BOMBARDIER

Toronto Site

PROPRIETARY INFORMATION

PPS 10.22

PRODUCTION PROCESS STANDARD

PREPARATION OF MOULDS

Issue 8
- This standard supersedes PPS 10.22, Issue 7.
- 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 preparation of composite, metal, wood and DSC 234-8 release fabric coated moulds used to fabricate composite laminates, sandwich panel assemblies and cast polyurethane foam parts.

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 13.13 - Personal Protective Respiratory Equipment.

3.2 PPS 13.26 - General Subcontractor Provisions.

3.3 PPS 13.39 - Bombardier Toronto Engineering Process Manual.

3.4 PPS 31.17 - Solvent Usage.

4 MATERIALS, EQUIPMENT AND FACILITIES

4.1 Materials

4.1.1 Abrasives: Scotch-Brite pads, Type A, fine (maroon); Scotch-Brite Roloc Disc, very fine (blue); Scotch-Brite Roloc Disc, super fine (grey).

4.1.2 DSC 234-13 mould release agents.

4.1.3 DSC 234-13-5 Parting Agent 13.

4.1.4 DSC 234-14 mould sealer.

4.1.5 Mould wax, mirror glaze (mirror bright). Used only for preparing wooden moulds.

4.2 Equipment

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

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 preparation of composite, metal, wood and DSC 234-8 release fabric coated moulds used to fabricate composite laminates, sandwich panel assemblies and cast polyurethane foam parts 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 preparation of composite, metal, wood and DSC 234-8 release fabric coated moulds used to fabricate composite laminates, sandwich panel assemblies and cast polyurethane foam parts 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 shall direct requests for approval to Bombardier Supplier Quality Management. Bombardier facilities shall 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 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 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 Bombardier Aerospace Supplier Quality Management.

5 PROCEDURE

5.1 General

5.1.1 Before use, inspect moulds for evidence of defects (e.g., surface chips, nicks, cracks, abrasions, etc.) that could cause parts to be rejected. Repair moulds showing evidence of damage or deterioration before use.

5.1.2 Perform pre-fitting of cores, foam inserts, foam edging, etc. into moulds before applying the mould release agent.

5.1.3 DSC 234-13 mould release agents produce an extremely thin, polymerized resin coating which, if applied to a clean surface and properly cured, will provide an acceptable release interface.

5.2 Preparation of Metallic Moulds

5.2.1 Prepare metallic moulds as follows:

Step 1. Ensure that metallic moulds are free of contamination such as moisture, oil, grease, release agents, etc.

Step 2. If necessary, abrade the mould surface using a very fine (blue) Scotch-Brite disc until all traces of resin residue have been removed. Buff the mould surface using a super fine (grey) Scotch-Brite disc. Solvent wash the mould surface according to PPS 31.17.

Step 3. Mask off the area of the vac-seal before applying mould release agent in order to facilitate vacuum bagging after part lay-up.

Step 4. Apply DSC 234-13 mould release agent to cleaned metallic moulds according to section 5.6.

5.3 Preparation of DSC 234-8 Release Fabric Coated Moulds

5.3.1 Inspect moulds faced with Teflon coated glass cloth (i.e., DSC 234-8 release fabric) for contamination such as moisture, oil, grease, etc. If contaminated, solvent wash according to PPS 31.17.

5.3.2 Moulds faced with Teflon coated glass cloth do not require further preparation before lay-up.

5.4 Preparation of Composite Moulds

5.4.1 Solvent wash composite moulds according to PPS 31.17 to remove all traces of resin residue. If there are still traces of residue, scrub clean with Scotch-Brite pads. Ensure that the cleaned mould is free of contamination such as moisture, oil, grease, release agents, etc.

5.4.2 If the composite moulds have surface porosity, surface crazing, pinholes, etc. seal as follows:

Step 1. Soak a cloth with DSC 234-14 mould sealer until wet but not dripping.

Step 2. Start at one end of the mould and work towards the other in order to apply a continuous thin wet film. If coating a large area, the application cloth may require re-soaking several times to maintain the thin wet film. Do not wipe back over an area just coated once the solvents have flashed off as the mould sealer dries rapidly. Do not allow the sealer to collect and dry in pools. These pools will not cure to a thin resin coating but rather as powdery white deposits with poor release qualities. Soak up the pools with a clean cloth.

Step 3. Apply a minimum of 2 coats of DSC 234-14 mould sealer allowing 1 hour air dry time between each coat

Step 4. Cure the final coat of DSC 234-14 mould sealer using one of the following cure schedules:

- 24 hours at room temperature
- 1 hour at 200°F to 300°F
- a standard oven cure cycle

5.4.3 Mask off the area of the vac-seal before applying mould release agent in order to facilitate vacuum bagging after part lay-up.

5.4.4 Apply DSC 234-13 mould release agent to cleaned composite moulds according to section 5.6.

5.5 Preparation of Wooden Moulds

5.5.1 Prepare wooden moulds as follows:

Step 1. Solvent wash wooden moulds according to PPS 31.17.

