BOMBARDIER
Toronto (de Havilland)
PROPRIETARY INFORMATION

PPS 18.04

PRODUCTION PROCESS STANDARD

Limitations on Shearing and Punching Titanium Alloys

Issue 4
- This standard supersedes PPS 18.04, Issue 3.
- Vertical lines in the left hand margin indicate changes over the previous issue.
- Direct PPS related questions to PPS.Group@aero.bombardier.com or (416) 375-4365.
- 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 maximum permissible thickness and subsequent edge finish requirements for shearing, blanking, punching and piercing of titanium and titanium alloy sheet.

1.1.1 This PPS complements the engineering drawings that specify its use as an authorized instruction and the procedure specified 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 Toronto (de Havilland), all materials must be approved and assigned Material Safety Data Sheet (MSDS) numbers by the Bombardier Toronto (de Havilland) 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 (de Havilland) Environment, Health and Safety Department.

3 References

3.1 PPS 13.26 - General Subcontractor Provisions.

3.2 PPS 27.04 - Edge Finishing of Titanium Alloy Parts.

4 Materials and Equipment

4.1 Materials

4.1.1 Suitable coolant, as required.

4.2 Equipment

4.2.1 For shearing, blanking, punching and piercing of titanium and titanium alloy sheet, use of high rigidity/high power machines and high speed carbide tools is recommended.

5 Procedure

5.1 General

5.1.1 Carry out shearing, blanking, punching and piercing of annealed titanium alloys.

5.1.2 Carry out shearing, blanking, punching and piercing of annealed titanium alloys on single thicknesses only.

5.1.3 For the purpose of this standard, shearing is considered as straight edge cutting of flat sheet material or parts.

5.1.4 For the purpose of this standard, blanking is considered as cutting a metal blank to a desired size and shape using close tolerance cutting dies.

5.1.5 For the purpose of this standard, piercing and punching are considered as producing a hole of a desired size and shape in a metal blank or part, using close tolerance punches and dies.

5.2 Shearing and Blanking

5.2.1 Refer to Table 1 for the limitations and requirements for shearing and blanking of titanium alloys.

5.2.2 After shearing or blanking, file, mill or sand the part to the finish size specified by the engineering drawing before edge finishing according to PPS 27.04.

Table 1 - shearing and Blanking

Sheet Thickness	Minimum Shear/Blank Oversize	Condition
0.000" - 0.090"	Not Required	Annealed
0.091" and thicker	0.010"	Annealed

5.3 Punching and Piercing of Holes

5.3.1 Refer to Table 2 for the limitations and requirements for punching and piercing of holes in titanium alloy sheet.

5.3.2 After punching or piercing, drill, ream, file or rout holes to the finish size specified by the engineering drawing before edge finishing according to PPS 27.04.

Table 2 - Punching and Piercing

SHEET THICKNESS	MINIMUM PUNCH/PIERCE UNDERSIZE	CONDITION
0.000" - 0.040"	0.015"	Annealed
0.041" and thicker	0.025"	

6 Requirements

6.1 Parts must meet the engineering drawing requirements.

7 Safety Precautions

7.1 Observe general shop safety precautions when performing the procedure specified herein.

8 Personnel Requirements

8.1 Personnel responsible for shearing, blanking, punching or piercing of titanium and titanium alloy sheet must have a good working knowledge of the applicable procedure and requirements as specified herein and must have exhibited their competency to their supervisor.