BOMBARDIER
Toronto (de Havilland)
PROPRIETARY INFORMATION

PPS 34.18

PRODUCTION PROCESS STANDARD

Application of Polyurethane Anti-Static Erosion Resistant Coatings (F36 and F40)

Issue 11 - This standard supersedes PPS 34.18, Issue 10.
- Vertical lines in the left hand margin indicate technical changes over the previous issue.
- This PPS is effective as of the distribution date.

Signed original on file. Validation of paper prints is the responsibility of the user.

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1 Scope

1.1 This Production Process Standard (PPS) specifies the procedure and requirements for the spray application of polyurethane anti-static erosion resistant coatings (finish codes F36 and F40).

1.1.1 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.

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

1.1.3 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 EHS-OP-005 - Hazardous Materials Management - *Bombardier Toronto (de Havilland) internal Environment, Health and Safety operating procedure*.

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 17.02 - Abrasive Blasting.

3.2.6 PPS 31.07 - Cleaning and Stripping of Painted Surfaces.

3.2.7 PPS 31.17 - Solvent Cleaning.

3.2.8 PPS 34.03 - Application of Polyurethane Enamel.

3.2.9 PPS 34.08 - Application of Epoxy-Polyamide Primer (F19).

3.2.10 PPS 34.11 - Priming and Painting of DASH 8 Aircraft Exterior Surfaces

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

3.2.12 PPS 34.34 - Surface Finishing Compounds (F33).

3.3 Bombardier Aerospace Specifications

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

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

3.3.3 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 B-274 polyurethane coating components: B-274 vehicle, curing agent and accelerator (CAAP Co., Inc.).

4.1.3 AS-P108 anti-static polyurethane coating components: AS-P108 vehicle and catalyst (CAAP Co., Inc.).

4.1.4 CAAPCOAT polyurethane thinner, CAAP Co. Inc.

4.1.5 Lint free cheesecloth or filter mesh.

4.1.6 Wipers (e.g., DSC 378-2).

4.1.7 Tack rags (e.g., DSC 375-1).

4.1.8 Abrasives,180 - 220 grit aluminum oxide abrasive paper.

4.1.9 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 Viscometer, “Gardco EZ cup” Zahn #2 cup; do not use other brands of Zahn cups.

4.2.2 Sling psychrometer or hygrometer (hair type).

4.2.3 Protective rubber gloves (e.g., neoprene rubber to DSC 422-5).

4.2.4 Mechanical paint shaker, capable of agitation of AS-P108 and B-274 polyurethane vehicle components to ensure uniform distribution of solids without adversely affecting the polyurethane vehicle component.

4.2.5 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.

4.2.6 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 F36 is an anti-static erosion resistant protective coating which is applied to the aircraft underbelly before the application of the F24 polyurethane enamel exterior topcoat.

5.1.2 F40 is an anti-static erosion resistant coating for use on radome surfaces, non-radome surfaces requiring rain erosion resistance and anti-static properties or non-radome surfaces requiring rain erosion protection only.

5.1.3 As detailed in section 5.6 and section 5.7, both F36 and F40 coatings are made up by application of a thickness of B-274 polyurethane followed by a thickness of AS-P108 anti-static polyurethane; the difference between the F36 and F40 coatings is the thickness of the B-274 polyurethane coating portion of the overall coating.

5.1.4 B-274 polyurethane vehicle and AS-P108 anti-static polyurethane vehicle contain isocyanate. Personnel working with these materials must be familiar with the safety precautions listed in section 7 before handling or using such material.

