
distilled water	42 days	ambient
lubricating oil, MIL-L-23699	24 hours	250^{o}F
hydraulic fluid[1]	7 days	Ambient
Jet A-1	42 days	Ambient

1. Hydraulic fluid to BMS 3-11 Type IV, Class 1, Grade A

3.3.11 Salt Spray Resistance (Type 2 only) - Three test panels A per Table 3 scratched diagonally corner to corner through the primer to the substrate shall exhibit no blistering, lifting of the primer or substrate corrosion after exposure to 5% salt spray for 3000 hours per ASTM B117 (test panels inclined at 6^o from the vertical). Blistering, lifting of the primer or substrate corrosion within 0.05 inch of the scribe lines does not constitute cause for failure.

3.3.12 Filiform Corrosion Resistance (Type 2 only) - Three test panels A per Table 3 shall exhibit no filiform corrosion under the primer after 1000 hours exposure when tested per Para. 5.4. Blistering, lifting of the primer, or substrate corrosion within 0.05 inch of the machined groove does not constitute cause for failure.

3.3.13 Impact Resistance - The primer shall not exhibit flaking or cracking when subjected to 40 in-lbs. impact from direct and 30 in-lbs from reverse sides. Three test panels B per Table 3 shall be tested per ASTM D2794.

3.3.14 Repairability - The primer shall show no blistering, loss of adhesion or other deleterious effects when tested per Para. 5.5.

3.3.15 Lap Shear Strength (Type 2 only) - Six bonded panels C prepared per Table 3 and Para. 4.2 and tested per ASTM D1002 (Figure 2 of ASTM D1002 with a 1" overlap using DHMS A6.12 Type 1) shall have an average shear strength of 1200 psi minimum and shall exhibit cohesive failure in the adhesive only.

Cohesive or adhesive failure in the primer is not acceptable.

3.3.16 Compatibility With DHMS C4.04 Type 6 - The cured system (fluid resistant primer, intermediate primer to DHMS C4.18 and topcoat qualified to DHMS C4.04) shall be evaluated as a system, as per requirements of DHMS C4.04 Type 6.

4 PREPARATION OF TEST PANELS

4.1 Preparation of Test Panels (if LAB test panels are not used)

Table 3: Test Panels

Panel	LAB Dwg.	Material	Size	Pre-Treatment
A	062-11C	2024-T3 bare QQ-A-250/4	3"x 6" x 0.032”	Chemical conversion coating to MIL-C-5541 Class1A
B	062-1C	2024-T3 clad QQ-A-250/5	3"x 6" x 0.032”	Chemical conversion coating to MIL-C-5541 Class1A
C	062-9	4 plies of DHMS P1.24 Type 2	3"x 6" x 0.040"	Clean with DHMS S5.01
D	062-11A	2024-T3 bare QQ-A-250/4	3"x 6" x 0.032”	Anodic coating to MIL-A-8625 Type I, Class 1

4.1.1 Application of Primer - The primer shall be prepared by first thoroughly mixing each of the components separately. The components shall be mixed together and thinned (if applicable) according to the manufacturer’s specifications. Allow primer to stand for 30 minutes before using. Spray the panels with one cross coat of the primer and air-dry for 7 days. The dry film thickness shall be 0.0004 to 0.0006 inch.

4.2 Preparation of Test Panels for Lap Shear Strength Test

4.2.1 Test panels shall be primed to a dry film thickness of 0.0004 to 0.0006 inch and cured for 7 days minimum at ambient conditions. The primer shall be then aged outdoors for not less than 6 months, or UV aged for 40 hours continuously (Atlas UVcon Model UC1 using UVA-340 fluorescent lamps, or equivalent). After ageing of the panels, hand scuff primer using 180 grit abrasive paper to remove approximately 1/2 the thickness of the aged primer. Clean all test panels using DHMS S5.01 Class 2 and clean Scotch Brite pads and wipe dry with a clean lint-free cloth.

5 TEST METHODS

5.1 Unless otherwise specified, tests shall be conducted at 18 to 25^{o}C and 30 to 80% relative humidity.

5.2 Low Temperature Flexibility - Test panels shall be conditioned for 5 hours ± 30 minutes at -65 ±5^{o}F. Each panel then shall be rapidly bent over a 4 inch diameter mandrel that has been conditioned at the same temperature and time as the test panels per ASTM D522 Method B.

5.3 Average Dry Film Weight -The length and width of the test panels shall be recorded. The panels shall be cleaned, dried and weighed to the nearest 0.0001 lb. The primer shall be applied to one side of the panels and allowed to cure. The primed panels shall be weighed and the thickness of the primer film shall be measured in at least five positions on each panel, to within 0.0001 inch (0.1 mil).

