

Canadian General Standards Board

CGSB

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**CANADIAN GENERAL
STANDARDS BOARD**

**OFFICE DES NORMES
GÉNÉRALES DU CANADA**

**DOPE: TAUTENING, FOR
AIRCRAFT FABRIC**

**ENDUIT DE TENSION
POUR TOILE D'AÉRONEF**

This standard is hereby withdrawn. It has been determined that the product covered by this standard is no longer used in quantities that would warrant the continued maintenance of the standard.

Cette norme est retirée par le présent avis. Il a été constaté que le produit qui fait l'objet de la présente norme n'est plus utilisé en quantité suffisante pour maintenir cette norme en vigueur.

Canada



CANADA

CANADIAN GOVERNMENT SPECIFICATIONS BOARD

SPECIFICATION

FOR

DOPE: TAUTENING, FOR AIRCRAFT FABRIC

1-GP-155a

31 DECEMBER 1968

SUPERSEDES 1-GP-155

22 DECEMBER 1961

THIS SPECIFICATION HAS BEEN PREPARED BY A GOVERNMENT - INDUSTRY COMMITTEE TO COMPLY WITH THE SPECIFIC REQUIREMENTS OF THE FEDERAL GOVERNMENT. IT IS INTENDED FOR USE IN A PROCUREMENT SYSTEM THAT INCLUDES INSPECTION PROCEDURES TO ENSURE COMPLIANCE WITH THE REQUIREMENTS OF THE SPECIFICATION AND ITS USE WITHOUT SUCH INSPECTION PROCEDURES MAY NOT BE ADVISABLE.

THIS SPECIFICATION APPLIES TO PIGMENTED AND NONPIGMENTED CELLULOSE-NITRATE TAUTENING DOPE FOR APPLICATION BY BRUSH AND SPRAY ON FABRIC-COVERED AIRCRAFT COMPONENTS.

DEPARTMENT OF DEFENCE PRODUCTION, OTTAWA, CANADA

25 CENTS

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and

Aeronautical, Equipment and Ammunition Subcommittee

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CANADIAN GOVERNMENT SPECIFICATIONS BOARD

Specification
for

DOPE: TAUTENING, FOR AIRCRAFT FABRIC

1. DEFINITION

1.1 This specification applies to pigmented and nonpigmented cellulose-nitrate tautening dope for application by brush and spray on fabric-covered aircraft components.

1.2 For more detailed information on uses, see par 8.1.

2. APPLICABLE PUBLICATIONS

2.1 The following publications are applicable to this specification:

2.1.1 CGSB 1-GP-71, Methods of Testing Paints and Pigments

2.1.2 CGSB 1-GP-12c, Standard Paint Colors

2.1.3 CGSB 4-GP-2, Canadian Standard Textile Test Methods

2.1.4 ASTM Standards on Paint, Varnish, Lacquer and Related Products.

2.2 Reference to the above publications to test methods therein, and to other specifications is to the issues in effect on the date of invitation to tender, unless otherwise specified.

3. CLASSIFICATION

3.1 The dope shall be supplied in two types, as specified by the purchaser:

Type 1 - Nonpigmented, Clear

Type 2 - Pigmented, Gloss.

4. GENERAL REQUIREMENTS

4.1 Type 1 dope shall consist of cellulose nitrate and plasticizers adequately dissolved in suitable solvents. The use of benzene is prohibited. The dope shall be compounded free from particles of undissolved ingredients and sediment. Type 2 dope shall contain light-fast pigments thoroughly dispersed in the same type of vehicle.

4.1.1 The nonvolatile vehicle of Type 1 shall contain, on a weight basis, 83-85 per cent cellulose nitrate and 15-17 per cent plasticizers. Type 2 shall contain 69-78 per cent cellulose nitrate and 22-31 per cent plasticizers.

