BOMBARDIER
Toronto Site
PROPRIETARY INFORMATION

PPS 16.08

PRODUCTION PROCESS STANDARD

APPLICATION OF POLYURETHANE PROTECTIVE COATING (F20)

Issue 8
- This standard supersedes PPS 16.08, Issue 7.
- Vertical lines in the left hand margin indicate changes over the previous issue.
- Direct PPS related questions to PPS.Group@aero.bombardier.com or (416) 375-7641.
- This PPS is effective as of the distribution date.

Prepared By:	(Christie Chung)	February 25, 2013
	PPS Group	
Approved By:	(L.K. John)	February 26, 2013
	Materials Technology	
	(B. DeVreede)	February 27, 2013
	Quality	

TABLE OF CONTENTS

Sections **Page**

Tables

Figures

1 SCOPE

1.1 This Production Process Standard (PPS) specifies the procedure and requirements for the application of polyurethane protective coating (finish code F20) to aircraft walkways, floors, undercarriage legs, etc., where specified on the relevant engineering drawing.

1.1.1 This PPS complements the engineering drawings that specify its use as an authorized instruction. The procedure specified in this PPS shall 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.

1.2 Refer to PPS 16.05 for the application of polyurethane type non-skid coatings.

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

1.2.2 Procedure or requirements specified in a Bombardier BAPS, MPS, LES or P. Spec. do not supersede the procedure or requirements specified in this PPS. Similarly, the procedure and requirements specified in this PPS are not applicable when use of a BAPS, MPS, LES or P. Spec. is specified.

2 HAZARDOUS MATERIALS

2.1 Before receipt at Bombardier Toronto, all materials shall be approved and assigned Material Safety Data Sheet (MSDS) numbers by the Bombardier Toronto 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 Environment, Health and Safety Department.

3 REFERENCES

3.1 EHS-OP-005 - Hazardous Materials Management - *Bombardier Toronto internal operating procedure*.

3.2 PPS 13.13 - Personal Protective Respiratory Equipment.

3.3 PPS 13.26 - General Subcontractor Provisions.

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

3.5 PPS 16.05 - Application of Non-Skid Coatings.

3.6 PPS 31.07 - Cleaning and Stripping of Painted Surfaces.

3.7 PPS 31.17 - Solvent Usage.

3.8 PPS 34.16 - Application of Urethane Compatible Primer (F23).

3.9 QAMTR 018 - Testing Paints and Adhesives.

3.10 QDI-09-02 - Process Control - *Bombardier Toronto internal Quality procedure*.

4 MATERIALS AND EQUIPMENT

4.1 Materials

4.1.1 Enamel, polyurethane protective coating, clear or pigmented, Finish Code F20, to DHMS C4.05.

4.1.2 Abrasive paper, aluminum oxide, 180 - 220 grit size.

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

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 shall 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 shall be provided, including in under-surface areas. Spray rooms shall be equipped with calibrated temperature and humidity indicators.

4.2.2 Film thickness gauge (e.g., elcometer or micrometer).

4.2.3 One of the following viscometers:

- #4 Ford cup.
- “Gardco EZ cup” Zahn #2 cup. Do not use other brands of Zahn cups.

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

5 PROCEDURE

5.1 General

5.1.1 F20 polyurethane is a fluid and weather resistant coating. It is to be used as a protective coating on aircraft walkways, floors, landing gear legs, etc.

5.2 Paint Shop Conditions

5.2.1 Ensure adequate lighting is provided.

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

5.2.3 Do not apply F20 polyurethane if the temperature is less than 60°F or the relative humidity is less than 30% or greater than 80% in the application area. Use the calibrated indicators (e.g., sling psychrometer or hygrometer) to monitor and record temperature and humidity conditions according to QDI-09-02.

5.3 Preparation of F20 Polyurethane Coating

5.3.1 Only use base and catalyst within their storage lives (as marked on the containers). Submit base or catalyst which is beyond it's storage life to a Bombardier approved laboratory or Bombardier Toronto Materials Laboratory for storage life extension testing according to QAMTR 018. Dispose of unacceptable base or catalyst (e.g., according to EHS-OP-005).

5.3.2 Dispose of base component showing signs of skinning, gelling, lumping, pigment separation or any other deterioration (e.g., according to EHS-OP-005).

5.3.3 Dispose of catalyst showing signs of milkiness, precipitation, darkening in colour or other signs of deterioration (e.g., according to EHS-OP-005).

5.3.4 Prepare F20 polyurethane coating as follows:

Step 1. Agitate the base component on a mechanical shaker for a minimum of 1 minute.

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

Step 3. Allow the mixture to stand (reaction time) for 30 minutes minimum. It is imperative that the mixture be allowed to stand for the reaction time specified in order to allow the polyurethane coating to achieve maximum fluid resistance.

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

Step 5. Check the viscosity of the mixture with a #4 Ford or Gardco EZ Cup (#2 Zahn cup). Reduce the mixture to spraying viscosity using thinner if necessary.

