# de Havilland Inc.

# Material Specification

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| **TITLE:** | **TWO COMPONENT, PIGMENTED BAKING EMAMEL (F5)** |
| **SPECIFICATION NUMBER:** | **DHMS C 4.07** |
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**TWO COMPONENT, PIGMENTED BAKING EMAMEL (F5)**

**REVISION RECORD**

| Iss. | Page | Description and Reason for Change |
|---|---|---|
| A | | This is a revised specification.<br>Detailed changes will not be noted. |
| B | | Corrected the Title. |

## 1.0 SCOPE

1.1 This specification covers the requirements for a one or two component pigmented baking enamel for application on prepared metal surfaces. This enamel is to be used as a topcoat for internal appearance items. This enamel is identified by de Havilland Finish Code as F5.

1.2 Products listed in the Qualified Products List (QPL) are the only ones authorized for use in production.

## 2.0 Classification

2.1 Types - Material conforming to this specification shall be identified by one of the following types:

Type I - single or one component product

Type II - two component product

Types I and II are interchangeable for application on parts where the drawing call-out is F5.

2.2 Classes

Material class designates the solvent blend that is compatible/required for the intended enamel application method.

Class A - For application with conventional painting equipment including airless spray or HVLP (High Volume Low Pressure)

Class B - For application with electrostatic painting equipment as well as conventional equipment

**NOTE**: When no Class is specified, Class A shall be used.

2.3 Grades

Material grades specify the solvent types and the solvent quantity that has been formulated into the enamel at spray viscosity in gm/l of Volatile Organic Compound (VOC).

Grade A - Conventional Enamel

Grade B - Low VOC.

**NOTE**: When no Grade is specified, Grade A shall be used.

## 3.0 APPLICABLE SPECIFICATIONS

The following documents shall form a part of this specification, to the extent 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.

### 3.1 de Havilland Specifications

DHLP 3055 - Tape Adhesion Test For Paints

DHLP 3090 - Pot Life of Catalyzed Paints

### 3.2 U.S. Government Specifications

### 3.2.1 Federal Specifications

QQ-A-250/5 - Aluminum Alloy, Alclad 2024, Plate and Sheet

### 3.2.2 U.S. Federal Standards

Federal Test Method Standard No. 141 - Paint, Varnish, Lacquer and Related Materials and Methods of Inspection and Testing

Federal Test Method Standard No. 595 - Colours

METHOD 4041 - Non-volatile Content of Paints

METHOD 4061 - Drying Time of Paints

METHOD 6101 - Measurement of Specular Gloss on Paints using Glossmeter

METHOD 6221 - Flexibility of Paints

METHOD 4411 - Fineness of Grind

### 3.3 American Society for Testing & Materials

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

ASTM D3363 - Pencil Hardness

ASTM D3794 - Viscosity - Zahn Cup

## 4.0 REQUIREMENTS

4.1 General Requirements

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

4.1.2 Components - The Type II enamel shall consist of two components, packaged separately, and supplied either in kit form or in bulk form, as stated on the Purchase Order. The components shall not be batch oriented, i.e. universal catalyst. The Type I enamel shall be supplied in container sizes as stated on the purchase order.

4.1.3 Condition in Container - Freshly opened, full containers of the Type II case component or Type I single 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. Freshly opened full container of the Type II catalyst component shall show no milkiness or precipitate.

4.1.4 Storage Stability - The previously unopened, packaged product shall meet all the requirements specified herein when stored at a temperature of 65 to 85$^{o}$F, for the following length of time:

Type I - 6 months

Type II - 12 months

### 4.2 Mixed Enamel Requirements

4.2.1 Viscosity - The viscosity of the admixed enamel, determined 30 minutes after mixing as per manufacturer's requirement when tested in accordance with ASTM D3794 shall be as follows:

| Enamel Type | No. 4 Ford Cup | No. 2 Zahn Cup |
|---|---|---|
| Type I | 5 - 10 sec. | 14 - 18 sec. |
| Type II | 22 - 28 sec. | 24 - 30 sec. |

4.2.2 Fineness of Grind - The fineness of grind of the admixed Type II enamel and the single component Type I enamel shall be not less than 5. The test shall be conducted in accordance with Federal Test Method Standard 141a, Method 4411.1. For Type II enamel the test shall be performed one hour after mixing.

