Sarah Palermo

From: Marc Zayas <marc@zayasdesign.com>
Sent: Friday, April 14, 2023 6:48 AM
To: Sarah Palermo
Cc: bill@bsp1.com; Steve Costa
Subject: Re: Irvington Boat Club
Attachments: 316-SS Cable Wire.pdf; Untitled attachment 00045.htm; A500_Grade A.pdf; Untitled attachment 00048.htm; AISI 304 SS_Newel_01.pdf; Untitled attachment 00051.htm; AISI 304 SS_Newel_02.pdf; Untitled attachment 00054.htm; Mahogany_Philippine Dark Red.pdf; Untitled attachment 00057.htm; TREX Select_Decking Cut Sheet.pdf; Untitled attachment 00060.htm; TREX Select_Decking_Arch Spec.pdf; Untitled attachment 00063.htm; image001.jpg; Untitled attachment 00066.htm

Good Morning,

As per request, please find the attached Cut Sheets for the Irvington Boat Club Deck Renovation.

Columns: 4” x 4” x 3/16” A500 Grade A Structural Steel
Newels: 3” x 3” x 3/16” 304 Stainless Steel
Cables: 3/16” 316 Stainless Steel
Railing Cap: Philippine Mahogany
Decking: Trex Select Winchester Gray

Please let me know if the attachments meet the requirements.

Thank you in advance
Best regards
Marc Zayas

ZAYASDESIGN

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Gibbs
WIRE & STEEL COMPANY, INC.

Technical Data Sheet

TYPE 316 STAINLESS STEEL WIRE

Similar in composition to Type 302, Type 316 stainless steel wire has a slightly higher nickel content and 2-2.50% molybdenum giving this alloy better corrosion resistance. Type 316's tensile strength is 10-15% lower than that of Type 302, and the alloy is slightly less magnetic in the spring temper than Type 302. With its superior cold working properties, it can be used for severe cold forming operations and exhibits short time tensile and creep strength properties at elevated temperatures.

Gibbs Type 316 stainless steel wire is coated for coiling and is available in the range 0.015 - .625" conforming to ASTM A313. All sizes are suitably coated for automatic coiling.

Chemical Composition Per ASTM-A-313							
Carbon	.07% max		Sulfur	.030% max		Nickel	10.50 – 13.50%
Maganese	2.00% max		Silicon	1.00% max		Molybdenum	2.00 – 2.50 %
Phosphorus	.045% max		Chromium	16.50 – 18.00%		Nitrogen	.10% max

Tensile Strength Table (ASTM-A-313)

Dia. Inch	Tensile Min PSI	Tensile Max PSI	Dia. Inch	Tensile Min PSI	Tensile Max PSI
Up to .010 incl.	245,000	275,000	.092 - .105 incl.	200,000	230,000
.010 - .011 incl.	240,000	270,000	.105 - .120 incl.	195,000	225,000
.012 - .013 incl.	240,000	270,000	.120 - .148 incl.	185,000	215,000
.013 - .014 incl.	240,000	270,000	.148 - .166 incl	180,000	210,000
.014 - .015 incl.	240,000	270,000	.166 - .177 incl.	170,000	200,000
.015 - .024 incl.	235,000	265,000	.177 - ..207 incl.	160,000	190,000
.024 - .041 incl.	235,000	265,000	.207 - ..225 incl.	155,000	185,000
.041 - .047 incl.	230,000	260,000	.225 - ..250 incl.	150,000	180,000
047 – 054 incl.	225,000	255,000	.250 - ..312 incl.	140,000	170,000
.054 - .062 incl.	220,000	250,000	.312 - ..375 incl.	135,000	165,000
.062 - .072 incl.	215,000	245,000	.375 - ..500 incl.	130,000	160,000
.072 - .080 incl.	210,000	240,000	.500 – over	125,000	155,000
.080 - .092 incl.	205,000	235,000			

The above charts are intended to provide general background information. You should also review the appropriate material specification. Please contact Gibbs if you have any questions.

Gibbs Wire & Steel Company Inc.
Metals Drive, Southington, CT 06489 (860) 621-0121

No. 1002 01/14

Designation: A500/A500M – 10a

Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes[1]

This standard is issued under the fixed designation A500/A500M; 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.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope*

1.1 This specification covers cold-formed welded and seamless carbon steel round, square, rectangular, or special shape structural tubing for welded, riveted, or bolted construction of bridges and buildings, and for general structural purposes.

1.2 This tubing is produced in both welded and seamless sizes with a periphery of 88 in. [2235 mm] or less, and a specified wall thickness of 0.875 in. [22 mm] or less. Grade D requires heat treatment.

NOTE 1—Products manufactured to this specification may not be suitable for those applications such as dynamically loaded elements in welded structures, etc., where low-temperature notch-toughness properties may be important.

1.3 The values stated in either SI units or inch-pound units are to be regarded separately as standard. Within the text, the SI units are shown in brackets. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard. The inch-pound units shall apply unless the "M" designation of this specification is specified in the order.

1.4 The text of this specification contains notes and footnotes that provide explanatory material. Such notes and footnotes, excluding those in tables and figures, do not contain any mandatory requirements.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

A370 Test Methods and Definitions for Mechanical Testing of Steel Products

A700 Practices for Packaging, Marking, and Loading Methods for Steel Products for Shipment

A751 Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products

A941 Terminology Relating to Steel, Stainless Steel, Related Alloys, and Ferroalloys

2.2 *Military Standards:*

MIL-STD-129 Marking for Shipment and Storage[3]

MIL-STD-163 Steel Mill Products, Preparation for Shipment and Storage[3]

2.3 *Federal Standards:*

Fed. Std. No. 123 Marking for Shipment[3]

Fed. Std. No. 183 Continuous Identification Marking of Iron and Steel Products[3]

2.4 *AIAG Standard:*

B-1 Bar Code Symbology Standard[4]

3. Terminology

3.1 *Definitions*—For definitions of terms used in this specification, refer to Terminology A941.

4. Ordering Information

4.1 Orders for material under this specification shall contain information concerning as many of the following items as are required to describe the desired material adequately:

4.1.1 Quantity (feet [metres] or number of lengths),

4.1.2 Name of material (cold-formed tubing),

4.1.3 Method of manufacture (seamless or welded),

4.1.4 Grade (A, B, C, or D),

4.1.5 Size (outside diameter and wall thickness for round tubing, and outside dimensions and wall thickness for square and rectangular tubing),

4.1.6 Copper-containing steel (see Table 1), if applicable,

4.1.7 Length (random, multiple, specific; see 11.3),

4.1.8 End condition (see 16.3),

4.1.9 Burr removal (see 16.3),

[1] This specification is under the jurisdiction of ASTM Committee A01 on Steel, Stainless Steel and Related Alloys and is the direct responsibility of Subcommittee A01.09 on Carbon Steel Tubular Products.

