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.

Designation: A623 – 22

Standard Specification for Tin Mill Products, General Requirements[1]

This standard is issued under the fixed designation A623; 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 U.S. Department of Defense.

1. Scope

1.1 This specification covers a group of common requirements, which unless otherwise specified in the purchase order or in an individual specification, shall apply to tin mill products.

1.2 In case of any conflict in requirements, the requirements of the purchase order, the individual material specification, and this general specification shall prevail in the sequence named.

NOTE 1—A complete metric companion to Specification A623 has been developed—Specification A623M; therefore no metric equivalents are presented in this specification.

1.3 The following safety caveat covers Annex A3 through Annex A10 of this specification: *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *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 *ASTM Standards:*[2]

A370 Test Methods and Definitions for Mechanical Testing of Steel Products

A623M Specification for Tin Mill Products, General Requirements [Metric]

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

A987 Practice for Measuring Shape Characteristics of Tin Mill Products

D1125 Test Methods for Electrical Conductivity and Resistivity of Water

E18 Test Methods for Rockwell Hardness of Metallic Materials

E112 Test Methods for Determining Average Grain Size

2.2 *U.S. Military Standards:*[3]

MIL-STD-129 Marking for Shipment and Storage

MIL-STD-163 Steel Mill Products, Preparation for Marking and Storage

2.3 *U.S. Federal Standard:*[3]

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

3. Terminology

3.1 *Definitions:*

3.1.1 *base box, n*—a unit of area equivalent to 112 sheets 14 by 20 in. or 31 360 in.^{2} (217.78 ft^2) (see Annex A1).

3.1.2 *base weight, n*—a term used to describe the thickness of tin mill products. The designated base weight multiplied by a factor of 0.00011 is the nominal decimal thickness, in inches of the material. Although it is customary industry-wide to use the term "pound" (for example, 75 lb), following the base weight designation, base weight is correctly used only to define nominal material thickness, and is not a measure of the weight of a base box.

3.1.3 *black plate, n*—light-gage, low-carbon, cold-reduced steel intended for use in the untinned state or for the production of other tin mill products; it is supplied only in a dry or oiled condition.

3.1.4 *box annealing, n*—a process involving slow heating of coils to a subcritical temperature, holding, and cooling therefrom, to soften the strip and relieve stresses produced during cold reduction. It is accomplished in a sealed container. By introducing and maintaining an inert or slightly reducing atmosphere during the cycle, a relatively bright surface is obtained.

[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 A01.20 on Tin Mill Products.

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[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.

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3.1.5 *bright finish, n*—a surface that has a melted tin coating.

3.1.6 *bundle, n*—a unit containing two or more packages of a cut size, supported by a platform, generally consisting of ten or more packages. (Also commonly referred to as a multiple-package lift containing two or more packages.)

3.1.7 *burr, n*—metal displaced beyond the plane of the surface by slitting or shearing (see 9.1.7 and 9.2.6).

3.1.8 *camber, n*—the greatest deviation of a coil edge from a straight line. The measurement is taken on the concave side and is the perpendicular distance from a straight line to the point of maximum deviation (see 9.1.9 and 9.2.7).

3.1.9 *chemical treatment, electrolytic tin plate, n*—a passivating chemical treatment applied to the surface of electrolytic tin plate to stabilize the plate surface characteristics compatible with a specified end use (see Annex A8 and Annex A10).

3.1.10 *chemically treated steel, n*—light-gage, low-carbon, cold-reduced steel that has a passivating or chemical treatment applied to the surface to provide rust resistance or retard underfilm corrosion, or both.

3.1.11 *cold reduction, n*—the process of reducing the thickness of the strip cold, generally accomplished by one rolling through a series of four-high mills arranged in tandem.

3.1.12 *continuous annealing, n*—a process consisting of passing the cold-reduced strip continuously and in a single thickness through a series of vertical passes within a furnace consisting of heating, soaking, and cooling zones to soften the strip and relieve stresses produced during cold reduction; an inert or slightly reducing atmosphere is maintained in the furnace to obtain a relatively bright strip.

3.1.13 *differentially coated tin plate, n*—electrolytic tin plate with a different weight of tin coating on each surface.

3.1.14 *double-reduced plate, n*—plate given a second major cold reduction following annealing. Some double-reduced products are produced to achieve a minimum level of ductility (% elongation) in the material. These products carry the designation of High Elongation Double Reduced, or HEDR.

3.1.15 *electrolytic chromium-coated steel, n*—light-gage, low-carbon, cold-reduced steel on which chromium and chromium oxides have been electrodeposited.

3.1.16 *electrolytic tin plate, n*—light-gage, low-carbon, cold-reduced steel on which tin has been electrodeposited by an acid or alkaline process.

3.1.16.1 *J Plate, n*—electrolytic tin plate, No. 50 or heavier tin coating, with improved corrosion performance for some galvanic detinning food products as specified in the table following 3.1.16.2 and as measured by the Special Property Tests for Pickle Lag (*PL*) (see Annex A3), Iron Solution Values (*ISV*) (see Annex A5), Tin Crystal Size (*TCS*) (see Annex A4). The alloy layer is normally light in color, characteristic of the acid tinning process.

3.1.16.2 *K Plate, n*—electrolytic tin plate, No. 50 or heavier tin coating, with improved corrosion performance for some galvanic detinning food products as specified in the following table and as measured by the Special Property Tests for Pickle Lag (*PL*) (see Annex A3), Iron Solution Value (*ISV*) (see Annex A5), Tin Crystal Size (*TCS*) (see Annex A4), and Alloy Tin Couple (*ATC*) (see Annex A6) and Aerated Media Polarization (AMP) (see Annex A9).

Special Properties Aims	
Pickle Lag[A]	10 s max
Iron Solution Value	20 µg Iron max
Tin Crystal Size	ASTM No. 9 or larger
Alloy Tin Couple[B]	0.12 µA/cm^2 max

[A] The Pickle Lag test is not necessary if the product is processed using an anneal atmosphere gas of HNX or H_2.
[B] Good mill practice has demonstrated the ability to average 0.05 µA/cm ^{2} or less over an extended period of production.

3.1.16.3 *Discussion*—The production of J Plate and K Plate require special processing and testing. In order to receive J Plate or K Plate, this requirement must be specified on the order.

3.1.17 *length dimension, n*—the longer dimension of a cut size.

3.1.18 *lot, n*—each 20 000 sheets or part thereof or the equivalent in coils, of an item in a specific shipment having the same order specifications.

3.1.19 *matte finish, n*—a surface that has an unmelted tin coating, generally on a shot-blast finish (SBF) base steel.

3.1.20 *mechanical designation, n*—an arbitrary number to designate Rockwell hardness and ultimate tensile strength characteristics for double-reduced plate (see 8.2).

3.1.21 *oiling, n*—a lubricant film applied to both surfaces of the plate.

3.1.22 *package, n*—a unit quantity of 112 sheets.

3.1.23 *passivating treatment, n*—a surface chemical treatment (see 3.1.9).

3.1.24 *ratio, n*—the number of base boxes in a package of a given size (see 3.1.1 and Annex A1).

3.1.25 *Rockwell hardness test, n*—a test for determining hardness (see Annex A2).

