BOMBARDIER

Toronto (de Havilland)

Proprietary Information

PPS 34.15

Production Process Standard (PPS)

Application of Anti-Static Polyurethane Enamel (F31 & F34)

Issue 16

- This standard supersedes PPS 34.15, Issue 15.
- This PPS is effective as of the distribution date.
- Validation of issue status is the responsibility of the user.
- Vertical lines in the left hand margin indicate technical changes over the previous issue.
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Issue 16 - Summary of Changes (over the previous issue)

The following summaries are not detailed and are intended only to assist in alerting PPS users to changes which may affect them; refer to the applicable sections of this PPS for detailed procedure and requirements.

- Added provision for masking using masking paper and/or masking tape, as necessary.
- Revised listing of relative humidity recording and/or indicating equipment.

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1 Scope

1.1 This Production Process Standard (PPS) specifies the procedure and requirements for the spray application of conductive, erosion resistant polyurethane enamels (finish codes F31 and F34) to aircraft parts and assemblies.

1.1.1 This standard covers the application of F31 and F34 enamels to parts in the detail or small assembly stage of manufacture. Refer to PPS 34.11 when painting major components (i.e. rudder, flaps, etc.) or completed aircraft with the exterior paint system.

1.1.2 This PPS complements the engineering drawings that specify its use as an authorized instruction. The procedure specified in this PPS must be followed to ensure compliance with all applicable specifications. In general, if this PPS conflicts with the engineering drawing, follow the engineering drawing. The requirements specified in this PPS are necessary to fulfil the engineering design and reliability objectives.

1.1.3 Refer to PPS 13.26 for the subcontractor provisions applicable to this PPS.

1.1.4 Procedure or requirements specified in a Bombardier BAPS, MPS, LES or P. Spec. **do not** supersede the procedure or requirements specified in this PPS.

2 Hazardous Materials

2.1 Before receipt at Bombardier Toronto (de Havilland), all materials must be approved and assigned Material Safety Data Sheet (MSDS) numbers by the Bombardier Toronto (de Havilland) Environment, Health and Safety Department. Refer to the manufacturer's MSDS for specific safety data on any of the materials specified in this PPS. If the MSDS is not available, contact the Bombardier Toronto (de Havilland) Environment, Health and Safety Department.

3 References

3.1 General

3.1.1 Unless a specific issue is indicated, the issue of the reference documents specified in this section in effect at the time of manufacture shall form a part of this specification to the extent indicated herein.

3.2 Bombardier Toronto (de Havilland) Specifications

3.2.1 PPS 9.06 - Electrical Bonding and Grounding of Aircraft Structures.

3.2.2 PPS 13.13 - Personal Protective Respiratory Equipment.

3.2.3 PPS 13.26 - General Subcontractor Provisions.

3.2.4 PPS 13.28 - Storage Life of Adhesives, Sealants, Paints and Composite Products.

3.2.5 PPS 31.17 - Solvent Usage.

3.2.6 PPS 34.08 - Application of Epoxy-Polyamide Primer (F19 and F45).

3.2.7 PPS 34.11 - Priming and Painting of Aircraft Exterior Surfaces.

3.2.8 PPS 34.16 - Application of Epoxy-Amine, Urethane Compatible, Intermediate Primer (F23).

3.2.9 PPS 34.34 - Surface Finishing Compounds (F33).

3.3 Bombardier Toronto (de Havilland) Internal Operating Procedures

3.3.1 EHS-OP-005 - Hazardous Materials Management.

3.4 Bombardier Aerospace Specifications

3.4.1 BAERD GEN-007 - Quality Control of Heat Treating Equipment and Hot Forming Equipment.

3.4.2 BAERD GEN-023 - Contamination Control for Compressed Air.

3.4.3 BAPS 138-055 - Accelerated Curing of Organic Compounds.

4 Materials and Equipment

4.1 Materials

4.1.1 Unless otherwise specified in this section, use only the materials specified; use of superseding or alternative materials is not allowed.

