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Specification and test method for road traffic markings

道路交通标线质量要求和检测方法

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Specification and test method for road traffic markings

1 Scope

This document specifies the classification, quality requirements, testing methods of road traffic markings.

This document applies to the quality requirements and testing of newly painted traffic markings on roads.

2 Normative references

The contents of the following documents constitute essential clauses of this document through normative references in the text. Among them, for dated references, only the version corresponding to that date applies to this document; for undated references, the latest version (including all amendments) applies to this document.

GB 2893 Safety colors

GB/T 8416 Surface colors for visual signalling

GB 18582 Limit of harmful substances of architectural wall coatings

GB/T 24717 Preformed road marking tapes

GB/T 24722 Glass beads for road markings

GB/T 26377 Retro reflectometer

GB/T 33503 Analytical method of the chemical composition in the glass containing lead

JT/T 280 Pavement marking paint

JT/T 688 Retroreflective term

JT/T 690 Method for measuring photometric properties of retroreflectors

JT/T 692.1 Test method for chromaticity performance of retroreflective materials - Part 1: Night color of retroreflective materials

JT/T 712 Pavement antiskid paint

b) For transverse markings and other markings, every 1500 m^2 of the marking area is taken as a testing unit; three representative graphics, characters or pedestrian crossings are selected from each testing unit as the inspection area;

c) In each inspection area, one test point is randomly selected for sampling at the lane center line, lane dividing line, lane edge line and other locations. A core sampling machine (specimen diameter 5 cm ~ 15 cm) or manual sampling (specimen equivalent diameter 5 cm ~ 15 cm) is used for sampling. Each inspection unit takes three groups of samples in total. The number of samples in each group shall meet the test needs.

6.1.2 Dimensions

Sampling is carried out in the following manner:

a) Select the inspection area according to 6.1.1a) or 6.1.1b);

b) In each inspection area, three test points are randomly selected for sampling at the lane center line and lane dividing line. Three data are measured at each test point.

6.1.3 Marking thickness

Sampling is performed as follows:

a) Select the inspection area according to 6.1.1a) or 6.1.1b);

b) Randomly select 3 test points at the lane center line, lane dividing line, lane edge line and other locations in each inspection area; measure 6 data at each test point.

6.1.4 Chromaticity performance

Sampling is performed as follows:

a) Select the inspection area according to 6.1.1a) or 6.1.1b);

b) Randomly select 3 test points at the lane center line, lane dividing line, lane edge line and other locations in each inspection area; measure 3 data at each test point.

6.1.5 Photometric performance

Sampling is performed as follows:

a) Select the inspection area according to 6.1.1a) or 6.1.1b);

b) Randomly select 3 test points at the center line, lane dividing line, lane edge line and other locations in each inspection area; measure 9 data at each test point.

6.1.6 Anti-skid performance

Sampling is performed as follows:

a) Select the inspection area according to 6.1.1a) or 6.1.1b);

b) Randomly select 3 test points at the center line, lane dividing line, lane edge line and other locations in each inspection area; measure 3 data at each test point.

6.2 Appearance

The appearance quality of the marking is checked by visual inspection.

6.3 Glass beads contained in hot melt paint markings

6.3.1 Percentage of the mass of glass beads contained in the marking material

Perform the test as follows.

a) Treat the specimen taken according to 6.1.1 by surface grinding and other methods, to remove foreign matter and impurities such as asphalt, concrete and glass beads on the surface; break the specimen into test blocks less than 2 mm.

b) Weigh about 60 g of the test block and place it in a conical flask.

c) Add about 250 mL of ethyl acetate and xylene mixed solvent (1:1), to dissolve organic components such as resin under continuous stirring. After the glass beads are precipitated, pour out the suspension.

d) Add 500 mL of the above mixed solvent and continue to dissolve organic components such as resin under continuous stirring. After the glass beads are precipitated, pour out the suspension. Repeat this operation three times; add 100 mL of acetone to wash and pour out the suspension.

e) Place the conical flask in a boiling water bath in a constant temperature water bath; heat for about 30 minutes; allow the remaining organic solvent to fully evaporate; cool to room temperature.

f) Add about 100 mL of dilute sulfuric acid or a mixed solution of dilute sulfuric acid and dilute hydrochloric acid (1:1); cover with a watch glass; heat in a constant temperature water bath for about 30 minutes; pour out the suspension after cooling to room temperature.

g) Add 300 mL of water and stir thoroughly. After the glass beads are precipitated, pour out the washing liquid; then wash them repeatedly with water for 5 ~ 6 times.

h) Add 50 mL of 95% ethanol to wash and pour out the washing liquid.

i) Place the conical flask in a constant temperature water bath and heat for about 30 minutes to fully evaporate the ethanol. Move the glass beads to a watch glass of

known weight. If there are residual glass beads in the flask, wash them with a small amount of water; pour them into the watch glass; pour out the water in the watch glass.