3.1.26 *rolling width, n*—the dimension of the sheet perpendicular to the rolling direction.

3.1.27 *single-reduced plate, n*—plate produced with one major cold reduction.

3.1.28 *steel Type D, n*—base-metal steel aluminum killed, sometimes required to minimize severe fluting and stretcher-strain hazards or for severe drawing applications (see Table 1).

3.1.29 *steel Type L, n*—base-metal steel, low in metalloids and residual elements, sometimes used for improved internal corrosion resistance for certain food-product containers (see Table 1).

3.1.30 *steel Type MR, n*—base-metal steel, similar in metalloid content to Type L but less restrictive in residual elements, commonly used for most tin mill products (see Table 1).

3.1.31 *surface appearance, n*—visual characteristics determined primarily by the steel surface finish. For electrolytic tin plate, the appearance is also influenced by the weight of coating and by melting or not melting the tin coating.

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TABLE 1 Chemical Requirements for Tin Mill Products

Element	Cast Composition, max %		
	Type D	Type L	Type MR
Carbon	0.12	0.13	0.13
Manganese	0.60	0.60	0.60
Phosphorus	0.020	0.015	0.020
Sulfur	0.03	0.03	0.03
Silicon[A,B]	0.020	0.020	0.020
Copper	0.20	0.06	0.20
Nickel	0.15	0.04	0.15
Chromium	0.10	0.06	0.10
Molybdenum	0.05	0.05	0.05
Aluminum[C]	0.20	0.10	0.20
Other elements, each	0.02	0.02	0.02

[A] When steel produced by the silicon killed method is ordered, the silicon maximum may be increased to 0.080 %.
[B] When strand cast steel produced by the aluminum killed method is ordered or furnished, the silicon maximum may be increased to 0.030 % when approved by the purchaser.
[C] Types L and MR may be supplied as non-killed or killed, which would respectively be produced without and with aluminum additions. Minimum aluminum level for Type D is usually 0.02 %.

3.1.32 *surface finishes, n*—steel surface finishes for tin mill products imparted by the finishing-mill work rolls; these may be either ground or blasted-roll finishes.

3.1.33 *temper designation, n*—an arbitrary number to designate a Rockwell hardness range for single-reduced products, which indicates the forming properties of the plate (see Section 8 and Tables 2 and 3).

TABLE 2 Temper Designations and Hardness Values Single-Reduced Tin Mill Products—Box Annealed

NOTE 1—Thinner plate (0.0083 in. ordered thickness and lighter) is normally tested using the Rockwell 15TS scale and the results converted to the Rockwell 30TS scale (see Annex A2 and Table A2.1).

Temper Designation	Rockwell Hardness Values All Thicknesses HR30TS[A]		Characteristics and Typical End Uses
	Nominal	Range[B]	
T-1 (T49)	49	45–53	soft for drawing parts such as nozzles, spouts, and oil filter shells
T-2 (T53)	53	49–57	moderately soft for drawing shallow parts such as rings, plugs, and pie pans
T-3 (T57)	57	53–61	fairly stiff for parts such as can ends and bodies, closures, and crown caps
T-4 (T61)	61	57–65	increased stiffness for can ends and bodies, crown caps, and large closures

[A] These ranges are based on the use of the diamond spot anvil and a 1⁄16 in. hardened steel ball indenter.
[B] The hardness ranges are requirements unless otherwise agreed upon between producer and user.

Test conditions:
1. For referee purposes, samples of blackplate, unreflowed ETP, and ECCS shall be aged prior to testing by holding at 400 °F for 10 min.
2. For referee purposes, the hardness test area on material produced with SBF or equivalent rolls shall be sanded smooth on both surfaces.
3. To avoid incorrect results due to the cantilever effect, samples shall have an area no larger than 4 in.^{2} and the point of testing shall be no more than ½ in. off the center of the samples.

TABLE 3 Temper Designations and Hardness Values Single-Reduced Tin Mill Products—Continuously Annealed

NOTE 1—Thinner plate (0.0083 in. ordered thickness and lighter) is normally tested using the Rockwell 15TS scale and the results converted to the Rockwell 30TS scale (see Annex A2 and Table A2.1).

Temper Designation	Rockwell Hardness Values All Thicknesses HR30TS[A]		Characteristics and Typical End Uses
	Nominal	Range[B]	
T-1	49	45–53	soft for drawing parts such as nozzles, spouts, and oil filter shells
T-2	53	49–57	moderately soft for drawing shallow parts such as rings, plugs, and pie pans
T-3 (T57)	57	53–61	moderate stiffness for parts such as can ends and bodies, closures, and crown caps
T-4 (T61)	61	57–65	increased stiffness for can ends, drawn (and ironed) can bodies, and large closures
T-5 (T65)	65	61–69	moderately high stiffness for can ends and bodies

[A] These ranges are based on the use of the diamond spot anvil and a 1⁄16 in. hardened steel ball indenter.
[B] The hardness ranges are requirements unless otherwise agreed upon between producer and user.

Test conditions:
1. For referee purposes, samples of blackplate, unreflowed ETP, and ECCS shall be aged prior to testing by holding at 400 °F for 10 min.
2. For referee purposes, the hardness test area on material produced with SBF or equivalent rolls shall be sanded smooth on both surfaces.
3. To avoid incorrect results due to the cantilever effect, samples shall have an area no larger than 4 in.^{2} and the point of testing shall be no more than ½ in. off the center of the samples.

3.1.34 *temper mill, n*—a mill for rolling basemetal steel after annealing to obtain proper temper, flatness, and surface finish. It may consist of one stand or two stands arranged in tandem.

3.1.35 *tin coating weight*—the weight of tin applied to the steel surface, usually stated as pounds per base box, distributed evenly over both surfaces of a base box, the total coated area being 62 720 in.^{2}. Thus, 0.25 lb/bb has a nominal weight of 0.125 lb on each of the two surfaces. Frequently, the coating is referred to as a designation number, and the decimal point is omitted. Thus, 0.25 lb/bb is 25.

3.1.35.1 For differentially coated tin plate, twice the nominal coating weight on each side is designated, usually by the number method; hence, 10/25 designates the nominal weight of 0.05 lb/bb on one side and 0.125 lb/bb on the other side.

3.1.36 *vapor vacuum deposition, n*—the condensation and solidification of the metal or metal containing vapors, under high vacuum, to form deposits onto a steel surface.

3.1.37 *width dimension, n*—the shorter dimension of a cut size.

4. Base Metal

4.1 The steel shall be made by the open-hearth, electric-furnace, or basic-oxygen process.

5. Chemical Composition

5.1 The steel shall conform to the chemical composition requirements as prescribed in Table 1, except as otherwise agreed upon between the manufacturer and the purchaser.

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6. Cast or Heat Analysis

6.1 For Type D, MR, and L, an analysis of each heat of steel shall be made by the supplier to determine the percentage of carbon, manganese, phosphorus, sulfur, silicon, and residual elements shown in Table 1. Other elements, unless agreed upon between the manufacturer and the purchaser, individually shall not exceed 0.02 %, maximum and while not necessarily analyzed are dependent on the suppliers' practices and controls.

