NORME INTERNATIONALE

INTERNATIONAL STANDARD

CEI
IEC
60598-2-3

Troisième édition
Third edition
2002-12

Luminaires –

Partie 2-3:
Règles particulières –
Luminaires d'éclairage public

Luminaires –

Part 2-3:
Particular requirements –
Luminaires for road and street lighting

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International Electrotechnical Commission
Международная Электротехническая Комиссия

CODE PRIX
PRICE CODE P

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

LUMINAIRES –

Part 2-3: Particular requirements – Luminaires for road and street lighting

FOREWORD

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This International Standard IEC 60598-2-3 has been prepared by subcommittee 34D: Luminaires, of IEC technical committee 34: Lamps and related equipment.

This third edition cancels and replaces the second edition, published in 1993, and its amendments 1 (1997) and 2 (2000) as well as interpretation sheets IS 01 and IS 02 (2001). It constitutes a technical revision.

The text of this standard is based on the following documents:

FDIS	Report on voting
34D/762/FDIS	34D/772/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

This standard is to be read in conjunction with IEC 60598-1.

The changes to the text introduced by this new edition introduce requirements for column-integrated luminaires.

The text introduced by interpretation sheets IS 01 and IS 02 is contained in subclause 3.6.5 Note 1 and subclause 3.12.1, second paragraph, respectively.

The committee has decided that the contents of this publication will remain unchanged until July 2006. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

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LUMINAIRES –

Part 2-3: Particular requirements – Luminaires for road and street lighting

3.1 Scope

This part of IEC 60598 specifies requirements for

- luminaires for road, street lighting and other public outdoor lighting applications;
- tunnel lighting;
- column-integrated luminaires with a minimum total height above normal ground level of 2,5 m;

and for use with electrical lighting sources on supply voltages not exceeding 1 000 V.

NOTE Column integrated luminaires with a total height below 2,5 m are under consideration.

3.1.1 Normative references

The normative references listed in Section 0 of IEC 60598-1 apply to this part as well as the following reference:

IEC 60364-7-714, 1996, *Electrical installations of buildings – Part 7: Requirements for special installations or locations – Section 714: External lighting installations*

IEC 60068-3-76:1997, *Environmental testing – Part 2-75: Tests – Test Eh: Hammer tests*

3.2 General test requirements

The provisions of Section 0 of IEC 60598-1 apply.

The tests described in each appropriate section of Part 1 shall be carried out in the order listed in this section of Part 2.

In order to facilitate testing, and due to the dimensions of the sample, it is allowed to make use of the appropriate parts of the luminaire only (this is mainly applicable to column-integrated luminaires).

3.3 Definitions

For the purposes of this section, the definitions of Section 1 of IEC 60598-1 apply together with the following definitions.

3.3.1
span wire
wire between main supports which carries the weight of the complete installation.

NOTE This may include several luminaires, supply cables and a stay wire.

3.3.2
suspension wire
wire attached to the span wire and carrying the weight of the luminaire

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3.3.3
stay wire
tensioned wire between main supports to limit lateral and rotary movement of the suspended luminaires

3.3.4
column-integrated luminaires
lighting systems formed with a luminaire integrated in a lighting column fixed in the ground

3.3.5
reflective or decorative external part of a column-integrated luminaire
device reflecting the light in a fixed direction or with a decorative purpose, mounted outside the lamp compartment generally at the top of the column-integrated luminaire

NOTE Such devices are referred to in this standard as "external parts".

3.3.6
lighting column
support intended to hold one or more luminaires, consisting of one or more parts: a post, possibly an extension piece, and if necessary a bracket. It does not include columns for catenary lighting

3.3.7
nominal height of a column-integrated luminaire
distance between the centre line of the point of entry of the external part and the intended ground level, for column-integrated luminaires planted in the ground, or the bottom of the flange plate, for column-integrated luminaires with a flange plate

3.3.8
door opening of a column-integrated luminaire
opening in the column of a column-integrated luminaire for access to electrical equipment

3.3.9
cable entry slot of a column integrated luminaire
opening in the part of a column-integrated luminaire below ground for the cable entry

3.3.10
connection box of a column integrated luminaire
box containing terminal blocks: protecting devices allowing the connection of a column-integrated luminaire to the mains and the looping of electricity supply cables

3.3.11
tunnel luminaires
luminaires for lighting tunnels which are mounted direct or on frames to the wall or ceiling of the tunnel

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3.4 Classification of luminaires

Luminaires shall be classified in accordance with the provisions of Section 2 of IEC 60598-1.

