Canadian General Standards Board

Office des normes générales du Canada

CAN/CGSB-1.121-93
March/Mars 1993

WITHDRAWAL

October 1998

CANADIAN GENERAL STANDARDS BOARD

VINYL PRETREATMENT COATING FOR METALS (VINYL WASH PRIMER)

This standard is hereby withdrawn. Its content is covered in CAN/CGSB-1.213-95, Etch Primer (Pretreatment Coating) for Steel and Aluminum.

RETRAIT

Octobre 1998

OFFICE DES NORMES GÉNÉRALES DU CANADA

ENDUIT AUX RÉSINES VINYLIQUES, PRÉPARATION DES SURFACES MÉTALLIQUES (PEINTURE PRIMAIRE RÉACTIVE VINYLIQUE)

Cette norme est retirée par le présent avis. Son contenu fait l'objet de CAN/CGSB-1.213-95, Peinture primaire réactive (enduit de traitement préliminaire) pour l'acier et l'aluminium.

Canada

NATIONAL STANDARD OF CANADA

CAN/CGSB-1.121-93

Supersedes 1-GP-121M

Vinyl Pretreatment Coating for Metals (Vinyl Wash Primer)

CGSB

Canadian General Standards Board

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Ottawa, Ontario
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NATIONAL STANDARD OF CANADA

CAN/CGSB-1.121-93

Supersedes 1-GP-121M
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VINYL PRETREATMENT COATING FOR METALS (VINYL WASH PRIMER)

The Department of National Defence administers a Qualification Listing Program for products conforming to the requirements of this standard. Further information on the listing program is available from the Director of Engineering and Maintenance Planning and Standardization (DEMPS 4) Ottawa, Canada K1A 0K2.

Prepared by the
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CANADIAN GENERAL STANDARDS BOARD

VINYL PRETREATMENT COATING FOR METALS (VINYL WASH PRIMER)

1. SCOPE

1.1 This standard applies to a two-component coating used as a tie-coat or as a preliminary treatment on clean, dry, metal surfaces prior to the application of a succeeding coating system. The purpose of the material is to increase the adhesion of the coating system.

1.2 For more detailed information on intended uses, see par. 8.2.

1.3 The testing and evaluation of a product agains this standard may require the use of materials and/or equipment that could be hazardous. This document does not purport to address all the safety aspects associated with its use. Anyone using this standard has the responsibility to consult the appropriate authorities and to establish appropriate health and safety practices in conjunction with any existing applicable regulatory requirements prior to its use.

2. APPLICABLE PUBLICATIONS

2.1 The following publications are applicable to this standard:

2.1.1 Canadian General Standards Board (CGSB)

1-GP-71 — Methods of Testing Paints and Pigments.

1-GP-164 — Solvent for Vinyl Pretreatment Coating

CAN/CGSB-8.2 — Sieves, Testing, Woven Wire, Metric.

2.1.2 Department of Consumer and Corporate Affairs

Hazardous Products Act.

2.1.3 Department of Transport

Transport of Dangerous Goods Regulations Circular No. ED 204 — Denatured Alcohol and Specially Denatured Alcohol.

2.1.4 ASTM

D 185 — Test Methods for Coarse Particles in Pigments, Pastes, and Paints

D 209 — Specification for Lampblack Pigment

D 304 — Specification for N Butyl Alcohol (Butanol)

D 605 — Specification for Magnesium Silicate Pigment (Talc)

D 1210 — Test Method for Fineness of Dispersion of Pigment-Vehicle Systems.

2.2 Reference to the publications in par. 2.1.1 and 2.1.4 and to other related standards is to the latest issues, unless otherwise specified by the authority applying this standard. The sources of all publications are shown in the Notes section.

3. CLASSIFICATION

3.1 Vinyl coating shall be supplied in the following types, as specified (par. 8.1).

3.1.1 *Types*

Type 1 — Mixing ratio 1:4 acid to resin ratio

Type 2 — Mixing ratio 1:1 acid to resin ratio.

