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Delineator

轮廓标

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Delineator

1 Scope

This Standard stipulates the product classification, technical requirements, test methods, inspection rules as well as marking, packaging, transportation and storage of the delineator.

This Standard is applicable to delineator set up in China's highways and urban roads; while parking lots and other places where delineator need to be set may be implemented by reference.

2 Normative References

The following documents are essential to the application of this document. For the dated documents, only the versions with the dates indicated are applicable to this document; for the undated documents, only the latest version (including all the amendments) are applicable to this document.

GB/T 228.1 Metallic Materials - Tensile Testing - Part 1: Method of Test at Room Temperature

GB/T 2893.4 Graphical Symbols - Safety Colors and Safety Signs - Part 4: Colorimetric and Photometric Properties of Safety Sign Materials

GB/T 3681 Plastics - Methods of Exposure to Direct Weathering, to Weathering Using Glass-Filtered Daylight, and to Intensified Weathering by Daylight Using Fresnel Mirrors

GB/T 3880.1 Wrought Aluminum and Aluminum Alloy Plates, Sheets and Strips for General Engineering - Part 1: Technical Conditions of Delivery

GB/T 3978 Standard Illuminants and Geometric Conditions

GB/T 3979 Methods for the Measurement of Object Color

GB/T 9286 Paints and Varnishes - Cross Cut Test for Films

GB/T 10125 Corrosion Tests in Artificial Atmospheres - Salt Spray Tests

GB/T 18226 Specification for Steel Component Anticorrosion of Highway Engineering

3.4 Persistence luminous

The brightness of self-luminous marks at a certain moment in the persistence time.

4 Product Classification

According to the setting conditions, the delineators are divided into post delineator buried on the ground and attached delineator attached to the structure. According to the shape of the reflector, the delineators are divided into trapezoidal, circular and rectangular delineator. According to the color, the delineators are divided into white and yellow delineator.

5 Technical Requirements

5.1 Structural dimension

5.1.1 Post delineator

5.1.1.1 The post delineator is composed of a cylinder, a black mark and a reflector; and the three parts shall be firmly connected. The cylinder is white. There shall be a 250mm long black mark on the upper part of the cylinder. There shall be a 180mm×40mm rectangular reflector in the middle of the black mark. Energy storage self-luminous material may be added on the basis of the reflector.

5.1.1.2 The cross-section of the cylinder is an isosceles triangle or a circular arc with hollow fillets.

5.1.1.3 When the post cross section is an isosceles triangle, the height of the post is 1250mm; the height of the triangle is 120mm; and the length of the base-edge is 100mm. See Figure 1 for dimensions and errors.

When the reflector is a micro-prism reflector, it shall not be penetrated by water or mist.

5.9 Salt spray corrosion resistance

After the salt spray corrosion resistance test, there shall be no signs of discoloration, blistering, rust or erosion for each component. The reflector shall not be infiltrated by water or mist; the reflective film shall not leak, or its edges shall be peeled off; the energy storage self-luminous material shall not appear traces such as chalking, spots, bubbles, cracks or uneven appearance.

5.10 High and low temperature resistance

After the high and low temperature resistance test, there shall be no signs of damage such as cracks, flaking, chipping, blistering, warping or deformation.

5.11 Weather resistance

After continuous natural exposure or artificial accelerated aging test:

- a) There should be no obvious cracks, nicks, bubbles, rust, erosion, peeling, discoloration, chalking, or deformation on the delineator.
- b) The chromaticity coordinates and luminance factors of the various colors of the delineator shall be kept within the range specified in Table 1 or Table 2.
- c) The reflector shall not show any signs of water penetration; the reflective film shall not show the phenomenon of peeling off the edge; the energy storage self-luminous material shall not show signs of chalking, spots, bubbles, cracks or uneven appearance.
- d) The luminous intensity coefficient value of the reflector shall be no lower than 50% of the corresponding specified value in Table 3 or Table 4; the retroreflective coefficient value of the reflective film shall be no lower than 80% of the corresponding specified value in Table 5; the luminous properties of energy storage self-luminous material shall be maintained at more than 75% before the test; the energy storage self-luminous material shall not show signs of chalking, spots, bubbles, cracks or uneven appearance.

