

Canadian General Standards Board

CGSB

Office des normes générales du Canada

ONGC

CAN/CGSB-1.169-M91
December/Décembre 1991

WITHDRAWAL

December 1999

**CANADIAN GENERAL
STANDARDS BOARD**

HIGH VISIBILITY COATING SYSTEM (FLUORESCENT) REMOVABLE

This standard is hereby withdrawn.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

RETRAIT

Décembre 1999

**OFFICE DES NORMES
GÉNÉRALES DU CANADA**

SYSTÈME DE REVÊTEMENT DE GRANDE VISIBILITÉ (FLUORESCENT) DÉCAPABLE

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

NATIONAL STANDARD OF CANADA

CAN/CGSB-1.169-M91

Supersedes 1-GP-169M

**High Visibility
Coating System
(Fluorescent)
Removable**



QUALITY

Withdrawn/Retiré

Canadian General Standards Board

CGSB

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HIGH VISIBILITY COATING SYSTEM (FLUORESCENT) REMOVABLE

This new edition supersedes CGSB standard 1-GP-169M, January 1980. There are no substantial technical changes.

Prepared by the
Canadian General Standards Board 

Approved by the
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Acknowledgment is made for the French translation of this National Standard of Canada by the Translation Bureau of the Department of the Secretary of State.

CANADIAN GENERAL STANDARDS BOARD

HIGH VISIBILITY COATING SYSTEM (FLUORESCENT) REMOVABLE**1. SCOPE**

- 1.1 This standard applies to a high-visibility, durable, exterior, fluorescent coating system capable of being removed without softening the permanent undercoats. The system consists of a fluorescent pigmented lacquer and a clear overcoating.
- 1.2 For additional information on intended uses, see par. 7.2.
- 1.3 The testing and evaluation of a product against 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-4M — Thinner, Petroleum Spirits

1-GP-12 — Standard Paint Colors

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

CAN/CGSB-1.94-M — Thinner Xylene (Xylol)

1-GP-121M — Coating, Vinyl, Pretreatment, for Metals (Vinyl Wash Primer)

CAN/CGSB-1.158-M — Cellulose Nitrate Primer, Modified Alkyd Type

1-GP-159M — Lacquer, Acrylic Cellulose Nitrate, Gloss.

2.1.2 Department of Consumer and Corporate Affairs

Hazardous Products Act

2.1.3 ASTM

D 362 — Specification for Industrial Grade Toluene

D 1200 — Test Method for Viscosity of Paints, Varnishes and Lacquers by Ford Viscosity Cup

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

E 308 — Method for Computing the Colors of Objects by Using the CIE System.

- 2.2 Reference to the publications in par. 2.1.1 and 2.1.3 and other related standards is to the latest issues unless otherwise specified by the authority applying this standard. The sources for all publications are shown in the Notes section.

3. GENERAL REQUIREMENTS

- 3.1 The fluorescent lacquer shall consist of a fluorescent pigment adequately dispersed in a mineral spirits soluble poly (butyl methacrylate) resin together with the necessary hydrocarbon solvents.

- 3.2 The clear overcoating shall be a solution of an aromatic soluble unmodified acrylic resin containing an ultra-violet light absorber. Ketones, 2-ethoxy-ethanol and aliphatic hydrocarbons shall not be present.
- 3.3 The fluorescent lacquer shall be satisfactory for spray application when reduced with (ASTM D 362) industrial grade toluene in accordance with the manufacturer's instructions (par. 7.1).
- 3.4 The clear overcoating shall be suitable for spray application when reduced with (ASTM D 362) toluene or (CAN/CGSB-1.94-M) xylene in accordance with the manufacturer's instructions (par. 7.1).
- 3.5 The packaged fluorescent lacquer and clear overcoating shall be homogeneous and free from lumps and grit. They shall show no hard settling, thickening, curdling or skinning when stored in the original unopened container for one year at temperatures not exceeding 40°C. At the end of this time, it shall be possible to remix each material to a uniform condition and they shall meet the requirements for applicability and appearance (par. 4.16).
- 3.6 **Pigment** — The pigment of the fluorescent lacquer shall consist of a powdered resin that contains fluorescent dye or dyes.
- 3.7 **Odour** — The odour of both the fluorescent pigmented lacquer and clear overcoating, both wet and dry, shall not be objectionable.

