American National Standard for Roadway and Area Lighting Equipment—Ingress Protection (Resistance to Dust, Solid Objects, and Moisture) for Luminaire Enclosures and Devices

C136.25-2025

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Foreword

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1 Scope

This standard details the requirements for ingress protection of luminaires and devices in roadway and area lighting equipment, installed for their intended use and specified by the end-user. While these requirements are suitable for most types of lighting equipment, it should not be assumed that all the listed degrees of protection apply to a particular type of equipment. The manufacturer of the equipment should be consulted to determine the degrees of protection available.

The adoption of this standard should promote uniform methods of describing the protection provided by the lighting equipment (luminaire) enclosure and devices.

Note: The basis for this standard is IEC 60529, *Degrees of protection provided by enclosures (IP Code)*, and IEC 60598-1, *Luminaires—Part 1: General requirements and tests, Section 9, Resistance to dust, solid objects, and moisture*. Tables 1, 2, and 3, in particular, are based on IEC 60529.

The types of protection covered by this standard are as follows:

a. protection of persons against contact with or approach to energized electrical components inside the light fixture (luminaire) enclosure and protection of the equipment against ingress of solid foreign bodies; and
b. protection of the equipment inside an enclosure against harmful ingress of water, solid foreign objects, or dust.

It should be noted that the IP rating of a luminaire has no bearing on its dirt depreciation characteristics. Testing is performed on new luminaires and is not an indicator of the life or reliability of the luminaire during its service life. Some components, such as seals and gaskets, deteriorate over time with exposure to heat and the environment and should be evaluated separately.

2 Normative References

This standard is intended to be used in conjunction with the following publications. The latest edition of the publication applies (including amendments).

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

IEC 60598-1, *Luminaires—Part 1: General requirements and tests, Section 9, Resistance to dust, solid objects, and moisture.*

ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*

ANSI C136.6, *American National Standard for Roadway and Area Lighting Equipment—Metal Heads and Reflector Assemblies—Mechanical and Optical Interchangeability*

ANSI C136.10, *American National Standard for Roadway and Area Lighting Equipment—Locking-Type Photocontrol Devices and Mating Receptacles—Physical and Electrical Interchangeability and Testing*

ANSI C136.14, *American National Standard for Roadway and Area Lighting Equipment—Elliptically Shaped, Enclosed Side-Mounted Luminaires*

ANSI C136.16, *American National Standard for Roadway and Area Lighting Equipment—Enclosed Post Top-Mounted Luminaires*

ANSI C136.18, *American National Standard for Roadway and Area Lighting Equipment—High-Mast Side-Mounted Luminaires*

ANSI C136.23, *American National Standard for Roadway and Area Lighting Equipment—Enclosed Architectural Luminaires*

ANSI C136.24, *American National Standards for Roadway and Area Lighting Equipment—Non-Locking (Button)-Type Photocontrols*

ANSI C136.27, *American National Standard for Roadway and Area Lighting Equipment—Tunnel Lighting and Underpass Luminaires*

ANSI C136.32, *American National Standard for Roadway and Area Lighting Equipment—Enclosed Setback Luminaires and Directional Floodlights for High-Intensity Discharge (HID) Lamps*

ANSI C136.35, *American National Standard for Roadway and Area Lighting Equipment—Locking Type Power Taps (LTPT)*

ANSI C136.37, *American National Standard for Roadway and Area Lighting Equipment—Solid State Luminaires Used in Roadway and Area Lighting*

ANSI C136.41, *American National Standard for Roadway and Area Lighting Equipment—Interface between an External Locking Type Control Device and Ballast or Driver*

ANSI C136.43, *American National Standard for Roadway and Area Lighting Equipment—Side-Mounted Solid State Security Luminaires*

ANSI C136.48, *American National Standard for Roadway and Area Lighting Equipment—Wireless Networked Lighting Controllers*

ANSI C136.58, *American National Standard for Roadway and Area Lighting Equipment—Luminaire Four-Pin Extension Module and Receptacle—Physical and Electrical Interchangeability and Testing*

3 Definitions

degrees of protection: The extent of protection provided by a luminaire or device enclosure against ingress of foreign objects or water, verified by standardized test methods.

direct contact: Contact of persons with energized components.

enclosure: A part that provides protection of equipment against external effects and direct contact.

hazardous live part: A part that, when energized, presents a danger to human touch.

