TEST REPORT

Report Number.....:	ZKT-2111296502S
Date of issue.....:	Dec. 06, 2021
Total number of pages.....:	141
Applicant's name.....:	Zhongshan Huangchuang Smart Household Technology co.,LTD
Address.....:	5th floor, No. 6, Kanglin street, Tongyi Industrial Zone, Guzhen, Zhongshan City, Guangdong Province
Test specification:	
Standard.....:	UL 1598 Luminaires (Ed. 5) Edition Date: March 26, 2021
Test procedure.....:	UL Test Report
Non-standard test method.....:	N/A

This test report is specially limited to the above client company and product model only. It may not be duplicated without prior written consent of ZKT Test.

Test Item description .....:	FAN LIGHT
Trade Mark .....:	N/A
Manufacturer.....:	Same as applicant
Model/Type reference .....:	F254 F258, F7788, F7799, F278, F288, F268, F8008, F248, F238, F228, F229, F231
Ratings .....:	Input: AC120V, 60Hz, 55W

Testing procedure and testing location:

Testing Laboratory.....:	**Shenzhen ZKT Technology Co., Ltd.**
Address.....:	1/F, No. 101, Building B, No. 6, Tangwei Community Industral Avenue, Fuhai Street, Bao'an District, Shenzhen,China
Date of Test.....:	Nov. 29, 2021 to Dec. 06, 2021
Tested by (name + signature).....:	Peter Huang
Reviewed by (name + signature).....:	Simon Gong
Approved by (name + signature).....:	Awen He

List of Attachments (including a total number of pages in each attachment): - Appendix 1 : 2 Pages product photos
Summary of testing:

Tests performed (name of test and test clause): Refer to appended clause table for details	**Testing location:** 1/F, No. 101, Building B, No. 6, Tangwei Community Industral Avenue, Fuhai Street, Bao'an District, Shenzhen,China

Copy of marking plate

FAN LIGHT
Model: F254
Input: AC120V, 60Hz, 55W

Zhongshan Huangchuang Smart Household Technology co.,LTD
5th floor, No. 6, Kanglin street, Tongyi Industrial Zone, Guzhen, Zhongshan City, Guangdong Province

Made in China

Remark on above marking:
/

POSSIBLE TEST CASE VERDICTS:	
- test case does not apply to the test object..... :	N/A
- test object does meet the requirement..... :	P (Pass)
- test object does not meet the requirement..... :	F (Fail)
TESTING:	
Date of receipt of test item..... :	Nov. 29, 2021
Date (s) of performance of tests..... :	Nov. 29, 2021 to Dec. 06, 2021

GENERAL REMARKS:

"(See Enclosure #)" refers to additional information appended to the report.
"(See appended table)" refers to a table appended to the report.

Throughout this report a ☐ comma / ☒ point is used as the decimal separator.

Manufacturer's Declaration per sub-clause 4.2.5 of IECEE 02:

The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided..... :	☐ **Yes** ☒ **Not applicable**

When differences exist; they shall be identified in the General product information section.

Name and address of factory (ies)..... :	Zhongshan Huangchuang Smart Household Technology co.,LTD 5th floor, No. 6, Kanglin street, Tongyi Industrial Zone, Guzhen, Zhongshan City, Guangdong Province

GENERAL PRODUCT INFORMATION:

Product Description:
This product is for indoor use only.

Model Differences:
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Additional application considerations – (Considerations used to test a component or sub-assembly) –
N/A

UL 1598			
Clause	Requirement Test	Result Remark	Verdict
5	**Mechanical construction**		P
5.1	**General**		P
5.1.1	The requirements in Clause 5 shall be used in conjunction with the applicable supplementary requirements in this Standard.		P
5.1.2	A part removed during user maintenance shall be		P
	designed to prevent replacement in a position that would affect the intended operation of the luminaire; or		N
	marked to indicate proper replacement, in accordance with Table 20.1.1, Item 1.33.		N
5.1.3	There shall be no sharp edges, burrs, or method of construction that can damage electrical insulation or reduce electrical spacings.		P
5.2	**Assembly and packaging**		P
5.2.1	All splices and electrical connections shall be completed at the factory, unless packaging requires partial disassembly. Only assembly and electrical connections that can be accomplished with ordinary tools or tools supplied with the luminaire shall be completed at the installation site.		P
5.2.2	A luminaire that requires partial assembly in the field shall be provided with assembly instructions as specified in Table 20.1.1, Item 1.33.		P
5.2.3	All the parts required to complete a luminaire shall be shipped together, or shipped separately and marked in accordance with Table 20.1.1, Item 1.8.		P
5.2.4	Parts such as decorative glassware may be shipped separately and do not require identification.		P
5.2.5	An unassembled luminaire with accessible non-current-carrying parts that can be energized after the luminaire is installed shall be provided with means for fastening and bonding those parts. The use of screws or snap-in or tab-mounted parts shall meet the intent of this requirement.		N
5.2.6	The number of conductors shall not exceed 5 when using a twist-on wire connector for field wire connection		P
5.2.7	Conductors intended for field connection shall have matching identification by color, number, letter, or other acceptable means		P

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Clause	Requirement Test	Result Remark	Verdict
5.2.8	A field connection between conductors of adjoining sections shall be accessible for inspection without the disconnection of any portion of the wiring.		N
5.3	**Enclosures**		P
5.3.1	A luminaire enclosure shall perform the following functions reduce the risk of contact with live parts; enclose electrical parts and components that can involve a risk of fire; protect internal parts from mechanical damage; and protect internal parts from the environment	Low voltage	N
5.3.2	All splices, open coil devices, capacitors, leads or terminals for field connection of supply wires, and other arcing live parts shall be provided with an enclosure		P
5.4	**Barriers**		N
5.4.1	A barrier shall be constructed of one of the following: ferrous or nonferrous metal at least 0.41 mm (0.016 in) thick; glass or ceramic at least 3 mm (0.118 in) thick; impregnated glass fiber sleeving at least 0.25 mm (0.010 in) thick that is rated for the temperature involved; vulcanized fiber at least 0.71 mm (0.028 in) thick; or a polymeric material that complies with Clause 5.7.1.6.		N
5.4.2	A barrier, other than of polymeric material, may be of a thickness less than that specified in Clause5.4.1 if it complies with the barrier strength test of Clause 16.1	considered	P
5.5	**Metal thickness for enclosures**		N
5.5.1	The thickness of an enclosure material constructed of sheet metal and extruded aluminum shall be in accordance with Table 5.5.1 or shall comply with the metal thickness equivalency test of Clause 16.2; and cast metal shall be in accordance with Table 5.5.2 or shall comply with the metal thickness equivalency test of Clause 16.2		N

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Clause	Requirement Test	Result Remark	Verdict
5.5.2	The thickness of a metal surface for mounting a convenience receptacle of the snap-in type shall comply with the receptacle manufacturer's metal thickness specification but shall not be less than 0.51 mm (0.020 in)		N
5.6	**Corrosion protection**		P
5.6.1	All ferrous metal parts, including hinges, bolts, and fasteners, exposed after assembly shall be protected against corrosion by painting, coating, or plating. Copper, aluminum, alloys of copper and aluminum, stainless steel, and similar materials having inherent resistance to atmospheric corrosion are not required to have additional corrosion protection.		P
5.6.2	Edges, punched holes, and spot welds in prefinished steel, enclosed steel pipe, and hanger locations for painting or plating in ferrous metals do not require any corrosion protection		N
5.6.3	The requirements of Clause 5.6.1 shall not apply to the following		N
	bearings, sliding surfaces of a hinge or shaft, hinge pins, and similar parts located on the exterior of enclosures where such protection is not practicable; and decorative parts		N
5.6.4	Vitreous enamels may be used as a protective coating for ferrous sheet metal having a minimum thickness of 0.6 mm (0.025 in)		N
5.7	**Polymeric materials**		N
5.7.1	General		N
5.7.1.1	Polymeric materials shall comply with the applicable requirements of Clauses 5.7.1.2 to 5.7.1.7.		N
5.7.1.2	An enclosure of polymeric material where all live parts are insulated or permanently spaced more than 0.8 mm (0.032 in) from the enclosure shall:		N
	have a minimum 5VA flammability rating or comply with the five-inch flame test of Clause 16.3;have a temperature rating equal to or greater than its maximum operating temperature in the luminaire;comply with the polymeric impact test of Clause 16.41 for the parts that can be subject to impact after installation; comply with the mold stress-relief test of Clause 16.4 for molded or formed thermoplastic material;		N

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Clause	Requirement Test	Result Remark	Verdict
	comply with the abnormal overlamping operation test in Clause 15.5; and be resistant to UV radiation where the material is exposed to the sun or to fluorescent or unjacketed metal halide light sources. The material shall be UV rated, tested in accordance with the UV exposure test of Clause 16.5.5, or comply with the exposure to UV light test of UL 746C		P
5.7.1.3	An enclosure of polymeric material where any uninsulated live parts are located within 0.8 mm (0.032 in) of the enclosure shall comply with Clause 5.7.1.2 and shall:		P
	have a minimum hot-wire ignition rating (HWI) of 15 s or comply with the hot-wire ignition test of Clause 16.6 or the glow-wire end product test of Clause 16.7; and		N
	have a minimum high-current arc resistance to ignition rating (HAI) of 15 arcs or comply with the high-current arc ignition test of Clause 16.8 or the end-product arc resistance test of Clause 16.9		N
5.7.1.4	An enclosure of polymeric material where arcing parts, such as unenclosed switch contacts, are located		N
	more than 13 mm (0.5 in) from the enclosure shall comply with Clause 5.7.1.2; within 13 mm (0.5 in) of the enclosure shall comply with Clause 5.7.1.2 and the hot-wire ignition test of Clause 16.6 or the glow-wire end product test of Clause 16.7.		N
5.7.1.5	A polymeric part used to suspend another part shall:		P
	have a minimum HB flammability rating or comply with the horizontal burning flame test of Clause 16.25		P
	have a temperature rating equal to or greater than the highest temperature measured on the part during the normal temperature test of Clause 14;		P
	comply with the polymeric support test of Clause 16.10 when the suspended part weighs more than 0.9 kg (2lb)		P
5.7.1.6	A polymeric material used as a barrier shall		N
	have a minimum HB flammability rating or comply with the horizontal burning flame test of Clause 16.25 have a temperature rating equal to or greater than its maximum operating temperature in the luminaire		N

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Clause	Requirement Test	Result Remark	Verdict
	for molded or formed thermoplastic parts, comply with the mold stress-relief test of Clause 16.4; and comply with the barrier strength test of Clause 16.1		N
5.7.1.7	A polymeric material that can affect the integrity of a grounding or bonding means shall		P
	have a minimum HB flammability rating or comply with the horizontal burning flame test of Clause 16.25;		P
	have a temperature rating equal to or greater than its maximum operating temperature in the luminaire; and		N
	in the case of thermoplastic parts, also comply with the mold stress-relief test of Clause 16.4 followed by the bonding circuit impedance test of Clause 17.2		P
5.7.2	Metallized polymeric parts		N
5.7.2.1	Metallized polymeric parts coated with an electrically conductive material shall comply with the metallized polymeric parts coating adhesion test of Clause 16.11 if peeling of the conductive material from the polymeric parts can result in the risk of electric shock, fire, or operating temperature limits being exceeded		N
5.7.2.2	The metallized parts that are accessible during user maintenance or component replacement without the use of tools and can involve the risk of shock shall be bonded to ground in accordance with Clause 6.14.3		N
5.8	**Baffles**	No such parts	N
5.8.1	A baffle shall be made of metal that complies with the appropriate requirements of Clause 5.5; or		N
	be made of nonmetallic material that complies with the five-inch flame test of Clause 16.3 or has a minimum 5VA flammability rating; and		N

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Clause	Requirement Test	Result Remark	Verdict
	if made of perforated material, have one of the following constructions a galvanized steel screen, or the equivalent, having a 14 x 14 mesh per square inch and wire with a minimum diameter of 0.46 mm (0.018 in) a perforated metal plate, having evenly distributed openings that are not more than 11 per cm^2 (71 per in^2) and that have a maximum dimension of 1.6 mm (0.063 in); or a perforated panel that complies with the flaming oil test of Clause 16.12		N
5.9	**Conduit knockouts and twistouts**		N
5.9.1	A conduit knockout or twistout shall be secured in place so it can be removed without distorting the enclosure but it remains in place during normal handling and shall comply with the conduit knockout and twistout test of Clause 16.13.		N
5.10	**Mechanical joints and fastenings**		P
5.10.1	The method of making a joint shall provide strength and rigidity and prevent turning that can result in movement of conductors or wiring devices after the assembly is completed		N
5.10.2	Self-threading screws, including sheet-metal screws, used to secure electrical or enclosure component parts in place or together, shall comply with the self-threading screw torque test in Clause 16.14, when the screw threads into nonferrous metal or polymeric material		N
5.10.3	A self-threading or sheet metal screw used for mounting or supporting a part that weighs more than 3.4 kg (7.5 lb) per screw shall comply with the self-threading screw torque test in Clause 16.14		N
5.10.4	If threads of sheet-metal or self-tapping screws extend into a wiring compartment for a distance of more than 5 mm (0.2 in), the conductors shall be reliably positioned away from the projecting screws, or the conductors shall be sufficiently loose to prevent damage to the insulation		N
5.10.5	Frictional contact between parts alone shall not be acceptable as means of preventing turning. Turning may be prevented by the use of a suitable lockwasher properly applied, a locknut seated against another nut, or an equivalent threaded assembly, or by some other equivalent method such as swaging or suitable adhesive		N

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Clause	Requirement Test	Result Remark	Verdict
5.10.6	A sheet metal nut for bolts larger than 6.4 mm (0.250 in) in diameter may be used to prevent turning or loosening if it is not depended upon for mechanical strength		N
5.10.7	Sheet-metal nuts fabricated of heat-treated steel may be used		N
	for assembly;to prevent turning of threaded tubing no larger than 1/4 IPS; or on bolts or studs that are no larger than 6.4 mm (0.250 in) in diameter		N
5.10.8	When used as a supporting device, unthreaded tubing joints shall comply with the loading test of Clause 16.15		P
5.10.8.1	Fasteners, such as ferrules secured to the end of steel support cable used to support all or part of the luminaire, shall comply with the loading test of Clause 16.15		P
5.10.8.2	Cast metal fasteners, such as chains, hooks, threaded nipples, and hickeys, used to support the luminaire or sections of the luminaire, shall comply with the loading test of Clause 16.15		P
5.10.9	Enclosure parts shall be secured by positive mechanical means, such as screws, welding, or interference fit		P
5.10.10	Enclosure parts may be secured by frictional contact alone under the following conditions		N
	the part does not have a knockout or conduit opening and complies with the snap-in or tab-mounted parts pull test without conduit opening of Clause 16.16; or the part has a knockout or conduit opening and complies with the snap-in or tab-mounted parts pull tests with conduit opening of Clause 16.17		N
5.10.11	Snap-in and tab-mounted parts that are secured together by interference fit alone and that have a knockout or conduit opening shall comply with the snap-in and tab-mounted parts test with conduit opening of Clause 16.17.		N
5.10.12	Decorative parts of a luminaire secured by friction alone or an adhesive alone shall comply with the loading test in Clause 16.15.		N
5.11	**Means of mounting**		N
5.11.1	A luminaire shall have means for mounting, and if special hardware is required, the hardware shall be provided and shall comply with the loading test of Clause 16.15.		N

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Clause	Requirement Test	Result Remark	Verdict
5.12	**Movable joints**		N
5.12.1	A movable joint, such as a swivel joint or telescoping arm, containing conductors shall be constructed so that movement of the joint will not result in damage to the insulation of conductors. Rotation shall be limited to 370 degrees, or the movable joint shall comply with the movable joint endurance test of Clause 16.19		N
5.12.2	A movable joint containing conductors shall comply with the movable joint torsion and pull tests of Clause 16.20 and shall remain intact and operable		N
5.13	**Raceway tubing**		P
5.13.1	Tubing shall be free from kinks or cracks, and if it is		P
	unthreaded metal tubing, it shall be at least 0.5 mm (0.020 in) thick;		N
	threaded metal tubing, it shall be at least 1.0 mm (0.040 in) thick; or		N
	metal tubing with rolled threads, it shall be at least 0.5 mm (0.020 in) thick		N
5.14	**Conductor protection**		N
5.14.1	Conductors that pass over edges or through openings in metal shall be secured from contacting the edges or be protected from cutting and abrasion. For sheet metal less than 1.1 mm (0.042 in) thick, protection shall be provided by one of the following methods		N
	rolling the edge of the metal not less than 120 degrees;		N
	a bushing or grommet of a material other than rubber at least 1.2 mm (0.047 in) thick; or		N
	glass sleeving at least 0.25 mm (0.010 in) thick		N
5.15	**Strain relief**		N
5.15.1	Genera		N
5.15.1.1	A strain-relief shall be provided for a flexible cord or conductor that can be subjected to pulling, pushing, flexing, or twisting after the luminaire has been installed		N
5.15.1.2	A strain-relief device, including a bushing with an integral strain-relief means, shall be designed to limit the holding pressure without damaging the cord jacket or conductor insulation		N
5.15.2	Flexible cord		N

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Clause	Requirement Test	Result Remark	Verdict
5.15.2.1	A strain relief for a flexible cord shall comply with the 15.9 kg (35 lb) strain-relief test of Clause 16.21.1		N
5.15..2.2	A strain relief shall be provided at both ends of a flexible cord when the cord supports a luminaire or luminaire part		N
5.15.2.3	A strain relief shall be provided at only one end of a flexible cord under the following conditions		N
	a strain-relief device for use in a standard conduit opening; or instructions to identify the strain relief to be used, in accordance with Table 20.1.1, Item 1.33		N
5.15.3	Conductors		N
5.15.3.1	The strain relief for a conductor shall comply with the pull test of Clause 16.21.2.		N
5.16	**Glass**	No such parts	N
5.16.1	General		N
5.16.1.1	Edges of glass accessible during normal use or maintenance shall be seamed, swiped, fire-polished, or similarly treated to eliminate sharpness		N
5.16.2	Minimum thickness		N
5.16.2.1	The minimum thickness and exposed area of glass used as an enclosure shall be in accordance with Table 5.16.2.1		N
5.16.2.2	The minimum thickness and exposed area of flat glass panels, smooth or otherwise, shall be in accordance with Table 5.16.2.1		P
5.16.2.3	The minimum thickness and exposed area of glass that is curved or bent, or of globes of any shape shall be in accordance with Table 5.16.2.1, unless the exposed area is less than 1774 cm^2 (275 in^2)		P
5.16.2.4	Untempered glass that is not in accordance with the minimum thickness shown in Table 5.16.2.1 shall provide equivalent mechanical strength		P
5.16.2.5	Tempered glass that is not in accordance with the minimum thickness and exposed area shown in Table 5.16.2.1 shall comply with the tempered glass impact test of Clause 16.22		N

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Clause	Requirement Test	Result Remark	Verdict
5.16.2.6	The minimum thickness of fluted, ribbed, or patterned glass shall be measured from a valley of one side to the other flat side, or between valleys on opposite sides		N
5.16.2.7	(MEX) In Mexico, borosilicate and tempered glass shall comply with the thermal shock tests of Clause 16.36 (MEX)		N
5.17	**Glass support**	No such parts	N
5.17.1	Glass shall be secured in place and shall not be subjected to undue strain that can result in breakage or release during normal use or maintenance		N
5.17.2	Glass mounted in a frame that is required to be opened or removed for maintenance shall be secured to the frame		N
5.17.3	Clips that are used to secure a glass panel to the frame shall overlap the glass at least 5 mm(0.20 in)		N
5.17.4	An adhesive material used as the sole support of glassware shall comply with the adhesive support test of Clause 16.23		N
5.17.5	A channel or frame for holding glass diffusers shall be		N
	steel at least 0.4 mm (0.016 in) thick nonferrous metal at least 0.5 mm (0.020 in) thick; or polymeric material at least 1.5 mm (0.059 in) thick		N
5.17.6	Glass globes, glass panels, or decorative glass parts shall be secured by one or more of the following means		N
	a circular fitter with at least three supports; a threaded stud and nut a threaded glass part and associated fitter a frictional contact assembly that complies with the glass support test of Clause 16.24 an adhesive that complies with Clause 5.17.4 its own weight in a frame or fitter that is not hinged; and a straight rod with a stop or a hook through a hole in the glass		N
5.18	**Thermal insulation**		P
5.18.1	Thermal insulation shall be fire-resistant material, such as glass fiber, inorganic material, or polymeric material		N
5.18.2	A polymeric thermal insulation material shall		N
	have a temperature rating equal to or greater than the operating temperature in the luminaire; and		N
	have a minimum HB flammability rating, or comply with the horizontal burning flame test of Clause 16.25		N

UL 1598			
Clause	Requirement Test	Result Remark	Verdict
5.18.3	Thermal insulation shall be reliably secured in place. It shall be attached to the luminaire in the correct position by at least one of the following means		N
	staples or bolts		N
	adhesive applied to at least one-third of the surface of the insulation;		N
	parts of the luminaire that do not have to be removed for installation. A supply conductor projecting through the insulation is not acceptable for securing the insulation in place; and		N
	other means if investigated and found to be mechanically equivalent		N
5.18.4	Thermal insulation shall not be located within 6.4 mm (0.25 in) of any opening for the connection of conduit unless the insulation is attached to a cover or other part that will be removed when conduit is being attached to the luminaire		N
5.18.5	Glass fiber thermal insulation provided as an integral part of the luminaire shall have a minimum density of 9.6 kg/m^3 (0.6 lb/ft^3)		N
5.19	**Continuous row mounting**		N
5.19.1	A luminaire intended for continuous row mounting shall have provision for a coupling method and be marked in accordance with Table 20.1.1, Item 2.16		N
5.19.2	A luminaire intended for continuous row mounting shall have adequate space for at least four 12 AWG branch circuit conductors		N
5.20	**Raceways**		N
5.20.1	The requirements in Clause 5.20 shall apply to surface-mounted or recessed luminaires intended to serve as a raceway for conductors of a circuit other than the conductors of the branch-circuit supplying the luminaire.		N
5.20.2	The raceway portion of a luminaire shall comply with the applicable requirements of UL 5 or CSA C22.2 No. 62	No fan blade	N
5.20.3	The luminaire shall comply with the temperature test of Clause 14.11 and be marked as suitable for use as a raceway, in accordance with Table 20.1.1, Item 1.7		N
6	**Electrical construction**		P
6.1	**General**		N

UL 1598			
Clause	Requirement Test	Result Remark	Verdict
6.1.1	The requirements in Clause 6 shall be used in conjunction with the applicable supplementary requirements in this Standard		N
6.1.2	Current-carrying parts shall be copper, copper alloy, nickel alloy, or stainless steel, unless otherwise specified in this Standard		N
6.2	**Wiring devices**		P
6.2.1	A wiring device shall be rated for the temperatures, locations, voltage, and current encountered during normal operation		P
6.2.2	A luminaire incorporating a wiring device rated for ac use shall be marked with the frequency or for ac use only, in accordance with Table 20.1.1, Item 1.4 or 3.7..	No such parts	N
6.2.3	A wiring device shall be prevented from any turning that can apply tension to conductor connections, result in damage to the conductor, or otherwise adversely affect the assembly. Friction alone between the mating parts of the assembly shall not be acceptable as a means to prevent turning		N
6.2.4	Parts of wiring devices that are removable from outside the enclosure without the use of ordinary tools shall not result in access to live parts within the enclosure		N
6.2.5	The rating of an attachment plug assembled to a flexible cord for connection to a branch circuit shall comply with Table 6.2.1		N
6.3	**Lampholders**		N
6.3.1	A lampholder of a luminaire shall be suitable for the application		N
6.3.2	A lamp-supported lampholder shall be provided with stranded conductors.		N
6.3.3	A husk or sleeve made of treated cellulosic fiber, provided to electrically insulate the terminals and screwshell of a lampholder, shall be at least 0.8 mm (0.032 in) thick and shall be positively retained. If the wire terminals of the lampholder are accessible with the husk or sleeve removed, they shall be additionally enclosed in accordance with Clause 5.3		N
6.3.4	The screwshell of a lampholder directly supplied by the branch circuit shall be connected to the neutral grounded conductor		P
6.4	**Switches**		N
6.4.1	General		P

UL 1598			
Clause	Requirement Test	Result Remark	Verdict
6.4.1.1	A switch shall have a minimum ampere rating equal to the total load current it controls multiplied by the load factor shown in Table 6.4.1.1		P
6.4.1.2	A switch shall disconnect all of the ungrounded conductors of a supply circuit simultaneously, except as specified in Clause 6.4.1.4		P
6.4.1.3	A single-pole switch shall not be connected in the neutral grounded conductor		P
6.4.1.4	When a single-pole photocontrol switch is used on a line-to-line supply, the luminaire shall be marked with a caution to disconnect the power before servicing, in accordance with Table 20.1.1, Items3.18 and 3.6		P
6.4.1.4	(CAN) In Canada, the caution marking of Table 20.1.1, Item 3.18, shall not be required		N
6.4.1.5	A luminaire provided with a receptacle for a photocontrol shall be		N
	shipped with the control or shorting plug; or marked to require the installation of the control or plug, in accordance with Table 20.1.1, Item 1.20		N
6.4.2	Interlock switches		P
6.4.2.1	An interlock switch shall be rated for the load it controls or shall comply with Clauses 6.4.2.2 to 6.4.2.4		P
6.4.2.2	A polymeric switch enclosure shall		N
	have a minimum V-2 flammability rating, or shall comply with the vertical burning flame test of Clause 16.26 or the needle flame test of Clause 16.27; and have a temperature rating suitable for the temperature attained during the normal temperature test of Clause 14		P
6.4.2.3	Current-carrying parts shall be copper, copper alloy, or stainless steel, except that stainless steel shall not be used for quick-connect terminals, solder terminals, and arcing parts		P
6.4.2.4	An interlock switch shall comply with the interlock switch endurance test of Clause 17.3.		P
6.5	**Receptacles**		P
6.5.1	A convenience receptacle in a luminaire shall be a grounding type and marked for maximum load in accordance with Table 20.1.1, Item 3.3 or 3.4		N
6.5.2	A convenience receptacle shall not be provided in a ground-mounted recessed or ceiling-mounted luminaire		N
6.5.3	A luminaire may be provided with a maximum of one duplex or two single convenience receptacles		N
6.6	**Fuses and fuseholders**		N

UL 1598			
Clause	Requirement Test	Result Remark	Verdict
6.6.1	A replaceable fuse shall be of the type that requires mounting in a fuseholder		N
6.6.2	The fuse identification and ampere rating shall be marked on or adjacent to the fuseholder as specified in Table 20.1.1, Item 3.5		N
6.6.3	A fuseholder shall disconnect all ungrounded conductors of the supply circuit simultaneously during fuse replacement.		N
6.6.4	A fuse shall not be connected in the neutral grounded conductor		N
6.7	**Ballasts and transformers**		N
6.7.1	General		N
6.7.1.1	A luminaire incorporating a ballast or transformer having an open circuit voltage of more than 1000 V shall be marked not for use in dwellings, in accordance with Table 20.1.1, Item 2.5		N
6.7.1.2	A ballast or transformer required to operate lamps of the type and wattage for which the luminaire was designed shall be provided with the luminaire and shall be wired in accordance with the diagram or instructions on or with the ballast. For luminaires designed for use with remote ballasts, see also Clause 6.7.2		P
6.7.1.3	When a luminaire is intended to be connected to the line and neutral grounded conductors of a branch circuit, as shown in Figure 6.7.1.1, and is provided with		P
	an auto-transformer or an auto-transformer-type ballast, the screwshell of the lampholder shall be connected to the neutral grounded conductor, unless provision is made to protect against accidental contact with the lamp screwbase during insertion or removal of the lamp; or		N
	an isolating-type transformer or ballast, the screwshell of the lampholder shall be separately bonded to ground, unless provision is made to protect against accidental contact with the lamp screwbase during insertion or removal of the lamp		N
6.7.1.4	When a luminaire intended to be connected to the line-to-line conductors of a branch circuit, as shown in Figure 6.7.1.1, and is provided with		N

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Clause	Requirement Test	Result Remark	Verdict
	an auto-transformer or auto-transformer-type ballast, provision shall be made to protect against accidental contact with the lamp screwbase during insertion or removal of the lamp; or		N
	an isolating-type transformer or ballast, the screwshell of the lampholder shall be separately bonded to ground, unless provision is made to protect against accidental contact with the lamp screwbase during insertion or removal of the lamp		N
6.7.1.5	Allowing the thermal test results of one HID ballast to represent other HID ballasts shall be acceptable, with the following exceptions		N
	a metal halide or mercury vapor type shall not represent a high-pressure sodium type		N
	a high pressure sodium type shall not represent a metal halide or mercury vapor type		N
	a lower wattage shall not represent a higher wattage type		N
	a ballast with one class insulation system shall not represent a ballast with a different class insulation system		N
	for a ballast of other than the enclosed and potted type with a Class 105 insulation system, a ballast with a bench-test temperature shall not represent a ballast with a higher bench-test temperature		N
	a ballast that is not thermally protected shall not represent a ballast whose thermal protector is buried within the ballast and has a temperature rating of less than the rating of the ballast system; or is located on the ballast core or under the wrap of an open coil and has a temperature rating of less than 90 °C for a Class 105 system, 110 °C for a Class 130 system, or 150 °C for a Class 180 system	No cord used	N
6.7.2	Luminaires with remote ballasts or transformers		N
6.7.2.1	A luminaire designed for use with a remote ballast or transformer and not provided with integral leads shall be provided with a means for terminating the ballast or transformer leads inside the luminaire		N
6.7.2.2	A luminaire designed for use with a remotely mounted ballast or transformer shall be thermally protected if it is of incandescent or HID type and is intended for recessed mounting		N

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Clause	Requirement Test	Result Remark	Verdict
6.7.2.3	A luminaire designed for use with a remote ballast or transformer shall be marked with the watts and lamp type in accordance with Table 20.1.1, Item 1.41		N
6.7.2.4	A luminaire designed for use with a remote ballast or transformer and required to be connected to secondary circuit conductors rated higher than 60 °C shall be marked to indicate the minimum acceptable temperature rating of the secondary conductors in accordance with Table 20.1.1, Item 1.1		N
6.8	**Capacitors**	Evaluated in UL adapter	N
6.8.1	A capacitor, other than the type specified in Clause 6.8.2, shall be rated for the appropriate voltage and the maximum available fault current (AFC) to which it can be subjected, as follows		N
	a value of 10 000 A minimum when connected directly across the branch circuit; a value of 200 A minimum when connected in series with a ballast coil; or the maximum current available to the capacitor under capacitor short-circuit condition, as determined by investigation		N
6.8.2	A dry metallized-film capacitor operating at a maximum of 330 V shall not be required to have a maximum available fault current rating.		N
6.8.3	A luminaire incorporating a capacitor as a component separate from the ballast shall		N
	have a maximum rating of 0.06 µF and a maximum operating potential of 500 V peak; or provide means to discharge the capacitor within 1 min after removal of the capacitor voltage, in accordance with Clauses 6.8.4 to 6.8.6		N
6.8.4	The means to discharge the capacitor may consist of a bleeder resistor or a closed loop of the circuit that is not opened by lamp removal or operation of a switch, fuse, or similar device		N
6.8.5	The voltage across the capacitor terminals at the end of 1 minute shall be reduced to a value of 50 V or less, and the energy stored shall be less than 20 J, as determined by the equation:		N
6.8.6	The maximum value of a bleeder resistor shall be determined by the equation		N