4. DETAILED REQUIREMENTS

The materials shall comply with the following detailed requirements, when tested in accordance with the specified test methods:

		Test Method		
		Fluorescent Lacquer	Clear Overcoating	CGSB 1-GP-71 ASTM
4.1	Nonvolatile, % by mass,	52	36	18.3 —
4.2	Benzene, % by mass (Note 1)	0.1	0.1	65.1 —
4.3	Fineness of grind, Hegman min.	5	—	— D 1210

4.4 Reduced Viscosity

4.4.1 When three volumes of the fluorescent lacquer are reduced with two volumes of toluene conforming to ASTM D 362, the No. 4 Ford Cup viscosity shall not be more than 22 s, when tested in accordance with ASTM D 1200.

4.4.2 When one volume of the clear overcoating is reduced with one volume of toluene conforming to ASTM D 362, the No. 4 Ford Cup viscosity shall not be more than 15 s, when tested in accordance with ASTM D 1200.

4.5 **Dilution Stability** — There shall be no evidence of incompatibility when one volume of the fluorescent lacquer is reduced with one volume of (ASTM D 362) toluene, and when one volume of the clear overcoating is reduced with one volume of (ASTM D 362) toluene or (CAN/CGSB-1.94-M) xylene, the thinned coatings being examined after 1 h standing when tested in accordance with CGSB standard 1-GP-71, Method 45.1.

4.6 Drying Time

4.6.1 Separate films of fluorescent lacquer and clear overcoating shall both dry hard in 1 h.

4.6.2 When the clear overcoating is drawn down over the pigmented film, which has dried 18 h, the system shall dry hard within 3 h and shall show no after-tack after 4 h, when tested in accordance with CGSB standard 1-GP-71, Method 5.1.

4.7 Colour

4.7.1 The fluorescent coating system shall be available in the two following commercial colours: Fire orange corresponding to CGSB 1-GP-12 colour, Red 609-401, and, Blaze orange corresponding to CGSB 1-GP-12 colour, Orange 608-401 (par. 7.1 and Note 2).

Note 1: Hazardous Products Act.

Note 2: The commercial colours are close to but are not a precise visual colour match with their respective CGSB standard 1-GP-12 colours. The differences are due to the fact that the fluorescent pigments used at present differ from those used in the preparation of the CGSB standard 1-GP-12 colours in 1965.

