DE HAVILLAND AIRCRAFT OF CANADA LIMITED

BOMBARDIER

Toronto Site

PPS 34.08 - APPLICATION OF EPOXY-POLYAMIDE PRIMER (F19 & F45)

Issue 53
- This standard supersedes PPS 34.08, Issue 52.
- Vertical lines in the left hand margin indicate technical changes over the previous issue.
- Direct PPS related questions to christie.chung@dehavilland.com or (416) 375-7641.
- This PPS is effective as of the distribution date.

THIS PPS IS CO-OWNED BY DE HAVILLAND AIRCRAFT OF CANADA LIMITED AND BOMBARDIER INC.

Prepared By:	(Christie Chung)	August 12, 2020
	De Havilland Canada PPS Group	
Approved By:	(Stephen Mabee)	August 16, 2020
	De Havilland Canada M&P Engineering	
	(Kenneth Quon)	August 18, 2020
	Bombardier Inc. M&P Engineering	

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

The information, technical data and designs disclosed in this document (the "information") are either the exclusive property of De Havilland Aircraft of Canada Limited and Bombardier Inc. or are subject to the proprietary rights of others. The information is not to be used for design or manufacture or disclosed to others without the express prior written consent of both De Havilland Aircraft of Canada Limited and Bombardier Inc. The holder of this document, by its retention and use, agrees to hold the information in confidence. These restrictions do not apply to persons having proprietary rights in the information, to the extent of those rights.

Issue 53 - 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.

- Specified this is a jointly owned PPS by both De Havilland Aircraft of Canada Limited and Bombardier Inc.
- Specified use of the following documents at frozen revisions for the DASH 8 program - BAERD GEN-018 at Rev. E; BAERD GEN-023 at Rev. A; and BAMS 565-001 at Rev. D.
- Specified that cure oven or area (convection or infrared (IR)) shall be qualified according to AMS 2750 meeting Type D, Class 3 requirements.
- Replaced all reference to “Akzo Nobel” with reference to “AkzoNobel”.
- Replaced BAEMM-001 reference with PPS 13.28.
- Specified AkzoNobel Aerospace Coatings Aerodur HS Primer 37092 as a two component system (i.e., 37092 (Base)/92217 (Hardener)).
- Defined pot life.
- Added sample of DH4900 Form to indicate data to be logged (see Figure 4).
- Allowed use of alternate equipment cleaning methods, provided all equipment is completely free of primer and contaminants prior to the next use of such equipment.
- Added reference to PPS 32.35 C10 coating if called out on the engineering drawing.

TABLE OF CONTENTS

Sections **Page**

Tables

Table of Contents

Figures **Page**

Flow Charts

1 SCOPE

1.1 This Production Process Standard (PPS) specifies the procedure and requirements for the application of epoxy primer (Finish Codes F19 and F45 as per PPS 23.02) onto aircraft parts and assemblies.

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.

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

1.2 If the engineering drawing specifies application of zinc chromate primer according to PPS 34.01 or F1 Finish Code, apply DHMS C4.01 Type 2 (F19) primer as specified herein.

1.3 This PPS is co-owned by De Havilland Aircraft of Canada Limited (DHC) and Bombardier Inc. (BA) due to its applicability for both the DHC DASH 8 and BA Lear 45 programs. Use of frozen revisions of Bombardier documents only applies to the DASH 8 program.

2 HAZARDOUS MATERIALS

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

3 REFERENCES

3.1 AMS 2750 - Pyrometry.

3.2 ASTM D3330 - Standard Test Method for Peel Adhesion of Pressure-Sensitive Tape.

3.3 BAERD GEN-018, Rev. E - Engineering Requirements for Laboratories.

3.4 BAERD GEN-023, Rev. A - Contamination Control for Compressed Air.

3.5 BAMS 565-001, Rev. D - Fluid Resistant (FR) Epoxy Primer for Aircraft Interior.

3.6 EHS-OP-005 - Hazardous Materials Management, *BA/DHC internal operating procedure*.

3.7 DH4900 - Fluid Resistant Primer Control Record, *BA/DHC internal operating procedure*.

3.8 PPS 2.16 - Installation of NAS Type Lockbolt Fasteners.

3.9 PPS 2.66 - Installation of Blind Rivets

3.10 PPS 2.67 - Installation of Hi-Lok/Hi-Tigue Fasteners.

3.11 PPS 2.68 - Installation of Hi-Lite Fasteners.

3.12 PPS 6.05 - Closure of Fluid Lines and Fluid System Components.

3.13 PPS 9.06 - Electrical Bonding and Grounding of Aircraft Structures.

3.14 PPS 13.13 - Personal Protective Respiratory Equipment.

3.15 PPS 13.26 - General Subcontractor Provisions.

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

3.17 PPS 13.39 - Bombardier Toronto Engineering Process Manual.

3.18 PPS 17.02 - Abrasive Blasting.

3.19 PPS 21.16 - Aircraft Weather/Pressure Sealing.

3.20 PPS 23.02 - Protective Treatment and Decorative Surface Finish Code System.

3.21 PPS 24.02 - Ion Vapour Deposited Aluminum Coatings (M2).

3.22 PPS 31.02 - Cleaning Processes for Aluminum and Aluminum Alloys.

3.23 PPS 31.05 - Surface Treatment of Corrosion Resistant Steel (C9).

3.24 PPS 31.07 - Cleaning and Stripping of Painted Surfaces.

3.25 PPS 31.09 - Cleaning of Titanium and Titanium Alloys.

3.26 PPS 31.17 - Solvent Usage.

3.27 PPS 32.01 - Chemical Conversion Coating of Aluminum and Titanium Alloys by Immersion (C1).

3.28 PPS 32.02 - Manual Application of C1 Chemical Conversion Coatings.

3.29 PPS 32.03 - Chromic Acid Anodizing (A1).

3.30 PPS 32.05 - Colour or Colourless Anodizing - Sulphuric Acid Process (A3).

3.31 PPS 32.07 - Corrosion Protection of Magnesium Alloys.

3.32 PPS 32.35 - Chemical Conversion Coating for Low Electrical Resistance (C10).

3.33 PPS 33.01 - Cadmium Plating (E1).

3.34 PPS 34.06 - Primer Coating (F17) for Magnesium Alloys.

3.35 PPS 34.07 - Application of F14 Primer to Thermoplastic Surfaces.

3.36 PPS 34.23 - Application of DSC 595 Adhesion Promoter

3.37 PPS 34.34 - Surface Finishing Compounds (F33).

4 MATERIALS, EQUIPMENT AND FACILITIES

4.1 Materials

4.1.1 Primer, fluid resistant epoxy, F19 Type 2, to DHMS C4.01 Type 2. The primers listed in Table I are considered acceptable alternatives to F19 Type 2 and may be used where the engineering drawing specifies the use of F19 Type 2 primer, with consideration of the limitations and exceptions specified therein.

4.1.2 Primer, fluid resistant epoxy, F19 Type 3, to DHMS C4.01 Type 3.

4.1.3 Primer, fluid resistant, high temperature epoxy, to DHMS C4.21 (F45).

4.1.4 Masking tape for paint adhesion testing, 1 inch wide, adhesion tested according to ASTM D3330 Method A with a minimum bond strength 60 oz/inch width (e.g., 3M Company No. 250 or No. 300). The masking tape shall also be adhesion tested according to ASTM D3330 Method A at the end of 12 months from the date of manufacture and every 3 months thereafter for up to 2 years.

