BOMBARDIER Toronto (de Havilland) **Proprietary Information**	**PPS 34.19** **Production Process Standard (PPS)**

Application of F41 Anti-Static Coating

Issue 17

- This standard supersedes PPS 34.19, Issue 16.
- 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 17 - 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 application of F41 anti-static epoxy coating to the exterior surfaces of composite components, details or assemblies.

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.

1.1.4 If the engineering drawing specifies application of F43 anti-static epoxy coating (BMS 10-21 Type II) according to this PPS, refer to Liaison Engineering for disposition.

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 9.06 - Electrical Bonding and Grounding of Aircraft Structures.

3.2.3 PPS 13.13 - Personal Protective Respiratory Equipment.

3.2.4 PPS 13.26 - General Subcontractor Provisions.

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

3.2.6 PPS 13.39 - Bombardier Toronto Engineering Process Manual.

3.2.7 PPS 31.17 - Solvent Usage.

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

3.3 Bombardier Aerospace Specifications

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

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

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

4 Materials, Equipment & Facilities

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 F41 anti-static epoxy coating:

- PPG Aerospace PRC-DeSoto Inc. 528X310 (Base) / 910X464 (Hardener) to BAMS 565-012 Type III or BMS 10-21, Type III.
- Akzo Nobel Aerospace Coatings 10P2-3 (Base) / EC-110 (Activator) to BAMS 565-012 Type III or BMS 10-21, Type III.

4.1.2.1 BMS 10-21 Type I anti-static epoxy coating has been replaced by BMS 10-21 Type III anti-static epoxy coating. Therefore, if the engineering drawing specifies the use of F41 anti-static epoxy coating to BMS 10-21 Type I, use F41 anti-static epoxy coating to BMS 10-21, Type III.

4.1.3 F19 primer to DHMS C4.01, Type 3 (white), epoxy polyamide, fluid-resistant.

4.1.4 Lint free cheesecloth or filter mesh.

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

4.1.6 Tack cloth (e.g., DSC 375-1).

4.1.7 Aluminum oxide abrasive paper, 180 - 220 grit. Abrasive pads (e.g., 3M Canada Ltd. Type A Fine maroon Scotch-Brite pads) may be used in place of abrasive paper.

4.1.8 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 Paint spray rooms equipped with forced or induced ventilation systems capable of maintaining sufficient ventilation to meet Occupational Health and Safety Act requirements. The air flow must not cause air turbulence or excessive air currents but be adequate to prevent dried overspray from settling on primed surfaces that are still tacky. Adequate lighting must be provided, including in under-surface areas. Spray rooms must be equipped with calibrated temperature and humidity indicators. Wash platforms and floors as frequently as required to avoid build-up of dust and loose overspray.

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

4.2.3 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.

4.2.4 Rubber gloves (e.g., DSC 422-5).

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

4.2.6 Masking paper, non-adhesive (e.g., 3M #06539, 3M #06736 “Scotchblok” or Kraft paper).

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

4.2.8 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.

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

4.3 Facilities

4.3.1 This PPS has been categorized as a “Controlled Special Process” according to PPS 13.39 and as such only facilities specifically approved according to PPS 13.39 are authorized to perform application of F41 anti-static epoxy coating according to this PPS.

4.3.2 Bombardier subcontractors must direct requests for approval to Bombardier Aerospace Supplier Quality Management. Bombardier Aerospace facilities must direct requests for approval to the appropriate internal Quality Manager.

4.3.3 Facility approval shall be based on a facility report, a facility survey and completion of a qualification test program, if required. The facility report must detail the materials and equipment to be used, the process sequence to be followed and the laboratory facilities used to show compliance with the requirements of this PPS. Any deviation from the procedure or requirements of this PPS must be detailed in the facility report. Based upon the facility report, Bombardier Toronto (de Havilland) Materials Technology may identify additional qualification and/or process control test requirements. During the facility survey, the facility requesting qualification must be prepared to demonstrate their capability. Once approved, no changes to subcontractor facilities may be made without prior written approval from Bombardier Aerospace Supplier Quality Management.

