BOMBARDIER
Toronto Site
PROPRIETARY INFORMATION

PPS 36.02

PRODUCTION PROCESS STANDARD

BONDING BALSA CORE TO ALUMINUM ALLOY SHEET

Issue 15
- This standard supersedes PPS 36.02, Issue 14.
- Vertical lines in the left hand margin indicate technical changes over the previous issue.
- Direct PPS related questions to christie.chung@aero.bombardier.com or (416) 375-7641.
- This PPS is effective as of the distribution date.

Prepared By:	(Christie Chung)	April 20, 2016
	PPS Group	
Approved By:	(*K. Quon*, for Bruce Campbell)	April 20, 2016
	Materials Technology	
	(Stephen Pitt)	April 21, 2016
	Quality	

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

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1 SCOPE

1.1 This Production Process Standard (PPS) specifies the procedure and requirements for bonding balsa core panels to aluminum alloy sheet using DSC 479-1 urethane adhesive.

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.

1.1.3 Procedure or requirements specified in a Bombardier BAPS, MPS, LES or P. Spec. do not supersede the procedure or requirements specified in this PPS. 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 BAERD GEN-018 - Engineering Requirements for Laboratories.

3.2 DHMS CS8.01 - End Grain Balsa Wood Panels.

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 13.39 - Bombardier Toronto Engineering Process Manual.

3.6 PPS 25.65 - DSC 479-1 One Part Urethane Adhesive.

3.7 PPS 31.17 - Solvent Usage.

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

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

3.10 PPS 34.08 - Application of Epoxy-Polyamide Primer (F19 & F45).

3.11 QAMTR 007 - Testing of Adhesives.

4 MATERIALS, EQUIPMENT AND FACILITIES

4.1 Materials

4.1.1 Aluminum alloy sheet, as specified on the engineering drawing.

4.1.2 DHMS CS8.01 end grain balsa wood panels, thickness and grade as specified on the engineering drawing.

4.1.3 DSC 479-1 urethane base adhesive.

4.2 Equipment

4.2.1 Mist spray bottle.

4.2.2 Mohair roller.

4.2.3 Neoprene rubber gloves (e.g., DSC 422-5).

4.2.4 Rubber roller.

4.2.5 Suitable platen press.

4.2.6 Temperature and humidity control equipment capable of maintaining the requirements specified in section 5.1.

4.2.7 Temperature and relative humidity continuous chart recording equipment.

4.2.8 Lint-free cotton wiping cloth (e.g. DSC 378-2).

4.3 Facilities

4.3.1 This PPS has been categorized as a Controlled Critical Process according to PPS 13.39 and as such only facilities specifically approved according to PPS 13.39 are authorized to perform bonding balsa core panels to aluminum alloy sheet using DSC 479-1 urethane adhesive according to this PPS.

4.3.2 Bombardier subcontractors shall direct requests for approval to Bombardier Aerospace Supplier Quality Management. Bombardier Aerospace facilities shall 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 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, Bombardier Toronto Materials Technology 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 Bombardier Aerospace Supplier Quality Management.

4.3.3.1 For approval of subcontractor facilities to perform bonding balsa core panels to aluminum alloy sheet using DSC 479-1 urethane adhesive according to this PPS, completion of a test program and submission of suitable test samples representative of production parts is required. Test samples shall meet the requirements specified in section 6.

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

5 PROCEDURE

5.1 Bonding Room Conditions

5.1.1 Maintain the temperature and relative humidity of the bonding areas within the range specified in Figure 1.

5.1.2 Maintain the temperature and relative humidity of the bonding areas on continuous chart recording equipment during times parts are being processed for Bombardier Toronto.

