BOMBARDIER
Toronto (de Havilland)
PROPRIETARY INFORMATION

PPS 2.19

PRODUCTION PROCESS STANDARD

Installation of Self Tapping and Drive Screws

Issue 4
- This standard supersedes PPS 2.19, 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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Tables

1 Scope

1.1 This Production Process Standard (PPS) specifies the procedure and requirements for installation of self tapping and drive screws.

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 1.09 - Drilling and Reaming.

3.2 PPS 13.26 - General Subcontractor Provisions.

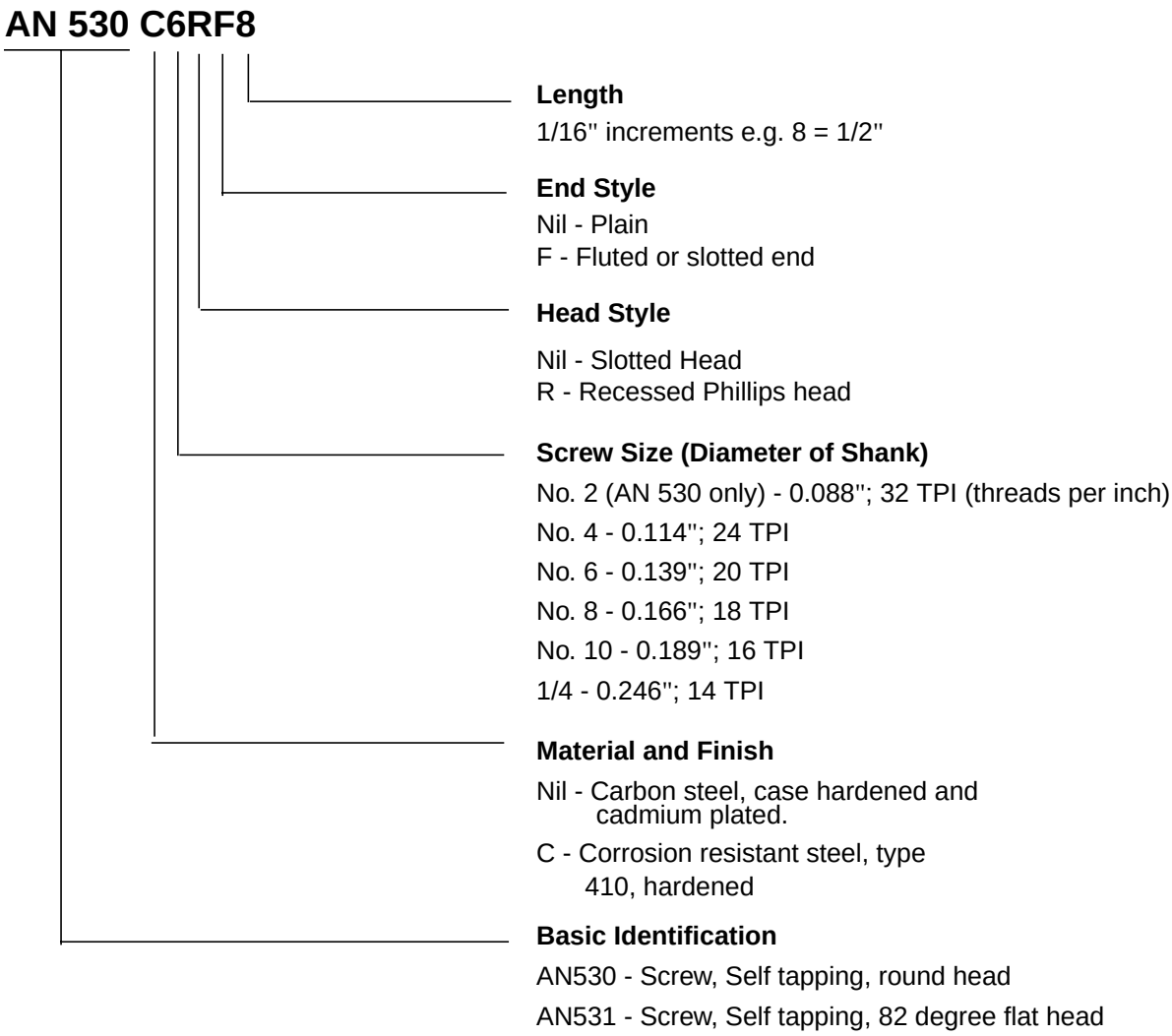
3.3 PPS 18.01 - Limitations on Shearing and Punching Aluminum Alloy Sheet.

