Note: The PROV implemented in July 2023 replaces OPSS 1716 COMMON, February 1991 with no technical content changes.

MATERIAL SPECIFICATIONS FOR WATER-BORNE TRAFFIC PAINT

TABLE OF CONTENTS

1716.01 SCOPE

This specification covers the requirements for water-borne traffic paint which is suitable for application onto concrete and bituminous pavements.

1716.02 REFERENCES

This specification refers to the following standards, specifications or publications:

Ontario Provincial Standard Specifications, Material

OPSS 1750 Traffic Paint Reflectorizing Glass Beads

Canadian General Standards Board

CGSB-1-GP-12C-1983 Standard Paint Colours
CGSB-1-GP-71-1983 Testing Paints and Pigments:

California Department of Transportation

8010-61G-30 Water Borne Traffic Paint

American Society for Testing and Materials

ASTM D185-84	Coarse Particles in Pigments, Pastes and Paints
ASTM D562-81(1985)	Consistency of Paints Using the Stormer Viscometer.
ASTM D711-84	No Pick-Up Time of Traffic Paint
ASTM D713-87	Conducting Road Service Tests on Traffic Paint
ASTM D869-85	Evaluating Degree of Settling of Traffic Paint
ASTM D2205-85	Traffic Paints
ASTM D2243-82(1987)	Freeze-Thaw Resistance of Water-Borne Paints
ASTM D2244-85	Calculation of Colour Differences from Instrumentally Measured Colour Coordinates
ASTM D2369-87	Volatile Content of Coatings
ASTM D3168-85	Practice for Qualitative Identification of Polymers in Emulsion Paints
ASTM D3960-87	Determining Volatile Organic Content (VOC) of Paints and Related Coatings
ASTM E70-77(1986)	Test Method for pH of Aqueous Solutions With the Glass Electrode
ASTM E97-82(1987)	Test Method for 45-deg., 0-deg., Directional Reflectance Factor of Opaque Specimens by Broad-Band Filter
ASTM E303-83	Measuring Surface Frictional Properties Using the British Pendulum Tester

United States Federal Standard

U.S. FED-STD-595B Dec. 15, 1989 Colours Used in Government Procurement

International Commission on Illumination

CIE 1976 - L^*, a^*, b^* Uniform Colour Space and Colour Difference Equation

1716.03 DEFINITIONS

For the purpose of this specification, the following definitions shall apply:

Compliance Certification means the procedure and requirements for establishing an approved source for materials.

Fingerprinting means the testing of water-borne by gas chromatographic and infrared spectroscopic techniques for verification purposes.

No Tracking Time means the time required for a newly applied pavement marking line to show no visible deposition of the material to the pavement surface outside the line when viewed from a distance of 15 metres, as determined by passing over the applied line at 60 km per hour in a simulated passing maneuver with a passenger car.

Pavement Marking Material means a material formulated for application onto bituminous or concrete pavement in order to delineate vehicle operating limits.

Reflectorization means a material, treatment, or process to enable incident light to be returned in high proportions in the general direction of the light source.

Service Test means the evaluation of pavement marking materials on a test deck and performance rating prior to compliance certification.

Traffic Paint means a paint specifically formulated for use as a pavement marking to delineate vehicle operating limits.

Water-Borne Traffic Paint means traffic paint whose components are carried in water either as an emulsion or a dispersion and will form a solid paint film on deposition and evaporation of water and volatiles after application.

1716.05 MATERIALS

1716.05.01 General

Water-borne traffic paint shall be homogeneous and shall be well ground to a uniform smooth consistency. It shall be free from skin, dirt, and other foreign particles and shall be capable of being sprayed at the temperature intended for the paint. The water-borne traffic paint shall flow evenly and smoothly and cover solidly when applied to pavements.

The materials used in the manufacture of the water-borne traffic paint shall be of high quality and consistency such that the appearance will not change in service to impair the colour or visibility of the delineation. The water-borne traffic paint film shall be flat in finish, and the white and yellow markings shall be visible under daylight and artificial light after the addition of the overlay glass beads.

1716.05.02 Colour

The water-borne traffic paint shall conform to the following colour requirements:

White - CGSB 1-GP-12C white 513-301

Yellow - Shall match either the yellow traffic paint chip of the Ministry of Transportation, Ontario or U.S. Federal 595B, Yellow 33538

Black - CGSB 1-GP-12C Black 512-301

The tolerance in colour allowed is as follows in the CIE L^*, a^*, b^* Uniform Colour Space and Colour Difference Equation when calculated from instrumentally measured colour differences conforming to ASTM D 2244:

White
L^* = +2 and -1.5 max
a^* = +1.5 and -1 max
b^* = +4 and -4 max

Yellow - MTO
L^* = +2 and -1.5 max
a^** = +3 and -1.5 max
b^* = +7 and -1.5 max

Yellow - U.S.
L^* = -2 and +4 max
a^* = -6 and +4 max
b^* = -9 and +10 max

1716.05.03 Chemical Composition

The chemical composition of the water-borne traffic paint shall be at the discretion of the paint manufacturer and shall be certified by the Owner.