4.2.3 Pot Life - (Type II only) Approximately 1 pint of admixed catalyzed enamel, reduced if necessary, shall show no lumping, gelling or separation after being stored in a closed container for 12 hours at 20-30°C (68-86°F) and shall meet all requirements of paragraphs 4.3.4 when tested in accordance with DHLP 3090.

4.2.4 Non-Volatile Content - The non volatile content of Type I and admixed Type II unthinned enamel shall be determined in accordance with the procedure given in Federal Test Method Standard 141a, Method 4041.1. The value obtained shall not vary more than ±2% from the value established during qualification or subsequent testing.

**4.3 Physical Properties of Primer Film**

4.3.1 Drying Time - When applied in accordance with the manufacturer's instructions, the enamel applied to a dry film thickness of 0.001 - 0.0015 inch, shall have the following drying characteristics:

Types I and II

(a) dry through in 15 minutes maximum at 275 ± 25°F (85-90% full cure)

(b) full cure in 7 days maximum at ambient temperature.

4.3.2 Colour - After drying through, the colour of the test sample shall match the master colour chip, as follows: the CIE Lab 1976 ΔE* should not be greater than ±1.0 and under certain circumstances 1.5 max. The tests to be performed with a 10° observer using both fluorescent and daylight illumination.

4.3.3 Gloss - The specular gloss measured in accordance with Fed. Test Method Standard 141a Method 6101, after drying through using a 60° measuring head shall be between 5 - 15 units.

4.3.4 Spraying Properties - The Types I and II enamels prepared for spraying shall spray satisfactory on test panel showing good leveling and no sagging, wrinkling, bubbling, or running. The dried film shall be free from grit, seeds, craters, blisters or any other surface irregularities.

4.3.5 Adhesion Wet Tape Test - Three Type A test panels prepared per para. 5.0 shall exhibit no blistering, no removal from the substrate and cohesive separation when tested in accordance with DHLP 3055 Method III, Class 3, after immersion in distilled water for 24 hours at room temperature.

4.3.6 Flexibility - Three Type A test panels prepared per para. 5.0 shall not exhibit cracking or loss of adhesion when bent over a 0.25 inch diameter mandrel when tested in accordance with FTMS 141a Method 6221.

4.3.7 Impact Resistance - Three Type A test panels prepared per para. 5.0 shall exhibit no cracking or loss of adhesion when subjected to direct and reverse impact with the Gardner Impact Tester in accordance with ASTM D2794. The minimum impact values shall be as follows:

| Types | Positive/Direct | Negative/Reverse |
|---|---|---|
| Type I | 30 in.lb (min) | 30 in.lb (min.) |
| Type II | 80 in.lb (min.) | 80 in.lb (min.) |

4.3.8 Pencil Hardness - One unscored Type A test panel, prepared per para. 5.0 shall exhibit a minimum pencil hardness when tested in accordance with ASTM 3363.

Type I - F min.

Type II - 2 H min.

## 5.0 Test Methods and Materials

5.1 General - Unless otherwise specified, tests shall be conducted at room temperature 70 - 80$^{o}$ F (21 - 27$^{o}$ C) and a relative humidity of 40 - 60%.

5.1.1 Room Temperature shall be defined as the ambient temperature range between 70 and 80$^{o}$ F.

5.2 Test Panels - Test panel type, Lab Dwg No., test panel description and paragraphs describing preparation are stated in Table 1.

5.3 Test Panel Preparation - Test panel type, Lab Dwg No., test panel description and paragraphs describing preparation are stated in Table 1.

5.3.1 All phases of test panel preparation shall be carried out in accordance with the following guidelines.

5.3.1.1 Each separate operation in the test panel batch preparation shall be performed by the same person from start to finish, i.e. priming or painting of the test panels shall not be started by one person and finished by another person.

5.3.1.2 Each separate operation once started shall be finished for the same batch of panels.

5.3.1.3 Baking enamels shall be applied only where the temperature is greater than 60$^{o}$F and the relative humidity is less than 80% in the primer application area.