3.4 PPS 27.05 - Manual Edge Finishing.

4 Materials and Equipment

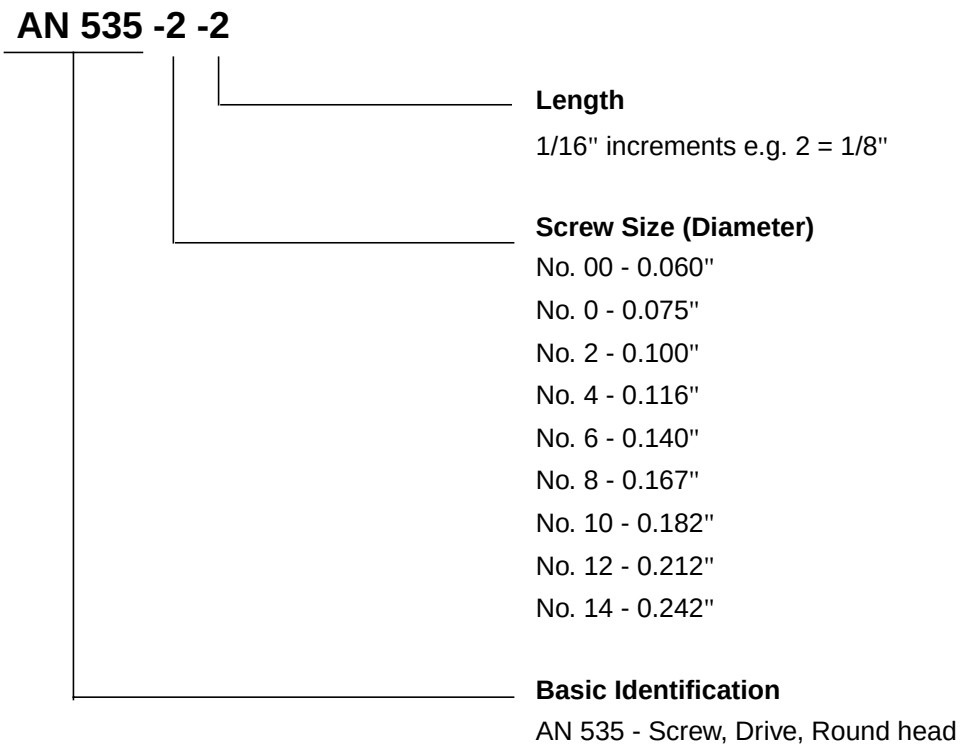
4.1 Materials

4.1.1 Self tapping and drive screws as specified on the engineering drawings. The AN part numbering system, and its correspondence to the Parker-Kalon (PK) numbering system (where applicable), is presented in Figure 1 for self tapping screws, and in Figure 2 for drive screws.



Note 1: AN530 and 531 screws correspond to PK Type Z screws. PK screws are specified by stating type, head style and configuration, shank diameter (as above), length, and material and finish. PK has an additional screw size (No. 7 - 0.151"). There is no AN part number for PK Type A (tapered to a point) self tapping screws. These screws are specified as noted above for PK screws.

Figure 1 - AN Part Numbering of Self Tapping Screws



Note: AN535 drive screws correspond to PK type U screws. PK screws are specified by stating type, shank diameter (as above) and length. PK has an additional screw size (No. 7 - 0.152").