TABLE I - ACCEPTABLE ALTERNATIVES TO F19 TYPE 2 PRIMER

ALTERNATIVES TO F19 TYPE 2	LIMITATIONS AND EXCEPTIONS (NOTE 1)
AkzoNobel Aerospace Coatings Aerodur HS Primer 37092 (Base)/ 92217 (Hardener) epoxy primer	• For priming of interior details and assemblies only; not for use on exterior aircraft surfaces. • For Aerodur HS 37092 primer only, it is acceptable to apply a dry film thickness of 0.0004" - 0.0009" instead of 0.0004" - 0.0006". • Perform receipt batch acceptance tests and control requirements according to BAMS 565-001, Rev. D and PPS 13.28.
PRC-DeSoto 515X349 (Green Base) / 910X533 (Activator)	• For subcontractors which are subject to the Aerospace National Emission Standards for Hazardous Air Pollutants (NESHAP) subpart for Aerospace manufacturing and rework facilities. • Perform receipt batch acceptance tests and control requirements according to DHMS C4.18 Type III, Class A, Grade A.
Tempo Aerospace Inc. 4500-P-23G (Base) / 4500-C-23G (Catalyst) / S-23 (Thinner) epoxy primer	• Perform receipt batch acceptance tests and control requirements according to BAMS 565-001, Rev. D and PPS 13.28.
Note 1. Alternative primer application, cure time, requirements, etc. shall be as specified for F19 Type 2.	

4.2 Equipment

4.2.1 Lint-free cotton gloves (e.g., DSC 422-1), preferably white.

4.2.2 Protective wrapping, plastic bags or neutral Kraft paper.

4.2.3 Lint-free cheese cloth or filter mesh.

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

4.2.5 Abrasive paper, 180 - 220 grit aluminum oxide or Scotch-Brite pads.

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

4.2.7 Masking paper, non-adhesive (e.g., 3M #06539, 3M #06736 “Scotchblok” or Kraft paper). Secure masking paper in place using the masking tape specified in paragraph 4.2.8.

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

4.2.9 Relative humidity recording and/or indicating equipment: sling psychrometer or hygrometer (e.g., Extech RHT20). Relative humidity recording and/or indicating equipment shall be calibrated and operated according to the manufacturers’ instructions.

4.2.10 Spray booths and rooms shall 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 shall be provided, including in under-surface areas.

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

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

4.2.13 Countersink priming kit:

- Suitable plastic bottles (e.g., 1 or 2 fl. oz.).
- Suitable small paint brush or cotton swabs (e.g., Q-Tips).
- Foam tip applicator (e.g., Dab-O-Matic #W/D-119-82).
- Polypropylene cap (e.g., Dab-O-Matic #18/400).

4.2.14 Plastic bottles with brush applicator top for primer touch-up.

4.2.15 Storage freezer, chest type, capable of maintaining temperature of 0°F (-18°C) or below.

4.2.16 Rubber roller for paint adhesion testing, 1.75" wide, 3.5" diameter, surface hardness of 70 to 80 Shore A Durometer, weighing 4.5 lbs.

4.2.17 Compressed air for use with spray guns. Compressed air used with spray application equipment shall meet the requirements of BAERD GEN-023, Rev. A.

4.2.18 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.

4.2.19 Accelerated cure oven or area (convection or infrared (IR)) qualified according to AMS 2750 meeting Type D, Class 3 requirements.

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 epoxy primer according to this PPS.

4.3.2 Subcontractors shall direct requests for approval to DHC or BA Quality.

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 shall 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 shall be detailed in the facility report. Based upon the facility report, DHC or BA Engineering may identify additional qualification and/or process control test requirements. During the facility survey, the facility requesting qualification shall be prepared to demonstrate their capability. Once approved, no changes to subcontractor facilities may be made without prior written approval from DHC or BA Quality.

4.3.3.1 For approval of subcontractor facilities to perform application of epoxy primer according to this PPS, completion of a test program and submission of suitable test samples is required. Test samples shall meet the visual examination, film thickness and adhesion requirements specified in section 6.

4.3.3.2 All testing and evaluation specified herein shall only be performed by DHC/BA Materials Laboratory or by laboratories accredited according to BAERD GEN-018, Rev. E.

5 PROCEDURE

5.1 General

5.1.1 For the purposes of this PPS, the term “MRB” (Material Review Board) is considered to include DHC/BA MRB and DHC/BA delegated MRB.

5.1.2 If the F19 type is not specified on the engineering drawing, use F19 Type 2 (green) primer on metallic surfaces and F19 Type 3 primer on non-metallic surfaces (e.g., fibre reinforced composites).

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

5.1.4 Only use F45 primer if specified by the engineering drawing.

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

5.1.6 If masking other than specifically referenced herein is required, it is acceptable to use masking paper (ref. paragraph 4.2.7) and/or masking tape (ref. paragraph 4.2.8), as necessary.

5.2 Preparation of Primer

5.2.1 Do not intermix base, catalyst and thinners of different manufacturers and types.

5.2.2 Only use base and catalyst within their storage lives (as marked on the containers). Submit base or catalyst which has exceeded its storage life for shelf life extension testing according to PPS 13.28.

5.2.3 Dispose of primer components showing signs of skinning, gelling, lumping, or pigment separation according to section 9.

5.2.4 Dispose of catalyst showing signs of milkiness, precipitation or other deterioration according to section 9.

5.2.5 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. paragraph 4.2.4) for a minimum of 1 minute.

Step 3. Hand mix the base and the catalyst in the ratio specified in Table II, Table III, Table IV or Table V, as applicable.

Step 4. Except when preparing primer for touch-up, if a reaction time is specified, allow the mixture to react for the specified time.

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

Step 6. For spray application, reduce the mixture to the spraying viscosity specified by the manufacturer using the specified thinner. Do not reduce primer 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.

Step 7. When preparing touch-up and/or countersink primer to be frozen for later use, fill touch-up bottles bearing the mixing date with the mixed components and immediately place the bottles in a freezer operating at a temperature of -58°F to 0°F (-50°C to -18°C).

5.3 Pot Life

5.3.1 Pot life is the time during which 'mix' of primer remains suitable for application.

5.3.2 The pot lives specified in Table II, Table III, Table IV and Table V are based on a temperature of 70 to 77°F (21 to 25°C) and 50% ± 10% relative humidity. Higher temperature and humidity conditions will shorten the pot life.

5.3.3 Discard excess primer upon expiration of the pot life according to section 9.

TABLE II - PREPARATION OF F19 TYPE 2 PRIMER

MANUFACTURER	COMPONENTS	MIXING RATIO (BY VOLUME)	REACTION TIME (NOTE 1)	POT LIFE
AkzoNobel Aerospace Coatings	10P4-2NF BASE	1	30 minutes minimum	16 hours
	EC-117S CATALYST	1		
	TR19 or TR20 THINNER	0 - 0.5 max.		
AkzoNobel Aerospace Coatings	Aerowave 2001 (or AW2001) BASE (Note 2)	3	Not Required	6 hours
	6005 CURING SOLUTION	1		
Tempo Paint & Varnish Co.	4500-PB-23B BASE (Note 3)	1	20 minutes minimum	8 hours
	4500-C-23B CATALYST	1		
	4500-S-23X THINNER	---	---	
Tristar Coatings Div. of Trebor Industries Ltd.	435P0033 BASE	1	15 minutes minimum	8 hours
	430C0035 CATALYST	1		
	SB42 (Slow) or SB43 (Medium) REDUCER	---	---	
Tristar Coatings Div. of Trebor Industries Ltd.	425P0076 BASE	1	15 minutes minimum	8 hours
	420C0078 CATALYST	1		

Note 1. Except for touch-up primer, if a reaction time is specified, allow the base and catalyst to react for the time specified before reduction.
Note 2. Aerowave 2001 (also known as AW2001) primer can not be used on sealed anodized parts. For application to unsealed anodized parts, shall be applied within 16 hours of anodizing.
Note 3. "B" designates colour to #34258 of Federal Standard 595.

TABLE III - PREPARATION OF ALTERNATIVES TO F19 TYPE 2 PRIMER

MANUFACTURER	COMPONENTS	MIXING RATIO (BY VOLUME)	REACTION TIME (NOTE 1)	POT LIFE
AkzoNobel Aerospace Coatings	Aerodur HS primer 37092 BASE	2	15 minutes minimum	2 hours
	92179 HARDENER	1		
AkzoNobel Aerospace Coatings	Aerodur HS primer 37092 BASE	5	Not Required	2 hours
	92217 HARDENER (Note 2)	2		
PRC DeSoto Inc.	515X349 BASE	1	30 minutes minimum	8 hours
	910X533 CURING SOLUTION	1		
Tempo Paint & Varnish Co.	4500-P-23G BASE	1	20 minutes minimum	8 hours
	4500-C-23G CATALYST	1		
	4500-S-23 THINNER	---	---	

Note 1. Except for touch-up primer, if a reaction time is specified, allow the base and catalyst to react for the time specified before reduction.
Note 2. When using 92217 hardener, manually mix the base and hardener components thoroughly for at least 2 minutes. Do not use a mechanical shaker.

