BOMBARDIER

Toronto Site

PROPRIETARY INFORMATION

PPS 10.52

PRODUCTION PROCESS STANDARD

CERTIFICATION OF PLATEN PRESS

Issue 5
- This standard supersedes PPS 10.52, Issue 4.
- 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.

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TABLE OF CONTENTS

Sections **Page**

Tables

Figures

1 SCOPE

1.1 This Production Process Standard (PPS) is to identify the equipment and operating requirements of platen presses used by Bombardier Toronto or its subcontractors for metal bonding and fabrication of composite structures.

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 10.28 - Assembly of Wire Thermocouples.

3.2 PPS 13.26 - General Subcontractor Provisions.

3.3 PPS 13.39 - Bombardier Toronto Engineering Process Manual.

3.4 QAPI 3.8.7.20 - Control of Inspection, Measuring and Test Equipment - *Bombardier Toronto internal Quality procedure*.

4 MATERIALS, EQUIPMENT AND FACILITIES

4.1 Materials

4.1.1 Thermocouples prepared according to PPS 10.28.

4.2 Equipment

4.2.1 Leather gloves (e.g., DSC 422-3).

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 utilize the platen press specified herein for metal bonding and fabrication of composite structures according to the applicable fabrication PPS (i.e., PPS 10.xx series or PPS 36.xx series).

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 Unless otherwise specified by Bombardier Aerospace Toronto Materials Technology, for approval of subcontractor facilities utilizing the platen press specified herein for metal bonding and fabrication of composite structures according to the applicable PPS's, completion of a test program and submission of suitable test samples representative of production parts is required. Test samples shall meet the requirements of the applicable fabrication PPS (i.e., PPS 10.xx series or PPS 36.xx series). Certification and re-certification of the platen press shall be as specified in section 6.

5 PROCEDURE

5.1 General

5.1.1 Platen presses meeting the requirements of this standard will be certified for curing and bonding both composites, and metal bonding.

5.1.2 Platen presses may receive a partial certification for curing composite parts at 260°F ± 10°F or metal bonded parts at 250°F ± 10°F, if the platen press will not be used for curing parts at higher temperatures.

5.1.3 The platen press control mode may be either manual or automatic, or combinations thereof. The control mode selected to run operational tests shall also be used in production. If a different control mode is later implemented, test and certify the platen press to that mode.

5.1.4 The platen press shall be clean and free from dirt, oil or any material detrimental to bonded structure.

5.1.5 Prepare and calibrate thermocouples according to PPS 10.28.

5.2 Platen Press Equipment Checks and Calibration

5.2.1 General

5.2.1.1 The pressure, thermal input, and cooling capacity of the platen press shall be adequate to meet the cure schedule as specified in the applicable fabrication PPS when operating in a fully loaded condition.

5.2.2 Temperature

5.2.2.1 Calibrate the platen press temperature set-point controller and monitoring equipment (hardware and software) according to QAPI 3.8.7.20.

5.2.2.2 Equip the platen press with a sufficient number of thermocouple connectors to monitor part temperatures according to the requirements of the applicable fabrication PPS.

5.2.2.3 Temperature recording equipment shall be capable of continuously recording each operating thermocouple throughout the cure cycle. However, multi-point recorders are acceptable, providing that each operating thermocouple is monitored at least once every 6 minutes.

5.2.2.4 The combined accuracy of the thermocouple, junction box, and recorder, shall be ± 5°F from 100°F to 365°F.

5.2.3 Pressure

5.2.3.1 Calibrate the platen press pressure set-point controller and monitoring equipment (hardware and software) according to QAPI 3.8.7.20.

5.2.4 Elapsed Time Measurement Equipment

5.2.4.1 Equip the platen press with elapsed time measurement equipment capable of continuously monitoring and logging the lapsed time during the heat-up, curing period, and cool-down of the platen press cycle. However, the heat-up rates of leading and lagging thermocouples may be determined by a multi-point recorder printout.