- 4.1.2 The cellulose nitrate shall be 5-6 seconds or 15-20 seconds grade and the nitration, on a dry weight basis, shall be between 11.0 and 12.2 per cent. The plasticizer shall consist of equal parts of castor oil and dioctyl or di-isooctyl phthalate.
- 4.2 The dope shall be suitable for brushing and spraying when reduced with 1-GP-50 or 1-GP-110 thinner in accordance with the manufacturer's instructions.
- 4.3 The odor of the dope shall be normal for the type of solvents required.
- 4.4 Stability - The dope shall not show any hard settling, thickening, gelling, caking, curdling or undue loss in viscosity in the original container for one year from date of shipment when stored at a temperature not exceeding 100°F (38°C). At the end of this period it shall meet all the requirements of the specification.

5. DETAIL REQUIREMENTS

Dope to this specification shall comply with the following detail requirements:

	<u>Min</u>	<u>Max</u>	<u>Test Method</u>	
			<u>1-GP-71</u>	<u>ASTM</u>
5.1 Drying Time, dry-hard, minutes	-	30	5.1	-
5.2 Gloss	80	-	13.1	-
5.3 Fineness of Grind, Hegman, Type 2 only	7	-	-	D1210
5.4 Nonvolatile, % by wt			18.3	-
5.4.1 Type 1	11.5	-		
5.4.2 Type 2	15	-		
Except Black 512-101	13	-		
5.5 Ash Content, % by wt, Type 1	-	0.30	Par 7.9	-
5.6 Acidity, % by wt of vehicle (as acetic acid)	-	0.06	Par 7.10	-

- 5.7 Color* - Type 2 dope shall conform to such of the following 1-GP-12c gloss colors as may be specified by the purchaser:

Blue 202-101 Yellow 505-101 Red 509-102 White 513-101 Black 512-101

5.8 Viscosity

- 5.8.1 Unreduced Viscosity - The viscosity of the dope when determined with a Stormer Viscometer at 77°F (25°C) shall be between 65 and 75 Krebs Units.

Method 4.5

- 5.8.2 Reduced Viscosity - The viscosity of the dope, when reduced by the addition of 2 volumes of 1-GP-50 or 1-GP-110 thinner to 1 volume of dope, shall be 18-25 seconds, when determined with a No. 4 Ford Cup.

Method D1200

* Aluminum-colored dope may be obtained by mixing 1 gal Type 1 clear dope with 10 oz Class A 1-GP-22 powder or 15 oz Class A 1-GP-24 paste aluminum pigment.

5.9 Hiding Power - Type 2 dope shall meet the following contrast ratio requirements when applied to black and white carrara glass in accordance with the specified method:

<u>Color Number</u>		<u>Dry Film Thickness</u> <u>in., max</u>	<u>Contrast Ratio</u> <u>min</u>
Blue	202-101	0.001	0.98
Yellow	505-101	0.001	0.88
Red	509-102	0.001	0.88
White	513-101	0.001	0.90
Black	512-101	0.001	1.00

Method 128.1 and 14.7

5.10 Blushing Resistance - No blushing, wrinkling nor bubbling shall occur when the dope is tested at 65 per cent relative humidity.

Method 38.2

5.11 Gasoline Resistance - Panels primed with 1-GP-132 zinc chromate primer and topcoated with dope shall withstand immersion in Type 3 3-GP-951 hydrocarbon fluid for 4 hours at 73°F (23°C) without marked softening, blistering, lifting, wrinkling, loosening or peeling. After a 24-hour recovery period there shall be no evidence of softening or discoloration, and the loss in gloss shall not exceed 5 units when compared with the original gloss. When subjected to the knife test, the ribbon produced shall be free from crumbling and evidence of intercoat separation. There shall be no flaking, loosening nor separation of coats in the area adjacent to the scratch. After recovery the film shall comply with the low-temperature flexibility requirement (par 5.13).

Method 107.5

5.12 Water Resistance - Panels primed with 1-GP-132 zinc chromate primer and topcoated with the dope shall withstand 24-hour immersion in water at 73°F (23°C) without blistering, lifting, loosening or peeling. After a 2-hour recovery period there shall be no evidence of softening or discoloration, and the loss in gloss shall not exceed 5 units when compared with the original gloss. When subjected to the knife test, the ribbon produced shall be free from crumbling and evidence of intercoat separation. There shall be no flaking, loosening nor separation of coats in the area adjacent to the scratch.