7. Product Analysis

7.1 Rimmed or capped steels are characterized by a lack of uniformity in their chemical composition, and for this reason, product analysis is not technologically appropriate unless misapplication is clearly indicated.

8. Mechanical Requirements

8.1 *Single-Reduced Tin Mill Products, Temper*—The term *temper*, when applied to single-reduced tin mill products, summarizes a combination of interrelated mechanical properties. No single mechanical test can measure all the various factors that contribute to the fabrication characteristics of the material. The Rockwell 30TS hardness value is a quick test, which serves as a guide to the properties of the plate. This test forms the basis for a system of temper designations as shown in Tables 2 and 3. A given temper shall have hardness values meeting the limits shown. The mechanical properties of continuously annealed plate and batch annealed plate of the same Rockwell 30TS temper designation are not identical. It is important to keep in mind that the Rockwell 30TS test does not measure all the various factors, which contribute to the fabrication characteristics of the plate.

8.2 *Double-Reduced Tin Mill Products, Mechanical Characteristics*—No test or group of tests have been developed that adequately predict the fabricating performance of double-reduced tin mill products. Some double-reduced products are produced to achieve a minimum level of ductility (% elongation) in the material. These products carry the designation High Elongation Double-Reduced, or HEDR. The required minimum elongation for HEDR products will be at the discretion of the producer and the user. No targets for HEDR products will be referenced aside from the UTS and hardness values in Table 4. Designations for mechanical properties showing typical applications are arranged in generally ascending level of strength as shown in Table 4.

8.3 Rockwell testing shall be in accordance with the latest revision of Test Methods and Definitions A370 and Test Methods E18 (see Annex A2).

9. Permissible Variation in Dimensions

9.1 *Dimensional Characteristics, Coils:*

9.1.1 *Thickness, Method for Determination*—When the purchaser wishes to make tests to ascertain compliance with the requirements of this specification for thickness of an item in a specific shipment of tin mill products in coils having the same order specification, the following procedure shall be used: Random and representative measurements using a hand micrometer must be made throughout the coil length. Measurements may be made at any location across the coil width except within 1 in. from the mill trimmed edge. The hand micrometers are assumed to be accurate to ±0.0001 in. No measurements are to be made within 3 ft of a weld.

9.1.2 *Thickness Tolerances* shall conform to those prescribed in Table 5 (also see Table 6).

9.1.3 *Transverse Thickness Profile* is the change in sheet thickness from strip center to edge at right angles to the rolling direction. Thickness measured near the edge is normally less than the center thickness. The gauge measured ¼ in. in from the mill trimmed edge shall be no more than either 13 % below the ordered thickness or 10 % less than the center thickness of the individual sheet being measured. Common components of transverse thickness profile are crown and feather edge.

9.1.4 *Crown* is the difference in strip thickness from the center of roll width and the locations 1 in. in from both mill-trimmed edges.

9.1.5 *Feather Edge* is the maximum difference in thickness across the strip width between points measured at ¼ in. and 1 in. from both mill-trimmed edges. The thickness ¼ in. from an edge is usually less than the thickness measured 1 in. or more from the same edge.

TABLE 4 Mechanical Designations Double-Reduced Tin Mill Products

NOTE 1—Thinner plate (0.0083 in. ordered thickness and lighter) is normally tested using Rockwell 15TS scale and the results converted to the Rockwell 30TS scale (see Annex A2 and Table A2.1).

Designation[B]	Nominal Longitudinal Ultimate Tensile Strengh psi	Nominal Rockwell Hardness HR30-TS[A]	Examples of Usage
DR-7.5	75 000	71	can bodies
DR-8	80 000	72	can bodies and ends
DR-8.5	85 000	73	can bodies and ends
DR-9	90 000	75	can bodies and ends
DR-9.5	95 000	76	can ends

[A] These values are based on the use of the diamond spot anvil and a 1/16 in. hardened steel ball indenter. Testing will be in accordance with Test Methods and Definitions A370. Rockwell values are too varied to permit establishment of ranges. For details, see *AISI Contributions to the Metallurgy of Steel,* "Survey of Mechanical Properties of Double Reduced Tin Plate," January 1966.

[B] Double-reduced products requiring a minimum % elongation or ductility will be designated as HEDR (for example, HEDR-8 temper). The specified amount of minimum elongation for a specific temper designation shall be agreed upon between the producer and the user.

TABLE 5 Thickness Tolerances

NOTE 1—When coils are specified, this does not afford the supplier the opportunity to discard all off-gage product and for that reason the following thickness tolerances are applicable for various lot sizes.

Lot Size, lb	Tolerance
0 to 12 000	95 % of the product of the coils shall be within the tolerances stated in Table 6
Over 12 000 to 30 000	97.5 % of the product of the coils shall be within the tolerances stated in Table 6
Over 30 000 to 150 000	99.0 % of the product of the coils shall be within the tolerances stated in Table 6
Over 150 000	99.5 % of the product of the coils shall be within the tolerances stated in Table 6

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TABLE 6 Ordered Thickness and Thickness Tolerances

NOTE 1—Thickness tolerances are +5 % and −8 % from the ordered thickness.

Ordered Thickness, in.	Thickness Tolerance, Over, in.	Thickness Tolerances Under, in.
0.0050	0.0003	0.0004
0.0055	0.0003	0.0004
0.0061	0.0003	0.0005
0.0066	0.0003	0.0005
0.0072	0.0004	0.0006
0.0077	0.0004	0.0006
0.0083	0.0004	0.0007
0.0088	0.0004	0.0007
0.0094	0.0005	0.0008
0.0099	0.0005	0.0008
0.0105	0.0005	0.0008
0.0110	0.0006	0.0009
0.0113	0.0006	0.0009
0.0118	0.0006	0.0009
0.0123	0.0006	0.0010
0.0130	0.0007	0.0010
0.0141	0.0007	0.0011
0.0149	0.0007	0.0012

9.1.6 *Width*—Coils are trimmed to the ordered width. The slit dimension shall not vary over width by more than −0, +⅛ in.

9.1.7 *Burr*—A maximum of 0.002 in. is permissible. Burr may be estimated by using a micrometer with a flat anvil and spindle and measuring the difference between strip thickness adjacent to the edge and strip thickness at the edge, which includes the displaced metal. Care must be taken during that measurement to avoid deforming the displaced metal.

9.1.8 *Coil Length*—Variation between the measured length by the purchaser versus the supplier's billed length shall not exceed the limits prescribed in Table 7.

9.1.8.1 Since it is a common practice for each consumer's shearing operation to keep a running measurement of their supplier's coil shipments, any length variation in small lots (1 to 5 coils) for a given period will automatically be included in this summary. Before concluding there is a length variation in these small lots the total length received from the supplier, regardless of base weight, over periods of one month or one quarter, or both should be checked.

9.1.9 *Camber* is limited to a maximum of ¼ in. in 20 ft of length, in accordance with the latest revision of measuring methods and definitions in Test Method A987.

9.1.10 *Inside Coil Diameters*—The standard inside diameter produced is approximately 16 in.

9.2 *Dimensional Characteristics, Cut Sizes:*

9.2.1 *Thickness, Method for Determination*—Random measurements must be made at least 1 in. from the edge of the sheet using a hand micrometer. The hand micrometers are assumed to be accurate to ±0.0001 in.