6 Test Methods

6.1 Test preparation

6.1.1 Preparation of specimen

The preparation of the specimen is as follows:

- a) Randomly extract the overall product of the delineator, or intercept a section of the cylindrical delineator with a complete black mark and reflective material, a length of no less than 350mm, as a product specimen;
- b) Randomly extract the reflector as a reflector specimen;
- c) Randomly select the reflective film, generally intercepting 1.22m×0.25m; and make the reflective film specimen according to the method specified in GB/T 18833;
- d) Randomly select the energy storage self-luminous material. Generally, 0.5m×0.5m is taken as the specimen of energy storage self-luminous material.

6.1.2 Test environment

The specimen shall be placed in an environment with a temperature of $23^{\circ}\text{C}\pm 2^{\circ}\text{C}$ and a relative humidity of $(50\pm 10)\%$. After being placed for 24h, various test work may be performed. General test work shall be carried out in an environment with a temperature of $23^{\circ}\text{C}\pm 2^{\circ}\text{C}$ and a relative humidity of $(50\pm 10)\%$.

6.2 Structural dimension

The composition of the structure shall be visually inspected; the external dimensions, the thickness of the plate, etc. shall be measured with tools such as a ruler and a plate thickness micrometer whose accuracy and range meet the requirements.

6.3 Appearance quality

6.3.1 Under the condition of daytime indoor illuminance greater than 70lx, visually inspect the appearance of the product or carefully check it with a 4X magnifier.

6.3.2 Put the blade of the knife-edge ruler close to the surface of the cylinder; measure the maximum gap between the surface of the cylinder and the blade, which is the surface unevenness tolerance.

6.4 Mechanical properties of material

6.4.1 The base plate and bracket materials shall be implemented in accordance with the provisions of the tensile test of metallic materials specified in GB/T 228.1.

6.4.2 Black marking materials shall be implemented in accordance with the provisions of the cross-cut test specified in GB/T 9286.

6.5 Colorimetric properties

6.5.1 Adopt the D65 standard illuminator and 45/0 lighting observation conditions specified in GB/T 3978, measure the reflectance of the specimen spectrum according to the method specified in GB/T 3979; and then calculate the chromaticity coordinates

of the color. Under the same conditions, respectively measure the illuminance of the specimen and the standard diffuse reflection whiteboard; and the ratio of the two is the illuminance factor. Or directly measure the chromaticity coordinates and illuminance factors of various colors.

6.5.2 The standard A light source and lighting observation conditions specified in GB/T 3978 are used: the field angle is $0.1^{\circ}\sim 1^{\circ}$, the incident angle is 0° , and the observation angle is 0.2° . According to the method specified in GB/T 3979, measure the reflectance of the reflector specimen spectrum, and then calculate the chromaticity coordinates of such color. Or directly measure the chromaticity coordinates of various colors.

6.6 Photometric Properties

6.6.1 Test principle and device

The test is carried out in a dark room. The test principle is shown in Figure 6; and the schematic diagram of the device is shown in Figure 7. Specifically:

- a) The light source adopts the standard A light source specified in GB/T 3978; and the spread angle of the reference center of the specimen to the light source aperture shall not exceed 0.2° . The unevenness of the vertical illuminance of the entire illuminated area of the specimen shall be no greater than 5%.
- b) The light detector is an illuminance meter calibrated by the spectral light efficiency curve, which is installed directly above the light source. The spread angle of the reference center of the specimen to the photodetector aperture shall be no greater than 12° [Translator Note: here it should be 12°]. The photodetector shall be able to move freely up and down to ensure that the observation angle changes from 0.2° to 1° or in greater range.
- c) The distance from the front surface of the photodetector to the sample surface shall be no less than 15m.
- d) Install the reflector specimen or the reflective film specimen of no less than $150\text{mm}\times 150\text{mm}$ on a rotatable sample holder. When it rotates along the second axis, the specimen can obtain the incident angle β_2 ; when it rotates along the first axis, the specimen can obtain the incident angle β_1 .

