Designation: ~~B210 – 12~~ B210/B210M – 19

Used in USNRC-NDT standards

Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes[1]

This standard is issued under the fixed designation ~~B210~~;B210/B210M; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope*

1.1 This specification[2] covers aluminum and aluminum-alloy drawn seamless tubes in straight lengths and coils for general purpose and pressure applications in alloys (Note 2), tempers, and thicknesses shown in Table 2 [Table 3]. Coiled tubes are generally available only as round tubes with a wall thickness not exceeding 0.083 in. [2.00 mm] and only in ~~nonheat-treatable~~non-heat-treatable alloys.

1.2 Alloy and temper designations are in accordance with ANSI ~~H35.1/H35.1(M).~~H35.1/H35.1M. The equivalent Unified Numbering System alloy designations are those of Table 1 preceded by A9, for example, A91100 for aluminum designation 1100 in accordance with Practice E527.

NOTE 1—See Specification B483/B483M for aluminum-alloy drawn tubes for general purpose applications; Specification B234 for aluminum-alloy drawn seamless tubes for condensers and heat exchangers; and Specification B241/B241M for aluminum-alloy seamless pipe and seamless extruded tube.

NOTE 2—Throughout this specification, use of the term *alloy* in the general sense includes aluminum as well as aluminum alloy.

~~1.3 A complete metric companion to Specification B210 has been developed—Specification B210M; therefore, no metric equivalents are presented in this specification.~~

1.3 For acceptance criteria for inclusion of new aluminum and aluminum alloys in this specification, see Annex A2.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate ~~safety~~ safety, health, and ~~health~~environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 The following documents of the issue in effect on date of material purchase form a part of this specification to the extent referenced herein:

2.2 *ASTM Standards:*[3]

B234 Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes for Surface Condensers, Evaporators, and Heat Exchangers

B241/B241M Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube

B483/B483M Specification for Aluminum and Aluminum-Alloy Drawn Tube and Drawn Pipe for General Purpose Applications

B557 Test Methods for Tension Testing Wrought and Cast Aluminum- and Magnesium-Alloy Products

B557M Test Methods for Tension Testing Wrought and Cast Aluminum- and Magnesium-Alloy Products (Metric)

B660 Practices for Packaging/Packing of Aluminum and Magnesium Products

B666/B666M Practice for Identification Marking of Aluminum and Magnesium Products

B807/B807M Practice for Extrusion Press Solution Heat Treatment for Aluminum Alloys

B881 Terminology Relating to Aluminum- and Magnesium-Alloy Products

B918/B918M Practice for Heat Treatment of Wrought Aluminum Alloys

[1] This specification is under the jurisdiction of ASTM Committee B07 on Light Metals and Alloys and is the direct responsibility of Subcommittee B07.03 on Aluminum Alloy Wrought Products.

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[2] For ASME Boiler and Pressure Vessel Code applications see related Specification SB-210 in Section II of that Code.

[3] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

***A Summary of Changes section appears at the end of this standard**

TABLE 1 Chemical Composition Limits[A,B,C,D]

Alloy	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Bi	Sn	Pb	Other Elements[E] Each	Other Elements[E] Total[F]	Al, min
1060	0.25	0.35	0.05	0.03	0.03	. . .	0.05	0.03				0.03[G]	. . .	99.60 min[H]
1100	-0.95 Si + Fe		0.05–0.20	0.05	. . .	. . .	0.10	. . .				0.05	0.15	99.00 min[H]
2011	0.40	0.7	5.0–6.0	. . .	. . .	. . .	0.30	. . .	0.20–0.6		0.20–0.6	0.05	0.15	rem
2014	0.50–1.2	0.7	3.9–5.0	0.40–1.2	0.20–0.8	0.10	0.25	0.15				0.05	0.15	rem
2024	0.50	0.50	3.8–4.9	0.30–0.9	1.2–1.8	0.10	0.25	0.15				0.05	0.15	rem
3003	0.6	0.7	0.05–0.20	1.0–1.5	. . .	. . .	0.10	. . .				0.05	0.15	rem
Alclad 3003[I]														
3102	0.40	0.7	0.10	0.05–0.40	. . .	. . .	0.30	0.10				0.05	0.15	rem
Alclad 3102[I]														
5005	0.30	0.7	0.20	0.20	0.50–1.1	0.10	0.25	. . .				0.05	0.15	rem
5050	0.40	0.7	0.20	0.10	1.1–1.8	0.10	0.25	. . .				0.05	0.15	rem
5052	0.25	0.40	0.10	0.10	2.2–2.8	0.15–0.35	0.10	. . .				0.05	0.15	rem
5083	0.40	0.40	0.10	0.40–1.0	4.0–4.9	0.05–0.25	0.25	0.15				0.05	0.15	rem
5086	0.40	0.50	0.10	0.20–0.7	3.5–4.5	0.05–0.25	0.25	0.15				0.05	0.15	rem
5154	0.25	0.40	0.10	0.10	3.1–3.9	0.15–0.35	0.20	0.20				0.05	0.15	rem
5456	0.25	0.40	0.10	0.50–1.0	4.7–5.5	0.05–0.20	0.25	0.20				0.05	0.15	rem
6061	0.40–0.8	0.7	0.15–0.40	0.15	0.8–1.2	0.04–0.35	0.25	0.15				0.05	0.15	rem
6063	0.20–0.6	0.35	0.10	0.10	0.45–0.9	0.10	0.10	0.10				0.05	0.15	rem
6262	0.40–0.8	0.7	0.15–0.40	0.15	0.8–1.2	0.04–0.14	0.25	0.15	0.40–0.7		0.40–0.7	0.05	0.15	rem
7072 cladding[J]	0.7 Si + Fe		0.10	0.10	0.10	. . .	0.8–1.3	. . .				0.05	0.15	rem
7075[K]	0.40	0.50	1.2–2.0	0.30	2.1–2.9	0.18–0.28	5.1–6.1	0.20				0.05	0.15	rem