5.2.4.2 Chart timing accuracy shall be within ± 2% of the actual elapsed time.

5.2.4.3 Calibrate elapsed time measuring equipment according to QAPI 3.8.7.20.

5.3 Operational Test - Dummy Load

5.3.1 During the operational test, the platens should be parallel.

5.3.2 Prepare a dummy panel for the operational test that will meet the following:

- The heat sink capacity of the dummy panel shall be at least equal to the maximum heat sink capacity that could occur under production conditions and the thermal conductivity of the dummy panel shall be similar to the thermal conductivity of the parts that will be made at that facility.
- For composite structures, the material of the dummy panel shall consist of cured or uncured fiberglass or composite structure or scrap that would represent a typical construction. For metal bonding, the material of the dummy panel shall consist of racks, tools, platens, and cured or uncured scrap metal laminates.
- Equip the dummy panel with a total of 10 thermocouples, 5 on the top and 5 on the bottom, positioned as shown in Figure 1.

5.3.3 Perform operational testing as follows:

Step 1. Load the platen press with the dummy panel.

Step 2. Gradually apply pressure to within $\pm$ 5 Kg/cm^2 of the required manometer setting for a 35 psi cure.

Step 3. Heat the dummy panel ensuring that the following requirements are met:

- Minimum permissible heat-up rates calculated from lagging thermocouple data are as follows:

  130°F to 190°F . . . . . 2°F/minute

  190°F to 230°F . . . . . 1°F/minute

  230°F to 250°F . . . . . .0.3°F/minute
- The leading thermocouple shall not exceed a heat-up rate of 8°F per minute.
- Calculate heat-up rates for each 5 minute interval.

After the leading thermocouple reaches 250°F, allow up to 60 minutes for part temperatures to reach 260°F $\pm$ 10°F. Each thermocouple shall then maintain 260°F $\pm$ 10°F for a minimum of 30 minutes.

Step 4. If certification to 355°F capability is desired, continue heating the platen press ensuring that the following part temperature requirements are met:

- Minimum permissible heat-up rates calculated from lagging thermocouple data are as follows:

  270°F to 330°F . . . . . 1°F/minute

  330°F to 345°F . . . . . .0.3°F/minute
- The leading thermocouple shall not exceed a heat-up rate of 5°F per minute.
- Calculate heat-up rates for each 5 minute interval.

After the leading thermocouple reaches 345°F, allow up to 60 minutes for part temperatures to reach 355°F ± 10°F. Each thermocouple shall then maintain 355°F ± 10°F for a minimum of 30 minutes.

Step 5. Cool the dummy panel to 125°F using a cooling rate not exceeding 5°F per minute while maintaining the pressure. Release the pressure at 125°F and terminate the run.

Step 6. Save temperature plots. Maintain adequate records to clearly document the results of the test run.

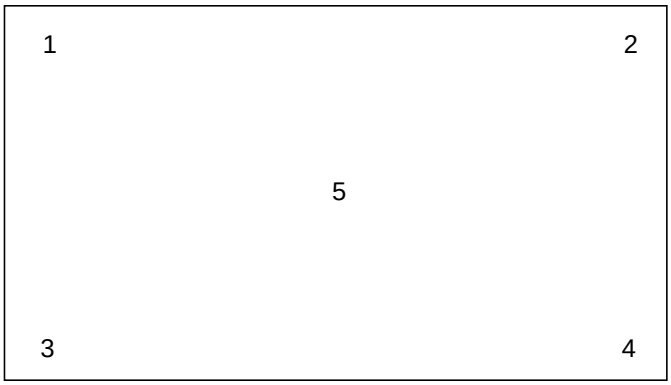

FIGURE 1 - DISTRIBUTION OF TEST THERMOCOUPLES

6 REQUIREMENTS

6.1 Refer to Table I for a listing of the checks and operational tests required for initial certification and re-certification.

TABLE I - CERTIFICATION AND RE-CERTIFICATION REQUIREMENTS

	SECTION	INITIAL CERTIFICATION	RE-CERTIFICATION (Note 1)
Platen Press Equipment Checks and Calibration	section 5.2	yes	every 6 months
Operational Test - Dummy Load	section 5.3	yes	every 6 months

Note 1. When the platen press has been overhauled or there has been an increase in the maximum production heat sink load, re-certify the platen press by the performance of the platen press equipment checks and calibration and the operational test before further fabrication of production parts.

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 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:

- have a working knowledge of platen press equipment checks and calibration requirements
- understand the requirements for thermocouple placement for platen press operational tests
- understand the requirements for preparing and placing dummy loads
- have a working knowledge of the operation of the platen press during certification tests