TABLE IV - PREPARATION OF F19 TYPE 3 PRIMER

MANUFACTURER	COMPONENTS	MIXING RATIO (BY VOLUME)	REACTION TIME (NOTE 1)	POT LIFE
DEFT Inc.	44GY034A BASE	2	Not required	4 hours
	44GY034A CATALYST	1		
	Distilled or De-ionized Water	3.6		
PRC DeSoto Inc.	512X310 BASE	1	30 minutes minimum	8 hours
	910X533 ACTIVATOR	1		
Tempo Paint & Varnish Co.	4500-PB-40 BASE	1	20 minutes minimum	8 hours
	4500-C-40 CATALYST	1		
	4500-S-23X THINNER	---	---	
Tristar Coatings Div. of Trebor Industries Ltd.	431P0074 BASE	1	20 minutes minimum	8 hours
	430C0035 CATALYST	1		
	SB42 (Slow) or SB43 (Medium) REDUCER	---	---	

Note 1. Except for touch-up primer, if a reaction time is specified, allow the base and catalyst to react for the time specified before reduction.

TABLE V - PREPARATION OF F45 PRIMER

MANUFACTURER	COMPONENTS	MIXING RATIO (BY VOLUME)	REACTION TIME (NOTE 1)	POT LIFE
PRC DeSoto Inc.	519X303 BASE	3	30 minutes minimum	8 hours
	910X357 CATALYST	1		
	020X324 THINNER	---	---	

Note 1. Except for touch-up primer, allow the base and catalyst to react for the time specified before reduction.

5.4 Preparation of Parts

5.4.1 Except as noted below, prepare metallic parts for priming according to paragraph 5.4.1.1, paragraph 5.4.1.2, paragraph 5.4.1.3 or paragraph 5.4.1.4, as applicable. In each of the following instances, ensure all trace of residual solvent is removed before applying primer.

- Prepare countersinks for priming by solvent cleaning according to PPS 31.17.
- Prepare the broken pin ends of pull type lockbolts installed according to PPS 2.16 for brush touch-up by solvent cleaning according to PPS 31.17.
- Prepare the exposed bare metal of the pulling stem fracture on blind rivets installed according to PPS 2.66 for brush touch-up by solvent cleaning according to PPS 31.17.
- Prepare the exposed bare metal of aluminum Hi-Lok and Hi-Lite collars installed according to PPS 2.67 and PPS 2.68, respectively, for brush touch-up by solvent cleaning according to PPS 31.17.

5.4.1.1 Except as noted in paragraph 5.4.1, prepare aluminum alloy parts according to Flow Chart 1.

5.4.1.2 Except as noted in paragraph 5.4.1, prepare magnesium alloy parts according to Flow Chart 2.

5.4.1.3 Except as noted in paragraph 5.4.1, prepare steel, brass, bronze, titanium and corrosion resistant steel parts according to Flow Chart 3.

5.4.1.4 Except as noted in paragraph 5.4.1, prepare tungsten parts according to Flow Chart 4.

5.4.2 Prepare fibre-reinforced composite parts according to Flow Chart 5.

5.4.3 Prepare polycarbonate and Kydex parts according to Flow Chart 6.

5.4.4 No further preparation is required for surfaces which have been prepared and sealed according to PPS 21.16. For sealed surfaces which have become contaminated, remove the sealant using a hard edged plastic scraper or spatula, solvent clean according to PPS 31.17 to remove residual sealant and then, re-seal according to PPS 21.16.

5.4.5 Mask off electrical bond contact areas as specified by the engineering drawing and PPS 9.06 using masking tape (ref. paragraph 4.2.8).

5.4.6 Except as noted below, prime parts within 24 hours of chemical treatment (e.g., anodizing, conversion coating, etc.). Parts which are to be primed within 24 hours do not require protective wrapping, but shall be kept free from contamination.

- Parts which will not be primed within 24 hours of chemical treatment shall be sealed in plastic bags or protectively wrapped in neutral Kraft paper. Solvent clean parts according to PPS 31.17 immediately after removal from the packages. Prime parts immediately after cleaning.
- Parts which have not been primed within 72 hours of chemical treatment (e.g., chemical conversion coating, anodizing, etc.) shall have the chemical finish stripped and re-processed according to the applicable chemical finishing PPS.

5.5 Handling of Cleaned Parts

5.5.1 Always wear clean, lint-free cotton gloves (ref. paragraph 4.2.1) while handling parts for priming.

5.5.2 Parts that are to be primed immediately following surface preparation or have been suitably protected against contamination do not require additional cleaning before F19 or F45 priming. If a part has become contaminated with grease or oil, reprocess it as specified in section 5.4 before priming.

5.5.3 If a part is to be primed more than 24 hours after surface preparation or if it has become contaminated with fingerprints, solvent clean the part according to PPS 31.17 immediately before priming.

5.6 Application of Primer (See Flow Charts 1, 2, 3, 4, 5 and 6)

5.6.1 Before the application of F19 or F45 primer, cap or plug all tube ends or bores not to be primed according to PPS 6.05. If the cap or plug size required is not available, protect the tube end or bore with masking tape (ref. paragraph 4.2.8).

5.6.2 Stir and/or agitate primer which has been left standing between spraying operations, as thinners may separate out of suspension.

5.6.3 All parts to be F45 primed require two coats (0.0004" - 0.0006" per coat) to obtain a dry film thickness of 0.0008" - 0.0012".

5.6.4 Except as noted below, all parts and assemblies to be F19 primed require one even coat of F19 Type 2 primer with a dry film thickness of 0.0004" - 0.0006":

- If the engineering drawing specifies a second coat of F19 primer after assembly (e.g., DASH 8 fuse interior), apply a thin, even coat of primer with a dry film thickness of 0.0002" - 0.0010" to previously primed surfaces in order to obtain a total dry film thickness of 0.0006" - 0.0016". In limited areas where it is difficult or impractical to achieve the minimum required dry film thickness, it is acceptable for the dry film thickness of the first coat to range from 0.0003" - 0.0006" and the dry film thickness of the second coat to range from 0.0002" - 0.0004" for a total dry film thickness of 0.0005" - 0.0010". In limited areas where it is difficult or impractical to restrict the dry film thickness to the maximum specified (e.g., in the bottom of deep recesses), it is acceptable for the dry film thickness of the first coat to range from 0.0004" - 0.0009" and the dry film thickness of the second coat to range from 0.0002" - 0.0016" for a total dry film thickness of 0.0006" - 0.0025".
- Fibre-reinforced composite parts to be surface finished according to PPS 34.34 have a thin coat (0.0002" - 0.0004") of F19 Type 3 primer applied before surface finishing to aid in detecting pin holes. After surface finishing according to PPS 34.34, apply an even coat of F19 Type 3 primer with a dry film thickness of 0.0004" - 0.0006" to all fibre-reinforced composite parts to obtain a total dry film thickness of 0.0006" - 0.0010".
- During the priming of formed sheet metal parts, extruded shapes, or machined parts, it is possible for the primer to pool in the bottom of deep recesses while priming the recess walls. The primer thickness at the bottom of these recesses may be between 0.0004" and 0.0012" (see Figure 1).