4.3.3.1 Unless otherwise specified by Bombardier Aerospace Supplier Quality Management, for approval of subcontractor facilities to perform application of F41 anti-static epoxy coating according to this PPS, completion of a test program and submission of suitable test samples representative of production parts is required. Test samples must meet the requirements specified in section 6.

5 Procedure

5.1 General

5.1.1 F41 is a carbon filled anti-static epoxy coating which is applied to the exterior surfaces of composite components to provide a conductive path for dissipating static build-up that occurs during flight. Refer to Flow Chart 1 for the surface preparation and F41 application sequence.

5.1.2 F41 coating is grounded to the aluminum substructure through a combination of stainless steel dimpled washers and aluminum fasteners as illustrated in Figure 1. Do not allow F41 to come into contact with aluminum fasteners or the aluminum substructure, as this will result in severe corrosion of the aluminum. Carbon-filled coatings and aluminum are incompatible when exposed to moisture.

5.1.3 Do not apply F41 coating if the temperature is less than 60°F (16°C) or the relative humidity is greater than 80%. Use calibrated indicators to monitor and record temperature and humidity conditions.

5.1.4 Always wear slip-on shoe coverings to avoid carry-over of dust from the spray room floor and to avoid damage to the aircraft surfaces.

5.1.5 If masking is required, it is acceptable to use masking paper (ref. para. 4.2.6) and/or masking tape (ref. para. 4.2.7), as necessary.

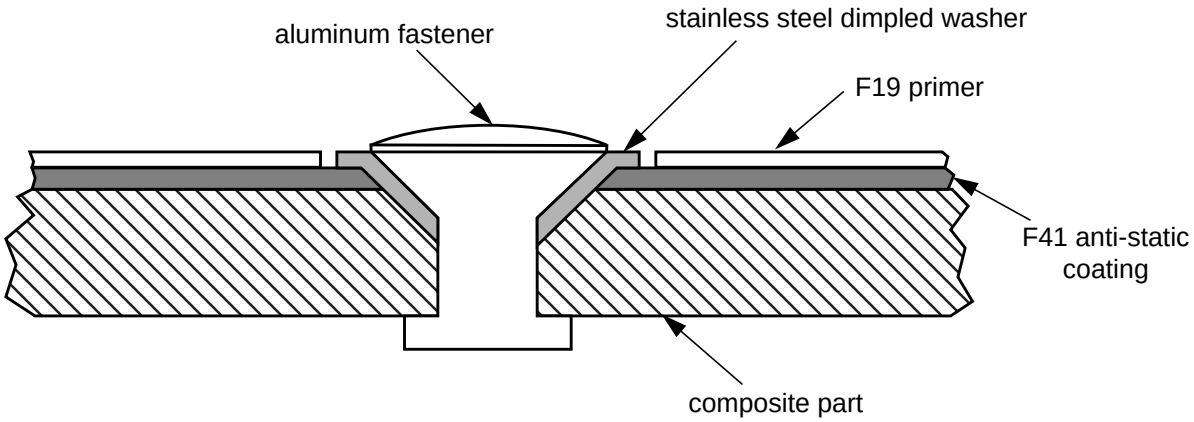

Figure 1 - Installation of Fastener and Stainless Steel Dimpled Washer

5.2 Preparation of Composite Surfaces

5.2.1 Sometimes, F19 is applied to parts in the process of detecting and filling pin holes. If this is the case and the F19 primer has either been heat cured or been room temperature cured for more than 48 hours, prepare the parts as follows before applying F41:

Step 1. Scuff the surface with 180 - 220 grit abrasive paper to assist paint adhesion.

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

Step 3. Re-activate the primer according to PPS 31.17.

5.2.2 Solvent clean the following surfaces according to PPS 31.17 before applying F41:

- Unprimed surfaces.
- Surfaces to which F19 has been applied during the process of detecting and filling pin holes on which the F19 has not been heat cured and has not room temperature cured for more than 48 hours.
- F33 finished parts on which the F33 finish has not been overcoated with F19.

5.2.3 After cleaning the surface, mask composite surfaces that are not to have F41 applied. Ensure that areas which will be in contact with the aluminum substructure are protected (i.e., the area around rivet holes on the back side of the composite part, edges, etc.). Use aluminum foil tape and solvent resistant paper or foil sheet to mask areas which are sensitive to cleaning solvents. Use masking tape and paper to mask areas which are not sensitive to cleaning solvents.