5.2 Paint Shop Conditions

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

5.2.2 Ensure adequate lighting is provided.

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

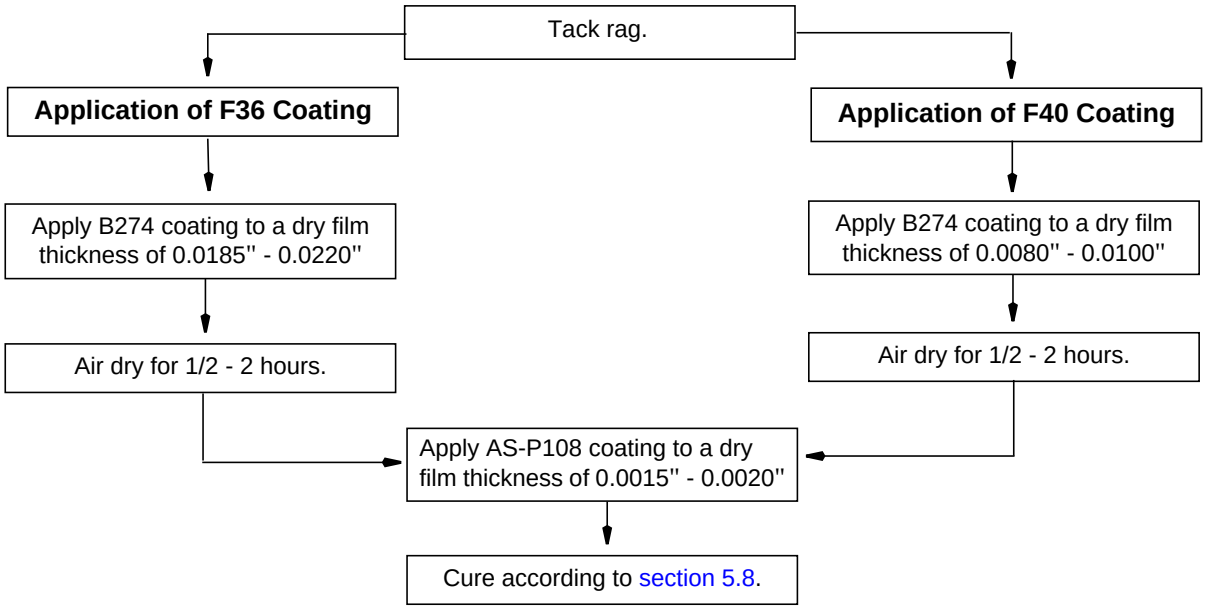
5.2.4 Do not paint parts or assemblies if the temperature is less than 60°F (16°C) or the relative humidity less than 30% or greater than 80% in the paint application area. Use calibrated indicators to monitor and record temperature and humidity conditions.

5.3 Preparation of Parts (See Flow Chart 1)

5.3.1 Unless otherwise specified by the engineering drawing, F36 and F40 anti-static erosion resistant coating must be applied to F23 primed surfaces only. Apply F23 primer according to PPS 34.16.

5.3.2 Use a tack cloth to remove loose particles (i.e., dust, etc.) from the F23 primed surface immediately before applying F36 or F40 anti-static erosion resistant coating.

Flow Chart 1 - Surface Preparation and Application of F36 and F40



5.4 Preparation of B-274 Polyurethane Coating (See Table I)

5.4.1 Use only B-274 polyurethane vehicle, curing agent and accelerator within their storage lives (as marked on the containers). Submit B-274 polyurethane vehicle, curing agent or accelerator that have exceeded their storage lives for shelf life extension testing according to PPS 13.28. Dispose of B-274 polyurethane vehicle, curing agent or accelerator showing signs of skinning, gelling, lumping, pigment separation or any other deterioration (e.g., according to EHS-OP-005).

5.4.2 Prepare B-274 polyurethane coating according to the manufacturers instructions, or as follows:

Step 1. Agitate B-274 polyurethane vehicle component on a mechanical paint shaker (ref. para. 4.2.4) for a minimum of one minute.

Step 2. Hand mix the curing agent with the B-274 polyurethane vehicle in the ratio specified in Table 1.

Step 3. Hand mix the accelerator with the B-274 polyurethane vehicle/curing agent in the ratio specified in Table 1.

Step 4. Strain the activated B-274 polyurethane vehicle mixture through a fine, clean, lint free cheesecloth or filter mesh.

Step 5. For spray application, reduce to the spraying viscosity specified by the manufacturer using the thinner specified in Table 1. Do not reduce coating 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 B-274 Erosion Resistant Polyurethane Coating

COMPONENTS	MIXING RATIO	POT LIFE
B-274 Polyurethane Vehicle (Base)	1 gallon	4 hours
B-274 Curing Agent (Note 1)	8 ounces	
B-274 Accelerator	8 ounces	
CAAPCOAT Polyurethane Thinner	As required to obtain correct viscosity	
Note 1. Do not use AS-P108 catalyst with B-274 polyurethane vehicle.		