Hazardous part: A part that presents a danger to human touch.

IP code: A coding system to indicate the degree of protection afforded by a lighting fixture (luminaire) or device against the ingress of foreign objects or water.

opening: A gap or aperture in an enclosure that exists or that may be formed by the introduction of a test probe.

probe, access: A test probe simulating a part of a person or tool to verify the possibility of ingress into an enclosure.

probe, object: A test probe simulating a foreign object to verify the possibility of ingress into an enclosure.

protection provided by an enclosure against access to hazardous parts: The protection of persons against contact with hazardous parts or hazardous live parts. This protection may be provided by the enclosure itself or through barriers as part of the enclosure, or distances inside the enclosure.

4 Designation of Protection

The degree of protection provided by an enclosure is indicated in the IP Code in the following manner:

Code alphanumeric order	First	Second	Third	Fourth
Code alphanumeric definition	Solid particle protection	Liquid ingress protection	Other protection	Other protection
Requirement	Yes	Yes	Optional	Optional
IP	0-6 or X	0-9 or X	F, H, M, S or W	F, H, M, S or W

The first numeral shall indicate the degree of protection provided by the enclosure against human contact or an object held by a person that could contact a hazardous part, and simultaneously, the protection of the equipment against the ingress of foreign objects, including dust. An enclosure shall be designated with a stated degree of protection indicated by the first numeral only if it complies with all lower degrees of protection.

The second numeral shall indicate the degree of protection provided by the enclosure against the harmful effects of the ingress of moisture.

Where a numeral is not required to be specified, the letter X shall replace it.

The third and fourth letter are optional supplementary letters for specific additional protections.

When an enclosure (luminaire or device) provides different degrees of protection for different mounting arrangements, the relevant information shall be indicated by the manufacturer in the instructions and/or label related to the respective mounting arrangements.

5 Degrees of Protection Against Access to Hazardous Parts (First Numeral)

The first characteristic numeral of the IP code number indicates compliance with the following tests for the degree of protection against access to hazardous parts. It also indicates compliance with tests shown in the next section for the degree of protection against solid foreign objects. The protection against access to hazardous parts is satisfactory if adequate clearance is kept between the specified access probe and hazardous parts. Lighting equipment operates at voltages below 1000 VAC. For voltages of less than 1000 VAC, the access probe must not touch the hazardous live parts. For luminaires operating at voltages exceeding 1000 VAC, when the access probe is placed in the unfavorable position(s) (positions where the probe is closest to uninsulated current-carrying parts), the equipment shall be capable of withstanding the dielectric tests as specified in the relevant product standard applicable to the equipment. The maximum voltage should be considered when the dielectric test voltage and adequate clearance are determined. The description of the tests is shown in Table 1.

Table 1—Degrees of Protection (of Persons) Against Access to Hazardous Parts, as Indicated by the First Characteristic Numeral*

First Characteristic Numeral	Degree of Protection of Persons Against Hazardous Parts	Test Definition
0	Non-protected	None
1	Protected against access to hazardous parts with the back of a hand	50 mm Ø access probe sphere, shall have adequate clearance from hazardous parts
2	Protected against access to hazardous parts with a finger	12 mm Ø, 80 mm length, jointed test finger, shall have adequate clearance from hazardous parts
3	Protected against access to hazardous parts with a tool	2.5 mm Ø access probe shall not penetrate
4**	Protected against access to hazardous parts with a wire	1.0 mm Ø access probe shall not penetrate
5**	Protected against access to hazardous parts with a wire	1.0 mm Ø access probe shall not penetrate
6**	Protected against access to hazardous parts with a wire	1.0 mm Ø access probe shall not penetrate

* This table is based on Table 1 in IEC 60529.

** Although they appear to be the same, the numerals 4, 5, and 6 are differentiated in Table 2.

6 Degrees of Protection against Foreign Objects, Such as Dust

The first characteristic numeral of the IP Code indicates compliance with tests for the degree of protection against access to hazardous parts as described in Section 5, and compliance with tests shown in Table 2 for the degree of protection against solid foreign objects and dust.

