BOMBARDIER
Toronto Site
PROPRIETARY INFORMATION

PPS 34.41

PRODUCTION PROCESS STANDARD

APPLICATION OF EPOXY-POLYAMIDE ENAMEL (F22)

Issue 20
- This standard supersedes PPS 34.41, Issue 19.
- Vertical lines in the left hand margin indicate technical changes over the previous issue.
- Direct PPS 34.41 related questions to michael.wright@aero.bombardier.com.
- This PPS is effective as of the distribution date.

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1 Scope

1.1 This Production Process Standard (PPS) specifies the procedure and requirements for application of F22 epoxy-polyamide enamel.

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 Site), all materials must be approved and assigned Material Safety Data Sheet (MSDS) numbers by the Bombardier (Toronto Site) 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 Site) 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 Site) Specifications

3.2.1 PPS 13.13 - Personal Protective Respiratory Equipment.

3.2.2 PPS 13.26 - General Subcontractor Provisions.

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

3.2.4 PPS 13.39 - Bombardier Toronto Engineering Process Manual.

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 Usage.

3.3 Bombardier (Toronto Site) 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, Equipment and 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 Enamel: epoxy-polyamide, fluid resistant, gloss, semi-gloss or lustreless, pigmented, finish code F22 to DHMS C4.11.

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

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

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

4.1.6 Polishing Compound, Met-All No. 1187, Dars Met-All Industries Inc.

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

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

4.2 Equipment

4.2.1 Spray booths and rooms must be equipped with suitable exhaust systems such that the air flow will 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.

4.2.2 Sling psychrometer or hygrometer (hair type).

4.2.3 Lint free cheesecloth or filter mesh.

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

4.2.5 Electronic coating thickness gauge (e.g., Elcometer).

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

4.2.7 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.

4.2.8 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 F22 epoxy-polyamide enamel 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 Site) 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 F22 epoxy-polyamide enamel according to this PPS completion of a test program and submission of suitable test samples is required. Test samples must meet the visual examination and film thickness requirements specified in section 6.

5 Procedure

5.1 General

5.1.1 F22 enamel is a fluid-resistant topcoat for use on F19 primed surfaces and unprimed fibre-reinforced composite surfaces.

5.1.2 Do not paint when 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.

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

5.2 Preparation of Parts

5.2.1 Prepare F19 primed surfaces as follows if the primer has been heat cured or cured at room temperature for more than 48 hours:

Step 1. Scuff the surface using 180 - 220 grit aluminum oxide abrasive paper. Take care to avoid excessive sanding; **do not** remove the primer from the surface or expose the base metal.

Step 2. Dust off scuffed areas with a clean cloth.

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

Step 4. Immediately before painting, tack rag to remove loose particles (i.e. dust, etc.).

5.2.2 Prepare F19 primed surfaces as follows if the primer has been cured at room temperature for 12 - 48 hours:

Step 1. Solvent clean according to PPS 31.17.

Step 2. Immediately before painting, tack rag to remove loose particles (i.e. dust, etc.).

5.2.3 Prepare F21 primed surfaces as follows:

Step 1. Scuff the surface using aluminum oxide abrasive paper (180 grit for vibrating sanders, 220 grit for hand abrading).

Step 2. Dust off the scuffed areas with a clean cloth.

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

Step 4. Immediately before painting, tack rag to remove loose particles (i.e. dust, etc.).

5.2.4 Prepare unprimed fibre-reinforced composite surfaces as follows:

Step 1. Lightly scuff the surface using 180 - 220 grit aluminum oxide abrasive paper, taking care not to expose or damage the composite fibres.

Step 2. Dust off the scuffed surfaces with a clean cloth.

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

Step 4. If necessary, tack rag immediately before painting.

5.3 Preparation of Enamel

5.3.1 Verify that base and catalyst are within their storage lives (as marked on the containers) before use. Submit base or catalyst that has exceeded its storage life for shelf life extension testing and action according to PPS 13.28.

5.3.2 Enamel base which shows signs of skinning, gelling, lumping, pigment separation or any other deterioration is not acceptable. Catalyst which shows signs of milkiness, precipitation or any other deterioration is not acceptable. Dispose of unacceptable base or catalyst according to EHS-OP-005.

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

Step 1. Agitate the base component on a mechanical paint shaker (ref. para. 4.2.6) for a minimum of 1 minute.

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

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

Step 4. Strain the mix through a clean, lint free cheesecloth or filter mesh.