Method 110.10

5.13 Low-Temperature Flexibility - The dried dope film shall show no cracking nor peeling when subjected to the bending test at 32°F (0°C) using a $\frac{1}{4}$ inch mandrel.

Method 119.4

5.14 Accelerated Weathering Resistance - The dope film shall withstand an exposure period of twenty 24-hour cycles in an accelerated weathering machine. After exposure there shall be no evidence of blistering, chalking, checking, flaking nor appreciable color change, except that some darkening of Yellow 505-101 will be permitted. The gloss after weathering shall be not less than 55 units. After bending the metal panel around a $\frac{1}{4}$ inch mandrel, there shall be no evidence of cracking or peeling.

Methods 122.10 and 119.5

5.15 Behavior Toward Undercoats and Self-Lifting - Two coats of dope, applied with an interval of 2 and 24 hr between coats over an aluminum test panel coated with 1-GP-132 zinc chromate primer, shall show no lifting of either the primer or the first coat of dope.

Method 133.1

5.16 Adhesion

5.16.1 Aluminum panels primed with 1-GP-132 zinc chromate primer and topcoated with the dope, when subjected to the knife test, shall produce a ribbon free from crumbling and evidence of intercoat separation. There shall be no flaking, loosening nor separation of coats in the area adjacent to the scratch.

5.16.2 When subjected to the tape test, there shall be no separation of topcoats from the primer.

Method 135.6

5.17 Properties of Treated Fabric - Fabric finished with the specified tautening scheme (par 7.3) shall have the following properties:

5.17.1 Appearance - When applied to a total dry weight of 2.0 - 2.75 ounces per square yard, the dope shall produce a smooth uniform surface.

Method Par 7.4

5.17.2 Tautness - The tautness of the finished fabric shall be such that a deflection of not less than 0.055 inch and not more than 0.100 inch is obtained, when subjected to the one-pound test.

Method Par 7.5

5.17.3 Tautness Retention - When a 2-ounce per square yard coating of 1-GP-134 Lacquer, White 513-101, is sprayed over the tautening system, the tautness of the complete system shall comply with the requirements of par 5.17.2.

Method Par 7.5

5.17.4 Breaking Strength - The breaking strength of the tautened fabric shall be not less than that of the untreated fabric itself. The application of 1-GP-134 Lacquer, White 513-101, shall not adversely affect the breaking strength.

Method Par 7.6

5.17.5 Bursting Strength - The bursting strength of the tautened fabric shall be not less than that of the untreated fabric itself. The application of 1-GP-134 Lacquer, White 513-101, shall not adversely affect the bursting strength.

Method Par 7.7

5.17.6 Brittleness - The breaking strength of the finished fabric shall be such that when the Model FT-1 Fabric Tester is used, there shall be no penetration of the doped fabric by the plunger or evidence of brittle dope as shown, for example, by "ring worm". The application of 1-GP-134 Lacquer, White 513-101, shall not adversely affect the brittleness.

Method Par 7.8

6. PREPARATION FOR DELIVERY

6.1 Unless otherwise specified, commercial packaging, packing and marking shall be acceptable.

6.2 Labelling - In addition to the labelling requirements of any relevant Acts or Regulations, each container shall be suitably labelled to show the following information:

Manufacturer's Name and Address
Name of Material
CGSB Specification No.
Type
For Type 2, 1-GP-12c Color
Qualification No. (when required)
Manufacturer's Batch No.
Manufacturer's Code No.
Date of Manufacture
Thinning Instructions for spraying using 1-GP-50 or 1-GP-110 thinner.

7. INSPECTION

7.1 Sampling - Sampling shall be carried out in accordance with Method 1.1 of CGSB 1-GP-71.

7.2 Testing - The methods of testing shall be those as specified with each requirement.

7.3 Preparation of Samples

7.3.1 Preparation of Test Frames - A strong rectangular frame is made from a square piece of plywood, 18 by 18 by $\frac{3}{4}$ in., by cutting out an internal square 14 by 14 in. All edges and corners shall be smooth. One face of the frame is covered with fabric as described in either MIL-C-5646, Cloth; Cotton, Airplane, or DTD 540, Linen Fabric and Tape, under a tension of approximately 2 lb per in. in warp and weft direction, the warp and weft threads being parallel to the sides of the frame.