- 4.7.2 After drying 24 h, the colour values of the coating system shall be in accordance with the applicable "Before Exposure" values in Tables 1 or 2 (par. 4.16).
- 4.8 **Adhesion** — The fluorescent coating system, prepared according to par. 6.2.1, shall show satisfactory adhesion to the prime coat and satisfactory adhesion of the clear overcoating to the fluorescent lacquer when subjected to the knife test. The ribbon produced in the knife test shall be free from crumbling, loosening or separation of coats in the area adjacent to the scratch, when tested in accordance with CGSB standard 1-GP-71, Method 135.1.
- 4.9 **Appearance (Clear Overcoating)** — A flowout on a glass panel of the clear overcoating as received shall be clear and free from grit and gel particles (par. 6.2.3).
- 4.10 **Solvent Resistance (Clear Overcoating)** — The clear overcoating shall not be lifted nor its appearance changed, when immersed for 15 min in mineral spirits conforming to CGSB standard 1-GP-4M (par. 6.2.4).
- 4.11 **Self-Lifting** — A dry film of the fluorescent lacquer shall take application of a second coat without blistering, wrinkling, loosening, softening or other defects due to intercoat action, when tested in accordance with CGSB standard 1-GP-71, Method 132.1 (Note 2).
- 4.12 **Applicability and Appearance**
- 4.12.1 When the unstrained fluorescent lacquer and the clear overcoating are each reduced for spraying (par. 3.3 and 3.4) there shall be no evidence of separation. Both materials shall show good working properties.
- 4.12.2 When the fluorescent lacquer and clear topcoat are applied by spray to a vertically mounted 150 x 300 mm primed aluminum panel, the complete fluorescent system that has air dried 4 h after the final coat shall be uniformly smooth and free from runs, sagging, bubbling, wrinkling, streaking or other defects (par. 6.2.1).
- 4.13 **Water Resistance** — The fluorescent coating system shall withstand 18 h immersion in reagent water at $23 \pm 2^\circ\text{C}$ without blistering, wrinkling, apparent loss of adhesion or any other film defects. When subjected to the tape test, the fluorescent lacquer shall show satisfactory adhesion to the lacquer base coat and there shall be no separation of the clear overcoating from the fluorescent lacquer film, when tested in accordance with CGSB standard 1-GP-71, Method 110.1 and Method 137.1 (Note 3).
- 4.14 **Removability** — Both before and after Florida exposure (par. 4.16), the fluorescent coating system shall be removable with xylene emulsion remover, without more than slight staining of the base lacquer (par. 6.3).
- 4.15 **Accelerated Weathering** — The fluorescent coating system shall withstand an exposure period of fifteen 24 h cycles in an accelerated weathering machine, without showing evidence of chalking, checking, cracking, flaking or peeling, and the coating system shall comply with the applicable requirements in Tables 1 or 2, when tested in accordance with CGSB standard 1-GP-71, Method 122.8 (Note 3).
- 4.16 **Outdoor Exposure** — The Fire orange (Red 609-401) system when exposed in southern Florida for 502 kJ/cm² (Note 4), and the Blaze orange (Orange 608-401) system when exposed in southern Florida for 377 kJ/cm² (Note 5), shall show no evidence of deterioration of film properties such as loss of intercoat adhesion, cracking, flaking, peeling or other film defects and the applicable spectrophotometric colour values shall be within the limits specified in Tables 1 or 2 (par. 6.4).

Note 3: Refer to par. 6.2.1 for panel preparation.

Note 4: Approximately 8 month's exposure

Note 5: Approximately 6 month's exposure

TABLE 1
Colour and Colour Limits Before and After Weathering
for the Fire Orange (Red 609-401) System

Exposure	Chromaticity Co-Ordinates			Luminance Factor Y (%)
	x	y	z	
Before Exposure	> 0.664	0.321-0.331	< 0.015	≥ 34.0
Weatherometer (300 h)	> 0.660	0.321-0.335	< 0.015	33.0-39.0
Southern Florida exposure (502 kJ/cm ²)	> 0.600	0.321-0.357	< 0.053	≥ 37.0

Note: All values refer to CIE source "C" and the CIE standard observer. The luminance factor Y is normalized such that the perfect white diffuser gives Y = 100%.

TABLE 2
Colour and Colour Limits Before and After Weathering
for the Blaze Orange (Orange 608-401) System

Exposure	Chromaticity Co-Ordinates			Luminance Factor Y (%)
	x	y	z	
Before Exposure	> 0.639	0.348-0.358	< 0.013	≥ 52.0
Weatherometer (300 h)	> 0.630	0.348-0.366	< 0.014	46.0-58.0
Southern Florida exposure (377 kJ/cm ²)	> 0.595	0.348-0.390	< 0.025	≥ 52.0

5. PREPARATION FOR DELIVERY

- 5.1 Unless otherwise specified (par. 7.1), preparation for delivery shall conform to normal commercial practice.
- 5.2 **Labelling** — In addition to complying with the labelling requirements of any relevant Acts and Regulations, each container shall be suitably labelled to show the following information:
- Name of material
 - Standard number: CAN/CGSB-1.169-M91
 - Colour conforming to CGSB standard 1-GP-12
 - Manufacturer's name and address
 - Manufacturer's batch number
 - Manufacturer's code number
 - Date of manufacture
 - Thinning instructions as described in par. 3.3 and 3.4.