j) Place the watch glass in an electric blast drying oven at 105 °C ~ 110 °C and heat for 1 h. Take out the watch glass; cool it in a desiccator to room temperature and weigh it. If there is quartz sand in the original specimen, it shall be removed by a glass bead selector before weighing. Perform three parallel tests at the same time.

k) Calculate the percentage of the mass of the contained glass beads to the mass of the marking material according to formula (1). The content of the surface scattered glass beads that sink into the marking line due to the spreading of glass beads during the marking can be ignored.

$$G = \frac{M}{M_0} \times 100\% \qquad \cdots\cdots (1)$$

Where:

G - The percentage of the mass of the contained glass beads to the mass of the marking material;

M - The mass of the glass beads, in grams (g);

M_0 - The mass of the specimen, in grams (g).

l) Calculate G for the three parallel tests respectively; take the average value.

6.3.2 Roundness of contained glass beads

The glass beads obtained in the test of 6.3.1 are used as specimens and the roundness of contained glass beads is tested according to the method specified in GB/T 24722.

6.4 Total organic content of hot-melt paint markings

The test is carried out according to the following steps.

a) Take an appropriate amount of the broken test block according to 6.3.1a); put it into a 30 mL ~ 50 mL porcelain crucible; place it in a desiccator to dry; weigh it after 24 hours (accurate to 0.01 g).

b) After weighing, put the porcelain crucible containing the broken test block into a muffle furnace with a maximum operating temperature of not less than 1000 °C and a temperature control accuracy within ±25 °C; heat it for 2 hours under the test conditions of (500 ± 25) °C; then cool it to room temperature; take it out and place it in a desiccator; weigh it for the first time after 24 hours (accurate to 0.01 g).

to Appendix A or using a marking thickness measuring instrument or digital caliper that meets the requirements.

6.8 Chromaticity performance

6.8.1 For the color of the marking material, the color coordinates and brightness factor of each test point shall be measured using a colorimeter with standard illuminant D65 and 45°/0° illumination observation conditions; the arithmetic mean shall be taken.

6.8.2 For the retroreflective color of the reflective marking, the illumination observation conditions of observation angle 1.05° and incident angle 88.76° shall be used to test according to the method specified in JT/T 692.1.

6.9 Photometric performance

6.9.1 Basic requirements

The center line of the two-lane road surface, lane dividing line, lane edge line, etc. shall be selected along the driving direction for testing.

6.9.2 Sample requirements

The test samples shall be selected according to the following requirements:

a) The initial retroreflective brightness coefficient shall be tested within 48 hours and 30 days after the marking is applied; the test shall be carried out after removing the excess glass beads on the marking surface;

b) The tested marking surface shall be dry and clean.

6.9.3 Environmental requirements

The test environment temperature shall be within the range of 10 °C ~ 40 °C; the relative humidity shall not exceed 85%.

6.9.4 Type I reflective marking test

6.9.4.1 Marking surface condition

The test of the retroreflective brightness coefficient of Type I reflective marking shall be carried out when the marking surface is dry.

6.9.4.2 Measuring instrument selection

The measuring instrument shall be selected according to the following requirements.

a) According to the method specified in JT/T 690, or using a portable marking retroreflective measuring instrument that meets the requirements of GB/T 26377,

Perform the test in the following steps.

a) Place the artificial continuous rainfall simulation spray device on the surface of the marking to ensure that the rainfall area and the test area are consistent.

b) The artificial continuous rainfall simulation spray device consists of a continuous rainfall environment chamber, an electric water pump, and a portable water storage tank. The size of the continuous rainfall environment chamber (length × width × height) is 610 mm × 400 mm × 810 mm. The main body of the chamber is made of aluminum alloy. The top shall be made of transparent material for easy testing and observation. A sprinkler head is installed on the top of the chamber to simulate continuous rainfall conditions after spraying. The electric water pump has a pressure of 0.48 MPa and a flow rate of 0.8 L/min ~ 3.5 L/min, driven by a battery installed on the base; the volume of the portable water tank is not less than 15 L.

c) Turn on the rainfall switch of the artificial continuous rainfall simulation sprinkler device; check the pressure and the atomization effect of the sprinkler head; ensure that the rainfall in the continuous rainfall environment chamber can be evenly sprayed on the test area; the rainfall is (50 ± 5) mm/h.

d) Place the retroreflective marking measuring instrument in the corresponding position, so that it can test the test area in the continuous rainfall environment chamber through the opening. The test diagram is shown in Figure 6.

e) Turn on the artificial continuous rainfall simulation sprinkler device, to allow the rain to completely soak the test marking.

f) After the marking is completely soaked, keep the rain continuously; start the measurement; record the measurement data every 10 seconds. When the retroreflection coefficient is measured for 6 consecutive times without obvious increase or decrease trend, it is considered that the retroreflection brightness coefficient has reached a stable state.

g) If the stable state is not reached within 5 minutes, the test fails. After reaching the stable state, start recording the measurement data; record the data 3 times every 10 seconds.

h) Other test steps shall be carried out according to 6.9.4.3.

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