1716.05.04 Reflectorization

The white and yellow paints shall be used with overlay glass beads which are applied uniformly after application of the paint at a rate as shown below. The white and yellow paints shall provide proper anchorage for overlay glass beads according to OPSS 1750.

Rate of application for overlay glass beads per litre of traffic paint.

% Volume Solids of Traffic Paint	Glass Beads Required in kg
40-56	0.7
57-70	0.8

Test samples of glass beads according to OPSS 1750 may be obtained from the Owner upon request.

1716.05.05 Physical Property Requirements

Water-borne traffic paints shall be supplied ready-mixed for use without any addition of water.

The handling and storage qualities must be acceptable with respect to degree of settling, uniform consistency, absence of skinning, and thixotropic properties. The water-borne traffic paint shall be capable of being sufficiently atomized to produce an uniformly applied paint stripe without side splatter and overspray within the limitation imposed by conventional striping equipment.

The physical properties of the water-borne traffic paints submitted for compliance certification shall conform to Table 1.

Samples are required by the Owner for laboratory testing. The supplier shall submit with each test sample, complete data on physical properties, application procedure, and material safety for the water-borne traffic paint.

1716.05.06 Service Test

Water-borne traffic paint, according to subsection 1716.05.05 and Table 1 shall be submitted for service test when requested by the Owner.

Water-borne traffic paints will be service tested according to the following:

a) Test deck location, time, and procedure of application shall be as specified by the Owner.

b) Test stripe shall be 10 cm in width and applied transversely by across the lanes of the road. Application of the traffic paint to a dry thickness of 230 microns $\pm$ 25 microns on bituminous or concrete pavement with about 20,000 AADT and application of overlay glass beads according to OPSS 1750 at the approved rate immediately over the white and yellow striped line.

c) The ease and uniformity of application, severity of overspray, covering properties, and drying time will be evaluated during application.

d) The applied water-borne traffic paint will be inspected periodically and its service performance will be rated by the Owner as specified in Table 2.

e) Approval will be given after one year of service rating providing the material conforms to Table 2 and meets the conditions of subsection 1716.09.02.

1716.07 PRODUCTION

1716.07.01 Plant Inspection

In order to qualify as a supplier of water-borne traffic paints, a manufacturer must satisfy the following minimum requirements:

a) Adequate facilities to produce minimum batches of 3000 litres.

b) A laboratory sufficiently equipped and staffed to provide a quality control program which will ensure compliance with this specification.

c) Properly documented production, sampling, and testing procedures and methods.

1716.07.02 Quality Control

A manufacturer shall be responsible for carrying out a quality control program to ensure that the water-borne traffic paints conform to this specification.

1716.08 QUALITY ASSURANCE

1716.08.01 Acceptance Criteria

The Owner may request samples to be taken from the shipments of water-borne traffic paints at any time for quality assurance testing. Samples shall be taken from each batch produced for delivery to the Owner. Criteria for accepting each production batch include the following requirements and manufacturing tolerances:

a) Density shall be within 0.05 kg/l of the value established on the test sample according to CGSB-1-GP-71 - Method 2.1.

b) Viscosity shall be within $\pm$ 5 KU of the reference value.

c) Colour Difference ΔE shall be within $\pm$ 1.5 of the value established on the reference sample.

d) Composition shall not vary by more than $\pm$ 5%, based on fingerprinting and other tests, ASTM D3168, of the value of the reference sample.

e) Total solids shall not vary by more than $\pm$ 2% from the value of the reference sample.

f) pH of the sample shall not vary by more than one unit from that of the value established for the reference sample.

g) No pickup time of each production batch sample shall be within $\pm$ 2.5 minutes of the value established for the test sample according to ASTM D711.

h) Directional Reflectance with:

   i. Minimum value of 70% white.
   ii. Minimum value of 50% yellow.

i) Hiding Power with minimum value of 8.4 m^2/l.

1716.08.02 Quality Control of Production Batches

A one litre sample from each production batch of water-borne traffic paint along with test results on density, viscosity at 25 °C, pH, total solids, and no-pickup time shall be delivered to the Owner's laboratory within two days of manufacture of the respective batches.

Delivery records shall be kept by the supplier of the number of containers of each batch shipped to each delivery point and a list of such shipments during each calendar week shall be given to the Owner at the end of each week until the entire order is completed and shipped.

1716.08.03 Storage

The water-borne traffic paint shall conform to this specification after storage.

1716.09 OWNER PURCHASE OF MATERIAL

1716.09.01 Trial Batch Application

A trial batch of water-borne traffic paints conforming to this specification may be purchased by the Owner for evaluation of application properties using the Owner's painting equipment. The trial batch shall consist of a minimum quantity of 1,000 litres of traffic paint.

No-tracking time will also be determined.

Those water-borne traffic paint conforming to this specification which exhibit satisfactory loading and application properties when used with the Owner's traffic painting equipment will be considered for purchase.

1716.09.02 Certificate of Compliance

The manufacturer shall submit a certificate of compliance with tenders indicating that the physical properties and chemical composition of all of the manufacturer's production batches of traffic paint for the Owner shall conform to this specification and shall not deviate from the allowable tolerances, unless approved by the Purchaser.

