



**ONTARIO
PROVINCIAL
STANDARD
SPECIFICATION**

**METRIC
OPSS 1714
FEBRUARY 1991**

**MATERIAL SPECIFICATION FOR FIELD REACTED
POLYMERIC PAVEMENT MARKING MATERIALS**

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This specification covers the requirements for field

1714.02 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 Specifications:

CGSB 1-GP-12C-1983 - Standard Paint Colours

American Society for Testing and Materials:

ASTM D 713-87 - Conducting Road Service Tests on Traffic Paint

ASTM D 868-85 - Degree of Bleeding of Traffic Paint

ASTM D 869-85 - Degree of Settling of Traffic Paint

ASTM D 1415-88 - Rubber Property - International Hardness

ASTM D 1644-88 - Non-Volatile Content of Varnishes

ASTM D 1652-88 - Epoxy Content of Epoxy Resins

ASTM D 2074-66(1987) - Total, Primary, Secondary, and Tertiary Amine Values of Fatty Amines by Alternative Indicator Method

ASTM D 2240-86 - Rubber Property - Durometer Hardness

ASTM D 2244-85 - Calculation of Colour Differences

from Instrumentally Measured Colour Coordinates

ASTM D 4060-84 - Abrasion Resistance of Organic Coatings by the Taber Abraser

ASTM E-97-82 (1987) - Test for 45-deg, 0-deg, Directional Reflectance Factor of Opaque Specimens by Broad Band Filter

ASTM E-298-84 - Assay of Organic Peroxides

ASTM E-303-83 - Measuring Surface Frictional Properties Using the British Pendulum Tester

United States Federal Standard:

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

International Commission on Illumination:

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

1714.03 DEFINITIONS

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

Compliance Certification: refers to the procedure and requirements for establishing an approved Designated Sources of Materials.

Field Reacted Polymeric Pavement Marking Material: refers to a pavement marking material consisting of two separate components: a polymerizable component and a curing agent or a polymerization catalyst. These two components are designed to be mixed at the site and applied during the pot life of the mixture.

Fingerprinting: refers to the testing of field reacted polymeric pavement marking materials by infrared spectroscopy and other techniques for verification purposes.

No Tracking Time: refers to the time required for a newly installed beaded 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 pavement marking line at 60 km per hour, in a simulated passing manoeuvre at about 60 km per hour with a passenger car.

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

Pot Life: refers to the length of time a material is usable after a curing agent or a polymerization catalyst has been mixed.

Reflectorization: refers to 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: refers to the evaluation of pavement marking materials on a test deck and performance rating prior to compliance certification.

1714.05 MATERIALS

1714.05.01 General

The ingredients used in the production of the field reacted polymeric pavement marking materials shall be of high quality consistency such that the appearance will not change in service to impair the colour or visibility of the delineation.

1714.05.02 Colour

The field reacted polymeric pavement marking material shall conform to the following colour requirements after mixing at the recommended proportions and curing:

- White - CGSB 1-GP-12C white 513-301.
- Yellow - shall match either the yellow colour 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

1714.05.03 Chemical Composition

The chemical composition of the field reacted polymeric pavement marking material shall be at the discretion of the manufacturer and shall be certified by the Authority.

1714.05.04 Reflectorization

Field reacted polymeric pavement marking material recommended for screed application shall contain premixed glass beads and overlay glass beads shall also be applied at a rate recommended by the manufacturer for reflectorization of the pavement markings. Field reacted polymeric pavement marking materials recommended for spray application shall be used with overlay glass beads for reflectorization. These materials shall provide proper anchorage for the glass beads which shall conform to OPSS 1750, with the exception of the requirement of silicone coating.

Test samples of glass beads conforming to the above requirements may be obtained from the Authority.

1714.05.05 Physical Property Requirements

The physical properties of the field reacted polymeric pavement marking material submitted for compliance certification shall conform to Table 1.

Samples are required by the Authority for laboratory testing. The supplier shall submit with each test sample, complete data for both components and mixing ratios of the field reacted polymeric pavement marking material.

1714.05.06 Service Tests

Field reacted polymeric pavement marking materials, conforming to the qualifications of 1714.05, and Table 1 shall be submitted for service tests when requested by the Authority.