3.2 When mixed ready-for-use, these two types are equivalent in composition and performance.

4. GENERAL REQUIREMENTS

4.1 The coating shall be supplied as a two-component system. The components (i.e., resin and acid) shall be packaged in separate containers and in such a manner as to conform to the Transport of Dangerous Goods Regulations.

4.2 The raw materials of the resin component shall be mixed and milled as required to produce a product that is uniform, stable, free from grit and entirely suitable for the purpose intended. The ingredients of the acid component shall be uniform in composition.

4.3 The resin component shall be capable of being broken up with a paddle to a smooth, uniform consistency and shall not liver, thicken, curdle, gel or show any other objectionable properties.

4.4 **Mixing and Application Properties**

4.4.1 ***Type 1*** — The acid and resin components shall be mixed together in the ratio of 1:4 by volume, followed by the addition of two parts by volume of solvent conforming to CGSB standard 1-GP-14.

4.4.2 ***Type 2*** — The acid and resin components shall be mixed together in the ratio of 1:1 by volume, without further reduction.

4.4.3 The components shall mix readily at any temperature between 5 and 35°C, and shall be suitable for spray application within that temperature range without further reduction. The mixture shall be smooth and homogeneous and shall show no sign of gelation on storage for 8 h.

4.5 The mixed coating shall exhibit good adhesion when applied to cleaned aluminum, steel and galvanized steel to a dry film thickness of 7 to 12 µm.

4.6 The components, when stored in their respective original unopened containers for one year from date of shipment at temperatures not exceeding 40°C, shall be readily mixed to a uniform condition by stirring, and when mixed together shall meet the drying time requirements conforming to par. 5.3.1.

4.7 **Odour** — The odour of the resin component and the acid component shall be normal for the permitted volatiles.

4.8 **Colour** — The colour of the coating after drying shall be characteristic of the pigments specified.

4.9 **Formula** — The coating shall consist of the following ingredients in approximate proportions specified. (The quantities shown for the resin component are slightly in excess of theoretical to allow for normal manufacturing losses.)

4.9.1 ***Type I***

a. Ingredients of resin component:

	kg	L
Poly(vinyl-butyral) resin*	30.0	27.3
Zinc tetroxychromate**	29.0	7.9
Magnesium silicate (ASTM D 605)	4.3	1.6
Lampblack (ASTM D 209)	0.32	0.2
Butanol, normal (ASTM D 304)	66.0	81.4
Ethanol, denatured***	197.5	243.8
	327.12	362.2

b. Ingredients of acid component:

	kg	L
Phosphoric acid (85%, technical grade)	15.0	8.7
Water	13.3	13.2
Ethanol, denatured***	55.0	67.9
	83.3	89.8

4.9.2 ***Type II***

a. Ingredients of resin component

	kg	L
Poly(vinyl-butyral) resin*	21.6	19.6
Zinc tetroxychromate**	20.9	5.7
Magnesium silicate (ASTM D 605)	3.1	1.1
Lampblack (ASTM D 209)	0.23	0.13
Butanol, normal (ASTM D 304)	47.5	58.6
Ethanol, denatured***	114.3	141.1
	207.63	226.23

b. Ingredients of acid component

	kg	L
Phosphoric acid (85%, technical grade)	10.8	6.3
Water	9.6	9.6
Ethanol, denatured***	169.4	209.1
	189.8	225.0

**The resin shall be a polyvinyl partial butyral resin containing only poly(vinyl butyral), polyvinyl alcohol and polyvinyl acetate in the molecule. The resin shall conform to the following requirements:*

	Min.	*Max.*
Polyvinyl alcohol, % by mass	18.0	21.0
Polyvinyl acetate, % by mass		1.0
Viscosity, 6% in methanol, mPa·s at 20°C	13.0	18.0
Relative density at 20°C	1.05	1.15

***The zinc chromate shall be low-solubility type, showing on analysis 16 to 19% CrO_3, 67 to 72% ZnO and not more than 1% water soluble salts.*

****Denatured ethanol used shall comply with formula DAG No. 2-D of the latest revision the Department of National Revenue of Circular No. ED 204. Technical isopropanol or blends of isopropanol and methanol-denatured ethanol containing not more than 5% water may be substituted on an equal basis for denatured ethanol.*