5.5 Preparation of AS-P108 Anti-Static Coating (See Table 2)

5.5.1 Use only AS-P108 polyurethane vehicle and catalyst within their storage lives (as marked on the containers). Submit storage life expired AS-P108 polyurethane vehicle or catalyst shall be actioned for shelf life extension testing according to PPS 13.28. Dispose of AS-P108 polyurethane vehicle or catalyst showing signs of skinning, gelling, lumping, pigment separation or any other deterioration (e.g., according to EHS-OP-005).

5.5.2 Prepare AS-P108 anti-static coating according to the manufacturers instructions, or as follows:

Step 1. Agitate the AS-P108 polyurethane vehicle component on a mechanical paint shaker (ref. para. 4.2.4) for a minimum of one minute.

Step 2. Hand mix the AS-P108 polyurethane vehicle with the catalyst in the ratio specified in Table 2.

Step 3. Strain the AS-P108 polyurethane vehicle/catalyst mixture through a fine, clean, lint free cheesecloth or filter mesh.

Step 4. For spray application, reduce to the spraying viscosity specified by the manufacturer using the thinner specified in Table 2. Do not reduce coating 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 2 - Preparation of AS-P108 Anti-Static Coating

COMPONENTS	MIXING RATIO	POT LIFE
AS-P108 Anti-Static Polyurethane Vehicle	1 quart	3 hours
AS-P108 Catalyst (Note 1)	1 ounce	
CAAPCOAT Polyurethane Thinner	As required to obtain correct viscosity	
Note 1. Do not use B-274 curing agent with AS-P108 anti-static polyurethane vehicle		

5.6 Application of F36 Coating

5.6.1 Apply F36 coating as follows:

Step 1. Apply B-274 polyurethane coating in several wet coats to a dry film thickness of 0.0185" - 0.022". Allow 15 minutes to 1 hour air dry between coats. Do not allow the application of B-274 coating to be interrupted for long intervals since spraying over cured urethane can result in intercoat adhesion failure. Measure the dry film thickness of the B-274 polyurethane coating on a test panel, sprayed using the same procedure as that used for production parts.

Step 2. Allow the final coat of B-274 polyurethane coating to cure for 1/2 - 2 hours. Failure to allow at least 1/2 hour before top coating with AS-P108 can result in wrinkling of the coating upon curing.

Step 3. Apply AS-P108 anti-static coating as **one** final cross coat to a dry film thickness of 0.0015" - 0.002" for a total dry film thickness of the F36 coating of 0.020" - 0.024".

5.7 Application of Anti-Static Erosion Resistant (F40) Coating

5.7.1 Apply F40 coating as follows:

Step 1. Apply B-274 polyurethane coating in several wet coats to a dry film thickness of 0.008" - 0.010". Allow 15 minutes to 1 hour air dry between coats. Do not allow the application of B-274 polyurethane coating to be interrupted for long intervals since spraying over cured urethane can result in intercoat adhesion failure. Measure the dry film thickness of the B-274 polyurethane coating on a test panel, sprayed using the same procedure as that used for production parts.

Step 2. Allow the final coat of B-274 polyurethane coating to cure for 1/2 - 2 hours. Failure to allow at least 1/2 hour before top coating with AS-P108 can result in wrinkling of the coating upon curing.

Step 3. Apply AS-P108 anti-static coating as **one** final cross coat to a dry film thickness of 0.0015" - 0.002" for a total dry film thickness of the F40 coating of 0.0095" - 0.0120".

5.8 Curing of Coating

5.8.1 If the F36 or F40 coating is to be topcoated with F24, allow the final coating of AS-P108 to dry for 3 - 24 hours at 60°F - 90°F (16°C - 32°C) before topcoating.

5.8.2 If the F36 or F40 coating is not to be topcoated, allow the final coating of AS-P108 to cure for 48 - 72 hours at 60°F - 90°F (16°C - 32°C) before handling, working or installing the coated parts or assemblies. Alternatively, curing may be accelerated after an initial 24 hour 60°F - 90°F (16°C - 32°C) cure by heating to a minimum of 150°F (66°C) for 3 hours. Ovens or areas (conventional or infrared (IR)) used for accelerated cure must be qualified according to BAPS 138-055 (including temperature uniformity survey according to BAERD GEN-007).