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Clause	Requirement Test	Result Remark	Verdict
6.8.7	An oil-filled capacitor shall be provided with an expansion spacing between any luminaire part and the capacitor terminals in accordance with Clause 6.8.8, unless marked otherwise on the capacitor.		N
6.8.8	In addition to the electrical spacing required in Clause 6.11, the minimum expansion spacing perpendicular to the capacitor terminal shall be		N
	11 mm (0.44 in) for a maximum of 300 V; o 13 mm (0.50 in) for a voltage more than 300 V.		N
6.9	**Conductors and cords**		P
6.9.1	Current-carrying conductors shall be copper, copper alloy, or nickel alloy		P
6.9.2	(CAN) In Canada, conductors shall be minimum 18 AWG, except as specified in Clause 6.9.3, and shall be rated for the voltage, current, temperature, and condition of service to which they will be subjected, in accordance with Table 6.9.1 (CAN)		P
6.9.3	and shall be rated for the voltage, current, temperature, and condition of service to which they will be subjected, in accordance with Tables 6.9.2 (USA) and 6.9.3 (USA)		P
6.9.4	(MEX) In Mexico, conductors of a size smaller than 18 AWG (0.82 mm^2) but not smaller than 24 AWG (0.21mm^2) may be used in the secondary of a transformer, ballast, or in a circuit using solid-state devices but they shall not be used in the power supply line.		P
6.9.5	A conductor or cord that can be flexed because of an adjustable, movable, or flexible part of a luminaire shall be of the stranded type and shall be secured so it will not be cut or abraded under conditions of intended use, including relamping, servicing, and inspection of supply connections		N
6.9.6	In a luminaire construction that allows the conductor or cord to be pushed back into the luminaire, the temperature rating of the conductor or cord shall be suitable for the operating temperature of any component it can contact		P

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Clause	Requirement Test	Result Remark	Verdict
6.9.7	An insulated conductor, including each insulated conductor of a cord, that is rated for 90 °C, 105 °C, or 125 °C shall be considered as rated for 150 °C if each conductor is individually provided with supplemental insulation consisting of snugly fitting woven glass fiber sleeving having at least a 0.25 mm (0.010 in) wall thickness or at least two layers of glass fiber tape that provide a total thickness of at least 0.25 mm (0.010 in)		P
6.9.8	An insulated wire connector having a voltage rating less than that required for the application may be used if the splice, including the connector, is additionally covered with insulation rated for the voltage difference between the required voltage and the rated voltage of the connector		
6.10	**Identification and polarity**		
6.10.1	A conductor terminal intended for the connection of the neutral conductor of the branch circuit shall be substantially white in color or be marked neutral adjacent to the terminal in accordance with Table 20.1.1, Item 1.5		
6.10.2	The insulation on a conductor intended for connection to the neutral conductor of the branch circuit shall be identified by one of the following means		
	be colored white or grey be of any color except green, with a continuous white tracer throughout its length be identified at the point where connected to the branch circuit by white paint, tape, ink, or permanent tag; or be provided with one or more raised longitudinal ridges, if a parallel conductor flexible cord		
6.10.3	The identified terminal of a wiring device shall be connected to the neutral conductor of the branch circuit		
6.10.4	A cord-and-plug-connected luminaire equipped with a polarized two-pole, two-wire parallel blade attachment plug shall be marked for proper polarity in accordance with Table 20.1.1, Item 4.5		N
6.11	**Electrical spacings**		P
6.11.1	The minimum spacings shall be not less than those shown in Table 6.11.1 between		P

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Clause	Requirement Test	Result Remark	Verdict
	uninsulated live parts of different potential; and uninsulated live parts and non-current-carrying metal parts		N
6.11.2	Spacings shall be measured with all fittings installed as intended, whether or not they are furnished with the luminaire. Parts that can be rotated after installation shall be moved to a position that minimizes the spacing being measured		P
6.11.3	The spacings at fuses and fuseholders shall be measured with the fuses in place and with the fuses removed. The fuses shall be those with the maximum standard dimensions		N
6.11.4	The spacing shall be determined using the voltage measured between the electrical parts, other than lamp igniters, operating under normal operation with the luminaire connected to a power supply of rated voltage and frequency		N
6.11.5	The spacing between uninsulated live parts of different circuits involving different voltages shall be not less than that required for the circuit of the higher voltage		N
6.11.6	The spacings between field wiring terminals of different potential and between the terminals and a grounded non-current-carrying part shall be not less than 3.2 mm (0.125 in) through air and 6.4 mm (0.250 in) over surface or as indicated in Table 6.11.1, whichever is greater		N
6.11.7	he spacings of a branch circuit conductor terminal shall be measured with the conductor installed. The size of the conductor shall be suitable for the luminaire current rating but shall not be smaller than 14 AWG		N
6.11.8	For the purposes of measuring spacings, a film-coated conductor shall be considered an uninsulated part		N
6.11.9	A spade or ring terminal shall be prevented from turning by a reliable restraint such as a shoulder or boss, if by turning the spacing is reduced below the value shown in Table 6.11.1		N
6.11.10	(CAN) In Canada, spacings for printed circuit boards shall comply with Annex F		N
6.12	**Electrical insulation**		P

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Clause	Requirement Test	Result Remark	Verdict
6.12.1	Electrical insulation, including that used in component wiring devices, shall be of material that is suitable for the particular application. The acceptability of insulating material shall include consideration of the following		P
6.13	**Accessibility of live parts**		N
6.13.1	General		N
6.13.1.1	Accessibility of a live part shall be determined by the articulate probe test of Clause 17.4 during user maintenance and normal operation		N
6.13.2	Accessibility of uninsulated parts		N
6.13.2.1	Uninsulated current-carrying parts specified in Clauses 6.13.2.2 to 6.13.2.4 may be accessible during user maintenance and normal operation. Contact with all other uninsulated current-carrying parts shall be prevented by an enclosure or barrier		N
6.13.2.2	Electrical connections that are in the recess of a wiring device and that are covered with an electrical insulating material as shown in Table 14.1.2, Item 19, are considered to be inaccessible. The depth of the recess shall be at least 0.8 mm (0.032 in)		N
6.13.2.3	The live parts of a lampholder or starter holder that make the electrical connection to the lamp or starter may be accessible		N
6.13.2.4	An uninsulated live part in the secondary circuit of an isolating transformer may be accessible if the maximum open circuit secondary voltage is 30 V rms or 42.4 V peak		N
6.13.2.5	The lampholder leads of a wall mounted luminaire that are accessible from below or behind the lampholder with the luminaire fully assembled in accordance with the manufacturer's instructions shall comply with the lampholder lead pull test in Clause 16.38. Accessibility shall be determined by the articulated probe test of Clause 17.4		N
6.13.3	Accessibility of insulated parts		N
6.13.3.1	Insulated current-carrying parts specified in Clauses 6.13.3.2 and 6.13.3.3 may be accessible during user maintenance and normal operation. Contact with all other insulated current-carrying parts shall be prevented by an enclosure or barrier		N

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Clause	Requirement Test	Result Remark	Verdict
6.13.3.2	The following conductors specified in Table 6.9.1 (CAN) or 6.9.2 (USA) shall be permitted to be used without additional mechanical protection		N
6.13.3.3	Flexible cords, equipment wire, and 600 V rated appliance wiring material specified in Tables (CAN), 6.9.2 (USA), and 6.9.3 (USA) may be accessible if:		N
6.13.3.4	Parts accessible only during user maintenance		N
6.13.3.4.1	The following insulated current-carrying parts may be accessible to incidental contact only during user maintenance that requires an enclosure part to be removed or opened to accomplish the operation		N
	the terminals of electrical components, if insulated with material that is mechanically secured in place; and any wiring or factory-made splices employing machine-applied twist-on wire connectors or other types of insulated wire connectors that are acceptable, if not disturbed during user maintenance		N
6.14	**Grounding and bonding**		N
6.14.1	General		N
6.14.1.1	Non-current-carrying metal parts and metallized polymeric parts that are accessible during user maintenance or component replacement without the use of tools and that can involve the risk of shock shall be bonded to ground and shall comply with the bond impedance test of Clause 17.2. A luminaire with non-current carrying parts bonded to ground shall have the resistance of the bonding circuit tested in accordance with Clause 17.2.1. If the resistance exceeds 0.10 , the bonding circuit shall be tested as specified in Clause 17.2.3		N
6.14.1.2	The following parts are not required to be bonded to ground		N
	the links of a metal chain used to support a pendant luminaire accessible non-current-carrying metal parts of luminaire components (for example, lampholders and switches) that are isolated from live parts; o decorative parts, metal guards, and metal shades that do not enclose live parts		N

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Clause	Requirement Test	Result Remark	Verdict
6.14.1.3	An individual grounding conductor of a chain-and-canopy suspended luminaire shall be interwoven through the chain from the luminaire to the canopy. Installation instructions shall be provided in accordance with Table 20.1.1, Item 1.33		N
6.14.2	Provision for grounding		N
6.14.2.1	A luminaire that requires grounding in accordance with Clause 6.14.1.1 shall be provided with a grounding means to provide connection to the branch circuit ground		N
6.14.2.2	The grounding means shall be in the same location as the power supply connection means and shall be a pigtail lead grounding conductor, a pressure terminal connector, a wire binding screw, or the equivalent.		N
6.14.2.3	A grounding terminal shall not be located on a removable part, unless the removal of the part during user maintenance does not interrupt the bonding continuity		N
6.14.2.4	A luminaire required to be grounded in accordance with Clause 6.14.1.1 and designed for mounting over an outlet box, but not incorporating a means to terminate the branch circuit grounding conductor, shall be provided with a mounting crossbar that has a grounding termination means		N
6.14.2.5	A grounding conductor shall not be smaller than the gauge of wire used for the luminaire supply conductors and in no case less than 18 AWG		N
6.14.2.7	The grounding conductor of a pendant luminaire may be terminated by hardware that is also used to secure a lampholder or lampholder bracket when that is the only available termination point		N
6.14.2.8	An insulated grounding conductor shall be identified by one of the following		N
	Green green with a yellow stripe; or green with a yellow tracer		N
6.14.2.9	A screw provided for luminaire grounding shall		N
6.14.2.10	A luminaire grounding conductor may be secured to a snap-fit lampholder if the bonding between the lampholder and the luminaire complies with the bonding circuit impedance test of Clause 17.2		N

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Clause	Requirement Test	Result Remark	Verdict
6.14.2.11	A terminal plate intended for use with a wire binding screw shall be of metal and shall provide a minimum of two full threads engagement with the screw		N
6.14.2.12	A pressure- or screw-type terminal block shall be suitable for the conductors involved, and grounding termination shall be marked with a grounding symbol or abbreviation in accordance with Table 20.1.1, Item 4.4		N
6.14.2.13	A post top type luminaire that is intended to be conductively connected to a grounded pole or post and that does not comply with Clause 6.14.2.1 shall be provided with installation instructions in accordance with Table 20.1.1, Item 1.33		N
6.14.3	Bonding		N
6.14.3.1	A bonding means shall consist of one of the following		N
	a pigtail lead bonding conductor of at least 18 AWG a terminal a welded, soldered, or brazed joint a screw, rivet, or welded stud a pressure terminal connector an assembly of bolt, nut, and lockwasher or starwasher, or other compressive fastener that complies with the bonding circuit impedance test of Clause 17.2; or an equivalent conductive path that complies with the bonding circuit impedance test of Clause 17.2		N
6.14.3.2	The bonding of a conductive part that is coated with vitreous enamel, paint, or similar coatings can require treatment of the part, such as masking, removal of the coating at points of connection, or the use of fastening means that penetrate the surface coating. If special treatment is required or if grounding continuity is not obvious, acceptability shall be determined by the bonding circuit impedance test of Clause 17.2		N
6.14.3.3	he continuity of the grounding system shall not rely on the dimensional stability of thermoplastic material unless the material has a temperature rating equal to or greater than the maximum operating temperature of the material in the luminaire and complies with the mold stress-relief test of Clause 16.4, followed by the bonding circuit impedance test of Clause 17.2		N

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Clause	Requirement Test	Result Remark	Verdict
6.14.3.3	A luminaire part shall be provided with a 18 AWG or larger stranded bonding conductor if the part		N
	is required to be bonded to ground in accordance with Clause 6.14.1.1; and is likely to be removed from the remainder of the luminaire during user maintenance and supports a live part		N
6.14.3.4	(USA) In the United States, a luminaire part shall be provided with a 18 AWG or larger stranded bonding conductor if the part:		N
	is required to be bonded to ground in accordance with Clause 6.14.1.1; and is likely to be removed from the remainder of the luminaire during user maintenance and supports a live part, other than a ballast with an integral enclosure		N
6.14.3.5	A bonding conductor shall be secured by one of the following methods		N
	a machine screw and nut a screw that threads into metal, with at least two full threads engaging rivets; or equivalent means as determined by investigation.		N
6.14.3.6	The bonding conductor shall not be smaller than the gauge of wire used for the luminaire supply conductors and in no case less than 18 AWG		N
6.14.3.7	A chain shall not be considered an effective bonding means		N
6.15	**Supply connections**		N
6.15.1	Power supply connections		N
6.15.1.1	A luminaire shall be provided with a means of connection to a single branch circuit and shall have one or more of the following		N
	conductors, when mounted on or over an outlet box provision for connection of conduit as specified in Clause 6.15.2 a length of a flexible cord tap conductors as specified in Clause 11.6.2 a pressure or screw terminal block		N

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Clause	Requirement Test	Result Remark	Verdict
	provision for a proprietary wiring system, and be marked in accordance with Table 20.1.1, Item 1.12, or installation instructions in accordance with Table 20.1.1, Item 1.33; or provision for connection of cable		N
6.15.1.2	The supply connection and grounding connection shall be accessible for inspection after installation as specified in Clause 10.5 or 11.6.1, as applicable		N
6.15.1.3	A luminaire shipped with an unconnected cord shall be provided with a strain-relief device and a wiring diagram with assembly instructions in accordance with Table 20.1.1, Item 1.33		N
6.15.1.4	A luminaire marked for branch circuit conductors rated more than 90 °C shall be marked not for use in dwellings, in accordance with Table 20.1.1, Item 2.5		N
6.15.1.5	A luminaire that requires branch circuit conductors rated higher than 60 °C, as determined during the normal temperature tests in Clause 14, or that complies with the temperature-test-exempt requirements of Clause 7.2 shall be marked with the minimum temperature rating of the branch circuit conductors in accordance with Table 20.1.1, Item 1.1		N
6.15.1.6	A luminaire intended to be mounted on or over an outlet box shall be provided with supply conductors long enough to extend 150 mm (6 in) into the outlet box		N
6.15.1.7	A post or pole mounted luminaire shall be provided with supply conductors extending 150 mm (6 in) beyond the field wiring compartment		N
6.15.2	Conduit connections		N
6.15.2.1	A luminaire provided with a means of conduit connection shall be shipped with provision to close all but one of the conduit openings. Closure plugs may be packaged separately with the luminaire.		N
6.15.2.2	The dimensions for the unthreaded opening and the minimum unobstructed diameter of the flat surface surrounding the back of an opening for conduit shall comply with the values shown in Table 6.15.2.1		N

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Clause	Requirement Test	Result Remark	Verdict
6.15.2.3	The unthreaded part of a hole and the back edge of an opening not threaded all the way through shall be smooth and well rounded for protection of the conductors. The unthreaded throat diameter shall have a minimum internal diameter as shown in Table 6.15.2.2		N
6.15.2.4	A threaded opening shall have one of the following configurations		N
	when tapped all the way through, the opening shall have at least 3.5 threads but no more than 5 threads; or when not tapped all the way through, the opening shall have at least 5 threads		N
6.15.2.5	The minimum unobstructed diameter surrounding the back of an opening threaded all the way through shall comply with the minimum diameter of flat surfaces as shown in Table 6.15.2.1, toaccommodate the conduit bushing		N
6.16	**Wiring compartment and junction box volume for branch circuit conductors**		N
6.16.1	The minimum volume of a field wiring compartment or junction box for branch circuit connections shall be determined as follows		N
	by calculating the required minimum volume in accordance with Clauses 6.16.2 and 6.16.3; or by providing a representative sample for engineering evaluation in accordance with Clauses6.16.4 and 6.16.5		N
6.16.2	The calculation shall include the following		N
	branch circuit conductors entering the luminaire branch circuit conductors leaving the luminaire insulated grounding conductors insulated bonding conductors ballast conductors lampholder conductors; through wire conductors control device conductors; and other accessory conductors		N
6.16.3	Table 6.16.1 shall be used to determine the conductor volume for the calculation, and the following conditions shall apply		N
	the volume of a wiring compartment or junction box with only one conduit or cable entry shall be calculated using two 12 AWG branch circuit conductors and one 12 AWG insulated grounding conductor		N

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Clause	Requirement Test	Result Remark	Verdict
	the volume of a wiring compartment or junction box with more than one conduit or cable entry shall be calculated using two 12 AWG branch circuit conductors entering, two 12 AWG branch circuit conductors leaving, and two 12 AWG insulated grounding conductors		N
	where the luminaire requires branch circuit conductors larger than 12 AWG, the input ampere rating shall determine the conductor size; and		N
	uninsulated grounding or bonding conductors integral to the luminaire shall not be counted		N
6.16.4	A sample of the wiring compartment or junction box provided for engineering evaluation shall be wired as intended, and the following shall apply		N
	conductors entering, leaving, or residing in the wiring compartment or junction box shall extend at least 150 mm (6 in) inside		N
	wire connectors of the appropriate type and size shall be used		N
	a wiring compartment or junction box with only one conduit or cable entry shall be wired with at least two 12 AWG branch circuit conductors and one 12 AWG insulated grounding conductor		N
	a wiring compartment or junction box with more than one conduit or cable entry shall be wired with at least two 12 AWG branch circuit conductors entering, two 12 AWG branch circuit conductors leaving, and two 12 AWG insulated grounding conductors		N
	the required number of insulated or uninsulated bonding conductors shall be installed		N
	all conductors for lampholder, ballasts, control devices, and other accessories intended to be provided with the luminaire shall be installed; and		N
	through-wiring branch circuit conductors as determined by the luminaire marking are installed using wire connectors of the appropriate type and size		N
6.16.5	The covers shall be installed as intended without damage to the conductors, wire connectors, and other accessories		N
6.17	**Separation of circuits**		N
6.17.1	Factory installed wiring		N

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Clause	Requirement Test	Result Remark	Verdict
6.17.1	Factory-installed power limited wiring and branch circuit wiring that come in random contact within the luminaire shall have insulation rated for the maximum voltage that exists in any of the circuits		N
6.17.2	Field-installed wiring		N
6.17.2.1	Luminaires designed for the field installation of power limited circuits shall be provided with a means of segregating or separating the field-installed power limited circuit wiring from the branch circuit wiring within the luminaire.		N
6.17.2.2	Power limited circuit wiring and the branch circuit wiring in the same wiring compartment shall be permanently separated a minimum 6.4 mm (0.250 in) by		P
	separate entries for field-installed branch circuit wiring and power limited wiring, and		P
	reliable routing of the conductors within the luminaire; or		P
	barriers that comply with Clauses 6.17.2.3 and 6.17.2.4.		P
6.17.2.3	A barrier used to separate power limited wiring from branch circuit wiring in a field wiring compartment shall be made of		N
	minimum 0.4 mm (0.016 in) thick metal bonded to other grounded parts of the luminaire		N
	minimum 0.7 mm (0.028 in) vulcanized fiber; or		N
	minimum 0.7 mm (0.028 in) molded polymeric material with a temperature rating suitable for the temperature involved		N
6.17.2.4	The width of an opening between a barrier and adjacent parts of the luminaire that separate power limited wiring from branch circuit wiring shall not exceed 1.6 mm (0.063 in). This dimension shall be measured between the barrier and the enclosure walls, components, or the like that serve as part of the compartment		N
6.18	**(MEX) Wire splices and connections**		N
6.18.1	(MEX) In Mexico, every wire splice shall be protected with glass, marble, ceramic material, or polymeric composition and shall also be accessible for maintenance and inspection		N

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Clause	Requirement Test	Result Remark	Verdict
6.18.2	(MEX) In Mexico, a wire splice shall be mechanically and electrically secure and shall be soldered unless a suitable connector is used that has insulation with a maximum operating temperature in accordance with Table 14.12.2 (MEX)		N
7	**Incandescent luminaires – supplementary requirements**		P
7.1	**General**		P
7.1.1	The requirements in Clause 7 are supplementary to other applicable requirements in this Standard.		P
7.1.2	A luminaire shall be marked, in a location visible during relamping, with a caution, the maximum lamp wattage, and the lamp type, in accordance with Table 20.1.1, Items 3.17 and 3.1		P
7.1.3	More than one lamp wattage and lamp type, as applicable, may be included in the lamp replacement marking if sufficient testing is conducted to confirm that the temperature requirements are met		N
7.1.4	An incandescent luminaire intended for connection to other than a nominal 120 V circuit shall be marked with the input line voltage in accordance with Table 20.1.1, Item 1.4		N
7.2	**Temperature test-exempt luminaires**		P
7.2..1	General		P
7.2.1.1	An incandescent luminaire that complies with Clause 7.2 is exempt from the normal temperature tests of Clause 14 but shall comply with all other applicable test requirements and the factory production tests of Clause 18		P
7.1.1.2	The following incandescent luminaires are not temperature test exempt		P
	recessed luminaires		N
	luminaires intended for mounting in environmental air-handling spaces, recreational vehicles, or exhaust ducts and hoods		N
	luminaires intended for operation in elevated ambient temperature		N
	luminaires provided with polymeric enclosures, barriers, water shields, or structural parts		P
	luminaires employing tungsten-halogen lamps		N

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Clause	Requirement Test	Result Remark	Verdict
	luminaires employing a lamp compartment having more lampholders than the number permitted in Table 7.2.1.1 or a lamp wattage greater than permitted in Table 7.2.1.2; and		N
	wet location luminaires with gaskets or bushings		N
7.2.1.3	The maximum number of lampholders and wattage of lamps shall be in accordance with Tables7.2.1.1 and 7.2.1.2		N
7.2.1.4	The lamp compartment of a pendant ceiling-mounted, surface wall-mounted, pole-mounted, or post-mounted luminaire shall be defined by one of the lamp compartment definitions shown in Figure 7.2.1.1		N
7.2.1.5	The lamp compartment of a surface ceiling-mounted luminaire shall comply with the requirements of Clause 7.2.5		N
7.2.1.6	The dimensions described in Clause 7.2.2 and 7.2.3 shall be measured using the following screwbase lamps		N
	medium base, 60 W A19 intermediate base, 25 W T8; or candelabra base, G16-1/2		N
7.2.2	Conductors integral to the luminaire		N
7.2.2.1	A conductor spaced		N
	50 mm (2 in) or less from a lamp or lampholder shall have a minimum insulation rating of 150 °C, unless otherwise specified in Clause 7.2.2.2 or 7.2.2.3, in which case the lowest conductor insulation rating specified may be used; or		N
	more than 50 mm (2 in) from a lamp or lampholder shall have a minimum insulation rating of 60 °C		N
7.2.2.2	A conductor shall have an minimum insulation temperature rating of 75 °C when there is a solid metal barrier between the conductor and the lamp or lampholder and the barrier is spaced a minimum of		N
	38 mm (1.5 in) from the lamp or lampholder; or 25 mm (1 in) from the lamp or lampholder, and the conductor is secured to prevent contact with the barrier		N
7.2.2.3	A conductor located in areas A or B as shown in Figure 7.2.2.1 shall be rated as shown in Table 7.2.2.1		N

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Clause	Requirement Test	Result Remark	Verdict
7.2.3	Branch circuit conductor insulation temperature ratings		N
7.2.3.1	A luminaire shall be marked with a minimum branch circuit temperature rating equal to or greater than the lowest insulation temperature rating permitted in Clauses 7.2.3.2 to 7.2.3.6 for any type luminaire. Clause 7.2.3.6 applies to wall-mounted luminaires only		N
7.2.3.2	A luminaire construction that permits a branch circuit conductor, assumed to be 150 mm (6 in) long, measured from the center of the outlet box face or luminaire conduit connection point, to come within 50 mm (2 in) of a lamp or lampholder shall be marked for branch circuit conductors with a minimum insulation temperature rating of 150 °C in accordance with Table 20.1.1, Item 1.1, and not for use in dwellings in accordance with Item 2.5, unless otherwise specified in Clauses 7.2.3.3, 7.2.3.4, or 7.2.3.5		P
7.2.3.3	A luminaire construction that prevents the branch circuit conductors, assumed to be 150 mm (6 in) long, measured from the center of the outlet box face or luminaire conduit connection point, from coming within 50 mm (2 in) of a lamp or lampholder shall be permitted to be connected to branch circuit conductors with a minimum insulation temperature rating of 60 °C in accordance with Table 20.1.1, Item 1.1, unless otherwise specified in Clause 7.2.3.4 or 7.2.3.5		P
7.2.3.4	A luminaire that provides a solid metal barrier between any lamp or lampholder and any branch circuit conductor, assumed to be 150 mm (6 in) long, measured from the center of the outlet box face or conduit connection point, shall be marked for branch circuit conductors with a minimum insulation temperature rating of 75 °C in accordance with Table 20.1.1, Item 1.1, provided that the barrier is spaced a minimum of		N
	38 mm (1.5 in) from the lamp or lampholder; or		N
	25 mm (1 in) from the lamp or lampholder, and the conductor is routed to prevent contact with the barrier		N
7.2.3.5	A luminaire that permits a branch circuit conductor to be located in areas A or B as shown in Figure 7.2.2.1 shall be marked in accordance with Table 20.1.1, Item 1.1, with the appropriate insulation temperature rating as specified in Table 7.2.2.1		P

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Clause	Requirement Test	Result Remark	Verdict
7.2.3.6	A wall-mounted luminaire shall have the outside surface of the canopy located at least 3.2 mm (0.125 in) from the lamp envelope and lampholder (see dimension A of Figure 7.2.3.1) and shall be marked to indicate the branch circuit temperature rating in accordance with Table 7.2.3.1 and be in accordance with marking requirements of Clause 10.6.9 (USA) and 10.6.9 (CAN)		N
7.2.4	Pendant ceiling-mounted luminaires		N
7.2.4.1	A free air space (see dimension X of Figure 7.2.4.1) of at least 100 mm (4 in) shall exist between a lamp or lamp compartment of a pendant luminaire and the ceiling or canopy it is mounted to when the luminaire is installed as intended. A pendant luminaire with a free air space less than 100 mm (4 in) shall comply with the requirements for a surface ceiling-mounted luminaire of Clause 7.2.5 to be considered test exempt		N
7.2.5	Surface ceiling-mounted luminaires		N
7.2.5.1	The general design and dimensions of a surface ceiling-mounted luminaire shall be as shown in Figure 7.2.5.1		N
7.2.5.2	The luminaires shown in Figure 7.2.5.1 shall be marked either caution, maximum 40 W for intermediate and candelabra base lamps, or caution, maximum 60 W for medium base lamps, in accordance with Table 20.1.1, Items 3.17 and 3.1		N
7.2.5.3	An exposed lamp compartment luminaire as shown in Figure 7.2.5.1 shall have no provision such as threaded canopies, clips, or thumbscrews to attach husks, diffusers, globes, shades, or other parts that can entrap hea		N
7.2.5.4	A partially enclosed lamp compartment as shown in Figure 7.2.5.1 shall be exposed at the top, with no glassware or other material partially or completely enclosing the area above the lamps		N
7.2.5.5	A luminaire shown in Figure 7.2.5.1 shall be provided with thermal insulation that completely closes off the opening to the outlet box at the ceiling line. The thermal insulation shall comply with Clause 5.18.5		N
7.2.5.6	A conductor integral to a surface ceiling-mounted luminaire shall be rated at least 150 °C		N

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Clause	Requirement Test	Result Remark	Verdict
7.2.5.7	The dimensions described in Figures 7.2.3.1 and 7.2.5.1 shall be measured using the following screwbase lamps		N
7.2.6	Surface ceiling-mounted luminaires – bullet shade		N
7.2.6.1	A luminaire shown in Figure 7.2.6.1 is considered to include a partially enclosed lamp compartment and shall be marked caution, maximum 150 W when used with a reflector-type lamp, or caution, maximum 100 W for other lamp types, in accordance with Table 20.1.1, Items 3.17 and 3.1		N
7.2.6.2	A luminaire shown in Figure 7.2.6.1 shall be provided with a mechanical means to prevent it from being aimed at or directed above the horizontal towards the ceiling or canopy, and the back of the shade shall have no open holes		N
7.2.6.3	A luminaire shown in Figure 7.2.6.1 shall be provided with thermal insulation that completely closes off the opening to the outlet box at the ceiling line. The thermal insulation shall comply with Clause 5.18.5		N
7.2.7	Surface wall-mounted luminaires		N
7.2.7.1	A luminaire that appears to be made so that it can be mounted either to a ceiling or wall and that does not comply with the requirements of Clause 7.2.5 or 7.2.6 shall be marked for wall mounting only, in accordance with Table 20.1.1, Item 2.10		N
7.2.7.2	A luminaire construction that permanently spaces the lamp or lampholder 50 mm (2 in) or more from the back plane of the luminaire canopy or from the edge of the outlet box on which it is mounted may have a minimum branch circuit conductor insulation temperature rating of 60 °C when the luminaire is marked to push the conductors into the outlet box, in accordance with Table 20.1.1, Item 1.25		N
7.3	**Tungsten-halogen luminaires**		N
7.3.1	Lamp containment barriers		N
7.3.1.1	A luminaire employing tungsten-halogen lamps as the primary light source shall be provided with a lamp containment barrier that will contain major particles resulting from a ruptured lamp, unless		N
	the lamp manufacturer declares on the lamp package that the lamp is suitable for use in an open luminaire; or		N

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Clause	Requirement Test	Result Remark	Verdict
	the luminaire is intended to be used with a lamp provided with an integral outer lamp envelope, and the lamp manufacturer does not provide a caution requiring an additional lamp containment barrier		N
7.3.1.2	A luminaire employing a tungsten-halogen lamp that does not require an additional lamp containment barrier may be provided with a lamp containment barrier or shall be		N
	marked with a caution, the maximum lamp wattage, and the type of shielded lamp, in accordance with Table 20.1.1, Items 3.1, 3.17 and 3.2; or		N
	marked with a caution, the maximum lamp wattage, the type of shielded lamp, and the lamp replacement requirements in accordance with Table 20.1.1, Items 3.1, 3.17, and 3.20. Additionally, the luminaire may be marked with the symbol shown in Figure D.4, if the luminaire is provided with instructions in accordance with Table 20.1.1, Item 1.33, that explain that the symbol on the lamp package is an indication that the lamp does not require additional shielding		N
7.3.1.3	A lamp containment barrier shall be secured in position by one of the following methods		N
	mechanical means that produces an interference fit physical fit; or other similar means		N
7.3.1.4	A luminaire with a removable lamp containment barrier that is required to be removed during user maintenance shall be marked to keep the barrier in place, in accordance with Table 20.1.1, Item 3.12		N
7.3.1.5	Open holes in a lamp containment barrier that are located at points where particles from a ruptured lamp are likely to drop and rest or that provide a direct line of sight to the filament from the outside the luminaire shall not permit the passage of a 3.3 mm (0.130 in) diameter rod		N
7.3.1.6	A lamp containment barrier shall be constructed of the following materials		N