Current edition approved Oct. 1, 2010. Published November 2010. Originally approved in 1964. Last previous edition approved in 2010 as A500/A500M–10. DOI: 10.1520/A0500_A0500M-10a.

[2] 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.

[3] Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

[4] Available from Automotive Industry Action Group (AIAG), 26200 Lahser Rd., Suite 200, Southfield, MI 48033, http://www.aiag.org.

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

TABLE 1 Chemical Requirements

Element	Composition, %			
	Grades A, B, and D		Grade C	
	Heat Analysis	Product Analysis	Heat Analysis	Product Analysis
Carbon, max[A]	0.26	0.30	0.23	0.27
Manganese, max[A]	1.35	1.40	1.35	1.40
Phosphorus, max	0.035	0.045	0.035	0.045
Sulfur, max	0.035	0.045	0.035	0.045
Copper, min[B]	0.20	0.18	0.20	0.18

[A] For each reduction of 0.01 percentage point below the specified maximum for carbon, an increase of 0.06 percentage point above the specified maximum for manganese is permitted, up to a maximum of 1.50 % by heat analysis and 1.60 % by product analysis.

[B] If copper-containing steel is specified in the purchase order.

4.1.10 Certification (see Section 18),
4.1.11 ASTM specification designation and year of issue,
4.1.12 End use,
4.1.13 Special requirements, and
4.1.14 Bar coding (see 19.3).

5. Process

5.1 The steel shall be made by one or more of the following processes: open-hearth, basic-oxygen, or electric-furnace.

5.2 When steels of different grades are sequentially strand cast, the steel producer shall identify the resultant transition material and remove it using an established procedure that positively separates the grades.

6. Manufacture

6.1 The tubing shall be made by a seamless or welding process.

6.2 Welded tubing shall be made from flat-rolled steel by the electric-resistance-welding process. The longitudinal butt joint of welded tubing shall be welded across its thickness in such a manner that the structural design strength of the tubing section is assured.

NOTE 2—Welded tubing is normally furnished without removal of the inside flash.

6.3 Except as required by 6.4, it shall be permissible for the tubing to be stress relieved or annealed.

6.4 Grade D tubing shall be heat treated at a temperature of at least 1100 °F [590 °C] for one hour per inch [25 mm] of thickness.

7. Heat Analysis

7.1 Each heat analysis shall conform to the requirements specified in Table 1 for heat analysis.

8. Product Analysis

8.1 The tubing shall be capable of conforming to the requirements specified in Table 1 for product analysis.

8.2 If product analyses are made, they shall be made using test specimens taken from two lengths of tubing from each lot of 500 lengths, or fraction thereof, or two pieces of flat-rolled stock from each lot of a corresponding quantity of flat-rolled stock. Methods and practices relating to chemical analysis shall be in accordance with Test Methods, Practices, and Terminology A751. Such product analyses shall conform to the requirements specified in Table 1 for product analysis.

8.3 If both product analyses representing a lot fail to conform to the specified requirements, the lot shall be rejected.

8.4 If only one product analysis representing a lot fails to conform to the specified requirements, product analyses shall be made using two additional test specimens taken from the lot. Both additional product analyses shall conform to the specified requirements or the lot shall be rejected.

9. Tensile Requirements

9.1 The material, as represented by the test specimen, shall conform to the requirements as to tensile properties prescribed in Table 2.

10. Flattening Test

10.1 The flattening test shall be made on round structural tubing. A flattening test is not required for shaped structural tubing.

10.2 For welded round structural tubing, a test specimen at least 4 in. [100 mm] in length shall be flattened cold between parallel plates in three steps, with the weld located 90° from the line of direction of force. During the first step, which is a test for ductility of the weld, no cracks or breaks on the inside or outside surfaces of the test specimen shall be present until the distance between the plates is less than two-thirds of the specified outside diameter of the tubing. For the second step,

TABLE 2 Tensile Requirements

Round Structural Tubing				
	Grade A	Grade B	Grade C	Grade D
Tensile strength, min, psi [MPa]	45 000 [310]	58 000 [400]	62 000 [425]	58 000 [400]
Yield strength, min, psi [MPa]	33 000 [230]	42 000 [290]	46 000 [315]	36 000 [250]
Elongation in 2 in. [50 mm], min, %[D]	25[A]	23[B]	21[C]	23[B]
Shaped Structural Tubing				
	Grade A	Grade B	Grade C	Grade D
Tensile strength, min, psi [MPa]	45 000 [310]	58 000 [400]	62 000 [425]	58 000 [400]
Yield strength, min, psi [MPa]	39 000 [270]	46 000 [315]	50 000 [345]	36 000 [250]
Elongation in 2 in. [50 mm], min, %[D]	25[A]	23[B]	21[C]	23[B]

[A] Applies to specified wall thicknesses (t) equal to or greater than 0.120 in. [3.05 mm]. For lighter specified wall thicknesses, the minimum elongation values shall be calculated by the formula: percent elongation in 2 in. [50 mm] = $56t + 17.5$, rounded to the nearest percent. For A500M use the following formula: $2.2t + 17.5$, rounded to the nearest percent.

[B] Applies to specified wall thicknesses (t) equal to or greater than 0.180 in. [4.57 mm]. For lighter specified wall thicknesses, the minimum elongation values shall be calculated by the formula: percent elongation in 2 in. [50 mm] = $61t + 12$, rounded to the nearest percent. For A500M use the following formula: $2.4t + 12$, rounded to the nearest percent.

[C] Applies to specified wall thicknesses (t) equal to or greater than 0.120 in. [3.05 mm]. For lighter specified wall thicknesses, the minimum elongation values shall be by agreement with the manufacturer.

[D] The minimum elongation values specified apply only to tests performed prior to shipment of the tubing.

no cracks or breaks on the inside or outside parent metal surfaces of the test specimen, except as provided for in 10.5, shall be present until the distance between the plates is less than one-half of the specified outside diameter of the tubing. During the third step, which is a test for soundness, the flattening shall be continued until the test specimen breaks or the opposite walls of the test specimen meet. Evidence of laminated or unsound material or of incomplete weld that is revealed during the entire flattening test shall be cause for rejection.

10.3 For seamless round structural tubing 2⅜ in. [60 mm] specified outside diameter and larger, a specimen not less than 2½ in. [65 mm] in length shall be flattened cold between parallel plates in two steps. During the first step, which is a test for ductility, no cracks or breaks on the inside or outside surfaces, except as provided for in 10.5, shall occur until the distance between the plates is less than the value of "H" calculated by the following equation:

$$H = (1+e)t/(e+t/D) \quad (1)$$

where:

H = distance between flattening plates, in. [mm],
e = deformation per unit length (constant for a given grade of steel, 0.09 for Grade A, 0.07 for Grade B, and 0.06 for Grade C),
t = specified wall thickness of tubing, in. [mm], and
D = specified outside diameter of tubing, in. [mm].