TABLE I - PREPARATION OF F20 POLYURETHANE COATING

COLOUR	COMPONENT	MIXING RATIO (By Volume)	VISCOSITY (@ 75 ± 5°F)		POT LIFE (NOTE 2)
			#4 FORD CUP	GARDCO EZ CUP	
Silver Gray	3401 Base	1	14 - 20 seconds	17 - 24 seconds	8 hours
	3401 Catalyst	1			
	4600-S-1 Thinner	Note 1			
Black	3403 Base	1	14 - 20 seconds	17 - 24 seconds	
	3401 Catalyst	1			
	4600-S-1 Thinner	Note 1			
Beige	3405 Base	1	14 - 20 seconds	17 - 24 seconds	
	3401 Catalyst	1			
	4600-S-1 Thinner	Note 1			

Note 1. Allow the base and catalyst components to react for 30 minutes minimum before reducing with thinner. Reduce with thinner as required to obtain correct viscosity.
Note 2. The pot life is the time during which mixed poryurethane coating remains suitable for application at 75 ± 5°F. The time indicated is for a 100 gram mix unless otherwise specified.

5.4 Preparation of Parts

5.4.1 For F19 primed surfaces which have been either heat cured or cured for more than 48 hours, prepare the surface 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 scuffed areas with a clean cloth.

Step 3. Solvent clean according to PPS 31.17.

Step 4. Apply a light coat of F23 primer (0.0003" - 0.0005") according to PPS 34.16.

Step 5. Allow the F23 coating to air dry for 2 to 24 hours.

Step 6. Tack rag to remove loose particles (i.e., dust, etc.) immediately before painting.

5.4.2 For F19 primed surfaces which have been cured for less than 48 hours at room temperature, prepare the surface by solvent cleaning according to PPS 31.17 and then tack rag immediately before painting.

5.4.3 For top-coated (i.e., F2, F4, F26 or F27) surfaces, prepare the surface by solvent cleaning according to PPS 31.17 and then tack rag to remove loose particles (i.e. dust, etc.) immediately before painting.

5.4.4 For wooden surfaces, prepare the surface for coating with F20 polyurethane by lightly sanding with 220 grit abrasive paper and then tack rag to remove loose particles (i.e. dust, etc.) immediately before painting.

5.4.5 For parts (other than wood) which have not been F19 primed or top-coated, prepare the surface for application of F20 polyurethane coating by priming according to PPS 34.08. After priming, prepare the primed surface according to paragraph 5.4.1 or section 5.4.2, as applicable.

5.5 Spray Application of F20 Polyurethane Coatings

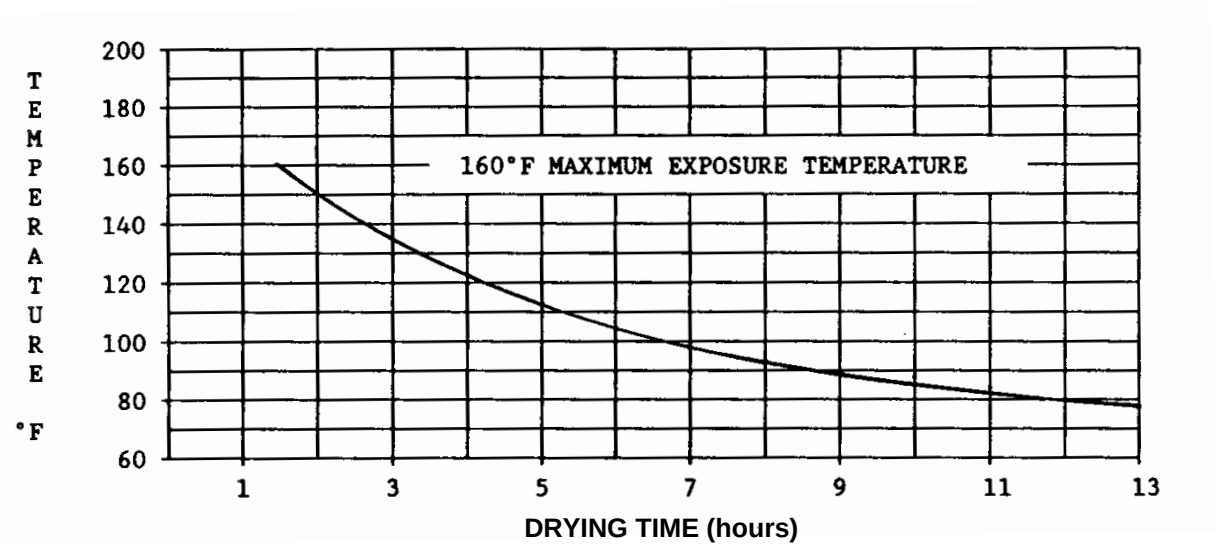
5.5.1 Apply the number of coats specified on the engineering drawing using suitable spraying equipment. For each coat of F20 specified, apply a thin even cover coat followed by a full wet coat to obtain a dry film thickness of 0.0018" - 0.0025".