TABLE 7 Coil Length Variation

No. of Coils	Variation, ±, %
1	3
100	0.1

9.2.2 *Thickness Tolerances*—Tin mill products in cut sizes are produced within thickness tolerances of +5 %, −8 % of the ordered thickness (see Table 6). Any sheets not meeting this requirement are subject to rejection.

9.2.3 *Transverse Thickness Profile* is the change in sheet thickness from strip center to edge at right angles to the rolling direction. Thickness measured near the edge is normally less than the center thickness. The gauge measured ¼ in. in from the mill trimmed edge shall be no more than either 13 % below the ordered thickness or 10 % less than the center thickness of the individual sheet being measured. Common components of transverse thickness profile are crown and feather edge.

9.2.4 *Crown* is the difference in strip thickness from the center of roll width and the locations 1 in. in from both mill-trimmed edges.

9.2.5 *Feather Edge* is the maximum difference in thickness across the strip width between points measured at ¼ in. and 1 in. from both mill-trimmed edges. The thickness ¼ in. from an edge is usually less than the thickness measured 1 in. or more from the same edge.

9.2.6 *Burr*—A maximum of 0.002 in. is permissible. Burr may be estimated by using a micrometer with a flat anvil and spindle and measuring the difference between strip thickness adjacent to the edge and strip thickness at the edge, which includes the displaced metal. Care must be taken during that measurement to avoid deforming the displaced metal.

9.2.7 *Camber*—The maximum permissible deviation is 1⁄16 in. for each 48 in. of length or fraction thereof, in accordance with the latest revision of measuring methods and definitions in Test Method A987.

9.2.8 *Out-of-Square* is the deviation of an end edge from a straight line, which is placed at a right angle to the side of the plate, touching one corner and extending to the opposite side. The amount of deviation is customarily limited to 1⁄16 in. for any edge measurement, except that a bundle may contain a maximum of four sheets with a deviation up to ⅛ in.

9.2.9 *Shearing Practice*—Tin mill products are sheared to the ordered width and to the ordered length. The greater dimension is considered length. The slit dimension shall not vary over the designated overrun by more than –0, +⅛ in. and the drum cut dimension shall not vary over the designated overrun by more than –0, +¼ in.

10. Special Requirements

10.1 *Welds*—Coils may contain lap or mash welds, the locations of which are marked. A hole may be punched adjacent to the weld for automatic rejection of the weld during shearing. The leading ends of lap welds shall not exceed 1 in.

10.2 *Cores*—If coil centers must be supported to minimize damage, this requirement should be so stated on the order as a special requirement.

11. Sheet Count—Cut Sizes

11.1 Small variations in sheet count/bundle should average out to at least the proper exact count in quantities of 400 packages or more.

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12. Retest Procedure

12.1 In the event the material fails to meet the specified requirements, two further series of samples are to be selected by the purchaser in accordance with the applicable procedures. Both retests must meet the specification limits to qualify as meeting the requirements.

13. Conditions of Manufacture

13.1 The purchaser should be informed of any alterations in the method of manufacture, which will significantly affect the properties of the purchased product. Similarly, the purchaser should inform the manufacturer of modifications in their fabrication methods, which will significantly affect the way in which the purchased product is used.

14. Inspection

14.1 The inspector representing the purchaser shall have entry, at all times while work on the contract of the purchaser is being performed, to all parts of the manufacturer's works that concern the manufacture of the material ordered. The supplier shall afford the inspector all reasonable facilities to satisfy him that the material is being furnished in accordance with this specification. Unless otherwise specified, all inspection and tests shall be made prior to shipment at the supplier's works and such inspection or sampling shall be made in conjunction with and to the extent of the manufacturer's regular inspection operations.

15. Rejection

15.1 Material that shows excessive number of injurious imperfections subsequent to its acceptance at the manufacturer's works, except as noted in the basis of purchase of the applicable specification, shall be rejected and the supplier notified.

16. Packaging

16.1 Unless otherwise specified, the tin plate shall be packaged and loaded in accordance with Practices A700.

16.2 When specified in the contract or order, and for direct procurement by or direct shipment to the Government, when Level A is specified, preservation, packaging and packing shall be in accordance with the Level A requirements of MIL-STD-163.

16.3 The standard method of shipping coils is with the eye of the coil vertical.

17. Marking

17.1 As a minimum requirement, the material shall be identified by having the manufacturer's name, ASTM designation, weight, purchaser's order number, and material identification legibly stenciled on top of each lift or shown on a tag attached to each coil or shipping unit.

17.2 When specified in the contract or order, and for direct procurement by or direct shipment to the Government, marking for shipment, in addition to requirements specified in the contract or order, shall be in accordance with MIL-STD-129 for military agencies and in accordance with Federal Std. No. 123 for civil agencies.

18. Keywords

18.1 strength; tensile; tin mill products

ANNEXES

(Mandatory Information)

A1. ABBREVIATED RATIO TABLES FOR TIN MILL PRODUCTS

A1.1 The base box is the unit of area of 112 sheets 14 by 20 in. or 31 360 in.^{2} (217.78 ft^2).

A1.2 To determine the number of base boxes represented by 112 sheets of any other dimensions, a computation is necessary. The computation is carried out using ratio tables.

A1.2.1 Tables A1.1-A1.6[4] are an abbreviated set of such ratio tables, which can be used to determine the number of base boxes represented by 112 and 1000 sheets in sizes from 1/16 in. square to 50 in. square.

A1.2.2 The following example demonstrates the use of these tables. The example applies to various sheet dimensions as follows:

A1.2.2.1 *Sheet with No Fractional Dimensions*—Step 1 only.

A1.2.2.2 *Sheet with Fractional Dimensions on Only One Dimension*—Steps 1 and 2.

A1.2.2.3 *Sheet with Fractional Dimensions on Both Dimensions*—Steps 1, 2, 3, and 4.

A1.2.3 An example of the use of abbreviated ratio tables to develop the number of base boxes represented by 112 and 1000 sheets with specified dimensions 28 1/16 by 34 1/2 in. is given in Table A1.7.

[4] These tables are reproduced, by permission of the American Iron and Steel Institute, from "Tin Mill Products," *Steel Products Manual,* AISI, 1963.