During the second step, which is a test for soundness, the flattening shall be continued until the specimen breaks or the opposite walls of the specimen meet. Evidence of laminated or unsound material that is revealed during the entire flattening test shall be cause for rejection.

10.4 Surface imperfections not found in the test specimen before flattening, but revealed during the first step of the flattening test, shall be judged in accordance with Section 15.

10.5 When low *D*-to-*t* ratio tubulars are tested, because the strain imposed due to geometry is unreasonably high on the inside surface at the 6 and 12 o'clock locations, cracks at these locations shall not be cause for rejection if the *D*-to-*t* ratio is less than 10.

11. Permissible Variations in Dimensions

11.1 *Outside Dimensions:*

11.1.1 *Round Structural Tubing*—The outside diameter shall not vary more than ±0.5 %, rounded to the nearest 0.005 in. [0.1 mm], from the specified outside diameter for specified outside diameters 1.900 in. [48 mm] and smaller, and ± 0.75 %, rounded to the nearest 0.005 in. [0.1 mm], from the specified outside diameter for specified outside diameters 2.00 in. [5 cm] and larger. The outside diameter measurements shall be made at positions at least 2 in. [5 cm] from the ends of the tubing.

11.1.2 *Square and Rectangular Structural Tubing*—The outside dimensions, measured across the flats at positions at least 2 in. [5 cm] from the ends of the tubing, shall not vary from the specified outside dimensions by more than the applicable amount given in Table 3, which includes an allowance for convexity or concavity.

TABLE 3 Permissible Variations in Outside Flat Dimensions for Square and Rectangular Structural Tubing

Specified Outside Large Flat Dimension, in. [mm]	Permissible Variations Over and Under Specified Outside Flat Dimensions,[A] in. [mm]
2½ [65] or under	0.020 [0.5]
Over 2½ to 3½ [65 to 90], incl	0.025 [0.6]
Over 3½ to 5½ [90 to 140], incl	0.030 [0.8]
Over 5½ [140]	0.01 times large flat dimension

[A] The permissible variations include allowances for convexity and concavity. For rectangular tubing having a ratio of outside large to small flat dimension less than 1.5, and for square tubing, the permissible variations in small flat dimension shall be identical to the permissible variations in large flat dimension. For rectangular tubing having a ratio of outside large to small flat dimension in the range of 1.5 to 3.0 inclusive, the permissible variations in small flat dimension shall be 1.5 times the permissible variations in large flat dimension. For rectangular tubing having a ratio of outside large to small flat dimension greater than 3.0, the permissible variations in small flat dimension shall be 2.0 times the permissible variations in large flat dimension.

11.2 *Wall Thickness*—The minimum wall thickness at any point of measurement on the tubing shall be not more than 10 % less than the specified wall thickness. The maximum wall thickness, excluding the weld seam of welded tubing, shall be not more than 10 % greater than the specified wall thickness. For square and rectangular tubing, the wall thickness requirements shall apply only to the centers of the flats.

11.3 *Length*—Structural tubing is normally produced in random lengths 5 ft [1.5 m] and over, in multiple lengths, and in specific lengths. Refer to Section 4. When specific lengths are ordered, the length tolerance shall be in accordance with Table 4.

11.4 *Straightness*—The permissible variation for straightness of structural tubing shall be ⅛ in. times the number of feet [10 mm times the number of metres] of total length divided by 5.

11.5 *Squareness of Sides*—For square and rectangular structural tubing, adjacent sides shall be square (90°), with a permissible variation of ±2° max.

11.6 *Radius of Corners*—For square and rectangular structural tubing, the radius of each outside corner of the section shall not exceed three times the specified wall thickness.

11.7 *Twist*—For square and rectangular structural tubing, the permissible variations in twist shall be as given in Table 5. Twist shall be determined by holding one end of the tubing down on a flat surface plate, measuring the height that each corner on the bottom side of the tubing extends above the surface plate near the opposite ends of the tubing, and calculating the twist (the difference in heights of such corners),

TABLE 4 Length Tolerances for Specific Lengths of Structural Tubing

	22 ft [6.5 m] and Under		Over 22 ft [6.5 m]	
	Over	Under	Over	Under
Length tolerance for specific lengths, in. [mm]	½ [13]	¼ [6]	¾ [19]	¼ [6]

TABLE 5 Permissible Variations in Twist for Square and Rectangular Structural Tubing

Specified Outside Large Flat Dimension, in. [mm]	Maximum Permissible Variations in Twist per 3 ft of Length [Twist per Metre of Length]	
	in.	[mm]
1½ [40] and under	0.050	[1.3]
Over 1½ to 2½ [40 to 65], incl	0.062	[1.6]
Over 2½ to 4 [65 to 100], incl	0.075	[1.9]
Over 4 to 6 [100 to 150], incl	0.087	[2.2]
Over 6 to 8 [150 to 200], incl	0.100	[2.5]
Over 8 [200]	0.112	[2.8]

except that for heavier sections it shall be permissible to use a suitable measuring device to determine twist. Twist measurements shall not be taken within 2 in. [5 cm] of the ends of the tubing.

12. Special Shape Structural Tubing

12.1 The availability, dimensions, and tolerances of special shape structural tubing shall be subject to inquiry and negotiation with the manufacturer.

13. Number of Tests

13.1 One tension test as specified in Section 15 shall be made from a length of tubing representing each lot.

13.2 The flattening test, as specified in Section 10, shall be made on one length of round tubing from each lot.

13.3 The term "lot" shall apply to all tubes of the same specified size that are produced from the same heat of steel.

14. Retests

14.1 If the results of the mechanical tests representing any lot fail to conform to the applicable requirements specified in Sections 9 and 10, the lot shall be rejected or retested using additional tubing of double the original number from the lot. The lot shall be acceptable if the results of all such retests representing the lot conform to the specified requirements.

14.2 If one or both of the retests specified in 14.1 fail to conform to the applicable requirements specified in Sections 9 and 10, the lot shall be rejected or, subsequent to the manufacturer heat treating, reworking, or otherwise eliminating the condition responsible for the failure, the lot shall be treated as a new lot and tested accordingly.

15. Test Methods

15.1 Tension test specimens shall conform to the applicable requirements of Test Methods and Definitions A370, Annex A2.

15.2 Tension test specimens shall be full–size longitudinal test specimens or longitudinal strip test specimens. For welded tubing, any longitudinal strip test specimens shall be taken from a location at least 90° from the weld and shall be prepared without flattening in the gage length. Longitudinal strip test specimens shall have all burrs removed. Tension test specimens shall not contain surface imperfections that would interfere with proper determination of the tensile properties.

