

This specification outlines the requirements for the supply and application of yellow and white paint materials for traffic markings on roadway pavement.

PART 1 REFERENCES

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

Government of Newfoundland and Labrador, Department of Transportation and Infrastructure (TI), Highway Design and Construction Division Specifications Book

Section 334

Pavement Smoothness

ASTM International

D185	Standard Test Methods for Coarse Particles in Pigments
D476	Standard Classification for Dry Pigmentary Titanium Dioxide Products
D562	Standard Test Method for Consistency of Paint Measuring Krebs Unit (KU) Viscosity Using a Stormer-Type Viscometer
D605	Standard Specification for Magnesium Silicate Pigment (Talc)
D711	Standard Test Method for No-Pick-Up Time of Traffic Paint
D868	Standard Practice for Determination of Degree of Bleeding of Traffic Paint
D869	Standard Test Methods for Evaluation Degree of Settling of Paint
D1155	Standard Test Method for Roundness of Glass Spheres
<u>D1210</u>	<u>Standard Test Method for Fineness of Dispersion of Pigment-Vehicle Systems by Hegman-Type Gage</u>
D1214	Standard Test Method for Sieve Analysis of Glass Spheres
D1309	Standard Test Method for Settling Properties of Traffic Paints during Storage
<u>D1394</u>	<u>Standard Test Methods for Chemical Analysis of White Titanium Pigments</u>
<u>D1849</u>	<u>Standard Test Method for Package Stability of Paint</u>
D2205	Standard Guide for Selection of Tests for Traffic Paints
D2243	Standard Test Method for Freeze-Thaw Resistance of

Water-Borne Coatings

D2244 Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates

D2369 Standard Test Method for Volatile Content of Coatings

D2805 Standard Test Method for Hiding Power of Paints by Reflectometry

D3723 Standard Test Method for Pigment Content of Water-Emulsion Paints by Low-temperature Ashing

D3960 Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paint and Related Coatings

E1347 Standard Test method for Color and Color-Difference Measurement by Tristimulus Colorimetry

Canadian General Standards Board (CGSB)

1- GP-71 Methods of Testing Paints and Pigments

1.206-M-89 Hot Applied Alkyd Traffic Paint

Other

Transportation Association of Canada Manual of Uniform Traffic Control Devices for Canada

Transportation of Dangerous Goods Act 1992

SAE AMS-STD-595 – Colors Used in Government Procurement

PART 2 GENERAL

2.1 SUBMITTALS

.1 Submit in accordance with Section 01340 – Shop Drawings, Samples and Submissions.

.2 Product Data:

.1 Submit manufacturer's printed product literature and data sheets for pavement markings and include product characteristics, performance criteria, physical size, finish, limitations, and instructions on the proper storage and use of the materials.

.4.3 The Contractor shall submit, in writing before work commences, the names of the suppliers of paint and glass beads.

~~2.4~~ The Contractor shall submit, as received from each supplier, certification that the materials supplied conform to the requirements of this Section; ~~and instructions on the proper storage and use of the materials.~~

~~.5~~ The Contractor shall submit, in writing, certification that the Equipment proposed for the Work is capable of applying the pavement markings as outlined in the Contract Documents.

2.2 CLOSEOUT SUBMITTALS

~~.1~~ Submit in accordance with Section 01720 - Closeout Submittals.

~~.2~~ Operations and Maintenance Data: submit information on materials relative to work of this Section for inclusion in operations and maintenance manual.

2.3 DELIVERY, STORAGE AND HANDLING

~~.1~~ Deliver, store and handle materials in accordance with Section 01600 – Material and Equipment and with manufacturer's written instructions.

~~.2~~ Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

~~.3~~ Storage and Handling Requirements:

~~.1~~ Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

~~.2~~ Store and protect materials from nicks, scratches, and blemishes.

~~.3~~ Replace defective or damaged materials with new.