The protection against the ingress of solid foreign objects/dust implies that the full diameter of the probe shall not pass through an opening in the enclosure. Object probes for numerals 3 and 4 shall not penetrate the enclosure. Dust-protected enclosures to numeral 5 allow a limited quantity of dust to penetrate under certain conditions. Dust-tight enclosures to numeral 6 do not allow any dust to penetrate.

Table 2—Degrees of Protection Against Solid Foreign Objects, as Indicated by the First Characteristic Numeral*

First Characteristic Numeral	Degree of Protection Against Solid Foreign Objects	Test Definition
0	Non-protected	None
1	Protected against solid foreign objects of 50 mm Ø and greater	50 mm Ø access probe sphere; shall not fully penetrate**
2	Protected against solid foreign objects of 12.5 mm Ø and greater	12.5 mm Ø access probe sphere; shall not fully penetrate**
3	Protected against solid foreign objects of 2.5 mm Ø and greater	2.5 mm Ø access probe; shall not penetrate at all**
4	Protected against solid foreign objects of 1.0 mm Ø and greater	1.0 mm Ø access probe; shall not penetrate at all**
5	Dust-protected	Ingress of dust is not totally prevented, but dust shall not penetrate in a quantity sufficient to interfere with operation of the equipment or impair safety
6	Dust-tight	No ingress of dust

* This table is based on Table 2 in IEC 60529.

** The full diameter of the object probe shall not pass through an opening of the enclosure.

7 Degrees of Protection Against Ingress of Moisture (Second Numeral)

The second characteristic numeral indicates the degree of protection provided by the enclosure concerning the harmful effects on the equipment components due to the ingress of moisture. The tests documented in Table 3 are performed with fresh water. The introduction of cleaning solvents and/or high-pressure cleaning may negate the results of the tests. Up to and including the second numeral 6, the designation implies compliance with the requirements for all lower numerals. An enclosure designated with the second numeral 7 or 8 only is considered unsuitable for exposure to water jets (designated by the second numeral 5 or 6) and need not comply with the requirements for numeral 5 or 6 unless the enclosure is dual coded.

Table 3—Degrees of Protection Against Water, as Indicated by the Second Characteristic Numeral*

Second Characteristic Numeral	Degrees of Protection Against Ingress of Water	Test Definition
0	Non-protected	None
1	Protected against vertically falling drops of water	Vertically falling drops of water shall have no harmful effects
2	Protected against vertically falling drops of water when the luminaire or device is tilted up 15 degrees	Vertically falling drops of water shall have no harmful effects when the enclosure is tilted at any angle up to 15 degrees on either side of the vertical
3	Protected against spraying water	Water sprayed at an angle up to 60 degrees on either side of the vertical shall have no harmful effects
4	Protected against splashing water	Water splashed against the enclosure from any direction shall have no harmful effects
5	Protected against water jets	Water projected in jets against the enclosure from any direction shall have no harmful effects ($^3/_8$" Φ nozzle, with 1-meter head)
6	Protected against powerful water jets	Water projected in powerful water jets against the enclosure from any direction shall have no harmful effects (same as numeral 5, with 3-meter head)
7	Protected against the effects of temporary immersion in water	The ingress of water in quantities causing harmful effects shall not be possible when the enclosure is temporarily immersed in water under standardized conditions of time and pressure
8	Protected against the effects of continuous immersion in water	The ingress of water in quantities causing harmful effects shall not be possible when the enclosure is continuously immersed in water under conditions that shall be agreed upon by the manufacturer and user, but which are more severe than numeral 7
9	Protected against high-pressure and high-temperature water jets	Water projected at high pressure and high temperature against the enclosure from any direction shall not have harmful effects

* This table is based on Table 3 in IEC 60529.