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Clause	Requirement Test	Result Remark	Verdict
	Ceramic glass in accordance with Clause 7.3.1.7 metal screen metal having minimum thickness of 0.41 mm (0.016 in); or polymeric material in compliance with Clause 7.3.1.8		N
7.3.1.7	The part of a glass containment barrier where particles from a ruptured lamp are likely to drop and rest shall have a minimum thickness of		N
	2.4 mm (0.095 in) for luminaires rated less than 100 W; and		N
	3.0 mm (0.118 in) for luminaires rated for 100 W or more		N
7.3.1.8	A polymeric lamp containment barrier, where particles from a ruptured lamp are likely to drop and rest, shall comply with the lamp containment barrier melt-through test of Clause 16.29 or the five-inch flame test of Clause 16.3		N
7.3.2	Accessibility of double-ended lamp terminals		N
7.3.2.1	Lamp terminals of a double-ended tungsten-halogen lamp shall not be accessible during relamping unless		N
	all ungrounded circuit conductors are disconnected by an interlock switch before the parts become accessible; or		N
	the supply circuit has one grounded conductor, and the lamp terminals can only make initial contact with the grounded lampholder terminal; or		N
	the supply circuit has one grounded conductor, and in order to be fully installed the lamp is required to be inserted into the grounded lampholder terminal first. The luminaire shall be marked adjacent to the lampholder connected to the grounded (neutral) supply connection with a caution and to indicate insertion of the lamp in this lampholder first, in accordance with Table 20.1.1, Items 3.18 and 3.10.		N
7.3.2.2	An interlock switch shall comply with the interlock switch endurance test of Clause 17.3		N
7.3.2.3	A luminaire employing a double-ended tungsten-halogen lamp without an interlock switch shall be marked with a caution and to disconnect power before servicing in accordance with Table 20.1.1, Items3.18 and 3.6		N

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Clause	Requirement Test	Result Remark	Verdict
7.3.2.4	A disconnect switch provided on a luminaire shall disconnect all ungrounded supply conductors, and the OFF position shall be marked on or adjacent to the switch		N
7.3.3	Tungsten-halogen lamp voltage incompatibility		N
7.3.3.1	The requirements in Clause 7.3.3 apply to a luminaire employing a tungsten-halogen lamp as the primary light source, and are not intended to cover auxiliary light sources within the same luminaire. These requirements shall not apply to photographic equipment with internal tungsten-halogen lamps		N
7.3.3.2	The lampholder voltage for a luminaire employing a lamp with a lamp base configuration shown in Table 7.3.3.1 shall be 30 V rms, 42.4 V peak, or less, regardless of the nominal luminaire input voltage		N
7.3.3.3	The lampholder voltage for a luminaire employing a lamp with a lamp base configuration shown in Table 7.3.3.2 shall be a nominal operating voltage of 120 V		N
7.3.3.4	An adapter shall not be provided to convert a luminaire employing a lamp with a lamp base configuration shown in Table 7.3.3.2 (for use at a nominal operating voltage of 120 V) to accommodate a lamp with a lamp base configuration shown in Table 7.3.3.1 (for use at 30 V rms, 42.4 V peak, or less) unless the adapter is provided with an integral, isolated, step-down transformer or voltage converter		N
8	**Fluorescent luminaires – supplementary requirements**		N
8.1	**General**		N
8.1.1	The requirements in Clause 8 are supplementary to other applicable requirements in this Standard		N
8.2	**Ballasts**		N
8.2.1	A fluorescent luminaire shall use a thermally protected ballast, except that a non-thermally protected simple reactance ballast may be used		N
	with straight tubular lamps; or		N
	when the luminaire is marked for outdoor use only, in accordance with Table 20.1.1, Item 2.4		N
8.2.2	A luminaire designed for use with a remotely mounted ballast shall meet the following requirements		N

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Clause	Requirement Test	Result Remark	Verdict
	it shall be provided with means for connection of the ballast using one of the power supply connections described in Clause 6.15		N
	it shall not employ single-pins type lampholders		N
8.3	**Supply cords and conductors**		N
8.3.1	When the supply cord of a luminaire permits the cord to be pushed back into the enclosure, resulting in a spacing between the cord and the ballast of less than 76 mm (3 in), the supply cord shall be rated for at least 90 °C or for the temperature of any component it can contact, whichever is greater		N
8.3.2	Conductors shall have a minimum temperature rating in accordance with Table 8.3.1 or the temperature measured during the normal temperature test of Clause 14		N
8.3.3	A recessed fluorescent luminaire shall not be provided with flexible cord for connection to the supply		N
8.4	**Lampholders**		N
8.4.1	Lampholders shall be of a type and voltage rating suitable for the lamp and ballast intended to be used		N
8.4.2	Lampholders of the bipin, miniature, medium, or mogul size shall have a voltage rating greater than the output voltage or voltage to ground, if marked on the ballast.		N
8.4.3	The voltage rating of lampholders intended for use with a simple reactance ballast shall be greater than the supply voltage		N
8.4.4	Circuit-interrupting-type lampholders required by the ballast marking shall be connected in accordance with the ballast wiring diagram		N
8.4.5	Lampholders of the single pin, slimline type shall have the circuit-interrupting mechanism in the stationary lampholder		N
8.4.6	Lampholders of the circuit-interrupting type shall be connected in the line side of the ballast and have a voltage rating greater than the supply voltage		N
8.4.7	The lampholders connected to the high voltage ballast conductors shall be rated		N
	600 V minimum; or		N

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Clause	Requirement Test	Result Remark	Verdict
	250 V and provided with a supplementary insulation consisting of 0.4 mm (0.016 in) thick material of fiber or phenolic composition; or		N
	250 V and provided with a 2 mm (0.078 in) permanent air space between the back of the lampholder and the metal of the luminaire.		N
8.4.8	Lampholders intended for use with HO (800 mA) and VHO (1500 mA) lamps shall be the recessed double contact type		N
8.5	**Temperature-test-exempt luminaires**		P
8.5.1	A luminaire that complies with the applicable requirements of Clause 8.5 is exempt from the normal temperature test of Clause 14 and the abnormal temperature test of Clause 15		P
8.5.2	The following constructions are not temperature test exempt		P
	Type IC recessed luminaires		N
	luminaires intended for mounting in non-residential exhaust ducts and hoods above cooking equipment		N
	luminaires intended for operation in elevated ambient temperature		N
	uminaires provided with polymeric enclosures or water shields with a mechanical temperature rating less than 105 °C		P
	luminaires marked for through wiring that do not comply with Clause 8.5.3;		P
	luminaires employing more than one ballast spaced less than 25 mm (1 in) end to end or 100 mm (4 in) side to side		N
	luminaires with wire whose insulation temperature rating does not comply with Table 8.3.1		N
	luminaires provided with a non-thermally-protected ballast, rated for use with single-ended fluorescent lamps		N
	wet locations luminaires with gaskets or bushings;		N
	luminaires provided with a thermally protected ballast located less than 75 mm (3 in) from a knockout or other power supply entry, unless the luminaire is marked for 90 °C supply conductors in accordance with Table 20.1.1, Item 1.1; and		N
	luminaires employing single-ended fluorescent lamps		N

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Clause	Requirement Test	Result Remark	Verdict
8.5.2	(USA) In the United States, luminaires employing single-ended fluorescent lamps and thermally protected ballasts shall be temperature test exempt		N
8.5.3	A luminaire intended for use with through wiring is temperature test exempt under the following conditions		N
	he wiring compartment is at least 13 mm (0.5 in) from the recessed housing; and		N
	there are no other heat-producing components mounted on or in the wiring compartment.		N
8.6	**Marking**		P
8.6.1	Instead of the current rating in amperes, as required by Clause 20.2.3, a luminaire employing		P
	a high-power-factor, reactor-type ballast or ballasts for bipin lamps (preheat or rapid start types) may be marked in accordance with Table 20.1.1, Item 1.27		N
	a low-power-factor, reactor-type ballast or ballasts for bipin lamps may be marked in accordance with Table 20.1.1, Item 1.28; or		P
	single-pin lamps (instant start type) and high-power-factor ballast or ballasts may be marked in accordance with Table 20.1.1, Item 1.29, using the multiplying factors shown in Table 8.6.1		N
8.6.2	A luminaire intended for use with an adapter plate and shipped without the adapter shall be marked to indicate the plate, in accordance with Table 20.1.1, Items 4.1 and 4.2		P
8.6.3	A luminaire designed for use with a remote ballast shall be marked to indicate that the intended ballast is thermally protected, in accordance with Table 20.1.1, Item 1.30		P
8.6.4	A luminaire designed for use with single-ended, compact fluorescent lamps and having non-thermally protected ballasts shall be marked to indicate the lamps intended, in accordance with Table 20.1.1, Item 3.21		N
8.6.5	A luminaire designed for use with germicidal lamps shall be marked to warn the user of the dangers of exposure of the eye and bare skin to UV radiation, in accordance with Table 20.1.1, Items 3.19 and 4.7		N
8.7	**Emergency battery packs**		N

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Clause	Requirement Test	Result Remark	Verdict
8.7.1	A luminaire provided with a factory-installed listed or certified emergency battery pack shall be:		N
	installed in accordance with the installation instructions marked on or provided with the pack; and		N
	marked to indicate emergency backup in accordance with Table 20.1.1, Item 1.42		N
8.8	**Luminaires incorporating instant-start electronic ballasts and bi-pin lampholders**		N
8.8.1	A luminaire with instant-start ballast(s), incorporating bi-pin lampholders shall		N
	be constructed with a ballast(s) identified as Type CC, or		N
	be constructed with lampholders intended for use with instant-start electronic ballasts in accordance with Clause 4.1. Lampholders marked with a circle “I” comply with these requirements.		N
8.9	**(CAN) Branch circuit disconnects**		N
8.9.1	(CAN) In Canada, each fluorescent luminaire utilizing double-ended lamps provided with ballasts intended for installation on branch circuits with voltages exceeding 150 volts to ground, includingmulti-voltage ballasts such as 120-277 V, shall be provided with one or more installed disconnect means that		N
	complies with Clause 8.9.2 (CAN)		N
	simultaneously opens all circuit conductors between the branch circuit conductors and one or more ballast(s); and		N
	are marked according to their specific locations, with the marking located and worded according to (i) or (ii), as follows when the disconnect means is installed inside the luminaire, the marking shall be located adjacent to such means and shall be worded in accordance with Table 20.1.1, Item 3.24 when the disconnect means is installed outside the luminaire and not accessible from the room side, the marking shall be located adjacent to the ballast and shall be worded in accordance with Table 20.1.1, Item 3.25		N
8.9.2	(CAN) In Canada, an acceptable disconnect means shall consist of one or more of the following		N

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Clause	Requirement Test	Result Remark	Verdict
	a mating connector with a current-interrupting rating and voltage rating suitable for the ballast(s) employed in the luminaire		N
	a multi-pole switch that opens all circuit conductors simultaneously and is rated in accordance with Clause 6.4.1.1		N
	a wiring harness that is considered suitable for this application		N
8.9.3	(CAN) In Canada, each fluorescent luminaire utilizing double-ended lamps intended to be installed on branch circuits with voltages exceeding 150 volts to ground and designed for use with remote ballasts, including multi-voltage ballasts such as 120-277 V, shall be provided with a disconnect means that complies with Clause 8.9.2 (CAN), at the ballast location		N
8.9.4	(CAN) In Canada, luminaires complying with Clause 8.7 are not required to be provided with disconnect means when marked in accordance with Table 20.1.1, Items 3.27 and 3.28		N
8.10	**(CAN) Branch circuit disconnects — Conversion kits**		N
8.10.1	(CAN) In Canada, a retrofit conversion kit designed to provide a disconnect means for currently installed fluorescent luminaires shall include		N
	a disconnect means that complies with Clause 8.9.2 (CAN)		N
	instructions that comply with Clause 8.10.2 (CAN)		N
	twist-on or push-in wire connectors, if supplied as components of the conversion kit, rated for a minimum 600 V; and		N
	a separate pressure-sensitive label, to be installed during retrofit, that complies with Clause8.9.1 (CAN) (c)		N
8.10.2	(CAN) In Canada, each conversion kit shall include the following markings on the smallest packaging unit		N
	a heading, in accordance with Table 20.1.1, Item 1.44		N
	a caution in accordance with Table 20.1.1, Item 3.26		N

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Clause	Requirement Test	Result Remark	Verdict
	instructions for the intended application and complete details if designed for a specific luminaire or ballast(s) type; and		N
	instructions regarding the installation of the label required in Clause 8.10.1 (CAN) (d)		N
9	**HID luminaires – supplementary requirements**		N
9.1	**General**		N
9.1.1	The requirements in Clause 9 are supplementary to other applicable requirements in this Standard		N
9.2	**Lampholders**		N
9.2.1	A lampholder intended to be used with a lamp that requires high-voltage starting pulses shall have a pulse rating suitable for the lamp starting voltage		N
9.2.2	The insulation on the lampholder conductors and the conductors of the output circuit of a ballast that requires high-voltage starting pulses shall be rated a minimum of 600 V.		N
9.3	**Lamp containment barriers for metal halide lamps**		N
9.3.1	A luminaire employing a metal halide lamp shall be provided with a lamp containment barrier that can contain major particles resulting from a ruptured lamp, unless		N
	the luminaire is intended for use with only a Type-O thick-glass parabolic reflector (PAR) lamp. The luminaire shall be marked with a caution, the lamp wattage and an ANSI designation in accordance with Table 20.1.1, Items 3.17, 3.8, and 3.9. The lamp designation in the marking specified in Item 3.8 shall include “/O” following the lamp ANSI electrical code designation to indicate the need to re-lamp with a metal halide Type-O lamp (e.g., M90/O); or		N
	the luminaire is provided with a means that only allows the use of a lamp that is a metal halide Type-O. The luminaire shall be marked with the lamp wattage and an ANSI designation in accordance with Table 20.1.1, Item 3.8. The lamp designation in the marking specified in Item 3.8 shall include “/O” following the lamp ANSI electrical code designation to indicate the need to relamp with a metal halide Type-O lamp (e.g. M155/O)		N

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Clause	Requirement Test	Result Remark	Verdict
9.3.2	A lamp containment barrier shall be secured in position		N
9.3.3	Open holes in a lamp containment barrier that are located at points where particles from a ruptured lamp are likely to drop and rest or that provide a direct line of sight to the arc tube from outside the luminaire shall not permit the passage of a 3.3 mm (0.130 in) diameter rod		N
9.3.4	A lamp containment barrier shall be constructed of the following material:		N
	Ceramic Glass metal screen metal having a minimum thickness of 0.41 mm (0.016 in); or polymeric material.		N
9.3.5	The part of a glass containment barrier where particles from a ruptured lamp are likely to drop and rest shall be minimum 3.0 mm (0.118 in) thick		N
9.3.5.1	A polymeric material shall not be used as a lamp containment barrier for vertically oriented (15°) metal halide lamps that are rated from 175 – 400 W unless the luminaire is marked to restrict its application to outdoor environments in accordance with Table 20.1.1, Item 2.4		N
9.3.6	If the part of a glass containment barrier where particles from a ruptured lamp are likely to drop and rest is not borosilicate or tempered glass, it shall comply with the lamp containment barrier thermal shock test of Clause 16.28		N
9.3.7	The part of a polymeric containment barrier where particles from a ruptured lamp are likely to drop and rest shall comply with the lamp containment barrier melt-through test of Clause 16.29 or the five-inch flame test of Clause 16.3		N
9.4	**Ultra-violet (UV) attenuation barriers for metal halide lamps without integral UV blocking outer glass envelopes**		N
9.4.1	Genera		N
9.4.1.1	A luminaire intended to be used with a metal halide lamp shall		N
	be provided with an UV attenuation barrier in accordance with Clauses 9.4.1.2 to 9.4.1.4		N

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Clause	Requirement Test	Result Remark	Verdict
	use a metal halide lamp with a quartz outer envelope that is marked with an ANSI lamp code that includes an “E” or “O” (e.g., M130/E) and be provided with a marking instructing the user to use only a metal halide lamp that is marked with the ANSI lamp code that includes an “E” or “O,” identifying it as complying with ANSI C78.380, in accordance with Table 20.1.1, Item 3.22; or		N
	use a metal halide lamp with a glass outer envelope and marked with an ANSI lamp code that includes an “E” or “O” or “S” (e.g., M135/O), identifying it as complying with ANSI C78.380. The lamp replacement marking shall also include the ANSI lamp code “E” or “O” or “S” as part of the lamp designation in accordance with Table 20.1.1, Item 3.8		N
9.4.1.2	An UV attenuation barrier shall be constructed of the following materials		N
	glass in accordance with Clause 9.4.2		N
	metal; or		N
	ceramic		N
9.4.1.3	A UV attenuation barrier shall not have any open holes that would permit direct viewing of the light source or light that is reflected from only one surface		N
9.4.1.4	A luminaire with a UV attenuation barrier shall be provided with an interlock switch in accordance with Clause 6.4.2 to de-energize the lamp when the lamp compartment is opened		N
9.4.2	Glass		N
9.4.2.1	A glass UV attenuation barrier shall be constructed of one of the following:		N
	soda lime glass having a minimum thickness of 4.0 mm (0.157 in)		N
	another type of glass that has a minimum thickness of 3.0 mm (0.118 in) and that complies with the ultra-violet transmission requirements specified in Table 9.4.2.1; or		N
	other types of glass with a minimum thickness of 3.0 mm (0.118 in) if the luminaire, lamp, and attenuation barrier comply with the accepted effective UV power limits described in the ANSI/IESNA RP 27 series of standards; and the luminaire is marked to identify the lamp in accordance with Table 20.1.1, Item 3.23.		N

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Clause	Requirement Test	Result Remark	Verdict
9.4.2.2	A UV attenuation barrier shall withstand without fracture a 2.7 J (2 ft·lb) impact using the test apparatus described in Clause 19.21		N
9.4.2.3	A UV attenuation barrier used on a ground-mounted recessed luminaire or a luminaire marked as suitable for installation within 1.22 m (4 ft) of the ground shall withstand without fracture a 6.8 J (5 ft·lb) impact using the test apparatus described in Clause 19.21		N
9.5	**Accessibility of double-ended lamp terminals**		N
9.5.1	Lamp terminals of a double-ended HID lamp shall not be accessible during relamping unless:		N
	all ungrounded circuit conductors are disconnected by an interlock switch before the parts become accessible;		N
	the supply circuit has one grounded conductor, and the lamp terminals can only make initial contact with the grounded lampholder terminal; or		N
	the supply circuit has one grounded conductor, and in order to be fully installed the lamp is required to be inserted into the grounded lampholder terminal first. The luminaire shall be marked, adjacent to the lampholder connected to the grounded supply connection, with a caution and with a statement indicating the method of lamp insertion in the lampholder. These markings shall be in accordance with Table 20.1.1, Items 3.18 and 3.10		N
9.5.2	An interlock switch shall comply with the interlock switch endurance test of Clause 17.3.		N
9.5.3	Luminaires employing a double-ended HID lamp without an interlock switch shall be marked with a caution and a warning to disconnect power before servicing, in accordance with Table 20.1.1, Items 3.18 and 3.6.		N
9.6	**Marking**		N
9.6.1	An HID luminaire shall be marked with the lamp wattage and lamp designation that coincide with the ballast rating, in accordance with Table 20.1.1, Item 3.8.		N
9.6.2	An HID luminaire using a lamp that does not have an ANSI designation shall be marked with a lamp wattage that coincides with ballast rating and, if applicable, the voltage and lamp type, in accordance with Table 20.1.1, Items 3.14 and 3.16		N

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Clause	Requirement Test	Result Remark	Verdict
9.6.3	More than one lamp wattage and lamp type, as applicable, may be included in the lamp replacement marking if testing is conducted to confirm that the temperature requirements are met.		N
9.6.4	A luminaire that uses only a low-pressure sodium lamp shall not be required to have a lamp replacement marking.		N
9.6.5	A luminaire with a removable lamp containment barrier as described in Clause 9.3 that is required to be removed during user maintenance shall be marked to keep the barrier in place, in accordance with Table 20.1.1, Item 3.12		N
9.6.6	A luminaire with a removable UV attenuation barrier that is required to be removed during user maintenance shall be marked with a caution and to keep the protective barrier in place or replace removable parts in accordance with Table 20.1.1, Items 3.19 and 3.13.		N
10	**Surface-mounted luminaires – supplementary requirements**		P
10.1	**General**		P
10.1.1	The requirements in Clause 10 are supplementary to other applicable requirements in this Standard.		P
10.2	**Mounting means**		P
10.2.1	A luminaire intended to be directly mounted to an outlet box shall be provided with two No. 8-32 machine screws if the luminaire surface containing the mounting screw holes is more than 3.2 mm (0.125 in) from the mounting surface. The length of each screw shall be at least 13 mm (0.5 in) plus the distance from the mounting surface to the luminaire surface that contains the screw holes		P
10.2.2	A crossbar intended as the sole support for mounting a luminaire to an outlet box shall be at least1.35 mm (0.053 in) thick if made of steel or at least 1.9 mm (0.075 in) thick if made of metal other than steel		N
10.2.3	The thickness of a crossbar may be reduced to 1.0 mm (0.040 in) for steel and 1.4 mm (0.055 in) for metal other than steel if reinforced by forming flanges along the edges		P
10.2.4	The thickness of a crossbar may be less than 1.0 mm (0.040 in) for steel and 1.4 mm (0.055 in) for metal other than steel if the crossbar complies with the loading test of Clause 16.15		P

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Clause	Requirement Test	Result Remark	Verdict
10.2.5	A luminaire, including lamps, shall be provided with means of support independent of the outlet box and shall be marked and provided with installation instructions in accordance with Table 20.1.1, Items1.21and 1.33, if it is		P
	a ceiling surface type and weighs more than 22.7 kg (50 lb); or		N
	a surface wall-mounted type and weighs more than 11.4 kg (25 lb)		N
10.2.6	A two-piece polymeric electrical connector and support assembly for mounting a luminaire to an outlet box shall		N
	be provided with a means for connecting the		N
	have no uninsulated live parts on the outlet box mounted piece that are accessible to incidental contact;		N
	comply with the polymeric connector loading test specified in Clause 16.30;		N
10.2.7	A luminaire that is supported by a lampholder screwshell shall not have		N
	a mass that exceeds 2.7 kg (6 lb); or a dimension that exceeds 400 mm (15.75 in).		N
10.2.8	Any part supported by the external threads on the body of a lampholder shall comply with the loading test of Clause 16.15		N
10.2.9	A luminaire intended to be mounted to an outlet box shall not be provided with a table, shelf, tray surface, basket, hook, eye, or other feature that allows the addition of weight.		N
10.2.10	A luminaire provided with means to support it independently of the outlet box may be provided with a table, shelf, tray surface, basket, hook, eye, or other feature that allows the addition of weight.		N
10.2.11	A luminaire supported by chain or cable shall use stranded wire from the point that the wire exits the luminaire enclosure to the point where it connects to the branch circuit supply conductors. The weight of the luminaire shall be supported by the chain or cable, not the conductors.		N
10.2.12	A flexible cord providing the sole support of a luminaire or luminaire part shall not be subjected to kinks or sharp bends, and shall be at least:		N
	a not-for-hard-usage jacketed type if supporting a mass of 2.3 kg (5 lb) or less; or		N

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Clause	Requirement Test	Result Remark	Verdict
	a hard-usage jacketed type if supporting a mass of 4.5 kg (10 lb) or less.		N
10.2.13	A joint in a circular chain link shall be welded. A joint in a chain link of another shape shall not be located within 30 degrees of the vertical, as shown in Figure 10.2.1, unless welded		N
10.2.14	(MEX) In Mexico, pendant luminaires weighing more than 6.8 kg (15 lb) or luminaires intended to be supported by a suspended ceiling grid shall be manufactured so as to accommodate safety devices that will provide support independent of the threaded tube or ceiling grid that normally supports the luminaire.		N
10.3	**Poles**		N
10.3.1	A pole used for support of a luminaire shall serve as or contain a raceway that extends the entire length of the pole. It shall be constructed of the following materials:		N
	metal; metal-lined wood;		N
10.3.2	A circular metal pole shall be		N
	steel at least 1.01 mm (0.040 in) thick; or aluminum alloy at least 1.27 mm (0.050 in) thick; and		N
10.3.3	A metal pole that is other than circular in shape shall be:		N
	steel at least 1.63 mm (0.064 in) thick; or aluminum alloy at least 1.88 mm (0.074 in) thick		N
10.3.4	A metal lining in a wood pole shall be		N
	steel at least 0.66 mm (0.026 in) thick; or other metal at least 0.81 mm (0.032 in) thick.		N
10.3.5	A pole shall be provided with the following		N
	a splice compartment a means for grounding the pole in accordance with Clause 6.14.2; and a means for bonding a luminaire to the pole in accordance with Clause 6.14.3		N
10.3.6	A pole 2.44 m (8 ft) or less in height shall not be required to be provided with the following		N

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Clause	Requirement Test	Result Remark	Verdict
	a splice compartment, provided that the incoming supply wiring can be brought up through the pole without additional splices or pull points; and the interior of the pole and any splices are accessible by removal of the luminaire; or		N
10.3.7	A splice compartment shall be located above ground level and shall be provided with a handhole that is		N
	rectangular, not less thanradius up to one-half of the width; or any other shape or size, provided a projected view of the finished opening encompasses the described area		N
10.3.8	A pole having its own means for supply connection shall be constructed in such a way that the point of connection of conduit or cable shall be located at least 150 mm (6 in) from the lower end of the metal raceway		N
10.3.9	A pole more than 30 m (100 ft) in length that is not provided with conductor support shall be marked in accordance with Table 20.1.1, Item 1.24		N
10.3.10	A pole shall comply with the applicable requirements for wet locations specified in Clause 13.4.		N
10.3.11	A ferrous metal raceway shall comply with the corrosion protection requirements specified in Clause 13.4.2		N
10.3.12	Aluminum intended for direct insertion into the ground or into concrete shall be provided with a protective coating		N
10.3.13	(CAN) In Canada, poles over 4 meters shall also comply with the requirements of CSA C22.2 No. 206		N
10.4	**Open holes and openings**		N
10.4.1	Open holes located 13 mm (0.5 in) or less from the surface on which the enclosure of a surface-mounted, outlet-box connected luminaire is intended to be mounted shall be considered to be one or more of the following		N
	luminaire mounting holes component mounting holes pendant device mounting holes; or access holes		N

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Clause	Requirement Test	Result Remark	Verdict
10.4.2	Open holes other than those specified in Clause 10.4.1 shall be considered to be general purpose open holes and shall comply with the requirements of Clause 10.4.3.		N
10.4.3	General purpose open holes, such as ventilating open holes, shall be located more than 13 mm (0.5 in) from the mounting surface of a luminaire and shall comply with the following		N
10.4.4	Luminaire mounting holes may be any shape. A maximum of four open holes shall be permitted within the area directly below the outlet box opening in accordance with Figure 10.4.1. The maximum area of each hole shall be 2.6 cm^2 (0.41 in^2). Two additional holes shall be permitted for each 610 mm (24 in) of luminaire length in excess of 1270 mm (50 in).		N
10.4.5	Component mounting holes may be provided in the back enclosure, facing the luminaire mounting surface, provided that they comply with the following		N
	The maximum diameter of any open holes is 7.9 mm (0.313 in).		N
	The maximum area of each unclosed portion of a slot used to accommodate components mounted in place or of an unused slot intended for accommodation of alternate components is 0.32 cm^2 (0.05 in^2).		N
	The maximum total area of all unused open holes for alternate component mounting is 5.16 cm^2 (0.80 in^2)		N
10.4.6	Component mounting holes that are not closed off shall not be located within the area directly below the outlet box opening shown in Figure 10.4.1, unless baffled in accordance with Clause 5.8		N
10.4.7	A luminaire with a canopy that covers 1160 cm^2 (180 in^2) or more of the mounting surface shall be provided with a back enclosure. The back enclosure shall comply with the enclosure requirements of Clause 5.3.1. An open hole in the back enclosure shall		N
	if circular , have a maximum area of 1160 cm^2 (180 in^2) and have a maximum diameter of 380 mm (15 in), as shown in Figure 10.4.2; or		N
	if not circular , have a maximum area of 1160 cm^2 (180 in^2) and a maximum linear length, usually diagonal, of 660 mm (26 in), as shown in Figure 10.4.3		N

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Clause	Requirement Test	Result Remark	Verdict
10.4.8	A luminaire with a canopy that covers less than 1160 cm^2 (180 in^2) of the mounting surface and has the dimensions specified in Clause 10.4.7, Item (a) or (b), is not required to be provided with a back enclosure		N
10.4.9	An open hole in a luminaire enclosure need not comply with the requirements of Clause 10.4.5 or 10.4.7, provided that the open hole is closed off by a noncombustible mounting surface. The luminaire shall be marked for mounting on a noncombustible surface, in accordance with Table 20.1.1, Item 2.6. This marking is not required when the opening is covered by a glass fiber pad that complies with the glass fiber requirement of Clause 5.18		N
10.4.10	An open hole or pair of holes may be provided for each stem or chain of a pendant device if each hole is closed by a suspension device. Knockouts may be provided in addition to, or in lieu of, the open hole or holes		N
10.4.11	An opening for a pull switch in a sheet metal drop canopy secured by set screws shall be located within 90 mm (3.5 in) of the center of the canopy		N
10.4.12	An opening for a pull switch in a sheet metal drop canopy secured by set screws that is reinforced by a minimum 3.2 mm (0.125 in) thick metal bar shall be located within 90 mm (3.5 in) of the means attaching the reinforcing bar to the canopy.		N
10.5	**Accessibility of supply connections**		N
10.5.1	A luminaire shall allow for the inspection of branch circuit connections after installation. A luminaire weighing 4.54 kg (10 lb) or less, excluding diffusers, light-directing parts, and decorative parts, may be removed to provide access to branch circuit connections, without additional access openings		N
10.5.2	An access opening or separate means of luminaire support shall be provided if branch circuit connections or internal wiring can be subjected to a force of more than 4.5 kg (10 lb) during installation or field inspection. Chain, cable, hinges, or equivalent means of luminaire support shall be capable of withstanding the loading test of Clause 16.15.		N
10.5.30	Access openings or openings through a supporting strap, cross-bar, or plate may be of any shape and shall be:		N