4.1.2 Enamel, Finish Code F31, to DHMS C4.13, Type I.

4.1.3 Enamel, Finish Code F34, to DHMS C4.13, Type II.

4.1.4 Lint-free cheesecloth or filter mesh.

4.1.5 Wiping cloths (e.g., DSC 378-2).

4.1.6 Tack rags (e.g., DSC 375).

4.1.7 Abrasive paper, aluminum oxide, 180 - 220 grit, (e.g., 3M TRI-M-ITE).

4.1.8 Protective wrapping material (e.g., Brown Kraft paper, Kimpac K41, AIR-CAP C120, D120 plastic bubble film, Poly Foam).

4.1.9 Polishing compound, Met-All No. 1187, Dars Met-All Industries Inc.

4.1.10 Compressed air for use with spray guns. Compressed air used with spray application equipment must meet the requirements of BAERD GEN-023.

4.2 Equipment

4.2.1 Relative humidity recording and/or indicating equipment: sling psychrometer or hygrometer (e.g., Extech RHT20). Relative humidity recording and/or indicating equipment must be calibrated and operated according to the manufacturers' instructions.

4.2.2 Viscometer, "Gardco EZ cup" Zahn #2 cup; do not use other brands of Zahn cups.

4.2.3 Mechanical paint shaker, capable of agitation of enamel base component to ensure uniform distribution of solids without adversely affecting the base component.

4.2.4 Masking paper, non-adhesive (e.g., 3M #06539, 3M #06736 "Scotchblok" or Kraft paper).

4.2.5 Masking tape utilizing rubber based adhesive (e.g., #218 or 3M #8428).

4.2.6 Spray guns and associated equipment (e.g., HVLP, air electrostatic, high pressure air assist, etc.) capable of applying coatings to the dry film thicknesses specified herein without unacceptable defects as specified in section 6. Operate spray guns and associated equipment according to the equipment manufacturers instructions.

4.2.7 Accelerated cure oven or area (conventional or infrared (IR)) qualified according to BAPS 138-055 (including temperature uniformity survey according to BAERD GEN-007).

5 Procedure

5.1 General

5.1.1 F31 and F34 polyurethane enamels are conductive, erosion resistant topcoats which prevent the build-up of static electricity on surfaces made of epoxy resin and graphite laminates or composites.

5.1.2 On the leading edges adjacent to de-icer boots, apply F31 enamel so that the enamel overlaps onto the de-icer boot by the amount specified on the engineering drawing.

5.1.3 Before applying F31 or F34 enamel to laminates or composites, the surface of the laminate or composite shall be finished using surface finishing compound according to PPS 34.34 and primed with F19 Type 3 white primer according to PPS 34.08.

5.1.4 F31 and F34 catalysts contain isocyanates. Operators working with these materials shall be familiar with the safety precautions listed in section 7 before handling or using such material.

5.1.5 If masking is required, it is acceptable to use masking paper (ref. para. 4.2.4) and/or masking tape (ref. para. 4.2.5), as necessary.

5.2 Paint Shop Conditions

5.2.1 Do not paint when the temperature is less than 60°F (16°C) or when the relative humidity is less than 30% or more than 80%. Use calibrated indicators to monitor and record the temperature and humidity conditions.

5.2.2 Wash floors as frequently as required to avoid build-up of dust and loose overspray.

5.2.3 Ensure that paint spray rooms are equipped with forced or induced ventilation systems capable of maintaining sufficient ventilation to meet the requirements of the Occupational Health and Safety Act. The air shall be introduced into the room in such a manner as not to cause turbulence or excessive air currents, yet shall be sufficient to prevent dried overspray from settling on surfaces which have been painted but remain tacky.

5.2.4 Ensure that adequate lighting is provided.

5.3 Preparation of Enamel (See Table 1)

5.3.1 Do not use catalyst or base which has exceeded its storage life (as marked on the containers). Submit catalyst and base which have exceeded their storage life for shelf life extension testing and action according to PPS 13.28.

5.3.2 Discard of any base component which shows signs of skinning, gelling, lumping, pigment separation or any other deterioration.

5.3.3 Dispose of any catalyst which has taken on a milky cast (e.g., according to EHS-OP-005).

5.3.4 Prepare enamel according to the manufacturers instructions, or as follows:

Step 1. Agitate the base component on a mechanical paint shaker (ref. para. 4.2.3) for a minimum of 1 minute.

Step 2. Mix the base and catalyst in the ratio specified in Table 1.

Step 3. Allow the mixed paint to stand for the reaction time specified in Table 1.

