BOMBARDIER

de Havilland
Material Specification

TITLE:	**ENAMEL, POLYURETHANE FOR AIRCRAFT EXTERIOR PAINT SYSTEM**
SPECIFICATION NUMBER:	**DHMS C 4.04**
ISSUE:	**P**
AMENDMENT:	**3**
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PAGE:	**1 of 19**

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REVISION RECORD

Issue	Page	Description and Reason for Change
J	10	Specified use of aluminum oxide abrasive paper.
	17	Code clarification for CA8000 Base Component and Catalyst.
		Updated company name from Dexter to Akzo Nobel.
	18	Added Akzo Nobel paint system (Eclipse enamel + 10-P20-44 intermediate primer).
		Minor changes were made throughout.
K		This is a complete revision.
Amd. 1		Updated format and revised PRC DeSoto's address in QPL.
L		Revised storage stability requirements.
Amd. 1	4	Table 1: added option to cure to dry tape at 6 hours at 90°F
	5	Table 3: Revised Gloss requirement for Semi-Gloss: 20-40 (was 35-45), and Flat: 5 maximum (was 7 maximum)
M	14	QPL: Added new enamel from PRC-Desoto
	16	Table 10: Correction of tint designation
		Added CA8000/S100X to table 10.
Amd. 1	14	QPL: Added new designations CT, CT1, CT2, CT3, CT4 to product CA8800.
		Added new Enamel CA8800/B900
N	14	QPL: Added Axon Products to Type 6, Class B, Grade B
		Re-Paginated
Amd. 1	12	QPL: Clarification for the finishing of the products: 6600, 6800, 6700

REVISION RECORD

Issue	Page	Description and Reason for Change
N		
Amd. 2	8	Table 7: Correction specimen A is with aged F19 primer QPL: Updated company name Trebor Ltd to Tristar Coating Ltd.
Amd. 3	8	Table 7: Correction specimens pre-treatment.
Amd. 4	14,15	QPL: Added Flat paint to Eclipse Series
O		Not use
P		Updated Materials Qualification Section 6 , standardizing with BA specifications.
	11	Table 8: Updated table clarifying testing are required for supplier and purchaser/user
Amd. 1	16	Added product definition for Gloss, Semi Gloss, Flat , CA8000/Sxxx, CA8020/Sxxx, CA8010/Sxxx.
Amd. 2	6	Added Table 7 to para. 3.3.10. Revised Table 5, Acceptance test.
Amd. 3	16	Update QPL, CA8020DX and CA8010DX

1 SCOPE

This specification covers the requirements for two- or three-part polyurethane enamel suitable for aircraft exterior application.

The enamel shall be used as a system only with intermediate primer qualified to DHMS C4.18.

1.1 Classifications

The enamel may be a clear,pigmented, gloss, semi-gloss, flat or textured enamel and shall be one of the following Types, Classes and Grades:.

Type 2 - Standard flexibility and high hydraulic fluid resistance, for use as an aircraft non-decorative top coat in areas where high resistance to phosphate ester hydraulic fluid is required (Bombardier Aerospace Toronto finish code F37)

Type 3 - Meeting flammability requirements per FAR 25, para.'s 25.853 and 25.855 Amendment 83, for interior use, especially on non-metallic substrates (Bombardier Aerospace Toronto finish code F24). This type is obsolete for new design.

Type 4 - High flexibility, for use as an aircraft decorative exterior top coat (Bombardier Aerospace Toronto finish code F24)

Type 5 - Flexible, camouflage top coat (Camolite) - RESERVED

Type 6 - Flexible, rain erosion resistant paint system (Bombardier Aerospace Toronto finish code F23 + F24)

Type 6I - Same as Type 6, except intermix system

Class A - For applications with conventional painting equipment including air or airless spray
Class B - For applications with electrostatic painting equipment as well as conventional equipment

Grade A - High VOC (volatile organic compound, > 420g/L) - conventional solvent
Grade B - Low VOC (volatile organic compound, 420 g/L max.) - conventional solvent (high solids)
Grade C - Water-based

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-PRF-23699 - Lubricating Oil, Aircraft Turbine Engine, Synthetic Base, NATO Code Number O-156