Average dry film weight = $\frac{W2 - W1}{A \times T}$ where,

W1 = weight of bare panel (lbs)
W2 = weight of coated panel (lbs)
A = coated surface area of panel (sq.ft.)
T = average thickness of primer film (mils)

5.4 Filiform Corrosion - Test panels shall have two diagonally machined grooves extending from corner to corner. The grooves shall be 1/16 to 1/8 inch wide and their depth shall be not less than 0.005 inch. Expose test panels to vapour from 12 normal HCL (technical grade) for 1 hour at 75 ± 5°F. Place panels immediately (while moist) in an environment at 95 ± 5°F and 80 ± 5% relative humidity.

5.5 Repairability - Test panels used in Para. 3.3.10 shall be air dried for 24 hours, sanded using 220 grit aluminum oxide abrasive paper and solvent cleaned using DHMS S5.01 Class 2. The primer shall be re-applied and air dried for 7 days.

Test panels shall be immersed for seven days in the test fluids specified Table 2. Each test panel used in repairability testing shall be immersed in the same fluid in which it was fluid resistance tested. Test per ASTM D3359 Method B within 30 minutes of removal from the test fluid.

6 MATERIAL QUALIFICATION REQUIREMENTS

6.1 Request For Qualification

All requests for qualification to this specification shall be addressed to Bombardier Aerospace Materials and Processes Engineering Department for approval.

All material qualification shall be site specific.

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

6.2 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.

6.2.1 A sample shall be submitted for testing at the discretion of Bombardier Aerospace Materials and Processes Engineeing for evaluation.

6.3 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.

6.4 Process Control Document

6.4.1 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.

6.4.2 When qualification has been granted, the PCD shall be signed by the supplier and Bombardier Aerospace Materials and Processes Engineering and shall not be changed without prior written approval.

6.4.3 The PCD and all production data shall be available to any Bombardier Aerospace auditors when requested.

6.5 Qualification Approval

6.5.1 Upon review of supplier's data, PCD and BA tests, the supplier will be advised either of product qualification or reasons for disqualification.

6.5.2 Products that are qualified will be listed in the Qualified Products List of this specification.

6.5.3 Re-qualification of the product may be requested by the Bombardier Materials and Process Engineering if there are any changes in the method of manufacture and/or formulation.

7 QUALITY ASSURANCE REQUIREMENTS

7.1 Batch/Lot Acceptance Tests

7.1.1 The manufacturer/supplier is responsible for the performance of all sampling, inspection and testing of each batch/lot as specified in **Table 4.**

7.1.2 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 4**. The report shall include the supplier's batch identification, materials specification and date of testing.

7.1.3 Bombardier Aerospace Materials and Processes 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.

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

7.2 Purchaser Batch/Lot acceptance tests

7.2.1 The purchaser is required to perform , inspection and testing of each batch/lot as specified in **Table 4**

7.2.2 **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.

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

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Table 4: Qualification and Batch Acceptance Tests

Test	Paragraph	Qualification	Acceptance[1]	
		Supplier	Supplier	Purchaser/ User
Condition in Container	3.1.3	x	x	x
Non-Volatile Content	3.1.5	x	x	
Viscosity	3.2.3	x	x	x
Fineness of Grind	3.2.4	x		
Pot Life	3.2.5	x	x	x
Drying Time	3.3.2	x	x	x
Surface Appearance	3.3.3	x	x	x
Gloss	3.3.5	x	x	
Flexibility	3.3.6	x	x	
Low Temperature Flexibility	3.3.7	x		
Hardness	3.3.8	x	x	
Dry Film Weight	3.3.9	x		
Fluid Resistance[2]	3.3.10	x	x	
Salt Spray Resistance	3.3.11	x		
Impact Resistance	3.3.13	x	x	x
Repairability	3.3.14	x		
Lap Shear Strength	3.3.15	x		
Compatibility with DHMS C4.04	3.3.16	x		

1. For batch acceptance test, use only test panels B. For the "Impact Resistance" test, it is acceptable to use test panel D as an alternative.Batch testing on a single panel per test is acceptable.

2. For batch acceptance, immersion in hydraulic fluid on test panel B only is acceptable.

8 ORDERING DATA

8.1 Prerequisite

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

8.2 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 Number)
- Type or Size of Containers
- Total Quantity
- Enamel Type, Class and Grade
- Acceptance Report
- Material Data Safety Sheets

9 PREPARATION FOR DELIVERY

9.1 Preservation and Packing

The enamel shall be packed 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 affect adversely conformance to the properties per Section 3 of this specification.