Figure 2 - AN Part Numbering of Drive Screws

4.2 Equipment

4.2.1 Suitable screw driver for installation of self tapping screws.

4.2.2 Suitable ball peen hammer or press for installation of drive screws.

5 Procedure

5.1 Preparation of Holes

5.1.1 Prepare parts for installation of self tapping screws by drilling holes to the size specified in Table 1 (sheet metal parts or Table 2 (non-ferrous castings or plastic parts). Prepare parts for installation of drive screws by drilling holes to the size specified in Table 3. Perform drilling according to PPS 1.09; if drill jigs are not available, drill mating parts simultaneously to ensure proper hole alignment. For aluminum alloy parts, it is acceptable to punch holes according to PPS 18.01 in place of drilling.

5.1.1.1 If self tapping screws are used with Tinnerman nuts, open up the base material to clearance hole size to accommodate the Tinnerman nut.

5.1.2 Ensure blind holes are deep enough to provide a minimum of 1/16" of clearance for the installed screws.

5.1.3 Chamfer moulded or drilled holes in plastics before screw installation.

5.1.4 Deburr holes according to PPS 27.05 before assembly of parts.

Table 1 - Hole Preparation Data for Installation of Self Tapping Screws in Sheet Metal

Screw Size (diameter)	Total Assembled Sheet Thickness	ALUMINUM ALLOYS		FERROUS METALS	
		Hole Size (Notes 1 & 2)	Recommended Drill Size	Hole Size (Notes 1 & 2)	Recommended Drill Size
Number 2	0.015" - 0.023"	-	-	0.063" - 0.067"	52 (0.0635")
	0.024" - 0.029"	0.063" - 0.067"	52 (0.0635")	0.067" - 0.071"	51 (0.0670")
	0.030" - 0.035"	0.063" - 0.067"	52 (0.0635")	0.070" - 0.074"	50 (0.0700")
	0.036" - 0.047"	0.063" - 0.067"	52 (0.0635")	0.073" - 0.077"	49 (0.0730")
	0.048" - 0.059"	0.067" - 0.071"	51 (0.0670")	0.073" - 0.077"	49 (0.0730")
	0.060"	0.070" - 0.074"	50 (0.0700")	0.076" - 0.080"	48 (0.0760")
Number 4	0.015" - 0.023"	-	-	0.086" - 0.090"	44 (0.0860")
	0.024" - 0.029"	-	-	0.089" - 0.093"	43 (0.0890")
	0.030" - 0.047"	0.086" - 0.090"	44 (0.0860")	0.093" - 0.097"	42 (0.0935")
	0.048" - 0.059"	0.086" - 0.090"	44 (0.0860")	0.096" - 0.100"	41 (0.0960")
	0.060" - 0.074"	0.089" - 0.093"	43 (0.0890")	0.099" - 0.103"	39 (0.0995")
	0.075" - 0.104"	0.089" - 0.093"	43 (0.0890")	0.101" - 0.105"	38 (0.1015")
	0.105"	0.093" - 0.093"	42 (0.0935")	-	-

Note 1. A dash (-) means that the particular screw size is not recommended for the specified assembled sheet thickness.

Note 2. For very hard material, use a drill one size larger in diameter and for very soft material, use a drill one size smaller in diameter. When using a larger or smaller diameter drill, adjust the hole size requirements accordingly.