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Clause	Requirement Test	Result Remark	Verdict
	a single opening that allows passage of a rod having a diameter of 44.5 mm (1.75 in); or		N
	two openings, each at least 10 cm^2 (1.5 in^2) in area, that allow passage of a rod having a diameter of 16 mm (0.625 in).		N
10.6	**Electrical construction**		P
10.6.1	The cord of a cord-connected luminaire that is required to be grounded shall contain an equipment grounding conductor		P
10.6.2	A conductor or flexible cord that is routed through the chain of a chain pendant luminaire shall have a minimum 0.80 mm (0.032 in) nominal insulation, and if a cord, it shall be at least Type SPT-1. A grounding conductor may be uninsulated.		P
10.6.3	A fluorescent or HID pendant luminaire designed for a chain, hook, or similar means of suspension may be provided with a flexible power cord.		N
10.6.4	Flexible cord provided with an attachment plug cap shall be at least of hard-usage type		N
10.6.5	A flexible cord shall be provided with a strain-relief device that complies with the strain-relief test specified in Clause 16.21.1. The flexible cord on a chain or cable suspended luminaire shall not be required to be provided with strain relief		N
10.6.6	A luminaire that can be adjusted, after installation, to change the angle of light shall be provided with one of the following:		P
	a cord bushing and a length of flexible cord of hard-usage type or heavier for connection to branch circuit conductors; or		N
	a junction box cord grip bushing without a length of flexible cord.		N
10.6.7	A luminaire shall be shipped with the cord mounted in place and connected		N
10.6.8	In a pendant luminaire, a bonding conductor may be terminated by hardware that is also used to secure a lampholder or lampholder bracket if that is the only available termination point and if that part of the lampholder is the only conductive part on the luminaire that is likely to become live.		N
10.6.9	(USA) In the United States, the temperature measured on the supply connections of a surface-mounted luminaire during the normal temperature test of Clause 14 shall		P

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Clause	Requirement Test	Result Remark	Verdict
	not exceed 60 °C; or		P
	not exceed 90 °C, and be marked for use with minimum 75 °C or 90 °C supply conductors, as appropriate, in accordance with Table 20.1.1, Item 1.1; or		P
	not exceed 200 °C, and be marked with a warning to prohibit use in dwellings, in accordance with Table 20.1.1, Item 2.5; and for use with minimum 105 °C, 125 °C, 150 °C, or 200 °C supply conductors, in accordance with Table 20.1.1, Item 1.1		P
10.6.10	(CAN) In Canada, the temperature measured on the supply connections of a surface-mounted luminaire with an integral outlet box during the normal temperature test of Clause 14 shall		N
	not exceed 75 °C; or		N
	not exceed 90 °C, and the luminaire shall be marked for use with minimum 90 °C supply conductors, in accordance with Table 20.1.1, Item 1.1; or		N
	not exceed 200 °C, and the luminaire shall be marked with a warning to prohibit use in dwellings, in accordance with Table 20.1.1, Item 2.5; and for use with minimum 105 °C, 125 °C, 150 °C, or 200 °C supply conductors in accordance with Table 20.1.1, Item 1.1.		N
10.7	**Tests**		P
10.7.1	A luminaire shall comply with the applicable normal temperature test of Clause 14.		P
10.7.2	A luminaire that appears to be suitable for either ceiling mounting or wall mounting shall be tested as one of the following:		P
	a ceiling-mounted luminaire; or a wall-mounted luminaire, and it shall be marked for wall mounting only, in accordance with Table 20.1.1, Item 2.10		N
10.7.3	A luminaire that is intended for under-cabinet mounting shall comply with the temperature test of Clause 14.4.		P
10.7.4	(MEX) In Mexico, pole- or arm-mounted luminaires intended for exterior public lighting shall comply with the vibration test of Clause 16.37 (MEX).		N
10.8	**Markings**		P

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Clause	Requirement Test	Result Remark	Verdict
10.8.1	A luminaire that requires branch circuit conductors rated greater than 60 °C and that may be installed in a dwelling shall include a caution and an installation warning marking on the luminaire and the carton, in accordance with Table 20.1.1, Items 3.17 and 1.32. Item 1.32 may be omitted if the carton is marked with Items 3.17 and 1.31 of Table 20.1.1		P
10.8.2	(USA) In the United States, a luminaire intended for under-cabinet mounting shall be marked in accordance with Table 20.1.1, Item 2.12.		P
10.8.3	A ceiling-mounted luminaire tested on an uninsulated ceiling shall be marked in accordance with Table 20.1.1, Item 2.6		N
10.8.4	A luminaire that has a flexible power cord and attachment plug and that is not provided with a hook, loop, or chain shall be marked for chain and hook suspension only, in accordance with Table 20.1.1, Item 1.22		N
11	**Recessed luminaires – supplementary requirements**	Portable luminaires	N
11.1	**General**		N
11.1.1	The requirements in Clause 11 are supplementary to other applicable requirements in this Standard.		N
11.1.2	Polymeric material used to form an enclosure or a housing or to provide structural support shall comply with the requirements of Clauses 5.7.1, 5.7.2, and 11.7.2.		N
11.1.3	A recessed luminaire intended for installation in a suspended ceiling and weighing more than 22.7 kg (50 lb) shall have provision for support independent of the ceiling grid.		N
11.1..4	A luminaire provided with integral suspended ceiling clips shall comply with the security of clips test of Clause 16.18 and shall be provided with installation instructions that specify the grid type, in accordance with Table 20.1.1, Item 1.33.		N
11.2	**Enclosures**		N
11.2.1	The surfaces of an enclosure described in Clause 5.3.2 that are not visible from the room side shall have no open holes, except as specified in Clauses 11.3.8 and 11.4.3		N

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Clause	Requirement Test	Result Remark	Verdict
11.2.2	Open holes in the surface of an enclosure of live parts that are visible from the room side shall comply with the requirements of Clause 10.4.		N
11.3	**Junction boxes**		N
11.3.1	A junction box that complies with the component requirements of Clause 4.1 and is attached to a luminaire may have openings that do not comply with Clauses 11.2.1 and 11.2.2		N
11.3.2	The wiring compartment (junction box) where the branch circuit connections to the luminaire are made shall be integral to the luminaire or securely fastened to its enclosure or frame. A wiring compartment attached by flexible conduit shall have additional means of securement		N
11.3.3	A luminaire provided with a through-wire junction box shall be marked with the number and size of the branch circuit conductors in accordance with Table 20.1.1, Item 1.40, and shall:		N
	be provided with hanger bars that attach either directly to the junction box or within 51 mm (2 in) of the junction box on the bracket that secures the junction box to the luminaire; or		N
	comply with the junction box rigidity test of Clause 16.31; or		N
	be marked for use with cable in accordance with Table 20.1.1, Item 1.37.		N
11.3.4	A luminaire marked with through branch circuit conductor temperature rating in accordance with Clause 11.3.3 and Table 20.1.1, Item 1.40, shall be considered in compliance with Clause 11.8.1.1		N
11.3.5	A polymeric junction box shall comply with the requirements of Clause 4.1		N
11.3.6	The minimum inside volume of the junction box shall comply with Clause 6.16		N
11.3.7	The thickness of a junction box, excluding covers, shall be a minimum of 1.25 mm (0.050 in) if sheet steel, 2.3 mm (0.09 in) if nonferrous sheet metal, or 3.2 mm (0.125 in) if cast metal, with the following exceptions		N
	the minimum thickness at or within 6.4 mm (0.25 in) of any right-angle bend in a drawn sheet steel box may be 0.9 mm (0.035 in)		N

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Clause	Requirement Test	Result Remark	Verdict
	the average thickness of the sides and ends of a drawn steel box may be 1.24 mm (0.049 in), based on three measurements made on the side and end of the box, but a minimum of 9.5 mm (0.375 in) from a right-angle bend. The three measurements shall be made in a line perpendicular to the front of the box at the following points: a point 6.4 mm (0.25 in) from the front, a point 6.4 mm (0.25 in) from the right-angle bend at the back, and a point equidistant between the two.		N
	the wall of a malleable iron box or a die-cast or permanent-mold-cast aluminum, brass, or bronze box shall be in accordance with Table 5.5.2		N
	a wall thickness of minimum 2.4 mm (0.094 in) shall be accepted for clearance of a cover screw in the area directly beneath the cover mounting lug if that area is no larger than 32.36 mm^2 (0.050 in^2) and has no straight-line dimension more than 12.7 mm (0.5 in)		N
	if a luminaire is marked for use with cable only as specified in Clause 11.3.3, the junction box may be in accordance with the thickness requirement for openings for conduit connection specified in Table 5.5.1		N
	if the luminaire complies with the junction box rigidity test of Clause 16.31, the junction box shall not be less than the thickness requirement for openings for conduit connection specified in Table 5.5.1		N
11.3.8	An open hole in a box, such as a mounting-screw hole, shall have no dimension larger than 6.7 mm (0.265 in), except that a pryout hole or slot may be provided in a knockout for 1 in or smaller trade size conduit, provided that the area of the hole or slot is no more than 26 mm^2 (0.040 in^2).		N
11.3.9	Unless it has been threaded or provided with a threaded connector, an open hole in a junction box intended for the entrance of conduit, armoured cable, or other wiring system shall be effectively closed		N
11.3.10	The thickness of a sheet steel plug or plate used to close an open hole in a metal junction box shall be as specified in Table 11.3.1		N
11.3.11	The thickness of a junction box cover shall be no less than		N
	for sheet metal, the thickness requirements for enclosures specified in Table 5.5.1; or		N

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Clause	Requirement Test	Result Remark	Verdict
	for cast metal, the thickness requirements of Table 5.5.2.		N
11.3.12	Metal junction boxes having an integral strain-relief mechanism for cable shall comply with the cable pull test of Clause 16.40 or with the requirements of Clause 4.1		N
11.4	**Recessed housing**		N
11.4.1	A recessed housing shall close off the opening in the surface in which it is mounted		N
11.4.2	A housing shall have a minimum thickness of 0.66 mm (0.026 in) if ferrous metal or 0.71 mm (0.028 in) if nonferrous metal		N
11.4.3	Where a luminaire recessed housing also serves as an enclosure, a top surface that is less than 30 degrees from the horizontal and any outer wall that contains any of the parts specified in Clause 5.3.2 shall have		N
	a maximum of two pryout slots, each having a maximum area of 26 mm^2 (0.04 in^2); and		N
	ballast mounting slots, each having a maximum unused area of 26 mm^2 (0.04 in^2)		N
11.4.4	A recessed housing of a Type Non-IC luminaire that does not serve as an enclosure may have open holes in the shape of a slot or louvre that shall be a maximum 9.5 mm (0.375 in) wide and 10 cm^2 (1.5 in^2) in area. Any other open hole shall not allow passage of a rod having a diameter of 25 mm (1 in) and not exceed 10 cm^2 (1.5 in^2) in area. The total area of all open holes shall be maximum 15 percent of the area of the opening in the mounting surface closed off by the recessed housing.		N
11.4.5	A recessed housing of a Type IC luminaire that does not serve as an enclosure may have open holes in the shape of a slot or louvre that shall be a maximum 4.8 mm (0.188 in) wide and 10 cm^2 (1.5 in^2) in area. Any other open hole shall not allow passage of a rod having a diameter of 6.4 mm (0.25 in) and shall not exceed 10 cm^2 (1.5 in^2) in area. The total area of all open holes shall be a maximum of 15 percent of the area of the opening in the mounting surface closed off by the recessed housing.		N

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Clause	Requirement Test	Result Remark	Verdict
11.4.6	A luminaire intended for installation in poured concrete shall be constructed to prevent the ingress of wet concrete into the areas provided for supply connection in a quantity sufficient to interfere with normal operation, shall comply with Clause 14.9, and shall be marked for installation in poured concrete in accordance with Table 20.1.1, Item 2.21		N
11.4.7	A luminaire with openings in the housing that exceed those specified in Clause 11.4.3, 11.4.4, or11.4.5 shall be marked for use in non-fire-rated installations only, in accordance with Table 20.1.1, Item 1.26.		N
11.5	**Thermal protectors**		N
11.5.1	General		N
11.5.1.1	A recessed luminaire shall be provided with a thermal protector unless the luminaire is		N
	intended to be installed in concrete only, as specified in Clause 11.4.6;		N
	inherently protected, complies with the temperature test of Clause 14.8, and is marked in accordance with Table 20.1.1, Item 2.24		N
	intended to be installed in the ground only and is marked in accordance with Table 20.1.1, Item 2.27;		N
	intended to be installed in an outdoor canopy or marquee where it is not intended to be covered with thermal insulation, and is marked in accordance with Table 20.1.1, Item 2.26		N
	fluorescent, when the ballast is required to have a thermal protector in accordance with Clause 8; or		N
	HID, Type IC, and marked in accordance with Table 20.1.1, Item 2.23.		N
11.5.1.2	A thermal protector shall comply with the requirements of Clause 4.1.		N
11.5.1.3	A thermal protector may be of the self-heating thermal protector (SHTP) type. If a self-heating thermal connector is connected to a grounded supply, it shall be connected in the ungrounded supply conductor. Figures 11.5.1.1 and 11.5.1.2 provide HID luminaire examples		N
11.5.1.4	The thermal protector in a luminaire with a ballast or transformer shall be rated for inductive loads and the voltage and current involved		N
11.5.2	Thermal protectors for HID luminaires		N

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Clause	Requirement Test	Result Remark	Verdict
11.5.2.1	An HID luminaire with a thermal protector that is intended to be connected in the luminaire circuit in the field shall be pre-wired to a plug or receptacle so that the protector cannot be unintentionally bypassed		N
11.5.3	Thermal protectors for incandescent luminaires		N
11.5.3.1	A thermal protector in a luminaire with medium-base lampholders that can accommodate lamps of higher wattage than that marked on the lamp replacement shall have a minimum rating of 300 W Tungsten multiplied by the number of medium-base lampholders.		N
11.5.3.2	The thermal protector in a luminaire with other than medium-base lampholders that can accommodate lamps of higher wattage than that marked on the lamp replacement shall have a minimum tungsten lamp wattage rating equal to twice the maximum wattage specified in the lamp replacement marking multiplied by the number of lampholders that it controls		N
11.6	**Electrical construction**		N
11.6.1	Inspection of supply connections		N
11.6.1.1	The branch circuit connections shall be accessible for visual inspection from the room side of the luminaire, unless:		N
	the luminaire is marked to restrict its use to installations where there is ready access to the ceiling side of the luminaire, in accordance with Table 20.1.1, Item 2.7; or		N
	access to branch circuit connections is provided in accordance with Clause 11.6.1.2		N
11.6.1.2	The branch circuit connections are considered accessible from the room side of the luminaire if:		N
	the center of the wiring compartment cover is visible through the access opening; and		N
	all parts that are required to be removed to gain access are easily removed and replaced from the room side of the luminaire; and		N
11.6.1.3	The branch circuit connections of a luminaire intended for use in poured concrete shall be accessible from the relamping side of the luminaire		N
11.6.2	Tap conductors		N
11.6.2.1	A tap conductor supplied with a luminaire shall:		N

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Clause	Requirement Test	Result Remark	Verdict
	be enclosed in a raceway extending at least 450 mm (18 in) but not more than 2 m (6.5 ft) from the luminaire		N
	extend at least 150 mm (6 in) from the raceway; and		N
	be at least 18 AWG if enclosed in a factory-installed raceway, or at least 14 AWG when supplied with a raceway and connectors for field installation		N
11.6.2.2	(USA) In the United States, a luminaire furnished with tap conductors without flexible metal conduit shall be furnished with a connection fitting for either		N
	1/2 in or larger trade size conduit; or		N
	3/8 in trade size conduit, provided the maximum number of conductors and the type of fitting are in accordance with the wire size and type shown in Table 11.6.2.1 (USA).		N
11.6.3	Rough-in and finishing sections		N
11.6.3.1	If electrical connections are required between the rough-in and finishing sections, they shall be completed by plugging an attachment plug provided as part of the finishing section into a receptacle on the rough-in section		N
11.7	**Tests**		N
11.7.1	Temperature		N
11.7.1.1	A luminaire shall comply with the normal and abnormal temperature tests in accordance with Table 11.7.1.1		N
11.7.1.2	A Type Non-IC luminaire with standard spacings shall comply with the normal temperature test of Clause 14.5 and the abnormal temperature test of Clause 15.2. A fluorescent luminaire that incorporates thermal protection within an integral ballast is not required to be subjected to the abnormal temperature test		N
11.7.1.3	A Type Non-IC luminaire with marked spacings shall comply with the normal temperature test of Clause 14.6 and the abnormal temperature test of Clause 15.3.		N
11.7.1.4	A Type IC luminaire with a thermal protector shall comply with the normal temperature test of Clause 14.7 and the abnormal temperature test of Clause 15.4		N

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Clause	Requirement Test	Result Remark	Verdict
11.7.1.5	A Type IC luminaire that is inherently protected shall comply with the normal temperature test of Clause 14.8		N
11.7.1.6	A convertible recessed luminaire shall comply with the requirements for both Type Non-IC and Type IC luminaires specified in Table 11.7.1.1		N
11.7.1.7	Each combination of trim/finishing section and housing/rough-in section shall comply with the performance requirements of Clause 11.7.1		N
11.7.1.8	A trim/finishing section shall be used with the housing/rough-in section of the same manufacturer		N
11.7.1.9	A luminaire intended to be installed in concrete only shall comply with Clause 14.9 and shall be marked in accordance with Table 20.1.1, Item 2.20		N
11.7.1.10	A ground-mounted recessed luminaire shall comply with the test of:		N
	Clause 14.5; or		N
	Clause 14.9 and shall comply with one of the following requirements it shall have normal operating temperatures on the mounting surfaces and recessed housing of 90 °C or less and be marked for ground mounting only, in accordance with Table 20.1.1, Item 2.27; or it shall be marked for noncombustible surfaces only, in accordance with Table 20.1.1, Item 2.6		N
11.7.1.11	A canopy-type luminaire shall be		N
11.7.1.12	A canopy-type luminaire that is marked for uncovered ceiling only, in accordance with Table 20.1.1, Item 2.25, shall be tested in accordance with Clause 14.5 for standard spacings or in accordance with Clause 14.6 for marked spacings, with no top on the test box.		N
11.7.1.13	A recessed luminaire provided with means to vary the depth of a lampholder within a lamp compartment or recessed housing shall be tested without the lampholder mounting bracket stop in place if the stop does not comply with the lampholder mounting stop test of Clause 16.35		N
11.7.2	Polymeric tests		N
11.7.2.1	Polymeric parts that serve as enclosures or housings required by this Standard shall comply with the tests in Clauses 11.7.2.2 to 11.7.2.4		N

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Clause	Requirement Test	Result Remark	Verdict
11.7.2.2	Using the test apparatus of Clause 19.21, an impact of 7 J (5 ft·lb) shall be applied to the polymeric part. The test shall be conducted		N
	at an ambient temperature of 25 °C; and		N
	immediately after conditioning for 3 h in a freezer operating at 0 °C		N
11.7.2.3	For a polymeric part that is intended for wet locations, an impact of 7 J (5 ft·lb) shall be applied, using the test apparatus specified in Clause 19.21. The test shall be conducted immediately after cold conditioning for 3 h at -35 °C for assemblies, such as outer housings, exposed to the room side or ceiling side of the installation.		N
11.7.2.4	A polymeric housing supporting a screw-shell-type lampholder shall be subjected to the lampholder mounting torque test of Clause 16.33 and the pull test of Clause 16.34.		N
11.8	**Markings**		N
11.8.1	General		N
11.8.1.1	The temperature of the branch circuit connections of a luminaire intended for use in a dwelling unit, when subjected to the normal temperature test of Clause 14, shall not exceed 90 °C, and the luminaire shall be marked in accordance with Clause 6.15.1.5		N
11.8.1.2	The temperature of the branch circuit connections of a luminaire intended for use in other than a dwelling unit, when subjected to the normal temperature test of Clause 14, shall		N
	not exceed 200 °C		N
	be marked for use with the appropriate temperature for branch circuit conductors, in accordance with Table 20.1.1, Item 1.1; and		N
	be marked not for use in dwellings, in accordance with Table 20.1.1, Item 2.5		N
11.8.1.3	If the temperature on any part of the luminaire mounting surface or recessed housing exceeds the limit for combustible building parts as shown in Table 14.1.2, Item 17, during the normal temperature test of Clause 14, the luminaire shall be marked for mounting on noncombustible material, in accordance with Table 20.1.1, Item 2.17		N

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Clause	Requirement Test	Result Remark	Verdict
11.8.1.4	A recessed luminaire that requires access from above the ceiling or from behind the wall to inspect splices shall be marked in accordance with Table 20.1.1, Item 2.7 or 2.8		N
11.8.1.5	A rough-in section shall be marked to indicate the appropriate finishing section to be used, in accordance with Table 20.1.1, Item 1.34		N
11.8.1.6	A trim/finishing section shall be marked with the manufacturer's identification and catalogue number, in accordance with Table 20.1.1, Items 4.1 and 4.2		N
11.8.1.7	A luminaire intended to be shipped separately from the trim shall be marked for trim identification, in accordance with Table 20.1.1, Item 1.9		N
11.8.1.8	A recessed luminaire with a thermal protector that is acceptable for connection to a branch circuit supply rated in excess of 20 A may be marked 30 A or 40 A, to indicate the maximum branch circuit rating, in accordance with Table 20.1.1, Item 1.2		N
11.8.1.9	An incandescent recessed luminaire employing a mogul base lampholder and a thermal protective device with a 20 A branch circuit rating shall be marked for connection to a branch circuit of 20 A max, in accordance with Table 20.1.1, Item 1.2		N
11.8.1.10	A Type Non-IC incandescent or HID luminaire shall be marked with a caution to keep it away from insulation and with the statement that a blinking light can indicate overheating, in accordance with Table 20.1.1, Items 1.13 and 3.11		N
11.8.1.11	A Type IC luminaire shall be marked with the luminaire type and with the statement that a blinking light can indicate overheating, in accordance with Table 20.1.1, Items 2.23 and 3.11		N
11.8.1.12	A Type IC luminaire shall be marked to indicate the minimum vapor barrier temperature, in accordance with Table 20.1.1, Item 1.14.		N
11.8.1.13	An inherently protected Type IC luminaire shall be marked with the luminaire type and with the statement that it is inherently protected, in accordance with Table 20.1.1, Items 2.23 and 2.24		N

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Clause	Requirement Test	Result Remark	Verdict
11.8.1.14	A ground-mounted recessed luminaire tested in sand during the normal temperature test of Clause 14.9 shall be marked ground-mounted recessed installation only or for installation in concrete only, in accordance with Table 20.1.1, Item 2.27 or 2.20		N
11.8.2	Lamp replacement		N
11.8.2.1	A recessed luminaire shall be marked with a caution, the maximum lamp wattage, and the type, in accordance with Table 20.1.1, Items 3.17 and 3.1.		N
11.8.2.2	Where a luminaire construction consists of a rough-in or housing section and a trim or finishing section, the relamping information shall be visible during relamping with all components installed in place.		N
11.8.2.3	The lamp replacement marking may be concealed behind a trim or finishing section that must be removed during relamping.		N
11.8.2.4	The lamp replacement marking may be concealed behind a trim or finishing section that is not required to be removed during relamping if the visible portion of the trim or finishing section is marked to indicate that the relamping marking is located on the concealed side, in accordance with Table 20.1.1, Item 3.15		N
11.8.2.5	A luminaire construction that requires a different lamp wattage or type for an alternate trim or finishing section shall be marked with a caution, the maximum lamp wattage, and the type in accordance with Table 20.1.1, Items 3.17 and 3.1 (see examples in Tables 20.1.4, 20.1.5, and 20.1.6).		N
11.8.3	Marked spacings		N
11.8.3.1	A Type Non-IC luminaire with marked spacings, as shown in Figures 19.14.1.1 and 19.14.1.2, shall be marked in accordance with Table 20.1.1, Item 1.19, to indicate the minimum spacings required to comply with the temperature test of Clause 14.6. The spacings shall be determined as follows		N

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Clause	Requirement Test	Result Remark	Verdict
	the minimum permissible center-to-center spacing of adjacent luminaires shall be determined by measuring the length and width of the luminaire, and adding 300 mm (12 in) to the larger dimension. The result shall be evenly divisible by 300 mm (12 in) or be rounded up to the next larger number evenly divisible by 300 mm (12 in), but in no case shall be less than 600 mm (24 in). The markings shall be 600, 900, 1200, 1500, or 1800 mm (24, 36, 48, 60, or 72 in) or larger, in increments of 300 mm (12 in)		N
	from the top of luminaire to the overhead building member the spacing shall be as follows: 13, 75, 150, 200, 250, 300, 380, 460, 600, 760, 900, 1050, or 1200 mm (0.5, 3, 6, 8, 10, 12, 15, 18, 24, 30, 36, 42, or 48 in) or larger, in increments of 150 mm (6 in).		N
	the luminaire center-to-side building member spacing shall be 1/2 the value specified in Item (a)		N
11.8.4	Convertible recessed luminaires – Type Non-IC to Type IC		N
11.8.4.1	A convertible luminaire shall comply with the applicable requirements for both Type Non-IC and Type IC recessed luminaires. In addition, the following requirements shall apply		N
	a rough-in section shall be marked to identify it as a convertible luminaire rough-in section, in accordance with Table 20.1.1, Item 1.36		N
	a rough-in section for a convertible recessed luminaire shall be marked with correlation markings that identify the trim/finishing section combinations that result in a Non-Type IC luminaire and those that result in a Type IC luminaire. The markings shall be located inside the housing or rough-in section and shall be in accordance with Table 20.1.1, Item 1.38		N
11.8.5	Luminaires with polymeric parts		N
11.8.5.1	Installation instructions for a luminaire provided with a polymeric junction box or wiring compartment shall specify the type of wiring method to be employed, in accordance with Table 20.1.1, Item 1.33		N
11.8.5.2	A luminaire that is provided with a polymeric recessed housing shall be marked not for use in fire-rated installations and for use in one- and two-family dwellings only or not for use in environmental air spaces, in accordance with Table 20.1.1, Items 1.26 and 1.39		N

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Clause	Requirement Test	Result Remark	Verdict
12	**Miscellaneous luminaires – supplementary requirements**		P
12.1	**General**		P
12.1.1	The requirements in Clause 12 are supplementary to other applicable requirements in this Standard		P
12.2	Air-handling luminaires		P
12.2.1	General		P
12.2.1.1	The requirements in Clause 12.2 apply to both recessed and surface-mounted luminaires for use with heating, ventilating, and air-conditioning systems in accordance with NFPA 90A and the *National Building Code of Canada*		P
12.2.1.2	The requirements in Clause 12.2 also cover plastic light diffusers or lenses intended for use with an air-handling luminaire.		P
12.2.2	Mechanical construction		P
12.2.2.1	The air path shall not be through the electrical enclosure		P
12.2.2.2	Lamps and lampholders may be located in an air path.		N
12.2.2.3	A nonmetallic material, adhesive, or coating used for a part, other than a lamp, lampholder, or light diffuser, that is located in the air path or plenum shall comply with the flame test of Clause 12.2.3.1		P
12.2.2.4	A frame or support for a plastic diffuser shall:		P
	provide a complete metal U-shaped channel around the perimeter of the diffuser		P
	overlap the diffuser a maximum of 19.1 mm (0.75 in) at either (short) end and a maximum of 12.7 mm (0.5 in) on either (long) side; and		N
	provide a visible clearance between the diffuser and each section of the channel; or		P
	be investigated and found to be equivalent		P
12.2.2.5	(CAN) In Canada, a plastic lens or light diffuser used with an air-handling luminaire shall comply with the *National Building Code of Canada*, Article 3.1.13.4.		P
12.2.3	Tests		P
12.2.3.1	Plastic material flame		P

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Clause	Requirement Test	Result Remark	Verdict
12.2.3.1.1	A sample of the material shall be held in a jig at 30 degrees from the horizontal over a vertical test flame for 5 min, with 19.1 mm (0.75 in) of the flame in contact with the sample. The test flame shall be supplied by a Bunsen burner with a nominal 11.1 mm (0.438 in) diameter barrel, adjusted to give a 38.1 mm (1.5 in) high yellow cone with the air shut off		P
12.2.3.1.2	The material shall not ignite or flame during or after the test.		P
12.2.3.2	Large scale fallout		N
12.2.3.2.1	The luminaire shall be mounted in a 3.6 m 2.4 m (12 ft 8 ft) draft-free test room with a 3 m (10 ft) ceiling. The luminaire shall be connected to an air duct with a controlled positive or negative airflow, as appropriate, of 6.8 m^3 (240 ft^3) per minute		N
12.2.3.2.2	12.2.3.2.1 A 53.3 cm 53.3 cm (21 in 21 in) steel pan, 10.2 cm (4 in) deep and 6 mm (0.25 in) thick shall be filled with alcohol to a point 5.1 cm (2 in) above the bottom of the pan. The pan shall be located 121.9 cm (4 ft) below the center of the diffuser surface, and the alcohol shall be ignited and allowed to burn until it is depleted or the diffuser falls from the luminaire.		N
12.2.3.2.3	The diffuser shall not ignite while it is in its intended position.		N
12.2.3.3	Impingement fire		P
12.2.3.3.1	Two luminaires shall be mounted with ends touching in a draft-free test room with a 3 m (10 ft) ceiling. One luminaire shall be connected to an air duct with a controlled positive or negative airflow, as appropriate, of 6.8 m^3 (240 ft^3) per minute		N
12.2.3.3.2	A 15.25 cm (6 in) diameter, 10.2 cm (4 in) deep steel container shall be filled with a minimum of 10.2 cm (4 in) of alcohol. The axial center of the pan shall be located at the center point of the diffuser edge that is farthest away from the luminaire connected to the air duct. The surface of the alcohol shall be 15.25 cm (6 in) from the diffuser. The alcohol shall be ignited and allowed to burn until it is depleted or the diffuser falls from the luminaire		P

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Clause	Requirement Test	Result Remark	Verdict
12.2.3.3	The flame shall not be propagated from the ignited diffuser to the adjacent diffuser.		P
12.2.4	Marking		P
12.2.4.1	A luminaire intended for air handling shall be marked in accordance with Table 20.1.1, Item 1.15		P
12.2.4.2	A luminaire intended for handling cooled or ventilated air only shall be marked in accordance with Table 20.1.1, Item 1.16		P
12.2.4.3	A light diffuser intended to be used with a luminaire shall be shipped with the luminaire		N
12.2.4.4	A plastic diffuser shall be shipped with the luminaire if it is supported by a frame integral to the luminaire		N
12.2.4.5	A luminaire, intended for use as an air-handling register, with open holes in the recessed housing exceeding those specified by Clause 11.4.4 shall be marked for use in a noncombustible ceiling plenum only, in accordance with Table 20.1.1, Item 2.9		N
12.2.4.6	A luminaire, intended for optional use as an air-handling register, with open holes in the recessed housing exceeding those specified by Clause 11.4.4 shall be marked for use in an environmental air-handling space other than ducts or plenums in accordance with Table 20.1.1, Item 1.18		P
12.2.4.7	(CAN) In Canada, the fitting and the marking specified in Clause 12.2.4.7, Items (b) and (c), shall not be required		P
12.3	**Luminaires for use above cooking equipment**		N
12.3.1	Genera		N
12.3.1.1	The requirements in Clause 12.3 apply to both recessed and surface-mounted luminaires for use in exhaust ducts or hoods above cooking equipment in nonresidential occupancies		N
12.3.2	Mechanical construction		N
12.3.2.1	The enclosure shall be constructed of one of the following:		N
12.3.2.2	An enclosure or part that serves to complete an enclosure shall be of stainless steel or steel coated with zinc or cadmium. The thickness of the coating shall be in accordance with Table 5.5.1		N