[A] Limits are in weight percent maximum unless shown as a range or otherwise stated.
[B] Analysis shall be made for the elements for which limits are shown in this table.
[C] For purposes of determining conformance to these limits, an observed value or a calculated value obtained from analysis shall be rounded to the nearest unit in the last right-hand place of figures used in expressing the specified limit, in accordance with the rounding-off method of Practice E29.
[D] In case of a discrepancy in the values listed in Table 1 with those listed in the *International Alloy Designations and Chemical Composition Limits for Wrought Aluminum and Wrought Aluminum Alloys* (known as the "Teal Sheets"), the composition limits registered with the Aluminum Association and published in the "Teal Sheets" shall be considered the controlling composition. The "Teal Sheets" are available at http://www.aluminum.org/tealsheets.
[E] *Others* includes listed elements for which no specific limit is shown as well as unlisted metallic elements. The producer may analyze samples for trace elements not specified in the specification. However, such analysis is not required and may not cover all metallic *Others* elements. Should any analysis by the producer or the purchaser establish that an *Others* element exceeds the limit of *Each* or that the aggregate of several *Others* elements exceeds the limit of *Other Elements Total*, the material shall be considered non-conforming.
[F] *Other elements*—Total shall be the sum of unspecified metallic elements 0.010 % or more, rounded to the second decimal before determining the sum.
[G] Vanadium 0.05 % max.
[H] The aluminum content shall be calculated by subtracting from 100.00 % the sum of all metallic elements present in amounts of 0.010 % or more each, rounded to the second decimal before determining the sum.
[I] Alloy clad with Alloy 7072.
[J] Composition of cladding alloy as applied during the course of manufacture. The samples from finished tube shall not be required to conform to these limits.
[K] A Zr + Ti limit of 0.25 percent maximum may be used with this alloy designation for extruded and forged products only, but only when the supplier or producer and the purchaser have mutually so agreed. Agreement may be indicated, for example, by reference to a standard, by letter, by order note, or other means which allow the Zr + Ti limit.

B985 Practice for Sampling Aluminum Ingots, Billets, Castings and Finished or Semi-Finished Wrought Aluminum Products for Compositional Analysis
E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications
~~E34 Test Methods for Chemical Analysis of Aluminum and Aluminum-Base Alloys (Withdrawn 2017)[4]~~
E215 Practice for Standardizing Equipment and Electromagnetic Examination of Seamless Aluminum-Alloy Tube
E527 Practice for Numbering Metals and Alloys in the Unified Numbering System (UNS)
E607 Test Method for Atomic Emission Spectrometric Analysis Aluminum Alloys by the Point to Plane Technique Nitrogen Atmosphere (Withdrawn 2011)[4]
E716 Practices for Sampling and Sample Preparation of Aluminum and Aluminum Alloys for Determination of Chemical Composition by Spark Atomic Emission Spectrometry
E1004 Test Method for Determining Electrical Conductivity Using the Electromagnetic (Eddy Current) Method
E1251 Test Method for Analysis of Aluminum and Aluminum Alloys by Spark Atomic Emission Spectrometry
E3061 Test Method for Analysis of Aluminum and Aluminum Alloys by Inductively Coupled Plasma Atomic Emission Spectrometry (Performance Based Method)

2.3 *ANSI Standards:*[5]

~~H35.1/H35.1(M)~~H35.1/H35.1M Alloy and Temper Designation Systems for Aluminum
H35.2 [H35.2M] Dimensional Tolerances for Aluminum Mill Products

2.4 *Military Standard:*[6]

MIL-STD-129 Marking for Shipment and Storage

[4] The last approved version of this historical standard is referenced on www.astm.org.
[5] Available from The Aluminum Association, Inc., ~~1525 Wilson Bl, Suite 600,~~1400 Crystal Drive, Suite 430, Arlington, VA ~~22209, http://www.aluminum.org~~22202, http://www.aluminum.org.
[6] Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5098.

TABLE 2 Tensile Property Limits (US Customary)[A,B]

Temper	Specified Wall Thickness,[C] in.	Tensile Strength, ksi		Yield Strength[D] (0.2 % offset), min, ksi	Elongation in 2 in. or 4 × Diameter, 4× Diameter,[E] min, %	
		min	max		Full-Section Specimen	Cut-Out Specimen
			Aluminum 1060[F]			
O	0.014–0.500	8.5	13.5	2.5	...	...
H12		10.0	...	4.0	...	...
H14		12.0	...	10.0	...	...
H18		16.0	...	13.0	...	...
H113[G]		8.5	...	2.5	...	...
			Aluminum 1100[F]			
O	0.010–0.500	11.0	15.5	3.5	...	...
H12		14.0	...	11.0	...	...
H14		16.0	...	14.0	...	...
H16		19.0	...	17.0	...	...
H18		22.0	...	20.0	...	...
H113[G]		11.0		3.5		
			Alloy 2011			
T3	0.018–0.049	47.0	...	40.0	...	...
T3	0.018–0.049	47.0	...	40.0	...	...
	0.050–0.500	47.0	...	40.0	10	8
T4511	0.018–0.049	44.0	...	25.0	...	...
					...	...
T4511	0.018–0.049	44.0	...	25.0	.	.
					..	..
	0.050–0.259	44.0	...	25.0	20	18
	0.050–0.259	44.0	...	25.0	20	18
	0.260–0.500	44.0	...	25.0	20	20
	0.260–0.500	44.0	...	25.0	20	20
T8	0.018–0.500	58.0	...	46.0	10	8
T8	0.018–0.500	58.0	...	46.0	10	8
			Alloy 2014			
O	0.018–0.500	...	32.0	16.0 max	...	...
O	0.018–0.500	...	32.0	16.0 max	...	...
T4, T42[H]	0.018–0.024	54.0	...	30.0	10	...
T4, T42[H]	0.018–0.024	54.0	...	30.0	10	...
	0.025–0.049	54.0	...	30.0	12	10
	0.025–0.049	54.0	...	30.0	12	10
	0.050–0.259	54.0	...	30.0	14	10
	0.050–0.259	54.0	...	30.0	14	10
	0.260–0.500	54.0	...	30.0	16	12
	0.260–0.500	54.0	...	30.0	16	12
T6, T62[H]	0.018–0.024	65.0	...	55.0	7	...
T6, T62[H]	0.018–0.024	65.0	...	55.0	7	...
	0.025–0.049	65.0	...	55.0	7	6
	0.025–0.049	65.0	...	55.0	7	6
	0.050–0.259	65.0	...	55.0	8	7
	0.050–0.259	65.0	...	55.0	8	7
	0.260–0.500	65.0	...	55.0	9	8
	0.260–0.500	65.0	...	55.0	9	8
			Alloy 2024			
O	0.018–0.500	...	32.0	15.0 max	...	...
O	0.018–0.500	...	32.0	15.0 max	...	...
T3	0.018–0.024	64.0	...	42.0	10	...
T3	0.018–0.024	64.0	...	42.0	10	...
	0.025–0.049	64.0	...	42.0	12	10
	0.025–0.049	64.0	...	42.0	12	10
	0.050–0.259	64.0	...	42.0	14	10
	0.050–0.259	64.0	...	42.0	14	10
	0.260–0.500	64.0	...	42.0	16	12
	0.260–0.500	64.0	...	42.0	16	12
T42[H]	0.018–0.024	64.0	...	40.0	10	...
T42[H]	0.018–0.024	64.0	...	40.0	10	...
	0.025–0.049	64.0	...	40.0	12	10