5.3 Preparation of F41 Anti-Static Coating

5.3.1 Submit expired base or catalyst for shelf life extension testing and disposition according to PPS 13.28.

5.3.2 Base or catalyst components which show signs of skinning, gelling, lumping, or any other deterioration are not acceptable. Dispose of unacceptable base or catalyst components (e.g., according to EHS-OP-005).

5.3.3 Prepare F41 anti-static coating according to the manufacturers instructions, or as follows:

Step 1. Agitate the base component on a mechanical paint shaker (ref. para. 4.2.5) for a minimum of 15 minutes and then examine it. If caked or lumpy material exists on the bottom of the container, stir to disperse the settled materials and agitate the container on the mechanical shaker for an additional 5 minutes. If the caked or lumpy material cannot be dispersed, dispose of the base component (e.g., according to EHS-OP-005).

Step 2. Hand mix the base and catalyst to the ratio specified in Table 1.

Step 3. Strain the mixture through a clean, lint free cheesecloth or filter mesh.

Step 4. Allow the mixture to stand for the reaction time specified in Table 1.

Step 5. For spray application, reduce the mixture to the spraying viscosity specified by the manufacturer using the reducer specified in Table 1 (as applicable). 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 F41 Anti-Static Coating

Manufacturer	Components	Mixing ratio (by volume)	Reaction Time (Note 1)	Reducing Ratio (by volume)	Pot Life of Mixture
PPG Aerospace PRC-DeSoto Inc.	528X310 (Base)	1	10 minutes	---	8 hours
	910X464 (Catalyst)	1			
Akzo Nobel Aerospace Coatings	10P2-3 (Base)	3	15 minutes	---	4 hours
	EC-110 (Catalyst)	1			
	TR-14 or TR-19 (Reducer)	---	---	(Note 2)	

Note 1. Allow the base and catalyst to react for the time specified before reducing.
Note 2. Add thinner as required to obtain spraying viscosity.

5.4 Application of F41 Anti-Static Coating

5.4.1 Apply prepared F41 anti-static coating as follows:

Step 1. Immediately before applying F41 anti-static coating, tack rag the surface to remove loose particles, dust, etc.

Step 2. Apply F41 to a dry film thickness of 0.0005" - 0.0010". If F41 is being applied to the external surface of a composite part, a light overspray of F41 on the unmasked internal surfaces of the part is acceptable.

5.5 Curing of F41 Anti-Static Coating Before Measuring Electrical Resistance

5.5.1 Before measuring the electrical resistance as specified in section 5.6, either cure the F41 coating at 75 ± 5°F (24 ± 3°C) for the time specified in Table 2 or use an accelerated cure by allowing the solvents to flash off and then heat curing as specified in Table 3.

Table 2 - Room Temperature Cure Times before Overcoating

F41 Coating	Cure Time Before Overcoat at 75 ± 5°F (24 ± 3°C)
PPG Aerospace PRC-DeSoto Inc. 528X310/910X464	4 - 24 hours
Akzo Nobel Aerospace Coatings 10P2-3/EC-110	4 - 16 hours

Table 3 - Accelerated Cure Times before Overcoating

F41 Coating	Solvent Flash Off at 75 ± 5°F (24 ± 3°C)	Accelerated Cure
PPG Aerospace PRC-DeSoto Inc. 528X310/910X464	30 minutes minimum	2 hours minimum at 140 - 160°F (60 - 71°C)
Akzo Nobel Aerospace Coatings 10P2-3/EC-110	15 - 30 minutes	30 minutes minimum at 140 - 160°F (60 - 71°C)

5.6 Electrical Resistance Measurement

5.6.1 After curing according to section 5.5, measure the electrical resistance of the F41 coating according to PPS 9.06.

5.6.2 Rework coatings which fail the electrical resistance test according to section 5.8.

5.7 Application of F19 Primer on Top of F41 Primer

5.7.1 Apply F19 primer, as specified in PPS 34.08, within 24 hours of the initial application of F41 coating.

5.8 Rework of Damaged or Defective Coatings

5.8.1 Repair coatings which are unacceptable due to excessive electrical resistance as follows:

Step 1. Use 180 - 220 grit abrasive paper to hand abrade the entire surface that is coated with F41. Remove as much F41 as possible without abrading the composite beneath. It is acceptable to leave a film of F41 on the part in order to prevent abrasion of the composite.

