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July 14, 1978
SUPERSEDING
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FEDERAL SPECIFICATION

COATINGS, EXTERIOR, FOR TINNED FOOD CANS

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

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers coatings applied to the outside of tinned food cans. The coatings are for protection against corrosion and for camouflage.

1.2 Classification.

1.2.1 Types and classes. Coatings shall be of the following types and classes as specified (see 6.1 and 6.2).

Type I	-	Precoated camouflage (translucent).
Class 1	-	For processed cans.
Class 2	-	For non-processed cans.
Type II	-	Postcoated camouflage (opaque).
Type III	-	Precoated unpigmented.
Class 1	-	For processed cans.
Class 2	-	For non-processed cans.

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-595	-	Colors.

(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, US Government Printing Office, Washington, DC 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 Services Administration Regional Offices in Boston, New York, Philadelphia, Washington, DC, Atlanta, Chicago, Kansas City, MO, Fort Worth, Houston, Denver, San Francisco, Los Angeles, and Seattle, WA.

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

Military Specification:

MIL-O-20582 - Opener, Can, Hand, Folding.

Military Standard:

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.

(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) Standard:

D-3335 - Low Concentration of Lead and Cadmium in Paint by Atomic Absorption Spectroscopy.

D-523 - Standard Test Method for Specular Gloss

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

3. REQUIREMENTS

3.1 Material. The contractor is given latitude in the selection of raw materials provided the coatings are of an organic type and conform to the requirements specified herein. The coatings shall be smooth and shall be free of blisters, wrinkles, or sagging. The exterior coating material shall contain not more than 0.06 percent lead when tested as specified in 4.2.1.1. The exterior coating shall not readily chip or flake during the can opening process when tested as specified in 4.2.3.

3.2 Physical properties of the coatings.

3.2.1 Weight and thickness. The weight and thickness of the dry coating on the cans shall be as specified in table I when tested as specified in 4.2.3.

TABLE I. Dry coating weight and thickness

Type	Class	Weight (minimum) milligrams per square inch (g/m^2)	Thickness (minimum) mils (mm)
I	1	Top, bottom, and body of can (each) - 3.0 (0.29)	--
I	2	Top, bottom, and body of can (each) - 3.0 (0.29)	--
II	-		0.5 (0.013)
III	1	Top, bottom, and body of can (each) - 1.0 (0.09)	--
III	2	Top, bottom, and body of can (each) - 2.5 (0.24)	--

3.2.2 Dryness (type II only). The coating shall show no evidence of wetness, tackiness, wrinkling, or other distortion when examined in accordance with 4.2.2.

3.2.3 Flexibility (type II only). The coating shall not crack, flake, peel, loosen, or lift when tested as specified in 4.2.3.

3.2.4 Adhesion.

3.2.4.1 Types I and III. When examined visually, there shall be no evidence of flaking, peeling, lifting, or loosening of the coating.

3.2.4.2 Type II. When tested as specified in 4.2.3, all specks and flakes of exterior coating in the food content shall not exceed 0.015 square inches (9.6 square mm) in the aggregate. In addition, the coating shall adhere elsewhere on the can to the extent that it is difficult to remove by scoring with the thumbnail.

3.2.5 Coating coverage.

3.2.5.1 Types I and III. The coating when examined visually (see 4.2.2) shall completely cover the can except that it need not cover the key solder area, key and tab. Whe level A packaging is specified in commodity specifications or canned subsistence specification (PPP-C-29) (see 6.2) the soldered side seam area of type I and III coated cans shall be stripe coated a minimum of 95 percent complete with a continuous, uniform organic coating which shall be sufficiently colored, by either its resinous ingredients or by addition of dyes or pigments, to facilitate inspection of its thoroughness of coverage. The stripe coating may be any color in a non-vivid shade. Alternatively, the exterior side seam striping may be clear. When clear striping is used, coverage shall be tested in accordance with 4.2.3.

3.2.5.2 Type II. The coating, when examined visually (see 4.2.2) shall completely cover the can, key, and tab, and 99 percent of the body, top and bottom, except for the following areas that are difficult to coat.

(a) Support points, provided there are no more than four uncoated areas and none of the uncoated areas exceeds 1/8 inch (3 mm) in the longest dimension.

(b) On cans equipped with key and tab, the area under the tab may be uncoated and a moderate thinning of the coating is permissible in the area under and adjacent to the key but no further than 1/8 inch (3 mm) from any part of the key.