NOTE Luminaires for road and street lighting are normally suitable for one or more of the following modes of installation:

a) on a pipe (bracket) or the like;

b) on a mast (column) arm;

c) on a post top;

d) on span or suspension wires;

e) on a wall.

3.5 Marking

The provisions of Section 3 of IEC 60598-1 apply. In addition, the following information shall be provided in the instruction leaflet supplied with the luminaire:

a) design attitude (normal operating position);

b) weight including control gear if any;

c) overall dimensions;

d) if intended for mounting more than 8 m above ground level, the maximum projected area subjected to wind force (see 3.6.3.1);

e) the range of cross-sectional areas of suspension wires suitable for the luminaire, if applicable;

f) suitability for use indoors provided the 10 °C, allowed for the effects of natural air movement, has not been deducted from measured temperature (see 3.12.1);

g) dimensions of the compartment in which the connection box is placed;

h) the torque setting in newton metres to be applied to any bolts or screws which fix the luminaire to its support.

3.6 Construction

The provisions of Section 4 of IEC 60598-1 apply together with the requirements of 3.6.1 to 3.6.5.

3.6.1 All luminaires shall have protection against ingress of moisture of at least IPX3, except for tunnel-lighting luminaires and glazing of column-integrated luminaires with an open-sided external part, for which IPX5 is required.

For column-integrated luminaires, door opening included, the IP classification shall be as follows:

1) parts below 2,5 m: IP3X (see IEC 60364-7-714)

2) parts above 2,5 m: IP2X (when the external part is open-sided, the IP classification of the glazing shall be 5X)

3.6.2 Luminaires for suspension on span wires shall be fitted with clamping devices for this purpose and the range of span-wire sizes for which the clamping devices are suitable shall be stated in the instruction leaflet supplied with the luminaire. The device shall clamp the span wire to prevent movement of the luminaire with respect to the span wire.

The suspension devices shall not damage the span wire during installation and during normal use of the luminaire.

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Compliance is checked by inspection after fitting the luminaire to the smallest and largest span wires in the range stated by the luminaire manufacturer.

NOTE Care should be taken to avoid electrolytic corrosion between the clamping device and the span wire.

3.6.3 The means for attaching the luminaire or external part to its support shall be appropriate to the weight of the luminaire or external part. The connection shall be designed to withstand wind speeds of 150 km/h on the projected surface of the assembly without undue deflection.

Fixings which carry the weight of the luminaire or external part and internal accessories shall be provided with means to prevent the dislodgement of any part of the luminaire or external part by vibration, either in service or during maintenance.

Parts of luminaires or external parts which are fixed other than with at least two devices, for example, screws or equivalent means of sufficient strength, shall have such extra protection as to prevent those parts falling and endangering persons, animals and surroundings, should a fixing device fail under normal conditions.

Compliance is checked by inspection and, for mast-arm or post-top mounted luminaires or external parts, by the test of 3.6.3.1.

The wind-force test is not required to be performed on tunnel luminaires.

NOTE In considering the possible effects of vibration, the luminaire should be studied in conjunction with the lamp and the column with which it may be used.

3.6.3.1 Static load test for mast-arm or post-top mounted luminaires or external parts

The luminaire or external part is mounted in such a way that the most critical surface is loaded.

The most critical surface is determined by calculating the highest value of $Cd \times S$

where

Cd is the drag coefficient;

S is the area of the surface to be loaded (m^2).

The drag coefficient depends on the shape of the surface. For luminaires or external parts for which the Cd is not measured, the value of 1,2 shall be taken.

NOTE 1 See Annex A for measurement of Cd.

The means of attachment shall be secured in accordance with the manufacturer's instructions.

A constant evenly distributed load is applied for 10 min on the most critical surface.