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Clause	Requirement Test	Result Remark	Verdict
12.3.2.3	The enclosure, including the diffuser and frame, shall be constructed so that cooking vapors and grease are excluded from the lamp and wiring compartments by welding, brazing, gasketing, or equivalent means		N
12.3.2.4	There shall be no openings in the enclosure unless provided for the connection of an appropriate metallic wiring system or for servicing the lamp compartment. All openings shall be closed in normal use		N
12.3.2.5	A means of connection for conduit shall be threaded and shall comply with Clause 6.15.2		N
12.3.2.6	All mounting holes of the luminaire shall be in an external mounting foot, lug, or flange		N
12.3.2.7	All mounting hardware, excluding screws, nuts, and washers, shall be mounted on the luminaire at the factory		N
12.3.2.8	A light diffuser shall be of glass that is resistant to thermal and mechanical shock, in accordance with Clauses 12.3.3.2 and 12.3.3.4		N
12.3.2.9	A recessed luminaire shall be provided with gasketing on the mounting surface between the luminaire and the cooking hood.		N
12.3.2.10	Gasket and sealing material shall be resistant to deterioration from the temperature, cooking grease, and vapors to which it will be subjected. The gasket and sealing material shall comply with the lard/fat and oil immersion test of Clause 12.3.3.6. Consideration shall be given to the irregularity of the contact surfaces, the aging, and the methods of installation of the light diffuser		N
12.3.3	Tests		N
12.3.3.1	Temperature		N
12.3.3.1.1	When tested as specified in Clause 14, a luminaire shall be mounted in a closed test compartment having a volume at least five times the approximate volume of the luminaire enclosure, and there shall be no restriction of the free flow of air inside the compartment.		N
12.3.3.1.2	A surface-mounted luminaire shall be suspended in the test compartment		N

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Clause	Requirement Test	Result Remark	Verdict
12.3.3.1.3	A recessed luminaire shall be enclosed in a test box constructed of nominal 12 mm (0.5 in) plywood that is reasonably tight but not sealed. The box dimensions shall be in accordance with the marking specified in Clause 12.3.4.2. The test box with the luminaire inside shall be mounted to an appropriate opening in an additional close-fitting wall inside the test compartment to simulate recessed mounting in the hood.		N
12.3.3.1.4	Air in the test compartment shall be maintained at a constant temperature of 75 2 °C or, at the manufacturer's option, the air in the test compartment may be as low as 25 °C.		N
12.3.3.1.5	When temperatures on the luminaire have stabilized, the full difference between the actual test ambient temperature and 75 °C shall be added to or subtracted from the observed readings		N
12.3.3.1.6	The resultant temperatures shall be within the limits specified for various materials in Clause 14		N
12.3.3.2	Thermal shock		N
12.3.3.2.1	While the luminaire and diffuser are at operating temperature, the diffuser shall be subjected to a spray of water at a temperature of 25 5 °C. The water spray shall be created using a rubber ear syringe and shall be directed and applied normal to the surface of the diffuser at the hottest location		N
12.3.3.2.2	There shall be no breaking or cracking of the diffuser that affects the integrity of the overall enclosure		N
12.3.3.3	Accelerated aging		N
12.3.3.3.1	One sample of the complete luminaire shall be exposed to a temperature of 10 °C above normal operating temperature in a circulating air oven for a period of 7 h. The normal operating temperature shall be established by the temperature test described in Clause 12.3.3.1, but in no case shall be less than 100 °C. Upon completion of this test, the mechanical abuse and sprinkler tests of Clauses 12.3.3.4 and 12.3.3.5 shall be conducted		N
12.3.3.3.2	Any distortion resulting from the test shall not prevent the luminaire from continuing to operate satisfactorily, and there shall be no water leakage into the luminaire		N
12.3.3.4	Mechanical abuse		N

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Clause	Requirement Test	Result Remark	Verdict
12.3.3.4.1	One sample of the diffuser assembly shall be subjected to an impact of 4.1 J (3 ft·lb) using the apparatus described in Clause 19.21		N
12.3.3.4.2	There shall be no breakage or cracking of the material, and there shall be no water leakage into the luminaire as determined by the sprinkler test of Clause 12.3.3.5		N
12.3.3.5	Sprinkler		N
12.3.3.5.1	A surface luminaire or the exposed surface of a recessed luminaire shall comply with the sprinkler test of Clause 16.5.3.		N
12.3.3.6	Lard/fat and oil immersion		N
12.3.3.6.1	Two groups of three gasket or sealing material specimens shall be tested for tensile strength and elongation both before and after immersion for 96 h. One group of specimens shall be immersed in lard or other animal fat, and the second group of specimens shall be immersed in corn oil. In all cases, the lard or other animal fat and the corn oil shall be maintained at a temperature of 100 °C		N
12.3.3.6.2	After exposure, the gasket or sealing material specimens shall have a tensile strength of at least 60 percent and an elongation of at least 75 percent of the values determined before exposure		N
12.3.4	Marking		N
12.3.4.1	The luminaire shall be marked		N
12.3.4.2	A recessed luminaire shall be marked with the minimum acceptable spacings, in accordance with Table 20.1.1, Item 1.19		N
12.4	**Elevated ambient temperature luminaires**		N
12.4.1	General		N
12.4.1.1	The requirements in Clause 12.4 apply to luminaires intended for use in locations that experience a continuous elevated ambient temperature		N
12.4.2	Tests		N
12.4.2.1	A luminaire shall		N
12.4.3	Marking		N
12.4.3.1	A luminaire intended to be used in an elevated ambient temperature shall be marked in accordance with Table 20.1.1, Item 1.6		N

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Clause	Requirement Test	Result Remark	Verdict
12.4.3.2	A luminaire may be marked in tabular form for multiple elevated ambient temperatures corresponding with supply wire temperature rating.		N
12.5	**Luminaire fittings**		P
12.5.1	A luminaire fitting shall comply with the applicable requirements in this Standard		P
12.5.2	A luminaire created by assembling luminaire fittings shall comply with the applicable requirements in this Standard.		P
12.6	**(CAN) – DELETED**		P
13	**Environmental location luminaires – supplementary requirements**		P
13.1	**General**		P
13.1.1	The requirements in Clause 13 are supplementary to other applicable requirements in this Standard		P
13.1.2	A luminaire shall be marked for a dry, damp, or wet location, as appropriate, and in accordance with Table 20.1.1, Item 2.1, Item 2.2, or Item 2.3.		P
13.1.3	A dry location luminaire shall not be provided with any markings, instructions, or illustrations, either on the carton or with the luminaire, that imply that it is suitable for use, or depict its use, in a damp or wet location.		P
13.2	**Damp and wet location luminaires**		P
13.2.1	General		P
13.2.1.1	Damp and wet location luminaires shall have electrical insulation material with moisture-resistant properties equivalent to treated cellulosic or vulcanized fiber, phenolic, urea, or ceramic. Untreated fiber shall not be used		P
13.2.1.2	The lampholder screwshells of the luminaire shall be copper, copper alloy of at least 80 percent copper, nickel alloy, or stainless steel.		P
13.3	**Damp location luminaires**		P
13.3.1	Marking		P
13.3.1.1	A luminaire intended for use in damp locations that complies with the requirements of Clauses 13.2 and 13.3, as applicable, shall be marked in accordance with Table 20.1.1, Item 2.2		P

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Clause	Requirement Test	Result Remark	Verdict
13.3.1.2	A damp location luminaire shall not be provided with any markings, instructions, or illustrations, on the carton or with the luminaire, that imply that it is suitable for use, or depict its use, in a wet location.		P
13.4	**Wet location luminaires**		P
13.4.1	Enclosures		P
13.4.1.1	A luminaire shall be constructed to prevent the accumulation of water on live parts, electrical components, or conductors not identified for use in contact with water		P
13.4.2	Corrosion protection		P
13.4.2.1	Copper, aluminum, alloys of copper and aluminum, stainless steel, and similar materials having inherent resistance to atmospheric corrosion may be used without additional corrosion protection		P
13.4.2.2	All exposed exterior and interior surfaces of ferrous metal parts shall be protected by one of the following		P
13.4.2.3	The requirements of Clause 13.4.2.2 shall not apply to the following		P
13.4.2.4	Edges, punched holes, and spot welds in prefinished steel, and hanger locations for painting or plating in ferrous metal shall not require any corrosion protection.		P
13.4.2.5	Welds in ferrous metals shall be painted with at least one coat of outdoor paint, and spot welds in galvanized steel shall be painted with at least one coat of paint		N
13.4.2.6.	Vitreous enamels may be used as a protective coating for ferrous sheet metal having a minimum thickness of 0.6 mm (0.025 in)		N
13.4.3	Drain holes		N
13.4.3.1	A luminaire that permits water to enter the luminaire during the rain test of Clause 16.5.2 or the sprinkler test of Clause 16.5.3 shall be provided with a drain hole		N
13.4.3.2	Drain holes, if provided, shall be located in the surface most likely to prevent the accumulation of wate		N
13.4.3.3	Drain holes shall permit the insertion of a 3.2 mm (0.125 in) diameter rod.		N
13.4.4	Water shields		N

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Clause	Requirement Test	Result Remark	Verdict
13.4.4.1	A polymeric water shield shall be of a UV-rated material or shall comply with the UV exposure conditioning test of Clause 16.5.5		N
13.4.4.2	A polymeric water shield that operates at a temperature higher than 65 °C, as determined by the normal temperature test of Clause 14, and that does not have a recognized temperature rating for the measured temperature shall comply with the thermal conditioning test of Clause 16.5.6		N
13.4.4.3	A glass or polymeric water shield of a ground-mounted recessed luminaire shall be subjected to the impact conditioning test of Clause 16.5.7 and shall then comply with the immersion test of Clause 16.5.4		N
13.4.4.4	A wooden water shield less than 13 mm (0.5 in) thick shall be subjected to the impact conditioning test of Clause 16.5.7 and shall then comply with the applicable rain, sprinkler, or immersion test		N
13.4.5	Gaskets and bushings		P
13.4.5.1	A gasket or bushing required to prevent water from entering the enclosure shall be secured to prevent its loosening during user maintenance by a clip, clamping ring, adhesive, or other mechanical means		P
13.4.5.2	A gasket or bushing shall be made of material as specified in Table 14.1.2, Item 20, and shall have a temperature rating suitable for the operating temperature, as determined by the normal temperature test of Clause 14, or shall withstand		N
	the luminaire gasket assembly accelerated aging test of Clause 16.5.8, with the gasket or bushing installed as intended in the luminaire; or		N
	the gasket accelerated aging test of Clause 16.5.9 or 16.5.10, for the gasket or bushing only		N
13.4.5.3	The adhesive that is used to secure a gasket or bushing required to prevent water from entering the enclosure and that is likely to be exposed, or not compressed as intended, during user maintenance, shall comply with		P
13.4.6	Lampholders		P
13.4.6.1	Exposed, single-pin, or recessed double-contact fluorescent lampholders shall be of the weatherproof type		P
13.4.7	Receptacles		N

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Clause	Requirement Test	Result Remark	Verdict
13.4.7.1	A receptacle in a ground-mounted surface luminaire shall be located at least 150 mm (6 in) above ground level.		N
13.4.8	Tests		N
13.4.8.1	A luminaire identified by the location designation, LOC, in Table 13.4.8.1 and Figure 13.4.8.1 shall be evaluated in accordance with Figure 13.4.8.2. No rain or sprinkler test is required when it is readily apparent by the luminaire design that no water will enter the enclosure if the luminaire is subjected to the applicable test for the location designated		N
13.4.8.2	A LOC-1, ceiling-mounted surface luminaire intended to be attached to an uncovered ceiling shall comply with the rain test of Clause 16.5.2		N
13.4.8.3	A LOC-1, ceiling-mounted surface luminaire intended to be attached to a covered ceiling shall comply with the sprinkler test of Clause 16.5.3 and be marked for covered ceiling only, in accordance with Table 20.1.1, Item 2.11		N
13.4.8.4	A LOC-2, ceiling-mounted pendant luminaire shall comply with the rain test of Clause 16.5.2		N
13.4.8.5	A LOC-3, ceiling-mounted recessed luminaire intended to be attached to an uncovered ceiling shall comply with the rain test of Clause 16.5.2 and the sprinkler test of Clause 16.5.3		N
13.4.8.6	A LOC-3, ceiling-mounted recessed luminaire intended to be attached to a covered ceiling only shall comply with the sprinkler test of Clause 16.5.3 and be marked for covered ceiling only, in accordance with Table 20.1.1, Item 2.11		N
13.4.8.7	A LOC-4, wall-mounted surface luminaire intended to be mounted with all of the enclosure above1.2 m (4 ft) from the ground shall comply with the rain test of Clause 16.5.2		N
13.4.8.8	A LOC-4, wall-mounted surface luminaire intended to be mounted with any part of the enclosure below 1.2 m (4 ft) from the ground shall comply with the rain test of Clause 16.5.2 and the sprinkler test of Clause 16.5.3, and be marked to indicate the luminaire mounting height, in accordance with Table 20.1.1, Item 2.18		N
13.4.8.9	A LOC-5, wall-mounted recessed luminaire intended to be mounted with all of the enclosure above 1.2 m (4 ft) from the ground shall comply with the rain test of Clause 16.5.2		N

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Clause	Requirement Test	Result Remark	Verdict
13.4.8.10	A LOC-5, wall-mounted recessed luminaire intended to be mounted with any part of the enclosure below 1.2 m (4 ft) from the ground shall comply with the rain test of Clause 16.5.2 and the sprinkler test of Clause 16.5.3, and be marked to indicate the luminaire mounting height, in accordance with Table 20.1.1, Item 2.18		N
13.4.8.11	A LOC-6, ground-mounted surface luminaire with electrical parts located above 1.2 m (4 ft) from the ground shall comply with the rain test of Clause 16.5.2		N
13.4.8.12	A LOC-6, ground-mounted surface luminaire with electrical parts located below 1.2 m (4 ft) from the ground shall comply with the rain test of Clause 16.5.2 and the sprinkler test of Clause 16.5.3, and be marked to indicate the luminaire mounting height, in accordance with Table 20.1.1, Item 2.18		N
13.4.8.13	A LOC-7, ground-mounted recessed luminaire shall comply with the immersion test of Clause 16.5.4 and be marked in accordance with Table 20.1.1, Item 2.14.		N
13.4.9	Marking		N
13.4.9.1	A luminaire that is intended for use in wet locations and that complies with the requirements of Clause 13 shall be marked in accordance with Table 20.1.1, Item 2.3.		N
13.4.9.2	A luminaire with adjustable mounting positions that is limited or restricted to a particular position to comply with the applicable tests shall be marked to indicate the limits of adjustment or the mounting position, in accordance with Table 20.1.1, Item 1.23		N
13.4.9.3	Installation instructions shall be provided for luminaires that require specific methods for sealing the mounting surface or specific fittings for supply connections, in accordance with Table 20.1.1, Item 1.33		N
14	**Normal temperature tests**		P
14.1	**General**		P
14.1.1	The test procedures shall be conducted in accordance with Clause 19		P
14.1.2	The test procedures for Type Non-IC (not intended for thermal insulation contact) and Type IC (intended for thermal insulation contact) recessed luminaires are summarized in Table 14.1.1		P

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Clause	Requirement Test	Result Remark	Verdict
14.1.3	The rated wattage of any lamp used for the temperature test shall be the highest wattage rating marked on the luminaire in accordance with Clause 19.8		P
14.1.4	Temperatures resulting from the normal temperature test shall not exceed the limits specified in Table 14.1.2 unless the component, material, or compound has been investigated and found acceptable for a higher temperature		P
14.2	**Surface ceiling luminaires**		N
14.2.1	A luminaire that appears to be suitable for either ceiling or wall mounting shall be tested as one of the following		N
14.2.2	A luminaire shall be mounted on the test apparatus specified in Clause 19.10, directly under the outlet box, in the intended manner		N
14.2.3	A pendant-mounted luminaire shall be tested when attached to the test ceiling with the shortest length of cord, chain, or stem permitted by the luminaire design		N
14.2.4	A luminaire that can be pendant mounted or mounted directly to the ceiling shall be tested while mounted directly to the test ceiling		N
14.2.5	A luminaire marked for installation on a noncombustible surface only shall be mounted on the test ceiling as shown in Figure 19.10.1, without thermal insulation		N
14.2.6	Thermocouples shall be attached to the test ceiling in locations where the highest temperatures are likely to occur, including		P
14.2.7	Supply conductor temperatures in the outlet box shall be measured using the temperature test probe shown in Figure 19.9.1. The probe shall be mounted to the outlet box ears with the copper surface facing the interior of the box		N
14.2.8	The test lamp shall comply with the requirements of Clause 19.8		P
14.2.9	The resulting temperatures shall not exceed those specified in Table 14.1.2, except as permitted by Clause 14.1.4, and any integral thermal protector shall not operate		P
14.3	**Surface wall luminaires**		N
14.3.1	A luminaire shall be mounted on the test apparatus of Clause 19.11, directly over the outlet box, in the intended manne		N

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Clause	Requirement Test	Result Remark	Verdict
14.3.2	Thermocouples shall be attached to the test wall in locations where the highest temperatures are likely to occur, including		N
14.3.3	Supply conductor temperatures in the outlet box shall be measured using the temperature test probe shown in Figure 19.9.1. The probe shall be mounted to the outlet box ears with the copper surface facing the interior of the box		N
14.3.4	The test lamp shall comply with the requirements of Clause 19.8.		N
14.3.5	The resulting temperatures shall not exceed those specified in Table 14.1.2, except as permitted by Clause 14.1.4, and any integral thermal protector shall not operate		N
14.4	**Under-cabinet luminaires**		P
14.4.1	A luminaire shall be mounted in the test alcove of Clause 19.12, in contact with the two walls and top of the alcove		P
14.4.2	Thermocouples shall be attached to the test alcove in locations where the highest temperatures are likely to occur, including		P
	the points where the luminaire contacts the walls and top of the alcove; and		P
	directly adjacent to the point that is closest to the highest source of heat		P
14.4.3	The test lamp shall comply with the requirements of Clause 19.8		P
14.4.4	The resulting temperatures shall not exceed those specified in Table 14.1.2, except as permitted by Clause 14.1.4, and any integral thermal protector shall not operate.		P
14.5	**Type Non-IC recessed luminaires (not intended for thermal insulation contact)**		P
14.5.1	A Type Non-IC luminaire shall comply with the normal temperature test of Clauses 14.5.2 to 14.5.5		P
14.5.2	The test lamp type and wattage shall be as follows:		P
14.5.3	A luminaire shall be installed in a test box as specified in Clause 19.13 in the configuration that results in the highest operating temperatures, considering different trim and maximum lamp wattage combinations specified in the lamp replacement markings, lampholder adjustment heights, and the like		P

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Clause	Requirement Test	Result Remark	Verdict
14.5.4	A luminaire marked for use with through wiring shall be tested in accordance with Clause 14.10 at the same time the normal temperature test is conducted.		P
14.5.5	The resulting temperatures shall not exceed those specified in Table 14.1.2, and any integral thermal protector shall not operate		P
14.6	**Type Non-IC marked spacings luminaires (not intended for thermal insulation contact)**		N
14.6.1	A marked spacings incandescent or HID luminaire shall comply with the normal temperature tests of Clauses 14.6.2 to 14.6.5		N
14.6.2	The test lamp type and wattage shall be as follows		N
14.6.3	A luminaire shall be installed in a test box as described in Clause 19.14 in the configuration that results in the highest operating temperatures, considering different trims, lampholder adjustment heights, and the like		N
14.6.4	A luminaire marked for use with through wiring shall be tested in accordance with Clause 14.10 at the same time the normal temperature test is conducted		N
14.6.5	The resulting temperatures shall not exceed those specified in Table 14.1.2, and any integral overheating protective device shall not operate		N
14.7	**Type IC recessed luminaires (intended for thermal insulation contact)**		N
14.7.1	A Type IC luminaire shall comply with the normal temperature tests of Clauses 14.7.2 to 14.7.5		N
14.7.2	The test lamp type and wattage shall be as follows		N
	or fluorescent luminaires, as marked on the ballast, unless marked otherwise on the luminaire;		N
14.7.3	A luminaire shall be installed in a test box as described in Clause 19.15 in the configuration that results in the highest operating temperatures, considering different trims, lampholder adjustment heights, and the like. All spaces around the luminaire and between it and the sides of the test box shall be filled with the thermal insulation described in Clause 19.16		N

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Clause	Requirement Test	Result Remark	Verdict
14.7.4	A luminaire marked for use with through wiring shall be tested in accordance with Clause 14.10 simultaneously with the normal temperature test		N
14.7.5	The resulting temperatures shall not exceed those specified in Table 14.1.2, and any integral overheating protective device shall not operate		N
14.8	**Type IC inherently protected recessed luminaires (intended for thermal insulation contact)**		N
14.8.1	A Type IC inherently protected luminaire shall comply with the normal temperature test of Clause14.7 and Clauses 14.8.2 to 14.8.4		N
14.8.2	The test lamp shall be the highest wattage lamp of any type that can be installed in the luminaire		N
14.8.3	The resulting temperatures shall not exceed those specified in Table 14.1.2		N
14.8.4	A luminaire marked for use with through wiring shall be tested in accordance with Clause 14.10 simultaneously with the normal temperature test.		N
14.9	**Recessed luminaires for use in poured concrete**		N
14.9.1	A luminaire marked for use in concrete shall comply with the normal temperature test of Clause 14.5, using the installation method of Clause 14.9.2 and the requirements of Clause 14.9.3		N
14.9.2	A luminaire shall be installed as intended in concrete. The minimum thickness of the concrete shall be 150 mm (6 in) from any point on the recessed housing. At the option of the luminaire manufacturer, 30 mesh dry builder's sand may be substituted for the concrete		N
14.9.3	The resulting temperatures shall not exceed those specified in Table 14.1.2		N
14.10	**Through-wiring junction box temperature**		N
14.10.1	The through wiring junction box temperature test simulates the heating effect of actual loading conditions and shall be performed simultaneously with the applicable normal temperature test of Clause 14		N

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Clause	Requirement Test	Result Remark	Verdict
14.10.2	Two lengths of electrical metallic tubing or flexible metallic conduit, suitable for the number and size of the through branch circuit conductors, shall be attached to the outlet box with the appropriate fittings. The lengths of raceway shall extend approximately 300 mm (12 in) outside of the test box		N
14.10.3	The test conductors placed in the outlet box shall be Type TW, TEW, or THHN and shall correspond to the number and size of the branch circuit conductors marked on the luminaire in accordance with Table 20.1.1, Item 1.40		N
14.10.4	For each two conductors marked on the luminaire, an amount of test conductor equal to the length of the box or 300 mm (12 in), whichever is greater, shall be placed inside the junction box by winding it back and forth as shown in Figure 14.10.1		N
14.10.5	The conductors shall be connected in series outside the raceway, and a separate supply source of any convenient voltage shall be connected and operated at 80 percent of the conductor's rated ampacity. The outer ends of the raceways shall be plugged to prevent air circulation		N
14.10.6	The temperature of the test conductors shall not exceed or be able to contact a surface that exceeds the branch circuit conductor rating marked on the luminaire		N
14.11	**Raceway temperature**		N
14.11.1	The raceway temperature test simulates the heating effect of actual loading conditions and shall be performed simultaneously with the applicable normal temperature test of Clause 14		N
14.11.2	The luminaire shall be operated with the maximum number, type, and size of conductors installed in the raceway as marked on the luminaire in accordance with Table 20.1.1, Item 1.40		N
14.11.3	The conductors shall be connected in series outside the raceway, and a separate supply source of any convenient voltage shall be connected and operated at 80 percent of the conductor ampacity rating. The outer ends of the raceways shall be plugged to prevent air circulation.		N

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Clause	Requirement Test	Result Remark	Verdict
14.11.4	The temperature of the test conductors shall not exceed or be able to contact a surface that exceeds the branch circuit conductor rating marked on the luminaire		N
14.12	**(MEX) Temperature rise**		P
14.12.1	(MEX) In Mexico, the temperature increase in normal operating conditions shall be determined by the procedures described in Clause 19.6 (MEX)		P
14.12.2	(MEX) In Mexico, the temperature increase in normal operating conditions shall not be more than the limits stated in Table 14.12.1 (MEX), and the temperatures obtained in the insulated conductors and connectors shall not be more than the limits indicated in Table 14.12.2 (MEX)		N
14.12.3	(MEX) In Mexico, the values of temperature rise in Table 14.12.1 (MEX) shall be based on ambient temperature of 25 °C, and the tests shall be conducted at an ambient temperature of 25 5 °C. The ambient temperature sensor shall be located at the height of the luminaire, but not in the direct light of the luminaire. The variances above or below 25 °C shall be subtracted or added, respectively		N
14.12.4	(MEX) In Mexico, temperature readings for determining compliance with Table 14.12.1 (MEX) shall be obtained using thermocouples or equivalent equipment, except for windings, including those encapsulated on which you must apply the resistance method described in NMX-J-230-ANCE orNMX-J-198-ANCE. A temperature shall be considered stable when three successive measurements taken at 15 min intervals do not change more than 1 °C		N
15	**Abnormal temperature tests**		P
15.1	**General**		P
15.1.1	The test procedures shall be conducted in accordance with Clause 19		P
15.1.2	The test procedures for Type Non-IC (not intended for thermal insulation contact) and Type IC (intended for thermal insulation contact) recessed luminaires are summarized in Table 15.1.1		P
15.1.3	Through-wiring, if installed, shall not be energized		P
15.2	**Type Non-IC recessed luminaires (not intended for thermal insulation contact)**		N

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Clause	Requirement Test	Result Remark	Verdict
15.2.1	A test box shall be constructed as specified in Clause 19.13.3		N
15.2.2	15.2.1 A luminaire shall be installed in the test box in the normal temperature test configuration of Clause 14.5 that results in the lowest operating temperatures on luminaire surfaces that contact the test box or that can contact thermal insulation		N
15.2.3	For ceiling-mounted luminaires, the thermal insulation specified in Clause 19.16 shall be placed around the luminaire in the test box as follows		N
	the initial depth of the thermal insulation shall be 100 mm (4 in) above the bottom of the test box or 50 mm (2 in) above the lowest glass portion of the test lamp, whichever is higher		N
	the initial depth of the insulation shall not exceed the height of the lamp compartment; and		N
	if more than one test iteration is required to achieve the results specified in Clause 15.2.7, an additional 50 mm (2 in) of thermal insulation shall be added for each successive iteration. The last increase in thermal insulation may be less than a 50 mm (2 in) increment, to ensure that the maximum 216 mm (8.5 in) height requirement is not exceeded. For each additional thermal insulation level, the test shall be restarted with all temperatures at room ambient		N
15.2.4	For recessed wall-mounted luminaires, the thermal insulation specified in Clause 19.16 shall be placed over a recessed luminaire mounted in the test wall so the topmost portion of the luminaire is under 216 mm (8.5 in) of thermal insulation		N
15.2.5	The test lamp type and wattage for		N
15.2.6	A luminaire shall be operated until the thermal protector trips or for a maximum of 7.5 h. If the protector does not trip within 3 h, the test shall be repeated with an additional 50 mm (2 in) of thermal insulation, until		N
15.2.7	Test results shall be acceptable if the thermal protector		N
15.3	**Type Non-IC marked spacings incandescent and HID recessed luminaires (not intended for thermal insulation contact)**		N
15.3.1	Abnormal insulation temperature		N

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Clause	Requirement Test	Result Remark	Verdict
15.3.1.1	A test box shall be constructed as specified in Clause 19.14.3		N
15.3.1.2	A luminaire shall be installed in the test box in the normal temperature test configuration of Clause 14.5 that results in the lowest operating temperatures on luminaire surfaces that contact the test box or that can contact thermal insulation		N
15.3.1.3	For ceiling-mounted luminaires, the thermal insulation specified in Clause 19.16 shall be placed around the luminaire in the test box as follows		N
15.3.1.4	For wall-mounted luminaires, the thermal insulation specified in Clause 19.16 shall be placed over a wall mounted luminaire so the topmost portion of a luminaire recessed in the test wall is under 216 mm (8.5 in) of thermal insulation		N
15.3.1.5	The test lamp type and wattage for		N
15.3.1.6	A luminaire shall be operated until the thermal protector trips or for a maximum of 7.5 h. If the protector does not trip within 3 h, the test shall be repeated with an additional 50 mm (2 in) of thermal insulation, until		N
15.3.1.7	Test results shall be acceptable if the thermal protector:		N
15.3.2	Reduced spacings abnormal temperature		N
15.3.2.1	The test shall be conducted as specified in Clause 14.5.		N
15.3.2.2	Test results shall be acceptable if the thermal protector		N
15.4	**Type IC incandescent recessed luminaires (intended for thermal insulation contact)**		N
15.4.1	General		N
15.4.1.1	A Type IC recessed incandescent luminaire shall comply with the abnormal overlamping and mislamping temperature tests described in Clauses 15.4.2 and 15.4.3, unless constructed as described in Clause 15.4.1.2		N
15.4.1.2	A Type IC incandescent luminaire with a thermal protector rated 110 5 °C or less and located within 38 mm (1.5 in) of the geometric center of the top shall be exempted from the tests specified in Clause 15.4.1.1.		N
15.4.2	Overlamping		N

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Clause	Requirement Test	Result Remark	Verdict
15.4.2.1	A test box shall be constructed as specified in Clause 19.15		N
15.4.2.2	A luminaire shall be installed in the test box in the configuration that resulted in the lowest operating temperatures on luminaire surfaces in contact with the test box or thermal insulation during the normal temperature test described in Clause 14.7		N
15.4.2.3	The abnormal test box shall be filled with the thermal insulation specified in Clause 19.16		N
15.4.2.4	A luminaire shall be tested with a lamp in accordance with Table 19.8.3 and shall have the voltage adjusted to operate the lamp at rated wattage		N
15.4.2.5	A luminaire rated for lamps that are not included in Table 19.8.3 shall be tested with a lamp of the same type used in the normal temperature test that is either		N
15.4.2.6	The test shall not be required to be conducted under the following conditions:		N
15.4.2.7	For a luminaire that has more than one lamp type, the abnormal test shall be conducted separately for each lamp type and for each lamp of a multi-lamp luminaire.		N
15.4.2.8	A luminaire shall be operated until the thermal protector trips or for a maximum of 7.5 h. If the thermal protector does not open within 3 h and the temperatures on the luminaire surfaces in contact with thermal insulation and points of support are less than 90 °C, the test shall be repeated with the next higher wattage lamp. If there is no higher wattage lamp or if the lamp will not fit, the test shall be repeated with the lamp and the trim that resulted in the next higher recessed housing temperature or point-of support temperature, or both, during the normal temperature test. Each iteration shall start with the luminaire at room ambient temperature. This process shall be repeated until		N
15.4.2.9	If the thermal protector does not open in 3 h, and the temperatures on the luminaire surfaces in contact with thermal insulation and points of support are greater than 90 °C, but less than 20 °C above the temperatures measured on these same points during the normal temperature test, the test procedure in Clause 15.4.2.10 shall be performed		N