TABLE 2 *Continued*

Temper	Specified Wall Thickness,[C] in.	Tensile Strength, ksi min	Tensile Strength, ksi max	Yield Strength[D] (0.2 % offset), min, ksi	Elongation in 2 in. or ~~4 × Diameter,~~ 4× Diameter,[E] min, % Full-Section Specimen	Cut-Out Specimen
	0.025–0.049	64.0	. . .	40.0	12	10
	~~0.050–0.259~~	~~64.0~~	~~...~~	~~40.0~~	~~14~~	~~10~~
	0.050–0.259	64.0	. . .	40.0	14	10
	~~0.260–0.500~~	~~64.0~~	~~...~~	~~40.0~~	~~16~~	~~12~~
	0.260–0.500	64.0	. . .	40.0	16	12
			Alloy 3003[F]			
~~O~~	~~0.010–0.024~~	~~14.0~~	~~19.0~~	~~5.0~~	~~...~~	~~...~~
O	0.010–0.024	14.0	19.0	5.0	. . .	. . .
	~~0.025–0.049~~	~~14.0~~	~~19.0~~	~~5.0~~	~~30~~	~~20~~
	0.025–0.049	14.0	19.0	5.0	30	20
	~~0.050–0.259~~	~~14.0~~	~~19.0~~	~~5.0~~	~~35~~	~~25~~
	0.050–0.259	14.0	19.0	5.0	35	25
	~~0.260–0.500~~	~~14.0~~	~~19.0~~	~~5.0~~	~~...~~	~~30~~
	0.260–0.500	14.0	19.0	5.0	. . .	30
~~H12~~	~~0.010–0.500~~	~~17.0~~	~~...~~	~~12.0~~	~~...~~	~~...~~
H12	0.010–0.500	17.0	. . .	12.0	. . .	. . .
~~H14~~	~~0.010–0.024~~	~~20.0~~	~~...~~	~~17.0~~	~~3~~	~~...~~
H14	0.010–0.024	20.0	. . .	17.0	3	. . .
	~~0.025–0.049~~	~~20.0~~	~~...~~	~~17.0~~	~~5~~	~~3~~
	0.025–0.049	20.0	. . .	17.0	5	3
	~~0.050–0.259~~	~~20.0~~	~~...~~	~~17.0~~	~~8~~	~~4~~
	0.050–0.259	20.0	. . .	17.0	8	4
	~~0.260–0.500~~	~~20.0~~	~~...~~	~~17.0~~	~~...~~	~~...~~
	0.260–0.500	20.0	. . .	17.0	. . .	. . .
~~H16~~	~~0.010–0.024~~	~~24.0~~	~~...~~	~~21.0~~	~~...~~	~~...~~
H16	0.010–0.024	24.0	. . .	21.0	. . .	. . .
	~~0.025–0.049~~	~~24.0~~	~~...~~	~~21.0~~	~~3~~	~~2~~
	0.025–0.049	24.0	. . .	21.0	3	2
	~~0.050–0.259~~	~~24.0~~	~~...~~	~~21.0~~	~~5~~	~~4~~
	0.050–0.259	24.0	. . .	21.0	5	4
	~~0.260–0.500~~	~~24.0~~	~~...~~	~~21.0~~	~~...~~	~~...~~
	0.260–0.500	24.0	. . .	21.0	. . .	. . .
~~H18~~	~~0.010–0.024~~	~~27.0~~	~~...~~	~~24.0~~	~~2~~	~~...~~
H18	0.010–0.024	27.0	. . .	24.0	2	. . .
	~~0.025–0.049~~	~~27.0~~	~~...~~	~~24.0~~	~~3~~	~~2~~
	0.025–0.049	27.0	. . .	24.0	3	2
	~~0.050–0.259~~	~~27.0~~	~~...~~	~~24.0~~	~~5~~	~~3~~
	0.050–0.259	27.0	. . .	24.0	5	3
	~~0.260–0.500~~	~~27.0~~	~~...~~	~~24.0~~	~~...~~	~~...~~
	0.260–0.500	27.0	. . .	24.0	. . .	. . .
~~H113[G]~~	~~0.010–0.500~~	~~14.0~~	~~...~~	~~5.0~~	~~...~~	~~...~~
H113[G]	0.010–0.500	14.0	. . .	5.0	. . .	. . .
			Alloy Alclad 3003[F]			
~~O~~	~~0.010–0.024~~	~~13.0~~	~~19.0~~	~~4.5~~	~~...~~	~~...~~
O	0.010–0.024	13.0	19.0	4.5	. . .	. . .
	~~0.025–0.049~~	~~13.0~~	~~19.0~~	~~4.5~~	~~30~~	~~20~~
	0.025–0.049	13.0	19.0	4.5	30	20
	~~0.050–0.259~~	~~13.0~~	~~19.0~~	~~4.5~~	~~35~~	~~25~~
	0.050–0.259	13.0	19.0	4.5	35	25
	~~0.260–0.500~~	~~13.0~~	~~19.0~~	~~4.5~~	~~...~~	~~30~~
	0.260–0.500	13.0	19.0	4.5	. . .	30
~~H14~~	~~0.010–0.024~~	~~19.0~~	~~...~~	~~16.0~~	~~...~~	~~...~~
H14	0.010–0.024	19.0	. . .	16.0	. . .	. . .
	~~0.025–0.049~~	~~19.0~~	~~...~~	~~16.0~~	~~5~~	~~3~~
	0.025–0.049	19.0	. . .	16.0	5	3
	~~0.050–0.259~~	~~19.0~~	~~...~~	~~16.0~~	~~8~~	~~4~~
	0.050–0.259	19.0	. . .	16.0	8	4
	~~0.260–0.500~~	~~19.0~~	~~...~~	~~16.0~~	~~...~~	~~...~~
	0.260–0.500	19.0	. . .	16.0	. . .	. . .
~~H18~~	~~0.010–0.500~~	~~26.0~~	~~...~~	~~23.0~~	~~...~~	~~...~~
H18	0.010–0.500	26.0	. . .	23.0	. . .	. . .
~~H113[G]~~	~~0.010–0.500~~	~~13.0~~	~~...~~	~~4.5~~	~~...~~	~~...~~
H113[G]	0.010–0.500	13.0	. . .	4.5	. . .	. . .
			Alloy 3102[F]			
~~O~~	~~0.018–0.049~~	~~12.0~~	~~17.0~~	~~4.0~~	~~30[I]~~	~~20[I]~~
O	0.018–0.049	12.0	17.0	4.0	30[I]	20[I]
	~~0.050–0.065~~	~~12.0~~	~~17.0~~	~~4.0~~	~~35~~	~~25~~
	0.050–0.065	12.0	17.0	4.0	35	25
			Alloy Alclad 3102[F]			
~~O~~	~~0.018–0.049~~	~~10.0~~	~~17.0~~	~~3.5~~	~~30[I]~~	~~20[I]~~ ~~25~~
O	0.018–0.049	10.0	17.0	3.5	30[I]	20[I]

