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5. Nonresidential Indoor Lighting

[…]

5.9 Additions and Alterations

5.9.1 ~~Summary~~

5.9.2 Overview

New additions, similar to newly constructed buildings, must meet ~~the~~ all mandatory measures for both the prescriptive and performance method of compliance. Prescriptive requirements, including the lighting power densities, must be met if the prescriptive method of compliance is used. If the performance approach is used and the new addition includes envelope or mechanical systems in the performance analysis, the lighting power densities may be traded-off against other ~~prescriptive building features~~system energy budgets.

Any space with a lighting system installed for the first time must meet the same lighting requirements as a newly constructed building~~s~~.

~~Lighting system~~ Entire Luminaire alterations include removing and reinstalling more than 10 percent of the existing luminaires, replacing or removing and adding luminaires, and redesign of the lighting system that includes adding, removing, or replacing walls or ceilings.~~modifications to lighting systems such as luminaire replacement, luminaire removal or relocation, and other similar modifications not considered to be modifications-in-place~~

~~Wiring alterations such as replacing or installing new wiring that connects the luminaires to switches, relays, branch circuits, and other control devices represents a lighting alteration and therefore must meet the applicable mandatory requirements as described below.~~

Luminaire Component Modifications~~-in-Place~~ include ~~lamp~~replacing the ballasts or drivers and the associated lamps, permanently changing the light source, and ~~ballast change-outs, reflector or~~ changing the optical system ~~modifications, whole fixture retrofit kits,~~such as reflectors.

Lighting Wiring alterations include wiring alterations that add a circuit feeding luminaires; that relocate, modify, or replace wiring between a switch or panelboard and ~~similar modifications~~luminaires; or that replace lighting control panels, panelboards or branch circuit wiring.

5.9.3 Additions

§141.0(a)

The nonresidential indoor lighting of the addition shall meet either the ~~applicable~~ prescriptive ~~lighting requirements of §110.9 §130.0 through §130.5, §140.3(c), and §140.6;~~approach or the performance ~~requirements in §140.1.~~approach.

When using the ~~Performance~~prescriptive approach, the indoor lighting in the addition ~~shall~~must meet the ~~applicable~~lighting requirements of §110.9, §130.0 through §130.5, §140.3(c), and §140.6.

When using the performance approach, the indoor lighting in the addition must meet the lighting requirements of §110.0 through §130.5; and ~~shall meet~~ one of the following two options of the performance requirements of §140.1:

1. The addition alone~~ shall comply with §140.1~~; or
2. ~~Meet the performance requirements for the~~The existing building, plus the addition, plus the alteration.

5.9.4 Alterations – General Information

§141.0(b)~~2Iii~~

5.9.3.1 Scope

Alterations to existing nonresidential, high-rise residential, ~~or~~ hotel/motel~~ buildings,~~, or re-locatable public school buildings; or alterations in conjunction with a change in building occupancy to a nonresidential, high-rise residential, or hotel/motel occupancy; shall meet the following requirements:

1. Comply with the requirements for Additions, or
2. Comply with the Prescriptive lighting requirements, or
3. Comply with the Performance approach~~:~~.

An Alteration is defined by the Energy Standards as follows:

1. Any change to a building's water-heating system, space-conditioning system, lighting system, electrical power distribution system, or envelope that is not an addition; and
2. Any regulated change ~~that is regulated by Part 6~~ to an outdoor lighting system that is not an addition; and
3. Any regulated change ~~that is regulated by Part 6~~ to signs located either indoors or outdoors~~.~~; and
4. Any regulated change to a covered process that is not an addition.

An Altered Component is defined by the Energy Standards as a component that has undergone an alteration and is subject to all applicable ~~Standards~~ requirements.