2.4 SITE CONDITIONS

~~.1~~ Sustainable Design Provisions:

~~.1~~ Seasonal restriction for high VOC content traffic marking coatings.

~~.1~~ Traffic marking coating application between May 1st and October 15th subject to seasonal use restriction and have VOC concentration maximum 150 g/L.

PART 3 PRODUCTS

3.1 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 Only water based (acrylic) ~~Either oil-based or waterborne~~ paint may be used in the Work.

~~.3 Oil-Based Traffic Paint:~~

~~.1 The paint shall meet CGSB Specification 1.206-M, but with paragraphs of that specification modified as shown in below.~~

~~Paragraph Modifications for this section~~

3.3	"... and shall meet the requirements for consistency (para. 4.1) and no-pick-up time (para. 4.2):	
4.1	Minimum changed from 80 to 85	
4.2	Maximum changed from 6 to 8	
4.3	Maximum changed from 60 to 90	
4.7	Minimum changed from 34 to 37	
4.10	Pigment composition (minimums in kg/L):	
	Pigment Description	Yellow
	Yellow (as PbCrO4)	0.10
	dioxide (as SiO2)	0.20
	Titanium dioxide	0.075
4.14	Change ASTM E97 to ASTM E1347. Add: yellow not less than 60 %	
4.15	Paint colours to match samples provided by TW	
6.2.1	Change 60 seconds to 90 seconds	
6.2.2	Add: SiO2 shall be determined using classical gravimetric method on insoluble portion of paint	

~~.43.2 LOW-TEMPERATURE WATER BASED BORNE (ACRYLIC) TRAFFIC PAINT:~~

~~.1 Polymer grade FASTRACK 5408 or FASTRACK 3427.~~

~~.2 Designed to be applied in environmental conditions such that operational temperatures shall be in the range of 2 °C and rising for FASTRACK 5408 and 5 °C and rising for FASTRACK 3427.~~

~~.3 Not contain prohibited material.~~

~~.4 Be certified by the manufacturer that the product does not contain mercury, lead, hexavalent chromium, toluene, chlorinated solvents, hydrolysable chlorine derivatives, ethylene-based glycol ether and their acetates or any carcinogens.~~

- .5 The paint shall be a homogeneous water-based mixture of particles well ground to a uniform smooth consistency, free of skin, dirt and other foreign matter.
- .4.6 ~~C~~eapable of being sprayed evenly and smoothly at its intended temperature and covering solidly when applied to the pavement.
- .7 The paint shall be supplied ready-mixed for use without adding water.
- .8 The paint materials shall be of a quality and consistency such that the paint's colour will not change in service to impair the visibility of the markings.
- .2.9 The paint film shall be flat in sheen finish and provide maximum brightness and visibility. White and yellow markings shall be visible in daylight and under artificial light after the addition of overlay glass beads.
- .10 Handling and storage qualities shall provide an acceptable degree of settling, uniformity, consistency, and absence of skinning and thixotropic properties.
- .3.11 The paint shall be capable of being sufficiently atomized to produce a uniformly applied paint stripe without side splatter and overspray within the limitations of conventional striping equipment.
- .12 The colour of the paint shall conform to the colour of white and yellow paint chips supplied by the Owner upon request.
- .5.13 The chemical composition and physical properties shall be determined by the paint manufacturer but shall comply with the requirements below.

Property	Min	Max	Test Method
Volatile matter (% by mass)		24	ASTM D2369
Pigment Content (% by mass) ¹	<u>60</u> 56	62	ASTM D3723
<u>Colour Yellow 33538</u> <u>White 37925</u>			<u>ASTM D2244. See Note 1</u>
<u>Titanium Dioxide (g/L):</u> <u>Yellow</u> <u>White</u>	<u>20</u> <u>150</u>		<u>ASTM D1394. See Note 2</u>
Viscosity, Krebs Unit (KU) at 25 °C	80	<u>95</u> 100	<u>ASTM D562. See Note 3</u>
Viscosity Change (KU) after heat-shear Stability Test at 25 °C		± 10	<u>ASTM D1849. See Note 3</u> <u>Caltrans 8010-61G-30</u>
Freeze-Thaw Resistance	Pass		ASTM D2243

