DSA IR 16-9

PENDANT LUMINAIRES: 2019 CBC

Disciplines: Structural

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PURPOSE

This Interpretation of Regulations (IR) clarifies acceptable methods for the support of pendant luminaires.

SCOPE

This IR is applicable to luminaires that are suspended from structural framing by cables, wires, solid rods, hollow tubes, or other similar suspension system. This includes single luminaire suspensions, or linear luminaire suspended from multiple support points.

BACKGROUND

As adopted by the California Building Code (CBC), American Society of Civil Engineers Standard 7: Minimum Design Loads and Associated Criteria for Buildings and Other Structures (ASCE 7), Chapter 13 defines seismic design requirements for pendant luminaires, which are therein referred to as light fixtures. Luminaires free to swing are addressed in the Exception of ASCE 7 Section 13.6.1. CBC Sections 1617A.1.18 through 1617A.1.21 contain amendments to ASCE 7 that may affect pendant luminaires, depending on the application.

1. FREE TO SWING LUMINAIRES

1.1 Pendant luminaires that are free to swing laterally shall be detailed and installed so that they can swing at least 45 degrees from the vertical in any direction without contacting an obstruction. When the free movement requirement is not met, luminaires shall be restrained per Section 2 below. In the determination of the following prescriptive dimensional requirements, the length of the pendant shall be measured from the bottom of the luminaire.

1.1.1 Adjacent luminaires shall be separated by a clear distance equal to at least 1.5 times the length of the pendant.

1.1.2 Luminaires shall be separated from suspended, unbraced building system components by a clear distance equal to at least 1.5 times the length of the pendant.

1.1.3 Luminaires shall be separated from suspended, braced building system components by a clear distance equal to at least 0.75 times the length of the pendant.

1.1.4 When it can be demonstrated by rational analysis that pendant luminaires (or adjacent components) will swing less than 45 degrees in the maximum credible earthquake, luminaire location and spacing may be based on such analysis in lieu of the limits prescribed above. Such alternate spacing dimensions shall be explicitly shown on the construction drawings.

1.2 Luminaire suspension system (including connections and support structure) shall be designed to support a load of at least 2 times the weight of the luminaire acting in line with the pendant and applied at the luminaire location. The following loading positions shall be considered:

1.2.1 Pendant in the vertical position.

1.2.2 Pendant rotated 45 degrees relative to vertical in the most critical plan direction.

1.2.3 Pendant rotated to any position between the positions described Sections 1.2.1 and 1.2.2 above that results in a more critical demand on the pendant, its connections, and/or support structure.

1.3 Rigid Pendants: When a pendant luminaire is supported by a rigid (rod-type) pendant, the pendant shall be attached to the structure above with a device that allows free rotation in any direction (e.g., ball and socket joint, hook and eye, etc.).

1.3.1 Devices that allow rotation around only one axis (e.g., hinge-type devices) are not acceptable.

1.3.2 Luminaires supported by hollow rods or other rigid pendant types shall be provided with a safety cable attached directly to the luminaire and directly to the supporting structure above. The safety cable (including connections and support structure) shall be designed to support a load of at least 2 times the weight of the luminaire in accordance with Section 1.2 above.

1.3.3 When a linear luminaire is supported by more than one rigid pendant, each pendant shall be attached to both the structure above and the luminaire with devices that allow free rotation in any direction. A separate safety cable shall be provided at each rigid pendant location in accordance with Section 1.3.2 above. Alternately, the luminaire may be restrained in accordance with Section 2 below.

1.4 When a luminaire is composed of multiple interconnected components, the connection of such components shall be sufficient to transfer a horizontal force equal to the weight of the luminaire on each side of the connection.

2. RESTRAINED LUMINAIRES

2.1 When luminaires are restrained from lateral movement all restraints, connections, and supports shall be designed to resist all applicable code prescribed forces.

2.2 Where restraint is provided by diagonal cable or wire braces that fasten to competent structure above, the suspension shall be stiffened against compression buckling due to the vertical component of the brace force and/or vertical seismic acceleration.

Exception: When it can be demonstrated by rational analysis that no upward vertical forces will occur given the configuration of the braces, the magnitude of the forces, and weight of the luminaire stiffening is not required.

2.3 Where linear luminaires with multiple pendants are restrained, lateral restraint shall be provided in both the transverse and longitudinal axes of the luminaire. In the transverse direction, restraint shall be provided at each pendant. In the longitudinal direction, lateral restraint may be provided at each end of the luminaire, provided the luminaire components are interconnected with adequate capacity.

3. LUMINAIRES WITH PENDANTS PENETRATING SUSPENDED CEILINGS

3.1 Where pendants penetrate suspended ceilings, they shall be coordinated with *IR 25-2: Metal Suspensions Systems for Lay-In Ceilings* or *IR 25-3: Gypsum Board Ceiling Suspension Conventional Construction* as applicable.

3.2 Pendant luminaires shall be supported directly from the structure above with hanger wires or cables passing through each pendant hanger and capable of supporting 2 times the weight of the luminaire. In accordance with American Society for Testing and Materials (ASTM) E580 Section 5.3.7 wire pendants used to support luminaires shall be 9 gauge or larger.

3.3 If a pendant luminaire is directly and independently braced below the ceiling (e.g., aircraft cables to walls) in accordance with Section 2 above, then a brace assembly is not required above the ceiling.

3.4 If a pendant luminaire is free to swing below the ceiling in accordance with Section 1 above, then a bracing assembly is required to restrain the point where each pendant hanger penetrates the ceiling.

3.4.1 The bracing assembly required for the pendant luminaire may be the same type as used in the ceiling construction but is in addition to those assemblies prescribed by IR 25-2 or IR 25-3, as applicable.

3.4.2 Special details are required to attach the pendant hanger to the bracing assembly and transmit the horizontal and vertical forces. These details shall be included on the construction drawings.

3.4.3 Where the weight of the luminaire is less than 20 pounds per pendant hanger the compression strut/post may be omitted.

3.5 Rigid conduit shall not be used for attachment of the luminaire.

4. OTHER REQUIREMENTS

4.1 Luminaires qualified by shake table tests may be exempt from the requirements above pending DSA acceptance of the qualification testing and specification of support by devices identical to those used in the tests

4.2 For luminaires weighing more than 20 pounds or 5 pounds per linear foot, all pendant connections, including those to the luminaire housing, shall be fully detailed on the construction drawings. The project inspector shall verify the installation in the field.

REFERENCES:

2019 California Code of Regulations (CCR)
Part 2: California Building Code (CBC) Sections 1617A.1 18 through 1617A.1.21