2.2 American Society for Testing & Materials

ASTM G26 - Light Exposure Apparatus (Xenon-Arc Type) With and Without Water for Exposure of Nonmetallic Materials
ASTM E308 - Practice for Computing the Colors of Objects by Using the CIE System
ASTM D387 - Color & Strength of Color Pigment with a Mechanical Muller
ASTM D522 - Mandrel Bend Test of Attached Organic Coatings
ASTM D523 - Specular Gloss
ASTM D1200 - Viscosity of Paints, Varnishes and Lacquers by Ford Viscosity Cup
ASTM D1210 - Fineness of Dispersion of Pigment-Vehicle Systems
ASTM D1535 - Color by the Munsell System
ASTM D1729 - Visual Evaluation of Colour Difference of Opaque Materials
ASTM D2369 - Volatile Content of Coatings
ASTM D2794 - Resistance of Organic Coatings to the Effect of Rapid Deformation (Impact)
ASTM D3359 - Measuring Adhesion by Tape Test
ASTM D3363 - Film Hardness by Pencil Test

2.3 Bombardier Aerospace Toronto Specifications

DHMS S5.01 - Slow Evaporating, Manual Wipe, Degreasing and Cleaning Compounds
DHMS C4.01 - Fluid Resistant, Epoxy Primer
DHMS C4.18 - Primer, Intermediate (F23)

2.4 Other Company Standards

BMS 3-11, Type IV Class 1, 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 enamel shall consist of two components (base compound and catalyst) or three components (base compound, catalyst and thinner). The component material shall be packaged separately and supplied in kit form.

3.1.3 Condition in Container - Freshly opened, full containers of 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 and/or shaker to a smooth, homogeneous condition. The catalyst component shall be clear and clean.

3.1.4 Storage Stability - When stored at 16 to 30^{o}C (60 to 86^{o}F), the unopened, packaged product shall meet all the requirements specified herein for a period of at least one year for conventional systems and of at least two years for high solids systems.

3.1.5 Non-Volatile Content - The non-volatile content of the base and catalyst component shall not vary 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 components of the enamel shall be mixed according to the manufacturer's instructions.

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

3.2.3 Viscosity - The viscosity of the enamel, after mixing for 30 minutes, when tested per ASTM D1200, shall be such that the enamel can be sprayed, with or without the addition of a thinner. A required spraying viscosity shall be 15 to 25 seconds in a #2 Zahn cup or 10 to 22 seconds in a #4 Ford cup.

3.2.4 Fineness of Grind - The fineness of grind of the mixed base component shall be not less than 7 for gloss, nor less than 5 for semi-gloss and flat when tested per ASTM D1210. This requirement applies to pigmented enamels only.

3.2.5 Pot Life - A sample of catalyzed material, reduced if necessary, shall show no lumping, gelling or separation after being stored in a closed container for the time specified below and shall meet all requirements of this specification, when tested at 16 to 30° C.

Grade A: all colours - 6 hours minimum

Grade B: white - 4 hours minimum
all other colours - 3 hours minimum

3.3 Film Properties

3.3.1 Drying Time - The enamel shall have the following drying characteristics under ambient drying conditions (16 to 30°C and 30 to 80% relative humidity):

Table 1: Drying Times for Polyurethane Enamel

DRYING TIMES[1]	GRADE A	GRADE B
dust-free	30 minutes max.	1 hour max.
to overcoat	2 hours max.	2 hours max.
dry through	8 hours max.	---
dry to tape	---	5 hours max. at 48°C or 6 hours max. at 32°C

1. The enamel also shall be capable of being force cured at temperature up to 48°C.

3.3.2 Surface Appearance - The enamel, after 8 hours drying time, shall be free from streaks, blisters, solvent popping and coarse particles. Except for textured enamels, the enamel film shall be free of surface irregularities. The dried film shall be free from grit, seeds, craters, blisters or any other surface irregularities.

3.3.3 Colour Match - Maximum deviation of the dried through enamel film of base colour from the master chip shall be per **Table 2** when tested to ASTM D1729 and ASTM E308. Colour shall be measured on the CIE 1976 L*a*b* system, using a 10° observer, and D65 illuminant (specular component included).