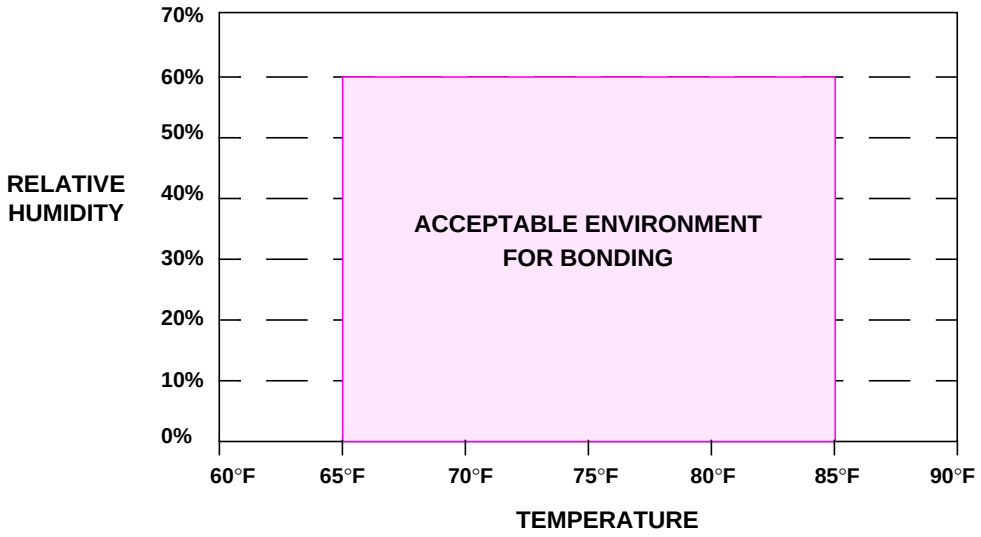

FIGURE 1 - TEMPERATURE AND HUMIDITY LIMITS

5.1.3 Inspect and clean bonding work areas at the intervals specified in Table I, or sooner where any accumulation of dust, dirt or other contamination is evident. Records of inspection and cleaning dates shall be maintained by the subcontractor and shall be available for inspection by Bombardier Aerospace.

TABLE I - SCHEDULE FOR INSPECTING AND CLEANING OF WORK AREAS

ITEMS	MAXIMUM INSPECTION TIME INTERVAL	MAXIMUM CLEANING TIME INTERVAL	METHOD OF CLEANING
Tables	24 hours	24 hours	Re-cover with clean Kraft paper
Floors	24 hours	24 hours	Vacuum and damp mop
Equipment	24 hours	24 hours	Wipe with damp cloth
Walls from the floor to a height of 7 feet	7 days	30 days	Wash with water
Walls above 7 feet high, ceilings, beams, light fixtures, etc.	30 days	6 months	Wash with water

5.2 Preparation of Parts

5.2.1 Aluminum Alloy Parts

5.2.1.1 Except as noted in paragraph 5.2.1.1.1 and paragraph 5.2.1.1.2, before bonding, conversion coat and F19 Type 2 prime all aluminum alloy sheet on both sides according to PPS 32.01 and PPS 34.08, respectively.

5.2.1.1.1 If the face of a bonded panel is specified as the finished decorative surface, conversion coat and F19 Type 2 prime the face sheet according to PPS 32.02 and PPS 34.08, respectively, on the bonding surface only.

5.2.1.1.2 Conversion coat radio rack panels on both sides according to PPS 32.01 and F19 Type 2 prime, on the bonding surface only, according to PPS 34.08.

5.2.1.2 Immediately before applying adhesive, solvent clean the bond surface according to PPS 31.17.

5.2.2 Balsa Core

5.2.2.1 Before being used for production, inspect balsa core panels for moisture content.

5.2.2.2 If moisture content exceeds the requirements specified in DHMS CS8.01, dry balsa core by placing the panels, open plied to allow access of air to all parts of each sheet, in a suitable drying oven, operating at a maximum temperature of 150°F, until the moisture content is within the limits specified in DHMS CS8.01.

5.2.2.3 Thoroughly clean balsa before applying adhesive to remove dust, machining debris or other dry contaminants using a vacuum cleaner. Do not use balsa for bonding if the surfaces are contaminated and cannot be cleaned using a vacuum cleaner.

