

QQ-T-425A  
September 28, 1970  
SUPERSEDING  
Fed. Spec. QQ-T-425  
October 15, 1956

## FEDERAL SPECIFICATION

### TINPLATE (HOT DIP AND ELECTROLYTIC)

This specification was approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal agencies.

#### 1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers tinplate produced from low carbon cold-reduced steel. It is available in either hot-dipped or electrolytic coatings. Normally tinplate is furnished in one grade comprised of a mixture of unassorted primes and seconds (see 6.3).

#### 1.2 Classification.

1.2.1 Base metal. Tinplate shall be furnished with one of the following steel types as specified (see 3.2 and 6.2):

Steel type D. Base-metal steel, aluminum killed, sometimes required to minimize severe fluting and stretcher-strain hazards or for severe drawing applications.

Steel type L. Base metal steel, low in metalloids and residual elements, generally used for improved internal corrosion resistance for certain food-product containers.

Steel type MC. Base-metal steel, rephosphorized, with residual elements similar to type MR, employed where greater strength is required and internal corrosion resistance is of lesser importance.

Steel type MR. Base-metal steel, similar in metalloid content to type L but less restrictive in residual elements, commonly used for most tin mill products.

Steel type N. A modification of the base-metal steel, furnished in either type L, MC, or MR compositions, renitrogenized for greater strength. The letter N is used as a suffix, for example, L-N, MC-N and MR-N.

1.2.2 Temper. Single reduced tinplate is normally furnished in the temper designations shown in tables I and II (see 6.2).

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1.2.2.1 Double reduced tinplate is normally furnished in the mechanical designations shown in table III (see 6.2 and 6.11).

TABLE I. Temper designations single-reduced tin mill products box annealed

Temper Designation	Approx. Rockwell Hardness Value, HR30T	Characteristic	Example of usage
T-1	49 ± 3	Soft for drawing.	Drawn requirements, nozzles, spouts, closures.
T-2	53 ± 3	Moderate drawing.	Rings and plugs, pie pans, closures, shallow-drawn and specialized can parts.
T-3	57 ± 3	Shallow drawing general purpose with fair degree of stiffness to minimize fluting.	Can ends and bodies, large-diameter closures, crown caps
T-4	61 ± 3	General purpose where increased stiffness desired.	Can ends and bodies, crown caps
T-5	65 ± 3	Stiffness, rephosphorized steel used for hardness to resist buckling.	Can ends and bodies, moderately or noncorrosive packs.
T-6	70 ± 3	Rephosphorized steel for great stiffness.	Can ends subjected to high internal pressure

Note: Lighter-base weight plate (nominally 75 lb/base box and lighter) is normally tested using the Rockwell 15T scale and the results converted to the Rockwell 30T scale (see Appendix A2 and Table A8 of ASTM A 623.)

TABLE II. Temper designations single-reduced tin mill products continuously annealed

Temper Designation	Approx. Rockwell Hardness Value, HR30T	Characteristic	Examples of usage
T-4-CA	61 ± 3	Moderate forming. Fair degree of stiffness.	Closures, can ends and bodies.
T-5-CA (TU)	65 ± 3	Increased stiffness to resist buckling.	Can ends and bodies.
T-6-CA	70 ± 3	Rephosphorized steel for great stiffness.	Can ends subjected to high internal pressure.

Note: Lighter-base-weight plate (nominally 75 lb/base box and lighter) is normally tested using the Rockwell 15T scale and the results converted to the Rockwell 30T scale (see Appendix A2 and Table A8 of ASTM A623).

TABLE III. Mechanical designations double-reduced tin mill products

Designation	Approx. Tensile-yield Strength, psi, Longitudinal at 0.2 percent Offset	Approx. Rockwell Hardness HR30T	Examples of usage
DR-8	80,000	73	Round can bodies and ends.
DR-9	90,000	76	Round can bodies and ends.
DR-10	100,000 min	80	Can ends subjected to high interval pressure and produced from steels to which nitrogen has been added.

Note: Lighter-base-weight plate (nominally 75 lb/base box and lighter) is normally tested using Rockwell 15T scale and the results converted to the Rockwell 30T scale (see Appendix A2 and Table A8 of ASTM A 623).

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1.2.3 Classes. Tinplate shall be classified according to the method of coating (hot dip or electrolytic) as follows:

Hot dip classes:

Common cokes  
Standard cokes  
Best cokes  
Kanner's special cokes  
1A charcoal

Electrolytic designation No.

10<sup>1</sup>/<sub>2</sub>  
25  
50  
50/25  
75  
75/25  
100  
100/25  
100/50  
135/25

<sup>1</sup>/<sub>2</sub> Not recommended for soldering applications.