15.3 The yield strength corresponding to an offset of 0.2 % of the gage length or to a total extension under load of 0.5 % of the gage length shall be determined.

16. Inspection

16.1 All tubing shall be inspected at the place of manufacture to ensure conformance to the requirements of this specification.

16.2 All tubing shall be free from defects and shall have a workmanlike finish.

16.2.1 Surface imperfections shall be classed as defects when their depth reduces the remaining wall thickness to less than 90 % of the specified wall thickness. It shall be permissible for defects having a depth not in excess of 33⅓ % of the specified wall thickness to be repaired by welding, subject to the following conditions:

16.2.1.1 The defect shall be completely removed by chipping or grinding to sound metal,

16.2.1.2 The repair weld shall be made using a low-hydrogen welding process, and

16.2.1.3 The projecting weld metal shall be removed to produce a workmanlike finish.

16.2.2 Surface imperfections such as handling marks, light die or roll marks, or shallow pits are not considered defects provided that the imperfections are removable within the specified limits on wall thickness. The removal of such surface imperfections is not required. Welded tubing shall be free of protruding metal on the outside surface of the weld seam.

16.3 Unless otherwise specified in the purchase order, structural tubing shall be furnished with square cut ends, with the burr held to a minimum. When so specified in the purchase order, the burr shall be removed on the outside diameter, inside diameter, or both.

17. Rejection

17.1 It shall be permissible for the purchaser to inspect tubing received from the manufacturer and reject any tubing that does not meet the requirements of this specification, based upon the inspection and test methods outlined herein. The purchaser shall notify the manufacturer of any tubing that has been rejected, and the disposition of such tubing shall be subject to agreement between the manufacturer and the purchaser.

17.2 It shall be permissible for the purchaser to set aside any tubing that is found in fabrication or installation within the scope of this specification to be unsuitable for the intended end use, based on the requirements of this specification. The purchaser shall notify the manufacturer of any tubing that has been set aside. Such tubing shall be subject to mutual investigation as to the nature and severity of the deficiency and the forming or installation, or both, conditions involved. The disposition of such tubing shall be subject to agreement between the manufacturer and the purchaser.

18. Certification

18.1 When specified in the purchase order or contract, the manufacturer shall furnish to the purchaser a certificate of compliance stating that the product was manufactured, sampled, tested, and inspected in accordance with this specification and any other requirements designated in the purchase order or contract, and was found to meet all such requirements. Certificates of compliance shall include the specification number and year of issue.

18.2 When specified in the purchase order or contract, the manufacturer shall furnish to the purchaser test reports for the product shipped that contain the heat analyses and the results of the tension tests required by this specification and the purchase order or contract. Test reports shall include the specification number and year of issue.

18.3 A signature or notarization is not required on certificates of compliance or test reports; however, the documents shall clearly identify the organization submitting them. Notwithstanding the absence of a signature, the organization submitting the document is responsible for its content.

18.4 A certificate of compliance or test report printed from, or used in electronic form from, an electronic data interchange (EDI) shall be regarded as having the same validity as a counterpart printed in the certifying organization's facility. The content of the EDI transmitted document shall conform to any existing EDI agreement between the purchaser and the manufacturer.

19. Product Marking

19.1 Except as noted in 19.2, each length of structural tubing shall be legibly marked to show the following information: manufacturer's name, brand, or trademark; the specification designation (year of issue not required); and grade letter.

19.2 For structural tubing having a specified outside diameter or large flat dimension of 4 in. [10 cm] or less, it shall be permissible for the information listed in 19.1 to be marked on a tag securely attached to each bundle.

19.3 *Bar Coding*—In addition to the requirements in 19.1 and 19.2, the manufacturer shall have the option of using bar coding as a supplementary identification method. When a specific bar coding system is specified in the purchase order, that system shall be used.

NOTE 3—In the absence of another bar coding system being specified in the purchase order, it is recommended that bar coding be consistent with AIAG Standard B-1.

20. Packing, Marking, and Loading

20.1 When specified in the purchase order, packaging, marking, and loading shall be in accordance with Practices A700.

21. Government Procurement

21.1 When specified in the contract, material shall be preserved, packaged and packed in accordance with the requirements of MIL-STD-163, with applicable levels being specified in the contract. Marking for shipment of such materials shall be in accordance with Federal Std. No. 123 for civil agencies and MIL-STD-129 or Federal Std. No. 183 if continuous marking is required.

21.2 *Inspection*—Unless otherwise specified in the contract, the manufacturer shall be responsible for the performance of all applicable inspection and test requirements specified herein. Except as otherwise specified in the contract, the manufacturer shall use its own or any other suitable facilities for the performance of such inspections and tests.

SUMMARY OF CHANGES

Committee A01 has identified the location of selected changes to this specification since the last issue, A500/A500M–10, that may impact the use of this specification. (Approved October 1, 2010)

(*1*) Revised Footnotes B and C in Table 2 for A500M usage.

Committee A01 has identified the location of selected changes to this specification since the last issue, A500/A500M–09, that may impact the use of this specification. (Approved April 1, 2010)

(*1*) Revised 1.2 to expand size and wall thickness range.

Committee A01 has identified the location of selected changes to this specification since the last issue, A500/A500M–07, that may impact the use of this specification. (Approved October 1, 2009)

(*1*) Revised 1.2 to expand wall thickness range.

Specification Sheet: Alloy 304/304L
(UNS S30400, S30403) W. Nr. 1.4301, 1.4307

Most Widely Used Austenitic Stainless Steel, a Versatile Corrosion Resistant Alloy for General Purpose Applications

Alloy 304/304L (UNS S30400/S30403) is the most widely utilized "18-8" chromium-nickel austenitic stainless steel. It is an economical and versatile corrosion resistant alloy suitable for a wide range of general purpose applications.

It is common practice for 304L to be dual certified as 304 and 304L. The low carbon chemistry of 304L combined with an addition of nitrogen enables 304L to meet the mechanical properties of 304.

Alloy 304/304L resists atmospheric corrosion, as well as, moderately oxidizing and reducing environments. The alloy has excellent resistance to intergranular corrosion in the as-welded condition. Alloy 304/304L has excellent strength and toughness at cryogenic temperatures.

Alloy 304/304L is non-magnetic in the annealed condition, but can become slightly magnetic as a result of cold working or welding. It can be easily welded and processed by standard shop fabrication practices.