TABLE 2 *Continued*

Temper	Specified Wall Thickness,[C] in.	Tensile Strength, ksi min	Tensile Strength, ksi max	Yield Strength[D] (0.2 % offset), min, ksi	Elongation in 2 in. or ~~4 × Diameter,~~ 4× Diameter,[E] min, % Full-Section Specimen	Cut-Out Specimen
	~~0.050–0.065~~	~~10.0~~	~~17.0~~	~~3.5~~	~~35~~	
	0.050–0.065	10.0	17.0	3.5	35	25
			Alloy 5005[F]			
~~O~~	~~0.018–0.500~~	~~15.0~~	~~21.0~~	~~5.0~~	~~...~~	~~...~~
O	0.018–0.500	15.0	21.0	5.0	. . .	. . .
			Alloy 5050[F]			
~~O~~	~~0.010–0.500~~	~~18.0~~	~~24.0~~	~~6.0~~	~~...~~	~~...~~
O	0.010–0.500	18.0	24.0	6.0	. . .	. . .
~~H32~~	~~0.010–0.500~~	~~22.0~~	~~...~~	~~16.0~~	~~...~~	~~...~~
H32	0.010–0.500	22.0	. . .	16.0	. . .	. . .
~~H34~~	~~0.010–0.500~~	~~25.0~~	~~...~~	~~20.0~~	~~...~~	~~...~~
H34	0.010–0.500	25.0	. . .	20.0	. . .	. . .
~~H36~~	~~0.010–0.500~~	~~27.0~~	~~...~~	~~22.0~~	~~...~~	~~...~~
H36	0.010–0.500	27.0	. . .	22.0	. . .	. . .
~~H38~~	~~0.010–0.500~~	~~29.0~~	~~...~~	~~24.0~~	~~...~~	~~...~~
H38	0.010–0.500	29.0	. . .	24.0	. . .	. . .
			Alloy 5052[F]			
~~O~~	~~0.010–0.450~~	~~25.0~~	~~35.0~~	~~10.0~~	~~...~~	~~...~~
O	0.010–0.450	25.0	35.0	10.0	. . .	. . .
~~H32~~	~~0.010–0.450~~	~~31.0~~	~~...~~	~~23.0~~	~~...~~	~~...~~
H32	0.010–0.450	31.0	. . .	23.0	. . .	. . .
~~H34~~	~~0.010–0.450~~	~~34.0~~	~~...~~	~~26.0~~	~~...~~	~~...~~
H34	0.010–0.450	34.0	. . .	26.0	. . .	. . .
~~H36~~	~~0.010–0.450~~	~~37.0~~	~~...~~	~~29.0~~	~~...~~	~~...~~
H36	0.010–0.450	37.0	. . .	29.0	. . .	. . .
~~H38~~	~~0.010–0.450~~	~~39.0~~	~~...~~	~~24.0~~	~~...~~	~~...~~
H38	0.010–0.450	39.0	. . .	24.0	. . .	. . .
			Alloy 5083[F]			
~~O~~	~~0.018–0.450~~	~~39.0~~	~~51.0~~	~~16.0~~	~~...~~	~~14~~
O	0.018–0.450	39.0	51.0	16.0	. . .	14
			Alloy 5086[F]			
~~O~~	~~0.010–0.450~~	~~35.0~~	~~46.0~~	~~14.0~~	~~...~~	~~...~~
O	0.010–0.450	35.0	46.0	14.0	. . .	. . .
~~H32~~	~~0.010–0.450~~	~~40.0~~	~~...~~	~~28.0~~	~~...~~	~~...~~
H32	0.010–0.450	40.0	. . .	28.0	. . .	. . .
~~H34~~	~~0.010–0.450~~	~~44.0~~	~~...~~	~~34.0~~	~~...~~	~~...~~
H34	0.010–0.450	44.0	. . .	34.0	. . .	. . .
~~H36~~	~~0.010–0.450~~	~~47.0~~	~~...~~	~~38.0~~	~~...~~	~~...~~
H36	0.010–0.450	47.0	. . .	38.0	. . .	. . .
			Alloy 5154[F]			
O	0.010–0.500	30.0	41.0	11.0	10	10
~~H34~~	~~0.010–0.500~~	~~39.0~~	~~...~~	~~29.0~~	~~5~~	~~5~~
H34	0.010–0.500	39.0	. . .	29.0	5	5
~~H38~~	~~0.010–0.250~~	~~45.0~~	~~...~~	~~34.0~~	~~...~~	~~...~~
H38	0.010–0.250	45.0	. . .	34.0	. . .	. . .
			Alloy 5456[F]			
~~O~~	~~0.018–0.450~~	~~41.0~~	~~53.0~~	~~19.0~~	~~...~~	~~14~~
O	0.018–0.450	41.0	53.0	19.0	. . .	14
			Alloy 6061			
~~O~~	~~0.018–0.500~~	~~...~~	~~22.0~~	~~14.0 max~~	~~15~~	~~15~~
O	0.018–0.500	. . .	22.0	14.0 max	15	15
~~T4~~	~~0.025–0.049~~	~~30.0~~	~~...~~	~~16.0~~	~~16~~	~~14~~
T4	0.025–0.049	30.0	. . .	16.0	16	14
	0.050–0.259	30.0	. . .	16.0	18	16
	~~0.260–0.500~~	~~30.0~~	~~...~~	~~16.0~~	~~20~~	~~18~~
	0.260–0.500	30.0	. . .	16.0	20	18
~~T42[H]~~	~~0.025–0.049~~	~~30.0~~	~~...~~	~~14.0~~	~~16~~	~~14~~
T42[H]	0.025–0.049	30.0	. . .	14.0	16	14
	~~0.050–0.259~~	~~30.0~~	~~...~~	~~14.0~~	~~18~~	~~16~~
	0.050–0.259	30.0	. . .	14.0	18	16
	~~0.260–0.500~~	~~30.0~~	~~...~~	~~14.0~~	~~20~~	~~18~~
	0.260–0.500	30.0	. . .	14.0	20	18
~~T6, T62[H]~~	~~0.025–0.049~~	~~42.0~~	~~...~~	~~35.0~~	~~10~~	~~8~~
T6, T62[H]	0.025–0.049	42.0	. . .	35.0	10	8
	~~0.050–0.259~~	~~42.0~~	~~...~~	~~35.0~~	~~12~~	~~10~~
	0.050–0.259	42.0	. . .	35.0	12	10
	~~0.260–0.500~~	~~42.0~~	~~...~~	~~35.0~~	~~14~~	~~12~~
	0.260–0.500	42.0	. . .	35.0	14	12
T8	0.035–0.350	45.0	. . .	40.0	8	. . .
			Alloy 6063			