1.2.4 Finish and appearance. The finish and appearance shall be one of the following as specified (see 6.2):

Bright (or melted coating) - Hot dip and electrolytic  
Matte (dull, unmelted coating - Electrolytic

1.2.5 Base weights. Tinplate shall be furnished in the following base weights (pounds per base box) as specified (see 6.2):

Base weight pounds per base box		
<u>Double or single reduced</u>		<u>Single reduced only</u>
55	85	107
60	90	112
65	95	118
70	100	128
75	103	135
80		

## 2. APPLICABLE DOCUMENTS

2.1 The following documents of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

### Federal Standards:

Fed. Std. No. 123 - Marking for Domestic Shipment (Civilian Agencies)  
Fed. Test Method Std. No. 151 - Metals; Test Methods

(Activities outside the Federal Government may obtain copies of Federal Specifications, Standards, and Handbooks as outlined under General Information in the Index of Federal Specifications and Standards and at the prices indicated in the Index. The Index, which includes cumulative monthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402.

(Single copies of this specification and other Federal Specifications required by activities outside the Federal Government for bidding purposes are available without charge from Business Service Centers at the General Service Administration Regional Offices in Boston, New York, Washington, D. C., Atlanta, Chicago, Kansas City, Mo., Fort Worth, Denver, San Francisco, Los Angeles and Seattle, Washington.

(Federal Government activities may obtain copies of Federal Specifications, Standards, and Handbooks and the Index of Federal Specification and Standards from the established distribution points in their agencies.)

### Military Standards:

MIL-STD-129 - Marking for Shipment and Storage.  
MIL-STD-163 - Steel Mill Products Preparation for Shipment and Storage.

(Copies of Military Specifications and Standards required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless a specific issue is identified, the issue in effect on date of invitation for bids or request for proposal shall apply.

### American Society for Testing and Materials (ASTM) Standards:

A 623 - General Requirements for Tin Mill Products  
A 624 - Single-Reduced Electrolytic Tin Plate  
A 626 - Double-Reduced Electrolytic Tin Plate  
A 630 - Determination of Tin Coating Weights for Hot-Dip and Electrolytic Tin Plate

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pa. 19103.)

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National Classification Board:

## National Motor Freight Classification.

(Application for copies should be addressed to the American Trucking Associations, Inc., ATTN: Tariff Order Section, 1616 P Street, N.W., Washington, D. C. 20036.)

Uniform Freight Classification Committee:

## Uniform Freight Classification.

(Application for copies should be addressed to the Uniform Classification Committee, 202 Union Station, Chicago, Ill. 60606.)

## 3. REQUIREMENTS

3.1 Manufacture.

3.1.1 Base metal. The base metal shall be made by the open-hearth, electric-furnace or basic-oxygen process.

3.2 Chemical composition. When specified in the contract or order (see 6.2), the cast analysis for the steel type (see 1.2.1) shall conform to the requirements shown in table IV.

TABLE IV. Chemical requirements for tin mill products

Element	Cast composition, max, percent			
	Type D	Type L <sup>a,b</sup>	Type MC <sup>b</sup>	Type MR <sup>a,b</sup>
Carbon	0.12	0.13	0.13	0.13
Manganese	0.60	0.60 <sup>c</sup>	0.70	0.60 <sup>c</sup>
Phosphorus	0.020	0.015	0.15	0.020
Sulfur	0.05	0.05	0.05	0.05
Silicon	0.020 <sup>c</sup>	0.010 <sup>c</sup>	0.010 <sup>c</sup>	0.010 <sup>c</sup>
Copper	0.20	0.06	0.20	0.20
Nickel	--	0.04	--	--
Chromium	--	0.06	--	--
Molybdenum	--	0.05	--	--
Other residual elements, each	--	0.02 <sup>c</sup>	--	--

<sup>a</sup>Double-reduced tin mill products are normally available only in types L and MR.

<sup>b</sup>Type N (renitrogenized steel with 0.007 percent nitrogen, min) is available in types L, MC, or MR. This is also applied for beer and carbonated beverage ends double-reduced plate specified as DR-10.

<sup>c</sup>Unless otherwise agreed upon between the manufacturer and the purchaser.

3.3 Coating. The tin coating shall be of commercially pure tin. The weight per base box shall conform to the requirements for hot dip coatings as shown in table V, and for electrolytic coatings as specified in table I of ASTM A 624 and A 626.