5.3.2 Test facilities not using Lab. Drawing prepared test panels shall perform the required pre-treatments as per para. 5.3.2.1, 5.3.2.2, 5.3.2.3 and 5.3.2.4.

5.3.2.1 Test panels specified in Table 1, shall be prepared as follows:

5.3.2.2 Test Panel Preparation Performed at de Havilland.

(a) Clean for chromic acid anodizing in accordance with PPS 31.02.

(b) Chromic acid anodize and seal in accordance with PPS 32.03.

(c) Mix baking enamel according to manufacturer's instructions and apply in accordance with PPS 34.39.

(d) After a 5 minute solvent flash-off time, bake the test panels in an oven at $275 \pm 25^{o}F$ for 15 minutes.

5.3.2.3 Test Panel Preparation Performed Outside de Havilland.

(a) Vapour degrease or solvent wash.

(b) Clean in an alkaline soap solution suitable for aerospace materials. After the recommended immersion time, thoroughly rinse the panels in tap water.

(c) Remove oxide film by immersing in a deoxidizing solution suitable for aerospace materials. After the recommended immersion time, rinse the test panels in tap water.

(d) While panels are still wet, immerse in a chromic acid anodizing bath. Anodize in accordance with MIL-A-8625 Type I. After anodizing, rinse, seal and dry the panels.

(e) Mix the baking enamel according to manufacturer's instruction. Spray apply the enamel in two wet cross coats to a dry film thickness of 0.001 - 0.0015 inch.

(f) After a 5 minute solvent flash-off time, bake the test panels in an oven at $275 \pm 25^{o}F$, for 15 minutes.

Table 1 - Test Panel Preparation

| Test Panel | Lab Dwg | Test Panel if not to Lab Dwg | Clean per para 5.3.2.2.a or 5.3.2.3.a,b and c | Anodize per para 5.3.2.2.b or 5.3.2.3.d | Apply baking enamel per para 5.3.2.2.c or 5.3.2.3.e | Solvent flash-off per para 5.3.2.2.d or 5.3.2.3.f | Bake per para 5.3.2.2.d or 5.3.2.3.f |
|---|---|---|---|---|---|---|---|
| A | 066-1 | clad 2024-T3<br>QQ-A-250/5<br>3" x 6" x .032" | x | x | x | x | x |

## 6.0 QUALITY ASSURANCE

### 6.1 Qualification

6.1.1 A supplier is responsible for the performance of all qualification testing, as specified in Table 2.

6.1.2 A supplier desiring qualification shall submit one copy of a report showing actual qualification test data and a sufficient quantity of product for de Havilland evaluation tests.

6.1.3 Upon review of supplier's data and de Havilland tests, the supplier shall be advised either of product qualification or reasons for disqualification.

6.1.4 Products that are qualified shall be listed in the Qualified Products List of this specification.

6.1.5 No changes in the method of manufacture and/or formulation shall be made without notification and prior written approval of Materials Technology and Quality Assurance Departments of de Havilland Inc.

Re-qualification of the product may be requested by the purchaser if there are any changes in the method of manufacture and/or formulation.

### 6.2 Qualification by Similarity

Where a product has been qualified to another similar specification, the supplier may submit this qualification test report required by para. 6.1 of this specification (Not applicable for flammability testing). The similar specification may be a government, company, or other specification where the requirements are similar to this specification.

### 6.3 Acceptance Tests

6.3.1 Unless otherwise specified in the contract or purchase order, the supplier is responsible for all acceptance tests, as specified in Table 2.

6.3.2 The supplier, performing acceptance tests per para. 6.3.1 shall furnish 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.

6.3.3 de Havilland 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 shall be returned to the supplier at the supplier's expense.