Step 5. If the enamel is going to be spray applied, reduce to the spraying viscosity specified by the manufacturer using the thinner specified in Table 1. Do not reduce enamel to be used for 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 F22 Epoxy-Polyamide Enamel

Manufacturer	Components	Mixing Ratio (by volume)	Reaction Time (Note 1)	Reducing Ratio (by volume)	Pot Life
Tempo Paint & Varnish Co.	1700 Series Flat Gloss Base	1	15 - 30 minutes	As required to obtain correct viscosity (Note 2)	16 hours
	1700-C-1 Catalyst	1			
	4500-S23 or 4500-S23X Thinner	---	---		
Tempo Paint & Varnish Co.	1800 Series Semi-Gloss Base	1	15 - 30 minutes	As required to obtain correct viscosity (Note 2)	16 hours
	1800-C-1 Catalyst	1			
	4500-S23 or 4500-S23X Thinner	---	---		
Tempo Paint & Varnish Co.	1900 Series Gloss Base	1	15 - 30 minutes	As required to obtain correct viscosity (Note 2)	16 hours
	1900-C-1A or 1900-C-1B Catalyst	1			
	4500-S23 or 4500-S23X Thinner	---	---		
Tristar Coatings Ltd. Starpoxy 410	419H5274 Base	1	15 - 30 minutes	As required to obtain correct viscosity (Note 2)	8 hours
	410C5275 Catalyst	1			
	SB43 Thinner	---	---		

Notes 1. Allow the base and catalyst to react for the time specified before reducing.
2. Do not reduce the base/catalyst mixture when brush applying.

5.4 Application of Enamel

5.4.1 Begin painting immediately after the surface has been prepared.

5.4.2 For spray application, apply a thin, even cover coating of enamel, followed by a full final coating to obtain a dry film thickness of 0.0018 - 0.0025". Allow 15 to 20 minutes air drying time between coats.

5.4.3 Brush apply F22 so that the coating is opaque and none of the surface underneath shows through (i.e., to a dry film thickness 0.0018" - 0.0025").

5.5 Curing of Enamel

5.5.1 Allow enamel to cure according to Table 2.

5.5.2 For curing before shipping or transportation, it is acceptable to use a high temperature cure as follows. 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).:

Step 1. Before heat curing, allow solvent to flash off for a minimum of 15 minutes at a temperature of 70°F - 80°F (21°C - 27°C).

Step 2. Heat cure the parts according to Figure 1.

Step 3. Allow the parts to cool to room temperature.

Step 4. Check the parts to ensure there is no evidence of solvent popping. If there is evidence of solvent popping, submit parts to Bombardier (Toronto Site) MRB or Bombardier (Toronto Site) delegated MRB for disposition.

Table 2 - Cure Schedule for F22 Epoxy-Polyamide Enamel

APPLICABILITY	MINIMUM CURE TIME
Shipping or transporting (provided parts are well wrapped according to section 5.8)	8 hours at room temperature
	Accelerated high temperature cure (see para. 5.5.2)
Overcoating with other paints or colours (i.e. decorative stripes) where taping or masking of the applied coating is required	12 hours at room temperature
Exposure to weather	24 hours at room temperature
Exposure to oil, fuel, or hydraulic fluid	7 days at room temperature
Full cure	
Notes 1. Room temperature is defined as an ambient temperature of 60°F - 80°F (16°C - 27°C). Do not allow the cure temperature to fall below 60°F (16°C) minimum.	