TABLE V. Hot dip tin coating weight test values

Class	Minimum average coating weight test value lbs/base box
Common cokes	0.85
Standard cokes	1.05
Best cokes	1.19
Kanner's special cokes	1.40
1A charcoal	1.80

### 3.4 Finish and appearance.

3.4.1 Hot dipped tinplate. Hot dip tinplate shall be of bright finish.

3.4.2 Electrolytic tinplate shall conform to the particular finish shown in ASTM A 624 and A 626 as specified in the contract or order.

3.5 Dimensions. Dimensional tolerances for either hot dipped or electrolytic material shall conform to ASTM A 623, section 8.

3.6 Identification marking. Each unit load shall be marked with the item name, base weight, size of sheet or coil width, steel type, temper or mechanical designation number, tin coating class, number of cut lengths or numbers of lineal feet (for coils), and unit weight. Unless otherwise specified in the contract or order, differentially coated tin plate shall be marked in accordance with the applicable portions of section 4 of ASTM A 624.

3.7 Workmanship. Hot dip and electrolytic tinplate shall be as nearly uniform in thickness as is practicable and shall be flat, clean, smooth and as evenly coated with tin on both sides as commercial practice will permit. The tinplate shall be free from deep scratches, seams, pits, and other serious defects which would affect the intended use (see 6.8).

## 4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may use his own facilities or any commercial laboratory acceptable to the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure that supplies and services conform to prescribed requirements.

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4.2 Lot. Unless otherwise specified in the contract or order, a lot shall consist of all tinplate of the same type, grade, class, finish, size, and base weight submitted for inspection at one time. Unless otherwise specified in the contract or order, the lot shall not exceed 20,000 sheets (see 6.9) or the equivalent in other dimensions or in coils.

#### 4.3 Examination.

4.3.1 Visual. Unless otherwise specified in the contract or order, all tinplate material shall be subject to visual examination to insure conformance to the requirements for finish (see 3.4), identification marking (see 3.6), and workmanship (see 3.7).

4.3.2 Dimensions and tolerances. All tinplate material shall be subject to examination to insure conformance to dimensional requirements (see 3.5).

4.3.3 Weight. For tinplate in cut lengths, material shall conform to table VI.

TABLE VI. Hot dip and electrolytic tinplate  
weight tolerances

Quantity	Weight tolerances	
	Over, percent	Under, percent
Individual cut lengths	10	10
1 package to 15 packages, incl	6	4
Over 15 packages to 200 packages, incl	4	4
Over 200 packages	2-1/2	2-1/2

#### 4.4 Sampling for tin coating weights.

4.4.1 For hot dip and electrolytic tinplate the procedure for coating weight sampling shall be that specified in 5.2 of ASTM A 626.

#### 4.5 Tests.

4.5.1 Chemical analysis. When chemical product analysis is required, specimens shall be prepared and tested in accordance with method 111 or 112 of Fed. Test Method Std. No. 151. In case of dispute, analysis by method 111 shall be the basis for acceptance or rejection. When method 111 is being used, sampling should be as shown for sheet material under method 111.

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

4.5.2 Tin-coating weight test. Tin-coating weight test shall be conducted in accordance with ASTM A 630.



4.6 Rejection and retest. Unless otherwise specified in the contract or order, rejection and retest shall be conducted in accordance with the general section of Fed. Test Method Std. No. 151.

## 5. PREPARATION FOR DELIVERY

5.1 Preservation and packaging. Preservation and packaging shall be level A or C as specified (see 6.2).

5.1.1 Level A. For military requirements, preservation for shipment shall be in accordance with MIL-STD-163.

5.1.2 Level C. Cleaning, drying, preservation, and packaging shall be in accordance with the manufacturer's commercial practice.

5.2 Packing. Tinplate shall be packed for shipment in accordance with level A or C as specified (see 6.2).

5.2.1 Level A. For military requirements, packing for shipment shall be in accordance with MIL-STD-163.

5.2.2 Level C. Packing shall be in accordance with commercial practice adequate to ensure acceptance and delivery by the carrier for the mode of transportation employed. Containers shall comply with the requirements of the Uniform Freight Classification Rules or National Motor Freight Classification Rules, as applicable to the mode of transportation.

## 5.3 Marking.

5.3.1 Civil agencies. In addition to any special marking specified in the contract or order, marking for shipment shall be in accordance with Fed. Std. No. 123.

5.3.2 Military activities. In addition to any special marking specified in the contract or order, marking for shipment shall be in accordance with MIL-STD-129.

## 6. NOTES

6.1 Intended use. Tinplate covered by this specification is intended for use where a neat appearance, protective properties, and easy solderability are of prime importance as, for example, in the manufacture of cans, containers, houseware, kitchenware, etc. Tinplate is commonly used as containers for food. Tinplate is not suitable for gasoline tanks, since it corrodes under these conditions. Terneplate is commonly used for this purpose.