Table 1 - Hole Preparation Data for Installation of Self Tapping Screws in Sheet Metal

Screw Size (diameter)	Total Assembled Sheet Thickness	ALUMINUM ALLOYS		FERROUS METALS	
		Hole Size (Notes 1 & 2)	Recommended Drill Size	Hole Size (Notes 1 & 2)	Recommended Drill Size
Number 6	0.015" - 0.023"	-	-	0.104" - 0.108"	37 (0.1040")
	0.024" - 0.029"	-	-	0.106" - 0.110"	36 (0.1065")
	0.030" - 0.035"	0.104" - 0.108"	37 (0.1040")	0.106" - 0.110"	36 (0.1065")
	0.036" - 0.047"	0.104" - 0.108"	37 (0.1040")	0.110" - 0.115"	35 (0.1100")
	0.048" - 0.059"	0.104" - 0.108"	37 (0.1040")	0.111" - 0.116"	34 (0.1110")
	0.060" - 0.074"	0.106" - 0.110"	36 (0.1065")	0.116" - 0.121"	32 (0.1160")
	0.075" - 0.104"	0.110" - 0.115"	35 (0.1100")	0.120" - 0.125"	31 (0.1200")
	0.105" - 0.127"	0.111" - 0.116"	34 (0.1110")	0.128" - 0.133"	30 (0.1285")
	0.128" - 0.250"	0.120" - 0.125"	31 (0.1200")	-	-
Number 7	0.018" - 0.029"	-	-	0.113" - 0.118"	33 (0.1130")
	0.030" - 0.047"	0.113" - 0.118"	33 (0.1130")	0.116" - 0.121"	32 (0.1160")
	0.048" - 0.059"	0.116" - 0.121"	32 (0.1160")	0.120" - 0.125"	31 (0.1200")
	0.060" - 0.074"	0.120" - 0.125"	31 (0.1200")	0.128" - 0.133"	30 (0.1285")
	0.075" - 0.104"	0.128" - 0.133"	30 (0.1285")	0.136" - 0.141"	29 (0.1360")
	0.105" - 0.127"	0.136" - 0.141"	29 (0.1360")	0.140" - 0.145"	28 (0.1405")
	0.128" - 0.250"	0.136" - 0.141"	29 (0.1360"	-	-
Number 8	0.024" - 0.029"	-	-	0.116" - 0.121"	32 (0.1160")
	0.030" - 0.035"	0116" - 0.121"	32 (0.1160")	0.120" - 0.125"	31 (0.1200")
	0.036" - 0.047"	0.120" - 0.125"	31 (0.1200")	0.120" - 0.125"	31 (0.1200")
	0.048" - 0.059"	0.128" - 0.133"	30 (0.1285")	0.128" - 0.133"	30 (0.1285")
	0.060" - 0.074"	0.136" - 0.141"	29 (0.1360")	0.136" - 0.141"	29 (0.1360")
	0.075" - 0.104"	0.140" - 0.145"	29 (0.1360")	0.140" - 0.145"	28 (0.1405")
	0.105" - 0.134"	0.147" - 0.153"	26 (0.1470")	0.149" - 0.155"	25 (0.1495")
	0.135" - 0.161"	0.149" - 0.155"	25 (0.1495")	0.152" - 0.158"	24 (0.1520")
	0.162" - 0.375"	0.152" - 0.158"	24 (0.1520")	-	-

Note 1. A dash (-) means that the particular screw size is not recommended for the specified assembled sheet thickness.

Note 2. For very hard material, use a drill one size larger in diameter and for very soft material, use a drill one size smaller in diameter. When using a larger or smaller diameter drill, adjust the hole size requirements accordingly.

Table 1 - Hole Preparation Data for Installation of Self Tapping Screws in Sheet Metal