Step 2. Apply a thin uniform coat of mould wax to the face of the mould and buff to a high gloss.

Step 3. Spray two light coats and one wet coat of undiluted Parting Agent 13 onto the waxed surface to produce a thin even film that covers the entire waxed area. Allow the Parting Agent 13 film to air dry for 1 to 4 hours before beginning the lay-up. As an alternative to Parting Agent 13, it is acceptable to apply DSC 234-13 mould release agent to cleaned wooden moulds according to section 5.6.

5.6 Application of Mould Release Agent

5.6.1 Ensure that the mould surface is clean and dry.

5.6.2 Ensure that the vac-seal area is masked off.

5.6.3 Apply mould release agent as follows:

Step 1. If necessary, it is acceptable to warm the mould to 120°F to drive off moisture entrapped on the mould surface.

Step 2. Soak a cloth with the mould release agent selected from Table I until it is wet but not dripping.

Step 3. Start at one end of the mould and work towards the other end while applying a continuous, thin, wet film. If coating a large area, the application cloth may require re-soaking several times to maintain the thin wet film. Do not wipe back over an area just coated once the solvents have flashed off as the mould release agent dries rapidly. Do not allow the release agent to collect and dry in pools. These pools will not cure to a thin resin coating but rather as a white deposit with poor release qualities. Soak up pools with a clean cloth.

Step 4. Apply 1 coat of DSC 234-13 mould release agent to previously treated moulds. If the mould has not been previously treated (i.e., new mould) or if all the release agent coats have been completely removed either by solvent washing or other means, apply a minimum of 3 coats of DSC 234-13 mould release agent. Allow 15 minutes between coats to air dry as specified in Table I for complete solvent evaporation.

Step 5. After applying the final coat of mould release agent, remove the applied masking tape on the vac-seal area.

Step 6. Cure the final coat of mould release agent according to Table I before laying-up any parts on the mould.

TABLE I - MOULD RELEASE AGENT CURE TIMES

MATERIAL	AIR DRY	FULL CURE
DSC 234-13-3 (Loctite Frekote 44 NC)	15 minutes	3 hours at room temperature or 15 minutes at 200°F to 300°F
DSC 234-13-4 (Loctite Frekote 700NC)	15 minutes	15 minutes at room temperature

6 REQUIREMENTS

6.1 Moulds shall be free from surface chips, nicks, cracks, abrasions, etc. that could cause parts to be rejected due to mould imperfections.

6.2 Moulds showing evidence of damage or deterioration shall be properly repaired before being used.

6.3 Prepared moulds shall be free of contamination such as moisture, oil, grease, etc.

7 SAFETY PRECAUTIONS

7.1 Observe standard plant safety precautions when performing the procedure specified herein.

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

7.3 Do not smoke or eat in the mould preparation areas.

7.4 Wear protective respiratory equipment according to PPS 13.13 when applying mould sealer or mould release agent.

7.5 Wear neoprene gloves when applying mould sealer or mould release agent.

7.6 Keep all containers closed when not in use.

7.7 Avoid skin contact with materials specified herein. If contact occurs, wash the contact area thoroughly with soap and water.

7.8 Avoid eye contact with materials specified herein. If contact occurs, immediately flush the eyes with large quantities of water for a minimum of 15 minutes at an eye wash station and report to the Health and Safety Centre.

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 additional personnel requirements. Certified and/or qualified personnel shall have a good working knowledge of the following, as applicable:

- PPS 10.22, engineering drawing notes and work orders regarding the preparation of moulds for use in the fabrication of fibre reinforced composite parts.
- The following theories regarding the preparation of moulds for use in the fabrication of fibre reinforced composite parts:
  - the characteristics of the different types of moulds such as metallic, composite, wooden and DSC 234-8 coated moulds.
  - the characteristics of the mould release agents.
  - why the use of mould sealer is required for composite moulds.
  - why it is necessary to ensure that the mould is free of contaminants before applying the mould release agents.
- The process and technique of preparing moulds for use in the lay-up of composite parts, specifically cleaning of moulds to remove contaminants, the application of liquid mould release agents, etc.

9 STORAGE

9.1 Label DSC 234-13 mould release agents and DSC 234-14 mould sealer containers as “Mould Release Agent” and “Mould Sealer”, respectively.

9.2 Use closed type containers with a pouring spout to store DSC 234-13 mould release agents and DSC 234-14 mould sealer in order to minimize airborne particles and moisture contamination as well as solvent evaporation.

9.3 DSC 234-13-3 (Loctite Frekote 44 NC), DSC 234-13-4 (Loctite Frekote 700 NC) and DSC 234-14 have a shelf life of one year in an unopened can. Reject mould release agents and mould sealers exceeding the specified maximum shelf life.

9.4 Store containers of Parting Agent 13 with the precautions necessary for flammable materials.