Property	Min	Max	Test Method
<u>Fineness by Grind (HU):</u>	<u>3.0</u>		<u>ASTM D1210</u>
Coarse Particles <u>Range: Sieve</u> 250 µm (% by mass):	Nil	Nil	ASTM D185 & D2205
Coarse Particles <u>Range: Sieve</u> <u>150 µm</u> (% by mass):	Nil	0.01	ASTM D185 & D2205
<u>Accelerated</u> Settling Rate (Up to 6 months)	<u>8.0</u> <u>6.0</u>		ASTM D869 ASTM D1309
Settling Rate (Up to 6 months)	8.0 <u>6.0</u>		ASTM D869 ASTM D1309
Skimming <u>Range</u> Properties	Nil	Nil	CGSB 1-GP-71, Method 10.1
Volatile Organic Compound (VOC) Content excluding water, g/L		150	ASTM D3960
No-Pickup Time, minutes		8	ASTM D711
<u>Dry Opacity</u>	<u>0.95</u>		<u>ASTM 2805. See</u> <u>Note 4</u>
Non-Volatile Vehicle (% by mass)	16.75		CGSB 1-GP-71, Method 19.1
Coalescing Agent (2,2,4- trimethyl -1,3-pentanediol monoisobutyrate) (% by mass of solid polymer)	40		
Type of Binder	Rohm & Haas Rhoplex Fastrack 3427 Emulsion, Dow Chemical DT-250NA Emulsion, or Owner-approved equivalent		
Reflectance (colour difference) %: Yellow White	50 <u>80.5</u>		ASTM E1347
<u>Cold Flexibility</u>	<u>Pass</u>		<u>See Note 5</u>
<u>Marker</u>	<u>Pass</u>		<u>See Note 6</u>
<u>FTIR</u>	<u>Pass</u>		<u>See Note 6</u>
Medium Chrome Yellow (g/L) (Lead chromate content - min	400		

Property	Min	Max	Test Method
87 %}			
<p>NOTES:</p> <p>1.) <u>Colour when applied and allowed to dry shall conform to the L*a*b colour coordinate system for the applicable U.S. Federal AMS-STD-595 colour. To be 20 % take that meets ASTM D605 with a photovolt green filter reflectance of 90 % minimum</u></p> <p>2.) <u>Titanium Dioxide pigment shall be Rutile meet ASTM D476 Type II.</u></p> <p>3. <u>Pour paint into a lined paint container to within 6.4 mm from the top, close the container, seal it with tape, then place the container in an oven maintained at 60°C ± 1°C for seven (7) days. Equilibrate the paint at standard conditions and mix thoroughly with gentle stirring for a minimum of five (5) minutes. The paint shall not show signs of living, hard settling, coagulating, lumps or coarse particles. Perform the consistency in accordance with ASTM D562 at 25°C. The paint shall show no increase or decrease in viscosity greater than 10 KU, over the original viscosity at 25°C.</u></p> <p>4. <u>Paint shall be applied at a wet film thickness of five (5) mil.</u></p> <p>5. <u>Cold Flexibility: The paint shall be applied to an aluminum Q panel at a wet film thickness of 15 mils and allowed to dry at room temperature (65-85°F) and ambient humidity (40-70% RH) for 24 hours. A cylindrical mandrel apparatus (per ASTM D522 method B) shall be put in a 40°F refrigerator with the mandrel apparatus for two (2) hours. After two (2) hours, the panel and test apparatus shall be removed and immediately tested according to ASTM D522 to evaluate cold flexibility. Paint must show no evidence of cracking, chipping or flaking when bent 180 degrees over a 12.7mm (0.5 inch) mandrel. It is important that neither the paint nor apparatus is allowed to warm up owing to handling or exposure to warm air any longer than necessary.</u></p> <p>6. <u>Polymer identity must be confirmed using the fluorescent marker test provided by the polymer manufacture. Polymer identity must also be confirmed by the FTIR match in the polymetric fingerprint region to a known reference polymer sample.</u></p>			

