BOMBARDIER
Turboprops *(de Havilland)*

PPS 25.54

PRODUCTION PROCESS STANDARD

BONDING USING ACRYLIC PLASTIC CEMENT

Issue 3
- This standard supersedes PPS 25.54, Issue 2.
- Vertical lines in the left hand margin indicate changes over the previous issue (e.g., changes initiated by Bombardier Corrective Action Request CAR #T4-4.9-133 and Bombardier Turboprops PPS Amendment Request AR #8464).

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This PPS is effective as of the distribution date specified on the accompanying distribution notice.

Direct any PPS related questions to the PPS Group (416) 375-7641.

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1 SCOPE

1.1 This Production Process Standard (PPS) specifies the procedure and requirements for bonding transparent acrylic plastic (plexiglas, MIL-P-5425) with Solvent Type II cement.

1.1.1 This PPS complements the engineering drawings that specify its use as an authorized instruction. The procedure specified in this PPS must be followed to ensure compliance with all applicable specifications. In general, if this PPS conflicts with the engineering drawing, follow the engineering drawing. The requirements specified in this PPS are necessary to fulfil the engineering design and reliability objectives.

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

1.1.3 Procedure or requirements specified in a Bombardier BAPS, MPS, LES or P. Spec. **do not** supersede the procedure or requirements specified in this PPS. 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 Turboprops, all materials must be approved and assigned Material Safety Data Sheet (MSDS) numbers by the Bombardier Turboprops 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 Turboprops Environment, Health and Safety Department.

3 REFERENCES

3.1 PPS 10.01 - Handling, Care and Finishing of Acrylic Plastic (Plexiglas).

3.2 PPS 13.26 - General Subcontractor Provisions.

3.3 PPS 31.17 - Solvent Usage.

3.4 QDI-15-01 - Storage Life of Adhesives, Sealants, Paints and Composite Products - *Bombardier Turboprops internal operating procedure*.

4 MATERIALS AND EQUIPMENT

4.1 Materials

4.1.1 Cement, Solvent Type II, Crystal Glass Co.

4.1.2 Masking tape, (e.g., Scotch Tape 600, 3M Company).

4.1.3 Methylene chloride.

4.2 Equipment

4.2.1 Suitable brush.

4.2.2 C-clamps or suitable clamping jig.

4.2.3 Sharp knife.

5 PROCEDURE

5.1 Preparation of Adhesive

5.1.1 Add the contents of one capsule of catalyst per pint of cement.

5.1.2 Thoroughly stir cement in its own container to obtain a homogeneous mixture.

5.2 Preparation of Parts

5.2.1 Prepare parts for bonding as follows:

Step 1. Remove protective masking paper, if any, from the parts. Save for re-application after bonding.

Step 2. Ensure that parts have been anneal formed or machined according to PPS 10.01 no more than 24 hours before the cementing operation.

Step 3. Smoothly finish the surfaces to be cemented such that they fit accurately together over the entire bonding area.

Step 4. If necessary, solvent clean acrylic plastic according to PPS 31.17 to remove grease or oil from the surfaces to be cemented.

5.2.2 Mask adjacent surfaces with tape, approximately 1/16" from the edge of the surface to be bonded. Apply tape firmly to the part to prevent seepage of cement under the tape and to confine the softening action of the cement. If several pieces of tape are used, ensure that they overlap by approximately 1/4".

5.3 Application of Cement

5.3.1 Soaking Method

5.3.1.1 If cement is to be applied by the soaking method, ensure that the cement's specific gravity is frequently checked and maintained according to Table I by addition of methylene chloride when the specific gravity falls below the minimum specified.

5.3.1.2 Immerse one of the bonding surfaces in the cement at room temperature (65°F minimum) for several minutes. The period of immersion will vary for different joints and can best be determined by experimentation. The “cushion” effect produced by the softening action of the cement must be deep enough to compensate for minor discrepancies in the fit of the parts.

TABLE I - SPECIFIC GRAVITY OF CATALYSED CEMENT

TEMPERATURE (°F)	SPECIFIC GRAVITY
68	1.17 - 1.21
77	1.16 - 1.20
86	1.15 - 1.19
95	1.14 - 1.18

5.3.2 Brush Application

5.3.2.1 When the shape of the parts does not lend itself to soaking, brush apply the cement at room temperature (65°F minimum) as follows:

Step 1. If necessary, thicken the cement by adding acrylic chips or shavings to achieve the consistency of a syrupy liquid. This may facilitate brushing.

Step 2. Brush cement evenly onto one of the surfaces to be cemented.

Step 3. Allow sufficient time for the surface to soften. The “cushion” effect produced by the softening action of the cement must be deep enough to compensate for minor discrepancies in the fit of the parts.

5.4 Bonding

5.4.1 Perform bonding in a clean area as specified in section 6.2.

5.4.2 Bond parts as follows:

Step 1. Before the cemented surfaces dries, assemble the wet softened surface to the dry mating surface and hold together gently for 20 to 30 seconds. This allows the dry surface to absorb some of the cementing liquid.