NOTE 2 See Figure 1 for methods of equal distribution of the load. In cases where bags are used, these can be filled with sand, lead shot or small balls.

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The load shall be equal to

$$F = 1/2\ Rh \times S \times Cd \times V^2\ (\mathrm{N})$$

where

Rh is equal to 1,225 kg/m^3 (air volumic mass);

V is the wind speed (m/s).

The wind speeds relevant to the mounting heights of luminaires or external parts shall be

V = 45 m/s (163 km/h) for heights up to 8 m;

V = 52 m/s (188 km/h) for heights between 8 m and 15 m;

V = 57 m/s (205 km/h) for heights of more than 15 m.

NOTE 3 In some countries, the wind speed is determined by national rules (for example, Japan).

The drag coefficient is 1,2 (or the exact value measured in Annex A).

After the test, there shall be no visible failure impairing the safety, no permanent deformation from the attachment which exceeds a slope of more than 2 cm/m, and no rotation around the point of attachment.

3.6.4 If the use of a single lampholder does not ensure the correct position of the lamp, an adequate supporting device shall be provided.

For adjustable lampholders or optical parts, suitable reference marks shall be provided.

Compliance is checked by inspection.

3.6.5 Glass covers shall either consist of a glass that fractures into small pieces or shall be provided with a guard of sufficiently small mesh or a film-coated glass that retains glass fragments.

For flat glass covers compliance is checked by inspection and, if the glass is not provided with a guard, by the following test.

The glass component is supported over the whole area to ensure that particles will not be scattered upon fragmentation and that movement of the particles is prevented. Shatter the glass with a centre punch at a point 30 mm from the mid-point of one of the longer edges of glass towards the centre. Within 5 min of fracture, count the particles in a 50 mm square, located approximately at the centre of the area of coarsest fracture but always within the confines of the glass.

NOTE Where possible, the area of measurement should not be within 30 mm of any edge, hole or machining of the glass.

A glass is deemed to have passed the test if the number of particles in the 50 mm square is more than 60; glass splinters and pieces less than the full thickness of the glass being excluded from the count. For glass of smaller size where a 50 mm × 50 mm area is not possible, the number of pieces necessary in the count is proportionately reduced.

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In the count of the total number of particles in the 50 mm square, the particles in the centre of the square plus those at the edge shall be taken into account. In order to count particles at the edge of the square, it is recommended that all pieces intersected by two adjacent sides be included and all particles intersected by the two other sides be ignored (see Figure 2).

A suitable method of counting the particles is to place a square of 50 mm side, of transparent material over the glass and mark a spot of ink as each particle within the square is counted.

NOTE 1 When the test sample remains as one sheet, the fragmentation lines would normally be used to indicate fractures and the size and number of particles would thus be evaluated, unless reinforcing or a film were employed.

NOTE 2 For glass covers formed from a flat plate, a test is under consideration.

3.6.6 The connection compartment of column-integrated luminaires shall provide adequate space within the door opening for

- the luminaire terminals;
- the protective devices;
- the termination and looping of electricity supply cables;
- the connection box (if any).

The compartment shall be provided with means for attaching such equipment. Where such means is of metal, it shall be of corrosion-resistant material or suitably protected against corrosion.

3.6.7 With regard to load calculation and verification of structural design by testing, column-integrated luminaires, except for their external part, shall comply with ISO standards, where available, otherwise regional or national standards, where applicable.

NOTE In Europe the EN 40, in Japan the JIL 1003 and in North America the ANSI C136 series apply

3.6.8 The door of a column-integrated luminaire shall be treated against corrosion in accordance with the treatment applied to the column-integrated luminaire.

Compliance is checked by inspection and by the test specified in 4.18 of Part 1.

The opening of the door shall be designed in such a way that only authorized persons will be able to open it.

A type test will be performed on a sample of the door. The test equipment shall be that used for the pendulum hammer, the vertical fall, spring-operated impact test apparatus specified in IEC 60068-2-75 or by other suitable means giving equivalent results. An impact energy of 5 Nm shall be applied three times.

Blows will be applied in the centre of the door on the largest side when the door has several facets.