The field reacted polymeric pavement marking material will be service tested conforming to the following:

- a. Test deck location and time for application shall be determined by the Authority.
- b. The test stripes shall be 10 cm in width and applied transversely across the lanes of the road. The application will be made by the supplier or the manufacturer or his agent, as recommended by the manufacturer except that the thickness of screed applied material shall be 1.90 mm \pm 0.40 mm.
- c. Application of test stripes of the field reacted

polymeric material on a bituminous or concrete pavement with about 20,000 AADT.

- d. Ease of application, quality, and nature of the stripes, including the shape of the edges and uniformity in thickness will be assessed.
- e. The field reacted polymeric pavement marking will be inspected periodically and its service performance will be rated by the Authority as outlined in Table 2.
- f. Approval will be given after 2 years of service rating, providing the material conforms to Table 2 and meets the conditions of 1714.05.05.

1714.07 PRODUCTION

1714.07.01 General

In order to qualify as a supplier of field reacted polymeric pavement marking material(s), a manufacturer must satisfy the following minimum requirements.

- a. Adequate production facilities.
- b. A laboratory sufficiently equipped and staffed to provide a quality control program which will ensure compliance with this specification; and
- c. Properly documented production, sampling and testing procedures and methods.

1714.07.02 Quality Control

A manufacturer shall be responsible for carrying out a quality control program to ensure that the field reacted polymeric pavement marking material(s) conform(s) to this specification.

1714.08 QUALITY ASSURANCE

1714.08.01 Acceptance Criteria

The Authority may request samples to be taken from the shipments of field reacted polymeric pavement marking material(s) at any time for quality assurance testing. Samples shall be taken from each batch produced for delivery to the Authority. Criteria for accepting each production batch include the following requirements and manufacturing tolerances:

- a. Composition shall not vary by more than \pm 5% of the reference value, as determined by fingerprinting and other specific tests for the materials conforming to the applicable ASTM specification

from ASTM D 1644, ASTM D 1652, ASTM D 2074 and ASTM E-298.

- b. Pot life shall not vary by more than ± 5 minutes of the value established for the reference sample, when tested at 25°C and 50% relative humidity.
- c. Directional reflectance with:

Minimum value of 70% white
Minimum value of 45% yellow

1714.08.02 Quality Control of Production Batches

A 500 g sample of the prepolymer or polymerizable component and an equivalent amount of curing agent or catalyst samples shall be supplied to the Authority for laboratory testing.

1714.08.03 Storage

The field reacted polymeric pavement marking materials shall conform to this specification after storage.

1714.09 AUTHORITY PURCHASE OF MATERIAL BY PURCHASE ORDER

1714.09.01 Certificate of Compliance

The manufacturer shall submit a certificate of compliance, with tenders, indicating the physical properties, material composition, and installation characteristics of all of the manufacturer's production batches of the field reacted polymeric pavement marking materials for the Authority shall conform to this specification and shall not deviate from the allowable tolerances, unless approved by the Authority.

1714.09.02 Delivery and Packaging of the Field Reacted Polymeric Pavement Marking Material

The delivery schedule, delivery location, colour, type, and quantity shall be as specified by the Authority. Both components of the field reacted polymeric pavement marking material supplied, shall be packaged to commercially acceptable standards. Each package shall have a label or marking with the following information:

- a. manufacturer's name and address

- b. type and colour of the field reacted polymeric pavement marking material
- c. manufacturer's code and batch numbers
- d. net weight in kilograms
- e. date of manufacture

1714.09.03 Measurement and Payment

The unit of measurement for the field reacted polymeric pavement marking material will be kilograms. Payment for supplying the field reacted polymeric pavement marking material shall be as specified on the Authority's purchase order.

1714.10 DESIGNATED SOURCES REQUIREMENTS

In order for a Supplier to be considered for addition to the List of Designated Sources of the Ministry of Transportation, Ontario for field reacted polymeric pavement marking material, the manufacturer shall supply a production sample of the pavement marking material to the Ministry along with complete material data in a prescribed form PAV.M.1714, available at the Ministry for conformance testing.

If the test sample conforms to this specification and the Ministry is satisfied that the Supplier has the equipment and ability to produce the material in bulk quantities, then the Ministry, upon written request to the Manager, Purchasing and Supply Office of the Ministry of Transportation, 1201 Wilson Avenue, Downsview, Ontario, M3M 1J8 will place the Supplier on the List of Designated Sources for Materials.

Subsequent changes in formulation, the inability to maintain quality production or to meet commitments, or failure to conform to this specification shall be cause for cancellation of approval and shall necessitate application for reapproval.