5. DETAILED REQUIREMENTS

5.1 **Resin Component** — The resin component shall comply with the following requirements:

		Min.	Max.	Test Method CGSB 1-GP-71	Test Method ASTM
5.1.1	Pigment, % by mass			21.1*	—
	Type 1	9.5	11.5		
	Type 2	10.7	12.7		
5.1.2	Nonvolatile vehicle, % by mass			19.1	—
	Type 1	8.5	10.5		
	Type 2	9.5	11.5		
5.1.3	Coarse particles retained on 45 µm (No. 325) sieve**, % by mass	—	0.2	—	D 185
5.1.4	Consistency, Krebs units	58	75	4.5	—
5.1.5	Fineness of grind, Hegman units	6	—	—	D 1210
5.1.6	Pigment composition, % by mass			50.18	—
5.1.6.1	Chromium oxide (CrO_3)	14.0	—		
5.1.6.2	Zinc oxide (ZnO)	57.0	—		
5.1.7	Solvent content, % by mass			—	—
5.1.7.1	n-butanol,				
	Type 1	19.0	—		
	Type 2	22.0	—		
5.1.7.2	Ethanol or isopropanol				
	Type 1	57.0	—		
	Type 2	52.0	—		

**Except that ethanol shall be used for the extraction.*
***See standard CAN/CGSB-8.2.*

5.1.8 ***Nonvolatile Vehicle Composition*** — The separate sample of the copolymer resin used in the coating and supplied with the sample as specified in par. 7.1.2 shall comply with the following requirements:

		Min.	Max.	Test Method CGSB 1-GP-71
5.1.8.1	Vinyl alcohol, % by mass	17.5	30	82.4
5.1.8.2	Butyraldehyde, % by mass	31	41	82.5

5.2 **Acid Component** — The acid component shall comply with the following requirements:

		Min.	Max.	Test Method CGSB 1-GP-71
5.2.1	Phosphoric acid, % by mass			77.1
	Type 1	15.0	16.5	
	Type 2	4.6	5.2	
5.2.2	Solvent (alcohol), % by mass			28.5
	Type 1	62.0	—	
	Type 2	84.0	—	

5.3 **Mixed Pretreatment Coating** — When the components are mixed in the proportions specified, the mixed coating shall comply with the following requirements:

5.3.1 ***Drying Time*** — The pretreatment coating shall dry hard in not more than 30 min when applied on a steel panel, when tested in accordance with CGSB standard 1-GP-71, Method 45.1.

5.3.2 ***Metal and Coating Anchorage*** — When tested in accordance with par. 7.2 the pretreatment coating itself, when primed with primer conforming to CGSB standard 1-GP-132 and topcoated with standard test lacquer, shall show satisfactory substrate and intercoat adhesion.

6. PREPARATION FOR DELIVERY

6.1 **Toxic Elements** — This coating shall be labelled to conform to the requirements of the Hazardous Products Act in respect to designated toxic elements.

6.2 **Labelling** — In addition to the labelling requirements of any relevant Acts or Regulations, each container of acid and resin components shall be clearly labelled stating the proportions of each to be used and shall have the following information applied by stencil, lithograph or securely affixed label:

Name of material

Standard number: CAN/CGSB-1.121-93 and type

Manufacturer's name and address

Manufacturer's batch number

Manufacturer's code number

Date of manufacture

CAUTIONARY NOTE to state that:

- This material should not be used over galvanized steel surfaces that have previously been treated with hexavalent chromium or other passivating treatments.
- The acid component should not be stored in direct sunlight or at temperatures exceeding 40°C.
- The components should not be mixed by shaking in a closed container.
- Materials more than one year old should be checked for serviceability before use.
- This is an acid-containing material and should therefore be handled with care.

6.3 **Instructions for Use** — The instructions shall include the following information:

6.3.1 ***Coating*** — Vinyl pretreatment coating is an etching primer for unpainted and untreated metals such as:

aluminum	cadmium	silver
steel	zinc	nickel
copper	galvanized steel	brass

6.3.2 ***Preparation of Surface*** — The surface must be clean, dry and free from rust and grease. Any passivating treatments shall first be removed by mechanical means.