Screw Size (diameter)	Total Assembled Sheet Thickness	ALUMINUM ALLOYS		FERROUS METALS	
		Hole Size (Notes 1 & 2)	Recommended Drill Size	Hole Size (Notes 1 & 2)	Recommended Drill Size
Number 10	0.024" - 0.035"	-	-	0.144" - 0.150"	27 (0.1440")
	0.036" - 0.047"	0.144" - 0.150"	27 (0.1440")	0.147" - 0.153"	26 (0.1470")
	0.048" - 0.074"	0.144" - 0.150"	27 (0.1440")	0.152" - 0.158"	24 (0.1520")
	0.075" - 0.104"	0.147" - 0.153"	26 (0.1470")	0.157" - 0.163"	22 (0.1570")
	0.105" - 0.124"	0.147" - 0.153"	26 (0.1470")	0.161" - 0.167"	20 (0.1610")
	0.125" - 0.163"	0.154" - 0.160"	23 (0.1540")	0.169" - 0.175"	18 (0.1695")
	0.164" - 0.199"	0.159" - 0.165"	21 (0.1590")	0.173" - 0.179"	17 (0.1730")
	0.200" - 0.375"	0.166" - 0.172"	19 (0.1660")	-	-
Number 12	0.024" - 0.047"	-	-	0.166" - 0.172"	19 (0.1660")
	0.048" - 0.059"	0.161" - 0.167"	20 (0.1610")	0.169" - 0.175"	18 (0.1695")
	0.060" - 0.074"	0.166" - 0.172"	19 (0.1660")	0.177" - 0.183"	16 (0.1770")
	0.075" - 0.104"	0.173" - 0.179"	17 (0.1730")	0.182" - 0.188"	14 (0.1820")
	0.105" - 0.124"	0.180" - 0.186"	15 (0.1800")	0.185" - 0.191"	13 (0.1850")
	0.125" - 0.163"	0.182" - 0.188"	14 (0.1820")	0.196" - 0.203"	9 (0.1960")
	0.164" - 0.199"	0.189" - 0.195"	12 (0.1890")	0.201" - 0.208"	7 (0.2010")
	0.200" - 0.375"	0.196" - 0.203"	9 (0.1960")	-	-
Number 14 (AN - 1/4)	0.030" - 0.047"	-	-	0.185" - 0.191"	13 (0.1850")
	0.048" - 0.059"	-	-	0.191" - 0.197"	11 (0.1910")
	0.060" - 0.074"	0.199" - 0.206"	8 (0.1990")	0.199" - 0.206"	8 (0.1990")
	0.075" - 0.104"	0.201" - 0.208"	7 (0.2010")	0.204" - 0.211"	6 (0.2040")
	0.105" - 0.124"	0.204" - 0.211"	6 (0.2040")	0.209" - 0.216"	4 (0.2090")
	0.125" - 0.163"	0.209" - 0.216"	4 (0.2090")	0.228" - 0.235"	1 (0.2280")
	0.164" - 0.193"	0.213" - 0.220"	3 (0.2130")	0.234" - 0.242"	15/64" (0.2344")
	0.194" - 0.199"	0.221" - 0.228"	2 (0.2210")	0.234" - 0.242"	15/64" (0.2344")
	0.200" - 0.375"	0.228" - 0.235"	1 (0.2280")	-	-

Note 1. A dash (-) means that the particular screw size is not recommended for the specified assembled sheet thickness.

Note 2. For very hard material, use a drill one size larger in diameter and for very soft material, use a drill one size smaller in diameter. When using a larger or smaller diameter drill, adjust the hole size requirements accordingly.

Table 2 - Hole Preparation Data for Installation of Self Tapping Screws in Non-Ferrous Castings and Plastics