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

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

Step 4. Mask composite surfaces that are not to have F41 applied according to para. 5.2.3. Ensure that areas which will be in contact with the aluminum substructure are protected (i.e., the area around rivet holes on the back side of the composite part, edges, etc.).

Step 5. Tack rag the surface to remove loose particles, dust, etc.

Step 6. Apply F41 to the entire scuffed surface so that the total dry film thickness of the F41 coating is less than 0.0010".

Step 7. Cure the F41 coating according to section 5.5.

Step 8. Measure the electrical resistance according to PPS 9.06. Rework coatings which fail the electrical resistance test according to this section.

5.8.2 Use a brush to touch up small pits and scratches with F41.

5.8.3 Remove any F41 from surfaces on composite parts which will be in contact with metallic surfaces (other than dimpled washers) by hand abrading the surface with 180 - 220 grit abrasive paper. Do not damage or expose the fibres of the composite part. Cover residual F41 with a brush coat of F19 primer applied according to PPS 34.08.

5.8.4 Repair other defects in F41 coating as follows:

Step 1. Locally strip the defective coating by hand abrading with 180 - 220 grit abrasive paper.

Step 2. Feather edge the old finish adjacent to the stripped area by sanding.

Step 3. Wipe the surface with a tack rag to remove loose particles, dust, etc.

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

5.9 Clean-up

5.9.1 It is recommended that the solvent specified in PPS 31.17 be used to remove F41 from tools and equipment before the F41 dries.

6 Requirements

6.1 Coated surfaces must be free of damage (such as scratches), defects (such as blemishes, runs, sags, pits, streaks, excessive “orange peel”, dried overspray, blisters or peeling) or other irregularities which impair appearance or protective qualities. Strip and re-coat damaged or parts with defects according to section 5.8. “Orange peel” is a texture effect resembling the skin of an orange; the paint will feel smooth but will appear to have small depressions when viewed at an angle to the light.

6.2 Areas that will be in contact with the aluminum substructure (i.e., around rivet holes on the backside of the composite part, edges, etc.) must be free of F41 coatings. If necessary, strip F41 coatings from these areas according to section 5.8.

6.3 Except as noted in para. 6.3.1, the total dry film thickness of F41 coating must be 0.0005'' - 0.0010''.

6.3.1 In small repair areas touched up by brush according to section 5.8, 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.

6.4 Cured F41 coating must meet the requirements for conductive paint as specified in PPS 9.06. Parts which fail the electrical resistance test are not acceptable and must be re-coated according to section 5.8.

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 Do not smoke or eat in paint spraying areas.

7.4 Wear protective respiratory equipment according to PPS 13.13 when mixing and applying F41 coating.

7.5 Keep all F41 component containers closed when not in use.

7.6 Ensure that spray booths and spray rooms are equipped with a forced or induced ventilation system capable of maintaining sufficient ventilation to meet the requirements of the Occupational Health and Safety Act.

7.7 No open flames or naked lights are allowed where painting or priming operations are carried out. The use of infra-red or other heat lamps in the paint booths (i.e., any area where paint is being applied) is prohibited.

7.8 Wear protective coveralls, rubber gloves and splash goggles when handling mixed F41 components. If skin contact occurs, wash the affected area thoroughly with soap and water. If eye contact occurs, flush eyes immediately with large quantities of water at an eye wash station and report to the Health Centre.

8 Personnel Requirements

8.1 This PPS has been categorized as a “Controlled Special Process” by PPS 13.39. Refer to PPS 13.39 for personnel requirements.

9 Storage of F41 Components

9.1 Store F41 components in a dry area at a temperature of 40 - 100°F (4 - 38°C); for optimum storage life, a temperature of 60 - 80°F (16 - 27°C) is recommended. Store F41 components according to the precautions necessary for flammable materials. Refer to PPS 13.28 for the storage life of F41 base and catalyst components.

Flow Chart 1 - Surface Preparation and Application of F41 Anti-Static Paint