Table 2: Colour Deviation Allowables

Reflectance y(%) (Tristimulus)	Maximum Deviation (ΔE*)
0 - 85	1.0
85 - 100	0.5

3.3.4 Gloss - The specular gloss measured per ASTM D523 at 48 hours after application shall meet the following requirements:

Table 3: Gloss Requirements for Polyurethane Enamel

	Measuring Head	Gloss Value
Gloss	60^o	90 minimum
Semi-Gloss	60^o	20-40
Flat	60^o	5 maximum

3.3.5 Pigment Strength (Intermix Systems only) - The pigmented strength of subsequent batches of base colours shall show a deviation no greater than 5% from that established for the master batch (first shipment) when determined per ASTM D387 and ASTM E308 (parameters as noted in para. 3.3.3). For this purpose, the supplier shall supply a colour chip and let-down ratio with each batch of base colour. The let-down ratios to be as agreed upon by Bombardier Aerospace Toronto and the supplier. The base colour compound as supplied shall be taken to be the dispersion of the pigment in the appropriate vehicle and this shall be applied by spraying to a thickness of 0.0020 to 0.0025". For spectrophotometers not having auto determination of pigment strength, it may be derived from the following expression:

Pigment Strength, $K/S = (1- R)^2 / 2R$, where
K = absorption coefficient,
S = scattering coefficient, and
R = reflectance (average of all wavelengths).

3.3.6 Flexibility

Type 2 enamel shall not exhibit cracking, crazing or loss of adhesion when bent over a 0.50" diameter mandrel. Two each of specimens B and C per **Table 7** shall be tested per ASTM D522 Method B.

Type 4 and Type 6 enamel shall not exhibit cracking, crazing or loss of adhesion when bent over a 0.25" diameter mandrel. Two each of specimens B and C per **Table 7** shall be tested per ASTM D522 Method B.

3.3.7 Low Temperature Flexibility - The enamel shall exhibit no cracking, crazing or loss of adhesion when bent over a 4.0" diameter mandrel. Two each of panels B and C per **Table 7** shall be tested per para. 5.1.

3.3.8 Hardness - The enamel shall have a pencil hardness of H minimum for Type 2 and of F minimum for Types 4 and Type 6. Two specimens A per **Table 7** shall be tested per ASTM D3363.

3.3.9 Fluid Resistance - When immersed in fluids per **Table 4**, the enamel shall show no blistering, loss of adhesion or other deleterious effects after the specified immersion time. Two each of specimens A, B and C per **Table 7** shall be tested in each fluid per ASTM D3359 Method B within 30 minutes of removal from the test fluid. After a recovery period of 24 hours, the coating shall have regained its pre-test hardness.

Table 4: Fluid Resistance Test

TEST FLUID	IMMERSION TIME	FLUID TEMPERATURE
distilled water	30 days	ambient
lubricating oil MIL-PRF-23699	24 hours	250°F
hydraulic fluid[1]	30 days	ambient
Jet A-1	30 days	ambient

1. To BMS 3-11 Type IV, Class 1, Grade A.

3.3.10 Impact Resistance - The enamel shall exhibit no flaking or cracking, when subjected to impact testing per ASTM D2794. The specimen type per Table 7 and test requirements are given below. The examination for flaking or cracking shall be performed with the unaided eye.

Table 5: Impact Resistance Requirements for Polyurethane Enamel

Paint Type	Test Spec. Qual. Test	Test Spec. Acceptance Test[1]	Gloss (in-lbs)		Semi-Gloss (in-lbs)		Flat (in-lbs)	
			Direct	Reverse	Direct	Reverse	Direct	Reverse
Type 2	A, B and C	A	30	10	15	5	10	3
Type 4	A, B, and C	A	80	80	60	30	30	15
Type 6	A, B, and C	A	40	40	--	--	--	--

1. F19 Type 2 may be substituted by the manufacturer's topcoat-compatible chromated epoxy base primer.

3.3.11 Wrap Capability (Class B only) - The thickness of the enamel shall not vary by more than 0.0005" when tested per para. 5.2 using two specimens F per Table 7.

3.3.12 Weather Resistance, Type 2 Enamel - The enamel shall meet the colour, gloss and flexibility requirements of this specification after exposure for 1000 hours in a xenon or open arc weatherometer per ASTM G26 Method 1.

3.3.13 Weather Resistance, Types 4 and 6 Enamel - The enamel shall meet the requirements of Table 6 after exposure for 1000 hours in a xenon or open arc weatherometer per ASTM G2 Method 1.