5.6.5 For priming of countersinks, apply F19 Type 2 primer to the countersink surface using a brush, cotton swab or foam tip applicator (see Figure 2). If applying primer in plastic bottles with a foam tip applicator, press the foam tip against the countersink surface and rotate 1/4 turn; replace the cap after application of primer. Apply only a very light coat of primer to avoid runs or sags and to avoid applying primer to the drilled walls of the fastener hole (see Figure 3); the drilled wall of the fastener hole shall be kept free from primer to ensure electrical continuity between the assembled sheets and the fastener shank. Allow the primer to cure for a minimum of 2 minutes before installing the fastener according to the applicable fastener PPS. After fastener installation, remove any excess primer around the fastener hole by solvent cleaning according to PPS 31.17.

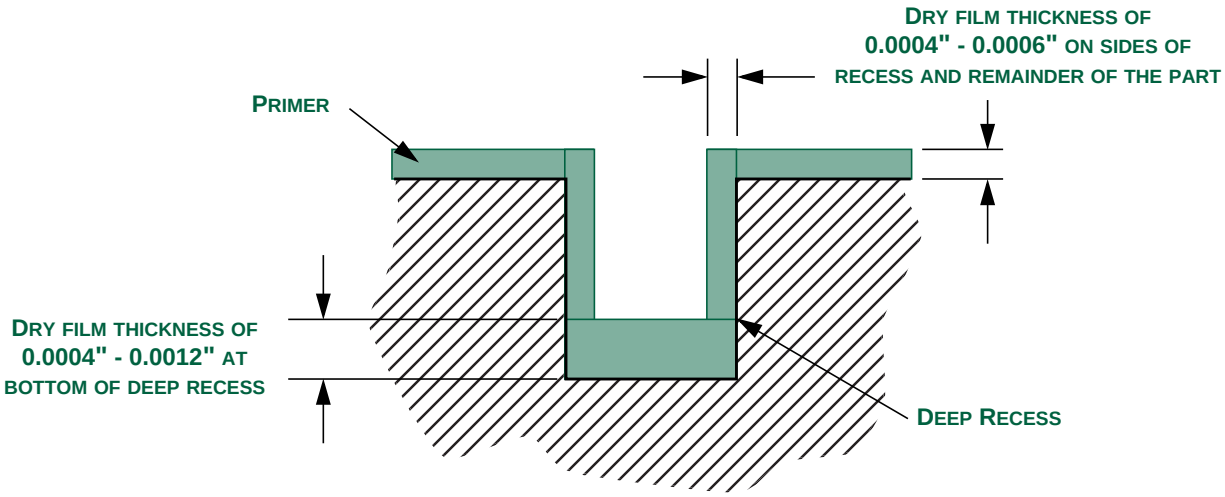


FIGURE 1 - F19 PRIMER THICKNESS IN DEEP RECESSES

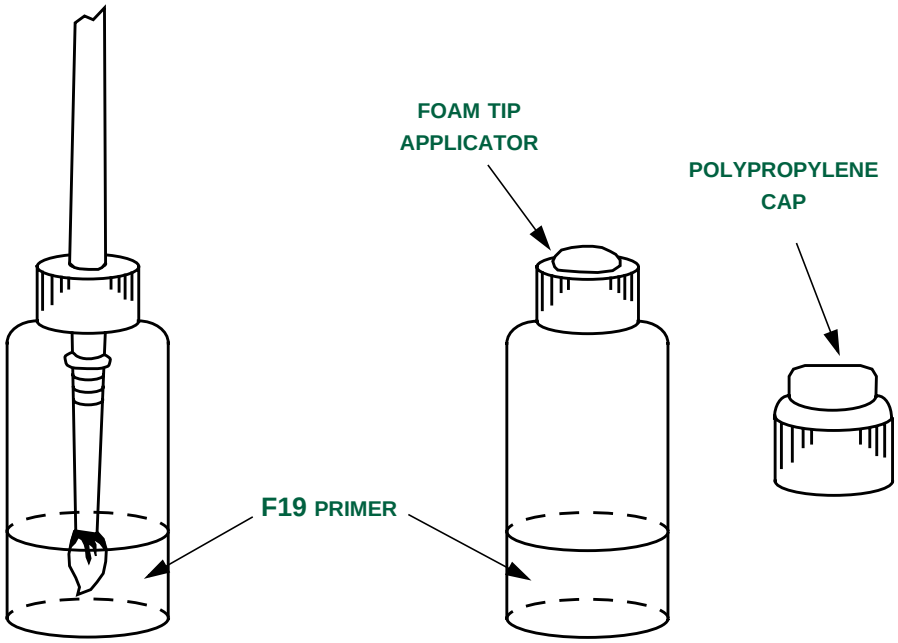


FIGURE 2 - GENERAL DESCRIPTION OF COUNTERSINK APPLICATORS

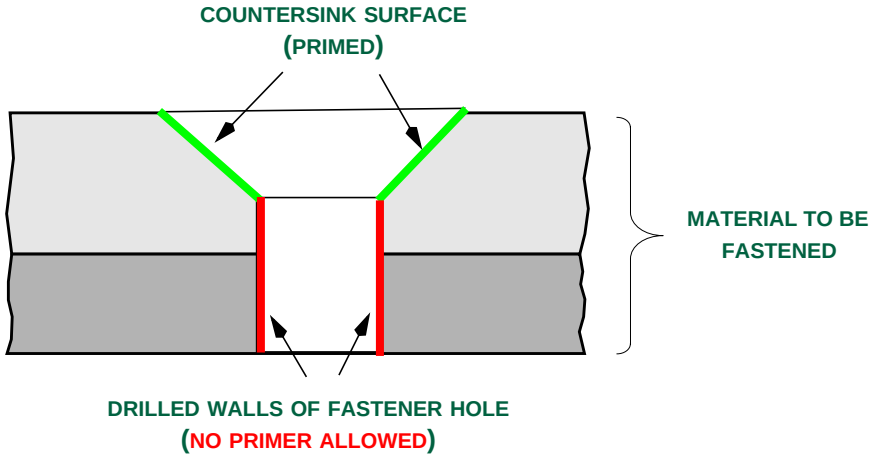


FIGURE 3 - PRIMER APPLICATION TO COUNTERSUNK FASTENER HOLE

5.7 Curing of Primer

5.7.1 Cure F19 primer coatings according to paragraph 5.7.1.1 (room temperature cure) or paragraph 5.7.1.2 (accelerated, high temperature, cure). Cure F45 primer coats according to paragraph 5.7.1.3. Alternatively, it is also acceptable to cure F19 or F45 primer coats according to the primer manufacturers instructions, provided damage to the coating or substrate will not result (e.g., do not cure primer coatings on polycarbonate or Kydex parts above 85°F (29°C), do not perform assembly operations until the primer coating has sufficiently cured, etc.). Accelerated cure ovens or areas shall meet the requirements as specified in paragraph 4.2.19.

5.7.1.1 For F19 coatings to be cured at room temperature (60°F (16°C) minimum), refer to Table VI for the minimum cure times:

TABLE VI - F19 ROOM TEMPERATURE CURE SCHEDULE

Cure Temperature	Minimum Cure Time (Note 1)			
	Before Overcoating or Sealant Application	Before Masking, Application of Surface Finishing Compound, Handling or Stacking	Before Exposure to Weather, Assembly or Application of Adhesives	Before Service (i.e., exposure to fuel, oil or hydraulic fluid)
60°F (16°C) minimum (Note 2)	90 minutes	8 hours	24 hours	168 hours

Note 1. For any applications not listed in this table, refer to Liaison Engineering for the minimum cure time.
Note 2. Do not cure F19 coatings applied to polycarbonate or Kydex above 85°F (29°C).

5.7.1.2 In order to reduce the cure time, it is acceptable to heat cure F19 coatings, on parts other than polycarbonate or Kydex, as follows.

Step 1. Allow parts to air dry at 60°F - 85°F (16°C - 29°C) for at least 5 minutes **before** heat curing them.

Step 2. Heat cure according to Table VII for either overcoating/sealant application or masking/application of surface finishing compound/handling/stacking, as applicable. For parts which are to be overcoated but will require masking before overcoating, ensure to heat cure for the time required for masking, not just the time required before overcoating. Accelerated cure ovens or areas shall meet the requirements as specified in paragraph 4.2.19.