62.3 DUAL-COATED, OVERLAY-TYPE, REFLECTORIZING GLASS BEADS

- 1 Beads shall be true spheres with a surface area that is smooth, lustrous, and free from cavities and scratches. spheres
- .2 Beads shall be manufactured from glass and of a composition that is designed to be highly resistant to the effects of traffic wear and weathering.

- .3 Beads must be moisture proofed with a high quality moisture resistant material that will overcome the negative effects of liquid or liquid vapours on the beads, before they are applied to traffic paint.
- .4 Beads must also have a second coating which will promote adhesion to traffic paint
- .4.5 No foreign material shall be contained in or among the beads.
- .6 The glass beads must have a minimum content of 90% glass residue.
- .7 The maximum concentration of contaminants as indicated below in the glass beads is:
- .1 Arsenic, 50mg/kg (50 ppm)
 - .2 Lead, 90mg/kg (90 ppm)
 - .3 Antimony, 75mg/kg (75 ppm)
- .2.8 Glass beads shall be colourless to the extent that they do not impart a noticeable hue to the paint.
- .3.9 The refraction index of the glass beads shall not be less than 1.50 when tested in accordance with CGSB Specification 1-GP-71, test mMethod 49.1.
- .7.10 Roundness:
- .1 A minimum of 75 % by mass of the glass beads shall be true spheres and shall be determined by one of the following methods:-
 - .1 Tested in accordance with The percentage of true spheres shall be determined by ASTM D1155, or;
 - .2 on a sample of approximately 1000 beads in a culture dish, by counting the number of true spheres under reflected light and magnification as follows:
 - .1 Retained on the 300 μ m sieve size, under 50x magnification;
 - .2 Passing the 300 μ m sieve size, under 100x magnification.
 - .2 Failure to meet roundness requirements by either method will be cause for rejection.
- .8.11 Imperfections:
- .1 The surface of the beads shall be smooth, lustrous and free of film, cavities, pits or scratches.
 - .4.2 Not more than 25 % of the true spheres shall have imperfections in the form of milkiess, air inclusions, dark specks and incipient fractures.

~~2.3~~ Testing for imperfections will be performed in accordance with CGSB Specification 1- GP-71, Test mMethod 149.1.

~~9.12~~ Glass beads shall meet the gradation requirements below when tested in accordance with ASTM D1214 on sample sizes of 50 to 100 g.

ASTM Sieve Size (µm)	Percent Passing
850	100
600	80 _ 100
300	20 _ 35
150	0 _ 8
75	0 _ 2

~~40.13~~ Moisture Resistance Test Procedure:

~~.1~~ Moisture resistance will be tested on a 100 g sample of beads will be placed in a 500 mL beaker, to which an equivalent volume of distilled water shall be added.

~~4.2~~ The beaker will be allowed to After standing for five (5), after which time minutes the water will be carefully poured off shall be decanted and the glass beads transferred to a clean dry beaker and the allowed to stand for five (5) minutes.

~~4.3~~ Slowly After standing for 5 minutes the beads shall be poured slowly the glass beads into a standard 125 mm glass via a funnel having into a standard stem of 125 mm length and 10 mm inside diameter.

~~2.1~~ The beads shall flow through the stem without stoppage. Slight initial agitation to start the flow at the beginning of the test is permissible.

~~2~~ Beads shall be treated so as to overcome the effect of water (vapour or liquid) on the beads before the beads are added to the painted marking.

~~3~~ Beads shall not agglomerate during storage and application, and shall flow freely from dispensing equipment whenever surface and atmospheric conditions are satisfactory for painting.