9.2 Packaging

The enamel shall be supplied in a kit packaged as a unit, or as separate components in bulk form as stated on the Purchase Order, consisting of base component and the required amount of catalyst and thinner to bring the enamel to spraying consistency.

9.3 Marking

Each container shall be legibly marked with the following information:

- Primer (conforms to DHMS C4.01), Types 2 or 3, Grades A, B, or C.
- Manufacturer's Name and Product Identification (trade name or code number)
- Date of Manufacture
- Batch Number
- Net Quantity (Imperial, U.S. or metric measure)

9.4 Shipping Documentation

Shipping document shall show:

- Bombardier Aerospace Purchase Order No.
- Specification DHMS C4.01, issue, Amd.
- Primer Type: Type 2 or 3, Grades A, B or C
- Number of Containers
- Batch Number
- Total Quantity (Imperial, U.S. or metric measure)
- Acceptance Test Reports (Certificate of Conformance)
- Material Safety Data Sheets

10 HEALTH AND SAFETY DATA

When supplying samples for qualification per Para. 6.2, 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 submitted with a completed DH 4339 form, "Application To Introduce A New Material", to the Material Safety Committee.

Upon receipt of DH 4340 form, “Recommendation”, that approves the use of the material, it can then be included on the Qualified Products List.

NOTE: Any change in the formulation of the material requires a re-submission of the MSDS.

QUALIFIED PRODUCTS LIST

MANUFACTURER	MANUFACTURER'S PRODUCT IDENTIFICATION	MSDS #	BOMBARDIER QUALIFICATION SHEET	PRODUCT APPROVAL
Type 2				
Manufacturer: Tempo Paint & Varnish Co., Div. of Tower Chemicals Co., 205 Fenmar Drive, Weston, Ont. M9L 2X4 (416) 746-2233	4500-PB-23B Base 4500-C-23B Catalyst 4500 S-23X Thinner	2125 2000 0277	PQS #1 PQS #4	May 9, 1974 March 29, 1983
Manufacturer: Tristar CoatingsLtd. 18 Cadetta Rd., R.R.9 Brampton, Ont., L6T 3Z8 (905) 794-1100	2 Parts: 425P0076 Base (Green) 420C0078 Catalyst 3 Parts: 435P0033 Base (Green) 430C0035 Catalyst SB42 -Slow Reducer SB43- Medium Reducer	 1628 1630 1251 1252 1622 1253	PQS #5	Dec. 20, 1984
Manufacturer: Akzo Nobel, Rijksstraatweg 31, 2170 AJ Sassenheim Netherlands (3171) 308 2905	10P4-2NF Base EC-117S Catalyst TR 19 or TR 20 Thinner	BOM006777 TBD BOM00674	PQS #15	July 28, 2016
Type 2 , Grade C				
Manufacturer: Akzo Nobel, Rijksstraatweg 31, 2170 AJ Sassenheim Netherlands (3171) 308 2905	2 Parts: Aerowave 2001 6005 Curing Solution	 3960 3959	PQS #10 & #14	May 16, 2013

MANUFACTURER	MANUFACTURER'S PRODUCT IDENTIFICATION	MSDS #	BOMBARDIER QUALIFICATION SHEET	PRODUCT APPROVAL
Type 2 , Grade C				
Manufacturer MAPAERO S.A 10 Ave. de la Rijole Pamiers, 01, FR 09100	3 Parts: P60-LC Base P60-A Catalyst DI Water	BOM000152	PQS #15	January 8, 2018
Type 3				
Tempo Paint & Varnish Co.,	4500 PB40 Base 4500 C 40 Catalyst 4500 S-23X Thinners	2026 0223 0277	PQS #3 PQS #4	March 29, 1983
Manufacturer: Tristar Coatings Ltd,	Starpoxy 430 3 Parts: 431P0074 Base 430C0035 Catalyst SB 42 -Slow Reducer SB 43 - Medium Reducer	 1897 1252 1622 1253	PQS #6	
Manufacturer: PRC-DeSoto Int. 11601 United Street, Mojave, CA 93501 (661) 824-4532	2 Parts: 512X310 Base 910X533 Activator	 - -	PQS #8	Oct. 20 1997

MANUFACTURER	MANUFACTURER'S PRODUCT IDENTIFICATION	MSDS #	BOMBARDIER QUALIFICATION SHEET	PRODUCT APPROVAL
Type 3 Grade C				
Manufacturer: DEFT Inc. 17451 Von Karman Ave. Irvine, CA 92614 (949) 474-0400	2 Parts: 44GY034A Base 44GY034A Catalyst		PQS #9	Nov. 2010