5.9.3.2 Indoor Lighting Exceptions

The following indoor lighting alterations are not required to comply with the lighting requirements in ~~Title 24, Part 6~~the Energy Standards:

1. ~~Replacement in kind of parts of an existing luminaire that include only new lamps, lamp holders, or lenses, when replacement of those parts is not a Luminaire-Modification-in-Place in accordance with § 141.0 (b) 2 I (iii).~~
2. ~~Lighting Alterations directly caused by the disturbance of asbestos.~~Entire luminaire alterations or component modification of portable luminaires, luminaires affixed to moveable partitions, or lighting excluded by §140.6(a)3.
3. In an enclosed space where only two luminaires are affected by entire luminaire alterations, luminaire component modifications, or lighting wiring alterations.
4. Disturbance of asbestos directly caused by entire luminaire alterations, luminaire component modifications, or lighting wiring alterations, unless the modifications are made in conjunction with asbestos abatement.
5. Lighting wiring alterations strictly limited to addition of lighting controls.

   EXCEPTION: Lighting alterations made in conjunction with asbestos abatement shall comply with the applicable requirements in §-141.0-(b)~~ 2 I.~~2I

5.9.3.3 **Skylight Exception**~~.~~

When the daylighting control requirements of §130.1(d) are triggered by the addition of skylights to an existing building and the lighting system is not re-circuited, the daylighting control need not meet the multi-level requirements in § 130.1(d). Daylit areas must be controlled separately from non-daylit areas. An automatic control must be able to reduce lighting power by at least 65~~%~~ percent when the daylit area is fully illuminated by daylight.

~~**A. Luminaire Classification and Power**~~

~~1. Luminaire classification and luminaire power shall be determined in accordance with §130.0(c). See section 5.2.4 of this chapter for information on luminaire classification and power.~~

~~2. For all newly constructed buildings, for all additions, and for most other applications, the Standards do not recognize the modification of a luminaire from one lighting technology to another. However, there are limited exceptions to this general rule for some lighting alterations.~~

~~For only a Lighting System Alteration or a Luminaire Modification-in-Place, in accordance with §141.0(b)2I; an existing incandescent, fluorescent, or HID luminaire may be modified and classified as a luminaire having a different number of, or type of light source(s), provided all of the following conditions are met:~~

~~i. The luminaire has been previously used and is in an existing installation; and,~~

~~ii. The modified luminaire is listed with the different number or type of light source(s) under the installed conditions; and~~

~~iii. The different light source(s) is not an LED lamp, integrated or non integrated type, as defined by ANI/IES RP-16-2010; and~~

~~iv. The modified luminaire does NOT contain:~~

~~a. Unused fluorescent or HID ballast(s); or~~

~~b. Unused fluorescent or HID lamp sockets; or~~

~~c. Sockets used only for lamp support; or~~

~~d. Screw sockets of any kind or for any purpose; and~~

~~v. The wattage of the modified luminaire shall be published in the manufacturer's catalog based on accredited testing lab reports.~~

~~**3. Non-Title 24 Lighting Alterations**~~

~~The Standards clarify in §130.0(c) that there are a number of luminaire modifications that shall not be recognized for compliance with the Standards. These non-recognized modifications typically involve the replacement of a lamp with other lamps. The standards do not recognize any screw-in product even if it reduces the consumption of the luminaire. The reason for this is that the screw-in product can always be unscrewed later on and an incandescent lamp inserted later on. Thus the current approach treats any screw in retrofit as having unreliable savings.~~

~~One popular retrofit product that does save energy is the screw-based LED retrofit kit, designed to be installed directly into a recessed downlight having an incandescent socket. However as a screw-in retrofit, it is not recognized by the standards, either for reducing luminaire wattage or as an alteration that triggers~~

~~compliance with the lighting alterations requirements or triggers compliance with the luminaire modifications in place..~~

~~Therefore, alterations that solely use one of these methods are not recognized as an alteration and as a result are not recognized as a luminaire modification in place and do not require showing Title 24 compliance. However, once compliance with the lighting alteration Standards is required, these alteration methods are not recognized for compliance. (i.e. the wattage of a recessed downlight is the rated wattage of its socket and is not reduced to the wattage of a screw-in LED retrofit kit).~~

~~The following shall not be recognized for compliance with the Standards:~~

~~a. Luminaires and luminaire housings designed to accommodate a variety of trims or modular components that allow conversion between incandescent and any other lighting technology without changing the luminaire housing shall be classified as incandescent.~~

~~b. Screw-based adaptors shall not be used to convert an incandescent luminaire to any type of non-incandescent technology. Screw-based adaptors, including screw-base adaptors classified as permanent by the manufacturer, shall not be recognized for compliance with Part 6.~~