Table 6: Weather Resistance Requirements for Types 4 & 6 Polyurethane Enamel

Test	Gloss	Semi-Gloss	Flat
Colour	Slight yellowing is acceptable		
Gloss (units)	65 min.	---	15 max.
Flexibility	No change	---	---
Negative Impact			
Type 4 (in-lbs)	45 min.	35 min.	15 min.
Type 6 (in-lbs)	25 min.	---	---

3.3.14 Whirling Arm Rain Erosion Resistance (Type 6 Enamel Only) - The enamel shall not peel by more than 0.25" from the paint leading edge when tested per para. 5.3 using D & E test specimens per **Table 7**.

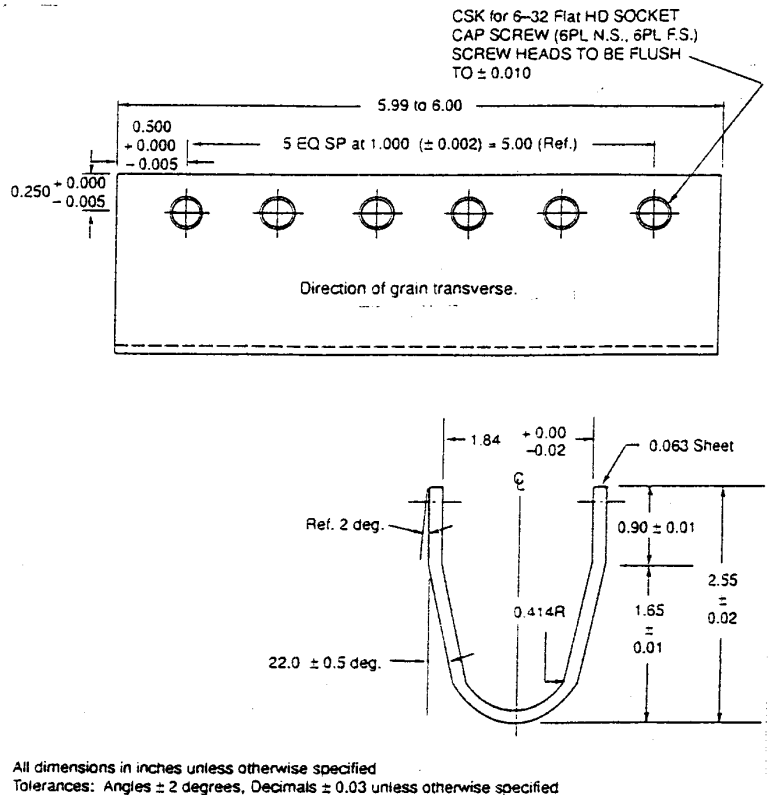

Figure 1. Whirling Arm Test Specimen

4 PREPARATION OF TEST SPECIMENS

4.1 Preparation of Test Specimens

Prepare test specimens in **Table 7** as follows:

4.1.1 Test specimen A shall be primed with epoxy primer to DHMS C4.01 Type 2 to a dry film thickness of 0.0004 to 0.0006" and cured for 7 days min. at ambient conditions without aging.

4.1.2 Test specimens B and D shall be primed with epoxy primer to DHMS C4.01 Type 2 to a dry film thickness of 0.0004 to 0.0006" and cured for 7 days min. at ambient conditions. The primer then shall be aged outdoors for 6 months min., or UV aged for 40 hours continuously (Atlas UVcon, Model UC1, using UVA-340 fluorescent lamps, or equivalent).

4.1.3 Test specimens C and E shall be primed with epoxy primer to DHMS C4.01 Type 3 to a dry film thickness of 0.0004 to 0.00006" and cured for 7 days minimum at ambient conditions. The primer then shall be aged outdoors for 6 months min., or UV aged for 40 hours continuously (Atlas UVcon, Model UC1, using UVA-340 fluorescent lamps, or equivalent).

4.1.4 Cleaning of Stored and Primed Test Specimens - After ageing of the specimens, hand scuff primer using 180 grit aluminum oxide abrasive paper to remove approximately 1/2 of the thickness of the aged primer. Clean the test panels using DHMS S5.01 Class 2 and a fine Scotch Brite pad and wipe dry with a clean lint-free cloth.