7.3.2 Preparation of Doped Specimens - Two brush coats of the dope under test are applied, the dope being worked well into the fabric. Succeeding coats are applied by spray with sanding to a smooth surface between coats. No. 400 silicon carbide abrasive paper (CGSB 30-GP-12) shall be used and 30 minutes drying allowed before sanding. When sufficient dope is applied to obtain a dry weight of 2.0 - 2.75 oz/sq yd, the doped fabric is allowed to dry (Method 103.1) 48 hr with both sides freely exposed to the air.

7.3.3 Preparation of Topcoated Specimens - When topcoating is specified, 1-GP-134 Lacquer, White 513-101, is applied by spray in sufficient coats to obtain a dry weight of 2 ± 0.2 oz/sq yd and dried 48 hr before testing.

7.4 Weight of Dope - Cut at least three 6 by 6 in. samples from the unsupported doped fabric and condition them 24 hr under standard conditions (Method 103.1). Determine the area by measuring each side of the sample to the nearest 0.10 in., weigh each sample to the nearest mg, and remove the dope by suitable solvent. Dry the fabric and condition it 24 hr under standard conditions (Method 103.1). Determine the weight of dope per sq yd, from the difference in weight before and after dope removal and the area of the sample.

7.5 Tautness

- 7.5.1 This method is based on Technical Note No. 729 of the National Advisory Committee for Aeronautics, by G.M. Kline and H. F. Schiefer, entitled "An Instrument for Estimating Tautness of Doped Fabrics on Aircraft," September 1939.
- 7.5.2 Place the instrument in contact with the fabric-covered panel or airplane section with the foot midway between the rib spacings of the panel or airplane section. Lower the foot on the specimen by means of the rack and pinion until the load on the fabric is 3 oz as indicated by the upper dial. Take a reading of the lower dial at this load. Increase the load on the fabric to 19 oz and take a second reading of the lower dial. The difference between these two readings of the lower dial is the deflection in mils of the doped fabric under 1 lb load, as tested. Make three readings at any one spot, and report any panels that are noticeably slack as "slack". A low deflection indicates a high tautness, and conversely a high deflection indicates a low tautness.

NOTE: Each instrument is calibrated individually and the upper dial reading will differ from instrument to instrument.

7.6 Breaking Strength - From the fabric on the frame cut six specimens, three in the warp and three in the weft direction, each 1 in. wide and sufficiently long to allow 5 in. between the jaws of a suitable testing machine having a rate of separation of jaws of 2 in. per min. Condition all specimens (Method 103.1) for 18 hr immediately preceding the test.

7.7 Bursting Strength - Determine the bursting strength of the fabric, with the doped side up and with the doped side down, in accordance with CGSB 4-GP-2 Method 11.1, Bursting Strength - Diaphragm Pressure Test (Mullen Test).

7.8 Brittleness

- 7.8.1 The following testing procedure is based upon Technical Development Report No. 129, (November 1950) "The Practical Determination of Strength of Doped Fabric," by H. Kendal King, Cecil B. Phillips and Alan R. Mores, Department of Transportation, Federal Aviation Administration Technical Development and Evaluation Center, Washington, D. C. 20590.
- 7.8.2 Apply the model FT-1 fabric tester to the doped face of the fabric so that the axis of the barrel (and guide) is perpendicular to the fabric surface. The foot with flush-positioned plunger shall be in good contact with a corresponding area of freely supported fabric and 1 in. or more from end support. Push the tester handle toward the fabric with a smooth, gradual motion. The resulting compression of the firing spring forces the foot against the fabric and gradually increases the tautness of the fabric. At the triggering point, the hammer strikes the plunger, driving its smooth rounded end out of the foot against the taut fabric surface with a sharp measured impact to give a determination of the fabric strength.
- 7.8.3 If the quality or condition of the doped fabric covering is dangerously below standard, either the dope will be cracked or the fibers of the textile backing will be ruptured by the force of the impact. No penetration of the doped fabric indicates that the material of the covering is equal to or exceeds the standard set by the measured impact.