6. INSPECTION

- 6.1 **Sampling** — Sampling shall be carried out in accordance with CGSB standard 1-GP-71, Method 1.1.
- 6.2 **Testing**
- 6.2.1 **Preparation of Test Panels**
- 6.2.1.1 Use aluminum test panels (CGSB 1-GP-71, Method 99.2), 75 x 150 x 0.5 mm thick, unless otherwise specified. Coat the panels with wash primer (CGSB 1-GP-121M) to a dry film thickness of $8 \pm 2 \mu\text{m}$. After

air drying 30 min (Method 103.1) spray the panels with primer (CAN/CGSB-1.158-M) to a dry film thickness of $10 \pm 2 \mu\text{m}$. After 30 min air drying apply by spray two coats of white lacquer (CGSB 1-GP-159M), allowing 30 min drying between coats. The total dry film thickness of the two coats of lacquer shall be $25 \pm 5 \mu\text{m}$. After application of the lacquer, air dry the panel 2 h and force dry for 1 h at 80°C (Method 103.2).

6.2.1.2 Reduce the pigmented fluorescent lacquer to 20 ± 1 s No. 4 Ford Cup viscosity with toluene (ASTM D 362) and apply two coats of the lacquer by spray to a total dry film thickness of $75 \pm 5 \mu\text{m}$, with 30 min air drying between coats and a further air drying of 18 h after the final coat.

6.2.1.3 Reduce the clear overcoating with toluene (ASTM D 362) to 15 ± 1 s No. 4 Ford Cup viscosity and apply in one coat to a dry film thickness of $40 \pm 2 \mu\text{m}$. Then air dry the panels for 72 h.

6.2.2 **Colour** — Measure the colour of the coated specimen prepared as described in par. 6.2.1, by spectrophotometry and computation with respect to CIE source "C" and the CIE standard observer and co-ordinate system. To account for the fluorescence of the specimen when irradiated by radiant energy, it is essential that the specimen be placed between the monochromator and the source as is shown schematically in Figure 1. This arrangement deviates from that commonly used for the measurement of a nonfluorescent specimen (Figure 2). It is also important that the geometry of irradiating and viewing the specimen be observed closely. The source should irradiate the specimen approximately perpendicularly while the light reflected and emitted by the specimen is viewed at an angle of approximately 45° . Use a nonfluorescent and diffuse white surface of known spectral reflectance relative to the perfect diffuser as a reference specimen. Carry out the numerical reduction of the spectrophotometric data to CIE tristimulus values X, Y, Z and chromaticity co-ordinates (trichromatic coefficients) x, y, z with respect to source "C" in a manner similar to that used for a nonfluorescent specimen. For example, the procedure laid down in ASTM E 308 Spectrophotometry and Description of Color in CIE 1931 System may be used. In the final result it is sufficient to give the chromaticity co-ordinates x, y, z and the luminance factor Y (%) relative to the perfect diffuser. Other specifications, such as excitation purity and dominant wavelength, are optional and may be given in addition to the above values.

6.2.3 **Appearance** — Flow out the clear overcoating on a glass panel and allow to drain 15 min in a vertical position. Examine the film for compliance with the requirement.

6.2.4 **Solvent Resistance** — Draw down a film of the clear overcoating on a clean glass plate with a $125 \mu\text{m}$ blade clearance. Air dry the film 72 h and then partially immerse the coated panel 15 min in mineral spirits (CGSB 1-GP-4M). Remove the panel and, after a recovery period of 30 min, examine the film for visible irregularities.