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TABLE A1.1 Tin Plate Ratios—Base Boxes per 112 Sheets Full-Inch Widths

Full-Inch Lengths	0	1	2	3	4	5	6	7	8	9
1	.0000	.0036	.0071	.0107	.0143	.0179	.0214	.0250	.0286	.0321
2	.0000	.0071	.0143	.0214	.0286	.0357	.0429	.0500	.0571	.0643
3	.0000	.0107	.0214	.0321	.0429	.0536	.0643	.0750	.0857	.0964
4	.0000	.0143	.0286	.0429	.0571	.0714	.0857	.1000	.1143	.1286
5	.0000	.0179	.0357	.0536	.0714	.0893	.1071	.1250	.1429	.1607
6	.0000	.0214	.0429	.0643	.0857	.1071	.1286	.1500	.1714	.1929
7	.0000	.0250	.0500	.0750	.1000	.1250	.1500	.1750	.2000	.2250
8	.0000	.0286	.0571	.0857	.1143	.1429	.1714	.2000	.2286	.2571
9	.0000	.0321	.0643	.0964	.1286	.1607	.1929	.2250	.2571	.2893
10	.0000	.0357	.0714	.1071	.1429	.1786	.2143	.2500	.2857	.3214
11	.0000	.0393	.0786	.1179	.1571	.1964	.2357	.2750	.3143	.3536
12	.0000	.0429	.0857	.1286	.1714	.2143	.2571	.3000	.3429	.3857
13	.0000	.0464	.0929	.1393	.1857	.2321	.2786	.3250	.3714	.4179
14	.0000	.0500	.1000	.1500	.2000	.2500	.3000	.3500	.4000	.4500
15	.0000	.0536	.1071	.1607	.2143	.2679	.3214	.3750	.4286	.4821
16	.0000	.0571	.1143	.1714	.2286	.2857	.3429	.4000	.4571	.5143
17	.0000	.0607	.1214	.1821	.2429	.3036	.3643	.4250	.4857	.5464
18	.0000	.0643	.1286	.1929	.2571	.3214	.3857	.4500	.5143	.5786
19	.0000	.0679	.1357	.2036	.2714	.3393	.4071	.4750	.5429	.6107
20	.0000	.0714	.1429	.2143	.2857	.3571	.4286	.5000	.5714	.6429
21	.0000	.0750	.1500	.2250	.3000	.3750	.4500	.5250	.6000	.6750
22	.0000	.0786	.1571	.2357	.3143	.3929	.4714	.5500	.6286	.7071
23	.0000	.0821	.1643	.2464	.3286	.4107	.4929	.5750	.6571	.7393
24	.0000	.0857	.1714	.2571	.3429	.4286	.5143	.6000	.6857	.7714
25	.0000	.0893	.1786	.2679	.3571	.4464	.5357	.6250	.7143	.8036
26	.0000	.0929	.1857	.2786	.3714	.4643	.5571	.6500	.7429	.8357
27	.0000	.0964	.1929	.2893	.3857	.4821	.5786	.6750	.7714	.8679
28	.0000	.1000	.2000	.3000	.4000	.5000	.6000	.7000	.8000	.9000
29	.0000	.1036	.2071	.3107	.4143	.5179	.6214	.7250	.8286	.9321
30	.0000	.1071	.2143	.3214	.4286	.5357	.6429	.7500	.8571	.9643
31	.0000	.1107	.2214	.3321	.4429	.5536	.6643	.7750	.8857	.9964
32	.0000	.1143	.2286	.3429	.4571	.5714	.6857	.8000	.9143	1.0286
33	.0000	.1179	.2357	.3536	.4714	.5893	.7071	.8250	.9429	1.0607
34	.0000	.1214	.2429	.3643	.4857	.6071	.7286	.8500	.9714	1.0929
35	.0000	.1250	.2500	.3750	.5000	.6250	.7500	.8750	1.0000	1.1250
36	.0000	.1286	.2571	.3857	.5143	.6429	.7714	.9000	1.0286	1.1571
37	.0000	.1321	.2643	.3964	.5286	.6607	.7929	.9250	1.0571	1.1893
38	.0000	.1357	.2714	.4071	.5429	.6786	.8143	.9500	1.0857	1.2214
39	.0000	.1393	.2786	.4179	.5571	.6964	.8357	.9750	1.1143	1.2536
40	.0000	.1429	.2857	.4286	.5714	.7143	.8571	1.0000	1.1429	1.2857
41	.0000	.1464	.2929	.4393	.5857	.7321	.8786	1.0250	1.1714	1.3179
42	.0000	.1500	.3000	.4500	.6000	.7500	.9000	1.0500	1.2000	1.3500
43	.0000	.1536	.3071	.4607	.6143	.7679	.9214	1.0750	1.2286	1.3821
44	.0000	.1571	.3143	.4714	.6286	.7857	.9429	1.1000	1.2571	1.4143
45	.0000	.1607	.3214	.4821	.6429	.8036	.9643	1.1250	1.2857	1.4464
46	.0000	.1643	.3286	.4929	.6571	.8214	.9857	1.1500	1.3143	1.4786
47	.0000	.1679	.3357	.5036	.6714	.8393	1.0071	1.1750	1.3429	1.5107
48	.0000	.1714	.3429	.5143	.6857	.8571	1.0286	1.2000	1.3714	1.5429
49	.0000	.1750	.3500	.5250	.7000	.8750	1.0500	1.2250	1.4000	1.5750
50	.0000	.1786	.3571	.5357	.7143	.8929	1.0714	1.2500	1.4286	1.6071

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TABLE A1.1 *Continued*

Full-Inch Lengths	10	11	12	13	14	15	16	17	18	19
10	.3571	.3929	.4286	.4643	.5000	.5357	.5714	.6071	.6429	.6786
11	.3929	.4321	.4714	.5107	.5500	.5893	.6286	.6679	.7071	.7464
12	.4286	.4714	.5143	.5571	.6000	.6429	.6857	.7286	.7714	.8143
13	.4643	.5107	.5571	.6036	.6500	.6964	.7429	.7893	.8357	.8821
14	.5000	.5500	.6000	.6500	.7000	.7500	.8000	.8500	.9000	.9500
15	.5357	.5893	.6429	.6964	.7500	.8036	.8571	.9107	.9643	1.0179
16	.5714	.6286	.6857	.7429	.8000	.8571	.9143	.9714	1.0286	1.0857
17	.6071	.6679	.7286	.7893	.8500	.9107	.9714	1.0321	1.0929	1.1536
18	.6429	.7071	.7714	.8357	.9000	.9643	1.0286	1.0929	1.1571	1.2214
19	.6786	.7464	.8143	.8821	.9500	1.0179	1.0857	1.1536	1.2214	1.2893
20	.7143	.7857	.8571	.9286	1.0000	1.0714	1.1429	1.2143	1.2857	1.3571
21	.7500	.8250	.9000	.9750	1.0500	1.1250	1.2000	1.2750	1.3500	1.4250
22	.7857	.8643	.9429	1.0214	1.1000	1.1786	1.2571	1.3357	1.4143	1.4929
23	.8214	.9036	.9857	1.0679	1.1500	1.2321	1.3143	1.3964	1.4786	1.5607
24	.8571	.9429	1.0286	1.1143	1.2000	1.2857	1.3714	1.4571	1.5429	1.6286
25	.8929	.9821	1.0714	1.1607	1.2500	1.3393	1.4286	1.5179	1.6071	1.6964
26	.9286	1.0214	1.1143	1.2071	1.3000	1.3929	1.4857	1.5786	1.6714	1.7643
27	.9643	1.0607	1.1571	1.2536	1.3500	1.4464	1.5429	1.6393	1.7357	1.8321
28	1.0000	1.1000	1.2000	1.3000	1.4000	1.5000	1.6000	1.7000	1.8000	1.9000
29	1.0357	1.1393	1.2429	1.3464	1.4500	1.5536	1.6571	1.7607	1.8643	1.9679
30	1.0714	1.1786	1.2857	1.3929	1.5000	1.6071	1.7143	1.8214	1.9286	2.0357
31	1.1071	1.2179	1.3286	1.4393	1.5500	1.6607	1.7714	1.8821	1.9929	2.1036
32	1.1429	1.2571	1.3714	1.4857	1.6000	1.7143	1.8286	1.9429	2.0571	2.1714
33	1.1786	1.2964	1.4143	1.5321	1.6500	1.7679	1.8857	2.0036	2.1214	2.2393
34	1.2143	1.3357	1.4571	1.5786	1.7000	1.8214	1.9429	2.0643	2.1857	2.3071
35	1.2500	1.3750	1.5000	1.6250	1.7500	1.8750	2.0000	2.1250	2.2500	2.3750
36	1.2857	1.4143	1.5429	1.6714	1.8000	1.9286	2.0571	2.1857	2.3143	2.4429
37	1.3214	1.4536	1.5857	1.7179	1.8500	1.9821	2.1143	2.2464	2.3786	2.5107
38	1.3571	1.4929	1.6286	1.7643	1.9000	2.0357	2.1714	2.3071	2.4429	2.5786
39	1.3929	1.5321	1.6714	1.8107	1.9500	2.0893	2.2286	2.3679	2.5071	2.6464
40	1.4286	1.5714	1.7143	1.8571	2.0000	2.1429	2.2857	2.4286	2.5714	2.7143
41	1.4643	1.6107	1.7571	1.9036	2.0500	2.1964	2.3429	2.4893	2.6357	2.7821
42	1.5000	1.6500	1.8000	1.9500	2.1000	2.2500	2.4000	2.5500	2.7000	2.8500
43	1.5357	1.6893	1.8429	1.9964	2.1500	2.3036	2.4571	2.6107	2.7643	2.9179
44	1.5714	1.7286	1.8857	2.0429	2.2000	2.3571	2.5143	2.6714	2.8286	2.9857
45	1.6071	1.7679	1.9286	2.0893	2.2500	2.4107	2.5714	2.7321	2.8929	3.0536
46	1.6429	1.8071	1.9714	2.1357	2.3000	2.4643	2.6286	2.7929	2.9571	3.1214
47	1.6786	1.8464	2.0143	2.1821	2.3500	2.5179	2.6857	2.8536	3.0214	3.1893
48	1.7143	1.8857	2.0571	2.2286	2.4000	2.5714	2.7429	2.9143	3.0857	3.2571
49	1.7500	1.9250	2.1000	2.2750	2.4500	2.6250	2.8000	2.9750	3.1500	3.3250
50	1.7857	1.9643	2.1429	2.3214	2.5000	2.6786	2.8571	3.0357	3.2143	3.3929

