BOMBARDIER
Toronto (de Havilland)
PROPRIETARY INFORMATION

PPS 23.06

PRODUCTION PROCESS STANDARD

DESIGNATION OF COPPER AND COPPER ALLOYS

Issue 2
- This standard supersedes PPS 23.06, Issue 1.
- Vertical lines in the left hand margin indicate changes over the previous issue.

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This PPS is effective as of the distribution date specified on the accompanying distribution notice.

Direct any PPS related questions to the PPS Group (416) 375-4365.

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Tables

1 SCOPE

1.1 This Production Process Standard (PPS) explains the alloy designations, the temper designations and the material specifications of copper and copper alloys (Wrought Products Only).

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.

4 ALLOY DESIGNATIONS

4.1 Unalloyed copper and copper alloys are designated by a three digit number system as defined by the Copper Development Association (CDA).

4.2 This designation system groups the various copper and copper alloy compositions and assigns a block of numbers to each group. The individual numbers are not a code or specification relating to alloying elements or composition but rather are an orderly method of defining and identifying coppers and copper alloys.

4.3 Refer to Table I for a listing of the groups and the applicable copper and copper alloy numbers.

TABLE I - ALLOY DESIGNATIONS OF COPPER AND COPPER ALLOYS

GROUP	COPPER/COPPER ALLOY NUMBER	DESCRIPTION
coppers	101-159	Commercially Pure Copper - 99.3% Cu min.
high copper alloys	160-195	Cadmium Coppers, Beryllium Coppers, Chromium Coppers, etc. - less than 99.3% Cu but more than 96% Cu and not included in another group
brasses	205-298	Copper - Zinc Alloys
	310-385	Copper - Zinc - Lead Alloys (Leaded Brasses)
	405-485	Copper - Zinc - Tin Alloys (Tin Brasses)
bronzes	502-529	Copper - Tin - Phosphorus Alloys (Phosphor Bronzes)
	532-548	Copper - Tin - Lead - Phosphorus Alloys (Leaded Phosphor Bronzes)
	606-642	Copper - Aluminum Alloys (Aluminum Bronzes)
	647-661	Copper - Silicon Alloys (Silicon Bronzes)
miscellaneous copper-zinc alloys	665-697	Copper - Zinc Alloys not included in any other group
copper-nickels	701-725	Copper Alloys with nickel as the principal alloying element
copper-nickel-zinc alloys	732-799	Copper Alloys with zinc and nickel as principal and secondary alloying elements. These alloys are commonly referred to as 'Nickel-Silvers' although they contain only trace amounts of silver, not intentionally added.

5 TEMPER DESIGNATIONS

5.1 Non-Heat Treatable Copper and Copper Alloys

5.1.1 The majority of coppers and copper alloys are not hardenable by heat treatment and are therefore classified as 'non-heat treatable'. They are however, hardenable by cold working.

5.1.2 Non-heat treatable copper and copper alloys are available from the mill in the tempers shown in Table II.

TABLE II - TEMPER DESIGNATION OF NON-HEAT TREATABLE COPPER AND COPPER ALLOYS

TEMPER	DEFINITION
drawn	As drawn condition, no subsequent treatment
extruded	As extruded condition, no subsequent treatment
forged	As forged condition, no subsequent treatment
hot rolled	As hot rolled condition, no subsequent treatment
1/4 hard	Cold worked to 1/4 hard temper
1/2 hard	Cold worked to 1/2 hard temper
hard	Cold worked to full hard temper
extra-hard	Cold worked to extra hard temper
spring	Cold worked to spring temper
extra-spring	Cold worked to extra-spring temper
stress relieved	Stress Relieved after shaping process
annealed	Annealed after shaping process

5.2 Heat Treatable Copper and Copper Alloys

5.2.1 Some coppers (ie. No. 150) and some copper alloys (ie. Beryllium Copper and Chromium Copper) are hardenable by heat treatment.

5.2.2 These compositions are available in the ‘solution heat treated’ condition (also referred to as ‘annealed’ or ‘solution annealed’), the ‘precipitation heat treated’ condition (ie. artificially aged), or the ‘cold worked condition’ with or without subsequent precipitation heat treatment.

5.2.3 Refer to Table III for a listing of the various tempers.

TABLE III - TEMPER DESIGNATIONS OF HEAT TREATABLE MAGNESIUM ALLOYS

TEMPER	DEFINITION
A	Solution heat treated
1/4 H	Solution heat treated and cold worked to 1/4 hard
1/2 H	Solution heat treated and cold worked to 1/2 hard
H	Solution heat treated and cold worked to full hard
AT	Solution heat treated and precipitation heat treated
1/4 HT	Solution heat treated, cold worked to 1/4 hard and precipitation heat treated
1/2 HT	Solution heat treated, cold worked to 1/2 hard and precipitation heat treated
HT	Solution heat treated, cold worked to full hard and precipitation heat treated

6 MATERIAL SPECIFICATIONS

6.1 Table IV lists the material specifications for the coppers and copper alloys and product forms used at Bombardier Toronto (de Havilland).

TABLE IV - MATERIAL SPECIFICATIONS FOR COPPER AND COPPER ALLOYS

GROUP	MATERIAL SPECIFICATION	COPPER/COPPER ALLOY NUMBER	MILL PRODUCT FORM
coppers	ASTM-B 280 (Note 1)	102, 103, 108, 120 & 122 (Note 2)	Seamless Tube
	QQ-C-502	101 - 130 (Note 3)	Strip, Bar, (Finished Edge), Rod, Wire & Shape
	QQ-C-576	101 - 130 (Note 3)	Sheet, Strip, Plate & Bar (Rolled)
	COMMERCIAL	Commercial Quality Copper	Sheet
high copper alloys	QQ-C-530	172 & 173	Bar, Rod & Wire
	QQ-C-533	170 & 172	Strip
Brasses	QQ-B-613	230, 240, 260, 268, 342, 353 & Comp 11 (Note 4)	Sheet, Strip, Plate & Bar
	QQ-B-626	230, 240, 260, 268, 342, 353, 360 (Comp 22), 377 & Comp 11 (Notes 4 & 5)	Strip & Bar (Finished Edge), Rod, Shapes & Forgings
	QQ-B-637	462, 464 (Comp 1), 482, 485 (Note 5)	Strip (Finished Edge), Rod, Bar, Shapes, Wire, Flat Wire & Forgings
	QQ-W-321	210 - 274 (Notes 3 & 6)	Wire
	COMMERCIAL	Commercial Quality Brass	Sheet, Strip, Bar & Rod
Bronzes	ASTM-B 150 (Note 1)	614 (Comp 3), 619, 623, 624, 630 (Comp 2), 642 (Note 5)	Rod, Bar & Shapes

Note 1. At Bombardier Toronto (de Havilland), material to this ASTM Specification supersedes a number of materials previously supplied to other specifications. Refer to EO 7336 for a complete listing.
Note 2. If no copper number is specified, copper number 122 is supplied by the mill.
Note 3. This material specification covers a large number of composition within the range shown. If no copper number is specified, any composition may be supplied by the mill.
Note 4. Composition 11 includes a large number of compositions within the brass group (i.e., Copper Alloy Numbers 205 - 485), any of which may be supplied by the mill. This composition is specified where the alloy is not critical, ie. any of the brasses would be acceptable.
Note 5. The number shown in brackets is the superseded alloy designation.
Note 6. This specification also covers bronzes and Copper-Nickel-Zinc Alloys which are not listed here.