TABLE 2 *Continued*

Temper	Specified Wall Thickness,[C] in.	Tensile Strength, ksi min	Tensile Strength, ksi max	Yield Strength[D] (0.2 % offset), min, ksi	Elongation in 2 in. or 4 × Diameter, 4× Diameter,[E] min, % Full-Section Specimen	Cut-Out Specimen
~~O~~	~~0.018–0.500~~	~~...~~	~~19.0~~	~~...~~	~~...~~	~~...~~
O	0.018–0.500	. . .	19.0	. . .	. . .	. . .
~~T4, T42[H]~~	~~0.025–0.049~~	~~22.0~~	~~...~~	~~10.0~~	~~16~~	~~14~~
T4, T42[H]	0.025–0.049	22.0	. . .	10.0	16	14
	~~0.050–0.259~~	~~22.0~~	~~...~~	~~10.0~~	~~18~~	~~16~~
	0.050–0.259	22.0	. . .	10.0	18	16
	~~0.260–0.500~~	~~22.0~~	~~...~~	~~10.0~~	~~20~~	~~18~~
	0.260–0.500	22.0	. . .	10.0	20	18
~~T6, T62[H]~~	~~0.025–0.049~~	~~33.0~~	~~...~~	~~28.0~~	~~12~~	~~8~~
T6, T62[H]	0.025–0.049	33.0	. . .	28.0	12	8
	~~0.050–0.259~~	~~33.0~~	~~...~~	~~28.0~~	~~14~~	~~10~~
	0.050–0.259	33.0	. . .	28.0	14	10
	~~0.260–0.500~~	~~33.0~~	~~...~~	~~28.0~~	~~16~~	~~12~~
	0.260–0.500	33.0	. . .	28.0	16	12
~~T83~~	~~0.025–0.259~~	~~33.0~~	~~...~~	~~30.0~~	~~5~~	~~...~~
T83	0.025–0.259	33.0	. . .	30.0	5	. . .
~~T831~~	~~0.025–0.259~~	~~28.0~~	~~...~~	~~25.0~~	~~5~~	~~...~~
T831	0.025–0.259	28.0	. . .	25.0	5	. . .
~~T832~~	~~0.025–0.049~~	~~41.0~~	~~...~~	~~36.0~~	~~8~~	~~5~~
T832	0.025–0.049	41.0	. . .	36.0	8	5
	~~0.050–0.259~~	~~40.0~~	~~...~~	~~35.0~~	~~8~~	~~5~~
	0.050–0.259	40.0	. . .	35.0	8	5
			Alloy 6262			
~~T6, T62[H]~~	~~0.025–0.049~~	~~42.0~~	~~...~~	~~35.0~~	~~10~~	~~8~~
T6, T62[H]	0.025–0.049	42.0	. . .	35.0	10	8
	~~0.050–0.259~~	~~42.0~~	~~...~~	~~35.0~~	~~12~~	~~10~~
	0.050–0.259	42.0	. . .	35.0	12	10
	~~0.260–0.500~~	~~42.0~~	~~...~~	~~35.0~~	~~14~~	~~12~~
	0.260–0.500	42.0	. . .	35.0	14	12
~~T9~~	~~0.025–0.375~~	~~48.0~~	~~...~~	~~44.0~~	~~5~~	~~4~~
T9	0.025–0.375	48.0	. . .	44.0	5	4
			Alloy 7075			
~~O~~	~~0.025–0.049~~	~~...~~	~~40.0~~	~~21.0 max[J]~~	~~10~~	~~8~~
O	0.025–0.049	. . .	40.0	21.0 max[J]	10	8
	~~0.050–0.500~~	~~...~~	~~40.0~~	~~21.0 max[J]~~	~~12~~	~~10~~
	0.050–0.500	. . .	40.0	21.0 max[J]	12	10
~~T6, T62[H]~~	~~0.025–0.259~~	~~77.0~~	~~...~~	~~66.0~~	~~8~~	~~7~~
T6, T62[H]	0.025–0.259	77.0	. . .	66.0	8	7
	~~0.260–0.500~~	~~77.0~~	~~...~~	~~66.0~~	~~9~~	~~8~~
	0.260–0.500	77.0	. . .	66.0	9	8
~~T73[K]~~	~~0.025–0.259~~	~~66.0~~	~~...~~	~~56.0~~	~~10~~	~~8~~
T73[K]	0.025–0.259	66.0	. . .	56.0	10	8
	~~0.260–0.500~~	~~66.0~~	~~...~~	~~56.0~~	~~12~~	~~10~~
	0.260–0.500	66.0	. . .	56.0	12	10

[A] See Annex A1.
[B] To determine conformance to this specification, each value for tensile strength and for yield strength shall be rounded to the nearest 0.1 ksi and each value for elongation to the nearest 0.5 % both in accordance with the rounding-off method of Practice E29.
[C] Coiled tube is generally available with a maximum wall thickness of 0.083 in. and only in ~~nonheat-treatable~~non-heat-treatable alloys.
[D] Yield strength to be determined only on straight tube.
[E] Elongation of full-section and cut-out sheet-type specimens is measured in 2 in. of cut-out round specimens, in 4× specimen diameter.
[F] In this alloy tube other than round is produced only in the F (as drawn) and O tempers. Properties for F temper are not ~~specified or guaranteed.~~specified, guaranteed, tested, or provided.
[G] Beginning with the 1982 issue the requirements for the H112 tempers were replaced by the H113 temper, applicable to other than round tube, which is fabricated by cold-forming annealed round tube and acquires some temper in this forming operation.
[H] Material in the T42 or T62 tempers is not available from the material producers.
[I] For specified wall thickness under 0.025 in., elongation is not required.
[J] Applicable only to round tube. The maximum yield strength for other-than-round tube shall be negotiated.
[K] Material in this temper exhibits improved resistance to stress corrosion compared to that of the T6 temper. The stress-corrosion resistance capability of individual lots is determined by testing the previously selected tension-test samples in accordance with the applicable electrical conductivity acceptance criteria of Table 3.Table 4.