~~c. Replacement of lamps in a luminaire manufactured or rated for use with linear fluorescent lamps, with linear lamps of a different technology such as linear LED lamps, shall not be recognized as converting the fluorescent luminaire to a different technology for compliance with Part 6.~~

~~d. An LED lamp, integrated or non-integrated type in accordance with the definition in ANSI/IES RP-16-2010, shall not be classified as a LED lighting system for compliance with Part 6. LED modules having screw-bases including screw based pig-tails, screw-based sockets, or screw-based adaptors shall not be recognized as a LED lighting system for compliance with Part 6.~~

~~e. Luminaires manufactured or rated for use with low-voltage incandescent lamps, into which have been installed LED modules or LED lamps, shall not be recognized as a LED lighting system for compliance with Part 6.~~

5.9.3.4 Alterations – Performance Approach

When using the Performance Approach (using a software program certified to the Energy Commission) the altered envelope, space–conditioning system, lighting and water heating components, and any newly installed equipment serving the alteration, shall meet the applicable requirements of §110.0 through §110.9, §~~s §~~120.0 through §120.6, and §~~s~~ 120.~~8~~9 through §130.5.

5.9.3.5 Alterations – Prescriptive Approach

~~A. Scope – Prescriptive Lighting Alterations~~

When using the Prescriptive Approach, the altered lighting shall meet the applicable requirements of §110.0~~ through~~, §110.9, ~~§120~~and §130.0 through §~~120.6, and §120.8 through §~~130.~~5~~4.

~~Any lighting alteration that increases the installed lighting power in an enclosed space shall meet the requirements of §110.9, §130.0, §130.1, §130.4, §140.3(c), and §140.6.~~

~~Lighting Alterations and Luminaire Modifications in-Place shall not exceed the lighting power allowance in §140.6.~~

5.9.5 ~~Requirements – Prescriptive Lighting~~ ~~Entire Luminaire~~Lighting Alterations

§141.0(b)2I, §141.0(b)2J

Lighting alterations are either alterations to entire luminaires, called Entire Luminaire Alterations, or modifications of installed luminaires, called Luminaire Component Modifications.

Entire Luminaire Alterations are alterations that include or affect the entire luminaire, such as the complete replacement of old luminaires with new; completely disconnecting the luminaire from the circuit, modifying it, and reinstalling it; or moving or modifying the walls or ceilings of the space along with modifying the space's lighting system. Luminaire Component Modifications are modifications in place that include replacing the ballasts or drivers and the associated lamps in the luminaire, permanently changing the light source of the luminaire, or changing the optical system of the luminaire. The Energy Standards compliance goals for the lighting alterations are twofold: first, the installation must meet the lighting power level specified in the Energy Standards, and second, the installation must provide the lighting controls functionality specified in the Energy Standards.

The 2016 Energy Standards allow three options for meeting the installed power and associated control requirements:

1. Installed lighting power that is greater than 85 percent of Table 140.6-C
2. Installed lighting power that is equal or less than 85 percent of Table 140.6-C
3. Where total rated power of the replacement luminaires in the occupancy, compared to the total rated power of the existing luminaires in the occupancy, have 50 percent lower power in hotel, office, and retail occupancies, and 35 percent lower power in all other occupancies.

Option 3 is new for 2016 and allows the maximum installed lighting power to be determined by totaling and taking a percentage of the currently installed lighting power, rather than by measuring the square footage of the space and multiplying it by a lighting power allowance. As this is likely to result in a lower allowed lighting power than option 2, bi-level controls are not required for this option. The control requirements for each option are described in Table 5-4~~, below~~.

