BOMBARDIER
Toronto Site
PROPRIETARY INFORMATION

PPS 33.05

PRODUCTION PROCESS STANDARD

COPPER PLATING (E7)

Issue 8
- This standard supersedes PPS 33.05, Issue 7.
- 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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	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 the application of copper flash as an undercoat for plating and copper plating for masking carbon and low alloy steel parts during carburizing, gas nitriding, or other heat treatment.

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.

1.2 Copper plating and copper flash is identified by Protective Treatment Code E7.

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 13.26 - General Subcontractor Provisions.

3.2 PPS 13.39 - Bombardier Toronto Engineering Process Manual.

3.3 PPS 23.02 - Protective Treatment and Decorative Surface Finish Code.System.

3.4 PPS 30.04 - Steel Heat Treatment - Carbon and Low Alloy.

3.5 PPS 31.03 - Cleaning of Carbon and Low Alloy Steel.

3.6 PPS 33.02 - Removal of Metallic Coatings.

4 MATERIALS, EQUIPMENT AND FACILITIES

4.1 Materials

4.1.1 Maskant (e.g., Micro-Stop lacquer).

4.2 Equipment

4.2.1 All equipment employed in carrying out the processes specified herein shall be approved by Bombardier Aerospace as meeting the requirements of this standard.

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 the application of copper flash as an undercoat for plating and copper plating for masking carbon and low alloy steel parts during carburizing, gas nitriding, or other heat treatment 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 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.

4.3.3.1 For approval of subcontractor facilities to perform the removal of metallic coatings from ferrous and non-ferrous aircraft parts according to this PPS, completion of a test program and submission of suitable test samples representative of production parts may be required. Test samples shall meet the requirements specified by Bombardier Toronto Engineering.

5 PROCEDURE (SEE FLOW CHART 1)

5.1 Preparation of Parts

5.1.1 Stress relieve parts having a tensile strength range of 180 - 200 ksi or greater, which have been machined, cold formed or ground, according to PPS 30.04 before cleaning and plating.

5.1.2 Clean parts according to PPS 31.03 before masking and copper flash or plating.

5.1.3 Mask off all areas not requiring copper flash or plate using a suitable maskant (e.g., Micro-Stop lacquer).

5.1.4 Rack parts so as to obtain a uniform plating thickness over the entire plated surface, without edge burning or excessive deposition of copper.

5.2 Flash and Plating Procedure

5.2.1 General

5.2.1.1 When flash or plate operations have commenced, complete the entire sequence without delay, and without allowing the parts to become dry at any time.

5.2.2 Flash Procedure

5.2.2.1 Perform copper flash according to Flow Chart 1.

5.2.2.2 Copper flash until the desired flash thickness is achieved.

5.2.3 Plating Procedure

5.2.3.1 Perform copper plating according to Flow Chart 1.

5.2.3.2 Once started, continue the plating process until the desired plating thickness is achieved. It is acceptable to remove the parts from the bath during the cycle to check the plating thickness.

5.2.4 Embrittlement Relief

5.2.4.1 Except as noted below, embrittlement relieve aircraft parts with a tensile strength range of 150 - 170 ksi or greater according to PPS 30.04 within 4 hours of plating:

- If more than one type of plating is required on a part, it is not necessary to embrittlement relief between plating processes provided that the part is embrittlement relieved after the final plating cycle within 4 hours of completion of the first plating process.
- If heat treatment is to be carried out within 1 hour of copper plating, embrittlement relief is not required.

5.3 Removal of Plating

5.3.1 If required, strip plating according to PPS 33.02.

6 REQUIREMENTS

6.1 Appearance and Adhesion

6.1.1 The copper deposit shall be free from blisters, cracks and pits, and shall be fully adherent to the base metal.

6.2 Plating Thickness

6.2.1 The thickness of the copper flash or copper plate shall be according to Table I.

TABLE I - COPPER PLATE AND FLASH THICKNESS

APPLICATION	THICKNESS
COPPER FLASH FOR PLATING	0.0001" - 0.0005"
MASKING FOR CASE HARDENING	0.001" - 0.002"
MASKING FOR HEAT TREATMENT	0.003" - 0.005"