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TABLE A1.1 *Continued*

Full-Inch Lengths	20	21	22	23	24	25	26	27	28	29
20	1.4286	1.5000	1.5714	1.6429	1.7143	1.7857	1.8571	1.9286	2.0000	2.0714
21	1.5000	1.5750	1.6500	1.7250	1.8000	1.8750	1.9500	2.0250	2.1000	2.1750
22	1.5714	1.6500	1.7286	1.8071	1.8857	1.9643	2.0429	2.1214	2.2000	2.2786
23	1.6429	1.7250	1.8071	1.8893	1.9714	2.0536	2.1357	2.2179	2.3000	2.3821
24	1.7143	1.8000	1.8857	1.9714	2.0571	2.1429	2.2286	2.3143	2.4000	2.4857
25	1.7857	1.8750	1.9643	2.0536	2.1429	2.2321	2.3214	2.4107	2.5000	2.5893
26	1.8571	1.9500	2.0429	2.1357	2.2286	2.3214	2.4143	2.5071	2.6000	2.6929
27	1.9286	2.0250	2.1214	2.2179	2.3143	2.4107	2.5071	2.6036	2.7000	2.7964
28	2.0000	2.1000	2.2000	2.3000	2.4000	2.5000	2.6000	2.7000	2.8000	2.9000
29	2.0714	2.1750	2.2786	2.3821	2.4857	2.5893	2.6929	2.7964	2.9000	3.0036
30	2.1429	2.2500	2.3571	2.4643	2.5714	2.6786	2.7857	2.8929	3.0000	3.1071
31	2.2143	2.3250	2.4357	2.5464	2.6571	2.7679	2.8786	2.9893	3.1000	3.2107
32	2.2857	2.4000	2.5143	2.6286	2.7429	2.8571	2.9714	3.0857	3.2000	3.3143
33	2.3571	2.4750	2.5929	2.7107	2.8286	2.9464	3.0643	3.1821	3.3000	3.4179
34	2.4286	2.5500	2.6714	2.7929	2.9143	3.0357	3.1571	3.2786	3.4000	3.5214
35	2.5000	2.6250	2.7500	2.8750	3.0000	3.1250	3.2500	3.3750	3.5000	3.6250
36	2.5714	2.7000	2.8286	2.9571	3.0857	3.2143	3.3429	3.4714	3.6000	3.7286
37	2.6429	2.7750	2.9071	3.0393	3.1714	3.3036	3.4357	3.5679	3.7000	3.8321
38	2.7143	2.8500	2.9857	3.1214	3.2571	3.3929	3.5286	3.6643	3.8000	3.9357
39	2.7857	2.9250	3.0643	3.2036	3.3429	3.4821	3.6214	3.7607	3.9000	4.0393
40	2.8571	3.0000	3.1429	3.2857	3.4286	3.5714	3.7143	3.8571	4.0000	4.1429
41	2.9286	3.0750	3.2214	3.3679	3.5143	3.6607	3.8071	3.9536	4.1000	4.2464
42	3.0000	3.1500	3.3000	3.4500	3.6000	3.7500	3.9000	4.0500	4.2000	4.3500
43	3.0714	3.2250	3.3786	3.5321	3.6857	3.8393	3.9929	4.1464	4.3000	4.4536
44	3.1429	3.3000	3.4571	3.6143	3.7714	3.9286	4.0857	4.2429	4.4000	4.5571
45	3.2143	3.3750	3.5357	3.6964	3.8571	4.0179	4.1786	4.3393	4.5000	4.6607
46	3.2857	3.4500	3.6143	3.7786	3.9429	4.1071	4.2714	4.4357	4.6000	4.7643
47	3.3571	3.5250	3.6929	3.8607	4.0286	4.1964	4.3643	4.5321	4.7000	4.8679
48	3.4286	3.6000	3.7714	3.9429	4.1143	4.2857	4.4571	4.6286	4.8000	4.9714
49	3.5000	3.6750	3.8500	4.0250	4.2000	4.3750	4.5500	4.7250	4.9000	5.0750
50	3.5714	3.7500	3.9286	4.1071	4.2857	4.4643	4.6429	4.8214	5.0000	5.1786