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Clause	Requirement Test	Result Remark	Verdict
15.4.2.10	The following test procedure shall be performed on a luminaire that complies with Clauseafter the luminaire has reached thermal stabilization		N
15.4.2.11	Test results shall be acceptable if the thermal protector		N
15.4.3	Mislamping		N
15.4.3.1	The test box shall be constructed as described in Clause 19.15		N
15.4.3.2	A luminaire shall be installed in the test box in the configuration that resulted in the lowest operating temperatures on luminaire surfaces in contact with the test box or thermal insulation during the normal temperature test, in Clause 14.7		N
15.4.3.3	The test box shall be filled with the thermal insulation specified in Clause 19.16		N
15.4.3.4	A luminaire marked for use with a reflector-type lamp shall be tested with a Type A lamp of the same wattage or the next higher wattage. Whenever possible, standard incandescent test lamps specified in Table 19.8.2 shall be used.		N
15.4.3.5	For a luminaire that has more than one lamp, the mislamping test shall be conducted separately for each lamp		N
15.4.3.6	The test shall be continued until		N
15.4.3.7	If the thermal protector does not open within 3 h, and the temperatures on the luminaire surfaces in contact with thermal insulation and the points of support are less than 90 °C, the test shall be repeated with the trim that resulted in the next higher recessed housing temperature or point-of support temperature, or both, during the normal temperature test. Each iteration shall start with the luminaire at room ambient temperature		N
15.4.3.8	If the thermal protector does not open in 3 h and the temperatures on the luminaire surfaces in contact with thermal insulation and the points of support are more than 90 °C, but less than 20 °C above the temperatures measured on these same points during the normal temperature test, the test procedure in Clause 15.4.3.9 shall be performed		N
15.4.3.9	Perform the following test procedure on a luminaire that complies with Clause 15.4.3.8 after the luminaire has reached thermal stabilization		N
15.4.3.10	Test results shall be acceptable if the thermal protector:		N

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Clause	Requirement Test	Result Remark	Verdict
15.5	**Abnormal overlamping operation test for incandescent luminaires with polymeric housings or enclosures**		N
15.5.1	A luminaire shall be operated as specified in the normal temperature test, with the largest possible wattage lamp the luminaire accommodates, for 7.5 h		N
15.5.2	There shall be no ignition of the polymeric material or exposure of live parts. Shrinkage, warpage, expansion, or cracking shall be acceptable		N
16	**Mechanical tests**		N
16.1	**Barrier strength**		N
16.1.1	A sample luminaire with the barrier mounted as intended shall be tested		N
16.1.2	A force of 44.5 N (10 lb) over an area of 6.45 cm^2 (1 in^2) shall be applied to the barrier for 1 min		N
16.1.3	The application of the force shall not result in		N
16.2	**Metal thickness equivalency**		N
16.2.1	General		N
16.2.1.1	A luminaire having reduced metal thickness shall comply with the compression and impact tests described in Clauses 16.2.2 and 16.2.3. Pendant-mounted luminaires having reduced metal thickness shall additionally comply with the flexing, and the torque and cantilever tests described in Clauses 16.2.4 and 16.2.5.		N
16.2.2	Compression		N
16.2.2.1	The luminaire shall be tested as follows		N
16.2.2.2	Test results shall be acceptable if		N
16.2.3	Impact		N
16.2.3.1	The sample luminaires shall be held in place and subjected to a single 7 J (5 ft·lb) impact, using the impact test apparatus described in Clause 19.21, falling through a vertical height of 1.29 m (4.24 ft), on surfaces being tested		N
16.2.3.2	The number of samples and the sequence of the procedure shall be in accordance with Figure 16.2.3.1		N
16.2.3.3	Test results shall be acceptable if the enclosure is capable of complying with all the applicable requirements of this Standard		N
16.2.4	Flexing		N

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Clause	Requirement Test	Result Remark	Verdict
16.2.4.1	The luminaire shall be supported directly below the pendant support connection points on maximum 25 mm (1 in) wide wooden blocks of sufficient length		N
16.2.4.2	A 89 N (20 lb) force shall be applied to a 39 cm^2 (6 in^2) piece of 19 mm (0.75 in) thick plywood centered on the top of the luminaire midway between the two supports closest to the end		N
16.2.4.3	The maximum deflection under load shall be 6.4 mm (0.25 in)		N
16.2.5	Torque and cantilever		P
16.2.5.1	General		P
16.2.5.1.1	During the torque and cantilever tests, a comparison shall be made between a control sample luminaire having the minimum metal thickness specified in Table 5.5.1 and a test sample luminaire having reduced metal thickness		P
16.2.5.2	Torque		P
16.2.5.2.1	The control and test sample luminaires shall be secured to a solid horizontal surface so that the sample overlaps the surface by a length equal to 10 percent of the sample's overall length. The opposite end of each luminaire shall be supported at the same height as the fixed end by a pivot arm that is attached to the luminaire but allows free rotation of the luminaire around its major axis. A 610 mm (24 in) long torque arm shall be connected to the pivot end of each luminaire at a right angle to its major axis as shown in Figure 16.2.5.2.1		P
16.2.5.2.2	A 4.4 N (1 lb) force shall be applied to one end of the arm in a direction that results in luminaire rotation deflection around the major axis.		P
16.2.5.2.3	During or after the test, the deflection of the test sample luminaire shall be equal to or less than the deflection of the control sample luminaire.		P
16.2.5.3	Cantilever		N
16.2.5.3.1	The control and test sample luminaires shall be secured at one end to a solid horizontal surface. The opposite end of each luminaire shall be suspended by the support provided with the luminaire		N
16.2.5.3.2	A 11.3 kg (25 lb) weight shall be applied to the suspended end of each luminaire. The weight shall be applied for 1 min		N

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Clause	Requirement Test	Result Remark	Verdict
16.2.5.3.3	During or after the test, the deflection of the test sample luminaire shall be equal to or less than the deflection of the control sample luminaire		N
16.3	**Five-inch flame**		N
16.3.1	Three samples of complete luminaires or enclosure specimens shall be subjected to this test, using the test apparatus of Clause 19.24.		N
16.3.2	The conditioning described in Clause 16.3.3 shall be conducted only if		N
16.3.3	After conditioning for 40 h at 23 2 °C and 50 5 percent relative humidity, the test samples shall be placed in a full-draft air-circulating oven for 7 d at a temperature at least 10 °C above the temperatures measured during the normal temperature test and, in no case, less than 70 °C		N
16.3.4	The sample shall be positioned to simulate intended usage, with a layer of surgical cotton located 300 mm (12 in) below the point of test flame application		N
16.3.5	The burner shall be placed in a location remote from the sample, in a vertical position, and ignited. The burner shall be adjusted to provide a 125 mm (5 in) overall height flame with a 38 mm (1.5 in) high inner blue cone		N
16.3.6	The flame shall be applied at an angle of approximately 20 degrees from the vertical to 3 different locations on each of the 3 samples, in the following areas, as appropriate		N
16.3.7	The flame shall be applied for 5 s and removed for 5 s. This cycle shall be repeated 5 times at each location.		N
16.3.8	Test results shall be acceptable when the following conditions are met		N
16.3.9	If any one of the 3 samples does not comply, 3 new samples shall comply when the test is repeated in a manner identical to that used for the unsuccessful sample, in order for the test results to be acceptable		N
16.4	**Mold stress relie**		P

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Clause	Requirement Test	Result Remark	Verdict
16.4.1	A sample of the complete thermoplastic enclosure shall be placed in a circulating air oven and maintained at a temperature 10 °C higher than the maximum temperature measured on the surface of the enclosure during the normal temperature test but in no case less than 70 °C, for a period of 7 h		P
16.4.2	After the sample has cooled to room temperature, the sample shall comply with the applicable requirements of this Standard		P
16.5	**Wet locations**		P
16.5.1	General		P
16.5.1.1	A luminaire with an opening for supply connections shall be fitted with the intended supply connection means		N
16.5.1.2	A luminaire provided with a receptacle that has an automatic closure cover shall withstand the rain test of Clause 16.5.2 and the sprinkler test of Clause 16.5.3, with the cover closed		N
16.5.1.3	A luminaire provided with a receptacle that does not have an automatic closure shall withstand the rain test of Clause 16.5.2 and the sprinkler test of Clause 16.5.3 with the cover open, closed, and with and without an attachment plug in place		N
16.5.2	Rain		P
16.5.2.1	A luminaire that is subjected to the rain test shall be conditioned by performing the normal temperature test of Clause 14 or by being operated for at least 30 min		P
16.5.2.2	After the conditioning, rings, frames, lamps, and other replaceable parts serving to compress gaskets and bushings shall be removed and then reinstalled		P
16.5.2.3	The rain test apparatus shall be in accordance with Clause 19.17		P
16.5.2.4	The luminaire shall be installed in accordance with the manufacturer's instructions. The mounting shall simulate the intended mounting method, and only the surfaces exposed to the elements shall be subjected to the rain test		P
15.5.2.5	The luminaire shall be positioned in the focal area of the spray heads of the rain test apparatus so that the greatest quantity of water is likely to enter the enclosure of the luminaire.		P
16.5.2.6	The test shall be conducted in the sequence shown in Table 16.5.2.1.		P

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Clause	Requirement Test	Result Remark	Verdict
16.5.2.7	Immediately after the rain test, the luminaire shall:		P
16.5.3	Sprinkler		N
16.5.3.1	A luminaire that is subject to the sprinkler test shall be conditioned by performing the normal temperature test of Clause 14 or by being operated for at least 30 min		N
16.5.3.2	After the conditioning, rings, frames, lamps, and other replaceable parts of the luminaire serving to compress gaskets and bushings shall be removed and then reinstalled		N
16.5.3.3	The sprinkler test apparatus shall be in accordance with Clause 19.18		N
16.5.3.4	The luminaire shall be installed in accordance with the manufacturer's instructions. The mounting shall simulate the intended mounting method, and only the surfaces exposed to the elements shall be subjected to the sprinkler test		N
16.5.3.5	A ground-mounted surface luminaire shall be turned about its vertical axis to four positions, each 90 degrees from the others. It shall remain in each position for 30 min during the 2 h portion of the test, with the adjustable parts arranged for maximum vulnerability to the water spray.		N
16.5.3.6	A ceiling-mounted or wall-mounted luminaire shall be installed with the vertical axis of the luminaire 910 mm (36 in) away from the vertical plane of the spray head and positioned with the dimensional center of the luminaire on a line projected from the centerline of the spray head		N
16.5.3.7	The test shall be conducted in the sequence shown in Table 16.5.3.1		N
16.5.3.8	Immediately after the sprinkler test, the luminaire shall:		N
16.5.4	Immersion		N
16.5.4.1	A luminaire shall be subjected to the immersion test in accordance with Table 16.5.4.1, with or without an auxiliary well form, and mounted face-up, with the screws that attach the face torqued to the manufacturer's recommended values		N
16.5.4.2	The luminaire shall be conditioned by being operated in a dry location at room temperature for3.5 h		N

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Clause	Requirement Test	Result Remark	Verdict
16.5.4.3	The luminaire shall be de-energized and immediately submerged under at least 300 mm (12 in) of water. The temperature of the water before submersion shall be 5 °C or lower. The luminaire shall remain under water for at least 4 h and then be removed from the water		N
16.5.4.4	The procedure of Clauses 16.5.4.2 and 16.5.4.3 shall be conducted three times. Before the second sequence and the third sequence, the luminaire shall be conditioned by placing it in a dry location at room temperature for approximately 16.5 h		N
16.5.4.5	Immediately following the third sequence, the luminaire shall be removed from the water and subjected to the dielectric voltage-withstand test of Clause 17.1. There shall be no dielectric breakdown, and no water shall have entered the luminaire		N
16.5.5	UV exposure conditioning		N
16.5.5.1	The weatherometer test apparatus shall be in accordance with Clause 19.25		N
16.5.5.2	Three test samples of a polymeric water shield or a polymeric material used for the enclosure of electrical equipment that will be exposed to a UV weathering source shall be acceptably resistant to degradation when exposed to		N
16.5.5.3	Table 16.5.5.1 summarizes the minimum property retention limitations after UV conditioning. The flammability classification of base samples of the material in the thinnest part thickness, and any color under consideration, shall not be reduced as a result of weatherometer conditioning. The average physical property values after UV conditioning shall not be less than 70 percent of the unconditioned value when the standardized small-scale physical tests indicated in Table 16.5.5.1 are performed		N
16.5.5.4	If the impact value for an enclosure material that has been tested in accordance with the requirements of Clause 16.5.5 has exhibited less than 70 percent but at least 25 percent retention of the impact property, it shall be considered acceptable, provided that it fulfills the following requirements		N
16.5.6	Polymeric thermal conditioning		N

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Clause	Requirement Test	Result Remark	Verdict
16.5.6.1	A polymeric water shield shall be conditioned in a circulating oven for 168 h at a temperature in accordance with Table 16.5.6.1 and as determined by the normal temperature test of Clause 14. The conditioning time may be reduced by 1/2 for each increase in oven temperature of 10 °C. If the sample is too large for the test oven, the sample may be cut to fit.		N
16.5.6.2	The water shield shall have no obvious deterioration or deformation after conditioning.		N
16.5.7	Impact conditioning		N
16.5.7.1	A sample of the water shield shall be mounted on the luminaire for impact conditioning. The sample shall be subjected to a 4.1 J (3 ft·lb) impact from the steel sphere of Clause 19.21 from a vertical distance of 775 mm (30.5 in) on any surface of the water shield that is exposed and that can be subjected to an impact during its intended use		N
16.5.7.2	The horizontal or top surface of the water shield shall be subjected to an impact from the steel sphere shown in Figure 19.21.1. Other surfaces of the water shield shall be subjected to an impact from the steel sphere suspended by a cord, as shown in Figure 19.21.2		N
16.5.8	Luminaire gasket assembly accelerated aging		N
16.5.8.1	A luminaire with gaskets and bushings in place shall be subjected to the luminaire gasket assembly accelerated aging test		N
16.5.8.2	The luminaire gasket assembly shall be conditioned in a circulating air oven for 240 h at 20 °C above the maximum gasket or bushing temperature as determined by the normal temperature test in Clause 14		N
16.5.8.3	After the conditioning, any part of the luminaire that affects the sealing of the gasket assembly shall be opened. There shall be no evidence of damage to the gasket assembly, and the gasket shall remain in place. The luminaire gasket assembly shall be closed and the luminaire shall fulfill the criteria of the following tests, as applicable		N
16.5.9	Gasket accelerated aging (Method A		N
16.5.9.1	A gasket or bushing shall be subjected to the gasket accelerated aging test		N

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Clause	Requirement Test	Result Remark	Verdict
16.5.9.2	Three specimens of the gasket or bushing material shall be evaluated for tensile strength and elongation, and the average values calculated		N
16.5.9.3	Three additional specimens shall be conditioned for 168 h in a circulating air oven at a temperature 20 °C above the maximum gasket or bushing temperature as determined by the normal temperature test of Clause 14		N
16.5.9.4	After conditioning, the 3 specimens shall have an average tensile strength of not less than 60 percent and an average elongation of not less than 75 percent of the values determined before conditioning		N
16.5.10	Gasket accelerated aging (Method B)		N
16.5.10.1	The test apparatus shall be in accordance with Clause 19.26		N
16.5.10.2	Three specimens of the gasket or bushing material shall be measured to determine the average thickness.		N
16.5.10.3	The test weight shall be placed on the middle portion of each specimen for a period of 2 h. At the end of that time, the weight shall be removed and the specimen shall be allowed to rest at room temperature for 30 min. The average thickness of the compressed portion of the 3 specimens shall be more than 50 percent of the initial thickness		N
16.5.10.4	The specimens shall be conditioned for 168 h in a circulating air oven at a temperature 20 °C above the maximum gasket or bushing temperature as determined by the normal temperature test of Clause 14		N
16.5.10.5	The procedure of Clauses 16.5.10.2 and 16.5.10.3 shall be repeated on the specimens approximately 24 h after removal from the oven. The average thickness of the compressed portion of the specimens shall be more than 50 percent of the initial thickness		N
16.5.11	Gasket adhesion		N
16.5.11.1	A gasket assembly secured by an adhesive shall be subjected to the gasket adhesion test		N
16.5.11.2	Three gasket assemblies shall be used to determine the average initial force required to remove the gasket from its mounting surface. The force shall be applied to the edge of the gasket in a plane perpendicular to the surface on which the gasket is mounted		N

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Clause	Requirement Test	Result Remark	Verdict
16.5.11.3	Six additional gasket assemblies shall be conditioned as described in Clause 16.5.10.4. The force required to remove the gaskets from the mounting surface of three samples shall be measured within 30 min after the conditioning. The force required to remove the gaskets from the mounting surface of the three remaining samples shall be measured 24 h after the conditioning		N
16.5.11.4	After conditioning, the average force necessary to remove the gaskets from the mounting surface shall be not less than 60 percent of the initial average value measured before conditioning		N
16.5.12	Paint adhesion		N
16.5.12.1	A painted enclosure or representative part shall be subjected to the tests of Clauses 16.5.12.2 and 16.5.12.3		N
16.5.12.2	An area of approximately 625 mm^2 (1 in^2) shall be cross-cut with a sharp knife. The cuts in the same direction shall be parallel and spaced 1 to 2 mm (0.40 to 0.80 in) apart. Cellulose adhesive tape shall be firmly applied to the cross-cut surface, and upon removal of the tape, not more than 15 percent of the paint shall be removed from the test sample.		N
16.5.12.3	When a sharp knife is scraped across the painted surface, the paint may have a tendency to curl, but shall not flake, crumble, or give evidence of lack of adhesion		N
16.6	**Hot-wire ignition (HWI)**		N
16.6.1	Five samples of a polymeric enclosure material shall be subjected to the hot-wire ignition test described in UL 746C and Clause 4.3.1 of CSA C22.2 No. 0.17		N
16.6.2	The average time to ignition shall be not less than 15 s		N
16.7	**Glow-wire end product**		N
16.7.1	The test apparatus shall be in accordance with Clause 19.28 and IEC 60695-2-11		N
16.7.2	Components can, under fault conditions or overload conditions, attain a temperature that ignites or affects the enclosure or electrical parts in their vicinity. The glow-wire test simulates thermal stresses that can be produced by sources of heat or ignition, for short periods, in order to evaluate the risk of fire		N

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Clause	Requirement Test	Result Remark	Verdict
16.7.3	Test specimens less than 0.25 mm (0.010 in) or more than 6.4 mm (0.25 in) thick shall not be acceptable for this test method		N
16.7.4	The test specimen shall be a complete subassembly or component. If it is necessary to cut off a suitable part to perform the test, the test conditions shall not be significantly different from the conditions of normal use with regard to shape, ventilation, effect of thermal stress, and the possibility of flames, burning, or glowing particles falling in the vicinity of the specimen.		N
16.7.5	Three test specimens shall be conditioned at a temperature of 23 2 °C and a relative humidity of 50 percent for a period of 40 h prior to the glow-wire test. The glow-wire test shall be conducted at an ambient temperature of 25 5 °C.		N
16.7.6	The specimen shall be fixed to the positioning clamp of the glow-wire test apparatus shown in Figure 19.28.1, so that heat losses due to the supporting means are insignificant. The tip of the glow-wire shall be applied to the part of the surface of the specimen that is likely to be subjected to thermal stresses in normal use. In cases where the areas subjected to the thermal stress during normal use are not specified in detail, the tip of the glow-wire shall be applied at the location where the section is thinnest, but it shall not be applied less than 15 mm (0.6 in) from the upper edge of the specimen. If possible, the tip of the glow-wire shall be applied to flat surfaces and not to grooves, knockouts, narrow recesses, or sharp edges		N
16.7.7	Before each test, the tip of the glow-wire shall be cleaned of any residue from previous tests		N
16.7.8	The tip of the glow-wire shall be electrically heated to the temperature specified in Table 16.7.1, as measured by the calibrated thermocouple, for the conditions involved. Before the test is started, the temperature and the heating current shall be constant for a period of at least 60 s. During this period of 60 s and during calibration, adequate screening shall be provided to ensure that heat radiation does not influence the specimen		N

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Clause	Requirement Test	Result Remark	Verdict
16.7.9	The tip of the glow-wire shall then to be brought into contact with the test specimen for 30 1 s. The heating current shall be maintained during this period. After this period, the glow-wire and specimen shall be slowly separated, avoiding any further heating of the specimen and any movement of air that can affect the result of the test. The penetration of the tip of the glow-wire into the specimen shall be mechanically limited to 7 mm (0.275 in)		N
16.7.10	During the application of the glow-wire and during the test period of 30 s, the specimen, the parts surrounding the specimen, and the layer of tissue paper and the pine board placed below shall be observed, and the following noted:		N
16.7.11	Test results shall be acceptable if:		N
16.8	**High-current arc ignition (HAI)**		N
16.8.1	Three samples of a polymeric enclosure material shall be subjected to the high-current arc ignition test described in UL 746C and CSA C22.2 No. 0.17		N
16.8.1.1	(MEX) In Mexico, three samples of a polymeric enclosure material shall be subjected to the high-current arc ignition test described in NMX-J-565/7-ANCE		N
16.8.2	The average number of arcs to result in ignition for the 3 samples tested shall not be less than 15		N
16.9	**End-product arc resistance**		N
16.9.1	The test current shall be based upon the maximum normal operating current. The voltage used for the test shall be equal to the available voltage at the live part. The arc shall be established between the live part and any adjacent part where breakdown is likely to occur. The arc shall be used to ignite materials forming parts of the enclosure or to ignite materials located between the parts of different potential. The arc shall be established by means of a copper or stainless steel conductive probe. The conductive probe shall be used to create arc tracking or a carbon buildup across the surface of the insulating material at a minimum rate of 30 arc separations per min. There shall be no ignition of the insulating material		N
16.10	**Polymeric support**		N

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Clause	Requirement Test	Result Remark	Verdict
16.10.1	A polymeric part shall support for 1 minute, without distortion, four times the weight of a part it is relied upon to suspend in its intended application.		N
16.10.2	The test shall be performed in an oven maintained at a temperature 10 °C higher than the maximum normal operating temperature of the polymeric part measured during the normal temperature test of Clause 14		N
16.10.3	A polymeric part shall be installed as intended, with the weight evenly distributed		N
16.11	**Metallized polymeric parts coating adhesion**		N
16.11.1	A metallized polymeric part that employs an electrically conductive material shall comply with the applicable requirements of UL 746C with respect to the adhesive properties of the material		N
16.12	**Flaming oil**		N
16.12.1	A sample of the complete finished bottom of the fire enclosure shall be securely supported in a horizontal position. Bleached cheesecloth of approximately 40 g/m^2 shall be placed in one layer over a shallow, flat-bottomed pan approximately 50 mm below the sample. The pan shall be of sufficient size to cover completely the pattern of openings in the sample, but not large enough to catch any of the oil that runs over the edge of the sample or otherwise does not pass through the openings		N
16.12.2	A small metal ladle (preferably no more than 65 mm in diameter), with a pouring lip and a long handle whose longitudinal axis remains horizontal during pouring, shall be partially filled with 10 ml of a distillate fuel oil that is a medium volatile distillate having a mass per unit volume between 0.845/ml and 0.865/ml, a flash point between 43.5 °C and 93.5 °C, and an average calorific value of 38 mJ/l. The ladle containing the oil shall be heated and the oil ignited and permitted to burn for 1 min, at which time all the hot flaming oil is poured at the rate of approximately 1 ml/s in a steady stream onto the center of the pattern of openings, from a position approximately 100 mm above the openings		N
16.12.3	The test shall be repeated twice at 5 min intervals, using clean cheesecloth		N

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Clause	Requirement Test	Result Remark	Verdict
16.12.4	During these tests, the cheesecloth shall not ignite		N
16.13	**Conduit knockout and twistout**		N
16.13.1	The following test shall apply only to conduit entries and shall be performed on a sample securely held in place using the test apparatus described in Clause 19.23		N
16.13.2	A force of 44 N (10 lb) shall be applied to a knockout for 1 min by means of a 6.4 mm (0.250 in) diameter mandrel with a flat end. The force shall be applied to the exterior surface of the knockout, in a direction perpendicular to the plane of the knockout, and at the point most likely to result in movement		N
16.13.3	The knockout shall remain in place, and the clearance between the knockout and the opening shall be no more than 1.6 mm (0.063 in) when measured after the force has been removed		N
16.14	**Self-threading screw torque**		N
16.14.1	Self-threading or sheet metal screws may be used if threads are not stripped when the screw is tightened with a torque of 3.39 N·m (30 lb·in) and if the part or the assembly supported by the screw withstands for 1 min a force equal to four times the mass of the part or assembly, applied in a direction coincident with the axis of the screw		N
16.15	**Loading**		N
16.15.1	A supporting device shall support a load equal to four times the total mass to be supported under intended operating conditions for 1 h. The load shall be applied in the direction of actual loading conditions		N
16.15.2	Where more than one support is provided, the load shall be distributed as follows		N
16.15.3	There shall be no deflection or deformation either during or after loading that reduces electrical spacings or compromises safety.		N
16.16	**Snap-in or tab-mounted parts pull test without conduit opening**		N

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Clause	Requirement Test	Result Remark	Verdict
16.16.1	A snap-in or tab-mounted part not provided with a knockout or conduit opening and not secured by at least one screw or rivet shall be assembled in accordance with the manufacturer's assembly instructions and subjected to the test of Clause 16.16.2		N
16.16.2	An evenly distributed 44.5 N (10 lb) force shall be applied for 1 minute in the direction most likely to dislodge the part being tested.		N
16.16.3	Before and after the test of Clause 16.16.2, the luminaire shall comply with the bonding circuit impedance test of Clause 17.2		N
16.16.4	The part shall remain attached to the luminaire, and permanent deformation of the luminaire or its parts shall not exceed 3.2 mm (0.125 in).		N
16.17	**Snap-in or tab-mounted parts pull test with conduit opening**		N
16.17.1	A snap-in or tab-mounted part of a luminaire provided with a knockout or conduit opening that is not additionally secured by at least one screw or rivet shall be tested as follows		N
16.17.2	The part shall remain attached to the luminaire and shall comply with the bonding circuit impedance test of Clause 17.2		N
16.17.3	If the part being tested is provided with more than one conduit opening, the test shall be repeated for each opening, using a new sample for each test		N
16.18	**Suspended-ceiling luminaires – security of clips**		N
16.18.1	A luminaire provided with integral suspended ceiling clips shall be mounted as intended to a representative ceiling grid		N
16.18.2	The ceiling grid shall be inverted so that the total weight of the luminaire is applied normal to the luminaire mounting plane for a period of 1 min		N
16.18.3	The luminaire shall remain attached to the ceiling grid by the mounting clips		N
16.19	**Movable joint rotation**		N
16.19.1	A movable joint shall be capable of withstanding 6000 cycles of motion, linear or rotational, without damage to the jacket or the insulation of the conductors. One cycle shall consist of moving the part to the maximum extent possible in one direction and back again, then to the maximum extent possible in the opposite direction		N

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Clause	Requirement Test	Result Remark	Verdict
16.20	**Movable joint torsion and pull**		N
16.20.1	A movable joint shall withstand the following for 1 min:		N
16.21	**Strain relief**		N
16.21.1	Strain relief for flexible cords		N
16.21.1.1	A pull force of 156 N (35 lb) shall be applied for 1 min to the flexible cord in a direction perpendicular to the plane of the entrance into the luminaire		N
16.21.1.2	Test results shall be acceptable if there is no:		N
16.21.2	Strain relief for conductors		N
16.21.2.1	A pull force of 89 N (20 lb) shall be applied for 1 min to the conductor in a direction perpendicular to the plane of the entrance to the conductor connection		N
16.21.2.2	There shall be no breaking of the conductor or loosening of the conductor connections.		N
16.22	**Tempered glass impact**		N
16.22.1	A test specimen of tempered glass shall be broken by impact to determine the acceptability of the temper of the glass		N
16.22.2	The test shall be conducted at 25 5 °C.		N
16.22.3	The specimen shall be weighed, and the weight of 65 cm^2 (10 in^2) shall be calculated		N
16.22.4	The lower surface of the tempered glass specimen shall be covered with adhesive tape to retain the particles when the specimen breaks		N
16.22.5	The glass shall be placed on a flat surface and shattered with a center punch at a point 30 mm (1.18 in) from the midpoint on the edge of the glass toward the center. The edge shall be defined as the longest dimension on an irregular shape. When shattered, the glass shall completely dice into particles		N
16.22.6	The 10 largest crack-free particles shall be weighed together within 5 min, to avoid further fracture. The total weight shall be less than the calculated weight of 65 cm^2 (10 in^2) of the original specimen		N
16.23	**Glass support adhesive**		N
16.23.1	One sample assembly of the glassware and the adhesive material used as the sole support shall be conditioned at 23 2 °C and a relative humidity of 50 5 percent for 48 h.		N

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Clause	Requirement Test	Result Remark	Verdict
16.23.2	The sample shall be conditioned in an air-circulating oven at the temperature and for the time specified by Table 16.23.1		N
16.23.3	After conditioning, the sample shall be removed from the oven and allowed to cool to room temperature. The sample shall be supported in the intended manner, shall be oriented so the adhesive supports the glass, and shall comply with the glass support test of Clause 16.24		N
16.24	**Glass supported by friction or adhesive**		N
16.24.1	A sample of each luminaire style employing a glass diffuser that is supported by friction or adhesive shall be tested as follows		N
16.24.2	The diffuser shall stay in place for 1 min.		N
16.25	**Horizontal burning flame**		P
16.25.1	The test apparatus shall be in accordance with Clause 19.29.		P
16.25.2	Three test bar specimens 125 5 mm (5.0 0.2 in) in length and 13 0.5 mm (0.50 0.02 in) in width, with a thickness not exceeding the minimum thickness of the polymeric part being evaluated, or 3 samples of the same size cut from the enclosure, shall be tested. The maximum thickness shall not exceed 13 mm (0.50 in), the edges of the specimens shall be smooth, and the radius on the corners shall not exceed 1.3 mm (0.05 in)		P
16.25.3	The specimens shall be conditioned for at least 48 h at 23 2 °C and at a relative humidity of 50 5 percent prior to testing		P
16.25.4	The test shall be conducted in a draft-free atmosphere in a test chamber with a minimum volume of 1 m^3 (35 ft^3). There shall be an adequate supply of air		P
16.25.5	Each specimen shall be marked by scribing two lines, 25 mm (1 in) and 100 mm (4 in) from one end of the specimen, for a span of 75 mm (3 in)		P
16.25.6	The specimen shall be supported at the end nearest the 100 mm (4 in) mark, in a support, with its longitudinal axis horizontal and its transverse axis inclined at 45 degrees to the horizontal		P