Step 2. Apply just enough even pressure over the cemented surfaces using clamps or a suitable jig to force out any air bubbles and allow the two parts to move together as shrinkage of the “cushion” progresses.

Step 3. Leave the cemented assembly clamped together until the joint is thoroughly hardened (4 hours minimum). If the extruded material is trimmed or sanded before the joint is completely set, a visible scar will be left.

5.5 Post Bonding Procedure

5.5.1 After bonding, process the assembly as follows:

Step 1. Using a sharp knife, remove any extruded adhesive from the joint.

Step 2. Place the assembly in a suitable fixture to provide support and anneal according to PPS 10.01.

Step 3. If required, trim material extruded at the joint with a sharp knife.

Step 4. If necessary, re-apply protective masking paper.

5.6 Clean-Up

5.6.1 Keep tools and equipment thoroughly clean. Remove cement from tools and equipment by solvent cleaning according to PPS 31.17.

6 REQUIREMENTS

6.1 General

6.1.1 Visual indication of poor adhesion must be cause for rejection.

6.1.2 The bond must be free of entrapped air, cracks, cavities or other imperfections.

6.1.3 Excess extrusion of material over the adjacent surfaces is not acceptable.

6.1.4 Do not use solvents to remove excess material.

6.2 Bonding Area Conditions

6.2.1 The cleanliness of the bonding area (e.g., tables, floors, equipment, walls, etc.) shall be checked and cleaned as necessary to ensure that dust accumulation, dirt or other contamination will not be evident. Maintain records of dates of cleaning.

6.2.2 Maintain the temperature and relative humidity of the bonding areas within the range specified in Figure 1. Bonding when the relative humidity is below 30% will increase the chance of static discharge and worker discomfort, but will not affect part quality.

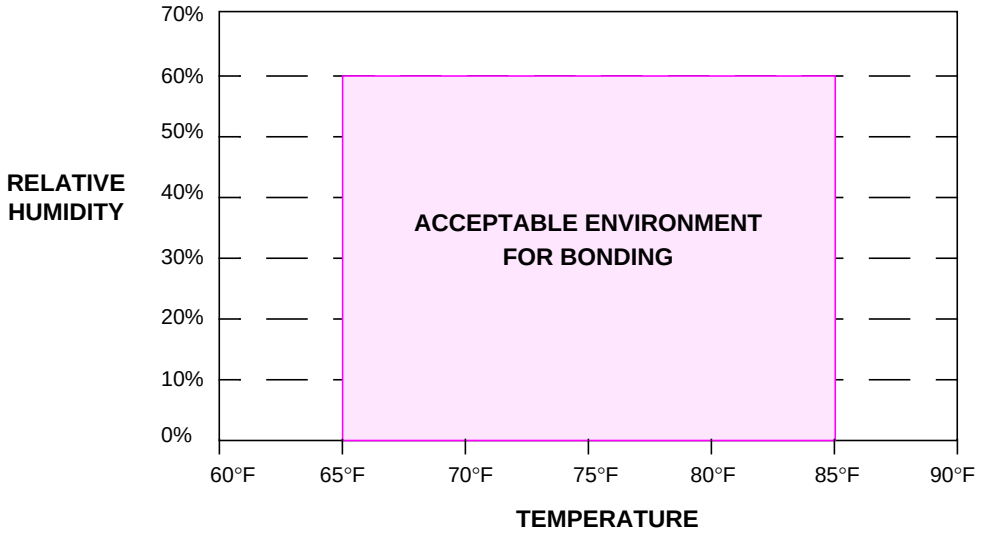

FIGURE 1 - TEMPERATURE AND HUMIDITY LIMITS

7 SAFETY PRECAUTIONS

7.1 Keep cement away from fire and other sources of ignition.

7.2 Ensure sufficient ventilation is supplied at all times when using cement. Avoid inhalation of fumes or vapours from cement.

7.3 Avoid skin contact with cement. Do not use protective hand cream as it may contaminate cleaned or cement coated surfaces. If skin contact occurs, wash thoroughly with soap and water.

7.4 Avoid eye contact with adhesive. If eye contact occurs, immediately flush eyes in a directed stream of water for at least 15 minutes while forcibly holding eyelids apart to ensure completed irrigation of all eye and lid tissue. Contact the Health Centre and a physician.

7.5 Wash hands thoroughly with soap and water immediately after using cement.

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

8 PERSONNEL REQUIREMENTS

8.1 Personnel responsible for bonding transparent acrylic plastic with Solvent Type II cement must have a basic understanding of the procedure and requirements as specified herein and must have exhibited their familiarity to their supervisor.

9 STORAGE

9.1 Store catalysed adhesive at a temperature of 60 to 80°F (16 to 26°C) according to the precautions necessary for flammable materials.

9.2 The storage life of the catalysed adhesive is specified in QDI-15-01. Clearly mark containers of cement with the storage life expiry date.

9.3 When not in use, keep containers of catalysed cement tightly closed.

9.4 Always use oldest stock first.