3.2.6 Color.

3.2.6.1 Type I. When tested as specified in 4.2.3, the color of the coating shall be camouflage conforming to No. 24098 of FED-STD-595. Color, as light as color No. 24201, will be acceptable.

3.2.6.2 Type II. When tested as specified in 4.2.3, the olive drab color shall be uniform and shall conform to color No. 34087 of FED-STD-595. Color as dark as color No. 34086 or as light as color No. 34127, will be acceptable.

3.2.6.3 Type III. The color shall be that resulting from the natural color of the resins used and not from pigmentation. Color matching is not required.

3.2.7 Gloss, (types I and II only). Specular gloss shall be not more than 45 when tested as specified in 4.2.3.

3.2.8 Opacity.

3.2.8.1 Type I. The coating shall be sufficiently translucent so the printing on the cans is legible when tested as specified in 4.2.3.

3.2.8.2 Type II. The coating shall be opaque.

3.2.9 Resistance to processing conditions. Type I, class 1, and type III, class 1 coatings, shall withstand the processing to which the coated can will be subjected without damage to the coating, such as blistering, color loss, cracking, or peeling, and without appearance of rust when tested as specified in 4.2.3.

3.3 Workmanship. The coatings covered by this specification shall conform to the quality of product established by this specification and the occurrence of defects shall not exceed the applicable acceptable quality levels. Small narrow scratches, which may be incurred in commercial double seaming and handling, will be permitted on the body and ends, and double seams of types I and III coated cans.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government.

4.2 Quality conformance inspection. Sampling for inspection shall be performed in accordance with the provisions of MIL-STD-105, except where otherwise indicated hereinafter.

4.2.1 Component and material inspection. In accordance with 4.1, components and materials shall be inspected in accordance with the requirements of referenced specifications, drawings, and standards unless otherwise excluded, amended, modified, or qualified in this specification, or applicable purchase document.

4.2.1.1 Presence of lead. The liquid coating material prior to application shall be tested to determine the absence of lead (see 3.1). The test for lead shall be as specified in 4.3.7. The sample unit shall be a 1-ounce (28 gm) composite. Results shall be reported to the nearest 0.01 percent.

4.2.2 Examination of the end item. The defects found during the examination of the end item shall be classified in accordance with the defects listed below. The sample unit for this examination shall be one coated can with lid. The lot size shall be expressed in units of coated cans. The inspection level shall be level I and the acceptable quality level (AQL) shall be 2.5 major defects and 4.0 total defects per 100 units.

Examine	Defect	Classification Major	Minor
Coating	Not type specified	X	
	Missing	X	
Coating coverage			
Types I and III	More than 5 percent of total can area uncoated except for key solder area, key, and tab, and permitted scratches 1/	X	
	From 1 to 5 percent of total can area uncoated except for key solder area, key, and tab, and permitted scratches as specified in 1/		X
	Flaking, peeling, lifting, or loosening of coating	X	
	Side seam area not stripe coated when specified	X	
	Stripe coating more than 5 percent uncoated	X	
	Stripe coating shade vivid	X	

Examine	Defect	Classification Major	Classification Minor
Coating coverage (cont'd)			
Type II	More than 5 percent of the total area uncoated except those areas difficult to coat as outlined in 3.2.5.2	X	
	From 1 to 5 percent of the total can area uncoated, except those areas difficult to coat as outlined in 3.2.5.2.		X
	Coating wet, tacky, wrinkled, or distorted 2/	X	
	More than 4 uncoated, support points		X
	Any absence of coating in support area, over 1/8 inch (3 mm) in length or width		X
	Coating easily removed when scored with thumbnail	X	
Coating appearance	Coating not smooth		X
	Blisters, wrinkles, or sags		X
Opacity			
Type II	Not opaque		X

1/ Small narrow scratches, which may be incurred in commercial double seaming and handling, will be permitted on the body and ends, and double seams of type I and III coated cans.

2/ The dryness of the coating shall be determined by placing the coated can on a table or stool so adjusted in height that the person conducting the test may rest his thumb on the can with his arm in a straight line from the wrist to shoulder. Bear downward on the coated can with the thumb exerting maximum pressure of the arm and at the same time twist the thumb through an angle of 90° in the plane of the coating.

