SLR-37-12

Annex XX

Resistance to water penetration for retro-reflective devices

1. Test for retro-reflective devices

1.1. Retro-reflective devices whether part of a lamp or not, or a sample unit of retro-reflective marking, shall be stripped of all removable parts and immersed for 10 minutes in water at a temperature of 50 °C ± 5 °C, the highest point of the upper part of the illuminating surface being 20 mm below the surface of the water. This test shall be repeated after turning the retro-reflective device through 180°, so that the illuminating surface is at the bottom and the rear face is covered by about 20 mm of water. These sample units shall then be immediately immersed in the same conditions in water at a temperature of 25 °C ± 5 °C.

1.2. No water shall penetrate to the reflecting surface of the retro-reflecting optical unit. If visual inspection clearly reveals the presence of water, the device shall not be considered to have passed the test.

1.3. If visual inspection does not reveal the presence of water or in case of doubt:

1.3.1. In the case of retro-reflectors, the CIL shall be measured by the method described in Annex 4 or Annex 14, the retro-reflective device being first lightly shaken to remove excess water from the outside.

1.3.2. In the case of a sample unit of retro-reflective marking the coefficient of retro-reflection R' shall be measured in conformity with Annex 7, the sample unit being first lightly shaken to remove excess water from the outside.

2. In case of advance warning triangles

The triangle - collapsible advance warning triangles are to be assembled as for use - shall be immersed flat for two hours on the bottom of a tank containing water at 25 °C ± 5 °C, with the active face of the triangle showing upwards and being 5 cm under the surface of the water. The triangle shall then be removed and dried. No part of the device may exhibit clear signs of deterioration which might impair the effectiveness of the triangle.

3. In case of marking plates

A section of a sample unit not less than 300 mm long shall be immersed in distilled water at a temperature of 23 ± 5ºC for a period of 18 hours; it shall then be left to dry for 24 hours under normal laboratory conditions.

After completion of the test, the section shall be examined. No part inside 10 mm from the cut edge shall show evidence of deterioration which would reduce the effectiveness of the plate.

Annex 8

 Alternative test procedures of resistance to water penetration for retro-reflective devices of the Classes IB and IIIB

1. As an alternative, at the request of the manufacturer, the following tests (moisture and dust test) shall be applied.

2. Moisture test

 The test evaluates the ability of the sample device to resist moisture penetration from a water spray and determines the drainage capability of those devices with drain holes or other exposed openings in the device.

2.1. Water spray test equipment

 A water spray cabinet with the following characteristics shall be used:

2.1.1. Cabinet

 The cabinet shall be equipped with a nozzle(s) which provides a solid cone water spray of sufficient angle to completely cover the sample device. The centreline of the nozzle(s) shall be directed downward at an angle of 45°± 5° to the vertical axis of a rotating test platform.

2.1.2. Rotating test platform

 The rotating test platform shall have a minimum diameter of 140 mm and rotate about a vertical axis in the centre of the cabinet.

2.1.3. Precipitation rate

 The precipitation rate of the water spray at the device shall be 2.5 (+1.6/-0) mm/min as measured with a vertical cylindrical collector centred on the vertical axis of the rotating test platform. The height of the collector shall be 100 mm and the inside diameter shall be a minimum of 140 mm.

2.2. Water spray test procedure

 A sample device mounted on a test fixture, with initial CIL measured and recorded shall be subjected to a water spray as follows:

2.2.1. Device openings

 All drain holes and other openings shall remain open. Drain wicks, when used, shall be tested in the device.

2.2.2. Rotational speed

 The device shall be rotated about its vertical axis at a rate of 4.0 ± 0.5 min -1.

2.2.3. If the retro-reflector is reciprocally incorporated or grouped with signalling or lighting functions, these functions shall be operated at design voltage according to a cycle of 5 min ON (in flashing mode, where appropriate), 55 min OFF.

2.2.4. Test duration

 The water spray test shall last 12 hours (12 cycles of 5/55 min).

2.2.5. Drain period

 The rotation and the water spray shall be turned OFF and the device allowed to drain for 1 hour with the cabinet door closed.

2.2.6. Sample evaluation

 Upon completion of the drain period. The interior of the device shall be observed for moisture accumulation. No standing pool of water shall be allowed to be formed, or which can be formed by tapping or tilting the device. The CIL shall be measured according to the method specified in Annex 4 after having dried the exterior of the device with a dry cotton cloth.

2.3. Dust exposure test

 This test evaluates the ability of the sample device to resist dust penetration which could significantly affect the photometric output of the retro-reflector.

2.3.1. Dust exposure test equipment

 The following equipment shall be used to test for dust exposure:

2.3.2. Dust exposure test chamber

 The interior of the test chamber shall be cubical in shape in size 0.9 to 1.5 m per side. The bottom may be "hopper shaped" to aid in collecting the dust. The internal chamber volume, not including a "hopper shaped" bottom shall be 2 m3 maximum and shall be charged with 3 to 5 kg of the test dust. The chamber shall have the capability of agitating the test dust by means of compressed air or blower fans in such a way that the dust is diffused throughout the chamber.

2.3.3. The dust

 The test dust used shall be fine powdered cement in accordance with standard ASTM C 150-84.[[1]](#footnote-1)\*

2.3.4. Dust exposure test procedure

 A sample device, mounted on a test fixture, with the initial CIL measured and recorded, shall be exposed to dust as follows:

2.3.5. Device openings

 All drain holes and other openings shall remain open. Drain wicks, when used, shall be tested in the device.

2.3.6. Dust exposure

 The mounted device shall be placed in the dust chamber no closer than 150 mm from a wall. Devices with a length exceeding 600 mm shall be horizontally centred in the test chamber. The test dust shall be agitated as completely as possible by compressed air or blower(s) at intervals of 15 min for a period of 2 to 15 s for the duration of 5 hours. The dust shall be allowed to settle between the agitation periods.

2.3.7. Measured sample evaluation

 Upon completion of the dust exposure test, the exterior of the device shall be cleaned and dried with a dry cotton cloth and the CIL measured according to the method specified in Annex 4.

1. \* American Society for Testing and Materials [↑](#footnote-ref-1)