Table 7: Test Panels

Specimen	LAB Dwg.	Material	Size	Pre-Treatment
A	062-1C2	2024-T3 clad to QQ-A-250/5	3"x 6" x .032"	Chemical conversion coat to MIL-C-5541 Class 1A + F19 primer to DHMS C4.01 Type 2(UnAged)
B	062-1C2	2024-T3 clad to QQ-A-250/5	3"x 6" x .032"	Chemical conversion coat to MIL-C-5541 Class 1A + F19 primer to DHMS C4.01 Type 2(Aged)
C	062-1C3	2024-T3 clad to QQ-A-250/5	3"x 6" x .032"	Chemical conversion coat to MIL-C-5541 Class 1A + F19 primer to DHMS C4.01 Type 3 (Aged)
D	070-1-2	2024-T3 clad to QQ-A-250/5	approx. 7" x 8" x .063"	Chemical conversion coat to MIL-C-5541 Class 1A + F19 primer to DHMS C4.01 Type 2 (Aged)
E	070-1-3	2024-T3 clad to QQ-A-250/5	Figure 1 stock size approx. 7" x 8" x .063"	Chemical conversion coat to MIL-C-5541 Class 1A + F19 primer to DHMS C4.01 Type 3 (Aged)
F	071-1	any aluminum alloy tube	1" dia. x 16" long, any wall thickness	Chemical conversion coat to MIL-C-5541 Class 1A

4.1.5 Application of Intermediate Primer (F23) - Immediately after cleaning, test specimens shall be primed with a chromated epoxy intermediate primer F23 conforming to DHMS C4.18 Type III to a dry film thickness of 0.0003 to 0.0005" and air dried at room temperature until tack-free (2.0 hours max.) before application of the polyurethane enamel top coat.

Test specimens D and E shall be masked off at the nose of the leading edge using the tangent point between the radius and the flat surface as a demarcation line on either side.

4.1.6 Application of Polyurethane Enamel - The enamel shall be mixed according to the manufacturer's recommendation, reduced with thinner (if necessary) to spraying viscosity and allowed to stand 30 minutes before using. The enamel shall be applied to a total dry film thickness of 0.0020 to 0.0025" in two or three coats. The test specimens shall be air cured at ambient conditions for 7 days prior to testing.

5 TEST METHODS

5.1 Unless otherwise specified, tests shall be conducted at 18 to 25°C (64 to 77°F) and 30 to 80% relative humidity.

5.2 Low Temperature Flexibility - The test specimens shall be conditioned at -54 ± 3°C (-65 ± 5°F) for 5 ± 0.5 hours. The specimens then shall be rapidly bent over a 4" diameter mandrel that has been conditioned at the same temperature and time as the test specimens per ASTM D522 Method B.

5.3 Wrap Capability - The test specimens shall be mounted vertically and electrically grounded. The coating shall be applied from one direction only using electrostatic spray equipment. Determine the coating thickness variation after 7 days of air cure.

5.4 Whirling Arm Rain Erosion Resistance - Immerse the test specimens in water at 24 ± 3°F (75 ± 5°F) for 24 hours prior to testing. Start the test within 1 hour of removal from water. Secure the specimen to the whirling arm fixture. Expose the specimen to 385 miles per hour (at specimen mid point) with 3 to 4" per hour water spray (1 to 4 mm drop size) for 30 minutes. The above test set-up and requirements (para. 3.3.14) are applicable to the Seattle Whirling Arm system. For other test set-up parameters, the exposure time will vary, and the correct correlation must be established before testing and stated in the test report.

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 Engineering 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 (QPL) of this specification including F23 primer to DHMS C4.18.

6.5.3 No changes in the method of manufacture and/or formulation of primer to DHMS C4.18 and/or DHMS C4.04 shall be made without notification and prior written approval of the Materials Technology and Quality Assurance departments of Bombardier Aerospace Toronto.

7 QUALITY ASSURANCE REQUIREMENTS

7.1 Batch 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 8.

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 8.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 8

Definition

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.

Table 8: Qualification and Batch Acceptance Tests

Test	Para.	Type 2 Enamel			Types 4 and 6 Enamel		
		Qualification	Acceptance		Qualification	Acceptance	
		Supplier	Supplier	Purchaser/ user	Supplier	Supplier	Purchaser/ user
Condition in Container	3.1.3	x	x	x	x	x	x
Non-Volatile Content	3.1.5	x	x		x	x	
Viscosity	3.2.3	x	x	x	x	x	x
Fineness of Grind	3.2.4	x			x		
Pot Life	3.2.5	x		x	x		x
Drying time	3.3.1	x	x	x	x	x	x
Surface Appearance	3.3.2	x	x	x	x	x	x
Colour Match [1]	3.3.3	x	x		x	x	
Gloss	3.3.4	x	x		x	x	
Pigment Strength[2]	3.3.5	x			x		
Flexibility	3.3.6	x			x		
Low Temp. Flexibility	3.3.7	x			x		
Hardness	3.3.8				x		
Fluid Resistance	3.3.9	x			x		
Impact Resistance	3.3.10	x	x	x	x	x	x
Wrap Capability	3.3.11	x			x		
Weather Resistance Type 2	3.3.12	x					
Weather Resistance Types 4 & 6	3.3.13				x		
Rain Erosion Resistance	3.3.14				x		