After the test, the sample shall show no damage, in particular :

- the locking device shall still be operational;
- no visible cracks shall be present on the sample;
- the level of IP protection shall not be reduced (see 3.6.1).

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3.6.9 For column-integrated luminaires:

- the cable entry slot shall be not less than 50 mm × 150 mm;
- the cable path from the slot to the connection compartment shall be not less than 50 mm, and shall be free from obstructions, sharp edges, burrs, flashes and the like that might cause abrasion of the cables.

Compliance is checked by inspection and by measurements.

NOTE In the USA, the size of the cable entry slot has to be in accordance with ANSI C136.

3.7 Creepage distances and clearances

The provisions of Section 11 of IEC 60598-1 apply.

3.8 Provision for earthing

The provisions of Section 7 of IEC 60598-1 apply together with the requirements of 3.8.1.

3.8.1 The attachment of the fixed part of the terminal shall be designed and executed so as to prevent it from being rotated when the clamping part is moved.

Compliance is checked by inspection and by the mechanical tests specified in Sections 14 and 15 of Part 1.

3.9 Terminals

The provisions of Sections 14 and 15 of IEC 60598-1 apply.

Terminals for supply connection shall allow the connection of conductors having nominal cross-sectional areas according to Table 14.1 of Section 14 of IEC 60598-1, excluding the provision of supply cables with cross-sectional areas smaller than 1 mm^2.

Compliance is checked by fitting conductors of the smallest and largest cross-sectional areas specified.

3.10 External and internal wiring

The provisions of Section 5 of IEC 60598-1 apply together with the requirements of 3.10.1.

3.10.1 A luminaire for road and street lighting shall be provided with a cord anchorage such that the conductors for supply cables are relieved from strain where they are connected to the terminals, if, without the cord anchorage, the weight of the supply cables would exert a strain on the connections.

Compliance is checked by the relevant test of Section 5 of IEC 60598-1, but with a pull of 60 N and a torque of 0,25 Nm.

The values for the pull and the torque to be applied depend on the weight of the supply cables. In general, the specified values are adequate, but for luminaires intended to be mounted higher than 20 m and where the weight of the supply cables affecting the cord anchorage exceeds 4 kg a pull of 100 N and a torque of 0,35 Nm are applied.

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3.11 Protection against electric shock

The provisions of Section 8 of IEC 60598-1 apply.

3.12 Endurance tests and thermal tests

The provisions of Section 12 of IEC 60598-1 apply together with the following.

3.12.1 When applying the limits given in the tables of Section 12 of IEC 60598-1, 10 °C shall be deducted from the temperatures measured on the luminaire in the test enclosure to allow for the effects of natural air movement which occur in the working environment of the luminaire.

Products intended for use outdoors only shall be tested at their declared t_a ± 5 °C. 10 °C can then be deducted from the measured temperature after the test.

3.12.2 Luminaires with an IP classification greater than IP20 shall be subjected to the relevant tests of 12.4, 12.5 and 12.6 of Section 12 of IEC 60598-1 after the test(s) of 9.2 but before the test(s) of 9.3 of Section 9 of IEC 60598-1 specified in 3.13 of this section of IEC 60598-2.

3.13 Resistance to dust and moisture

The provisions of Section 9 of IEC 60598-1 apply together with the following.

3.13.1 For luminaires with an IP classification greater than IP20 the order of the tests specified in Section 9 of IEC 60598-1 shall be as specified in 3.12 of this section of IEC 60598-2.

3.14 Insulation resistance and electric strength

The provisions of Section 10 of IEC 60598-1 apply.

3.15 Resistance to heat, fire and tracking

The provisions of Section 13 of IEC 60598-1 apply.