Applications

- Chemical and Petrochemical Processing — pressure vessels, tanks, heat exchangers, piping systems, flanges, fittings, valves and pumps
- Food and Beverage Processing
- Medical
- Mining
- Petroleum Refining
- Pharmaceutical Processing
- Power Generation — nuclear
- Pulp and Paper

Standards

ASTM ..... A 240
ASME ..... SA 240
AMS 5511/5513
QQ-S 766

Chemical Analysis

Weight % (all values are maximum unless a range is otherwise indicated)

Element	304	304L
Chromium	18.0 min.–20.0 max.	18.0 min.–20.0 max.
Nickel	8.0 min.–10.5 max.	8.0 min.–12.0 max.
Carbon	0.08	0.030
Manganese	2.00	2.00
Phosphorus	0.045	0.045
Sulfur	0.030	0.030
Silicon	0.75	0.75
Nitrogen	0.10	0.10
Iron	Balance	Balance

Physical Properties

Density
0.285 lbs/in^3
7.90 g/cm^3

Specific Heat
0.12 BTU/lb-°F (32–212°F)
500 J/kg-°K (0–100°C)

Modulus of Elasticity
29.0 x 10^6 psi
200 GPa

Thermal Conductivity 212°F (100°C)
9.4 BTU/hr/ft^2/ft/°F
16.3 W/m-°K

Melting Range
2550–2590°F
1398–1421°C

Electrical Resistivity
29.1 Microhm-in at 68°F
74 Microhm-cm at 20°C

Mean Coefficient of Thermal Expansion

Temperature Range °F	Temperature Range °C	in/in/°F	cm/cm °C
68–212	20–100	9.2 x 10^{-6}	16.6 x 10^{-6}
68–932	20–500	10.6 x 10^{-6}	18.2 x 10^{-6}
68–1600	20–870	11.0 x 10^{-6}	19.8 x 10^{-6}

Mechanical Properties

	Typical*	ASTM Type 304	ASTM Type 304L
0.2% Offset Yield Strength, ksi	42	30 min.	25 min.
Ultimate Tensile Strength, ksi	87	75 min.	70 min.
Elongation in 2 inches, %	58	40 min.	40 min.
Reduction in Area, %	70	—	—
Hardness, Rockwell B	82	92 max.	92 max.

**0.375 inch plate*

Alloy 304-304L rev 06/2014
rev 01/2023 PDF link

SANDMEYER STEEL COMPANY
ONE SANDMEYER LANE • PHILADELPHIA, PA 19116-3598
800-523-3663 • +1-215-464-7100 • FAX +1-215-677-1430
www.SandmeyerSteel.com

Providing Solutions, With Materials and Value Added Products, for Process Industries

Corrosion Resistance

Alloy 304/304L has good resistance to atmospheric corrosion, foods and beverages and to many organic and inorganic chemicals in moderately oxidizing to moderately reducing environments. The high chromium content of the alloy provides resistance to oxidizing solutions such as nitric acid up to 55% weight and up to 176°F (80°C).

Alloy 304/304L also resists moderately aggressive organic acids such as acetic. The nickel present in the alloy provides resistance to moderately reducing solutions such as pure phosphoric acid, whatever the concentration, in cold solutions and up to 10% diluted hot solutions. The alloy can also operate successfully in caustic solutions free of chlorides or fluorides at moderate temperatures.

Alloy 304/304L does not perform well in more highly reducing environments such as those containing chlorides and sulfuric acid.

Alloy 304/304L performs well in fresh water service with low levels of chlorides (less than 100ppm). At higher chloride levels the grade is susceptible to crevice corrosion and pitting. For successful performance under these more severe conditions, higher molybdenum content is need such as 316/316L. Alloy 304/304L is not recommended for service in marine environments.

In most instances, the corrosion resistance of Alloys 304, 304L and 304H will be roughly equal in most corrosive environments. However, in environments that are sufficiently corrosive to cause intergranular corrosion of welds and heat-affected zones Alloy 304L should be used because of its low carbon content.

Lowest Temperature (°F) at Which the Corrosion Rate Exceeds 5 mpy

CORROSION ENVIRONMENT	Type 304	Type 316L	2205 (UNS S32205)	2507
0.2% Hydrochloric Acid	>Boiling	>Boiling	>Boiling	>Boiling
1% Hydrochloric Acid	86p	86	185	>Boiling
10% Sulfuric Acid	—	122	140	167
60% Sulfuric Acid	—	<54	<59	<57
96% Sulfuric Acid	—	113	77	86
85% Phosphoric Acid	176	203	194	203
10% Nitric Acid	>Boiling	>Boiling	>Boiling	>Boiling
65% Nitric Acid	212	212	221	230
80% Acetic Acid	212p	>Boiling	>Boiling	>Boiling
50% Formic Acid	≤50	104	194	194
50% Sodium Hydroxide	185	194	194	230
83% Phosphoric Acid + 2% Hydrofluoric Acid	113	149	122	140
60% Nitric Acid + 2% Hydrochloric Acid	>140	>140	>140	>140
50% Acetic Acid + 50% Acetic Anhydride	>Boiling	248	212	230
1% Hydrochloric Acid + 0.3% Ferric Chloride	68p	77p	113ps	203ps
10% Sulfuric Acid + 2000ppm Cl- + N_2	—	77	95	122
10% Sulfuric Acid + 2000ppm Cl- + SO_2	—	<<59p	<59	104
WPA1, High Cl- Content	<<50	≤50	113	203
WPA2, High F- Content	<<50	≤50	140	167

ps = pitting can occur
ps = pitting/crevice corrosion can occur

WPA	P_2O_5	Cl^-	F^-	H_2SO_4	Fe_2O_3	Al_2O_3	SiO_2	CaO	MgO
1	54	0.20	0.50	4.0	0.30	0.20	0.10	0.20	0.70
2	54	0.02	2.0	4.0	0.30	0.20	0.10	0.20	0.70

Fabrication Data

Alloy 304/304L can be easily welded and processed by standard shop fabrication practices.

Hot Forming

Working temperatures of 1652–2102°F (750–1150°C) are recommended for most hot working processes. For maximum corrosion resistance, the material should be annealed at 1900°F (1038°C) minimum and water quenched or rapidly cooled by other means after hot working.

Cold Forming

The alloy is quite ductile and forms easily. Cold working operations will increase the strength and hardness of the alloy and might leave it slightly magnetic.

Welding

Alloy 304/304L can be readily welded by most standard processes. A post weld heat treatment is not necessary.

Machining

Alloy 304/304L is subject to work hardening during deformation and is subject to chip breaking. The best machining results are achieved with slower speeds, heavier feeds, excellent lubrication, sharp tooling and powerful rigid equipment.