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TABLE A1.1 *Continued*

Full-Inch Lengths	30	31	32	33	34	35	36	37	38	39
30	3.2143	3.3214	3.4286	3.5357	3.6429	3.7500	3.8571	3.9643	4.0714	4.1786
31	3.3214	3.4321	3.5429	3.6536	3.7643	3.8750	3.9857	4.0964	4.2071	4.3179
32	3.4286	3.5429	3.6571	3.7714	3.8857	4.0000	4.1143	4.2286	4.3429	4.4571
33	3.5357	3.6536	3.7714	3.8893	4.0071	4.1250	4.2429	4.3607	4.4786	4.5964
34	3.6429	3.7643	3.8857	4.0071	4.1286	4.2500	4.3714	4.4929	4.6143	4.7357
35	3.7500	3.8750	4.0000	4.1250	4.2500	4.3750	4.5000	4.6250	4.7500	4.8750
36	3.8571	3.9857	4.1143	4.2429	4.3714	4.5000	4.6286	4.7571	4.8857	5.0143
37	3.9643	4.0964	4.2286	4.3607	4.4929	4.6250	4.7571	4.8893	5.0214	5.1536
38	4.0714	4.2071	4.3429	4.4786	4.6143	4.7500	4.8857	5.0214	5.1571	5.2929
39	4.1786	4.3179	4.4571	4.5964	4.7357	4.8750	5.0143	5.1536	5.2929	5.4321
40	4.2857	4.4286	4.5714	4.7143	4.8571	5.0000	5.1429	5.2857	5.4286	5.5714
41	4.3929	4.5393	4.6857	4.8321	4.9786	5.1250	5.2714	5.4179	5.5643	5.7107
42	4.5000	4.6500	4.8000	4.9500	5.1000	5.2500	5.4000	5.5500	5.7000	5.8500
43	4.6071	4.7607	4.9143	5.0679	5.2214	5.3750	5.5286	5.6821	5.8357	5.9893
44	4.7143	4.8714	5.0286	5.1857	5.3429	5.5000	5.6571	5.8143	5.9714	6.1286
45	4.8214	4.9821	5.1429	5.3036	5.4643	5.6250	5.7857	5.9464	6.1071	6.2679
46	4.9286	5.0929	5.2571	5.4214	5.5857	5.7500	5.9143	6.0786	6.2429	6.4071
47	5.0357	5.2036	5.3714	5.5393	5.7071	5.8750	6.0429	6.2107	6.3786	6.5464
48	5.1429	5.3143	5.4857	5.6571	5.8286	6.0000	6.1714	6.3429	6.5143	6.6857
49	5.2500	5.4250	5.6000	5.7750	5.9500	6.1250	6.3000	6.4750	6.6500	6.8250
50	5.3571	5.5357	5.7143	5.8929	6.0714	6.2500	6.4286	6.6071	6.7857	6.9643

Full-Inch Lengths	40	41	42	43	44	45	46	47	48	49
40	5.7143	5.8571	6.0000	6.1429	6.2857	6.4286	6.5714	6.7143	6.8571	7.0000
41	5.8571	6.0036	6.1500	6.2964	6.4429	6.5893	6.7357	6.8821	7.0286	7.1750
42	6.0000	6.1500	6.3000	6.4500	6.6000	6.7500	6.9000	7.0500	7.2000	7.3500
43	6.1429	6.2964	6.4500	6.6036	6.7571	6.9107	7.0643	7.2179	7.3714	7.5250
44	6.2857	6.4429	6.6000	6.7571	6.9143	7.0714	7.2286	7.3857	7.5429	7.7000
45	6.4286	6.5893	6.7500	6.9107	7.0714	7.2321	7.3929	7.5536	7.7143	7.8750
46	6.5714	6.7357	6.9000	7.0643	7.2286	7.3929	7.5571	7.7214	7.8857	8.0500
47	6.7143	6.8821	7.0500	7.2179	7.3857	7.5536	7.7214	7.8893	8.0571	8.2250
48	6.8571	7.0286	7.2000	7.3714	7.5429	7.7143	7.8857	8.0571	8.2286	8.4000
49	7.0000	7.1750	7.3500	7.5250	7.7000	7.8750	8.0500	8.2250	8.4000	8.5750
50	7.1429	7.3214	7.5000	7.6786	7.8571	8.0357	8.2143	8.3929	8.5714	8.7500

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TABLE A1.2 Tin Plate Ratios—Base Boxes per 112 Sheets Full-Inch Widths