5.3 Preparation of Adhesive

5.3.1 Prepare DSC 479-1 adhesive according to PPS 25.65.

5.3.2 The pot life of mixed DSC 479-1 adhesive shall be as specified in PPS 25.65.

5.4 Bonding

5.4.1 Perform bonding of balsa core panel to aluminum sheets as follows:

Step 1. Using a mohair roller, or other suitable spreader, apply a uniform thin coat of adhesive to one bonding surface of the balsa core panel and allow to cure a minimum of one hour at room temperature before further working.

Step 2. Apply one coat of adhesive to the bond surface of the aluminum sheet and a second coat to the balsa core panel. Each coat of adhesive shall be as thin and uniform as possible.

Step 3. Allow the adhesive to cure for 1 hour minimum at room temperature.

Step 4. Using a mist spray bottle, spray a thin coat of de-ionized water to the adhesive coated surfaces of the balsa core and the aluminum sheet.

Step 5. Allow the water to remain on the balsa core and aluminum sheet for 5 to 10 minutes, then immediately assemble the aluminum sheet to the balsa core in such a manner as to minimize air entrapment in the glue line.

Step 6. Using a rubber roller, apply moderate pressure to the bonded assembly to ensure good consolidation.

Step 7. Flip the bonded assembly over and repeat Step 1 through Step 6 to bond a new sheet of aluminum to the other side of the balsa core panel.

Step 8. Install the assembly in a suitable platen press and apply a pressure of 15 to 35 psi to the entire bonding surface and cure according to section 5.5.

5.5 Curing

5.5.1 Allow the assemblies to cure under pressure for a minimum of 24 hours at room temperature. Double the cure time for each 10°F drop in temperature below 75°F.

5.5.2 After 1 hour, verify that the platen press is maintaining the correct pressure.

5.5.3 Upon completion of curing, remove assemblies from the press and stack flat for a minimum of 72 hours at room temperature before further handling.

5.6 Clean-Up

5.6.1 Remove uncured excess adhesive from tools and assemblies according to PPS 31.17.

6 REQUIREMENTS

6.1 Production Parts

6.1.1 Bonded panels shall not exhibit bulges, warps, edge peeling or surface lifting.

6.1.2 Carry out tap testing for delaminations and voids on each side of the panel.

6.1.3 Any evidence of defects in the panels is cause for rejection.

6.2 Test Panels

6.2.1 Prepare one test panel (12" X 22" minimum size) to receipt test each new batch of DSC 479-1 adhesive as follows:

Step 1. Chemical conversion coat and F19 Type 2 prime two 0.020" thick QQ-A-250/5 Alclad 2024-T3 aluminum alloy sheets on both sides according to PPS 32.01 and PPS 34.08, respectively.

Step 2. Solvent clean the F19 primed aluminum alloy sheets' bond surfaces according to PPS 31.17.

Step 3. Prepare 3/8" or 0.5" thick DHMS CS8.01, Type ALL, balsa core panel according to section 5.2.2.

Step 4. Bond balsa core panel to aluminum sheets according to section 5.4.

Step 5. Cure according to section 5.5.

6.2.2 Submit the test panel to an approved laboratory as specified in paragraph 4.3.3.2 for testing according to QAMTR 007.

6.2.2.1 The average climbing drum peel strength shall not be less than 100 inch pound per 3 inch width, with no single specimen less than 90 inch pound per 3 inch width.

7 SAFETY PRECAUTIONS

7.1 Safety precautions applicable to the materials and procedures specified herein shall be defined by the subcontractor performing the work for Bombardier Toronto.

8 PERSONNEL REQUIREMENTS

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

9 STORAGE

9.1 Store adhesive components according to the precautions necessary for flammable materials.

9.2 Store adhesive components at a temperature of 70 - 80°F (21 - 26°C).

9.3 Storage life of DSC 479-1 adhesive shall be according to PPS 13.28.

9.4 Clearly mark containers of adhesive components with the storage life expiry date.

9.5 When not in use, keep containers of adhesive components tightly closed.

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

9.7 Store solvents according to PPS 31.17.