4.2.3 Testing of the end item. The end item shall be tested for the characteristics listed in table II. The lot size shall be expressed in units of one coated can, each with lid. In order to limit the size of the sample unit, the sequence of testing may be in the order listed in table II which will permit a sample unit of one coated can, with lid. The inspection level shall be level S-2 of MIL-STD-105. Numerical requirements shall be reported as lot average and there shall be no evidence of failure to meet the requirements as specified. All other requirements, reported as "pass" or "fail", are applicable to the sample unit with an AQL of 4.0 defects per 100 units.

TABLE II. Testing of the end item

Characteristic	Requirement	Test method	Number of determinations per sample unit	Results reported as pass or fail	Results reported as numerically to nearest
Color (all types)	3.2.6	4.3.5	1	X	-
Adhesion (type II)	3.2.4	4.3.4	1	X	-
Adhesion (types I and III)	3.2.4	4.3.4.1	1	X	-
Gloss (types I and II)	3.2.7	4.3.6	1	-	whole number
Coating thickness (type II) 1/	3.2.1	4.3.2	3	-	0.1 mil (0.0026 mm)
Flexibility (type II) 1/	3.2.3	4.3.3	1	X	-
Coating coverage (side seam coating clear) (Types I and III)	3.2.5.1	4.3.8	1	X	-

TABLE II. Testing of the end item (cont'd)

Characteristic	Requirement	Test method	Number of determinations per sample unit	Results pass or fail	reported as numerically to nearest
Coating weight (types I and III) 1/					
Top of can	3.2.1	4.3.1.1	1	-	0.1 milligram
Bottom of can	3.2.1	4.3.1.2	1	-	0.1 milligram
Body of can	3.2.1	4.3.1.3	1	-	0.1 milligram
Translucency (type I)	3.2.8.1	4.3.9	1	X	
Resistancy to processing (type I, class 1 and type III, class 1)	3.2.9	4.3.10	1	X	

1/ In lieu of testing, characteristics may be determined by examination of invoices or other valid documentation from the contractor (see 3.1).

4.3 Test methods.

4.3.1 Weight of coating.

4.3.1.1 Top of can. Cut one 2 by 2 inch (51 by 51 mm) panel or a 4 square inch circular disc (2581 mm^2) from the top of the can and weigh to the nearest milligram. Remove the coating from each panel with a stripping chemical that does not react with the base tinplate. If the inside of the can is coated, care should be taken so that only the exterior coating is removed from each test panel. Reweigh test panels and report the average coating weight in milligrams per square inch (62.5 mm). If the can is of such dimensions that a 2 by 2 inch (51 by 51 mm) panel or a 4 square inch circular disc (2581 mm^2) cannot be cut from the top, the whole top shall be used for the test. The stripping chemical used by the contractor shall be recorded in the test report.

4.3.1.2 Bottom of can. Repeat the test specified in 4.3.1.1 except that the panel shall be cut from the bottom of the can. If the can is of such dimension that a 2 by 2 inch (51 by 51 mm) panel or a 4 square inch circular disc (2581 mm^2) cannot be cut from the bottom, the whole bottom shall be used for the test.

4.3.1.3 Body of can. Repeat the test specified in 4.3.1.1 except that the panel shall be cut from the body of the can. If the body of the can is so small that a 2 by 2 inch (51 by 51 mm) panel or a 4 square inch circular disc (2581 mm^2) cannot be cut from the body, the whole body shall be used for the test.

4.3.2 Thickness of coating. Measure the thickness of the can, in three different areas, with a gauge accurate to 0.1 mil (0.0026 mm). Remove the coating from the measured areas, with a stripping chemical that does not react with the tinplate and remeasure the thickness in the same location where the initial measurements were made. If the inside of the can is coated, care should be taken so that only the exterior coating is removed. The difference in the readings represents the thickness of coating. The stripping chemical used by the contractor shall be recorded in the test report. Other methods which are accurate to 0.1 mil (0.0026 mm) may be used.

4.3.3 Flexibility After the coated can has been conditioned for 1 hour at 150° ± 2°F (66 ± 1°C), a panel approximately 2 by 5 inches (51 by 127 mm) shall be cut from the can. The panel, cooled to room temperature and with the coating up, shall be bent rapidly (in lengthwise direction) over a 1/4 inch (6 mm) mandrel and then examined for cracks. Cracks starting at the end of the bend and extending to 1/4 inch (6 mm) from the edges will be disregarded. Observe for defects cited in 3.2.3.