Step 4. Strain the mixture through a fine, clean, lint-free cheesecloth or filter mesh.

Step 5. For spray application, reduce the mixture to the spraying viscosity specified by the manufacturer using the thinner specified in Table 1. Do not reduce enamel to be used for brush touch-up. Verify the spray viscosity against the specified requirements with a “Gardco EZ cup” Zahn #2 cup. Ensure that the cup is thoroughly cleaned after every use. If there is reason to doubt the accuracy of the cup (e.g., clogging of the orifice) submit the cup for calibration or replace with a new certified cup.

Table 1 - Preparation of F31 and F34 Polyurethane Enamels

Finish Code	Manufacturer	Components	Mixing Ratio (by volume)	Reaction Time (Note 1)	Reducing Ratio (by volume)	Pot Life at 60% Relative Humidity (Note 2)
F31 (DHMS C4.13, Type I)	Tempo Paint & Varnish Co.	2800-B-1 Base	4	15 - 30 minutes	Reduce as necessary to obtain correct spraying viscosity	6 hours
		2800-C-1 Catalyst	1			
		4600-S-1 Thinner	---			
	Aerazur	706 032 Base	Refer to the manuacturers’ instructions for mixing ratio, reaction time, dilutant, reducing ratio and pot life.			
		706 320 Hardener				
F34 (DHMS C4.13, Type II)	Akzo Nobel Aerospace Coatings (Laminar X-500)	8B6A Laminar	4	15 - 30 minutes	5	6 hours
		50C3A Catalyst	1			
		66C28 Thinner	---		1	

Notes 1. Allow base and catalyst to react for the time specified before reducing.
2. Pot life will be longer at lower relative humidity and shorter at higher relative humidity.

5.4 Preparation of Parts

5.4.1 Prepare F19 primed surfaces as follows:

Step 1. If the surface has been heat cured or cured at room temperature for more than 48 hours, scuff the surface using 180 - 220 grit aluminum oxide abrasive paper and dust off scuffed areas with a clean cloth. Then, re-activate the primer according to PPS 31.17.

If the surface has been room temperature cured for 12 - 48 hours, solvent clean according to PPS 31.17.

Step 2. Immediately before priming, tack rag to remove loose particles, dust, etc.

Step 3. Apply a 0.0003" - 0.0005" thick coat of F23 primer according to PPS 34.16.

Step 4. Allow the F23 to air dry for 2 - 24 hours before painting.

Step 5. Immediately before painting, tack rag the surfaces to remove loose particles, dust, etc.

5.4.2 Prepare de-icer boot fringe areas which require the application of F31 enamel as follows:

Step 1. Solvent clean the surface according to PPS 31.17.

Step 2. Scuff the surface using 180 - 220 grit aluminum oxide abrasive paper.

Step 3. Dust off the surface with a clean cloth.

Step 4. Immediately before painting, tack rag the surface to remove loose particles, dust, etc.

5.5 Application of Enamel

5.5.1 Start painting immediately after surface preparation.

5.5.2 Apply the enamel in even coats to achieve a dry film thickness of 0.003" - 0.004". Allow the enamel to air dry for 15 - 20 minutes between coats. The number of coats necessary to achieve this thickness shall be determined by the Paint Shop.