Operation	Tool	Lubrication	CONDITIONS					
			Depth-mm	Depth-in	Feed-mm/t	Feed-in/t	Speed-m/min	Speed-ft/min
Turning	High Speed Steel	Cutting Oil	6	.23	0.5	.019	13–18	42.6–59
			3	.11	0.4	.016	20–25	65.6–82
			1	.04	0.2	.008	26–31	85.3–101.7
	Carbide	Dry or Cutting Oil	6	.23	0.5	.019	75–85	246–278.9
			3	.11	0.4	.016	90–100	295.3–328.1
			1	.04	0.2	.008	110–120	360.8–393.7
			Depth of cut-mm	Depth of cut-in	Feed-mm/t	Feed-in/t	Speed-m/min	Speed-ft/min
Cutting	High Speed Steel	Cutting Oil	1.5	.06	0.03–0.05	.0012–.0020	18–23	59–75.5
			3	.11	0.04–0.06	.0016–.0024	19–24	62.3–78.7
			6	.23	0.05–0.07	.0020–.0027	20–25	65.6–82
			Drill ø mm	Drill ø in	Feed-mm/t	Feed-in/t	Speed-m/min	Speed-ft/min
Drilling	High Speed Steel	Cutting Oil	1.5	.06	0.02–0.03	.0007–.0012	10–14	32.8–45.9
			3	.11	0.05–0.06	.0020–.0024	12–16	39.3–52.5
			6	.23	0.08–0.09	.0031–.0035	12–16	39.3–52.5
			12	.48	0.09–0.10	.0035–.0039	12–16	39.3–52.5
					Feed-mm/t	Feed-in/t	Speed-m/min	Speed-ft/min
Milling Profiling	High Speed Steel	Cutting Oil			0.05–0.10	.002–.004	12–22	39.4–72.2

SANDMEYER STEEL COMPANY

Stainless Steel - Grade 304

Chemical Formula

Fe, <0.08% C, 17.5-20% Cr, 8-11% Ni, <2% Mn, <1% Si, <0.045% P, <0.03% S

Topics Covered

Background

Grade 304 is the standard "18/8" stainless; it is the most versatile and most widely used stainless steel, available in a wider range of products, forms and finishes than any other. It has excellent forming and welding characteristics. The balanced austenitic structure of Grade 304 enables it to be severely deep drawn without intermediate annealing, which has made this grade dominant in the manufacture of drawn stainless parts such as sinks, hollow-ware and saucepans. For these applications it is common to use special "304DDQ" (Deep Drawing Quality) variants. Grade 304 is readily brake or roll formed into a variety of components for applications in the industrial, architectural, and transportation fields. Grade 304 also has outstanding welding characteristics. Post-weld annealing is not required when welding thin sections.

Grade 304L, the low carbon version of 304, does not require post-weld annealing and so is extensively used in heavy gauge components (over about 6mm). Grade 304H with its higher carbon content finds application at elevated temperatures. The austenitic structure also gives these grades excellent toughness, even down to cryogenic temperatures.

Key Properties

These properties are specified for flat rolled product (plate, sheet and coil) in ASTM A240/A240M. Similar but not necessarily identical properties are specified for other products such as pipe and bar in their respective specifications.

Composition

Typical compositional ranges for grade 304 stainless steels are given in table 1.

Table 1. Composition ranges for 304 grade stainless steel

Grade		C	Mn	Si	P	S	Cr	Mo	Ni	N
304	min.	-	-	-	-	-	18.0	-	8.0	-
	max.	0.08	2.0	0.75	0.045	0.030	20.0		10.5	0.10
304L	min.	-	-	-	-	-	18.0	-	8.0	-
	max.	0.030	2.0	0.75	0.045	0.030	20.0		12.0	0.10
304H	min.	0.04	-	-	-0.045	-	18.0	-	8.0	-
	max.	0.10	2.0	0.75		0.030	20.0		10.5	

Mechanical Properties

Typical mechanical properties for grade 304 stainless steels are given in table 2.

Table 2. Mechanical properties of 304 grade stainless steel

Grade	Tensile Strength (MPa) min	Yield Strength 0.2% Proof (MPa) min	Elongation (% in 50mm) min	Hardness	
				Rockwell B (HR B) max	Brinell (HB) max
304	515	205	40	92	201
304L	485	170	40	92	201
304H	515	205	40	92	201
304H also has a requirement for a grain size of ASTM No 7 or coarser.					

Physical Properties

Typical physical properties for annealed grade 304 stainless steels are given in table 3.

Table 3. Physical properties of 304 grade stainless steel in the annealed condition

Grade	Density (kg/m^3)	Elastic Modulus (GPa)	Mean Coefficient of Thermal Expansion (µm/m/°C)			Thermal Conductivity (W/m.K)		Specific Heat 0-100°C (J/kg.K)	Electrical Resistivity (nΩ.m)
			0-100°C	0-315°C	0-538°C	at 100°C	at 500°C		
304/L/H	8000	193	17.2	17.8	18.4	16.2	21.5	500	720

Grade Specification Comparison

Approximate grade comparisons for 304 stainless steels are given in table 4.

Table 4. Grade specifications for 304 grade stainless steel

Grade	UNS No	Old British		Euronorm		Swedish	Japanese JIS
		BS	En	No	Name	SS	
304	S30400	304S31	58E	1.4301	X5CrNi18-10	2332	SUS 304
304L	S30403	304S11	-	1.4306	X2CrNi19-11	2352	SUS 304L
304H	S30409	304S51	-	1.4948	X6CrNi18-11	-	-
These comparisons are approximate only. The list is intended as a comparison of functionally similar materials **not** as a schedule of contractual equivalents. If exact equivalents are needed original specifications must be consulted.							

Possible Alternative Grades

Possible alternative grades to grade 304 stainless steels are given in table 5.

Table 5. Possible alternative grades to 304 grade stainless steel

Grade	Why it might be chosen instead of 304
301L	A higher work hardening rate grade is required for certain roll formed or stretch formed components.
302HQ	Lower work hardening rate is needed for cold forging of screws, bolts and rivets.
303	Higher machinability needed, and the lower corrosion resistance, formability and weldability are acceptable.
316	Higher resistance to pitting and crevice corrosion is required, in chloride environments
321	Better resistance to temperatures of around 600-900°C is needed…321 has higher hot strength.
3CR12	A lower cost is required, and the reduced corrosion resistance and resulting discolouration are acceptable.
430	A lower cost is required, and the reduced corrosion resistance and fabrication characteristics are acceptable.

Corrosion Resistance

Excellent in a wide range of atmospheric environments and many corrosive media. Subject to pitting and crevice corrosion in warm chloride environments, and to stress corrosion cracking above about 60°C. Considered resistant to potable water with up to about 200mg/L chlorides at ambient temperatures, reducing to about 150mg/L at 60°C.