8 Specific Additional Protections (Optional)

Letter	Significance
H	High-voltage apparatus
M	Tested for harmful effects due to the ingress of water when the movable parts of the equipment (e,g., the rotor of a rotating machine) are in motion
S	Tested for harmful effects due to the ingress of water when the movable parts of the equipment (e.g., the rotor of a rotating machine) are stationary
W	Suitable for use under specified weather conditions and provided with additional protective features or processes

9 Markings

If an IP Code designation is required, the lighting equipment enclosure shall be marked with the proper IP Code designation as provided by an ISO/IEC 17025–accredited test laboratory. The IP Code shall be displayed on the equipment identification label or on a secondary label in proximity to the identification label. The IP Code designation may also be displayed on any instruction, operation, maintenance, or technical manuals that are supplied with lighting equipment or enclosure. Furthermore, the following information shall be noted and displayed on any manuals supplied with the lighting fixture enclosure:

a. If one part of an enclosure has a different degree of protection than that of another part of the same enclosure, the degrees of protection shall be noted on the enclosure labeling and in any manuals supplied with the luminaire or device if the manuals contain the luminaire or device IP rating. If there is no degree of protection for the luminaire or device in its entirety, only the part(s) with protection need to be noted on the labeling with the associated IP rating.

   Example: The optical assembly of the luminaire versus the housing.

b. If the mounting position of the luminaire or device enclosure has an influence on the degree of protection, details of such shall be provided.

   Example: The degree of tilt at which a photocontrol device is mounted on an ANSI C136.10 or C136.41 receptacle.

c. If specific mounting or installation of the luminaire or device has an influence on the degree of protection, details of such shall be provided.

   Example: The degree of protection is applicable only when a locking photocontrol is twist-locked into a C136.10 or C136.41 receptacle.

d. For enclosures rated with second characteristics 7 or 8, the maximum time of immersion shall be provided.

10 General Test Requirements

The luminaire or device enclosure shall provide the degree of protection against the ingress of dust, foreign objects, and moisture in accordance with the classification of the luminaire and the IP Code marked on the luminaire. Generally, testing of the luminaire enclosures shall be as designated in Tables 1, 2, and 3 of this standard and in accordance with the IEC 60598 document referenced in this standard, with participation by the manufacturer. Compliance is checked by the appropriate tests specified in Section 9 of IEC 60598, and for other IP ratings by the appropriate tests specified in IEC 60529.

11 Suggested Ratings

The suggested minimum ratings shown in Table 4 for ANSI C136 equipment are based on typical requirements for specific equipment. It shall be noted that these suggested minimum ratings cover not only the use of IP Code ratings for the luminaire enclosure (complete luminaire) but also the separate rating of the optical system. Manufacturers and specifiers, using the optical system only rating, should ensure that they recognize and conform to Section 9, item a). It should be noted that although this standard applies primarily to luminaires, it also includes the two most common types of photo controls. For a separate rating of the optical system, testing is to be performed on the complete fixture (luminaire), not with the optical system removed from the fixture (luminaire).

Table 4—Suggested IP Ratings for ANSI C136 Luminaires

ANSI C136 Luminaire	Luminaire Enclosure	Optical System for Non-LED Luminaires	Optical System for LED Luminaires (C136.37)
C136.6, NEMA head	IP13	IP03	IP65
C136.14, cobra head	IP33	IP54	IP65
C136.16, post top	IP43	IP44	IP65
C136.18, high mast	IP33	IP54	IP65
C136.23, architectural	IP33	IP54	IP65
C136.27, tunnel	IP66	IP66	IP66
C136.32, set back	IP33	IP54	IP65
C136.43, side-mounted security luminaires	IP-33	N/A	IP65
C136.53, enclosed pendant mounted luminaires	IP54	IP65	IP65
C136.57, wall pack luminaires	IP33	IP54	IP65

Note: It is difficult to provide direct correlations between IP ratings, NEMA enclosure, and NRTL damp/wet location ratings, which are all commonly used in North America. For the purposes of this standard, the IP rating for the luminaire enclosure defines its level of protection. This standard establishes IP ratings for luminaires only and does not recommend any IP ratings for devices internal to the fixture. Similarly, devices external to a luminaire enclosure are not required to have an IP rating; however, they shall be rated for wet locations according to the appropriate device safety standard.

Table 5—Suggested IP Ratings for ANSI C136 Devices

ANSI C136 Device	Degree of Protection
C136.10, PC locking type (receptacle mounted)	IP53
C136.24, PC button (window—external of luminaire)	IP66
C136.48, networked lighting controller (mounted)	IP53
C136.35, ancillary devices (mounted)	IP53
C136.58, receptacles (LEX-R/L10-R) when assembled to module (LEX-M/L10-M) or cap (LEX-C)	IP54
C136.58, modules (LEX-M/L10-M)	IP65

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