1. For colour match, aluminum faced cardboard, 10 caliper pare with 0.00035 inch thick aluminum foil on one side, or equivalent specimen is acceptable. For acceptance test, ASTM D1535 may be used. In case of disagreement, qualification test results will be use

2. For type 6 intermix system only.

8 ORDERING DATA

8.1 Prerequisite

Products furnished under this specification for production use shall be qualified and listed on the QPL before issuing a Purchase Order.

8.2 Procurement Documents

Procurement documents should specify the following:

- Title, Number, Issue and Amendment Number of this specification
- Type and Size of Containers (Imperial, U.S. or metric measure)
- Total Quantity (Imperial, U.S. or metric measure)
- Enamel Type, Class and Grade
- Colour, Colour Chip Standard Number or Colour Control Sample
- Acceptance Test Report
- Material Safety Data Sheets (for clear and each colour supplied)

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 the property conformance to 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 the base component and the required amounts of catalyst and thinner needed to bring the enamel to spraying consistency.

9.3 Marking

Each container shall be legibly marked with the following information:

- Enamel, Polyurethane (conforms to DHMS C4.04), Type, Class, and Grade
- Manufacturer's Name and Product Identification (Trade Name or Code Number)
- Date of Manufacture
- Batch Number
- Net Quantity (Imperial, U.S. or metric measure)
- Colour and Colour Chip Standard Number

9.4 Shipping Documentation

Shipping document shall show:

- Bombardier Aerospace Toronto Purchase Order No.
- Specification Number
- Number of Containers
- Batch Number
- Total Quantity (Imperial, U.S. or metric measure)
- Enamel Type, Class, and Grade
- Acceptance Test Reports

- Material Safety Data Sheets(s)
- Colour and Colour Chip Standard Number

10 HEALTH AND SAFETY DATA

When supplying samples for qualification, 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 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 be included on the Qualified Products List.

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

ENAMEL, POLYURETHANE
FOR AIRCRAFT EXTERIOR PAINT SYSTEM

QUALIFIED PRODUCTS LIST

ONLY THE INDICATED PRIMER IS ACCEPTABLE FOR USE AS A SYSTEM WITH THE ASSOCIATED ENAMEL.

Classification	Manufacturer	Manufacturer's Product Identification No.		MSDS #	Qualification No.	Product Approval
Type 2 Class A Grade A	Enamel Tempo Paint & Varnish Co. 205 Fenmar Drive Weston, Ont. M9L 2X4 (416) 746-2233	4600 Series	Base Catalyst		PQS #3	Dec. 7, 1984
	Primer Tempo Paint & Varnish Co. (same address as above)	4500-PB-60X 4500-C-60X	Base Catalyst		DHMS C4.18 PQS #3	Jan. 14, 1991
Type 3 Class A Grade A	Tempo Paint & Varnish Co. (same address as above)	4800 Series	Base Catalyst		PQS #6	OBSOLETE
Type 4 Class A Grade A	Enamel PRC-Desoto Inc. 11601 United Street, Mojave, CA 93501 (661) 824-4532	800 Series 91C0	Base Catalyst		PQS #4	Apr. 1, 1977
	Primer PRC-Desoto Inc. (same address as above)	515X349 910X533	Base Catalyst		DHMS C4.18 PQS #4	Oct. 1, 1991
Type 4 Class A Grade A	Enamel Tempo Paint & Varnish Co. (same address as above)	Base/Catalyst 6600 Series (gloss) 6700 Series (Flat) 6800 Series (semi gloss)			PQS #8	Jun. 24, 1985
	Primer Tempo Paint & Varnish Co. (same address as above) or	4500-PB-60X 4500-C-60X	Base Catalyst	0236 0237	DHMS C4.18 PQS #3	Jan. 14, 1991
	Primer Tristar Coating Ltd. 18 Cadetta Rd. R.R.9 Brampton, Ont. L6T 3Z8 (416) 794-1100	425IP0501 420C0078 SB 41E & SB43	Base Catalyst Solvent	1852 1630 1253	DHMS C4.18 PQS #4	Oct. 1, 1991
Type 4 Class A Grade A	Enamel Tristar Coating Ltd. (same address as above).	620H 620C SB61	Base Catalyst Reduce	See Table 9	PQS #14	Oct. 21, 1988
	Primer Tristar Coating Ltd. (same address as above)	425IP0501 420C0078 SB 41E & SB43	Base Catalyst Solvent	1852 1630 1253	DHMS C4.18 PQS #4	Oct. 1, 1991