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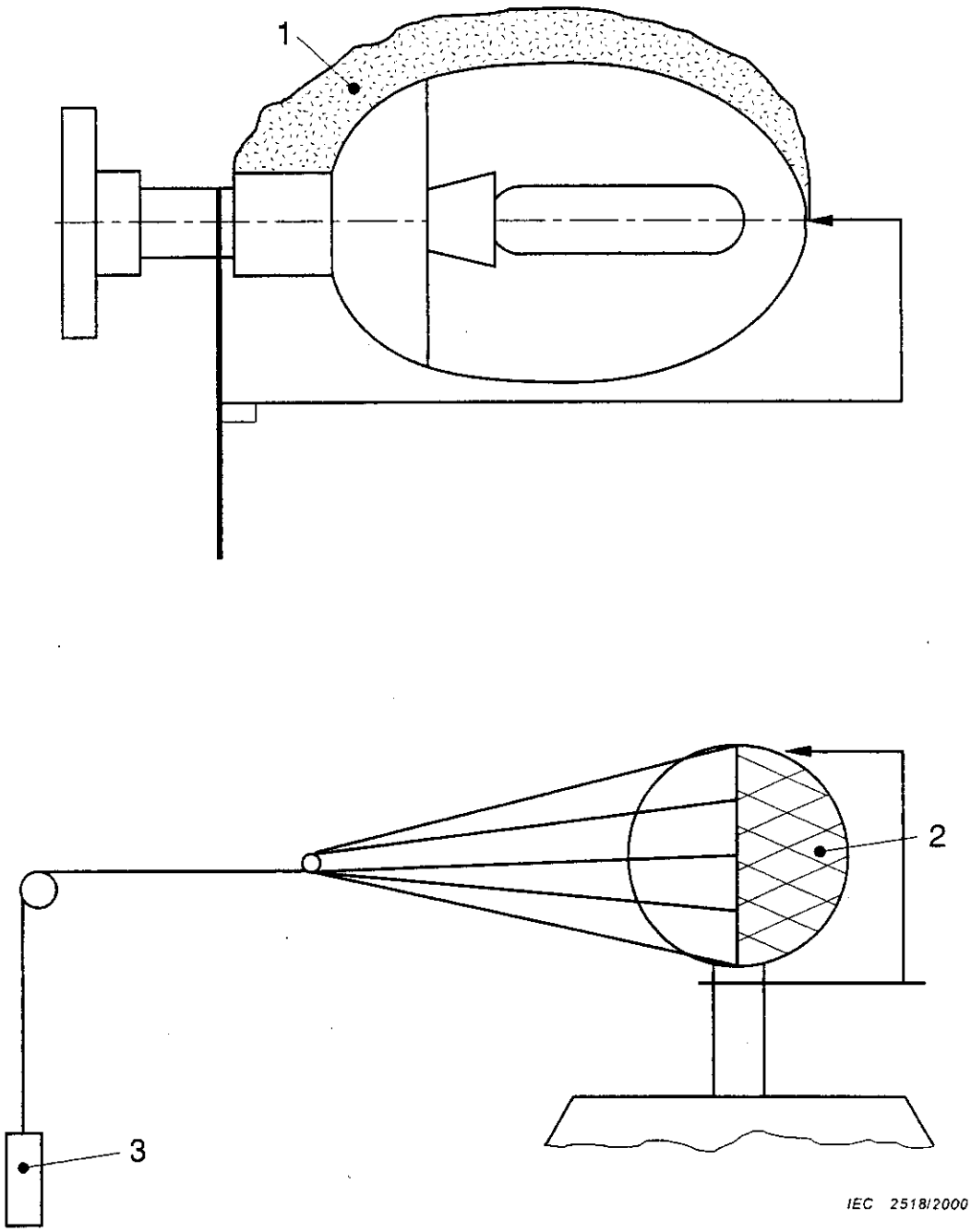
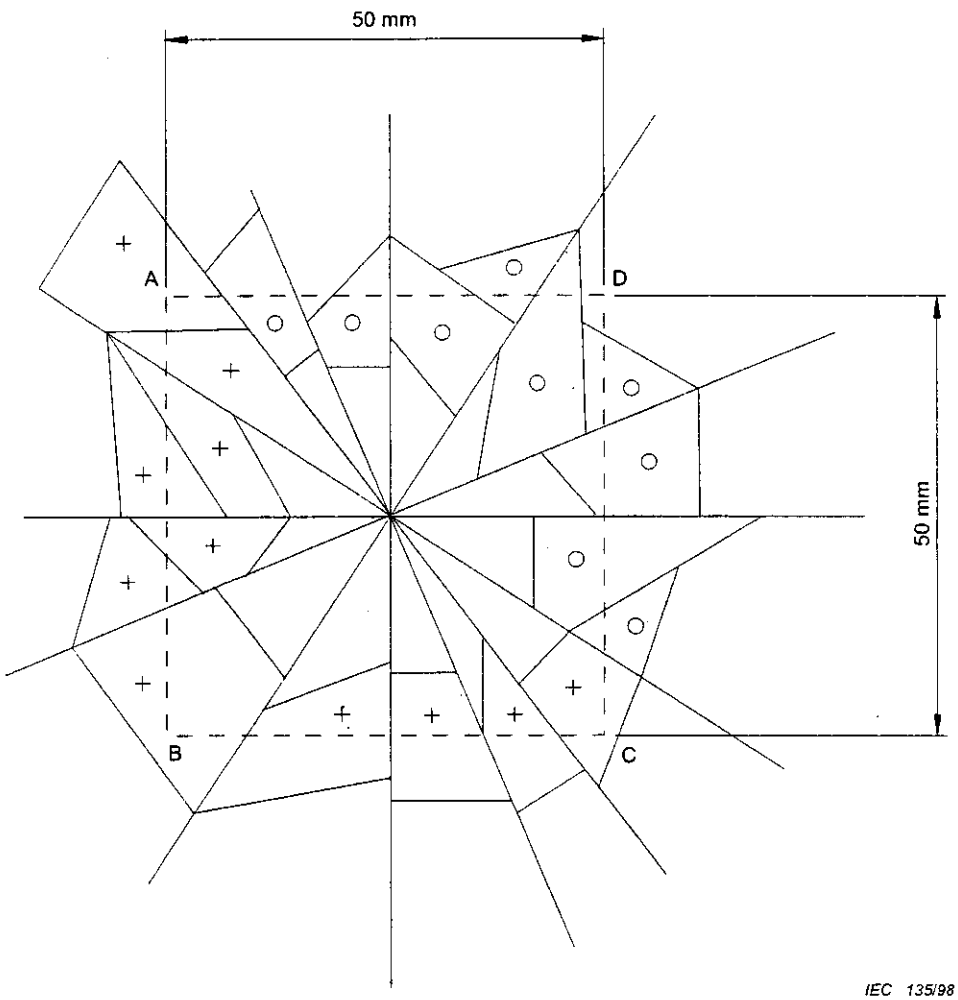