1716.09.03 Delivery and Packaging of Water-Borne Traffic Paint

The delivery schedule, delivery location, colour, and quantity shall be as specified on the Owner's purchase order.

The water-borne traffic paint shall be furnished in returnable drums with airtight liners.

Each drum shall be clearly marked on the side and the top with weather resistant markings to show the following information:

a) Manufacturer's name and address.

b) Type of traffic paint.

c) Colour.

d) Manufacturer's code and batch numbers date of filling the drum.

e) Volume of contents in litres.

A small portion of the water-borne traffic paint may be required in 20-litre containers. The quantity will be specified on the purchase order.

1716.09.04 Measurement and Payment

Measurement of water-borne traffic paint shall be by litres.

Payment at the price specified in the purchasing order shall be for the supply of water-borne traffic paint.

TABLE 1
PHYSICAL PROPERTY REQUIREMENTS FOR WATER-BORNE TRAFFIC PAINT

Test and Property	Requirements		Test Methods		
	Min.	Max.	CGSB 1-GP-71	ASTM	OTHER
Volatile Organic Content %		8.5		D3960	
Settling 6 months	8.0			D869	
Hiding Power m^2/l	8.4				Pfund cyptometer with #3.5 wedge
Skinning 48 hours	nil	nil	10.1		
Viscosity KU					
@ 7 °C		135.0			
@ 25 °C	85	110.0	4.5	D562	
Viscosity Change after Heat-Shear Stability Test at 25 °C KU		10.0			Caltrans 8010-61G-30
Freeze-Thaw Stability	Pass			D2243	
Coarse Particles					
# 60 sieve - 250 μm	nil	nil		D185 & D2205	
# 100 sieve - 150 μm		0.01			
No Pickup Time, mins.		8.0*		D711	
Directional Reflectance %				E97	
White Paint	70.0				
Yellow Paint	50.0				
Black Paint		12			
Skid Resistance BPN Units	**			E303	

* For coning type of traffic paints, this value can be higher.

** Values to be established.

TABLE 2
PERFORMANCE REQUIREMENTS FOR SERVICE TEST
AT ABOUT 20,000 AADT FOR WATER-BORNE TRAFFIC PAINT

Property	Performance Requirements					
	Newly Installed Paints	Service Life Ratings of				Test Method
		3 mths	1 yr	1.5 yrs	2 yrs	
Directional Reflectance %						ASTM
White	≥ 70	≥ 70	≥ 50	≥ 50	≥ 50	E-97*
Yellow	≥ 50	≥ 50	≥ 35	≥ 35	≥ 35	
Black	≤ 12	≤ 12				
Retroreflectance						Instrument
mcd/m^2/lux						Mirolux
White	**	**	**	**	**	12
Yellow	**	**	**	**	**	
Black	**	**				
No Tracking Time, mins.	≤ 2					MTO
Durability						
White and Yellow		≥ 90	≥ 85	≥ 75	≥ 70	ASTM D913
Black		≥ 90				& MTO***
Appearance	10	≥ 8	≥ 7	≥ 6	≥ 5	ASTM D713 & MTO****

* These values were obtained on a typical asphalt surface.

** Values to be established.

*** Durability is calculated, first by estimating the % wear from the photographs/video images of stripes taken at test sites, and then deducting the value obtained from 100.

**** Rating 1 - 10; perfect score is 10.

Rating made on inspection of the markings by a panel of evaluators from the Owner.

WATER-BORNE TRAFFIC PAINT DATA FORM

A. MANUFACTURER'S NAME _____
ADDRESS _____
_____

TELEPHONE NO. _____

B. SAMPLE IDENTIFICATION
Manufacturer's Code No. _____ Paint Batch No. _____
Colour of Paint _____ Sample Date _____

C. TEST DATA

Density, kg/l	1-GP-71 M2.1	_____
Volatile Organic Content %	ASTM D 3960	_____
No Pickup Time, minutes	ASTM D711	_____
Hiding Power, m^2/l	Pfund Cryptometer	
	OPSS 1716, Table 1	_____
pH	ASTM E70	_____
Total Solids	ASTM D2369	_____
Freeze-Thaw Stability	ASTM D2243	_____
Viscosity Change after Heat-Shear Stability	OPSS 1716, Table 1	_____

D. COMPOSITION OF PAINT

	% by Mass	% by Volume
Pigment and Fillers	_____	_____
Binder	_____	_____
Water	_____	_____

Composition of Pigment and Fillers	% by Mass
1	_____
2	_____
3	_____
4	_____
5	_____
6	_____
7	_____
8	_____

Type of Binder _____

VOC individual components mg/litre

_____ _____
_____ _____
_____ _____
_____ _____

E. MATERIAL SAFETY DATA

_____
_____
_____

F. APPLICATION PROCEDURE

Surface Preparation _____
Minimum Pavement Temperature _____
Paint Temperature _____ min °C _____ max °C
Mode of Application _____
Air Temperature _____ min °C Humidity _____ max %

NOTE: This form must be completed in full forwarded with paint sample. Samples submitted without a completed Paint Data form will not be considered.