Classification	Manufacturer	Manufacturer's Product Identification No.		MSDS #	Qualification No.	Product Approval
Type 6 **Class B** **Grade A**	Enamel Tristar Coating Ltd. 18 Cadetta Rd. R.R.9 Brampton, Ont. L6T 3Z8 (416) 794-1100	620H 620C SB61	Base Catalyst Reducer	See Table 9	PQS #14	Jul. 16, 1991
	Primer Tristar Coating Ltd. (same address as above)	425IP0501 420C0078 SB 41E & SB43	Base Catalyst Solvent	1852 1630 1253	DHMS C4.18 PQS #4	Oct. 1, 1991
Type 6 **Class B** **Grade A**	Enamel PRC-Desoto Inc. 11601 United Street Mojave, CA 93501 (661) 824-4532	Ti-Flex FE102	Base	See Table 9	PQS #16	Jun. 4, 1992
	Primer PRC-Desoto Inc. (same address as above)	515x349 910x533	Base Catalyst	2323 2322	DHMS C4.18 PQS #2	Sep. 12, 1990
Type 6I[1] **Class B** **Grade A**	Enamel Akzo Nobel, East Water Street Waukegan, Illinois, 60085-5652, tel (847) 623-4200 fax (847) 625-3200	24-F2 Series PC-101 TR-20	Base Catalyst Retarder Reducer	See Table 9	PQS #15	July 16, 1991
Type 6 **Class B** **Grade B**	Enamel PRC-Desoto Inc. (same address as above)	420HS Series 910X899 020K017	Enamel Catalyst Flow Control Component	2259 2241	PQS #17	Jun. 7, 1994
	Primer PRC-Desoto Inc. (same address as above)	515x349 910x533	Base Catalyst	2323 2322	DHMS C4.18 PQS #2	Sep. 12, 1990

Classification	Manufacturer	Manufacturer's Product Identification No.		MSDS #	Qualification No.	Product Approval
Type 6 **Class B** **Grade B**	Enamel PRC-Desoto Inc. (same address as above)	Gloss CA8000/SXXX CA8000Z CA8000XX (C,C1,C2,CT,CT1,CT2)	Base Tints Catalyst Thinners	Table 10 2800 2801	PQS #18	Mar. 15, 1999
		Semi Gloss CA 8020/SXXX CA 8020DX	Base Catalyst	4001		
		Flat CA8010/SXXX CA8010DX	Base Catalyst	4000		
	Primer PRC-Desoto Inc. (same address as above)	515x349 910x533	Base Catalyst	2323 2322	DHMS C4.18 PQS #2	Sep. 12, 1990
Type 6 **Class B** **Grade B**	Enamel PRC-Desoto Inc. 11601 United Street Mojave, CA 93501 (661) 824-4532	CA8000/YXXX (Y:B=Boeing,E=European, F=Federal,I=Internal, P=Pantone,S=PRC) CA8000X (X:Z=For all solid color paints,B=Metallic effect colors) CA8000XX (C,C1,C2,C3,CT,CT1,CT2, CT3)	Base Catalyst Thinners	See Table 10 2800 2801	PQS #18	Mar. 15, 1999
	Primer (Intermediate) PRC-Desoto Inc. (same address as above)	CA7000 A CA7000 B CA7000 C	Base Catalyst Epoxy	2819 2818 2817	DHMS C4.18 PQS #5	Dec. 2, 1999
	Enamel PRC-Desoto Inc.	CA8800/SXXX CA8800Z CA8000 or CA8800 (C, C1, C2, C3, CT, CT1, CT2, CT3, CT4)	Base Tints Catalyst Thinners	Table 10 3701 3702	PQS #20	July 22, 2005
	Primer (Intermediate) PRC-Desoto Inc.	CA7755 A CA7755BE	Base Catalyst	3703 3704	DHMS C4.18 PQS #7	July 22, 2005
	Enamel PRC-Desoto Inc.	CA8800/B900 CA8800Z CA8800F (F1, F2, F3, F4)	Base Catalyst Thinners	3141 2021 3142	PQS #20	July, 2006