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Clause	Requirement Test	Result Remark	Verdict
16.25.7	A screen of wire gauze approximately 125 125 mm (5 5 in) shall be supported in a horizontal position 10 mm (0.4 in) below the edge of the specimen, with the free end of the specimen even with the edge of the gauze, in accordance with Figure 19.29.1		P
16.25.8	The gas supply and the air ports of the burner shall be adjusted until a 20 mm (0.79 in) long blue flame is produced		P
16.25.9	The burner shall be placed so that the burner flame contacts the end of the specimen as shown in Figure 19.29.1. The free end shall be exposed to the burner flame for 30 s		P
16.25.10	If the specimen warps, melts, or shrinks away from the burner flame, the flame shall be moved to keep it in contact with the specimen. Excessive distortion of the specimen during the test can invalidate the results		N
16.25.11	The burner shall be removed after 30 s or when the flame front reaches the 25 mm (1 in) mark, whichever comes first, and placed at least 450 mm (18 in) from the specimen.		P
16.25.12	Materials rated as HB shall		P
16.25.13	If only 1 specimen from a set of 3 specimens does not comply with the requirements, another set of 3 specimens shall be tested. All specimens from this second set shall comply with the requirements in order for material in that thickness to be classified as HB		P
16.26	**Vertical burning flame**		P
16.26.1	The vertical flame test apparatus shall be in accordance with Clause 19.30		P
16.26.2	Five test bar specimens 125 5 mm (5.0 0.02 in) in length and 13 0.5 mm (0.50 0.02 in) in width with a thickness not exceeding the minimum thickness of the polymeric part being evaluated, or 5 samples of the same size cut from the enclosure, or 5 samples of the complete enclosure shall be tested. The maximum thickness shall not exceed 13 mm (0.50 in), the edges of the specimens shall be smooth, and the radius on the corners shall not exceed 1.3 mm (0.05 in)		P
16.26.3	The specimens shall be conditioned for at least 48 h at a temperature of 23 2 °C and a relative humidity of 50 5 percent prior to testing		P

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Clause	Requirement Test	Result Remark	Verdict
16.26.4	The test shall be conducted in a draft-free atmosphere in a test chamber with a minimum volume of 1 m3 (35 ft3). There shall be an adequate supply of air.		P
16.26.5	Each specimen shall be supported from the upper 6 mm (0.25 in), with the longitudinal axis vertical, by the clamp of a ring stand so that the lower end of the specimen is 9.5 mm (0.37 in) above the top of the burner tube and 300 mm (12 in) above a horizontal layer of 6 mm (0.25 in) thick, free-standing, dry, absorbent surgical cotton approximately 50 50 mm (2 2 in), as shown in Figure 19.30.1		P
16.26.6	The burner shall be adjusted to produce a blue flame 19 mm (0.75 in) high in the vertical position		P
16.26.7	The test flame shall be placed centrally under the lower end of the test specimen with the burner tube 9.5 mm (0.37 in) below the specimen. The flame shall be applied to the specimen for 10 s and then removed at least 150 mm (6 in) away from the specimen. The duration of flaming shall be recorded		P
16.26.8	When flaming of the specimen ceases, the burner flame shall be immediately placed under the specimen for an additional 10 s flame impingement time. The flame shall then be withdrawn again. The duration of flaming time and glow time of the specimen shall be recorded		P
16.26.9	If the specimen drips molten or flaming material during either flame application, the burner shall be tilted to an angle of up to 45 degrees and withdrawn slightly from one of the sides of the specimen during the flaming application, to avoid dripping into the tube of the burner		N
16.26.10	The arithmetic mean of the burning times recorded shall be calculated for each specimen		N
16.26.11	Materials shall be rated as V-0, V-1, or V-2 on the basis of test results obtained on small bar specimens tested.		N
16.26.12	If any 1 specimen from a set of 5 specimens does not comply with the requirements, another set of 5 specimens shall be tested. The additional set of 5 specimens shall be tested if the total number of seconds is in the range of 51 to 55 s for V-0 and 251 to 255 s for either V-1 or V-2. All specimens from this second set shall comply with the appropriate requirements in order for the material in that thickness to be rated as V-0, V-1, or V-2		N

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Clause	Requirement Test	Result Remark	Verdict
16.26.13	Materials rated as V-0 shall not have		N
16.26.14	Materials rated as V-1 shall not have		N
16.26.15	For materials rated as V-2, the requirements of Clause 16.26.14 shall apply, except that specimens of materials shall be permitted to drip flaming particles that ignite the surgical cotton		N
16.27	**Needle flame**		N
16.27.1	The test apparatus shall be in accordance with Clause 19.31		N
16.27.2	Three samples of the enclosure or component of a luminaire shall be subjected to the test.		N
16.27.3	The test specimens shall be conditioned for 24 h at a temperature of 23 2 °C and a relative humidity of 50 5 percent		N
16.27.4	The test shall be conducted in a draft-free atmosphere in a test chamber with a minimum volume of 1 m^3 (35 ft^3). There shall be an adequate supply of air		N
16.27.5	The specimen shall be arranged in its most unfavourable position of normal use. The means to support the specimen shall not influence the effect of the burner flame or the propagation of flames		N
16.27.6	The burner flame shall be adjusted to an overall height of 11 to 13 mm (0.43 to 0.50 in) in the vertical position, and kept at least 150 mm (6 in) away from the specimen to prevent the influence of heat or radiation on the specimen, except when the flame is being applied		N
16.27.7	The burner flame shall be applied to part of the inside surface of the specimen that is likely to be affected by flames resulting from normal use or from fault conditions, or from any source of accidental ignition		N
16.27.8	The tube of the burner shall be oriented to allow application of the flame in the mostunfavourable location. When the burner flame has been positioned so that the tip of the flame is in contact with the surface of the specimen, the burner shall not be moved.		N
16.27.9	The burner shall be tilted to an angle of 45 degrees from the horizontal, and the end of the burner tube shall be positioned 8 mm (0.32 in) below the specimen and 5 mm (0.20 in) from the specimen, as shown in Figure 19.31.1		N

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Clause	Requirement Test	Result Remark	Verdict
16.27.10	The burner flame shall be applied to the specimen for 30 s and removed for 60 s and then reapplied to the same location for 30 s		N
16.27.11	The burner flame may be applied to the outside surface of the specimen if the electrical components that are enclosed by the specimen are of the encapsulated type or of such a size that the flame cannot be applied inside		N
16.27.12	The burner flame may be applied to more than one point on the same specimen as long as the previous tests do not affect the result of the test		N
16.27.13	During the test, the specimen and the parts surrounding the specimen shall be observed. In the case of ignition of the specimen or of the parts surrounding it, the duration of burning shall be measured. Duration of burning shall be the time interval from the moment the test flame is removed until the flames have extinguished or the glowing of the specimen is no longer visible		N
16.27.14	Test results shall be acceptable if:		N
16.27.15	A specimen having an HB flammability rating as specified in Clause 16.25 shall be considered to have the equivalent of a V-2 rating if it complies with the test of Clauses 16.27.1 to 16.27.14		N
16.28	**Lamp containment barrier thermal shock**		N
16.28.1	Three test samples of the glass containment barrier specified in Clause 9.3 shall be subjected to the test at a room temperature of 25 5 °C		N
16.28.2	Three tubular quartz arc tube test segments shall be chosen, based on the size and weight shown in Table 16.28.1. The length shall be adjusted to comply with the required segment weight		N
16.28.3	Each arc tube segment shall be removed from the oven and, within 2 s, placed on the thinnest part of each lamp containment barrier, with the longitudinal axis of the cylinder perpendicular to the plane of the barrier		N
16.28.4	The test sample shall be supported on its outer edges and oriented as it would be with the luminaire installed in accordance with its installation instructions		N
16.28.5	Three quartz arc tube segments shall be chosen in accordance with Table 16.28.1 and shall be preheated in an oven to 1100 °C for at least 15 minutes. The length of arc tube segment shall be adjusted to maintain the indicated weight		N

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Clause	Requirement Test	Result Remark	Verdict
16.28.6	The test sample shall not shatter or crack		N
16.29	**Polymeric lamp containment barrier melt-through**		N
16.29.1	Three test samples of the polymeric containment barrier shall be subjected to the test. Each test sample shall:		N
16.29.2	Three quartz arc tube segments shall be chosen in accordance with Table 16.28.1 and shall be preheated in an oven to 1100 °C for at least 15 min. Each arc tube segment shall then be removed from the oven and, within 2 s, placed on the thinnest part of each lamp containment barrier, where particles from a ruptured lamp arc tube are likely to drop and rest, with the longitudinal axis of the cylinder perpendicular to the plane of the barrier.		N
16.29.3	The cotton indicator located below the barrier sample shall not be ignited as result of this test		N
16.30	**Polymeric connector loading**		N
16.30.1	A two-piece polymeric connector shall support a 90.7 kg (200 lb) weight attached to it for 1 min when secured to an outlet box mounted in an oven adjusted to operate at 100 °C		N
16.30.2	Test results shall be acceptable if there is no distortion of the connector		N
16.31	**Junction box rigidity**		N
16.31..1	A junction box intended for pulling conductors shall be tested as follows		N
16.31.2	Permanent deformation of the junction box, its hardware, or its attachment to the luminaire shall not exceed 3.2 mm (0.125 in)		N
16.32	**Splice inspection**		N
16.32.1	A short length of 14 AWG or larger wire shall be connected to the luminaire leads in the junction box or wiring compartment. The luminaire shall be mounted in the manner intended.		N
16.31.2	A visual inspection of the splices in the wiring compartment shall be conducted from the room side of the luminaire		N
16.32.3	The connections to the branch circuit supply, including the ground, shall be visible through the luminaire access opening. All parts that are required to be removed to gain access to the splices shall be easily removed and replaced from the room side of the luminaire.		N

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Clause	Requirement Test	Result Remark	Verdict
16.33	**Lampholder mounting torque**		N
16.33.1	A torque of 2.26 N·m (20 lb·in) shall be gradually applied to a medium-base screwshell-type lampholder and held for 1 min using the test apparatus of Clause 19.27		N
16.33.2	Test results shall be acceptable if		N
16.34	**Lampholder pull**		N
16.34.1	A force of 89 N (20 lb) shall be gradually applied to the screwshell of a medium-base lampholder in a straight down direction and held for 1 min using the test apparatus of Clause 19.27		N
16.34.2	There shall be no permanent deformation of the polymeric housing, and electrical spacings shall comply with Clause 6.11		N
16.35	**Lampholder mounting bracket stop test**		N
16.35.1	The bracket that supports the lampholder shall be adjusted so that it contacts the stops. A force of 4.5 kg (10 lb) shall be applied to the lampholder support bracket for 2 min, and the displacement of the stop from the original position shall be measured		N
16.35.2	The displacement of any stop shall not exceed 3.2 mm (0.125 in) from its original position. The lampholder support bracket shall not be displaced past any stop.		N
16.36	**(MEX) Thermal shock**		N
16.36.1	(MEX) Curved borosilicate glass		N
16.36.1.1	(MEX) In Mexico, borosilicate glass shall be heated in an oven at a constant and controlled temperature for 15 min to establish a differential in temperature of 75 1 °C between the oven temperature and a cold environment (tap water). The glass shall be removed from the oven and immersed glass in the cold environment, keeping the rim of the glass 15 mm (0.59 in) above the water level. In order for the glass to be considered acceptable, the glass shall not show any breakage.		N
16.36.2	(MEX) Tempered glass		N

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Clause	Requirement Test	Result Remark	Verdict
16.36.2.1	(MEX) In Mexico, tempered glass shall be heated in an oven at a constant and controlled temperature for 15 min to establish a differential in temperature of 170 1 °C between the oven temperature and a cold environment (tap water). The glass shall be removed from the oven and immersed in a flat way in the cold environment in order to produce a uniform thermal shock throughout the entire glass		N
16.37	**(MEX) Vibration**		N
16.37.1	(MEX) In Mexico, the luminaire shall remain in the holding device and all luminaire parts shall remain intact using the test apparatus of Clause 19.34 (MEX).		N
16.37.2	(MEX) In Mexico, the complete luminaire, without the lamp, shall be mounted 25 cm from the middle of the mounting point and the working plane. The mounting axis, if possible, shall be different from the vibration axis		N
16.37.3	(MEX) In Mexico, the luminaire shall undergo vibration testing at 10/40/10 Hz for 20 min, summing up 40 10 s for each sweeping sequence. The vibration table shall be adjusted to obtain an acceleration force of 0.125 10% times the force of gravity (g) at 10 Hz and 2.0 10% at 40 Hz		N
16.38	**Lampholder lead pull**		N
16.38.1	A pull force of 89 N (20 lbf) shall be applied for 1 min to each conductor terminating at the lampholder in any direction permitted by the luminaire construction.		N
16.38.2	No uninsulated live parts shall be made accessible as a result of the application of the test force		N
16.39	**Ground-screw assembly strength**		N
16.39.1	A 12 AWG (3.3 mm^2) solid-copper, insulated conductor shall be stripped to a length of 2.5 cm (1 inch) minimum. The wire shall be wrapped around the screw under the screw head so that it makes a minimum 180° turn. The conductor shall be seated to follow any wire guides or dimples provided to align the conductor with the mating surface. The ground screw shall be tightened with a calibrated torque screwdriver to 1.6 N·m (14 lb-in)		N
16.39.2	When tested as described in this section, there shall not be:		N

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Clause	Requirement Test	Result Remark	Verdict
16.40	**Cable pull test**		N
16.40.1	A metal junction box having an integral strain-relief mechanism for cable shall be assembled as described in Clauses 16.40.2 to 16.40.5 and subjected to the test method specified in either Clause 16.40.6 or Clauses 16.40.7 and 16.40.8, at the manufacturer's option		N
16.40.2	A strain-relief mechanism intended to secure only one cable shall be tested using 1 sample of each strain-relief mechanism and intended cable AWG. A strain-relief mechanism intended to secure 2 cables under a common clamp, are to be tested using 1 sample having 1 cable and another 1 sample having 2 cables for each strain-relief mechanism and intended cable AWG		N
16.40.3	Samples of the cable that comply with Clause 4.1 are to be assembled as intended to the junction box using the strain-relief mechanism. The cable or cables are to be of the size marked on the luminaire that the strain-relief mechanism is intended to secure		N
16.40.4	After assembly, the cut end of the cable to extend approximately 6.4 mm (1/4 inch) beyond the strain-relief mechanism. The wires of the cable are to be allowed to project approximately 152 mm (6 inches) inside the box. A screw that can be tightened with a screwdriver is to be tightened as follows:		N
16.40.5	The free end of the cable is to be formed into a loop and securely fastened by tape or equivalent means. The pull is to be applied to the loop by a hook or other convenient method. A mechanism intended to secure more than one cable is to have the pull applied separately to each cable, one pull at a time		N
16.40.6	Each sample is to be subjected to a direct pull of 267 N (60 lbs) for 5 minutes. The results shall be acceptable if the sample withstands the pull without		N
16.40.7	Each sample is to be subjected to a direct pull of 110 N (25 lbs) for 5 minutes. The results shall be acceptable if the cable withstands the pull without		N
16.40.8	Aging and dielectric test method		N

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Clause	Requirement Test	Result Remark	Verdict
16.40.8.1	Six previously untested samples are to be subjected to the Aging and Dielectric Test. Each sample shall be prepared in the same manner as for the pull test		N
16.40.8.2	Each assembly is to be conditioned in an air-circulating oven for 168 hours at 90 1°C (194 1°F). The samples are then to be removed from the oven and cooled to room temperature before being handled. Once the cooling process is done, each sample is to be subjected to a potential of 5000 Vac for a period of 1 minute. The potential is to be applied between the insulated conductors of the cable and between the insulated conductors and the fitting or bare wire ground.		N
16.40.8.3	The results shall be acceptable if there is no cracking, breaking, or other indication that the strain-relief mechanism has been damaged and there is no dielectric breakdown after the oven-conditioning test		N
16.41	**Polymeric impact**		N
16.41.1	The sample luminaires shall be held in place and subjected to a single 7 J (5 ft·lb) impact, using the impact test apparatus described in Clause 19.21, falling through a vertical height of 1.29 m (4.24 ft), on surfaces being tested. The test samples shall be conditioned by placing them in a conditioning environment in accordance with Table 16.41.1 for at least 3 h prior to the test		N
16.41.2	The number of samples and the sequence of the procedure shall be in accordance with Figure 16.2.3.1		N
16.41.3	Test results shall be acceptable if the enclosure is capable of complying with all the applicable requirements of this standard		N
17	**Electrical tests**		N
17.1	**Dielectric voltage-withstand**		N
17.1.1	The dielectric voltage-withstand test apparatus shall be in accordance with Clause 19.20		N
17.1.2	A luminaire shall withstand for a period of 1 minute, without breakdown, a test potential applied between live parts and accessible non-current-carrying metal parts, including parts accessible only during relamping		N

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Clause	Requirement Test	Result Remark	Verdict
17.1.3	The test potential shall be 1000 V for incandescent-type luminaires and 1000 V plus twice the rated input voltage for all other types of luminaire		N
17.1.4	The applied potential shall be gradually increased from zero at a uniform rate until the required test value is reached or breakdown occurs. During the test, any switches or other controls shall be in the ON position		N
17.1.5	The test shall be performed on a fully assembled luminaire. Non-current-carrying parts or decorative parts not likely to become energized shall not be required to be in place.		N
17.1.6	Solid state components that are not relied upon to reduce the risk of electric shock and that can be damaged by the applied dielectric potential may be disconnected for the test. The circuitry may be rearranged for the purpose of the test to reduce the likelihood of solid state component damage while retaining the representative dielectric stress on the circuit		N
17.2	**Bonding circuit impedance**		N
17.2.1	The test apparatus shall be in accordance with Clause 19.19.2. The measured resistance between the point of connection of the branch circuit equipment grounding conductor and any non-current carrying metal parts of the luminaire described in Clause 6.14.1.1 shall not exceed 0.10		N
17.2.2	If the resistance measured in Clause 17.2.1 exceeds 0.10 the test of Clause 17.2.4 shall be conducted		N
17.2.3	The test apparatus shall be in accordance with Clause 19.19.2. The measured voltage between the point of connection of the branch circuit equipment grounding conductor and any non-current carrying metal parts of the luminaire described in Clause 6.14.1.1 under the conditions specified in 17.2.4 shall comply with 17.2.5		N
17.2.4	The test of impedance shall be performed by passing a 30 A current from a part to be grounded to the grounding terminal means for a period of 2 min and measuring the potential drop between them at the end of the period.		N
17.2.5	When tested in accordance with Clause 17.2.4:		N
	the resulting voltage drop shall not exceed 4.0 V; and		N

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Clause	Requirement Test	Result Remark	Verdict
	there shall be no melting of any conductor or metal in the bonding circuit		N
	there shall be no heating or burning that is likely to create a fire hazard.		N
17.3	**Interlock switch endurance**		N
17.3.1	A luminaire incorporating an interlock switch shall be connected to a supply circuit and operated at rated lamp voltage, wattage, and frequency, with the switch contacts connected in the ungrounded conductor		N
17.3.2	Accessible non-current-carrying metal parts of the luminaire shall be connected to the grounded conductor of the supply circuit through a 3 A quick-acting plug-type fuse.		N
17.3.3	The switch shall be operated by means of the interlocking mechanism provided in the luminaire for 500 cycles at a rate not exceeding 6 cycles per min.		N
17.3.4	Test results shall be acceptable if there is no		N
	electrical or mechanical malfunction of the switch;		N
	fault indicated by opening of the fuse; and		N
	dielectric breakdown when subjected to the dielectric voltage-withstand test of Clause 17.1		N
17.4	**Articulate probe**		N
17.4.1	The articulate probe of Clause 19.22 shall not contact live parts when inserted through any openings in an enclosure, with the probe in every possible position. Where necessary, an electrical indicator may be used to determine whether contact is made with live parts		N
17.5	**(MEX) Insulation resistance**		N
17.5.1	(MEX) In Mexico, the insulation resistance test apparatus shall be in accordance with Clause 19.33 (MEX).		N
17.5.2	(MEX) In Mexico, the insulation resistance shall be measured between live parts of opposite polarity and between live parts and the luminaire housing. The resistance measured shall be not less than 2.0 M		N
18	**Factory production tests**		

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Clause	Requirement Test	Result Remark	Verdict
18.1	**Dielectric voltage-withstand**		N
18.1.1	A dielectric voltage-withstand test shall be performed on 100 percent of production of luminaires that contain conductors that are		N
18.1.2	A fluorescent luminaire with the construction described in Clause 18.1.1 and provided with a removable cover for access to conductors shall not be required to be subjected to the factory dielectric voltage-withstand test		N
18.1.3	The dielectric voltage-withstand test apparatus shall be in accordance with Clause 19.20.		N
18.1.4	Luminaires shall be fully assembled, with control and protective components in conducting position, switches in the ON position, and fuses in place. Isolated non-current-carrying metal parts or decorative parts not likely to become energized shall not be required to be in place.		N
18.1.5	Solid state components that are not relied upon to reduce the risk of electric shock and that can be damaged by the applied dielectric potential may be disconnected for the test. The circuitry may be rearranged for the purpose of the test to reduce the likelihood of solid state component damage while retaining the representative dielectric stress on the circuit.		N
18.1.6	The luminaire shall be subjected, without breakdown, to a voltage of 1200 V ac, for a duration of 1 s, between		N
	primary wiring and accessible non-current-carrying metal parts that can become energized; and		N
	primary wiring and accessible uninsulated live parts in the secondary circuit of an isolating transformer rated for a maximum open circuit voltage of 30 V rms or 42.4 V peak.		N
18.2	**Grounding continuity**		N
18.2.1	General		N
18.2.1.1	A grounding continuity test shall be performed on luminaires with:		N
18.2.1.2	The testing shall be performed as follows:		N
18.2.1.3	The grounding continuity test apparatus shall be in accordance with Clause 19.19		N

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Clause	Requirement Test	Result Remark	Verdict
18.2.1.4	The measured or calculated resistance between the point of connection of the grounding means and any non-current-carrying metal parts described in Clause 18.2.1.1 shall not exceed 0.10 .		N
18.2.2	Grounding continuity test for unassembled luminaires		N
18.2.2.1	A grounding continuity test shall be performed on a representative design at least once per quarter.		N
18.2.2.2	The grounding continuity test for a luminaire that is shipped with the enclosure unassembled, or with snap-in or tab-mounted parts, shall be conducted in the following manner		N
	the luminaire shall be completely assembled in accordance with the assembly instructions. The grounding continuity test shall be performed after the applicable parts pull test specified in Items (b) and (c). The grounding continuity test apparatus shall be in accordance with Clause 19.19. The resistance between the two test points shall not exceed 0.10		N
	if the assembled enclosure part is not provided with a knockout or conduit opening, the parts pull test of Clause 16.16 shall be conducted		N
	if the assembled enclosure part is provided with a knockout or conduit opening, the parts pull test of Clause 16.17 shall be conducted.		N
18.3	**Glass support**		N
18.3.1	One sample of each luminaire style that employs a glass diffuser supported by friction alone shall be tested at least once per quarter to determine compliance with Clause 16.24		N
18.4	**Strain relief**		P
18.4.1	One sample of each luminaire design with a power supply cord shall be tested at least once per quarter to determine compliance with the strain-relief test of Clause 16.21.1.		P
18.4.2	One sample of each luminaire design with a lamp-supported lampholder shall be tested at least once per quarter to determine compliance with the strain-relief test of Clause 16.21.2		P
18.5	**Polarity**		N

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Clause	Requirement Test	Result Remark	Verdict
18.5.1	One sample of each luminaire design required to comply with the identification and polarity requirements of Clause 6.10 shall be tested at least once per quarter to determine compliance with the polarity test of Clause 18.5.2, unless the polarity can be verified visually		N
18.5.2	Continuity shall be verified between the point where the identified (neutral) branch circuit conductor is intended to be connected to the luminaire and the lampholder screwshell, using an indicating device such as an ohmmeter or other continuity testing device.		N
18.6	**Ground screw torque**		N
18.6.1	One sample of each luminaire design provided with a screw for securing the branch circuit equipment grounding conductor shall be tested at least once per quarter to determine compliance with the ground-screw assembly strength test of Clause 16.39		N
18.7	**Test records**		P
18.7.1	Test records shall be retained for a period of at least 6 months, and shall include test quantity, test dates, catalogue or model numbers, test results, and disposition of any non-complying products.		P
19	**Test procedures and apparatus**		P
19.1	**Installation and support**		P
19.1.1	A luminaire shall be installed or supported to simulate intended usage, in accordance with the manufacturer's instructions. Where more than one method may be used, it shall be installed or supported to allow recording of the maximum temperature that can be encountered under the intended uses		P
19.1.2	A luminaire part designed to be adjustable by the user shall be positioned or adjusted to cause maximum heating of the luminaire, mounting surface, or both. A luminaire part that is marked in accordance with Table 20.1.1, Item 2.31, shall be positioned for the temperature test in accordance with the marking		P
19.1.3	A luminaire that is intended to be mounted to the floor shall have no room obstructions, ceiling, or walls closer than 0.91 m (3 ft)		P
19.1.4	A pole-mounted luminaire not provided with a pole shall be mounted on a representative length of pole and meet the conditions of Clause 19.1.3		N

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Clause	Requirement Test	Result Remark	Verdict
19.2	**Temperature test stabilization**		P
19.2.1	Temperature tests shall be conducted in accordance with Clause 19.2 and the normal and abnormal temperature tests of Clauses 14 and 15		P
19.2.2	Temperatures shall be measured by thermocouples, as specified in Clause 19.7		P
19.2.3	The temperature of ballast and transformer coils shall be measured using thermocouples that are directly in contact with the inner surfaces of the coil or using the rise-of-resistance method described in Clause 19.6. The resulting temperature shall not exceed the applicable temperatures specified in Table 14.1.2.		N
19.2.4	Temperatures shall be measured after they have stabilized, when		P
	the test has been running for a minimum of 7.5 h; or		P
	the test has been running for a minimum of 3 h; and		N
	three successive readings taken at 15 min intervals are within 1 °C of one another and are not rising		N
19.3	**Voltage**		P
19.3.1	General		P
19.3.1	The test voltages specified in Clauses 19.3.2 to 19.3.5 shall be used when conducting temperature tests		P
19.3.2	Incandescent luminaires, non-transformer operated		P
19.3.2.1	The test voltage for a standard test lamp shown in Tables 19.8.1, 19.8.2, and 19.8.3 shall be adjusted to achieve the rated lamp wattage		P
19.3.2.2	The test voltage for lamps other than standard test lamps shall be adjusted to achieve the rated lamp wattage and shall be within 2 percent of the rated lamp voltage		P
19.3.3	Incandescent luminaires, power supply operated (transformer)		P
19.3.3.1	The test voltage shall be the nominal system voltage specified in Table 19.3.3.1		P
19.3.3.2	The test voltage for a luminaire that employs ampere-rated automotive-type lamps shall be adjusted to the rated input voltage of the power supply		N

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Clause	Requirement Test	Result Remark	Verdict
19.3.3.3	The test lamp, when evaluated separately, shall operate within 5 percent of the rated lamp wattage or amperage, as applicable, at rated lamp voltage.		P
19.3.4	HID luminaires		N
19.3.4.1	The test voltage shall be the nominal system voltage corresponding to the rated ballast input voltage, as specified in Table 19.3.3.1.		N
19.3.4.2	A capacitor shall have a capacitance rating within 5 percent of the ballast manufacturer's specification		N
19.3.4.3	The test lamp, when evaluated in open air, using the same ballast and capacitor that will be used in the luminaire, shall operate within 5 percent of the rated lamp wattage after a 15 min stabilization period. The voltage may be adjusted to be within the 5 percent range, and this voltage shall be used as the test voltage		N
19.3.5	Fluorescent luminaires		N
19.3.5.1	The test voltage shall be the nominal system voltage corresponding to the ballast input voltage rating, as specified in Table 19.3.3.1.		N
19.4	**Frequency**		N
19.4.1	Frequency-sensitive equipment shall be tested at rated frequency, and equipment marked with more than one frequency shall be tested at the frequency that will produce the maximum temperature rise		N
19.5	**Ambient temperature**		P
19.5.1	Tests shall be conducted in an ambient temperature of 25 5 °C. Ambient temperature variations above or below 25 °C shall be respectively subtracted from or added to temperatures recorded at points on the luminaire		P
19.5.2	The ambient temperature shall be measured by means of a thermocouple or thermometer.		P
19.5.3	A thermocouple intended to measure ambient temperature shall be immersed in 15 ml (0.5 oz) of mineral oil in a glass container or attached to a metal mass of approximately 30 g (1 oz) that is within a cylindrical metal shield open at the top and bottom		P

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Clause	Requirement Test	Result Remark	Verdict
19.5.4	The glass container or cylindrical metal shield shall be placed in the horizontal plane passing through the midpoint of the luminaire's vertical axis at a horizontal distance from the luminaire equal to at least 3 times the luminaire diameter		N
19.5.6	Tests may be conducted in an elevated ambient temperature, in accordance with Clause 12.4.2, at the option of the manufacturer		P
19.6	**Rise-of-resistance temperature method**		N
19.6.1	The temperature of a coil may be determined by the rise-of-resistance method (comparing the resistance of the winding at the temperature to be measured with its resistance at a known temperature) using the formula specified in Clause 19.6.2		N
19.6.2	The temperature of a winding shall be calculated using the following formula:		N
19.6.3	Since it is usually necessary to de-energize the winding before measuring R_H, and the resistance of the coil can change rapidly as the temperature decreases, it is sometimes necessary to determine the value of R_H at the end of the test by taking several resistance measurements at short intervals, beginning as quickly as possible after the instant of shutdown. A curve of the resistive values and time shall be plotted and extrapolated to give the value of R_H at the end of the test		N
19.6	**(MEX) Temperature rise**		P
19.6.1	(MEX) In Mexico, in order to perform the temperature rise test, the terminals necessary for measuring the resistance in the different windings shall be pulled out. The thermocouple shall be on the hottest accessible part of the ballast		P
19.6.2	(MEX) In Mexico, without energizing the ballast, the resistance shall be measured after the ballast has thermally stabilized at the ambient temperature. This shall be the cold resistance,		P
19.6.3	(MEX) In Mexico, the ballast shall be energized, and the corresponding load shall be connected. These conditions shall be maintained until the ballast reaches thermal stability		P
19.6.4	(MEX) In Mexico, the ballast shall be de-energized, and least three measurements of resistance shall be taken for each winding. These shall be completed in the 5 min after cutting the power. This shall be the hot resistance, R.		N