5.6 Curing of Enamel

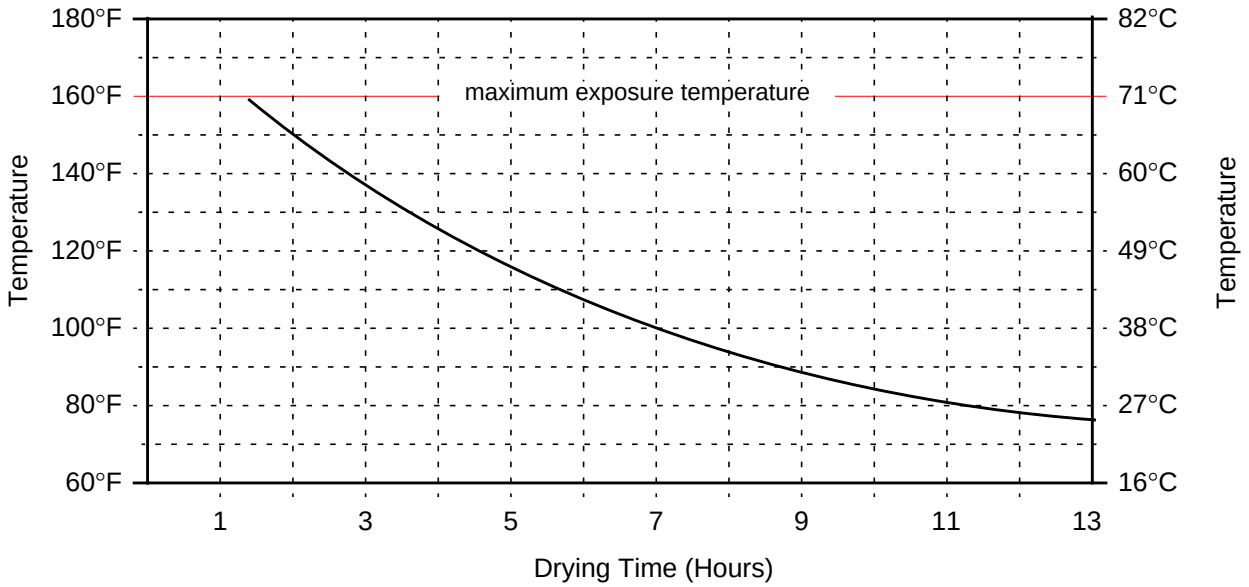
5.6.1 Allow the enamel to cure to handle for 12 hours at 75°F ± 5°F (24°C ± 3°C) **before** measuring the electrical resistance according to section 5.7. This cure to handle time may be accelerated as follows:

Step 1. After applying the final coat of F31 or F34, allow the coated surfaces to cure at room temperature (75°F ± 5°F/24°C ± 3°C) for 30 minutes.

Step 2. Heat cure the parts as specified in Figure 1 (maximum temperature: 160°F (71°C)).

Step 3. Allow the parts to cool to room temperature before measuring the electrical resistance according to section 5.7 and, if applicable, protective wrap according to section 5.10 before handling or transporting.

5.6.1.1 **After** electrical resistance measurement, allow the enamel to cure according to Table 2.



Note 1: Drying times are for coating thickness of 0.003" - 0.004". Thicker or thinner coats will require proportionally longer or shorter cure to handle times.

Note 2. Accelerated cure ovens or areas (conventional or infrared (IR)) must be qualified according to BAPS 138-055 (including temperature uniformity survey according to BAERD GEN-007).

Figure 1 - Accelerated Cure to Handle Schedule for F31 and F34 Enamel

Table 2 - Cure Schedule for F31 and F34 Polyurethane Enamels

Applicability	Minimum Cure Time
Measuring electrical resistance or otherwise handling	12 hours at 70°F - 80°F (21°C - 27°C) or according to Figure 1
Shipping or transporting (provided electrical resistance is acceptable and parts are wrapped according to section 5.10).	
Exposure to weather	24 hours at 70°F - 80°F (21°C - 27°C)
Exposure to oil, fuel, or hydraulic fluid	7 days at 70°F - 80°F (21°C - 27°C)
Full cure	

5.7 Measuring Electrical Resistance

5.7.1 After cure to handle according to section 5.6, measure the electrical resistance of the F31 or F34 coating according to PPS 9.06.

5.8 Clean-Up

5.8.1 Clean equipment promptly to avoid a build-up of dry paint on or in the equipment. Use the solvent specified in PPS 31.17 to clean brushes, spray guns, etc.

5.8.2 Dispose of excess mixed F31 or F34 (e.g., according to EHS-OP-005).

5.8.3 Dispose of empty cans or containers, rags, wipers or paper contaminated with raw catalyst or mixed F31 or F34 (e.g., according to EHS-OP-005).

5.8.4 If mixed F31, F34, or raw catalyst is spilled, clean it up (e.g., according to EHS-OP-005).

5.9 Rework of Damaged or Defective Coatings

5.9.1 After allowing the coating to cure for at least 24 hours, remove dried overspray by solvent cleaning according to PPS 31.17 or by polishing with Met-All polishing compound.

5.9.2 Use a brush to touch up small pits and scratches. Repair other minor defects as follows:

Step 1. Locally strip coatings with other minor defects by abrading with 180 grit abrasive paper. Do not expose the raw fibres of the part.