~~14.14~~ Adherence Coating TestDual Coating of Glass Beads— For Waterborne Paint Only

~~.1~~ The beads shall have both a moisture-resistant silicone coating, and an adhesion-promoting silane coating. The beads shall pass the moisture resistance test (in accordance with Subsection 2.1.8 of this Section), and the adherence coating test.

~~2.1~~ ~~Prepare~~The adherence coating test shall use a solution of 0.2 grams of dansyl chloride ~~and~~ dissolved in 25 mL of acetone. This solution may be used for several tests during the day if kept refrigerated in a closed dark container between uses. A fresh solution shall be made daily.

~~3~~ ~~The adherence coating test shall be performed as follows:~~

- .1 Weigh 10 grams of beads and place in aluminium trays.
- .2 Saturate the glass beads with dansyl chloride solution using an eyedropper.
- .3 Dry the beads in an oven at 600 °C (1400 °F) for 15 minutes. ~~(The bBeads will be yellow and agglomerated).~~
- .4 Rinse the beads in a funnel lined with new filter paper and pour 100 mL of acetone over them. Use suction during this step.
- .5 Remove the beads from the funnel and place in aluminium trays.
- .6 ~~DOver-d~~ry the beads in an oven until free flowing.
- .7 Place the glass beads on filter paper and inspect colour under ultra-violet light in a dark room. A yellow-green fluorescence will be observed if adherence coating is present.

2 If all beads have a yellow green fluorescence, the ~~adherence~~adhesive coating is properly applied and the beads are acceptable. If only some of the beads have a yellow-green fluorescence, the beads are not properly coated and this is a cause for rejection. If no yellow-green fluorescence are seen, adherence coating was not applied and this is a cause for rejection.

~~12.15~~ Chemical Stability:

- .1 Exposure of glass beads to paint film constituents, humidity, atmospheric conditions, or diluted acid or alkali solutions shall not result in dulling of the surface that would adversely affect reflective properties of the beads.
- .2 Glass beads shall be resistant to deterioration by calcium chloride, as determined on a 10 g sample of beads placed in a 1000 mL beaker, covered with 500 mL of a calcium chloride solution (1.0 normal solution), left to soak for three hours, and rinsed with 100 mL of distilled water three times, and air dried.
 - .1 The beads will be examined under a microscope and compared with an untreated sample. Dulling of the surface of the beads or other detrimental effects shall constitute failure of this test.

3.23.4 EQUIPMENT

- .1 The Contractor shall supply all Equipment needed for applying pavement markings, as recommended by the manufacturer of the pavement marking paint products. Equipment shall not contaminate the paint or other pavement marking materials or cause damage to the pavement.
- .2 Line Painting Equipment:
 - .1 Line painting Equipment shall be capable of applying centre, lane and edge line markings to the required thickness and at widths of 100 or 200 mm, as a uniform stripe with sharp edges.
 - .2 The Equipment shall have a glass bead dispenser and shall be capable of applying the beads to the wet painted line uniformly at the recommended rate by means of a pressurized overlay glass bead gun.
 - .3 The Equipment shall have a heater capable of heating the paint to any temperature up to 80 °C and maintaining a constant temperature during the spraying operation.
 - .4 The Equipment shall have a metering device to measure the number of litres of paint applied.
 - .5 The Contractor shall supply one or more shadow vehicles mounted with an arrow board and signs to adequately warn and advise the driving public of the slow-moving striping vehicle and wet pavement marking paint ahead.
- .3 Equipment for Other Pavement Markings:
 - .1 Equipment for applying other pavement markings shall be capable of applying paint at the required thickness and dispensing glass beads to the wet paint uniformly at the required rates.
 - .2 Equipment shall be capable of painting the longitudinal lines outlining cross-hatched islands at a width of 100 mm or 200 mm, and cross-hatching bars and "Stop" bars at a width of 400 mm.
 - .3 Equipment shall be capable of painting arrows and similar markings, using templates supplied by the Owner.
- .4 Paint Removal Equipment:
 - .1 Equipment shall be made available for removal of pavement markings as ordered by the Owner, or as required to correct markings applied in error or non-conformance per TI, Highway Specifications Book 334.07.02. The Equipment shall be capable of removing markings with minimal damage to the pavement surface.

