BOMBARDIER
Toronto (de Havilland)
PROPRIETARY INFORMATION

PPS 34.25

PRODUCTION PROCESS STANDARD

Application of the DHMS C4.30 Primer/Base Coat/Clear Coat Paint System (F47)

Issue 3
- This standard supersedes PPS 34.25, Issue 2.
- Vertical lines in the left hand margin indicate technical changes over the previous issue.
- 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 the DHMS C4.30 primer/base coat/clear coat paint system (Finish Code F47 as per PPS 23.02) to major components and complete DASH 8 aircraft.

1.1.1 This PPS complements the engineering drawings that specify its use as an authorized instruction and the procedure specified 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 PPS 6.05 - Closure of Fluid Lines and Fluid System Components.

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 23.02 - Protective Treatment and Decorative Surface Finish Code System.

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

3.3 Bombardier Aerospace Specifications

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

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 DHMS C4.30 primer/base coat/clear coat paint system.

4.1.3 Masking tape utilizing rubber based adhesive (e.g., 3M #218 or 3M #8428) for masking off areas which are not to be primed or painted.

4.1.4 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 Lint free cheesecloth or filter mesh.

4.2.2 Mechanical paint shaker, capable of agitation of primer, base coat and clear coat base components to ensure uniform distribution of solids without adversely affecting the base components.

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

4.2.4 Sling psychrometer or hygrometer (hair type).

4.2.5 Spray areas 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.

4.2.6 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 Abrasive pads, fine grade (e.g., Scotch-Brite) for reactivating coatings where the maximum drying time has been exceeded.

4.2.8 Film thickness gauge (e.g., Elcometer).

4.2.9 Abrasive paper, 180 - 220 grit aluminum oxide or Scotchbrite pads, for removing and/or blending coating defects.

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 the DHMS C4.30 primer/base coat/clear coat paint system according to this PPS.

4.3.2 This PPS has been identified as a “controlled” specification according to Bombardier Aerospace and as such only facilities specifically approved by Bombardier Aerospace are authorized to perform application of the DHMS C4.30 primer/base coat/clear coat paint system according to this PPS. For the purposes of this PPS, a “controlled” specification is one which requires specific Bombardier Aerospace approval of particular facilities to perform the particular process or procedure specified by that specification.

4.3.3 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.

4.3.4 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.

4.3.4.1 Unless otherwise specified by Bombardier Aerospace Supplier Quality Management, for approval of subcontractor facilities to perform application of the DHMS C4.30 primer/base coat/clear coat paint system 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 The DHMS C4.30 primer/base coat/clear coat paint system (F47) is composed of 3 compatible coatings:

- Primer coat, non-chromate, urethane compatible, corrosion inhibiting
- Base coat, high solids, polyurethane topcoat
- Clear coat, high solids, polyurethane topcoat

5.1.2 Only apply F47 if specified by the engineering drawing.

5.1.3 Refer to Table 1 for the temperature and relative humidity limits in the application area for each of the F47 coatings. Use calibrated indicators to monitor and record temperature and humidity conditions.

5.1.4 Wash all equipment (e.g., cranes, baskets, frames, filters, etc.) frequently to avoid build-up of dust and loose overspray.

Table 1 - Temperature and Relative Humidity Limits in Coating Application Areas

MANUFACTURER	F47 COATINGS	RELATIVE HUMIDITY	TEMPERATURE
Akzo Nobel Aerospace Coatings	Alumigrip 4101 Primer Coat	35 - 75%	60°F - 95°F (16°C - 35°C)
	Aerodur 3001 Base Coat	30 - 95%	
	Aerodur 3002 Clear Coat	40 - 95%	
Mankiewicz	H/S-CF-Primer 113-44	30 - 75%	60°F - 85°F (16°C - 29°C)
	ALEXIT H/S-Basecoat 411-22	30 - 75%	60°F - 95°F (16°C - 35°C)
	ALEXIT HS-Clearcoat 411-14	30 - 75%	

5.2 Preparation, Application & Drying of F47 Primer Coatings

5.2.1 Preparation of Parts for F47 Primer Coat Application

5.2.1.1 Prepare surfaces for F47 primer coat application according to PPS 34.11. Immediately before priming, tack rag all surfaces to remove particles, dust, etc.