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6.2 Ordering data. Purchasers should select the preferred options permitted herein and include the following information in procurement documents:

- a. Title, number, and date of this specification.
- b. Steel type, tin coating designation number, temper designation or mechanical designation desired, class, and base weight (see 1.2).
- c. Finish (see 1.2.4).
- d. Chemical composition (see 3.2).
- e. Special marking required for differentially coated tin plate (see 3.6).
- f. Preparation for delivery requirements (see section 5).
- g. Dimensions, coil or cut size (see 6.4).
- h. Quantity in base boxes (see 6.5 and 6.10).

6.2.1 Information on the intended end use should be given to enable the producer to select the proper combination of processing treatments.

### 6.3 Definitions.

6.3.1 Primes. Tinplate that is free from defects readily observable by the unaided eye.

6.3.2 Seconds. Tinplate that has minor imperfections to a moderate degree or extent. These defects are in the coating, in the base metal, or are defects incidental to the manufacturing process.

6.4 Tinplate is commonly available in both cut length and coil form. The hot dipped sizes range in steps of 1/16 inch and normally cut length products range in size from 24 inches to 36 inches in width and in steps of 1/16 inch from 18 inches to 48 inches in length. Electrolytic sizes range in steps of 1/16 inch from 24 to 36 inches in width and in steps of 1/16 inch from 18 to 45 inches in length.

6.5 The quantity contained in a package is traditional and was originally set at 112 to conform to the English weight system and to permit manual handling of packages conveniently and individually. Units of 56 and 224 are used for smaller and larger than normal sizes to keep the package weight within the range of convenient manual handling.

6.6 In modern practice tinplate is packed in bundles which are equivalent to 10, 12, 15, or 20 packages. The package is not ordinarily used as a shipping unit but is essentially a unit of quantity.

6.7 The practice in the production of tinplate is to shear to a minimum of 1/8 inch in width and 1/4 inch in length over the specified dimensions. The greater dimension is the length. The practice for coiled products is to trim 1/4 inch over the specified dimension.

6.8 Hot dipped tinplate (charcoal or cokes) is available in cut length form only. Electrodeposited tinplate is available in either cut lengths or coils. Because of the nature of coils, individual areas or portions of the coils will have defects present to a greater extent than may occur in cut lengths.

6.9 Base box weights. Tinplate is selected and sold on the basis of its weight per unit area rather than on a gage or thickness basis. The unit of area is the base box, equal to the area of 112 sheets, 14 by 20 inches, or 31,360 square inches (217.8 square feet). Table VII lists the base weights in pounds of tinplate commonly produced and the approximate thickness in inches. The approximate thicknesses are included for information only and should not be used in the contract or order to specify the required tin plate.

TABLE VII. Nominal base weight, theoretical thickness and thickness tolerances

Nominal weight lb/base box	Theoretical thickness		Thickness tolerances, over and under	
	in.	mm	in.	mm
55	0.0061	0.155	0.0006	0.015
60	.0066	.168	.0007	.018
65	.0072	.183	.0007	.018
70	.0077	.196	.0008	.020
75	.0083	.211	.0008	.020
80	.0088	.224	.0009	.023
85	.0094	.239	.0009	.023
90	.0099	.251	.0010	.025
95	.0105	.267	.0011	.028
100	.0110	.279	.0011	.028
103	.0113	.287	.0011	.028
107	.0118	.300	.0012	.030
112	.0123	.312	.0012	.030
118	.0130	.330	.0013	.033
128	.0141	.358	.0014	.036
135	.0149	.378	.0015	.038

6.10 Since a base box is equivalent in area to 112 sheets of 280 square inches each, for other sizes the number of base boxes in a package of 112 plates may be determined from the following formula:

$$\text{Number of base boxes in package} = \frac{A}{280}$$

Where A = the ordered size in square inches for an individual plate.

Ratio tables which provide the same information are shown in ASTM A 623.

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6.11 Rolling direction. Double reduced plate is relatively brittle and has very distinct directional properties. The rolling direction must be specified on cut sizes and will be indicated by underlining the slit (rolling width) dimension. To minimize the flange-cracking hazard when the product is used for can bodies, the rolling direction must be around the circumference of the can.

MILITARY CUSTODIANS

Army - MR  
Navy - AS  
Air Force - 84

Review activities:

Army - MU, GL  
Navy - AS  
Air Force - 85  
DSA - IS

User activities:

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Navy - OS  
Air Force -

Preparing activity:

Army - MR

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