TABLE 5 Minimum Outside Diameter Flattening Factor (US Customary)

Alloy	Temper	Wall Thickness, in.	[Wall Thickness, mm] Over	[Wall Thickness, mm] Through	Minimum Diameter Flattening Factor, *F*
1100	O	0.014–0.500	0.32	12.50	2
	H12	0.014–0.500	0.32	12.50	3
	H14	0.014–0.500	0.32	12.50	6
	H16	0.014–0.500	0.32	12.50	8
3003	O	0.025–0.500	0.63	12.50	2
	H12	0.025–0.500	0.63	12.50	3
	H14	0.025–0.500	0.63	12.50	6
	H16	0.025–0.500	0.63	12.50	8
2024	O	0.018–0.049	0.45	1.20	3
		0.050–0.500	1.20	12.50	4
	T3	0.018–0.500	0.45	12.50	8
5052	O	0.010–0.450	0.25	11.50	3
	H32	0.010–0.450	0.25	11.50	6
	H34	0.010–0.450	0.25	11.50	8
5086	O	0.010–0.450	0.25	11.50	3
	H32	0.010–0.450	0.25	11.50	8
6061	O	0.018–0.120	0.45	3.20	3
		0.121–0.238	3.20	6.30	4
		0.239–0.500	6.30	12.50	6
	T4	0.025–0.500	0.63	12.50	6
	T6	0.025–0.500	0.63	12.50	8
7075	O	0.025–0.049	0.63	1.20	4
		0.050–0.259	1.20	6.30	5
	T6	0.025–0.259	0.63	6.30	10

2.5 *AMS Specification:*[7]

AMS 2772 Heat Treatment of Aluminum Alloy Raw Materials

2.6 *Federal Standard:*[6]

Fed. Std. No. 123 Marking for Shipment (Civil Agencies)

2.7 *Other Standards*[8]

CEN EN 14242 Aluminum and Aluminum Alloys – Chemical Analysis – Inductively Coupled Optical Emission Spectral Analysis

3. Terminology

3.1 *Definitions:*

~~3.1.1 *alclad seamless pipe or alclad seamless tube*—a composite pipe or tube product composed of a seamless aluminum alloy core having on either the inside or the outside surface a metallurgically bonded aluminum or aluminum-alloy coating that is anodic to the core, thus electrolytically protecting the core against corrosion.~~

~~3.1.2 *extruded seamless round tube*—an extruded hollow product having a round cross section and a uniform wall thickness, which does not contain any line junctures resulting from method of manufacture.~~

~~3.1.3 *producer*—the primary manufacturer of the material.~~

~~3.1.4 *seamless pipe*—extruded or drawn seamless tube having certain standardized sizes of outside diameter and wall thickness commonly designated by "Nominal Pipe Sizes" and American National Standards Institute (ANSI) Schedule Numbers. Note that while this is a combined SI and Metric Units Specification, there are no standard equivalent metric sizes for Pipe. Metric sizes are converted and shown only for user convenience.~~

~~3.1.5 *supplier*—jobber or distributor as distinct from producer.~~

3.1.1 ~~*Definitions*—~~Refer to Terminology B881 for definitions of ~~other~~ product terms used in this specification.

3.2 *Definitions of Terms Specific to This Standard:*

[7] Available from Society of Automotive Engineers (SAE), 400 Commonwealth Dr., Warrendale, PA 15096-0001.

[8] Available from European Committee for Standardization, Central Secretariat (CEN), rue de Stassart 36, B1050 Brussels, Belgium. http://www.cen.eu/esearch.

TABLE 1 Chemical Composition Limits[A,B,C,D]

Alloy	Silicon Each	Silicon Total[F]	Iron	Iron	Copper	Copper	Other Elements[E] / Manganese	Magnesium	Chromium	Zinc	Ti
				1060						0.25	0.0
1100	—0.95 Si + Fe	0.05–0.20	0.05	...	...	0.10	...			0.05	
2011	0.40	0.7	5.0–6.0	...	...	...	0.30	...	0.20–0.6	0.20–0.6	
2014	0.50–1.2	0.7	3.9–5.0	0.40–1.2	0.20–0.8	0.10	0.25	0.15			
2024	0.50	0.50	3.8–4.9	0.30–0.9	1.2–1.8	0.10	0.25	0.15			
3003	0.6	0.7	0.05–0.20	1.0–1.5	...	...	0.10	...			
Alclad 3003[J]											
3102	0.40	0.7	0.10	0.05–0.40	...	...	0.30	0.10			
Alclad 3102[J]											
5005	0.30	0.7	0.20	0.20	0.50–1.1	0.10	0.25	...			
5050	0.40	0.7	0.20	0.10	1.1–1.8	0.10	0.25	...			
5052	0.25	0.40	0.10	0.10	2.2–2.8	0.15–0.35	0.10	...			
5083	0.40	0.40	0.10	0.40–1.0	4.0–4.9	0.05–0.25	0.25	0.15			
5086	0.40	0.50	0.10	0.20–0.7	3.5–4.5	0.05–0.25	0.25	0.15			
5154	0.25	0.40	0.10	0.10	3.1–3.9	0.15–0.35	0.20	0.20			
5456	0.25	0.40	0.10	0.50–1.0	4.7–5.5	0.05–0.20	0.25	0.20			
				6061						0.40–0.80.	
				6063						0.20–0.60.	
				6262						0.40–0.80.	
7072 cladding	0.7 Si + Fe	0.10	0.10	0.10	...	0.8–1.3	...			0.05	
7075[K]	0.40	0.50	1.2–2.0	0.30	2.1–2.9	0.18–0.28	5.1–6.1	0.20			

TABLE 3 Tensile Property Limits[A,B] (Metric SI)