Key

1 Sandbag
2 Net
3 Weight

Figure 1 – Different procedures for the static wind-force test



+ Particles counted (intersected by two selected adjacent sides: AB/BC)

○ Particles not counted (not intersected by two selected adjacent sides: AB/BC)

Figure 2 – Counting particles at the edge of the square

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Annex A
(informative)

Drag coefficient measurement

A.1 Measurement methods

The drag coefficient measurement is performed in the same way as the method used to determine the drag coefficient values introduced in ISO 4354.

The luminaire measurement is easier than measurement on a complicated structure (motionless tested luminaire representing the actual size of the luminaire).

The common practice is to place the luminaire as indicated by the manufacturer's installation rules in a wind tunnel.

The wind tunnel should be such that the surface *S* of the luminaire represents 5 % maximum of the cross-sectional area of the wind tunnel.

The wind speed used in the measurement should represent as far as possible the reality, according to 3.6.3.1. A speed of 25 m/s should be considered as a minimum.

After the measurement, no visible failure must impair the safety of the luminaire.

A.2 Reference documents

ISO 4354:1997, *Wind actions on structures*

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Annex B
(normative)

Schedule of amended clauses containing more serious/critical requirements which require products to be retested

This new edition of IEC 60598-2-3 broadens the scope of the standard to incorporate requirements for column-integrated luminaires. For other types of luminaires for road and street lighting, this new edition introduces no requirements that are more serious or critical. Consequently, luminaires for road and street lighting which have been shown to comply with IEC 60598-2-3, second edition, including its amendment 1 (1997) and its amendment 2 (2000), can be accepted as complying with this new edition without retesting.

NOTE Where more serious/critical requirements are introduced in future amendments/editions of this standard, these clauses will be marked 'R' and scheduled in this annex.

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