6.3 Removability

6.3.1 **Ingredients** — Use a remover complying with the following formula:

	<u>% by mass</u>
Xylene	56.3
Triton X-102 (Rohm and Haas Co.)	3.4
Pine Oil (LLL-P-400a Type II)	2.6
Cyclohexanol	2.6
2-butoxyethanol	1.7
Isopropyl Alcohol (99%)	0.4
Water (reagent)	17.8
Sodium Chromate	0.2
Corn Starch	15.0

6.3.2 **Compounding Procedure** — Add ingredients in the order listed above, accompanied by constant stirring at a moderate speed. Add small portions at a time and disperse each portion thoroughly before another is added. After dispersing the final ingredient, stir the mixture an additional 5 min.

6.3.3 **Procedure** — Prepare the 75×150 mm panels as specified in par. 6.2.1. Place the panel on a rack so that the 150 mm dimension forms a 60° angle with the horizontal. Pour approximately 20 mL of the thoroughly mixed remover on the coated area at a constant rate, taking 30 to 35 s for the pouring procedure. Allow the remover to act on the coating system for 5 min. Remove the panel from the rack and place on a clean, dry horizontal surface for scrubbing. For the scrubbing operation use a dry brush, having a block (metal or wood) measuring $15 \times 40 \times 90$ mm

with brush stock of 59 appropriately staggered tufts, each tuft having 50 ± 5 straight nylon fibres 2.30 mm in diameter and the fibres extending 16 mm beyond the block. Weight the scrubbing brush with a 2.3 kg weight and pass the brush over the remover-coated areas 10 times with the 40 mm edges of the brush blocks facing the direction of the brushing motion. Rinse the panels 1 min under tap water, place on the rack, and repeat the entire operation. Repeat the above test on panels that have been subjected to the required Florida exposure (par. 4.16).

- 6.4 **Outdoor Exposure** — Using aluminum test panels 150 x 300 x 0.5 mm thick prepared as specified in par. 6.2.1 and select, expose and examine in accordance with CGSB standard 1-GP-71, Method 143.1.

7. NOTES

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

- a. Whether lacquer or overcoating or both are required (par. 3.3 and 3.4)
- b. Colour of fluorescent lacquer (par. 4.7.1)
- b. Preparation for delivery, if other than as specified (par. 5.1).

7.2 Intended Uses

- 7.2.1 The paint system conforming to this standard is intended for use as a high-visibility finish that can be readily removed without impairing the underlying permanent protective finish. Fluorescent finishes gradually fade and lose brightness after exposure to sunlight with some colours being affected sooner than others. The Orange 608-401 fades faster than the Red 609-401.

- 7.2.2 This material is attacked by most solvents, greases and oils. In applying it to aircraft, avoid areas likely to come in contact with these materials.

- 7.2.3 Cleaning materials containing organic solvents should not be used. Use aqueous solutions of water-base cleaning compounds (e.g., MIL-C-25769 Cleaning Compound, Aircraft Surface, Alkaline Waterbase).

- 7.3 This standard is based in part on the following United States Military Specifications:

MIL-P-21600A (Wep), Paint System, Fluorescent, Removable, for Aircraft Application

MIL-P-21563B (Aer), Paint System, Fluorescent, for Aircraft Application.

7.4 Sources of Referenced Publications

- 7.4.1 The publications referred to in par. 2.1.1 may be obtained from the Canadian General Standards Board, Sales Unit, Ottawa, Canada K1A 1G6. Telephone (819) 956-0425 or 956-0426. Fax (819) 956-5644.

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

- 7.4.3 The publications referred to in par. 2.1.3 may be obtained from ASTM, 1916 Race Street, Philadelphia, PA 19103, U.S.A. or from the Standards Council of Canada, Standards Sales Branch, 350 Sparks Street, Suite 1200, Ottawa, Ontario K1P 6N7.