5.6 Curing

5.6.1 Allow F20 polyurethane coatings to cure according to Table II.

TABLE II - CURE SCHEDULE FOR F20 POLYURETHANE COATING

APPLICABILITY	MINIMUM CURE TIME
Multiple Coats (before application of a second coat)	15 - 20 minutes at 75 ± 5°F (Note 1)
Multiple Coats (before the application of third and subsequent coats)	2 - 4 hours at 75 ± 5°F (Note 1)
Overcoats with other colours or paint (if taping or masking is required)	12 - 16 hours at 75 ± 5°F (Note 1)
Cure to Handle for Storage or Transporting	1. Allow the solvent in coating to flash off at room temperature (75 ± 5°F) for a minimum of 30 minutes. 2. Cure the parts (160°F maximum) according to Figure 1. 3. Allow the parts to cool to room temperature.
Exposure to Moisture, Rain or Temperatures Below 60°F	24 hours at 75 ± 5°F (Note 1)
Exposure to Oil, Fuel or Hydraulic Fluid	7 days at 75 ± 5°F (Note 1)
Full Cure	
Note 1. Longer cure times may be necessary at temperatures below 75 ± 5°F.	



Drying times shown are for coating thickness of 0.020" - 0.025". Thicker or thinner coatings will require proportionally longer or shorter drying times.

FIGURE 1 - CURE TO HANDLE

5.7 Clean-Up

5.7.1 Clean equipment promptly to avoid dried F20 on or in the equipment.

5.7.2 Remove uncured F20 from tools by solvent cleaning according to PPS 31.17.

5.8 Rework of Damaged or Defective Coatings

5.8.1 Touch-up small pits and scratches by brush. Rework minor defects other than small pits or scratches as follows:

Step 1. Locally strip coatings with according to PPS 31.07.

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

Step 3. Wipe clean with a tack rag.

Step 4. Spot in the applicable pre-treatment coatings where the base material has been exposed, lapping slightly over the old finish.

Step 5. Re-paint the area according to the procedure specified herein.

5.8.2 Completely strip coatings with major defects (e.g., unacceptable coating thickness) according to PPS 31.07. After stripping, reprocess the parts according to the original process sequence. If a coating fails to meet the requirements a second time after having been stripped and re-processed once, suspend the process and determine the cause of failure and take corrective actions prior to commencing processing production parts.

5.9 Protection for Transport or Storage

5.9.1 Individually wrap F20 polyurethane coated parts to be transported or stored in protective wrapping material and place in cardboard boxes to provide protection against damage.

6 REQUIREMENTS

6.1 Ensure that painted surfaces are free of damage (such as scratches), defects (such as blushes, runs, sags, pits, streaks, blisters, peeling) or other irregularities that impair appearance or protective qualities. Rework such damage or defects according to paragraph 5.8.1.

6.2 The dry film thickness, as measured with a film thickness gauge or micrometer, shall be 0.0018" - 0.0025". Check dry film thickness at selected locations. When using an electronic thickness gauge on previously primed parts, check thickness at locations where the primer thickness was previously measured and recorded. When using a micrometer on previously primed parts, check thickness at locations where the total material thickness, including the primer, was previously measured and recorded. If thickness measurement on parts is not practical, measure the thickness on a test panel sprayed with the production parts. Coatings that fail to meet the film thickness requirements are not acceptable. Rework unacceptable coatings according to paragraph 5.8.2.

7 SAFETY PRECAUTIONS

7.1 Observe standard plant safety precautions when performing the procedure specified herein.

7.2 Smoking or eating is prohibited in paint spraying areas.

7.3 When applying F20 polyurethane coating wear protective respiratory equipment according to PPS 13.13.

7.4 Refer to PPS 31.17 for the safety precautions for handling and using solvents.

7.5 Open flames or naked lights are not allowed where painting operations are carried out. The use of infra-red or other heat lamps in the paint shop is prohibited.

7.6 Dispose of containers, rags, wipers or paper, contaminated with mixed F20 or raw catalyst, according to EHS-OP-005.

7.7 If mixed F20 or raw catalyst spills, clear the immediate area of all personnel and clean the spill according to EHS-OP-005.

8 PERSONNEL REQUIREMENTS

8.1 Personnel responsible for the application of F20 polyurethane coating shall have a good working knowledge of the applicable procedure and requirements as specified herein and shall have exhibited their competency to their supervisor.

9 ADDITIONAL INFORMATION

9.1 Store F20 polyurethane protective coating with the precautions necessary for flammable materials in a dry area at a temperature of 40°F - 100°F. For optimum storage life a temperature of 60°F - 80°F is recommended.

9.2 Refer to PPS 13.28 for the storage life of F20 catalyst. The catalyst is sensitive to moisture and therefore shall be kept in tightly closed containers.