6.10 Salt spray corrosion resistance

According to the requirements of GB/T 10125, dissolve chemically pure sodium chloride in distilled water to prepare a $(5.0 \pm 0.1)\%$ (mass fraction) salt solution (pH value between 6.5 and 7.2); so that the salt solution is continuously atomized in salt fog box; and the temperature in the box is maintained at $35^{\circ}\text{C} \pm 2^{\circ}\text{C}$. The test surface of the specimen is at an angle of 30° to the vertical direction; and the two adjacent samples maintain a certain gap with the line spacing no less than 75mm; and the product specimen or the reflective film specimen are continuously exposed in the salt spray space for 120h. After the test, use the running water to wash off the salt deposits on the surface of the specimen; then rinsed by distilled water; and then placed under standard test conditions to recover for 2h. Finally, use a 4X magnifier for a comprehensive inspection.

6.11 High and low temperature resistance

Put the product specimen or the reflective film specimen into the test chamber; start the cold source; and gradually reduce the temperature in the box to $-40^{\circ}\text{C} \pm 3^{\circ}\text{C}$; the specimen is kept at this temperature for 72h. Turn off the power, and let the test box warm up naturally to room temperature (for about 5h~12h). The temperature of the test chamber was raised to $70^{\circ}\text{C} \pm 3^{\circ}\text{C}$; and maintained at this temperature for 24 hours. Finally turn off the power, and let the test chamber naturally cool to room temperature. Take out the specimen and place it under standard test conditions for 2h; then use 4X magnifier to check the change of its surface.

6.12 Weather resistance

6.12.1 The weather resistance performance test time is:

- a) The natural exposure test is 2 years;
- b) The artificial weather accelerated aging test is 1200h.

6.12.2 The natural exposure test method is:

- a) According to the requirements of GB/T 3681, install the product specimen or the reflective film specimen (the size of the reflective film specimen shall be no less than 150mm×250mm) on the surface of exposure rack at least 0.8m above the ground; with the specimen surface facing due south, and form the local latitude angle or $45^{\circ} \pm 1^{\circ}$ with the horizontal surface. The surface of the specimen shall not be shielded by other objects from sunlight, and no water may accumulate on it.
- b) The selection of exposure location is as close as possible to the actual use environment or represents the place with most severe weather of a certain climate type.

7.1.2 If one of the following conditions occurs, type inspection shall be carried out:

- a) In the formal production process, if there are major changes in raw materials and processes, which may affect product performance;
- b) When the production is restored after more than half a year shutdown;
- c) When there is a big difference between the exit-factory inspection result and the last type inspection.

7.2 Batching, sampling and judgment

7.2.1 Batching

The delineators made of the raw materials with the same batch number, the same formula and the same specifications may be regarded as a batch, generally no more than 1000 pieces.

7.2.2 Sampling

Sampling shall be performed according to JT/T 495.

7.2.3 Judgment rules

If any of the indicators does not meet the requirements in the type inspection, re-take double quantities of specimens, re-inspect this indicator. When the re-inspection result is still unqualified, the type inspection is judged as unqualified.

If any of the indicators in the exit-factory inspection items does not meet the requirements of this Standard, re-take double quantities of specimens and re-inspect the indicators; if the re-inspection sample is still unqualified, such batch is determined to be a disqualified batch.

8 Marking, Packaging, Transportation and Storage

8.1 Marking

The delineator shall have clear and durable mark. The mark of the post delineator shall be set on the surface of the cylinder 50mm~200mm from the ground. The mark of the attached delineator shall be set on the reflector surface or the bracket. Its contents include:

- a) The manufacturer's name, trademark or other symbol that can represent the manufacturer;
- b) The implemented standards include standard codes, serial numbers and year

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