**Table 2 - QUALIFICATION AND BATCH ACCEPTANCE TESTSS**

| Property | Paragraph | Qualification | Acceptance |
|---|---|---|---|
| Condition in Container | 4.1.3 | x | x |
| Viscosity | 4.2.1 | x | |
| Fineness of Grind | 4.2.2 | x | |
| Pot Life | 4.2.3. | x | |
| Non Volatile Content | 4.2.4 | x | x |
| Drying Time * | 4.3.1 | x | x |
| Colour * | 4.3.2 | x | x |
| Gloss * | 4.3.3 | x | |
| Spraying Properties * | 4.3.4 | x | x |
| Adhesion Wet Tape † | 4.3.5.1 | x | x |
| Flexibility ** | 4.3.6 | x | |
| Impact ** | 4.3.7 | x | |
| Pencil Hardness | 4.3.8 | x | |

*. Test panel size for spraying properties shall be 4 ft x 6 ft minimum. Test panels may be scrap parts (skins) or test fuselages, and may be used to test drying time, colour and gloss.

†. Unless otherwise specified, a minimum of three test specimens shall be used for testing the properties below. More than one test may be performed on each test specimen provided these tests do not affect the result of subsequent tests. Wherever possible, tests shall be conducted away from the edge of the test panel.

## 7.0 ORDERING DATA

### 7.1 Prerequisite

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

### 7.2 Procurement Documents

The Purchase Order shall specify all of the data stated in Table 3.

## 8.0 PREPARATION FOR DELIVERY

### 8.1 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 adversely affect the property conformance as specified in paragraph 4.0 of this specification.

### 8.2 Packaging

The primer shall be supplied either in a kit packaged as a unit, consisting of base component, curing solution and thinners as applicable, or in bulk form.

### 8.3 Marking

8.3.1 Component containers shall be durably and legibly marked with the information stated in Table 3.

8.3.2 The shipping containers (kit boxes or bulk containers) shall be marked in a conspicuous location, in a durable and legible manner with the information stated in Table 3.

## 8.4 Shipping Documentation

The documentation accompanying each shipment shall show the data outlined in Table 3.

**Table 3 - DOCUMENTATION AND LABELLING REQUIREMENTS**

| | Para 7.2 Procurement Documents | Para 8.3.1 Component Container | Para 8.3.2 Shipping Container | Para 8.4 Shipping Documents |
|---|---|---|---|---|
| Spec. No., Issue & Amdt. No. Type, Class & Grade | x | x | x | x |
| Manufacturer's Name | x | x | x | x |
| Base & Curing Soln. Number | x | x | x | x |
| Date of Manufacture | | x | x | x |
| Batch Number | | x | x | x |
| Quantity in Imperial Metric or U.S. Measure | x | x | x | x |
| Mixing Instructions | | x | | |
| Application Instructions | | x | | |
| Flammability Toxicity Warning | | x | x | |
| Acceptance Test Report | x | | x | x |
| DHC Purchase Order No. | x | | x | x |
| No. of Shipping Containers | | | x | x |
| MSDS Numbers | x | | x | x |
| Certificate of Compliance | | | | x |

## 9.0 HEALTH AND SAFETY DATA

When supplying samples for qualification per para 6.1.2, 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, reactivity data, physical properties, preparation information and procedures for storage and disposal.

This (MSDS) must then be supplied with a completed DH 4339 "Application To Introduce A New Material" form to the Material Safety Committee.

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

**NOTE:** Any changes in the formulation of the material require a resubmission of the Material Safety Data Sheet.

## QUALIFIED PRODUCTS LIST

| MANUFACTURER'S NAME AND ADDRESS | MANUFACTURER'S PRODUCT IDENTIFICATION NO. | MSDS # | DATE OF PRODUCT APPROVAL |
|---|---|---|---|
| | **TYPE I** | | |
| Tempo Paint & Varnish Co.<br>205 Fenmar Dr.<br>Weston, ON<br>M9L 2X4<br>(416) 746-2233<br><br>Distributor:<br>Trebor Industrial Sales<br>1724 St. Clair Ave. W.<br>Toronto, ON | 2200 series<br>Alkyd Enamel | 0412 | PQS 1<br>Dec. 7, 1982 |
| | **TYPE II** | | |
| Tristar Coating Division<br>18 Cadetta Rd.<br>R.R. #9<br>Brampton, ON<br>L6T 3Z8<br>(416) 794-1100 | Starcron 570 Series<br>Epoxy Acrylic Enamel | 1871 & 1872 | PQS 2<br>March 20, 1992 |