5.2.2 Preparation of F47 Primer for Application

5.2.2.1 Only use primer base and catalyst within their storage lives (as marked on the containers).

5.2.2.2 Dispose of primer components showing signs of skinning, gelling, lumping, or pigment separation (e.g., according to EHS-OP-005).

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

5.2.2.4 Prepare the primer according to the manufacturer's instructions, or as follows:

Step 1. Manually stir the base component in its original container to break up any caked solids on the bottom of the container.

Step 2. Agitate the base component in its original container on a mechanical paint shaker (ref. para. 4.2.2) for a minimum of 1 minute. Ensure that the pigment is uniformly dispersed.

Step 3. Hand mix the base and the catalyst or curing solution in the ratio specified in Table 2.

Step 4. Strain the mixture through a clean, lint free cheese cloth or filter mesh.

Step 5. For spray application of Mankiewicz H/S-CF-Primer 113-44, reduce the mixture to spraying viscosity using the specified thinner. Do not reduce primer to be used for touch-up.

Table 2 - Preparation of F47 Primer for Application

MANUFACTURER AND PRIMER	COMPONENTS	MIXING RATIO (BY VOLUME)	REACTION TIME (Note 1)	POT LIFE
Akzo Nobel Aerospace Coatings Alumigrip 4101	4101P001 Base	1	Not Required	4 hours
	4901 (CS4901) Curing Solution	1		
Mankiewicz Seevenax H/S-CF-Primer 113-44	113-44 Base	2	Not Required	4 hours
	135-44 Catalyst	1		
	902-66 Thinner	1		

5.2.3 Application of F47 Primer Coat

5.2.3.1 Stir and/or agitate primer which has been left standing between spraying operations.

5.2.3.2 Spray apply F47 primer in one cross-coat or two wet-on-wet coats (0.0004" - 0.0006" per coat) to obtain a dry film thickness of 0.0006" - 0.0009".

5.2.4 Drying of F47 Primer Coat

5.2.4.1 Allow the primer to dry according to Table 3 before overcoating with base coat. Ensure that the maximum primer drying time is not exceeded before overcoating with base coat.

Table 3 - Drying of F47 Primer Coat

MANUFACTURER	PRIMER	DRY TIME (at 60°F - 85°F (16°C - 29°C))
Akzo Nobel Aerospace Coatings	Alumigrip 4101	2 - 72 hours
Mankiewicz	H/S-CF-Primer 113-44	4 - 72 hours
Note 1. Accelerated high temperature curing is not allowed.		

5.3 Preparation, Application & drying of F47 Base Coat

5.3.1 Preparation of Primed Parts for F47 Base Coat Application

5.3.1.1 Prepare parts to which a properly dried F47 primer coat has been applied as follows:

Step 1. Remove oil grease or other contaminants by solvent cleaning according to PPS 31.17, as required.

Step 2. Mask off areas in the base coat application area which are not to be painted. Cap or plug all tube ends or bores not to be painted according to PPS 6.05; if the cap or plug size required is not available, protect the tube end or bore with masking tape.

Step 3. Immediately before applying F47 base coat, tack rag all surfaces to remove particles, dust, etc.

5.3.1.2 If the maximum primer dry time has been exceeded, the surface must be reactivated as follows before base coat application:

Step 1. Lightly abrade the primer coating with a fine grade abrasive pad.

Step 2. Solvent clean according to PPS 31.17.

5.3.2 Preparation of F47 Base Coat for Application

5.3.2.1 Only use F47 base coat components (i.e., base and catalyst) within their storage lives (as marked on the containers).

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

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

5.3.2.4 Prepare Akzo Nobel Aerospace Coatings Aerodur 3001 base coat according to the manufacturer's instructions, or as follows:

Step 1. Manually stir the base component in its original container to break up any caked solids on the bottom of the container.

Step 2. Agitate the base component in its original container on a mechanical paint shaker (ref. para. 4.2.2) for a minimum of 1 minute. Ensure that the pigment is uniformly dispersed.

Step 3. Hand mix the base and curing solution in the ratio specified in Table 4.

Step 4. Hand mix the base/curing solution mixture) and the activator in the ratio specified in Table 4 and stir until homogeneous.

Step 5. Allow the mixture to react for the reaction (induction) time specified in Table 4.

Step 6. Strain the mixture through a clean, lint free cheese cloth or filter mesh.