Full-Inch Lengths	1/16	1/8	3/16	1/4	5/16	3/8	7/16	1/2	9/16	5/8	11/16	3/4	13/16	7/8	15/16
1	.0002	.0004	.0007	.0009	.0011	.0013	.0016	.0018	.0020	.0022	.0025	.0027	.0029	.0031	.0033
2	.0004	.0009	.0013	.0018	.0022	.0027	.0031	.0036	.0040	.0045	.0049	.0054	.0058	.0063	.0067
3	.0007	.0013	.0020	.0027	.0033	.0040	.0047	.0054	.0060	.0067	.0074	.0080	.0087	.0094	.0100
4	.0009	.0018	.0027	.0036	.0045	.0054	.0063	.0071	.0080	.0089	.0098	.0107	.0116	.0125	.0134
5	.0011	.0022	.0033	.0045	.0056	.0067	.0078	.0089	.0100	.0112	.0123	.0134	.0145	.0156	.0167
6	.0013	.0027	.0040	.0054	.0067	.0080	.0094	.0107	.0121	.0134	.0147	.0161	.0174	.0188	.0201
7	.0016	.0031	.0047	.0063	.0078	.0094	.0109	.0125	.0141	.0156	.0172	.0188	.0203	.0219	.0234
8	.0018	.0036	.0054	.0071	.0089	.0107	.0125	.0143	.0161	.0179	.0196	.0214	.0232	.0250	.0268
9	.0020	.0040	.0060	.0080	.0100	.0121	.0141	.0161	.0181	.0201	.0221	.0241	.0261	.0281	.0301
10	.0022	.0045	.0067	.0089	.0112	.0134	.0156	.0179	.0201	.0223	.0246	.0268	.0290	.0313	.0335
11	.0025	.0049	.0074	.0098	.0123	.0147	.0172	.0196	.0221	.0246	.0270	.0295	.0319	.0344	.0368
12	.0027	.0054	.0080	.0107	.0134	.0161	.0188	.0214	.0241	.0268	.0295	.0321	.0348	.0375	.0402
13	.0029	.0058	.0087	.0116	.0145	.0174	.0203	.0232	.0261	.0290	.0319	.0348	.0377	.0406	.0435
14	.0031	.0063	.0094	.0125	.0156	.0188	.0219	.0250	.0281	.0313	.0344	.0375	.0406	.0438	.0469
15	.0033	.0067	.0100	.0134	.0167	.0201	.0234	.0268	.0301	.0335	.0368	.0402	.0435	.0469	.0502
16	.0036	.0071	.0107	.0143	.0179	.0214	.0250	.0286	.0321	.0357	.0393	.0429	.0464	.0500	.0536
17	.0038	.0076	.0114	.0152	.0190	.0228	.0266	.0304	.0342	.0379	.0417	.0455	.0493	.0531	.0569
18	.0040	0080	.0121	.0161	.0201	.0241	.0281	.0321	.0362	.0402	.0442	.0482	.0522	.0563	.0603
19	.0042	.0085	.0127	.0170	.0212	.0254	.0297	.0339	.0382	.0424	.0467	.0509	.0551	.0594	.0636
20	.0045	.0089	.0134	.0179	.0223	.0268	.0313	.0357	.0402	.0446	.0491	.0536	.0580	.0625	.0670
21	.0047	.0094	.0141	.0188	.0234	.0281	.0328	.0375	.0422	.0469	.0516	.0563	.0609	.0656	.0703
22	.0049	.0098	.0147	.0196	.0246	.0295	.0344	.0393	.0442	.0491	.0540	.0589	.0638	.0688	.0737
23	.0051	.0103	.0154	.0205	.0257	.0308	.0359	.0411	.0462	.0513	.0565	.0616	.0667	.0719	.0770
24	.0054	.0107	.0161	.0214	.0268	.0321	.0375	.0429	.0482	.0536	.0589	.0643	.0696	.0750	.0804
25	.0056	.0112	.0167	.0223	.0279	.0335	.0391	.0446	.0502	.0558	.0614	.0670	.0725	.0781	.0837
26	.0058	.0116	.0174	.0232	.0290	.0348	.0406	.0464	.0522	.0580	.0638	.0696	.0754	.0813	.0871
27	.0060	.0121	.0181	.0241	.0301	.0362	.0422	.0482	.0542	.0603	.0663	.0723	.0783	.0844	.0904
28	.0063	.0125	.0188	.0250	.0313	.0375	.0438	.0500	.0563	.0625	.0688	.0750	.0813	.0875	.0938
29	.0065	.0129	.0194	.0259	.0324	.0388	.0453	.0518	.0583	.0647	.0712	.0777	.0842	.0906	.0971
30	.0067	.0134	.0201	.0268	.0335	.0402	.0469	.0536	.0603	.0670	.0737	.0804	.0871	.0938	.1004
31	.0069	.0138	.0208	.0277	.0346	.0415	.0484	.0554	.0623	.0692	.0761	.0830	.0900	.0969	.1038
32	.0071	.0143	.0214	.0286	.0357	.0429	.0500	.0571	.0643	.0714	.0786	.0857	.0929	.1000	.1071
33	.0074	.0147	.0221	.0295	.0368	.0442	.0516	.0589	.0663	.0737	.0810	.0884	.0958	.1031	.1105
34	.0076	.0152	.0228	.0304	.0379	.0455	.0531	.0607	.0683	.0759	.0835	.0911	.0987	.1063	.1138
35	.0078	.0156	.0234	.0313	.0391	.0469	.0547	.0625	.0703	.0781	.0859	.0938	.1016	.1094	.1172
36	.0080	.0161	.0241	.0321	.0402	.0482	.0563	.0643	.0723	.0804	.0884	.0964	.1045	.1125	.1205
37	.0083	.0165	.0248	.0330	.0413	.0496	.0578	.0661	.0743	.0826	.0908	.0991	.1074	.1156	.1239
38	.0085	.0170	.0254	.0339	.0424	.0509	.0594	.0679	.0763	.0848	.0933	.1018	.1103	.1188	.1272
39	.0087	.0174	.0261	.0348	.0435	.0522	.0609	.0696	.0783	.0871	.0958	.1045	.1132	.1219	.1306
40	.0089	.0179	.0268	.0357	.0446	.0536	.0625	.0714	.0804	.0893	.0982	.1071	.1161	.1250	.1339
41	.0092	.0183	.0275	.0366	.0458	.0549	.0641	.0732	.0824	.0915	.1007	.1098	.1190	.1281	.1373
42	.0094	.0188	.0281	.0375	.0469	.0563	.0656	.0750	.0844	.0938	.1031	.1125	.1219	.1313	.1406
43	.0096	.0192	.0288	.0384	.0480	.0576	.0672	.0768	.0864	.0960	.1056	.1152	.1248	.1344	.1440
44	.0098	.0196	.0295	.0393	.0491	.0589	.0688	.0786	.0884	.0982	.1080	.1179	.1277	.1375	.1473
45	.0100	.0201	.0301	.0402	.0502	.0603	.0703	.0804	.0904	.1004	.1105	.1205	.1306	.1406	.1507
46	.0103	.0205	.0308	.0411	.0513	.0616	.0719	.0821	.0924	.1027	.1129	.1232	.1335	.1438	.1540
47	.0105	.0210	.0315	.0420	.0525	.0629	.0734	.0839	.0944	.1049	.1154	.1259	.1364	.1469	.1574
48	.0107	.0214	.0321	.0429	.0536	.0643	.0750	.0857	.0964	.1071	.1179	.1286	.1393	.1500	.1607
49	.0109	.0219	.0328	.0438	.0547	.0656	.0766	.0875	.0984	.1094	.1203	.1313	.1422	.1531	.1641
50	.0112	.0223	.0335	.0446	.0558	.0670	.0781	.0893	.1004	.1116	.1228	.1339	.1451	.1563	.1674

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TABLE A1.3 Tin Plate Ratios—Base Boxes per 112 Sheets Fractional Widths and Length

	1/16	1/8	3/16	1/4	5/16	3/8	7/16	1/2	9/16	5/8	11/16	3/4	13/16	7/8	15/16
1/16	.0000	.0000	.0000	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0002	.0002	.0002	.0002	.0002
1/8	.0000	.0001	.0001	.0001	.0001	.0002	.0002	.0002	.0003	.0003	.0003	.0003	.0004	.0004	.0004
3/16	.0000	.0001	.0001	.0002	.0002	.0003	.0003	.0003	.0004	.0004	.0005	.0005	.0005	.0006	.0006
1/4	.0001	.0001	.0002	.0002	.0003	.0003	.0004	.0004	.0005	.0006	.0006	.0007	.0007	.0008	.0008
5/16	.0001	.0001	.0002	.0003	.0003	.0004	.0005	.0006	.0006	.0007	.0008	.0008	.0009	.0010	.0010
3/8	.0001	.0002	.0003	.0003	.0004	.0005	.0006	.0007	.0008	.0008	.0009	.0010	.0011	.0012	.0013
7/16	.0001	.0002	.0003	.0004	.0005	.0006	.0007	.0008	.0009	.0010	.0011	.0012	.0013	.0014	.0015
1/2	.0001	.0002	.0003	.0004	.0006	.0007	.0008	.0009	.0010	.0011	.0012	.0013	.0015	.0016	.0017
9/16	.0001	.0003	.0004	.0005	.0006	.0008	.0009	.0010	.0011	.0013	.0014	.0015	.0016	.0018	.0019
5/8	.0001	.0003	.0004	.0006	.0007	.0008	.0010	.0011	.0013	.0014	.0015	.0017	.0018	.0020	.0021
11/16	.0002	.0003	.0005	.0006	.0008	.0009	.0011	.0012	.0014	.0015	.0017	.0018	.0020	.0021	.0023
3/4	.0002	.0003	.0005	.0007	.0008	.0010	.0012	.0013	.0015	.0017	.0018	.0020	.0022	.0023	.0025
13/16	.0002	.0004	.0005	.0007	.0009	.0011	.0013	.0015	.0016	.0018	.0020	.0022	.0024	.0025	.0027
7/8	.0002	.0004	.0006	.0008	.0010	.0012	.0014	.0016	.0018	.0020	.0021	.0023	.0025	.0027	.0029
15/16	.0002	.0004	.0006	.0008	.0010	.0013	.0015	.0017	.0019	.0021	.0023	.0025	.0027	.0029	.0031

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