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Clause	Requirement Test	Result Remark	Verdict
19.6.5	(MEX) In Mexico, the time between cutting the line and taking the first reading shall not exceed 80 s in any case		N
19.6.6	(MEX) In Mexico, the values of hot resistance versus time shall be graphed in order to obtain the hot resistance at the instant that the line was cut		N
19.6.7	(MEX) In Mexico, the relationship between the average temperature and resistance shall be determined using the following formula		N
19.7	**Thermocouples**		P
19.7.1	Temperatures recorded at points on a luminaire shall be measured by means of thermocouples		P
19.7.2	Thermocouples shall have conductors no larger than 0.21 mm^2 (24 AWG) and no smaller than 0.05 mm^2 (30 AWG). Thermocouples shall comply with the requirements specified in ASTM MNL 12 and thermocouples as listed in the table of the limits of error specified in NIST ITS 90, or ISA MC96.1. Thermocouple conductors smaller than 30 AWG may be used for miniature circuitry and components. The thermocouple junction shall be fused.		P
19.7.3	If referee temperature measurements are required, 30 AWG iron and constantan thermocouples and a potentiometer-type instrument shall be used.		N
19.7.4	A thermocouple junction and the adjacent thermocouple conductor shall be held in good thermal contact with the surface of the material where a temperature is being measured. Tape alone shall not be relied upon as a means to provide good thermal contact of the thermocouple junction. Acceptable means of securing a thermocouple include water glass, cyanoacrylate, melting the tip into plastic, soldering, or wedging between two surfaces.		P
19.7.5	A thermocouple used to measure a conductor temperature for through wiring shall be placed in contact with the conductor through a slit in the insulation and retained in place by a wrap of tape.		P
19.8	**Test lamps**		P
19.8.1	The type and wattage of lamp or lamps specified by the manufacturer shall be used for test purposes		P

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Clause	Requirement Test	Result Remark	Verdict
19.8.2	Test lamps, other than those shown in Table 19.8.2 with upper and lower temperature limits, when evaluated in open air, shall operate within 5 percent of the rated lamp wattage at rated lamp voltage		P
19.8.3	Incandescent test lamps shall be seasoned for at least 45 min at 115 percent of the rated lamp voltage		N
19.8.4	Incandescent reflector test lamps shall be of the widest beam spread available. A Type MR test lamp shall have a dichroic reflector		N
19.8.5	Fluorescent and HID test lamps shall be seasoned for at least 100 h.		N
19.8.6	Fluorescent and HID lamps used for a temperature test shall be rated for the ballast involved		N
19.8.7	The rated wattage of any test lamp for a surface ceiling-mounted luminaire shall be the maximum lamp wattage marked on the luminaire or the wattage of the largest lamp specified in Table 19.8.4 that can fit in the luminaire, whichever is larger.		N
19.9	**Branch circuit conductor temperature probe**		N
19.9.1	The temperature probe shown in Figure 19.9.1 shall be positioned in the outlet box adjacent to the outlet box mounting tabs, as shown, by a mechanical means, to determine the temperature of the branch circuit conductors during the temperature test.		N
19.10	**Surface ceiling temperature test apparatus**		N
19.10.1	The temperature test ceiling apparatus shall conform to Figure 19.10.1 and shall be constructed as follows:		N
19.10.2	Thermocouples may be routed through the flexible conduit to the outlet box		N
19.10.3	The test ceiling apparatus shall be mounted in a draft-free room, and shall be located not less than 1800 mm (72 in) above the floor, a minimum of 300 mm (12 in) below the room ceiling, and a minimum of 600 mm (24 in) from any wall or other obstruction.		N
19.11	**Surface wall temperature test apparatus**		N

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Clause	Requirement Test	Result Remark	Verdict
19.11.1	The temperature test wall apparatus shall conform to Figure 19.11.1 and shall be constructed as follows		N
	wooden parts of the structure shall be secured together with wood screws or nails		N
	a metal octagonal outlet box, 4 x 1-1/2 in trade size, shall be mounted in the center of the plywood panel, projecting through and flush with the outer face. The box shall be mounted with two steel angle brackets, 1.25 mm (0.050 in) thick, 38 mm (1.5 in) long, 25 mm (1 in) flanges, attached to opposite sides of the box and secured with wood screws to the inside of the plywood panel		N
19.11.2	Thermocouples may be routed through the flexible conduit to the outlet box		N
19.11.3	The test wall shall be mounted in a draft-free room, and shall be located a minimum of 900 mm (36 in) above the floor and a minimum of 300 mm (12 in) below the room ceiling, with the 1 x 4 in ends in a horizontal position		N
19.12	**Surface-mounted under-cabinet luminaire test alcove**		N
19.12.1	The test alcove shown in Figure 19.12.1 shall have three sides made of plywood conforming to Clause 19.32, joined at right angles to form a corner with butt-fitted seams secured by wood screws or nails. Each side shall project 300 mm (12 in) beyond the luminaire		N
19.12.2	The luminaire shall be mounted inside so it touches two walls and the top of the alcove, in the configuration and orientation that result in the highest temperatures.		N
19.13	**Temperature test boxes for Type Non-IC recessed luminaries (not intended for thermal insulation contact)**		P
19.13.1	General		P
19.13.1.1	The test box shall be rectangular and have four sides, a top, and a bottom, constructed of plywood conforming to Clause 19.32, with butt-fitted seams secured with wood screws or nails. The bottom or front represents the mounting surface in which a hole is cut for the ceiling or wall aperture, respectively		P
19.13.1.2	The following parts may contact the test box		P
19.13.2	Normal temperature test		P

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Clause	Requirement Test	Result Remark	Verdict
19.13.2.1	The sides and top of the test box as shown in Figure 19.13.2.1 for a ceiling- or wall-mounted luminaire shall be 13 mm (0.5 in) from the lamp housing or heat-producing components, or shall be in contact with permanently attached parts that are more than 13 mm (0.5 in) from the lamp housing or heat-producing components		P
19.13.2.2	Holes for conduit entrance, thermocouple leads, and supply leads shall be sealed		P
19.13.3	Abnormal temperature test		P
19.13.3.1	The four sides of the test box as shown in Figure 19.13.3.1 for a ceiling-mounted luminaire shall be a minimum distance of 215 mm (8.5 in) from the nearest part of the lamp housing or from other parts enclosing heat-producing components such as lamps or through-wiring junction boxes. The top edge of the sides of the test box shall be a minimum of 215 mm (8.5 in) above the highest point of any permanently attached part of the lamp housing.		P
19.13.3.2	Thermal insulation of the loose-fill type specified in Clause 19.16 shall be poured into the test box through the open top, in progressive layers, without applying any compacting procedure		N
19.13.3.3	The four sides of the test box shown in Figure 19.13.3.2 for a wall-mounted luminaire shall be a minimum distance of 215 mm (8.5 in) from the lamp housing or heat-producing components. The depth of the box shall be 150 mm (6 in) or, if the luminaire is deeper, a dimension that provides contact with the back of the lamp housing		N
19.13.3.4	Thermal insulation of the loose-fill type specified in Clause 19.16 shall be poured into the test box through the open top, without applying any compacting procedure, until the box is full		N
19.14	**Temperature test box for Type Non-IC, marked spacings, recessed ceiling-mounted luminaires (not intended for thermal insulation contact)**		N
19.14.1	Marked spacings normal temperature test		N
19.14.1.1	The test box shown in Figure 19.14.1.1 shall be square and shall have four sides, a top, and a bottom constructed of plywood conforming to Clause 19.32, with butt-fitted seams secured with wood screws or nails		N

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Clause	Requirement Test	Result Remark	Verdict
19.14.1.2	The luminaire light aperture center, as shown in Figure 19.14.1.2, shall be located in a hole cut in the center of the surface of the test box that represents the ceiling surface		N
19.14.1.3	The inside length of each of the four sides of the test box shall be twice the light aperture center to the building side wall marked on the luminaire, as shown in Table 19.14.1.1 and Figure 19.14.1.1		N
19.14.1.4	The inside height of the test box shall be the measured height of the luminaire plus the spacing, as marked on the luminaire, to an overhead building member		N
19.14.1.5	Holes for conduit entrance, thermocouple leads, and supply leads shall be sealed		N
19.14.2	Marked spacings abnormal temperature test – reduced spacings		N
19.14.2.1	The test box shown in Figure 19.14.2.1 shall be rectangular and shall have four sides, a top, and a bottom constructed of plywood panels conforming to Clause 19.32, with butt-fitted seams secured with wood screws or nails. The bottom shall represent the mounting surface in which a hole shall be cut for the ceiling aperture		N
19.14.2.2	Holes for conduit entrances, thermocouples, and supply leads shall be sealed.		N
19.14.2.3	The sides and top of the test box shall be 13 mm (0.5 in) from the lamp housing or other heat-producing components, or shall be in contact with permanently attached parts that are more than 13 mm (0.5 in) from the lamp housing or other heat-producing components		N
19.14.2.4	The following parts may contact the test box		N
19.14.3	Marked spacings abnormal temperature test – thermal insulation		P
19.14.3.1	The test box shown in Figure 19.14.3.1 shall be rectangular and shall have four sides and a bottom constructed of plywood panels conforming to Clause 19.32, with butt-fitted seams secured with wood screws or nails. The bottom shall represent the mounting surface in which a hole shall be cut for the ceiling aperture.		P
19.14.3.2	The four sides of the test box shall be a minimum distance of 215 mm (8.5 in) from the nearest part of the lamp housing or other heat-producing components. The top edge of the sides of the test box shall be a minimum of 215 mm (8.5 in) above the highest point of the lamp housing		P

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Clause	Requirement Test	Result Remark	Verdict
19.14.3.3	Thermal insulation of the loose-fill type specified in Clause 19.16 shall be poured into the test box through the open top, in progressive layers, without applying any compacting procedure		N
19.15	**Temperature test box for Type IC recessed luminaries (intended for thermal insulation contact)**		N
19.15.1	The test box shall be rectangular and shall have four sides and a bottom constructed of plywood panels conforming to Clause 19.32, with butt-fitted seams secured with wood screws or nails. The bottom or front shall represent the mounting surface in which a hole shall be cut for the ceiling or wall aperture, respectively		N
19.15.2	The four sides of the test box shown in Figure 19.15.1 for a ceiling-mounted luminaire shall be a minimum distance of 215 mm (8.5 in) from the nearest part of the lamp housing or heat-producing parts. The top edge of the sides of the test box shall be a minimum of 215 mm (8.5 in) above the highest point of any permanently attached part of the lamp housing		N
19.15.3	The four sides of the test box shown in Figure 19.15.2 for a wall-mounted luminaire shall be a minimum distance of 215 mm (8.5 in) from the nearest part of the lamp housing. The depth of the box shall be 150 mm (6 in) or, if the luminaire is deeper, a dimension that provides contact with the back of the lamp housing.		N
19.15.4	Thermal insulation of the loose-fill type specified in Clause 19.16 shall be poured into the test box through the open top, until level with the top, without applying any compacting procedure		N
19.16	**Thermal insulation used for recessed temperature tests**		N
19.16.1	Thermal insulation of the loose-fill type shall be conditioned to the density specified by the insulation manufacturer to obtain a required rated thermal resistance of Rsi 0.56 to 0.678 (R3.2 to R3.85) per inch		N
19.16.2	Thermal insulation shall be conditioned, if required, by a blowing or vacuum machine before it is placed around the test luminaire. Density shall be verified by placing insulation into a box of known volume and weight, and then weighing the filled box. The difference in weight between the empty and full box, divided by the volume, shall be the insulation density		N
19.17	**Rain test apparatus**		N

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Clause	Requirement Test	Result Remark	Verdict
19.17.1	The rain test apparatus shall to consist of 3 spray heads mounted in a water supply pipe rack as shown in Figure 19.17.1. The spray heads shall be in accordance with Figure 19.17.2		N
19.17.2	The water pressure shall be maintained at 34.5 kPa (5 psi) at each spray head		N
19.18	**Sprinkler test apparatus**		N
19.18.1	The sprinkler test apparatus shall consist of a single spray head mounted as shown in Figure		N
19.18.2	The water pressure shall be maintained at 140 kPa (20 psi) at the spray head		N
19.19	**Bond impedance and ground continuity test apparatus**		N
19.19.1	Bond impedance		N
19.19.1.1	The bond impedance test apparatus shall consist of an indicating instrument and an ac or dc power supply of approximately 12 V providing a current of 30 A through the bonding means being evaluated.		N
19.19.2	Ground continuity		N
19.19.2.1	The ground continuity test apparatus shall be an ohmmeter or similar indicating instrument capable of measuring 0.10		N
19.20	**Dielectric voltage-withstand test apparatus**		P
19.20.1	The dielectric voltage-withstand test apparatus shall include a 40 to 70 Hz transformer having an essentially sinusoidal output with a rating sufficient to maintain the required test potential and a means of indicating and regulating the output test potential. The sensitivity for the trip circuit shall be a maximum of 100 mA at the specified test voltage, and the equipment shall include an audible or visible indication of breakdown.		P
19.20.2	If the output of the test equipment is 500 VA or more, the test potential shall be indicated by a voltmeter in the primary circuit or in a tertiary winding circuit, by a selector switch marked to indicate the test potential, or by a marking in a readily visible location to indicate the test potential of equipment having a single test potential output. When a marking is used without an indicating voltmeter, the equipment shall include a positive means, such as a power-on lamp, to indicate that the manually reset switch has been reset following a tripout		N

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Clause	Requirement Test	Result Remark	Verdict
19.20.3	If the output of the test equipment is less than 500 VA, the equipment shall include a voltmeter in the output circuit to directly indicate the test potential		N
19.21	**Impact test apparatus**		P
19.21.1	The impact shall be produced by dropping a steel sphere 51 mm (2 in) in diameter and weighing 0.54 kg (1.18 lb) from the height required to produce the desired impact force, as shown in Figure 19.21.1		P
19.21.2	For surfaces other than horizontal, the steel sphere shall be suspended by a cord and shall swing as a pendulum through the vertical distance required to produce the required impact force, as shown in Figure 19.21.2.		P
19.22	**Articulate probe**		N
19.22.1	The articulate probe shall be constructed in accordance with Figure 19.22.1.		N
19.23	**Conduit knockout and twistout test apparatus**		N
19.23.1	A conduit knockout or twistout test plate shall be supported as shown in Figure 19.23.1		N
19.24	**Five-inch flame test apparatus**		N
19.24.1	The test apparatus shall be as shown Figure 19.24.1 and in accordance with ASTM D 5048		N
19.24.2	The burner shall be of the Bunsen or Tirrill type with a length of tube 89 to 101 mm (3.50 to 3.98 in) and an inside diameter of 9.5 to 11.1 mm (0.375 to 0.438 in)		N
19.24.3	The burner shall be supported by a 20 degree angle block, and suitable guidance means shall be provided to allow the burner to be positioned repeatedly in the same position relative to the material under test.		N
19.24.4	The gas supply shall be of technical grade methane gas or natural gas having an energy density of approximately 37 mJ/m^3 (1000 btu/ft^3).		N
19.24.5	A cotton indicator shall be placed approximately 300 mm (12 in) below the test specimen.		N
19.25	**UV exposure test apparatus**		P

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Clause	Requirement Test	Result Remark	Verdict
19.25.1	The apparatus shall be in accordance with ASTM G 155-98		P
19.26	**Gasket compression test apparatus**		N
19.26.1	The test apparatus shall be as shown in Figure 19.26.1. The backing plate shall be galvanized or painted sheet steel, 50 mm (2 in) wide, 225 mm (9 in) long, and 1.6 to 3.5 mm (0.063 to 0.140 in) thick		N
19.26.2	The test specimen shall be 25 mm (1 in) wide and 200 mm (8 in) long, and shall be attached to the backing plate by the manufacturer, using the proposed adhesive and production method		N
19.26.3	The weight shall be a round steel bar 100 mm (4 in) in diameter, approximately 300 (12 in) long, weighing 18 kg (40 lb), and producing a pressure of 69 kPa (10 lbs/in^2) on the test specimen.		N
19.27	**Lampholder mounting torque test apparatus**		N
19.27.1	The test apparatus shall be as shown in Figure 19.27.1		N
19.28	**Glow-wire test apparatus**		P
19.28.1	The description of the test apparatus shown in Figure 19.28.1 is an excerpt from IEC 60695-2-1. See the IEC publication for complete apparatus details and operation		P
19.28.2	The glow-wire shall consist of a specified loop of a nickel/chromium (80/20) wire with a nominal diameter of 4 mm (0.16 in). The loop shall be formed so as to prevent fine cracking at the tip		P
19.28.3	A sheathed fine-wire thermocouple, having an overall diameter of 0.5 mm (0.02 in) and wires of NiCr and NiAl, Type K, with the welded point located inside the sheath, shall be used for measuring the temperature of the glow-wire. The sheath shall consist of a metal resistant to the temperature of at least 960 °C. The thermocouple shall be arranged in a pocket hole, 0.6 mm (0.24 in) in diameter, drilled in the tip of the glow-wire		N
19.28.4	The instrument for measuring the thermovoltage shall be capable of reading 1000 °C with an accuracy of 1 °C		

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Clause	Requirement Test	Result Remark	Verdict
19.28.5	The glow-wire shall be electrically heated with a low-voltage transformer, and the current required to heat the tip to a temperature of 960 °C shall be between 120 and 150 A. A voltage adjustment method shall be provided to allow continuous adjustment of the power level to achieve the desired glow-wire tip temperature.		N
19.28.6	The positioning clamp shall be designed to support the test specimen and apply the glow-wire to the specimen in a horizontal plane with a force of 0.8 to 1.2 N (0.18 to 0.27 lb). The force shall be maintained at this value when either the glow-wire or the specimen is moved horizontally towards the other. The mechanism shall allow at least 7 mm (0.275 in) penetration of the glow-wire into the specimen, and a stop mechanism shall be provided to mechanically limit penetration to a distance of 7 mm (0.275 in).		N
19.28.7	To evaluate of the risk of spread of fire or of falling glowing particles from the specimen, a piece of flat, smooth, white pine wood board, approximately 10 mm (0.4 in) thick and covered with a single layer of tissue paper, in loose contact, shall be located at a distance of 200 5 mm (7.8 0.2 in) below the glow-wire. The tissue paper shall be undyed, soft, strong, and lightweight, weighing between 12 and 30 gm/m^2 (0.004 and 0.009 oz/ft^2)		P
19.29	**Horizontal burning flame test apparatus**		N
19.29.1	The test apparatus shall be as shown in Figure 19.29.1 and in accordance with ASTM D 635		N
19.30	**Vertical burning flame test apparatus**		N
19.30.1	The test apparatus shall be as shown in Figure 19.30.1 and in accordance with ASTM D 3801		N
19.30.2	The burner shall be of the Bunsen or Tirrill type with a length of tube 89 to 101 mm (3.50 to 3.98 in) and an inside diameter of 9.5 to 11.1 mm (0.375 to 0.438 in). The tube shall not be equipped with stabilizers and other end attachments		N
19.30.3	The gas supply shall be of technical grade methane gas or natural gas having an energy density of approximately 37 mJ/m^3 (1000 btu/ft^3).		N
19.31	**Needle flame test apparatus**		N

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Clause	Requirement Test	Result Remark	Verdict
19.31.1	The test apparatus shall be in accordance with Figure 19.31.1		N
19.31.2	The burner to produce the test flame shall consist of a tube that is at least 35 mm (1.38 in) long and that has a bore of 0.4 to 0.6 mm (0.016 to 0.024 in) and an outer diameter not exceeding 0.9 mm (0.035 in). A hypodermic needle, with the tapered end cut off, may be used for the test apparatus		N
19.31.3	The burner shall be supplied with butane or propane gas having a purity of at least 95 percent. There shall be no air admitted to the burner tube.		N
19.32	**Plywood test box material**		N
19.32.1	The plywood used for constructing temperature test boxes shall be 12 mm (0.5 in) thick, with at least one side that has all voids filled and sanded		N
19.33	**(MEX) Insulation resistance test apparatus**		P
19.33.1	(MEX) In Mexico, insulation resistance measurements shall be made using a 500 V dc insulation tester or other suitable equipment. For safety reasons, the test shall be performed with the luminaire disconnected from the power supply and away from the rain test apparatus		P
19.34	**(MEX) Vibration test apparatus**		P
19.34.1	(MEX) In Mexico, the following equipment shall be used for vibration testing:		P
20	**Marking**		P
20.1	**Genera**		P
20.1.1	A luminaire shall be legibly marked using one or more of the following methods in accordance with Table 20.1.1		P
20.1.2	A pictogram in accordance with Annex D may be used as a substitute for the corresponding text of Table 20.1.1, and shall be the subject of special investigation		P
20.1.3	A marking shall be of the minimum size (S _) and in the location (L _) shown in the “Format” column of Table 20.1.1 and as defined in Tables 20.1.2 and 20.1.3		N

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Clause	Requirement Test	Result Remark	Verdict
20.1.4	Verbatim in the "Text" column of Table 20.1.1 indicates that the marking shall consist of only the exact words shown or a marking including these words and conveying the original intent. Alternative wording for other markings in the Table may be used, subject to evaluation		N
20.1.5	The characters of embossed, molded, or cast lettering, either in or out, shall be a minimum of 0.25 mm (0.010 in) in depth		N
20.1.6	20.1.1 When a permanent-type label (Type P) is required in accordance with Table 20.1.3, paint stencilled, ink-stamped, and indelibly printed lettering shall be legible as determined by the test of Clause 20.3. The stamping device shall provide consistent and even pressure, regardless of the operator.		N
20.1.7	Pressure-sensitive labels and nameplates of the permanent type (Type P) that are secured by adhesive shall be in accordance with CSA C22.2 No. 0.15 or UL 969		N
20.1.8	The adhesive of pressure-sensitive labels and nameplates of the permanent type (Type P) shall be suitable for the mounting surface, temperature, and environment.		N
20.2	**Identification and ratings**		P
20.2.1	A luminaire shall be marked with the following		P
20.2.2	A luminaire shall be marked with catalogue number, model number, series number, or other similar designation in accordance with Table 20.1.1, Item 4.2		P
20.2.3	A luminaire that employs a ballast or transformer shall be marked with the input rating in volts, hertz, and total amperes or watts, in accordance with Table 20.1.1, Item 1.3, unless		N
20.2.4	Where parts of a luminaire, except for lenses, diffusers, and decorative parts, are shipped in more than one package, each package shall be marked with the following		N
20.2.5	(CAN) In Canada, bilingual marking is the jurisdiction of Canadian provincial regulatory authorities, which may require marking to also be in French, as shown in Annex B.		N
20.3	**Durability of stamped ink marking test**		P

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Clause	Requirement Test	Result Remark	Verdict
20.3.1	Stamped ink markings shall be dried at room temperature for at least 5 d, after which they shall be given one wipe with a cloth dampened with water, and then a second wipe with a cloth dampened with mineral spirits, without becoming illegible.		P
20.4	**Luminaire mounting and orientation**		N
20.4.1	When the mounting position of a luminaire is not visually evident and it is required to be mounted or oriented in a particular position to comply with this Standard, a marking shall be provided to instruct the installer, in accordance with Table 20.1.1, Item 2.13.		N
20.4.2	A luminaire that has a mounting surface temperature of more than 90 °C, but not more than 150°C, during the normal temperature test shall be marked for installation on a noncombustible surface only, in accordance with Table 20.1.1, Item 2.6		N
20.5	**Wiring instructions**		P
20.5.1	Wiring instructions that specify the proper method of connecting the grounding means and maintaining polarity shall be included with the luminaire in a manner that will require the installer to handle the instructions during installation, or the luminaire carton shall be marked to require installation by a person familiar with the construction and operation of the product and the hazards involved, in accordance with Table 20.1.1, Item 1.31		P
20.6	**(MEX) Marking requirements in Mexico**		N
20.6.1	(MEX) General		N
20.6.1.1	(MEX) In Mexico, markings and labels on luminaires, instruction sheets, and cartons shall meet the requirements of Clauses 20.6.2 (MEX), 20.6.3 (MEX), and 20.6.4 (MEX), as applicable		N
20.6.1.2	(MEX) In Mexico, markings and labels on luminaires, instruction sheets, and cartons shall meet the following requirements		N
20.6.2	(MEX) Luminaires		N
20.6.2.1	(MEX) In Mexico, luminaires shall be marked with the following:		N
	the name or trademark, model, or manner in which the manufacturer or importer identifies the product		N

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Clause	Requirement Test	Result Remark	Verdict
	the maximum wattage in watts and maximum current in amperes;		N
	the nominal frequency (Hz), when the frequency is different from 60 Hz		N
	the type and lamp wattage in watts		N
20.6.3	(MEX) Instruction sheets		N
20.6.3.1	(MEX) In Mexico, instruction sheets shall include the following		N
	a sentence that invites the customer to read the instruction sheet		N
	the national manufacturer's or importer's name, address, telephone number, and telefax number		N
20.6.4	(MEX) Cartons		N
20.6.4.1	(MEX) In Mexico, cartons shall include the following markings		N
	a graphic representation or product name, except when it is obvious		N
	the national manufacturer's or importer's name, address, telephone number, and telefax number;		N

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Clause	Requirement Test	Result Remark	Verdict

	TABLE: List of critical components				P
Object/part no.	Manufacturer/ trademark	Type/model	Value/rating	Standard	Mark(s) of conformity [1)]
Enclosure	SABIC JAPAN LLC	945(GG)	V-0 or Better, 120 ºC min. 1.5mm	UL 94	UL
PCB	Interchangeable	Interchangeable	94 V-0, 130℃	UL796	UL
LED	Interchangeable	Interchangeable	12V	--	UL
[1)] An asterisk indicates a mark which assures the agreed level of surveillance					
Supplementary information:					

	TABLE: Temperature measurements		P
	Type reference.....	FAN LIGHT	—
	Lamp used.....	LED	—
	Lamp control gear used.....	--	—
	Mounting position of luminaire.....	As in normal use	—
	Supply wattage (W).....	44.3	—
	Supply current (A).....	2.5	—
	Calculated power factor.....	--	—
	Table: measured temperatures corrected for ta = 25 °C:		P
	- abnormal operating mode.....	Short-circuit output of LED Driver	—
	- test 1: rated voltage.....	--	—
	- test 2: 1,06 times rated voltage or 1,05 times rated wattage.....	127.2V	—
	- test 3: Load on wiring to socket-outlet, 1,06 times voltage or 1,05 times wattage....	--	—
	- test 4: 1,1 times rated voltage or 1,05 times rated wattage.....	132V	—
	Through wiring or looping-in wiring loaded by a current of A during the test	--	—

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Clause	Requirement Test	Result Remark	Verdict

Temperature measurements, (°C)							
Part	Ambient	normal				abnormal	
		test 1	test 2	test 3	limit	test 4	limit
Terminal	23.5	--	34.9	--	85	--	--
Enclosure	23.5	--	37.2	--	60	--	--
PCB	23.5	--	56.5	--	130	--	--
Mounting surface	23.5	--	29.2	--	90	30.8	130
Supplementary information:N/A							

	Table: Dielectric Voltage Withstand Test			P
Measured between:		Measured time	voltage	result
Enclosure to LED body		1min	500Vdc	No breakon

	Table: touch current measurement			P
Measured between:		Measured (mA)	Limit (mA)	Comments/conditions
Enclosure		0.05	0.5	Normal working

	TABLE: Abnormal condition tests						P
	Ambient temperature (°C) .....:		See below				—
	Power source for EUT: Manufacturer, model/type, output rating ..... :		--				—
Component No.	Fault	Supply voltage (V)	Test time	Fuse #	Fuse current (A)	Observation	
C1	S-C	12	1s	--	--	External Fuse opened immediately, no hazards.	
C2	S-C	12	1s	--	--	External Fuse opened immediately, no hazards.	

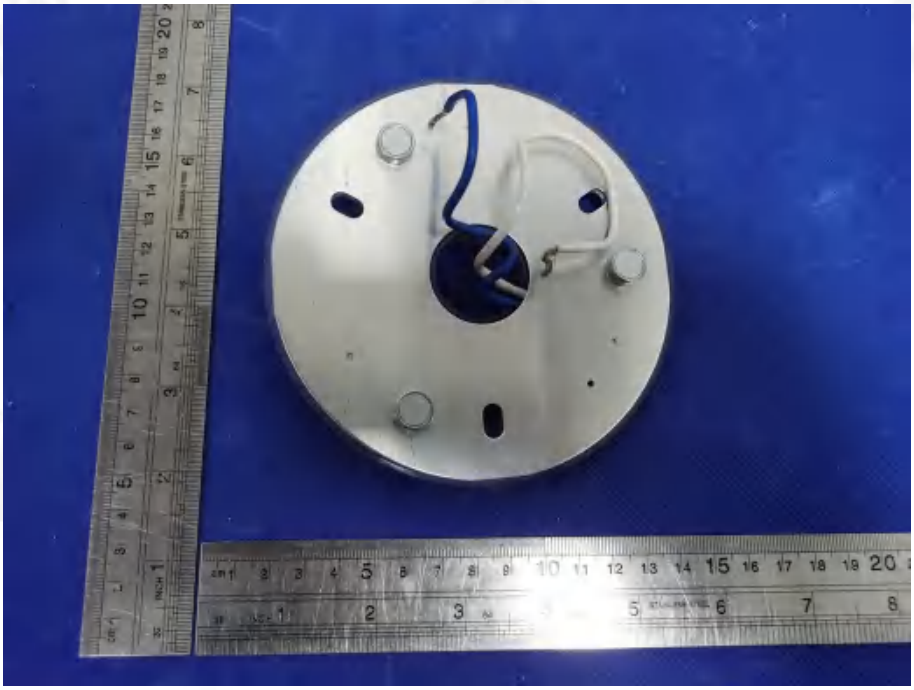
ANNEX I:

Photo-documentation

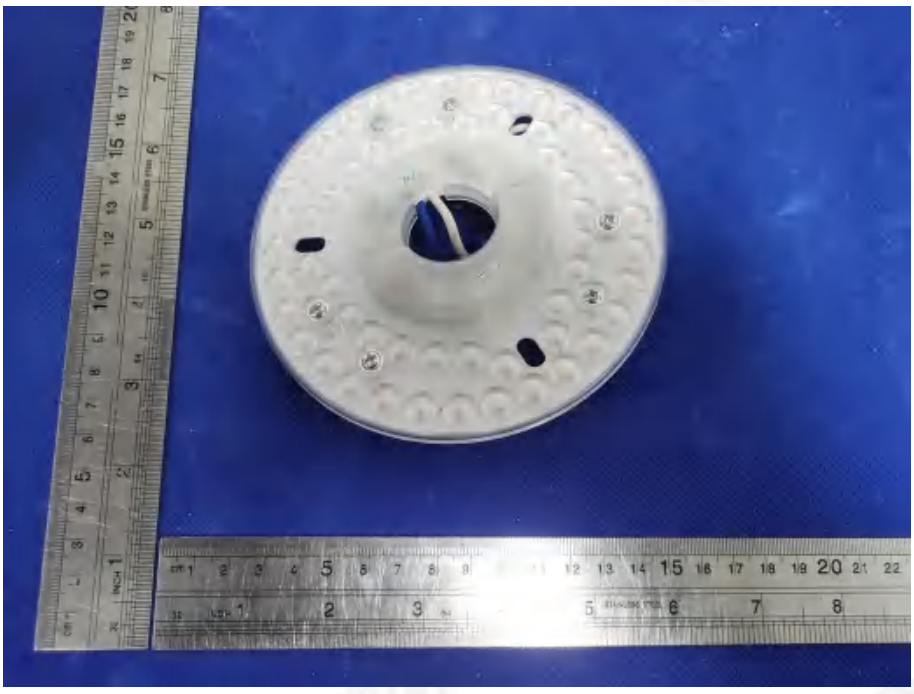
EUT photo 1

EUT photo 2

EUT Photo 3



EUT Photo 4



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