PART 4 EXECUTION

4.1 GENERAL

- .1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Owner.
- .2 The Work shall be performed in accordance with the Transportation Association of Canada (TAC) Manual of Uniform Traffic Control Devices for Canada (MUTDC), Part C.
- .3 Traffic paint shall be transported in accordance with the Transportation of Dangerous Goods Act. Drivers certified under the Act may be employed by the Contractor to transport traffic paint under the authority of the Owner's permit, provided that the conditions of the permit are adhered to.

4.2 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates and surfaces to receive pavement markings acceptable for product installation in accordance with MPI instructions prior to pavement markings application
 - .1 Visually inspect substrate in presence of the Owner.
- .2 Pavement surface: dry, free from water, frost, ice, dust, oil, grease and other deleterious materials.
- .3 Proceed with Work only after unacceptable conditions rectified.

4.3 TRAFFIC CONTROL

- .1 In accordance with Section 01570 – Traffic Regulation.

.44.4 TIMING OF THE WORK:

- .1 Pavement markings shall be applied within the following time frames after completion of paving under the Contract:
 - .1 No sooner than seven (7) calendar days (to allow the new asphalt concrete to cure), and for white edge lines no sooner than completion of shoulder grading; and
 - .2 No later than 14 calendar days for arterial highways and 21 calendar days for other classes of highway.

.54.5 PRE-MARKING:

- .1 The Owner shall provide the measurements and pre-markings on the pavement to establish the position of pavement markings, as follows:

- .1 Painted symbols at the beginning of each type of centreline marking identified in Table 5, and painted dots along the centreline;
 - .2 Painted dots to mark edgelines that are not parallel to centreline, as on tapers to auxiliary lanes; otherwise, the Contractor shall paint edgelines using the pre-marked or painted centreline as the control line;
 - .3 Outline of each cross-hatched island; and
 - .4 Location of each type of arrow.
- .2 The Contractor shall notify the Owner at least ten business days prior to the Work under this Section, to allow the Owner to schedule the pre-marking crew.
- .3 Should the Contractor's line-painting Equipment be unable to paint parallel edgelines using the centerline as control per 2 of the Pre-Marking Subsection 3.2.6.1.2 of this Section, the Contractor shall pre-mark the edge lines or otherwise ensure they are painted parallel to the centerline.

64.6 SURFACE PREPARATION:

- .1 Pavement markings shall be applied only on clean and dry surfaces. Any contaminants such as dirt, loose particles and oily residue shall be removed before painting.

4.7 APPLICATION:

- 7.1 All pavement markings shall be accurately placed based on pre-markings, and shall present a crisp, uniform appearance in daylight and darkness.
- 8.2 The applied markings shall be to the satisfaction of the Owner with respect to paint thickness, retro-reflectivity, the straightness and spacing of lines, the accuracy of dimensions and positioning of other markings, and absence of overspray and tracking.
- 3 Unless otherwise approved by the Owner, apply paint when air temperature minimum 10 °C, wind speed maximum 60 km/h and no rain forecast within the next four (4) hours.
- 9.4 Apply traffic paint evenly at rate of 3 m² /L to form minimum dry thickness of 255 µm ±25 µm.
- 10.5 Paint shall be applied to the pavement surface to a.
 - 6 Do not thin paint unless approved by the Owner.
 - 7 Symbols and letters to dimensions indicated.
 - 8 Paint lines of uniform colour and density with sharp edges.

.9 Thoroughly clean distributor tank before refilling with paint of different colour.