5.9 Rework of Damaged or Defective F36 or F40 Coatings

5.9.1 Remove dried overspray by solvent cleaning according to PPS 31.17 after allowing the coating to cure for at least 24 hours.

5.9.2 Touch up small pits and scratches by brush. Rework coatings with other minor defects as follows:

Step 1. Locally strip the damaged or defective coating using chemical stripper according to PPS 31.07 or by abrasive blasting according to PPS 17.02.

Step 2. Feather edge the old finish adjacent to the stripped area by sanding with abrasive paper and wipe with a tack rag.

Step 3. Spot in the applicable pre-treatment coating where the base material (metal or composite) has been exposed, lapping slightly over the old finish.

Step 4. Re-coat the area according to the procedure specified herein.

5.9.3 Process coatings with major defects as follows:

Step 1. On metal surfaces, strip the coating completely using chemical stripper according to PPS 31.07 or by abrasive blasting according to PPS 17.02. On fibre-reinforced composites, abrade coatings with abrasive paper, as required, to remove defects.

Step 2. Re-process parts according to the original coating sequence.

5.10 Clean-up

5.10.1 Clean equipment promptly to avoid dried coating on or in the equipment.

5.10.2 Remove uncured polyurethane coating from tools and other areas by solvent cleaning according to PPS 31.17.

5.10.3 Dispose of excess mixed F36 and activated AS-P108 polyurethane vehicle (e.g., according to EHS-OP-005).

5.10.4 Dispose of empty cans or containers, rags, wipers or paper contaminated with mixed F36, activated AS-P108 polyurethane vehicle, AS-P108 polyurethane vehicle or B-274 polyurethane vehicle (e.g., according to EHS-OP-005).

6 Requirements

6.1 Visual Examination

6.1.1 Examine coated surfaces for damage such as scratches, defects (blemishes, runs, sags, pits, streaks, excessive orange peel, dried overspray, blisters, peeling), or other irregularities that impair appearance or protective qualities. Damaged or defective coatings must be reworked according to section 5.9.

6.2 Coating Thickness

6.2.1 Except as noted in para. 6.2.3, the total dry film thickness of F36 coating must be 0.020" - 0.024". When using a micrometer on previously primed parts, check the thickness at locations where the underlying primer has been previously measured and recorded. When using a micrometer on previously unprimed surfaces of fibre-reinforced composites, measure the thickness at locations where the material thickness has been previously recorded. If the thickness cannot be measured with a micrometer, measure dry film thickness on a test panel sprayed using the same procedure as that used for production parts. Coatings which fail to meet the film thickness requirements are not acceptable and must be reworked according to section 5.9.

6.2.2 The total dry film thickness of F40 coating must be 0.0095" - 0.0120". Check the thickness at locations where the total material thickness, including the primer, has been previously measured and recorded. If thickness cannot be measured with a micrometer, measure the dry film thickness on a test panel sprayed using the same procedure as that used for production parts. Coatings which fail to meet the film thickness requirements are not acceptable and must be reworked according to section 5.9.

6.2.3 In small repair areas touched up by brush according to section 5.9, 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.

7 Safety Precautions

7.1 The safety precautions specified herein are specific to Bombardier Toronto 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 Smoking or eating is prohibited in paint spraying areas.

7.4 When preparing or applying B-274 or AS-P108 polyurethane coating, wear protective respiratory equipment according to PPS 13.13.

7.5 Keep all containers closed when not in use.

7.6 Spray booths and spray rooms shall be equipped with a suitable exhaust system.

7.7 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.

7.8 In the event of spillage of mixed F36, activated AS-P108 polyurethane vehicle, AS-P108 polyurethane vehicle or B-274 polyurethane vehicle, clear the immediate area of all personnel and clean the spill (e.g., according to EHS-OP-005).

7.9 Wear protective coveralls, rubber gloves and splash goggles at all times when handling mixed F36, F40 or their components. Avoid skin contact with mixed F36, F40 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 polyurethane anti-static erosion resistant coatings 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 F36 and F40 components in a dry area at a temperature of 40°F - 100°F (4°C - 38°C). For optimum storage life, a temperature of 60°F - 80°F (16°C - 27°C) is recommended. Refer to PPS 13.28 for the storage life of B-274 and AS-P108 components.

9.2 Store F36 and F40 components with the precautions necessary for flammable materials.