Classification	Manufacturer	Manufacturer's Product Identification No.		MSDS #	Qualification No.	Product Approval
Type 6 Class B Grade B	Enamel	Eclipse Series	Base		PQS # 19	Jan. 12, 2000
	Akzo Nobel	(Gloss: ECL-G-XXXX		2877		
	East Water Street	Flat: ECL-F-XXXX)		2878		
	Waukegan, Illinois	Curing Solution: PC-233		2880		
	60085-5652	TR-109,	Thinners	3533		
	(847) 623-4200	TR-111,		3534		
		TR-112,		3535		
	Primer (Intermediate)	TR-113				
	PRC- DeSoto Canada Inc.			2819	DHMS C4.18	Dec. 2, 1999
	(same address as above)	CA7000 A	Base	2818	PQS # 5	
		CA7000 B	Catalyst	2817		
		CA7000 C	Epoxy			
Type 6 Class B Grade B	Enamel	Eclipse Series	Base		PQS # 19	Jan. 12, 2000
	Akzo Nobel	(Gloss: ECL-G-XXXX		2877		
	(same address as above)	Flat: ECL-F-XXXX)		2878		
		Curing Solution: PC-233		2880		
		TR-109,	Thinners	3533		
		TR-111,		3534		
		TR-112,		3535		
	Primer (Intermediate)	TR-113				
	Akzo Nobel			2421	DHMS C4.18	Nov. 7, 2000
	(same address as above)	10-P20-44	Base	2879	PQS # 6	
		EC-273	Catalyst	239		
		TR-114	Thinner			
Type 6 Class B Grade B	Enamel	PG-99 Series	Base	3772	PQS #21	Aug. 27, 2007
	Axon Products Inc.	PH - 19	Hardener	3773		
	307 Echelon Rd	SC - 10R	Reducer	3775		
	Greenville, South Carolina	SC - 6	Reducer	3777		
	29605	SC - 2	Reducer	3774		
	(864) 299 2819					
	Primer (Intermediate)					
	Axon Products Inc.	EP - 2 - Y1	Base	3778	DHMS C4.18	Aug. 27, 2007
	(same address as above)	EH - 12	Hardener	3779	PQS #8	
		SC - 11	Reducer	3780		

1. Intermix system is identified by Type letter "I". For base colours, description and MSDS numbers, see Table 9.

Table 9: Intermix Base Colours

Base Colour No.	Description	MSDS No.
PB8 - 3	White	1927
PB8 - 13	Lamp Black	1935
PB8 - 20	Violet	1934
PB8 - 21	Blue	1925
PB8 - 22	Phat. Blue	1926
PB8 - 30	Monastr. Red	1932
PB8 - 31	Red Oxide	1933
PB8 - 32	Med. Cad. Red	1923
PB8 - 33	Lt. Cad. Red	1931
PB8 - 36	Red	1924
PB8 - 40	Yellow	1930
PB8 - 41	Ferr. Yellow	1929
PB8 - 42	Chrm. Yellow	1922
PB8 - 43	Yellow	1928
PB8 - 50	Phat. Green	1919
PB8 - 61	Molyb. Orange	1921
PB8 - 63	Orange	1920

Table 10: Desothane HS Tint Bases

Desothane Tint Base Number	MSDS No.
CA8000/S11X	2781
CA8000/S22X	2782
CA8000/S31X	2783
CA8000/S38X	2784
CA8000/S39X	2785
CA8000/S41X	2786
CA8000/S42X	2787
CA8000/S52X	2788
CA8000/S53X	2789
CA8000/S68X	2790
CA8000/S69X	2791
CA8000/S92X	2792
CA8000/S100X	3713
CA8000/S200	2793
CA8000/S201	2794
CA8000/S400X	2795
CA8000/S405X	2796
CA8000/S406X	2797
CA8000/S407X	2798
CA8000/S601X	2799