- 7.4.4 The publications referred to in par. 7.2.3 and 7.3 may be obtained from The Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120, U.S.A.

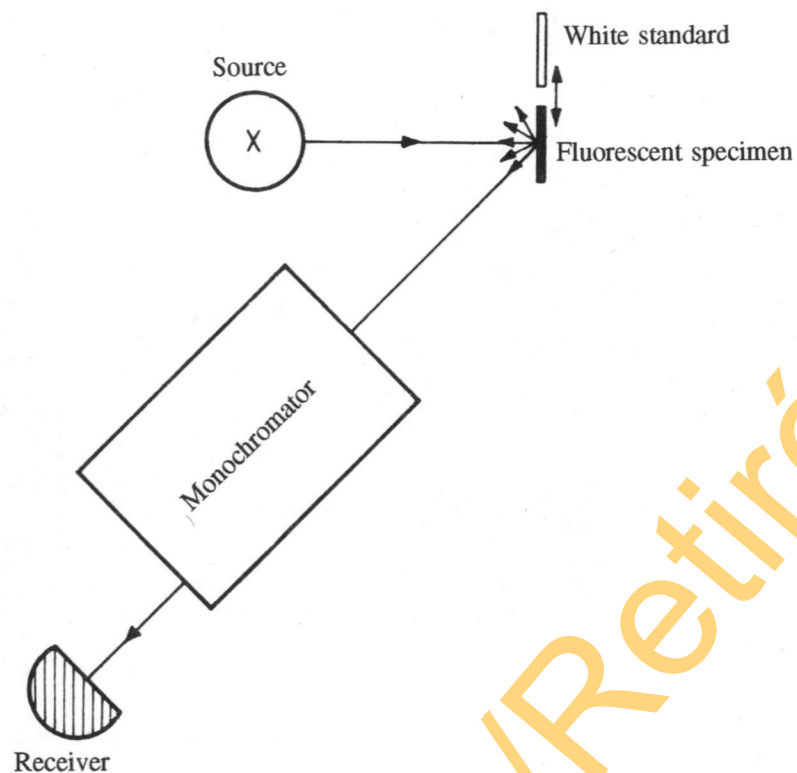


FIGURE 1

Spectrophotometry of a Fluorescent Specimen

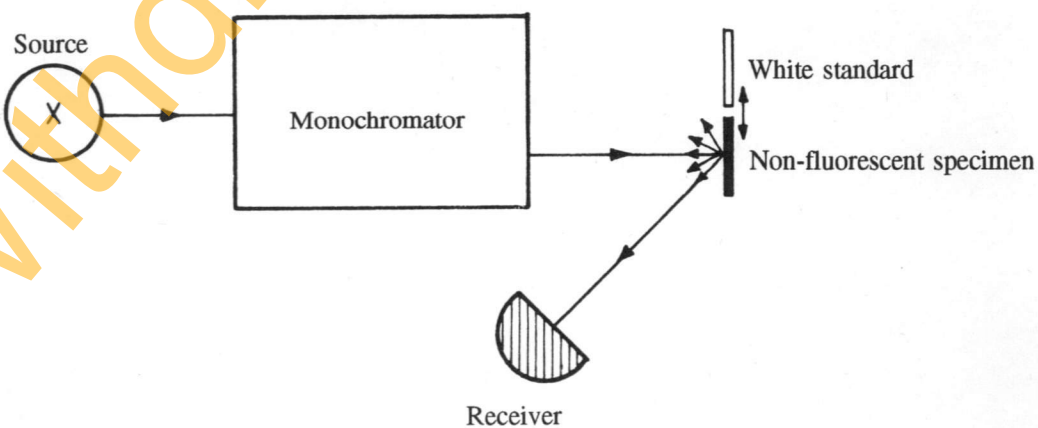


FIGURE 2

Spectrophotometry of a Non-Fluorescent Specimen



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