4.3.4 Adhesion (type II only). Before testing, the coated can shall either be allowed to dry for 48 hours or shall be conditioned for 1 hour at 150° ± 2°F (66 ± 1°C). After drying, a can opener conforming to MIL-O-20582 shall be used to open the can after which the lid shall be folded back and the contents of the can examined for evidence of exterior coating. The area of specks and flakes of coating shall be estimated by suitable means, e.g., by removing them and arranging them in a rectangular area accurately drawn to be 0.015 sq. in. (9.6 square mm).

4.3.4.1 Adhesion (types I and III). A can opener conforming to MIL-O-20582 shall be used to open both ends of the can to be tested. The cut edges of both the lid and the can shall be examined for evidence of removal of coating in the form of chips or flakes. Thin line scratches of the coating due to the opener blade will not be regarded as chips or flakes.

4.3.5 Color matching. The color of the coating shall be compared with the specified color and tolerance colors under natural north sky daylight or artificial equivalent. The viewing distance shall be sufficient to render coating striations normally encountered in roller-applied coatings relatively inconspicuous for purposes of color comparison. In borderline cases, the examination for color shall be made by comparing the color tolerance panel side by side with a flat or flattened section of the can, viewing approximately a 3/4 by 1/2 inch (19 by 13 mm) area of each with the assistance of a superimposed sheet of white paper in which there is a 3/4 by 1 inch (19 by 25 mm) view opening. When examining type III coating, it is only necessary to determine that the coating contains no pigmentation.

4.3.6 Specular gloss. The specular gloss shall be determined in accordance with ASTM D 523 on panels of suitable size cut from the coated can. The panels shall be flattened smooth and held in a horizontal plane during the test, if necessary by a magnetic table or other suitable device. Alternately, gloss may be determined by visual comparison with a coated panel which has a gloss of 45 as determined by the above referenced method.

4.3.7 Test for lead. The presence of lead shall be determined in accordance with ASTM D 3335 on the sample specified in 4.2.1.1. The amount of lead shall be calculated on the basis of the non-volatile matter in coating material.

4.3.8 Test for clear side seam coating coverage. The clear coated side seam area of the can or can body to be tested shall be immersed for 1 minute in an electrodeless copper plating solution at room temperature 65° to 90°F (18 to 32°C). Areas without coating will be indicated by a plating out of reddish colored copper. The amount of uncoated area shall be estimated and reported as percentage of the total side seam area. Prior to use in the test, the plating solution shall be checked for plating adequacy by immersing in it the side-seam area of a non-side-striped can, on which it should deposit a readily visible reddish copper plate in 1 minute.

4.3.9 Translucency. The translucency of the type I coating shall be determined by observing the required printing on the coated cans under natural north sky daylight or artificial equivalent. All coated markings of 8 point in size or greater shall be legible when viewed at an angle nearly normal to the surface.

4.3.10 Resistance to processing. After processing (see 6.1.3), type I, class 1 and type III, class 1 coatings shall be observed for damage to the coating, such as blistering, color loss, cracking, peeling, or appearance of rust.

5. PREPARATION FOR DELIVERY

This section is not applicable to this specification.

6. NOTES

6.1 Definitions.

6.1.1 Precoated coating. Coating applied to flat sheets of tinplate prior to fabricating the plate into cans.

6.1.2 Postcoated coating. Coating applied to food cans after they have been filled with food, sealed, and processed.

6.1.3 Processed cans. Cans used in the processing of perishable food products, wherein the processing (sterilization) is performed on cans packed with food and sealed.

6.1.4 Nonprocessed cans. Cans used to pack food products which are not processed, (not sterilized) in the can and nonperishable food products such as crackers, coffee, dehydrated foods, etc.

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) Type and class required (see 1.2.1).
(c) When level A packaging is required (see 3.2.5.1).

6.3 Metric equivalents. Metric equivalents, indicated in parentheses throughout this document, are based on practices, conversion factors, and symbols specified in ASTM E 380 Standard for Metric Practice, and are for information only. In each instance, the value stated in US customary units shall be controlling.

Military Custodians:

Army - GL
Navy - SA

Review activity:

Army - MD, MR

User activities:

Army - DPSC - SS
Navy - MC, MS

Civil Agency Coordinating Activities:

AGR-AMS
COM-NBS
GSA-FSS
JUS-FPI
HEW-FDA

Preparing activity:

Army - GL

Project No. 8030-0440

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