5.3.2.5 Prepare Mankiewicz 411-22 base coat as follows:

Step 1. Manually stir the base component in its original container to break up any caked solids on the bottom of the container.

Step 2. Agitate the base component in its original container on a mechanical paint shaker (ref. para. 4.2.2) for a minimum of 1 minute. Ensure that the pigment is uniformly dispersed.

Step 3. Hand mix the base and thinner in the ratio specified in Table 4.

Step 4. Hand mix the base/thinner mixture and the activator in the ratio specified in Table 4 and stir until homogeneous.

Step 5. Strain the mixture through a clean, lint free cheese cloth or filter mesh.

Table 4 - Preparation of F47 Base Coat for Application

MANUFACTURER	COMPONENTS	MIXING RATIO (BY VOLUME)	REACTION TIME (Note 1)	POT LIFE
Akzo Nobel Aerospace Coatings Aerodur 3001	3001GXXX Base	6	15 minutes	1.5 - 2 hours
	CS6000 Curing Solution	1		
	A900X Activator	0.5		
Mankiewicz ALEXIT H/S-Basecoat 411-22	411-22 Base	3	Not Required	2 hours
	902-31 Activated Thinner or 902-21 Slow Activated Thinner	0.75		
	405-86 Hardener	1		

5.3.3 Application of F47 Base Coat

5.3.3.1 Stir and/or agitate mixed base coat which has been left standing between spraying operations.

5.3.3.2 Spray apply one cross-coat or two wet-on-wet coats (0.0005" - 0.0010" per coat) to obtain a dry film thickness of 0.0010" - 0.0020". Allow 2 hours minimum flash off time between coats.

5.3.4 Drying of F47 Base Coat

5.3.4.1 Allow the F47 base coat to dry according to Table 5 before overcoating with additional base coat (e.g., for stripes, insignia, etc.) or overcoating with clear coat.

Table 5 - Drying of F47 Base Coat

MANUFACTURER	BASE COAT	DRY TIME (at 60°F - 85°F (16°C - 29°C))
Akzo Nobel Aerospace Coatings	Aerodur 3001	2 - 72 hours
Mankiewicz	ALEXIT H/S-Basecoat 411-22	2 - 120 hours
Note 1. Accelerated high temperature curing is not allowed.		

5.4 Preparation, Application & Curing of F47 Clear Coat

5.4.1 Preparation of Dried F47 Base Coat for F47 Clear Coat Application

5.4.1.1 Prepare parts to which a properly dried F47 primer and base coats have been applied as follows:

Step 1. Remove oil grease or other contaminants by solvent cleaning according to PPS 31.17, as required.

Step 2. Mask off areas in the clear coat application area which are not to be painted. Cap or plug all tube ends or bores not to be painted according to PPS 6.05; if the cap or plug size required is not available, protect the tube end or bore with masking tape.

Step 3. Immediately before applying F47 clear coat, tack rag all surfaces to remove particles, dust, etc.

5.4.1.2 If the maximum base coat dry time has been exceeded, the surface must be reactivated as follows before clear coat application:

Step 1. Lightly abrade the base coat with a fine grade abrasive pad.

Step 2. Solvent clean according to PPS 31.17.

5.4.2 Preparation of F47 Clear Coat for Application

5.4.2.1 Only use clear coat base and hardener within their storage lives (as marked on the containers).

5.4.2.2 Dispose of clear coat components showing signs of skinning, gelling, lumping, or pigment separation (e.g., according to EHS-OP-005).

5.4.2.3 Dispose of hardener showing signs of milkiness, precipitation or other deterioration (e.g., according to EHS-OP-005).

5.4.2.4 Prepare the F47 clear coat according to the manufacturer's instructions, or as follows:

Step 1. Manually stir the base component in its original container to break up any caked solids on the bottom of the container.

Step 1. Continue to manually stir the base component until homogeneous; **do not** agitate ALEXIT-H/S-Clearcoat 411-14 base on a mechanical paint shaker. For 3002G00002 base, it is acceptable to agitate the base component in its original container on a mechanical paint shaker (ref. para. 4.2.2) for a minimum of 1 minute in place of manually stirring.

Step 2. Hand mix the base and the hardener (or curing solution) in the ratio specified in Table 6.

Step 3. Allow the mixture to react for the reaction (induction) time specified in Table 6, as applicable.

Step 4. Strain the mixture through a clean, lint free cheese cloth or filter mesh.