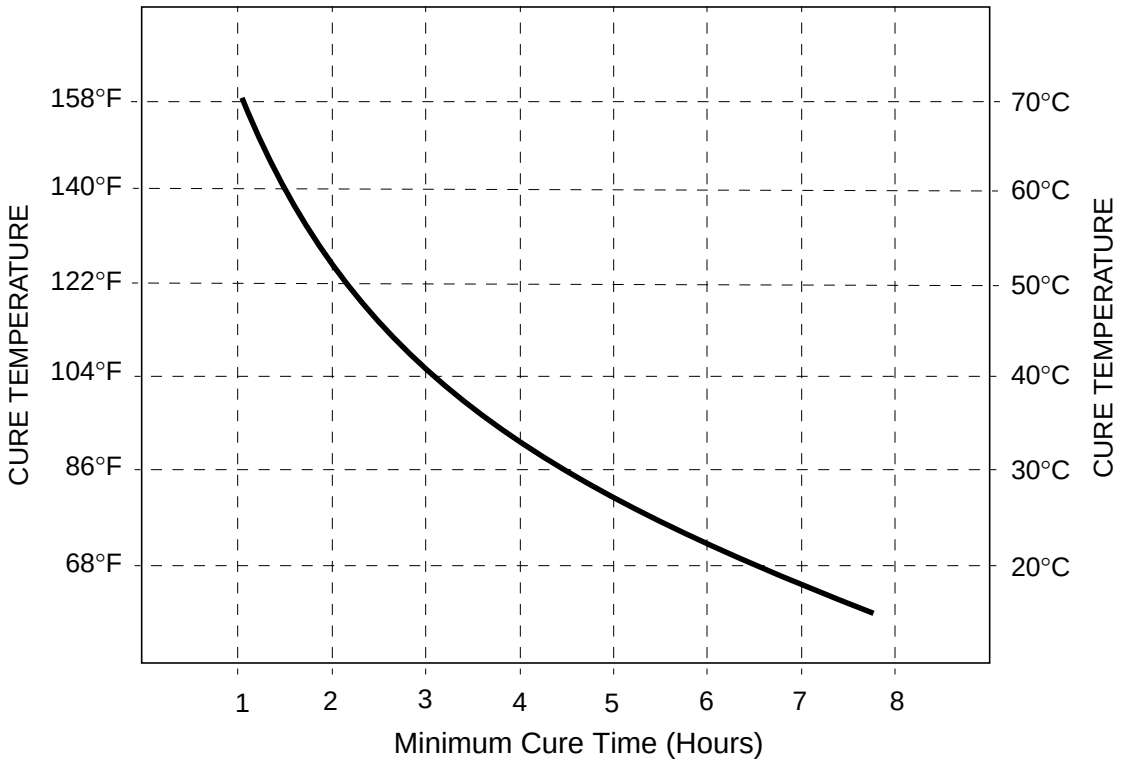

Figure 1 - Cure of F22 Enamel for Shipping or Transport

5.6 Clean Up

5.6.1 Promptly clean equipment with the solvent specified in PPS 31.17 to avoid dried paint on or in the equipment.

5.7 Rework of Damaged or Defective Coatings

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

5.7.2 Touch up small pits, pin holes and scratches by brush. Repair coatings with other minor defects as follows:

Step 1. Locally strip (according to PPS 31.07) or abrade the coating, as required.

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

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

Step 4. Re-apply the applicable pre-treatment coatings where the base material (metal or plastic) has been exposed, lapping slightly over the old finish.

Step 5. Re-paint the area according to the procedures specified in this standard.

5.7.3 On metal surfaces, completely strip coatings with major defects using chemical stripper according to PPS 31.07 or by abrasive blasting according to PPS 17.02. On fibre-reinforced composites, use abrasive paper (180 - 220 grit) to abrade coatings with major defects as required to remove the defects. After removal of the defective coating, reprocess the parts according to the original painting sequence.

5.8 Protection for Transport or Storage

5.8.1 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 to provide protection against damage.

6 Requirements

6.1 Ensure painted surfaces are free of damage (such as scratches), defects (such as blemishes, runs, sags, pits, streaks, excessive orange peel, dried overspray, blisters, peeling, solvent popping, pits, pin holes, etc.) and other irregularities that impair appearance or protective qualities. Rework damaged or defective coatings according to section 5.7.

6.2 The dry film thickness of the F22, as measured with an electronic thickness gauge or micrometer, must be 0.0018" - 0.0025". If using an electronic thickness gauge or micrometer on previously primed parts, check the thickness at locations where the underlying primer has been previously measured and recorded. If 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 electronic coating thickness gauge or micrometer, coat a test panel, using the same procedure as for production parts. Coatings which fail to meet the film thickness requirements are not acceptable.

6.2.1 In small repair areas touched up by brush according to section 5.7, 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 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.

7.4 Do not smoke or eat in paint spraying areas.

7.5 Always wear protective respiratory equipment as specified in PPS 13.13 when applying F22 epoxy-polyamide enamel.

7.6 Do not have open flames or unprotected lights in areas where painting operations are carried out. Do not use infrared or other heat lamps in the paint booths (i.e. in any area where paint is being applied).

7.7 Always wear protective coveralls, rubber gloves and splash goggles when handling F22 or its components. Avoid skin contact with mixed F22 or its components; if contact occurs, wash contact area 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.

7.8 Refer to PPS 31.17 for safety precautions relating to solvents.

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

9.1 Store primer 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. Store base and catalyst components according to PPS 13.28 with the precautions necessary for flammable materials.