Temper	Specified Wall Thickness[C] Over	Specified Wall Thickness[C] Through	Tensile Strength, MPa Min	Tensile Strength, MPa Max	Yield Strength[D] (0.2 % offset), MPa Min	Yield Strength[D] (0.2 % offset), MPa Max	Elongation,[E] min, % Full-Section Specimen in 50 mm	Elongation,[E] min, % Cut-Out Specimen in 50 mm	Elongation,[E] min, % Cut-Out Specimen in 5× diameter ($5.65\sqrt{A}$)
					Aluminum 1060[F]				
O	0.25	12.50	60	95	15	. . .	. . .	. . .	. . .
H12	0.25	12.50	70	. . .	30	. . .	. . .	. . .	. . .
H14	0.25	12.50	85	. . .	70	. . .	. . .	. . .	. . .
H18	0.25	12.50	110	. . .	90	. . .	. . .	. . .	. . .
H113[G]	0.25	12.50	60	. . .	15	. . .	. . .	. . .	. . .
					Aluminum 1100[F]				
O	0.32	12.50	75	105	25	. . .	. . .	. . .	. . .
H12	0.32	12.50	95	. . .	75	. . .	. . .	. . .	. . .
H14	0.32	12.50	110	. . .	95	. . .	. . .	. . .	. . .
H16	0.32	12.50	130	. . .	115	. . .	. . .	. . .	. . .
H18	0.32	12.50	150	. . .	140	. . .	. . .	. . .	. . .
H113[G]	0.32	12.50	75	. . .	25	. . .	. . .	. . .	. . .
					Alloy 2011				
T3	0.45	1.20	325	. . .	275	. . .	. . .	. . .	. . .
	1.20	12.50	325	. . .	275	. . .	10	8	7
T4511	0.45	1.20	305	. . .	170	. . .	. . .	. . .	. . .
	1.20	6.30	305	. . .	170	. . .	20	18	16
	6.30	12.50	305	. . .	170	. . .	20	20	18
T8	0.45	12.50	400	. . .	315	. . .	10	8	7
					Alloy 2014				
O	0.45	12.50	. . .	220	. . .	110	. . .	. . .	. . .
T4, T42[H]	0.45	0.63	370	. . .	205	. . .	10	. . .	. . .
	0.63	1.20	370	. . .	205	. . .	12	10	. . .
	1.20	6.30	370	. . .	205	. . .	14	10	. . .
	6.30	12.50	370	. . .	205	. . .	16	12	10
T6, T62[H]	0.45	0.63	450	. . .	380	. . .	7	. . .	. . .
	0.63	1.20	450	. . .	380	. . .	7	6	. . .
	1.20	6.30	450	. . .	380	. . .	8	7	. . .
	6.30	12.50	450	. . .	380	. . .	9	8	7
					Alloy 2024				
O	0.45	12.50	. . .	220	. . .	100	. . .	. . .	. . .
T3	0.45	0.63	440	. . .	290	. . .	10	. . .	. . .
	0.63	1.20	440	. . .	290	. . .	12	10	. . .
	1.20	6.30	440	. . .	290	. . .	14	10	. . .
	6.30	12.50	440	. . .	290	. . .	16	12	10
T42[H]	0.45	0.63	440	. . .	275	. . .	10	. . .	. . .
	0.63	1.20	440	. . .	275	. . .	12	10	. . .
	1.20	6.30	440	. . .	275	. . .	14	10	. . .
	6.30	12.50	440	. . .	275	. . .	16	12	10
					Alloy 3003[F]				
O	0.25	0.63	95	130	35	. . .	. . .	. . .	. . .

TABLE 3 *Continued*

Temper	Specified Wall Thickness[C]		Tensile Strength, MPa		Yield Strength[D] (0.2 % offset), MPa		Elongation,[E] min, %		
	Over	Through	Min	Max	Min	Max	Full-Section Specimen in 50 mm	Cut-Out Specimen in 50 mm	Cut-Out Specimen in 5× diameter ($5.65\sqrt{A}$)
	0.63	1.20	95	130	35	...	30	20	...
	1.20	6.30	95	130	35	...	35	25	...
	6.30	12.50	95	130	35	...	...	30	27
H12	0.25	12.50	120	...	85	...	...	...	...
H14	...	0.63	140	...	115	...	3	...	...
	0.63	1.20	140	...	115	...	5	3	...
	1.20	6.30	140	...	115	...	8	4	...
	6.30	12.50	140	...	115	...	...	...	...
H16	0.25	0.63	165	...	145	...	...	...	...
	0.63	1.20	165	...	145	...	3	2	...
	1.20	6.30	165	...	145	...	5	4	...
	6.30	12.50	165	...	145	...	...	...	...
H18	...	0.63	185	...	165	...	2	...	...
	0.63	1.20	185	...	165	...	3	2	...
	1.20	6.30	185	...	165	...	5	3	...
	6.30	12.50	185	...	165	...	...	...	...
H113[G]	0.25	12.50	95	...	35	...	...	...	...
Alloy Alclad 3003[F]									
O	0.25	0.63	90	125	30	...	...	...	...
	0.63	1.20	90	125	30	...	30	20	...
	1.20	6.30	90	125	30	...	35	25	...
	6.30	12.50	90	125	30	...	...	30	27
H14	0.25	0.63	135	...	110	...	...	...	...
	0.63	1.20	135	...	110	...	5	3	...
	1.20	6.30	135	...	110	...	8	4	...
	6.30	12.50	135	...	110	...	...	...	...
H18	0.25	12.50	180	...	160	...	...	...	...
H113[G]	0.25	12.50	90	...	30	...	...	...	...
Alloy 3102[F]									
O	0.50	1.20	85	115	30	...	30[I]	20[I]	...
	1.20	1.60	85	115	30	...	35	25	...
Alloy Alclad 3102[F]									
O	0.50	1.20	70	115	25	...	30[I]	20[I]	...
	1.20	1.60	70	115	25	...	35	35	...
Alloy 5005[F]									
O	0.45	12.50	105	145	35	...	...	...	...
Alloy 5050[F]									
O	0.25	12.50	125	165	40	...	...	...	...
H32	0.25	12.50	150	...	110	...	...	...	...
H34	0.25	12.50	170	...	140	...	...	...	...
H36	0.25	12.50	185	...	150	...	...	...	...
H38	0.25	12.50	200	...	165	...	...	...	...
Alloy 5052[F]									
O	0.25	11.50	170	240	70	...	...	...	...
H32	0.25	11.50	215	...	160	...	...	...	...
H34	0.25	11.50	235	...	180	...	...	...	...
H36	0.25	11.50	255	...	200	...	...	...	...
H38	0.25	11.50	270	...	215	...	...	...	...
Alloy 5083[F]									
O	0.45	11.50	270	350	110	...	...	14	...
Alloy 5086[F]									
O	0.25	11.50	240	315	95	...	...	...	...
H32	0.25	11.50	275	...	195	...	...	...	...
H34	0.25	11.50	300	...	235	...	...	...	...
H36	0.25	11.50	325	...	260	...	...	...	...
Alloy 5154[F]									
O	0.25	12.50	205	285	75	...	10	10	9
H34	0.25	12.50	270	...	200	...	5	5	4
H38	0.25	6.30	310	...	235	...	...	...	...
Alloy 5456[F]									
O	0.45	11.50	285	365	130	...	...	14	...
Alloy 6061									
O	0.45	12.50	...	150	...	95	15	15	13
T4	0.63	1.20	205	...	100	...	16	14	...
	1.20	6.30	205	...	110	...	18	16	...
	6.30	12.50	205	...	110	...	20	18	16
T42[H]	0.63	1.20	205	...	95	...	16	14	...
	1.20	6.30	205	...	95	...	18	16	...
	6.30	12.50	205	...	95	...	20	18	16

