BOMBARDIER
Toronto Site
PROPRIETARY INFORMATION

PPS 10.10

PRODUCTION PROCESS STANDARD

FABRICATION OF POLYURETHANE FOAM

Issue 14
- This standard supersedes PPS 10.10, Issue 13.
- Vertical lines in the left hand margin indicate 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.

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1 SCOPE

1.1 This Production Process Standard (PPS) specifies the procedure and requirements for mixing and moulding of polyurethane foam.

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 PPS 10.22 - Preparation of Moulds.

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 13.39 - Bombardier Toronto Engineering Process Manual.

3.6 PPS 31.17 - Solvent Usage.

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

4 MATERIALS, EQUIPMENT AND FACILITIES

4.1 Materials

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

4.1.2 BASF Foam, Semi-Rigid, parts A (EX-S-3120 Resin) and B (17 ISO Hardener).

4.1.3 BASF Elastofoam I 1178-WUC 3122T, Semi-Rigid, 3 parts (R/FR Paste/Iso).

4.1.4 DSC 525-1 Stafoam AA602.

4.1.5 Gyftane FR-2100, Rigid, parts A and B.

4.1.6 Isofoam PE-2, Rigid, parts A (polymer component) and B (resin component).

4.1.7 Stepanfoam SX-195, Semi-Rigid, parts A (SX-195T base) and B (SX-195R).

4.1.8 Vultafoam 16-F-1904, Rigid, parts A and B.

4.1.9 Vultafoam XR-1116-S, Rigid, parts A and B.

4.2 Equipment

4.2.1 Chemical splash goggles.

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

4.2.3 Mixing device, nylon or metal propeller type.

4.3 Facilities

4.3.1 This PPS has been identified as a “Critical or Special” process according to PPS 13.39 and as such only facilities specifically approved according to PPS 13.39 are authorized to perform mixing and moulding of polyurethane foam 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 mixing and moulding of polyurethane foam 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.

5 PROCEDURE

5.1 General

5.1.1 Polyurethane foams contain isocyanate. Personnel working with these materials shall be familiar with the safety precautions listed in section 7 before handling or using such materials.

5.2 Preparation of Parts

5.2.1 Metal parts, which are to come in contact with foam, shall be anodized, alodined or primed, as specified on the engineering drawing. Immediately before applying foam, solvent clean the contacting surfaces according to PPS 31.17.

5.2.2 Prime fibre reinforced and polycarbonate parts which are to be in contact with the foam according to PPS 34.07. Alternatively, fibre reinforced parts may be lightly sanded with 180 - 220 grit abrasive paper in place of priming.

5.2.3 If possible, heat parts to be filled with foam to approximately 100°F.

5.3 Mould Preparation

5.3.1 Prepare moulds according to PPS 10.22.

5.3.2 Except when using BASF or Stepanfoam polyurethane foam systems, before applying foam, pre-heat the mould to 100°F ± 15°F. When using BASF and Stepanfoam systems, pre-heating of the mould is not required.

5.4 Foam Preparation

5.4.1 Weigh out the required amounts of the system components into separate containers in the mixing ratio specified in Table I.

5.4.2 For two component systems, add the second component of the particular system to the first and mix thoroughly.

5.4.3 For BASF Elastofoam I 1178 (3 component system), add FR Paste to the resin component (R) and mix thoroughly before adding the third component (ISO) to the mix and then continue mixing.

5.4.4 When mixing BASF foam systems, use a nylon or metal propeller type mixing device, mounted in a drillmotor; operate the drillmotor at a reduced rpm as required, by using an air reducer.

5.4.5 When the mixture appears uniform and lighter in colour, pour the mix immediately into the prepared moulds or part cavities.

5.5 Moulding Foam

5.5.1 Distribute the foam evenly in the prepared mould or part cavity so as to minimize the distance the foam shall travel to fill the mould or cavity.

5.5.2 Allow the foam to remain in the mould for a minimum of 30 minutes before removing.

5.5.3 Except for Stafoam AA602, allow the foam to cure for a minimum of 1 hour at room temperature before cutting or machining. Allow Stafoam AA602 to cure for either a) 2 hours at 250°F to 275°F, b) 4 hours at 120°F, or c) 24 hours at room temperature.

TABLE I - FOAM MIXING DATA

FOAM SYSTEM	COMPONENTS	MIXING RATIO (Parts by weight)	POT LIFE
BASF Foam (Semi-Rigid foam)	EX-S-3120 Resin	100	15 seconds
	17 ISO Hardener	54	
BASF Elastofoam I 1178-WUC 3122T (Semi-Rigid foam)	R	72.5	45 seconds
	FR Paste	27.5	
	ISO	38	
Gyftane FR-2100 (Rigid foam)	Part A	100	30 seconds
	Part B	100	
Isofoam PE-2 (Rigid foam)	Part A - Polymer	100	1/2 to 2 minutes
	Part B - Resin	100	
Stepanfoam SX-195 (Semi-Rigid foam)	SX-195T base	100	
	SX-195R	43	
DSC 525-1 Stafoam AA602 (Note 1)	T	100	1 minute at room temperature
	R	39	
Vultafoam 16-F-1402 (Rigid foam)	Part A	100	1/2 to 2 minutes
	Part B	100	
Vultafoam 16-F-1904 (Rigid foam)	Part A	100	
	Part B	100	
Vultafoam XR-1116-S (Rigid foam)	Part A	100	
	Part B	140	

Note 1. The cure time of Stafoam AA602 shall be one of the following: 2 hours at 250°F to 275°F; or 4 hours at 120°F; or 24 hours at room temperature.

5.6 Clean-Up and Disposal

5.6.1 Scrape excess uncured foam on adjacent surfaces back into mixing container, using a non-metallic scraper.

5.6.2 Dispose of excess foam and all chemical wastes according to national legislation and local regulations.

5.6.3 In the event of spillage of components or mixed foam, the immediate area shall be cleared of all personnel and the spill cleaned up according to national legislation and local regulations.

6 REQUIREMENTS

6.1 The mould or part shall be completely filled with foam.

6.2 There shall be no uncured areas of foam.

6.3 Surface irregularities such as bubbles, porosity and cavities which are not detrimental to the appearance or function of the part are acceptable.

6.4 The “First-off” of each new part shall be used to evaluate the production technique, and shall then be submitted to Bombardier Toronto Engineering for assessment.

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 “Critical or Special Process” according to PPS 13.39. Refer to PPS 13.39 for personnel requirements.

9 STORAGE

9.1 Store polyurethane foam components in a dry area at a temperature of 60°F to 80°F.

9.2 Keep all containers tightly closed when the materials are not in use.

9.3 The storage life of polyurethane foam components shall be as specified in PPS 13.28. For polyurethane foam components which are not referenced in PPS 13.28, refer to Liaison Engineering for the storage life.