AERONAUTICAL MATERIAL SPECIFICATION

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TOLERANCES
Nickel and Nickel-Base Alloy Tubing

1. PURPOSE: To publish established manufacturing tolerances.

2. APPLICATION: Tolerances shown herein apply, unless otherwise agreed upon by purchaser and vendor. These tolerances apply to materials and conditions as indicated and are based on individual measurements, unless otherwise noted. The term "excl" is used to apply only to the higher figure of the specified range. Ovality is the difference between the maximum and minimum diameters of any one section of a tube. Mean OD is the average of two dimensions taken at right angles to each other.

3. DIAMETER:

3.1 Seamless, Cold Finished:

3.1.1 Nickel-Copper Alloy, Annealed:

TABLE I

Nominal OD Inch	Nominal Wall Thickness % of OD	Tolerance, Inch				
		OD		Mean OD		Ovality
		Plus	Minus	Plus	Minus	
0.400 and under	3.0 and under	-	-	0.004	0	0.004
0.400 and under	Over 3.0	0.004	0	-	-	-
Over 0.400 to 0.625, excl	3.0 and under	-	-	0.005	0	0.005
Over 0.400 to 0.625, excl	Over 3.0	0.005	0	-	-	-
0.625 to 1.500, incl	3.0 and under	-	-	0.005	0.005	0.01x0D
0.625 to 1.500, incl	Over 3.0	0.005	0.005	-	-	-
Over 1.500 to 4.500, incl	3.0 and under	-	-	0.010	0.010	0.01x0D
Over 1.500 to 4.500, incl	Over 3.0	0.010	0.010	-	-	-
Over 4.500 to 6.000, incl	3.0 and under	-	-	0.015	0.015	0.01x0D
Over 4.500 to 6.000, incl	Over 3.0	0.030	0.030	0.015	0.015	-
Over 6.000 to 7.500, incl	3.0 and under	-	-	0.020	0.020	0.01x0D
Over 6.000 to 7.500, incl	Over 3.0	0.040	0.040	0.020	0.020	-
Over 7.500 to 8.625, incl	3.0 and under	-	-	0.025	0.025	0.01x0D
Over 7.500 to 8.625, incl	Over 3.0	0.050	0.050	0.025	0.025	-

3.1.2 Nickel-Chromium-Iron Alloy, Annealed:

TABLE II

Nominal OD Inch	Nominal Wall Thickness % of OD	Tolerance, Inch				
		OD		Mean OD		Ovality
		Plus	Minus	Plus	Minus	
0.400 and under	3.0 and under	-	-	0.004	0	0.004
0.400 and under	Over 3.0	0.004	0	-	-	-
Over 0.400 to 0.625, excl	3.0 and under	-	-	0.005	0.005	0.005
Over 0.400 to 0.625, excl	Over 3.0	0.005	0.005	-	-	-
0.625 to 1.500, incl	3.0 and under	-	-	0.0075	0.0075	0.01xOD
0.625 to 1.500, incl	Over 3.0	0.0075	0.0075	-	-	-
Over 1.500 to 3.500, incl	3.0 and under	-	-	0.010	0.010	0.01xOD
Over 1.500 to 3.500, incl	Over 3.0	0.010	0.010	-	-	-
Over 3.500 to 4.500, incl	3.0 and under	-	-	0.015	0.015	0.01xOD
Over 3.500 to 4.500, incl	Over 3.0	0.015	0.015	-	-	-
Over 4.500 to 6.000, incl	3.0 and under	-	-	0.020	0.020	0.01xOD
Over 4.500 to 6.000, incl	Over 3.0	0.040	0.040	0.020	0.020	-
Over 6.000 to 6.625, incl	3.0 and under	-	-	0.025	0.025	0.01xOD
Over 6.000 to 6.625, incl	Over 3.0	0.050	0.050	0.025	0.025	-

3.2 Copper Furnace Brazed, Cold Finished:

3.2.1 Nickel-Copper Alloy, Annealed:

TABLE III

Nominal OD Inch	Nominal Wall Thickness Inch	OD Tolerance, Inch	
		Plus	Minus
0.125	0.028	0.001	0.001
0.188	0.028	0.001	0.001
0.250	0.028	0.003	0
0.312	0.028	0.003	0
0.375	0.028	0.003	0
0.500	0.028	0.005	0
0.625	0.028	0.005	0
0.625	0.035	0.005	0

4. WALL THICKNESS:

4.1 Copper Furnace Brazed, Cold Finished:

4.1.1 Wall thickness of nickel-copper alloy tubes shall not vary more than plus and minus 0.002 inch.

4.2 Seamless, Cold Finished:

4.2.1 Wall thickness of all tubes except for those alloys and sizes shown in 4.2.2 and 4.2.3 shall not vary more than plus and minus 10%.