6.3.3 ***Preparation*** — Stir the base thoroughly and add the acid component and any solvent-thinner slowly with constant agitation in the following proportions:

Type 1	
Resin component	4 parts by volume
Acid component	1 part by volume
Solvent (CGSB 1-GP-164)	2 parts by volume
Type 2	
Resin component	1 part by volume
Acid component	1 part by volume

6.3.4 ***Application*** (to be supplied by manufacturer)

6.3.5 ***Overcoating Time*** — After application, the coating must not be overcoated before 30 min but must be overcoated within 8 h.

6.3.6 ***Coverage*** — The recommended dry film thickness is 7 to 12 µm. It should be noted that this is a semi-transparent covering that will not hide the substrate.

6.3.7 ***Precautions***

— Thinner is not normally required for Type 2.

— Only enough material should be mixed for use within 8 h, since after this time gelation may occur.

— Acid component must not be used as a thinner. If extra thinner is deemed desirable, use the thinner conforming to CGSB standard 1-GP-164.

— Adequate ventilation must be provided at all times during application of the wash primer.

6.3.8 Equipment may be cleaned with the thinner conforming to CGSB standard 1-GP-164.

6.4 Packaging

6.4.1 The materials shall be packaged in one of the following ways, as specified (par. 8.1):

Type 1

1. 16 L resin component and 4 L acid component
2. 4 L resin component and 1 L acid component
3. 1 L resin component and 250 mL acid component.

Type 2

1. 20 L resin component and 20 L acid component
2. 4 L resin component and 4 L acid component
3. 1 L resin component and 1 L acid component.

6.4.2 The acid component shall be packaged in suitable nonmetallic containers.

6.4.3 The supplier shall fill the containers in such a manner that the total contents of one container of the resin component, when mixed with the total contents of the acid component, shall constitute one unit. Unless otherwise specified (par. 8.1), the components shall be packed together in one carton.

7. INSPECTION

7.1 Sampling

7.1.1 Sampling shall be carried out in accordance with CGSB standard 1-GP-71, Method 1.1, except that 1 L samples of the acid and resin component shall be taken and placed in separate, clean, dry, suitable nonmetallic containers.

7.1.2 ***Special Samples*** — When requested by the testing laboratory or the purchaser (par. 8.1), samples of the following ingredient materials shall be taken:

500 mL poly(vinyl butyral) resin
250 mL zinc tetroxychromate
250 mL lampblack
250 mL magnesium silicate
500 mL ethanol (or isopropanol)
250 mL (bottle) phosphoric acid
500 mL normal butanol.

7.2 Testing

7.2.1 ***Metal and Coating Anchorage*** — Coat in accordance with CGSB standard 1-GP-71, Method 98.2, a 100 x 300 mm aluminum panel prepared as specified in CGSB standard 1-GP-71, Method 99.1, to a dry film thickness of 7 to 12 µm with mixed pretreatment coating as specified in par. 4.4.1. After air drying 30 min, spray on the lower half of the panel a single wetcoat of primer in accordance with CGSB standard 1-GP-132 to an additional dry film thickness of 5 to 8 µm. After the primer has dried 30 min to 2 h, topcoat the lower half of the primed panel with two coats of standard test lacquer in accordance with CGSB standard 1-GP-71, Method 150.4, allowing 30 min between coats. Apply each lacquer topcoat to a dry film thickness of 15 to 18 µm. Determine the adhesion of the pretreatment coating to the panel and to the topcoated primer in accordance with CGSB standard 1-GP-71, Method 135.1, after the last coat of lacquer has dried 24 h.

8. NOTES

8.1 **Options** — The following options must be specified in the application of this standard:

a. Type of product (par. 3.1)

b. Type of packaging (par. 6.4.1)

c. If components to be packed in other than one carton (par. 6.4.3)

d. If special samples are required (par. 7.1.2)

8.2 **Intended Uses**

8.2.1 Pretreatment vinyl coating to this standard is intended for use as a pretreatment or tie-coat to improve the adhesion of coatings to metals. For use in vinyl systems such as on sandblasted or sandwashed ship bottoms, the pretreatment must always be used prior to application of primer conforming to CGSB standard 1-GP-122.