TABLE 3 *Continued*

Temper	Specified Wall Thickness[C]		Tensile Strength, MPa		Yield Strength[D] (0.2 % offset), MPa		Elongation,[E] min, %		
	Over	Through	Min	Max	Min	Max	Full-Section Specimen in 50 mm	Cut-Out Specimen in 50 mm	Cut-Out Specimen in 5× diameter $(5.65\sqrt{A})$
T6, T62[H]	0.63	1.20	290	...	240	...	10	8	...
	1.20	6.30	290	...	240	...	12	10	...
	6.30	12.50	290	...	240	...	14	12	10
T8	1.00	8.00	310	...	275	...	8	6	...
Alloy 6063									
O	0.45	12.50	...	130	...	...	...	...	...
T4, T42[H]	0.63	1.20	150	...	70	...	16	14	...
	1.20	6.30	150	...	70	...	18	16	...
	6.30	12.50	150	...	70	...	20	18	16
T6, T62[H]	0.63	1.20	230	...	195	...	12	8	...
	1.20	6.30	230	...	195	...	14	10	...
	6.30	12.50	230	...	195	...	16	12	10
T83	0.63	6.30	230	...	205	...	5	...	...
T831	0.63	6.30	195	...	170	...	5	...	...
T832	0.63	1.20	285	...	250	...	8	5	...
	1.20	6.30	275	...	240	...	8	5	...
Alloy 6262									
T6, T62[H]	0.63	1.20	290	...	240	...	10	8	...
	1.20	0.63	290	...	240	...	12	10	...
	6.30	12.50	290	...	240	...	14	12	10
T9	0.63	10.00	330	...	305	...	5	4	3
Alloy 7075									
O	0.63	1.20	...	275	...	145[J]	10	8	...
	1.20	12.50	...	275	...	145[J]	12	10	9
T6, T62[H]	0.63	6.30	530	...	455	...	8	7	...
	6.30	12.50	530	...	455	...	9	8	7
T73[K]	0.63	6.30	455	...	385	...	10	8	...
	6.30	12.50	455	...	385	...	12	10	9

[A] ~~Limits are~~ See Annex A1 ~~in weight percent maximum unless shown as a range or otherwise stated.~~.

[B] ~~Analysis shall be made for the elements for which limits are shown in this table.~~

[B] ~~For purposes of determining conformance to these limits, an observed value or a calculated value obtained from analysis~~ To determine conformance to this specification, each value for tensile strength and for yield strength shall be rounded to the nearest ~~unit in the last right-hand place of figures used in expressing the specified limit, in~~ 0.1 MPa and each value for elongation to the nearest 0.5 % both in accordance with the ~~rounding-off~~rounding method of Practice E29.

[C] ~~In case of a discrepancy in the values listed in~~ Coiled tube is generally available ~~Table 1~~with ~~those listed in the~~a maximum wall thickness ~~International Alloy Designations and Chemical Composition Limits for Wrought Aluminum and Wrought Aluminum Alloys~~of 2.00 mm and only ~~(known as the "Teal Sheets"), the composition limits registered with the Aluminum Association and published in the "Teal Sheets" shall be considered the controlling composition. The "Teal Sheets" are available at http://www.aluminum.org/tealsheets.~~in non-heat-treatable alloys.

[D] Yield strength to be determined only on straight tube.

[E] ~~Others includes listed elements for which no specific limit is shown as well as unlisted metallic elements. The producer may analyze samples for trace elements not specified in the specification. However, such analysis is not required and may not cover all metallic~~Elongation in 50 mm apply for tube tested in full-section, for sheet-type specimens, for tubes having a flat wall, and for similar curved specimens for ~~Others~~tubes ~~elements. Should any analysis by the producer or the purchaser establish that an~~ having a curved wall, up to a maximum wall thickness of 12.50 mm. Elongations in 5*D* $(5.65\sqrt{A})$ where ~~*Others*~~*D* ~~element exceeds the limit of~~ and ~~*Each*~~*A* ~~or that the aggregate of several~~ are diameter and cross-sectional area of ~~Others elements exceeds the limit of~~the specimens, respectively, ~~Total,~~apply to ~~the material shall be considered non-conforming.~~round test specimens machined from wall thicknesses over 6.30 mm.

[F] ~~Other elements~~ In ~~—Total shall be the sum of unspecified metallic elements 0.010 % or more, rounded to the second decimal before determining the sum.~~ this alloy tube other than round is produced only in the F (as drawn) and O tempers. Properties for F temper are not specified, guaranteed, tested or provided.

[G] ~~Vanadium 0.05 % max.~~ Beginning with the 1982 issue the requirements for the H112 tempers were replaced by the H113 temper, applicable to other than round tube, which is fabricated by cold-forming annealed round tube and acquires some temper in this forming operation.

[H] ~~The aluminum content shall be calculated by subtracting from 100.00 % the sum of all metallic elements present in amounts of 0.010 % or more each, rounded to the second decimal before determining the sum.~~ Material in the T42 or T62 tempers is not available from the material producers.

[I] ~~Alloy clad with Alloy 7072.~~ For specified wall thickness under 0.63 mm, elongation is not required.

[J] ~~Composition of cladding alloy as applied during the course of manufacture. The samples from finished tube shall not be required to conform to these limits.~~ Applicable only to round tube. The maximum yield strength for other-than-round tube shall be negotiated.

[K] ~~A Zr +Ti limit of 0.25 percent maximum may be used with this alloy designation for extruded and forged products only, but only when the supplier or producer and the purchaser have mutually so agreed. Agreement may be indicated, for example, by reference to a standard, by letter, by order note, or other means which allow the Zr +Ti limit.~~ Material in this temper exhibits improved resistance to stress corrosion compared to that of the T6 temper. The stress corrosion resistance capability of individual lots is determined by testing the previously selected tension-test samples in accordance with the applicable electrical conductivity acceptance criteria of Table 4.

3.2.1 *capable of*—the test need not be performed by the producer of the material. However, should subsequent testing by the purchaser establish that the material does not meet these requirements, the material shall be subject to rejection.

3.2.2 *drawn seamless ~~tube—~~tube/pipe—*~~seamless tube~~ tube/pipe which does not contain any junction lines or welds of any type resulting from method of manufacture, that is subjected to drawing after ~~extrusion.~~extrusion having certain standardized sizes of outside diameter and wall thicknesses commonly designated by "Nominal Pipe Sizes" and American National Standards Institutes (ANSI) Schedule Numbers. Note that while this is a combined US Customary and Metric Units specification, there are no standard equivalent metric sizes for Pipe. Metric sizes are converted and shown only for user convenience.