TABLE 1
PHYSICAL PROPERTY REQUIREMENTS FOR FIELD REACTED
POLYMERIC PAVEMENT MARKING MATERIALS

TEST AND PROPERTY	REQUIREMENTS		TEST METHODS	
	Min.	Max.	ASTM	OTHERS
Settling, 6 months Component A	6		D 869	
Component B	6			
Pot Life min. at 25°C		20		MTO
Bleeding	5		D 868	
Directional Reflectance %			E 97	
White	70			
Yellow	45			
Black		12		
Hardness IRHD	90	98	D 1415	
Abrasion Resistance 1000 cycles/g	*		D 4060 CS-17	
Skid Resistance BPN Units	*		E-303	

* Values to be established

TABLE 2

PERFORMANCE REQUIREMENTS FOR SERVICE TEST AT ABOUT 20,000 AADT
FOR FIELD REACTED POLYMERIC PAVEMENT MARKING MATERIALS

Property	Performance Requirements							Test Method
	Newly Installed Marking	Service Life Ratings of					5 years	
		3 months	1 year	2 years	3 years	4 years		
Directional Reflectance %								
White	≥ 70		≥ 50	≥ 50	≥ 50	≥ 50	≥ 50	ASTM E-97*
Yellow	≥ 45		≥ 35	≥ 35	≥ 35	≥ 35	≥ 35	
Black	≤ 12	≤ 12						
Retroreflectance mcd/m ² lux								Instrument Mirolux
White	**		**	**	**	**	**	
Yellow	**		**	**	**	**	**	
Black	**	**						
No Tracking Time, mins.	≤ 15							
Durability								MTO***
White and Yellow			≥ 95	≥ 90	≥ 80	≥ 75	≥ 70	
Black		≥ 90						
Appearance	10	≥ 9	≥ 8	≥ 7	≥ 6	≥ 5	≥ 5	ASTM D713 & MTO****

* These values are based on markings placed 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 Authority.

FIELD REACTED POLYMERIC PAVEMENT MARKING MATERIAL DATA FORM

A. MANUFACTURER'S NAME _____
ADDRESS _____

TELEPHONE NO. _____

B. SAMPLE IDENTIFICATION	COMPONENT A	COMPONENT B
Commercial, Trade Name of Sample	-----	-----
Manufacturer's Code No.	_____	_____
Batch No.	_____	_____
Colour	_____	_____
Date of Manufacture	_____	_____

C. MATERIAL COMPOSITION	COMPONENT A	COMPONENT B
Resins and Conditions, wt %	_____	_____
Pigments and Fillers, wt %	_____	_____
% Active Polymerization Catalyst, Curing Agent	_____	_____
Glass Beads, wt %	_____	_____
Gradation of Glass Beads	_____	_____
	_____	_____
	_____	_____

D. TEST DATA

Settling, 6 months	ASTM 869	_____
Component A		_____
Component B		_____
Bleeding, mixed material	ASTM D868	_____
Pot Life at 25°C min.	MTO	_____
Hardness*, IRHD	ASTM D 1415	_____
Shore A° or D°	ASTM D 2240	_____
Abrasion Resistance	ASTM D4060	

1000 cycles/g CS-17 _____

E. MATERIAL SAFETY DATA FOR BOTH COMPONENTS

FORM PAV-M-1714
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F. PROCEDURE FOR OVERLAY AND INLAY APPLICATION

1. Pavement Surface Preparation Procedure

2. Pavement Temperature Range for Application

Minimum °C _____
Maximum °C _____

3. Air Temperature

Minimum °C _____
Maximum °C _____

4. Humidity Maximum %

5. Mix Ratio of Component A & B

Mixing Procedure Quantities _____
Pot Life min. at 25°C _____

6. Types of Pavement ** where the application is not recommended.

7. E q u i p m e n t f o r A p p l i c a t i o n

8. A p p l i c a t i o n P r o c e d u r e f o r G l a s s B e a d s O v e r l a y

- _____
9. Particulars regarding suitability of application onto partly worn existing pavement marking.
- a. on solvent based traffic paint _____
 - b. on water-borne traffic paint _____
 - c. on thermoplastic pavement marking _____
 - d. on field reacted polymeric pavement marking _____
10. Any Other Relevant Information _____
- _____
- _____
- _____
- _____

* Hardness may also be measured conforming to ASTM D 2240
** Refers to the age of pavement, the surface texture, e.g. OFC, DFC, and whether it is asphalt or concrete pavement.

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