Heat Resistance

Good oxidation resistance in intermittent service to 870°C and in continuous service to 925°C. Continuous use of 304 in the 425-860°C range is not recommended if subsequent aqueous corrosion resistance is important. Grade 304L is more resistant to carbide precipitation and can be heated into the above temperature range.

Grade 304H has higher strength at elevated temperatures so is often used for structural and pressure-containing applications at temperatures above about 500°C and up to about 800°C. 304H will become sensitised in the temperature range of 425-860°C; this is not a problem for high temperature applications, but will result in reduced aqueous corrosion resistance.

Heat Treatment

Solution Treatment (Annealing) - Heat to 1010-1120°C and cool rapidly. These grades cannot be hardened by thermal treatment.

Welding

Excellent weldability by all standard fusion methods, both with and without filler metals. AS 1554.6 pre-qualifies welding of 304 with Grade 308 and 304L with 308L rods or electrodes (and with their high silicon equivalents). Heavy welded sections in Grade 304 may require post-weld annealing for maximum corrosion resistance. This is not required for Grade 304L. Grade 321 may also be used as an alternative to 304 if heavy section welding is required and post-weld heat treatment is not possible.

Machining

A "Ugima" improved machinability version of grade 304 is available in bar products. "Ugima" machines significantly better than standard 304 or 304L, giving higher machining rates and lower tool wear in many operations.

Dual Certification

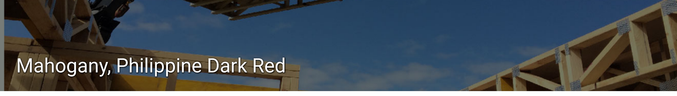
It is common for 304 and 304L to be stocked in "Dual Certified" form, particularly in plate and pipe. These items have chemical and mechanical properties complying with both 304 and 304L specifications. Such dual certified product does not meet 304H specifications and may be unacceptable for high temperature applications.

Applications

Typical applications include:

- Food processing equipment, particularly in beer brewing, milk processing & wine making.
- Kitchen benches, sinks, troughs, equipment and appliances
- Architectural panelling, railings & trim
- Chemical containers, including for transport
- Heat Exchangers
- Woven or welded screens for mining, quarrying & water filtration
- Threaded fasteners
- Springs

Source: Atlas Steels Australia



Mahogany, Philippine Dark Red

Philippine dark red mahogany is a tropical hardwood typically from South East Asia and widely used as an alternative to teak.

Other Names: Shorea Polysperma, Shorea Sqamata, Shorea Palosapis, Tiaong, Red Lauan, Ganguile, Bataan (see also Meranti). Also sold as White Lauan when pale in colour.

Botanical Name: Shorea Negrosensis

Common Form: Sawn

Species Type: Hardwood

Overview Properties Description Suppliers

Shrinkage

	Very Low	Low	Medium	High	Very High
		✓	✓		
Tangential :		3.80%			
Radial :		2.00%			
Unit Movement Tangential:			0.32%		
Unit Movement Radial:		0.18%			

Strength Group

	Very High	High	Reasonably High	Medium High	Medium	Reasonably Low	Low	Very Low
Unseasoned:	S1	S2	S3	S4	S5	S6	S7	S8
					✓			
Seasoned:	SD1	SD2	SD3	SD4	SD5	SD6	SD7	SD8
						✓		

Stress Grade

	Structural No. 1	Structural No. 2	Structural No. 3	Structural No. 4	Structural No. 5
Unseasoned:	F11	F8	F7	F5	F4
Seasoned:	F14	F11	F8	F7	F5

Density per Standard

Seasoned:	650kg/m^3
Unseasoned:	1100kg/m^3

Joint Group

	Very High	High	Reasonably High	Medium	Low	Very Low
Unseasoned:	J1	J2	J3	J4	J5	J6
				✓		
Seasoned:	JD1	JD2	JD3	JD4	JD5	JD6
			✓			

Colour

	White, yellow, pale straw to light brown	Pink to pink brown	Light to dark red	Brown, chocolate, mottled or streaky
			✓	

Mechanical Properties

Modulus of Rupture - Unseasoned:	65
Modulus of Rupture - Seasoned:	88
Modulus of Elasticity - Unseasoned:	10
Modulus of Elasticity - Seasoned:	12
Maximum Crushing Strength - Unseasoned:	33
Maximum Crushing Strength - Seasoned:	51
Impact - Unseasoned:	3.1
Impact - Seasoned:	3.5
Toughness - Unseasoned:	
Toughness - Seasoned:	
Hardness - Unseasoned:	2.6
Hardness - Seasoned:	3.2

Durability

	Low	Moderate	Reasonably High	High
	(0 - 5 yrs)	(5 - 15 yrs)	(15 - 25 yrs)	(more than 25 yrs)
In-Ground:	✓			
	(0 - 7 yrs)	(7 - 15 yrs)	(15 - 40 yrs)	(More than 40 yrs)
Above ground:		✓		
	(0 - 20 yrs, usually < 5)	(21 - 40 yrs)	(41 - 64 yrs)	(More than 60 yrs)
Marine Borer Resistance:	✓			

Lyctid Borer Susceptibility:	Susceptible
Lyctid Borer Susceptibility - Other:	
Termite Resistance:	Not Resistant

Fire Properties

	0	1	2	3	4	5	6	7	8	9	10
EFH Spread-of-Flame Index:										▼	
EFH Smoke-Developed Index:					▼						

	1 - non-combustible	2 - reasonably non-combustible	3 - slightly combustible	4 - combustible
Fire Properties Group Number:				

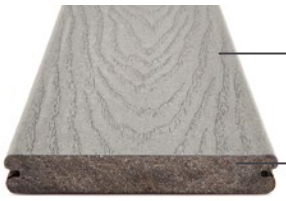
Group Number - Other:	3 if used on MDF or particleboard ≥12mm; veneer thickness 0.6-0.85mm
Average Specific Extinction Area:	<250
Bushfire Resistance:	Not Tested

Trex Select®

EARTH TONES

MID-PRICED, HIGH-PERFORMANCE DECKING & FASCIA

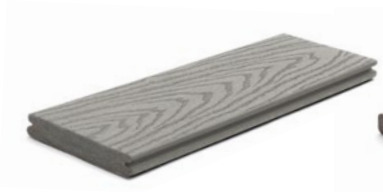
Trex Select® decking and Trex® Fascia are wood thermoplastic composite lumber (WTCL) boards with an integrated shell that covers the boards on the top surface and sides. The integrated shell consists of a proprietary surface formulation that produces a natural, wood-like grain pattern finish. An alternative to naturally durable hardwood lumber, Select Decking and Fascia are ICC-ES SAVE-certified to be a minimum of 95.4% recycled content of wood fiber and polyethylene by weight.