8.2.2 This coating may be used over clean galvanized steel surfaces that have not previously been given a passivating treatment (Note 1). It may also be used as a preliminary coat under marine primer in accordance with CGSB standard 1-GP-48, expoxy zinc rich coating in accordance with CGSB standard 1-GP-183 and as a tie-coat over inorganic zinc coating in accordance with CGSB standard 1-GP-171 and epoxy zinc rich coating in accordance with CGSB standard 1-GP-183.

8.2.3 Magnesium parts used with aluminum and other metals must have a pretreatment conversion coating, or other durable masking agent, to prevent direct contact between the primer and magnesium surfaces.

8.2.4 Although vinyl pretreatment is compatible with bituminous coatings, it need not be used with bituminous materials that have good adhesion by themselves.

8.2.5 When necessary, the mixed coating to this standard may be thinned with the solvent conforming with CGSB standard 1-GP-164 in the proportion necessary to obtain the required film thickness. Equipment used in applying the coating may be cleaned with the same solvent. Thinning is not normally required for Type 2.

8.3 **Related Publications**

8.3.1 CGSB Standards (as to use in the system)

1-GP-48 — Primer, Marine, for Steel

1-GP-52 — Enamel, Alkyd, Marine, Interior, Fire Retardant

1-GP-61 — Enamel, Alkyd, Marine, Exterior and Interior

1-GP-122 — Primer, Vinyl, Anticorrosive

1-GP-123 — Paint, Vinyl, Antifouling, for Ships' Bottoms

1-GP-132 — Primer, Zinc Chromate, Low Moisture Sensitivity

1-GP-171 — Coating, Inorganic Zinc

1-GP-173 — Enamel, Vinyl-Alkyd, Exterior, Flat Black

1-GP-182 — Paint, Vinyl, Exterior

1-GP-183 — Coating, Zinc Rich, Epoxy.

Note 1: *Information regarding passivation treatment should be requested from the supplier of the galvanized metal.*

The following test may be employed to determine if the surface has received hexavalent chromium passivating treatment:

Diphenyl Carbazide Spot Test — This test is used to detect the presence of hexavalent chromium as follows: dissolve 0.5 g *of 1 to 5 diphenyl carbohydrazide in a solvent mixture consisting of* 20 mL *of acetone and* 20 mL *of 95% ethanol using a warm* (50°C) *water bath. Add* 40 mL *of dilute phosphoric acid (1:1). Place several drops on the surface. If a pink or purple colour develops, it indicates presence of chromate ion. The test solution is heat and light sensitive and must be discarded when it discolours.*

This test method was taken from the American Iron and Steel Institute Report, "Five Year Test Results: AISI Research Project on Paintability of Galvanized Steel", October 1966. This publication may be obtained from the American Iron and Steel Institute, 1133 15th Street, NW, Suite 300, Washington, DC 20005, U.S.A.

8.3.2 U.S. Military Specifications

DOD-P-15328D — Primer (Wash), Pretreatment (Formula No. 117 for Metals)

MIL-C-8514 — Coating Compound, Metal Pretreatment, Resin-Acid.

8.4 **Sources of Referenced Publications**

8.4.1 The publications referred to in par. 2.1.1 and 8.3.1 may be obtained from the Canadian General Standards Board, Sales Centre, Ottawa, Canada K1A 1G6. Telephone (613) 941-8703 or 941-8704. Fax (613) 941-8705.

8.4.2 The publications referred to in par. 2.1.2 and 2.1.3 may be obtained from the Canada Communication Group, Publishing, Ottawa, Canada K1A 0S9. Telephone (819) 956-4802.

8.4.3 The publication referred to in par. 2.1.4 may be obtained from ASTM, 1916 Race Street, Philadelphia, PA 19103, U.S.A. or from the Standards Council of Canada, Standards Sales Branch, 45 O'Connor Street, Suite 1200, Ottawa, Ontario K1P 6N7.

8.4.4 The publications referred to in par. 8.3.2 may be obtained from the Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120, U.S.A.