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

Step 4. Overcoat, apply sealant, mask, apply surface finishing compound, handle or stack, as applicable.

Step 5. Allow the coating to cure at room temperature (60°F (16°C) minimum) for the additional time specified in Table VII (i.e., under the heading “Additional time at room temperature”).

TABLE VII - F19 ACCELERATED (HIGH TEMPERATURE) CURE SCHEDULES

Heat Cure Temperature (Notes 2, 3 & 4)	Minimum Cure Times (Note 1)			
	High Temperature Cure		Additional Time at Room Temperature (60°F (16°C) minimum) After Heat Curing	
	Before Overcoating or Sealant Application	Before Masking, Application of Surface Finishing Compound, Handling or Stacking	Before Exposure to Weather, Assembly or Application of Adhesives	Full Cure Before Service (i.e., Exposure to Fuel, Oil or Hydraulic Fluid)
85 - 125 (°F) (29 - 52 (°C))	30 minutes	1 hour	8 hours	48 hours
125 - 160 (°F) (52 - 71 (°C))	15 minutes	20 minutes	4 hours	24 hours
160 to 200 (°F) (71 to 93 (°C))	5 minutes	8 minutes	2 hours	10 hours
200 - 250 (°F) (93 - 121 (°C))	3 minutes	3 minutes	30 minutes	4 hours

Note 1. For any applications not listed in this table, refer to Liaison Engineering for the minimum cure time.
Note 2. Allow parts to air dry at 60°F - 85°F (16°C - 29°C) for at least 5 minutes **before** heat curing them as specified above.
Note 3. Do not heat cure F19 coatings applied to polycarbonate or Kydex parts.
Note 4. Do not cure F19 coatings applied to high strength metal bonded parts above 160°F (71°C).

5.7.1.3 Cure F45 coatings at room temperature (60°F (16°C) minimum) for the cure times specified in Table VIII.

TABLE VIII - F45 CURE SCHEDULES

APPLICATION (NOTE 1)	MINIMUM CURE TIME (NOTE 2)
Before overcoating with other paints	1 hour
Dry to stack	4 hours
Before shipping or transporting	8 hours
Before application of polysulphide sealant	90 minutes
Before application of adhesives	24 hours
Before exposure to weather	24 hours
Before riveting	24 hours (Note 3)
Before exposure to oil, fuel, or hydraulic fluid	168 hours (7 days)
Full cure	168 hours (7 days)

Note 1. For any applications not listed above, cure for a minimum of 24 hours.

Note 2. Cure F45 coatings at room temperature (60°F (16°C) minimum); do not heat cure.

Note 3. If primer adhesion problems are being experienced during riveting, allow the primer to cure for 168 hours (7 days) before riveting.

5.8 Rework of Damaged or Defective Coatings

5.8.1 Minor Defects

5.8.1.1 Touch-up damaged or defective F19 Type 2 and Type 3 primer coatings in non-appearance areas with a brush.

5.8.1.2 Repair damaged or defective F19 Type 2 and Type 3 coatings in appearance areas or areas to be painted as follows:

Step 1. Remove or blend the damaged or defective primer by sanding it with abrasive paper or a Scotch-Brite pad. For primer coatings on metallic substrates only, it is also acceptable to strip the damaged or defective primer according to PPS 31.07, provided that the restrictions and limitations of PPS 31.07 are adhered to.

Step 2. Solvent clean the area according to PPS 31.17.

Step 3. If the base material of the part has been exposed, refer the part to Liaison Engineering for repair.

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

5.8.1.3 Touch-up all damaged or defective F45 primer coatings with a brush.

5.8.1.4 For brush touch-up, it is acceptable to use pre-mixed frozen primer prepared according to section 5.2. Let bottles of frozen primer warm at 60°F - 80°F (16°C - 27°C) for a minimum of 30 minutes before applying with a brush. The pot life of pre-mixed frozen F19 Type 2 primer, from the time of removal from the freezer, is 8 hours. Discard any primer that has been out of the freezer for more than 8 hours. Check the mixing dates on touch-up bottles of pre-mixed frozen primer on a daily basis and discard any bottles which have been prepared and stored for more than 12 days.

5.8.1.5 In small repair areas touched up by brush application of primer, it is acceptable to vary from the dry film thickness limitations specified in section 5.6 provided that complete primer coverage is visually verified. Take care to avoid application of an excessively thick or thin primer coating beyond the dry film thickness limitations specified in section 5.6.

5.8.2 Major Defects

5.8.2.1 Repair coatings with major defects as follows:

Step 1. Completely strip primer on metal surfaces using chemical stripper according to PPS 31.07 or by abrasive blasting according to PPS 17.02. Abrade coatings on fibre-reinforced composites with 180 - 220 grit abrasive paper to remove defects.

Step 2. Re-prime the area according to the procedure specified herein.

5.9 Verification of Primer Coating

5.9.1 For each ‘mix’ of primer prepared, perform a paint adhesion test as follows on a randomly chosen part primed using that batch of primer. For the purposes of this PPS, a ‘mix’ of primer is defined as a distinct quantity of mixed base, catalyst or hardener and thinner which has a pot life during which the primer may be acceptably applied. If the representative parts fails, perform the paint adhesion test on each of the parts primed with that ‘mix’ of primer. Refer any parts which fail the test to MRB for disposition.

Step 1. After the primer coating has fully cured, apply a suitable length of 1 inch wide masking tape (see paragraph 4.1.4) to the representative part, leaving a short length at one end to act as a handle.

Step 2. Press the tape down firmly using a rubber roller (see paragraph 4.2.16).

Step 3. Allow the tape to remain on the part for approximately 1 minute.

Step 4. Remove the tape with one abrupt motion, pulling the tape perpendicular to the surface of the part. If there is any evidence of primer lifting, consider the paint adhesion test a failure.

5.9.2 During each shift when parts are being primed, on randomly selected parts ensure that the dry film thickness of F19 and F45 primer is as specified in section 5.6 using a suitable film thickness gauge. If the coating fails to meet the dry film thickness requirements, determine and rectify the cause of the failure before processing any more parts.

5.10 Protection for Transport or Storage

5.10.1 Use caution when handling all primed parts to be transported or stored to prevent damage to the primer coating and to the parts.

6 REQUIREMENTS

6.1 All testing and evaluation specified herein shall only be performed by DHC/BA Toronto Materials Laboratory or by laboratories accredited according to BAERD GEN-018.

6.2 The primer coating shall meet the characteristics listed on the Fluid Resistant Primer Control Record (e.g., Form DH4900, see Figure 4).

6.3 Except as noted in paragraph 5.8.1.5, the dry film thickness of F19 and F45 primer shall be as specified in section 5.6. Before measuring the dry film thickness, allow the coating to cure for at least 90 minutes at room temperature (60°F (16°C) minimum) or, for F19 coatings, heat cure before handling according to Table VII. Take care when measuring the dry film thickness to avoid damaging the coating, especially when the coating has not fully cured.

6.4 Primed surfaces shall 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.

6.5 The adhesion of the primer coating shall be as specified in section 5.9.

FLUID RESISTANT PRIMER CONTROL RECORD WEEK NO. _____/20____

CHARACTERISTIC		Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday	
1. Mixing Ration (Table 1)	D														
	N														
2. Viscosity (Table 1)	D														
	N														
3. Application Thickness	D														
	N														
4. Part Marking Legibility	D														
	N														
1. Mixing Ratio (Table 1)	D														
	N														
2. Viscosity (Table 1)	D														
	N														
3. Application Thickness	D														
	N														
4. Part Marking Legibility	D														
	N														

REMARKS

NOTES:
1. Check characteristics on day and night shift.
2. Note deviations and corrective action in Remarks column.
3. Return completed forms to Quality Assurance.

DH4900 Rev 1

UNCONTROLLED - FOR REFERENCE ONLY

FIGURE 4 - FORM DH4900 SAMPLE

7 DHC/BA SAFETY PRECAUTIONS

7.1 The safety precautions specified herein are specific to DHC/BA to meet Canadian Federal and Provincial government environmental, health and safety regulations. It is strongly 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 standard plant safety precautions when performing the procedure specified herein.