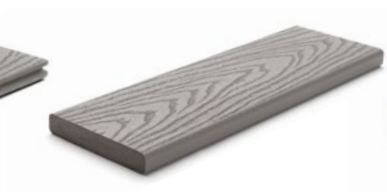
Shell: impact-, scratch- and fade-resistant

Core: 95% recycled materials

DECKING



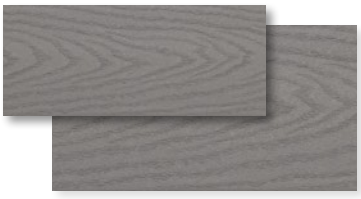
1" Grooved edge



1" Square edge

2" Square edge

FASCIA



8" or 12" Widths

FEATURES	DECKING BOARDS		FASCIA BOARDS	
	1" x 6"	2" x 6"	8"	12"
Actual Dimensions - Standard	.82" x 5.5"	1.3" x 5.5"	.56" x 7.25"	.56" x 11.375"
Actual Dimensions - Metric	20 mm x 140 mm	33 mm x 140 mm	14 mm x 184 mm	14 mm x 288 mm
Available Lengths - Standard	12', 16', 20'	12', 16', 20'	12'	12'
Available Lengths - Metric	365 cm, 487 cm, 609 cm	365 cm, 487 cm, 609 cm	365 cm	365 cm
Grooved Edge	X			
Square Edge	X	X	X	X
Weight per Lineal Foot	2.2 lbs	3.4 lbs	2.0 lbs	3.3 lbs

PHYSICAL & MECHANICAL PROPERTIES

TEST	TEST METHOD	VALUE
Flame Spread	ASTM E 84	Class B
Thermal Expansion	ASTM D 1037	1.9×10^{-5} in/in/°F
Moisture Absorption	ASTM D 1037	< 1.2%
Screw Head Pull-Through	ASTM D1761	161 lbf/screw*
Fungus Resistance	ASTM D1413	Rating – no decay
Termite Resistance	AWPAE1-72	Rating = 9.7

*Fastener used in testing: #8 x 2.5" approved Stainless Steel Screw

COLORS

Earth Tones (monochromatic)

FASTENERS

Trex Hideaway® Hidden Fastening System

Self-gapping, glass-filled nylon fastener with 304 grade stainless steel, sharp point screw for wood framing.

Other approved fasteners include, color-matched composite deck screw, matching composite plug with composite screw, color-coordinated fascia screw and uncoated stainless steel fascia screw.

For a full list of approved fasteners, download our Installation Guide at **trex.com/literature**

COMPOSITE DECKING – TREX SELECT

Part 1 General

1.1 Section Includes

A. Composite Decking **-** Trex Select

1.2 Related Sections

A. Section 06-1100 – Wood Framing

1.3 References

A. ASTM D-7032-04: Standard Specification for Establishing Performance Ratings for Wood-Plastic Composite Deck Boards and Guardrail Systems (Guards or Handrails), ASTM International.
B. ASTM D-7031-04: Standard Guide for Evaluating Mechanical and Physical Properties of Wood-Plastic Composite Products, ASTM International
C. ASTM E-84-01: Test Method for Surface Burning Characteristics of Building Materials, ASTM International.
D. ASTM D 570: Water Absorption of Plastics
E. ASTM D 1761: Mechanical Fasteners in Wood
F. ASTM D -1413-99: Test method for Wood Preservatives by Laboratory Soil-block Cultures
G. ASTM C177: Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus

1.4 Design/Performance Requirements

A. Structural Performance:
    a. Deck: Uniform Load – An allowable span of 16 in. on-center and 100 lbf/sq.ft.
    b. Tread of Stairs: Concentrated Load: An allowable span of 9 in. on-center, and 750 lbf-and 1/8” max. deflection, with a concentrated load of 300 lbf on area of 4 sq. in.
B. Fire-Test Response Characteristics per ASTM E-84.
    a. Flame-spread Index of 70.

1.5 Submittals

A. Product Data Indicate sizes, profiles, surface style, and performance characteristics
B. Samples: For each product specified, one sample representing actual product color, size, and finish.

1.6 Delivery, Storage, and Handling

A. Store Trex products on a flat and level surface. Support bundles on supplied dunnage.
B. Keep material covered using the provided bundle cover until time of installation.
C. See www. Trex.com for detailed storage recommendations:
    https://documents.trex.com/is/content/Trex/trex-care-cleaning-guide-transcend-enhance-selectpdf.pdf

1.7 Warranty

A. Provide manufactures warranty against rot, decay, splitting, checking, splintering, fungal damage, and termite damage for a period of 25 years for a residential installation and 10 years for a commercial installation. In addition provide the Trex Fade and Stain Warranty against food staining and fading beyond 5 Delta E (CIE units) for a period of 25 years for a residential installation and 10 years for a commercial installation. Specific terms for warranties can be found at; www.Trex.com

Part 2 Products

2.1 Manufacturers

A. Contract Documents are based on products supplied by; Trex Company, Inc., 160 Exeter Dr., Winchester, VA 22603.
B. Substitutions: Not permitted under Division 01

2.2 Applications/Scope

A. Wood-Plastic Composite Lumber;
    a. Material Description: Composite Decking consisting of recycled Linear Low- Density Polyethylene (LLDPE) and recycled wood. The product is extruded into shapes and sizes as follows:
        i. Trex Transcend Decking Boards; 1 x 5.5".
        ii. Lengths – 12, 16, and 20 feet
        iii. Color – To be specified by owner from Trex' standard list of colors.
    b. Physical and Mechanical Properties as follows:

Test	Test Method	Value
Flame spread	ASTM E 84	70
Thermal Expansion	ASTM D 1037	1.9 x 10^{-5} inch/inch/degreeF
Moisture Absorption	ASTM D 1037	< 1%
Screw Head Pull-Through	ASTM D1761	161 lbf per screw**
Fungus Resistance	ASTM D1413	Rating - no decay
Termite Resistance	AWPAE1-72	Rating = 9.7

** Fastener used in testing: #8 x 2.5 in. HEADCOTE Stainless Steel Screw

2.2 Accessories

A. Fasteners:
    a. Trex Universal Hideaway Hidden Fasteners
    b. Screws; See - https://documents.trex.com/is/content/Trex/trex-recommended-fasteners-decking-fascia-2021pdf.pdf#1 for the updated recommendations on fasteners.

Part 3 Execution

3.1 Installation

A. Install according to Trex installation guidelines: https://documents.trex.com/is/content/Trex/2021_decking_installation_guide_012221pdf.
B. Cut, drill, and rout using carbide tipped blades
C. Do not use composite wood material for structural applications

3.2 Cleaning

A. Following cleaning recommendations as found in Trex installation guide at: https://documents.trex.com/is/content/Trex/trex-care-cleaning-guide-transcend-enhance-selectpdf.pdf