7.9 Ash - Weigh to the nearest 0.1 mg several grams of the material from a stoppered flask into a porcelain evaporating dish that has been previously ignited and weighed. Evaporate to dryness on a hot plate and ignite the residue in the dish at a dull red heat (not exceeding 600°C). Wet the dry residue with a small amount of dibutyl phthalate to slow down the rate of combustion and the loss of material by flaring. When all combustible material is destroyed, cool, weigh and calculate the percentage of ash.

7.10 Acidity of Dope

7.10.1 Weigh to an accuracy of 1 mg, 5 to 10 g of Type 1 dope or a corresponding amount of extracted vehicle (Method 21.1) of Type 2 dope from a stoppered weighing bottle into a 500 ml glass-stoppered flask containing 200 ml of CO₂-free distilled water. Add the sample in a thin stream to the water while agitating the contents of the flask so that the solids will be precipitated from the sample in a fibrous or flocculent form. Complete the addition as expeditiously as possible to avoid excessive loss of solvent by evaporation and accumulation of carbon dioxide. Stopper the flask and shake it vigorously to thoroughly mix the contents of the flask. Allow it to stand for 1 hr at 21 - 32°C (70 - 90°F) with frequent shaking. Decant the liquid through a fast filter paper into a 1 liter glass-stoppered Erlenmeyer flask. Add 100 ml of warm distilled water to the 500 ml sample flask, stopper and shake vigorously. Decant the water through the filter paper, and repeat this operation a few more times. Finally, wash the precipitate in the filter paper with a stream of the warm distilled water from a wash bottle. Keep both flasks stoppered as much as possible to avoid pick-up of carbon dioxide from the air. Add a few drops of phenolphthalein indicator solution to combined filtrates and titrate with 0.1N NaOH to a pink color that persists for 30 sec while the solution is continuously agitated in the stoppered flask. Run a blank, duplicating each operation in the extraction of the sample, on an equal volume of the distilled water.

7.10.2 Calculate the free acidity, as acetic acid, as follows:

$$\% \text{ acetic acid} = \frac{(A-B)N \times 0.06 \times 100}{S}$$

where A = ml of standard sodium hydroxide solution used to titrate sample
 B = ml of standard sodium hydroxide solution used to titrate blank
 N = normality of standard sodium hydroxide solution
 S = grams of sample used.

8. NOTES

8.1 Intended Uses

8.1.1 Type 1 Dope is intended for use as a tautening undercoat on aircraft fabric-covered components and for making repairs to doped fabric surfaces.

8.1.2 Type 2 Dope is intended primarily as a topcoat pigmented finish where a tautening dope is indicated, and also as a tautening pigmented undercoat.

8.1.3 These dopes may be used on cotton or linen fabric, but should not be used on rubberized fabric.

8.2 Ordering Data - Purchasers should specify whether Type 1 or Type 2 dope is required, and the color of Type 2 desired (par 5.7.) Purchasers should further specify details of packaging, packing and marking if commercial practice is not suitable; and if a qualified product is required.

8.3 Qualification

- 8.3.1 Qualification Procedure - Details regarding the procedure for qualification of 1-GP-155 dope for aircraft fabric may be obtained from:

Quality Assurance Division
Technical Services Branch
Canadian Forces Headquarters
Department of National Defence
Ottawa 4, Canada.

The laboratories are located in the Canadian Government Printing Bureau Building, Sacré-Coeur Blvd., Hull, P.Q.

- 8.3.2 Qualified Products - Federal Government departments and agencies may also obtain information from the above address regarding availability of qualified products.

- 8.4 Related Specifications - United States Military Specifications MIL-D-5553, Dope, Cellulose Nitrate, Clear, and MIL-D-5554, Dope, Cellulose Nitrate, Gloss.

- 8.5 The publications referred to in par 2.1.1 to 2.1.3 are obtainable from the CGSB Secretary.

- 8.6 The publication referred to in par 2.1.4 is obtainable from the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pa., 19103, U.S.A.