7.3 Do not smoke, eat, or drink in paint spraying areas.

7.4 Wear personal protective respiratory equipment according to PPS 13.13 when applying primer.

7.5 Keep all primer and solvent containers closed when not in use.

7.6 Ensure the spray booths and rooms are equipped with suitable exhaust systems. Paint spray rooms shall be equipped with forced or induced ventilation systems capable of maintaining sufficient ventilation to meet Occupational Health and Safety Act requirements.

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

7.8 Wear protective coveralls, rubber gloves and splash goggles when handling mixed F19 or F45 primer or their components.

7.9 Avoid skin contact with mixed F19 and F45 primers or their components. If skin contact occurs, wash the affected area thoroughly with soap and water.

7.10 Avoid eye contact with primer. If contact occurs, flush the eyes immediately with large quantities of water at an eye wash station and report to the Health Centre.

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

8 PERSONNEL REQUIREMENTS

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

9 DISPOSAL OF CHEMICAL WASTES

9.1 Dispose of all chemical wastes according to national legislation and local regulations. At DHC/BA, dispose of chemical wastes according to EHS-OP-005.

9.2 At DHC/BA, dispose of chemical contaminated work clothes, rags, etc., into Red Containers labelled “Waste Rags”.

10 STORAGE

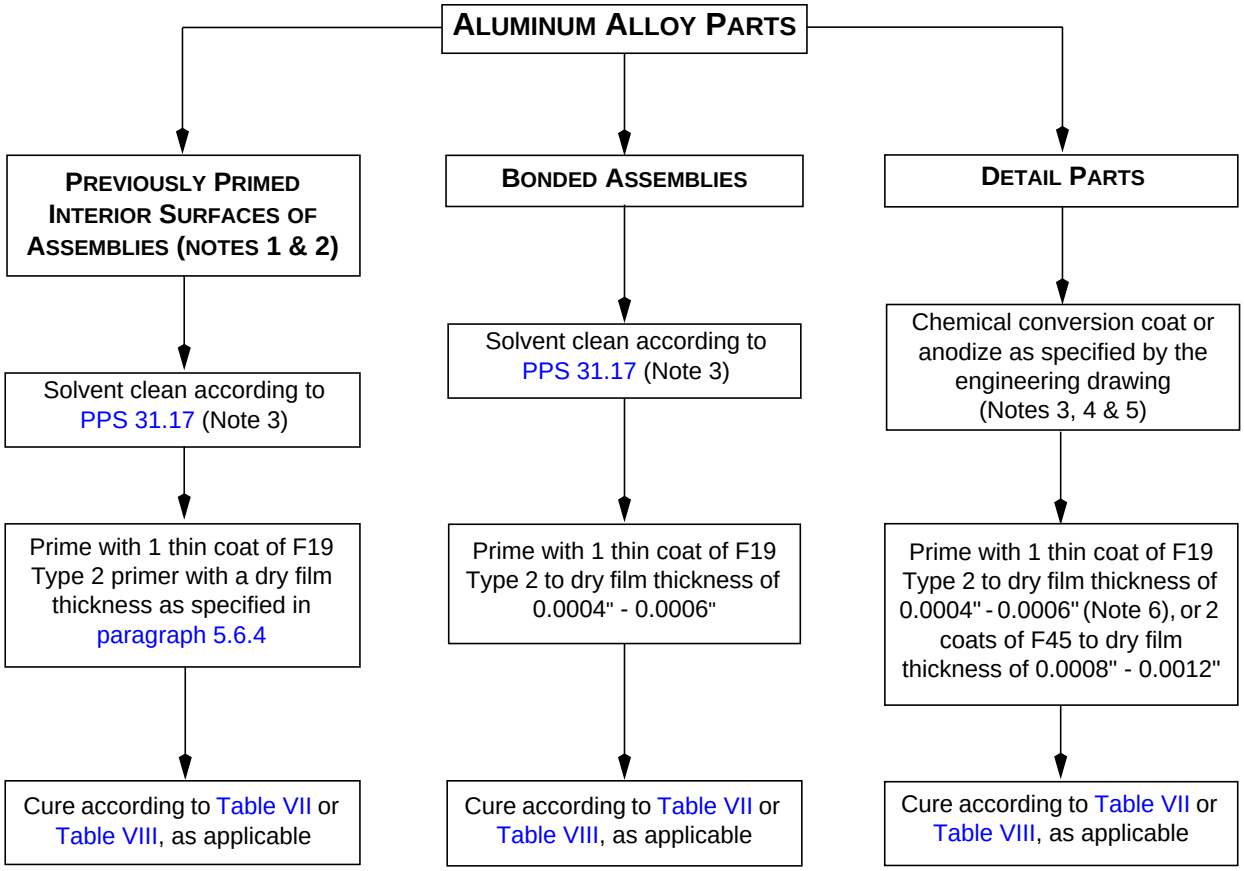
10.1 Always use the oldest stock first (i.e., first in/first out (FIFO) basis).

10.2 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 primer catalyst and base according to PPS 13.28.

11 ADDITIONAL INFORMATION

11.1 After use, clean equipment promptly according to PPS 31.17 to avoid drying of primer on or in the equipment. Use of alternate cleaning methods are acceptable, provided all equipment is completely free of primer and contaminants prior to the next use of such equipment.

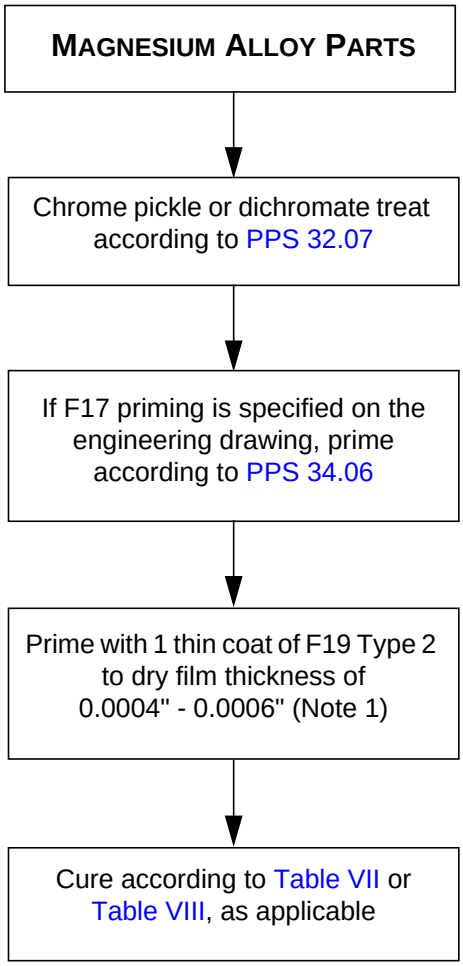
FLOW CHART 1 - SURFACE PREPARATION AND PRIMING OF ALUMINUM



Notes:

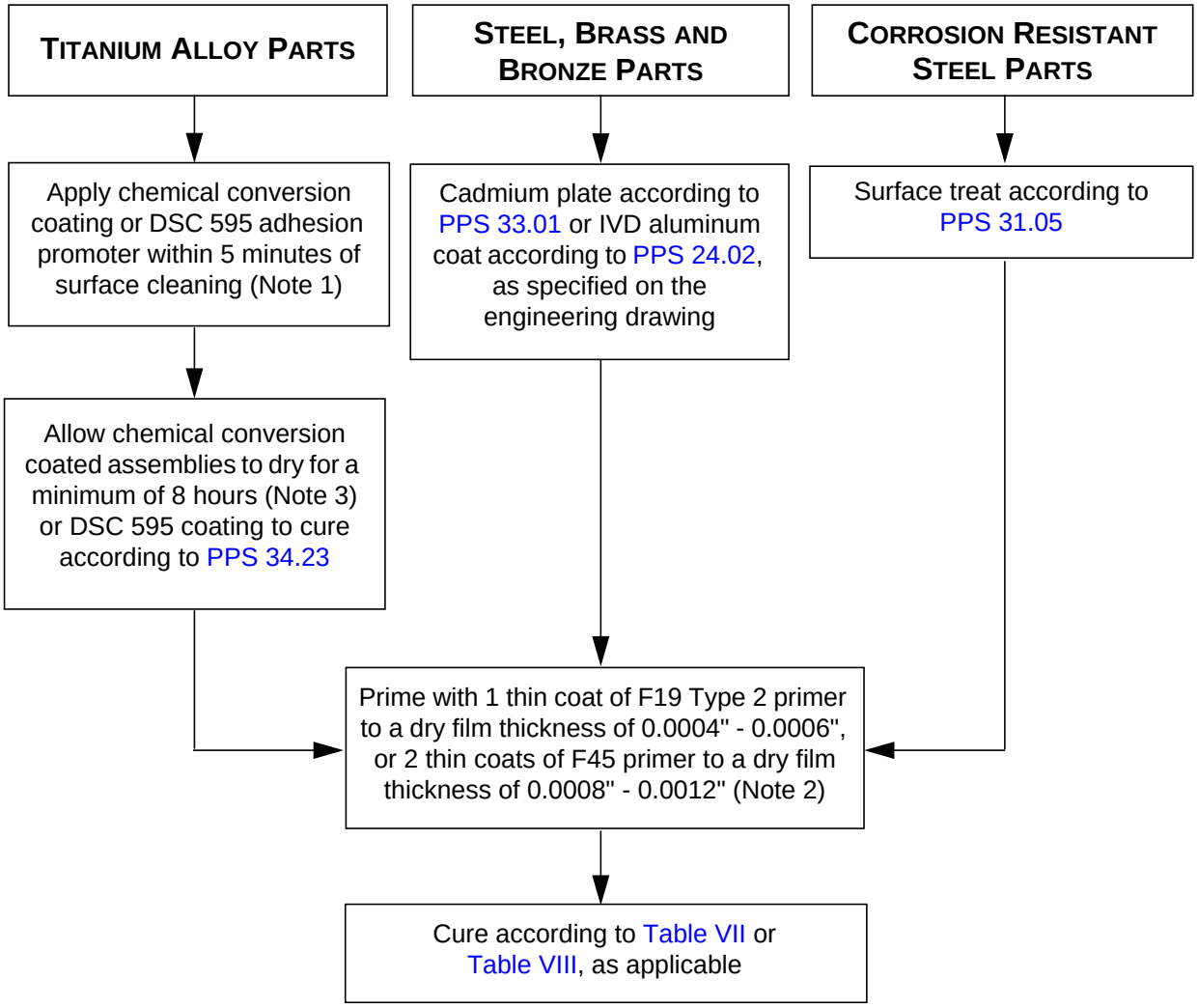
1. The entire interior surface of structurally completed assemblies (e.g., fuselage) is to be primed. Previously primed surfaces do not require scuffing before re-priming.
2. Unprimed rivet heads in primed assemblies do not require application of chemical conversion coating before priming.
3. If possible, carry out F19 or F45 priming immediately following surface preparation. If a part has become contaminated with grease or oil, reprocess it as specified in section 5.4 before priming. If a part is to be primed more than 24 hours after surface preparation or if it has become contaminated with fingerprints, solvent clean the part according to PPS 31.17 immediately before priming.
4. The engineering drawing will specify **either** chemical conversion coat (PPS 32.02, C1 or PPS 32.35, C10) **or** anodizing according to PPS 32.03, A1 (chromic acid anodizing) or PPS 32.05, A3 (sulphuric acid anodizing).
5. If using AkzoNobel Aerospace Coatings AW2001 water based epoxy primer as an alternative to F19 Type 2, primer shall be applied to unsealed anodized parts within 16 hours of anodizing. Do not use AkzoNobel Aerospace Coatings AW2001 water based epoxy primer on sealed anodized surfaces.
6. The dry film thickness on detail parts may be up to 0.0012" thick, as specified in paragraph 5.6.4.

FLOW CHART 2 - SURFACE PREPARATION AND PRIMING OF MAGNESIUM



Note 1. If possible, carry out F19 priming immediately following surface preparation. If a part has become contaminated with grease or oil, re-process according to section 5.4 before priming. If a part is to be primed more than 24 hours after surface preparation or if it has become contaminated with fingerprints, solvent clean the part according to PPS 31.17 immediately before priming.

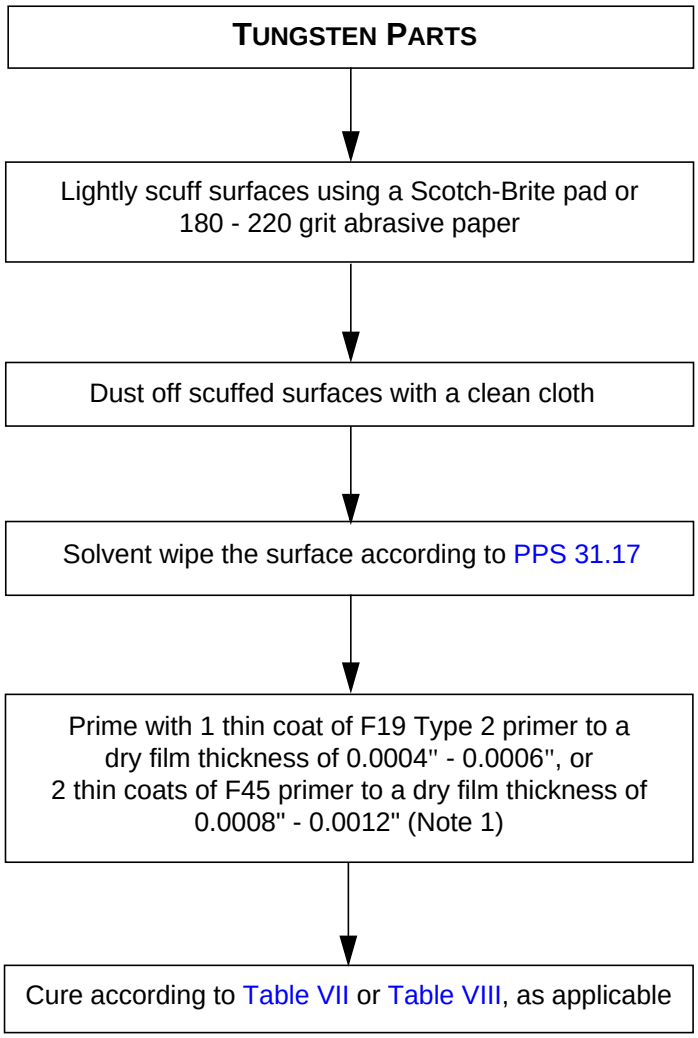
FLOW CHART 3 - SURFACE PREPARATION AND PRIMING OF TITANIUM, STEEL, BRASS, BRONZE AND CORROSION RESISTANT STEEL



NOTES:

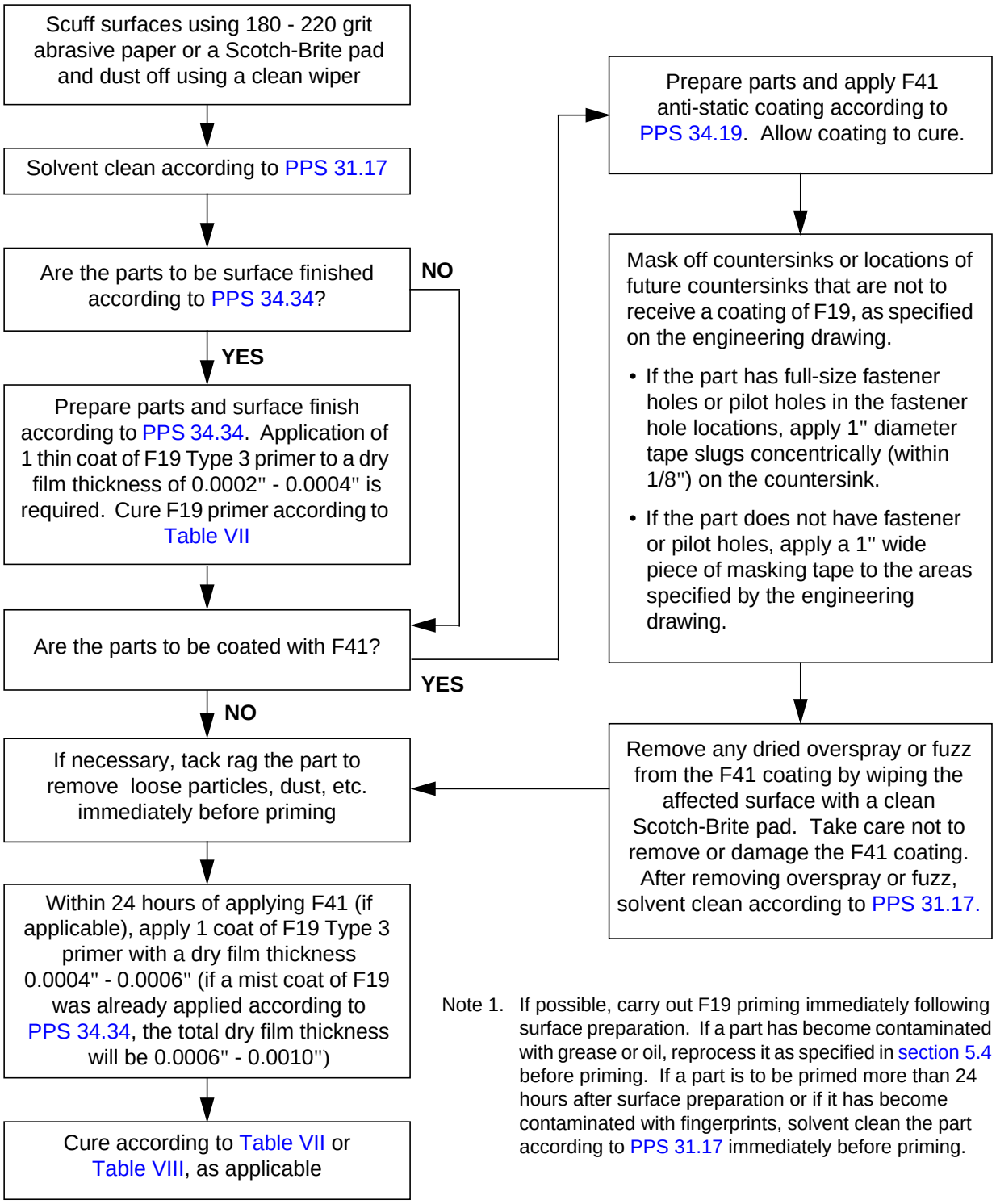
1. Manually chemical conversion coat assemblies according to PPS 32.02. For detail parts, chemical conversion coat by immersion according to PPS 32.01. Apply DSC 595 adhesion promoter according to PPS 34.23. Clean assemblies and detail parts according to PPS 31.09 before chemical conversion coating or application of DSC 595 adhesion promoter. Apply chemical conversion coating only while the parts are still wet.
2. If possible, carry out F19 or F45 priming immediately following surface preparation (make sure to allow chemical conversion coated parts to dry for at least 8 hours before priming). If a part has become contaminated with grease or oil, reprocess it as specified in section 5.4 before priming. If a part is to be primed more than 24 hours after surface preparation or if it has become contaminated with fingerprints, solvent clean the part according to PPS 31.17 immediately before priming.
3. Chemical conversion coated surfaces shall be suitably protected from contamination before application of primer.

FLOW CHART 4 - SURFACE PREPARATION AND PRIMING OF TUNGSTEN



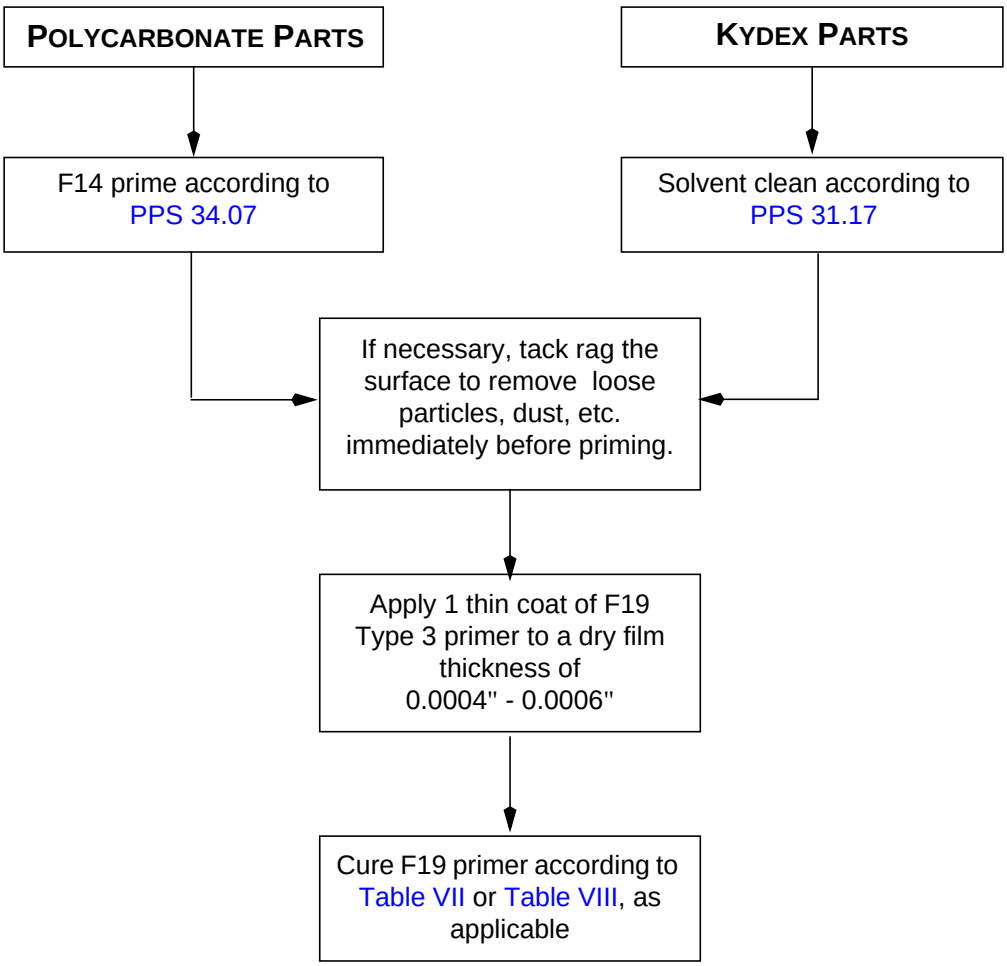
Note 1. If possible, carry out F19 or F45 priming immediately following surface preparation. If a part has become contaminated with grease or oil, reprocess it as specified in section 5.4 before priming. If a part is to be primed more than 24 hours after surface preparation or if it has become contaminated with fingerprints, solvent clean the part according to PPS 31.17 immediately before priming.

FLOW CHART 5 - SURFACE PREPARATION AND PRIMING OF FIBRE-REINFORCED COMPOSITE PARTS (NOTE 1)



Note 1. If possible, carry out F19 priming immediately following surface preparation. If a part has become contaminated with grease or oil, reprocess it as specified in section 5.4 before priming. If a part is to be primed more than 24 hours after surface preparation or if it has become contaminated with fingerprints, solvent clean the part according to PPS 31.17 immediately before priming.

FLOW CHART 6 - SURFACE PREPARATION AND PRIMING OF POLYCARBONATE AND KYDEX PARTS (NOTE 1)



Note 1. If possible, carry out F19 priming immediately following surface preparation. If a part has become contaminated with grease or oil, reprocess it as specified in section 5.4 before priming. If a part is to be primed more than 24 hours after surface preparation or if it has become contaminated with fingerprints, solvent clean the part according to PPS 31.17 immediately before priming.