Screw Size (Diameter)	Non-Ferrous Castings		Thermoset Plastic (Note 1)		Thermoplastic (Note 2)	
	Hole Size (Note 3)	Recommended Drill Size	Hole Size	Recommended Drill Size	Hole Size	Recommended Drill Size
Number 2	0.078" - 0.082"	47 (0.0785")	0.078" - 0.082"	47 (0.0785")	0.078" - 0.082"	47 (0.0785")
Number 4	0.104" - 0.108"	37 (0.1040")	0.099" - 0.103"	39 (0.0995")	0.093" - 0.097"	42 (0.0935")
Number 6	0.128" - 0.133"	30 (0.1285")	0.128" - 0.133"	30 (0.1285")	0.120" - 0.125"	31 (0.1200")
Number 7	0.144" - 0.150"	27 (0.1440")	0.136" - 0.141"	29 (0.1360")	0.128" - 0.133"	30 (0.1285")
Number 8	0.152" - 0.158"	24 (0.1520")	0.149" - 0.155"	25 (0.1495")	0.144" - 0.150"	27 (0.1440")
Number 10	0.180" - 0.186"	15 (0.1800")	0.177" - 0.183"	16 (0.1770")	0.169" - 0.175"	18 (0.1695")
Number 12	0.199" - 0.205"	8 (0.1990")	0.199" - 0.205"	8 (0.1990")	0.191" - 0.197"	11 (0.1910")
Number 14	0.234" - 0.242"	15/64" (0.2344")	0.234" - 0.242"	15/64" (0.2344")	0.221" - 0.228"	2 (0.2210")

Note 1. For the purposes of this standard, Thermoset plastic includes Bakelite, Formica, and other Phenol Formaldehydes.
Note 2. For the purposes of this standard, Thermoplastic includes Nylon, Kydex, Plexiglas, Cellulose Acetates, Cellulose Nitrates, Acrylate and Styrene Resins.
Note 3. For very hard material, a size larger drill may be used; for very soft material a size smaller drill shall be used.

Table 3 - Hole Preparation Data for Drive Screws

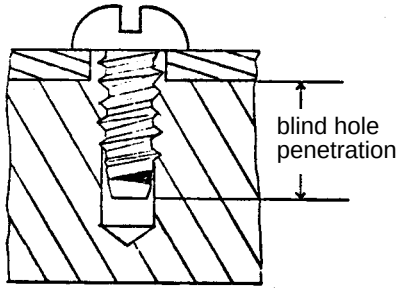
SCREW SIZE (DIAMETER)	HOLE SIZE	RECOMMENDED DRILL SIZE
Number 00	0.052" - 0.056"	55 (0.0520")
Number 0	0.067" - 0.071"	51 (0.0670")
Number 2	0.086" - 0.090"	44 (0.0860")
Number 4	0.104" - 0.108"	37 (0.1040")
Number 6	0.120" - 0.125"	31 (0.1200")
Number 7	0.136" - 0.141"	29 (0.1360")
Number 8	0.144" - 0.149"	27 (0.1440")
Number 10	0.161" - 0.167"	20 (0.1610")
Number 12	0.191" - 0.197"	11 (0.1910")
Number 14	0.221" - 0.228"	2 (0.2210")

5.2 Installation of Self Tapping Screws

5.2.1 Install the self tapping screw using a suitable screwdriver.

5.2.2 For non-ferrous castings and plastic parts, ensure the minimum blind hole penetration specified in Table 4 is met.

Table 4 - Minimum Blind Hole Penetration of Self Tapping Screws in Plastic Parts or Non-Ferrous Castings

	Screw Size (Diameter)	Minimum Blind Hole Penetration	
		Non-Ferrous Castings	Plastic
	Number 2	1/8"	3/16"
	Number 4	3/16"	1/4"
	Number 6	1/4"	1/4"
	Number 7	1/4"	1/4"
	Number 8	1/4"	5/16"
	Number 10	1/4"	5/16"
	Number 12	9/32"	3/8"
	Number 14	5/16"	3/8"

5.3 Installation of Drive Screws

5.3.1 Install drive screws using a suitable ball peen hammer or press. Ensure that the depth the drive screw engages in the material to which the part is being fastened is equal to at least a distance equalling the diameter of the shank of the drive screw.

6 Requirements

6.1 Installed screws shall not be loose, nor shall they show signs of over-tightening such as cracked base material or embedded heads.

7 Safety Precautions

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

8 Personnel Requirements

8.1 Personnel responsible for installation of self tapping and drive screws must have a good working knowledge of the procedure and requirements as specified herein and must have exhibited their competency to their supervisor.