Step 5. For spray application, reduce the mixture to spraying viscosity using the specified thinner, as applicable. Do not reduce clear coat to be used for touch-up.

Table 6 - Preparation of F47 Clear Coat for Application

MANUFACTURER	COMPONENTS	MIXING RATIO (BY VOLUME)	REACTION TIME	POT LIFE
Akzo Nobel Aerospace Coatings Aerodur 3002	3002G00002 Base	2	15 minutes	4 hours
	CS6003 Curing Solution	2		
	A9055 Thinner	1		
Mankiewicz ALEXIT HS-Clearcoat 411-14	ALEXIT-H/S-Clearcoat 411-14 Base	1	not required	4 hours (Note 2)
	ALEXIT-Hardener 405-86	1		
	ALEXIT-Thinner 901-72	0.5, 0.75 or 1 (Note 1)		

Note 1. When using compressed air spraying or electrostatic application, the 901-72 thinner mixing ratio is 0.5 parts (by volume) for one coat application and 0.75 parts (by volume) for two coat application. When using air assisted airless application, the mixing the 901-72 thinner mixing ratio is 1.0 parts (by volume) for one and two coat applications.

Note 2. For two coat applications, freshly mixed ALEXIT 411-14 clear coat must be used for the second coat.

5.4.3 Application of F47 Clear Coat

5.4.3.1 Stir clear coat which has been left standing between spraying operations.

5.4.3.2 Spray apply F47 clear coat in one single cross-coat or two wet-on-wet coats (0.0005" - 0.0008" per coat) to obtain a dry film thickness of 0.0010" - 0.0015". When applying two wet-on-wet coats of allow 30 minutes minimum between coats. For two coat applications of ALEXIT- HS-Clearcoat 411-14, freshly mixed clear coat must be used for the second coat.

5.4.4 Curing of F47 Clear Coat

5.4.4.1 Before exposure to oil, fuel or hydraulic fluid, the final F47 clear coat must be fully cured. **Full cure** of F47 clear coat is assured if the part is allowed to cure at a minimum of 77°F (25°C) and 50% relative humidity for at least 7 days (168 hours). Allow for a longer cure time at temperatures below 77°F (25°C), 60°F (16°C) minimum, or at relative humidity levels other than 50% (i.e., higher **or** lower). Note: Accelerated, high temperature curing is not allowed.

5.5 Rework of Damaged or Defective Coatings

5.5.1 Touch-up damaged or defective F47 primer, base coat or clear coat in non-appearance areas with a brush. Do not use thinner when mixing F47 primer, base coat or clear coat for touch-up application by brush.

5.5.2 Repair damaged or defective F47 primer, base coat or clear coat in appearance areas:

Step 1. Remove or blend the defect by sanding it with abrasive paper or a Scotchbrite pad and solvent cleaning the area according to PPS 31.17. If defects penetrate the substrate (e.g., scratches extending through the F47 coatings into the aircraft skin), refer to Liaison Engineering for disposition.

Step 2. Re-apply all applicable coatings in the area where the defect has been removed according to the procedure specified herein.

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

6 Requirements

6.1 Except as noted in para. 5.5.3, the dry film thickness of the F47 primer coat, base coat and clear coat must be as specified in section 5.2, section 5.3 and section 5.4. Before measuring the dry film thickness, allow each coating to dry for at least 90 minutes at 70°F - 85°F (21°C - 29°C) and 50 - 60% relative humidity. Take care when measuring the dry film thickness to avoid damaging the coating, especially when the coating has dried but has not fully cured. Refer to PPS 34.11 for additional film thickness measurement instructions and requirements.

6.2 F47 coated surfaces must be free of 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 of the coating. Check F47 primer and base coats for defects before overcoating.

6.3 Refer to PPS 34.11 for dry adhesion tape testing on cured F47 primer/base coat/clear coat paint system coatings.

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 Refer to PPS 31.17 for the safety precautions for solvent cleaning.

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 Additional Information

9.1 Store F47 primer, base coat and clear coat components in a dry area at a temperature of 40°F - 100°F (4°C - 38°C) according to PPS 13.28; for optimum storage life, a temperature of 60°F - 80°F (16°C - 27°C) is recommended.

9.2 After use, clean equipment promptly according to PPS 31.17 to avoid drying of primer, base coat or clear coat on or in the equipment.