~~.1~~ Overlay glass beads shall be applied at a rate of 0.7 kg/L of paint ed area immediately after application of paint.

.4.10 Longitudinal lines shall be of the types and widths shown below.

Line Type	Colour	Width (mm)
Single Solid	Yellow	100
	White	100/200
Single Broken	Yellow	100
	White	100/200
Combination (Solid Beside Broken)	Yellow	100
Double Solid	Yellow	2 lines x 100

.1 Single broken 100 mm-wide lines between traffic lanes shall have a "skip" pattern of 1:3 (3 m line and 9 m space).

.2 Single broken 200 mm wide lines that mark the edge of travelled lane through a taper, auxiliary lane or intersection shall have a skip pattern of 1:1 (3 m line and 3 m space).

.2.11 Cross-hatching lines shall be 400 mm wide, uniformly spaced at 6 m and at an angle of 2:1 in the direction of travel (2 units along the direction of travel to 1 unit perpendicular to it), and/or as directed by the Owner.

.3.12 Stop bars shall be 400 mm wide, applied at 90° to the edge of the travelled lane across the lane(s) as indicated in the Contract Documents or as directed by the Owner.

~~.4 Pavement markings~~

~~.1 Shall be applied only on dry pavement having a surface temperature as follows:~~

~~.1 For Oil-based Paint, 5 °C and rising; or~~

~~.2 For Waterborne Paint, 10 °C and rising.~~

.2.13 Pavement markings shall be applied in a manner that reduces tracking by the wheels of vehicles that cross over the painted markings.

.1 Tracking of longitudinal centre, lane and edge lines shall not exceed 3 % of line length as determined by the Owner.

.3.14 Pavement markings that do not conform to the requirements of this Section Documents and/or as specified by the Owner shall be removed and/or replaced as directed by the Owner.

4.24.8 SAMPLING AND TESTING OF MATERIALS

- .1 The Contractor shall arrange for the Owner to take samples of paint, 1 L minimum for each colour, from the paint truck on site.
- .2 The Owner shall take on-site random samples of glass beads, 15 kg minimum, for testing at a laboratory.
- .3 Testing costs shall be borne by the Owner if test results are satisfactory, and by the Contractor if test results fail. In the latter case, samples from another batch of paint and/or glass beads shall be taken for new tests.
- .4 Should the Contractor wish to appeal any test results, such appeal may be made only once and in writing within 48 hours of their receipt of test results.
 - .1 The Contractor shall make provision for the Owner to obtain additional samples for the appeal testing, the results of which shall be binding on both the Owner and the Contractor.
- .5 Retroreflectivity shall meet the following requirements when tested no sooner than ten business days and no later than twenty business days after application of markings:
 - .1 Yellow Paint 200 mcd/lx/m²
 - .2 White Paint 250 mcd/lx/m²

4.9 TOLERANCE

- .1 Paint markings: within plus or minus 12 mm of dimensions indicated.
- .2 Remove incorrect markings in accordance with Highway Specifications Book 334.07.02.

4.10 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01710 – Reinstatement and Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01710 – Reinstatement and Cleaning.

4.11 PROTECTION

- .1 Protect pavement markings until dry.

- ~~6.2~~ The Contractor shall be responsible for control of the paint spray during application so that it does not get on vehicles or other private property. In the event that this occurs, the Contractor shall be responsible for the costs of removing the paint off the private or public property and the repair of any damage that occurs as a result of the paint or its removal.

PART 5 PAYMENT

5.1 MEASUREMENT FOR PAYMENT

- .1 Pavement markings including symbols and letters shall be measured by lump sum measure.

5.2 BASIS OF PAYMENT

- ~~.1~~ All costs associated with work as outlined in this specification shall be deemed to be included in the appropriate unit price quoted as outlined in subsection 1.1 Measurement for Payment and as included in the MERX Schedule of Quantities and Prices.

- ~~4.2~~ Traffic Control will be measured in accordance with Section 01570 – Traffic Regulation.