Step 2. Feather edge the old finish adjacent to the stripped area by sanding with 220 grit abrasive paper.

Step 3. Wipe the abraded area with a tack rag.

Step 4. If the base material has been exposed, spot in the pre-treatment coating, lapping slightly over the old finish.

Step 5. Repaint the area according to the procedures specified in this standard.

5.9.3 Completely strip coatings with major defects by abrading with 180 grit abrasive paper. Repaint the parts according to the original processing sequence of this standard.

5.9.4 Rework coatings which fail the electrical resistance test as follows:

Step 1. Hand abrade the entire F31 or F34 coated surface using 220 grit aluminum oxide abrasive paper. Do not sand through the coating.

Step 2. Dust off the abraded surface with a clean cloth.

Step 3. Solvent clean the surface according to PPS 31.17.

Step 4. Immediately before re-applying F31 or F34, tack rag the surface to remove loose particles.

Step 5. Apply F31 or F34 to the abraded surface to a maximum dry film thickness of 0.004".

Step 6. After re-coating, measure the electrical resistance as specified in section 5.7.

5.10 Protection for Transport or Storage

5.10.1 Wrap painted parts to be transported or stored individually in protective wrapping material (see Materials section, para. 4.1.8) and place them in cardboard boxes, if possible, to provide protection against damage.

6 Requirements

6.1 Ensure painted surfaces are free from damage (such as scratches), defects (such as blemishes, runs, sags, pits, streaks, excessive orange peel, dried overspray, blisters, peeling, solvent popping, etc.) and other irregularities that impair appearance or protective qualities. Damaged or defective coatings must be reworked according to section 5.9.

6.2 The dry film thickness of the enamel must be 0.003" - 0.004". Measure paint thickness using a micrometer at locations where the thickness of the bare part has been measured and recorded. If the thickness cannot be measured with a micrometer, spray a test panel using the same procedure as that for production parts and measure the paint thickness of the test panel. Coatings too thin or too thick are not acceptable and must be reworked as specified in section 5.9.

6.2.1 In small repair areas touched up by brush application, it is acceptable to vary from the dry film thickness limitations provided that complete coverage is visually verified. Take care to avoid application of an excessively thick or thin coating beyond the dry film thickness limitations specified.

6.3 F31 and F34 coatings must meet the electrical resistance requirements specified in PPS 9.06. Rework coatings failing the electrical resistance test according to section 5.9.

7 Safety Precautions

7.1 The safety precautions specified herein are specific to Bombardier Toronto (de Havilland) to meet Canadian Federal and Provincial government environmental, health and safety regulations. It is recommended that other facilities consider these safety precautions; however, suppliers, subcontractors and partners are responsible for ensuring that their own environmental, health and safety precautions satisfy the appropriate local government regulations.

7.2 Observe general shop safety precautions when performing the procedure specified herein.

7.3 Do not smoke or eat in paint spraying areas.

7.4 Wear protective respiratory equipment as specified in PPS 13.13.

7.5 Ensure that spray booths and spray rooms are equipped with a suitable exhaust system.

7.6 No open flames or naked lights are allowed where painting operations are carried out. The use of infra-red or other heat lamps in the paint shop is prohibited.

7.7 In the event of spillage of raw catalyst, mixed F31 or F34, clear the immediate area of all personnel and clean up the spill (e.g., according to EHS-OP-005).

7.8 Wear protective coveralls, rubber gloves and splash goggles at all times when handling mixed F31, F34 or their components. Avoid skin contact with mixed F31, F34 or their components; if contact occurs, wash thoroughly with soap and water. Should accidental eye contact occur, flush eyes immediately with large quantities of water at an eye wash station and report to the Health Centre.

8 Personnel Requirements

8.1 Personnel responsible for the spray application of F31 and F34 carbon filled polyurethane enamels must have a good working knowledge of the procedure and requirements as specified herein and shall have exhibited their competency to their supervisor.

9 Storage

9.1 Store F31 and F34 enamel in a dry area at a temperature of 40°F - 100°F (4°C - 38°C). For optimum storage life (as specified in PPS 13.28), a temperature of 60°F - 80°F (16°C - 27°C) is recommended. Store base and catalyst components according to PPS 13.28 with the precautions necessary for flammable materials.