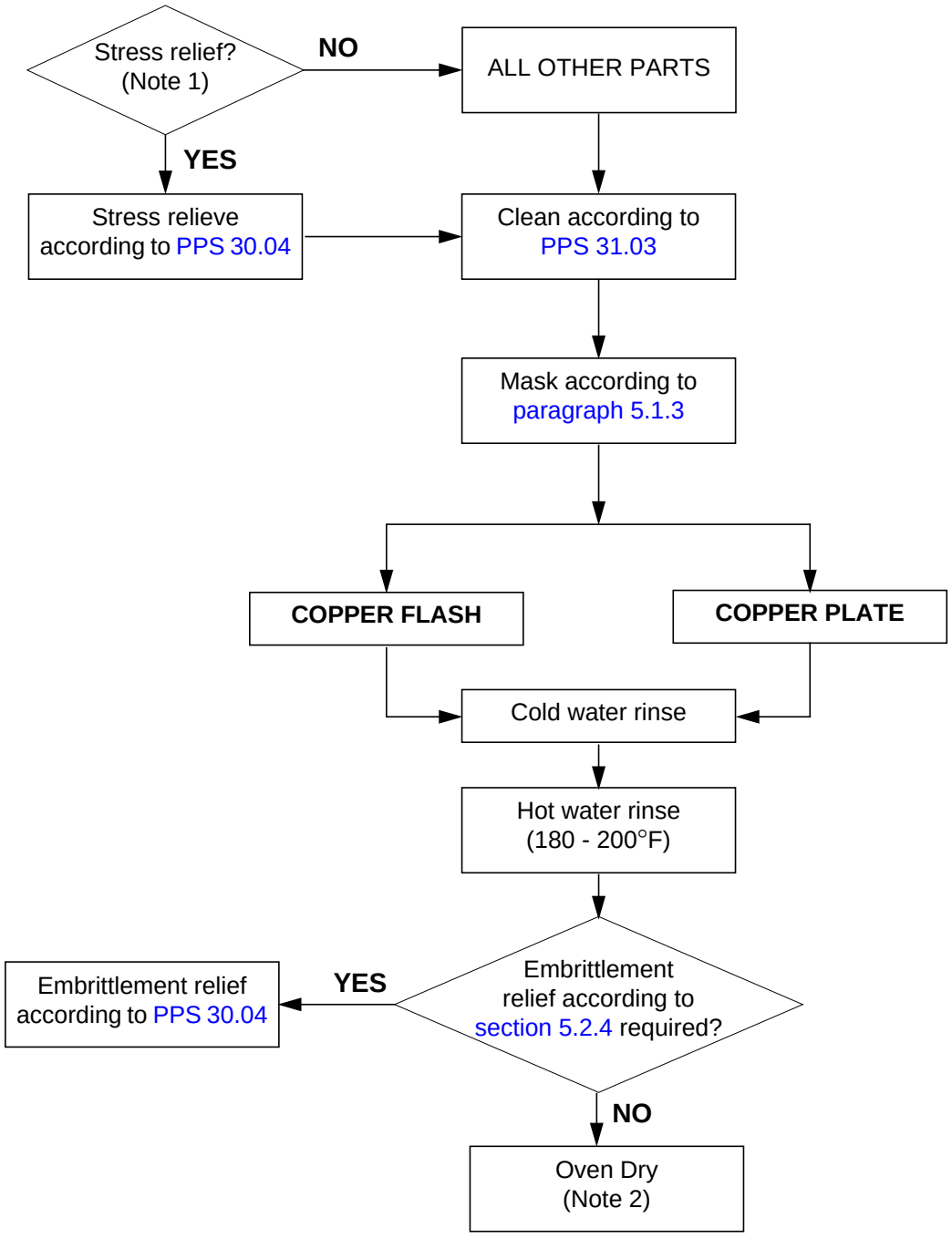
7 SAFETY PRECAUTIONS

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.

FLOW CHART 1 - COPPER FLASH AND PLATE



Note 1. Stress relieve parts having a tensile strength range of 180 - 200 ksi or greater, which have been machined, cold formed or ground.

Note 2. Oven dry parts for 1 to 1 1/2 hours at 375 ± 25°F. This is not necessary if parts are to be heat treated (including embrittlement relief) within 1 hour of plating.