Table 5-4: (Modified Table 141.0-E) New Control Requirement for ~~Entire Luminaire~~Lighting Alterations

Applicable Section 130.1 Control requirements:	Lighting power is reduced by 35/50% compared to existing	Resulting lighting power, compared to the lighting power allowance specified in Section 140.6(c)2, Area Category Method	
		Lighting power is ≤ 85% of allowance	Lighting power is > 85% to 100% of allowance
Section 130.1(a)1, 2, and 3 Area Controls	Yes	Yes	Yes
Section 130.1(b) Multi-Level Lighting Controls – only for alterations to general lighting of enclosed spaces 100 square feet or larger with a connected lighting load that exceeds 0.5 watts per square foot	Not Required	Bi-level control for each enclosed space, minimum one step between 30-70 percent of lighting power regardless of luminaire type, or meet Section 130.1(b)	Yes
Section 130.1(c) Shut-Off Controls	Yes[1]	Yes	Yes
Section 130.1(d) Automatic Daylight Controls	Not Required	Not Required	Yes
Section 130.1(e) Demand Responsive Controls – only for alterations > 10,000 ft^2 in a single building, where the alteration also changes the area of the space, or changes the occupancy type of the space, or increases the lighting power	Not Required	Not Required	Yes

[1] As bi-level controls are not required for this option, partial-off controls are not required to be installed in place of "full off" automatic shutoff controls for library book stack aisles, corridors and stairwells (see Sections 141.0(b)2Iii and Jii).

The following lighting alterations are not required to comply with §141.0(b)2I, Entire Luminaire Alterations, or §141.0(b)2J, Luminaire Component Modifications:

1. Alterations in an enclosed space where only two luminaires are replaced or reinstalled.
2. Alterations that would directly cause the disturbance of asbestos, unless the alterations are made in conjunction with asbestos abatement.
3. Alterations of portable luminaires, luminaires affixed to moveable partitions, or lighting excluded by §140.6(a)3.

The acceptance testing requirement of §130.4 is not required for alterations where lighting controls are added to control 20 or fewer luminaires.

~~1. Lighting System Alterations include alterations where an existing lighting system is modified, luminaires are replaced, or luminaires are disconnected from the circuit, removed and reinstalled, whether in the same location or installed elsewhere.~~

~~a. Luminaire Modifications-in-Place are separately addressed in item C, below.~~

~~2. Lighting system alterations do not include:~~

~~a. Portable luminaires~~

~~b. lighting, or §141.0(b)2J, Luminaire Component Modificationsluminaires affixed to moveable partitionslighting excluded in accordance to §140.6(a)3.~~

~~1. (See section 5.4.6 of this chapter)~~

~~3. When 10% of the luminaires in an enclosed space are altered, that space shall comply with the requirements in Table 5-11. Affected luminaires include any luminaire that is changed, replaced, removed, relocated; or, connected to, altered or revised wiring.~~

~~Following is a summary of the requirements in Table 5-11:~~

~~i. For alterations that do not change the area of the enclosed space or the space type:~~

~~a. When the sum total < 10% of existing luminaires in the enclosed space are altered:~~

~~• The existing lighting power is permitted, and~~

~~• The existing lighting control provisions are permitted~~

~~b. When the sum total ≥ 10% of existing luminaires in the enclosed space are altered, and~~

~~• The resulting installed lighting power density after the alteration is ≤ 85% of the allowed lighting power per §140.6 using the Area Category Method. The lighting power density shall not be greater than allowed according to §140.6.~~

~~• Lighting control requirements are as follows:~~

~~o §130.1(a) Manual Area Controls~~

~~o §130.1(b) Multi-Level Lighting Controls, or have a two level lighting control with at least one control step between 30 and 70% of design lighting power in a manner providing reasonably uniform illuminations~~

~~o §130.1(c) Automatic Shut-Off Controls~~

~~c. When the sum total ≥ 10% of existing luminaires in the enclosed space are altered, and~~

~~• The resulting installed lighting power density after the alteration is > 85% of the allowed lighting power per §140.6 using the Area Category Method~~

~~• Lighting control requirements are as follows:~~

~~o §130.1(a) Manual Area Controls~~

~~o §130.1(b) Multi-Level Lighting Controls~~

~~o §130.1(c) Automatic Shut-Off Controls~~

~~§130.1(d) Daylight Controls. Daylight controls are required only for luminaires that are altered.~~

~~ii. For lighting alterations that take place in spaces where there has been a change the area of the enclosed space, or change the space type, or increase the lighting power in the enclosed space:~~

~~a. When any number of existing luminaires in the enclosed space are altered, the resulting installed lighting power after the alteration shall not exceed the allowance in §140.6 using the Area Category Method. Note that these requirements do not apply if none of the existing luminaires are altered and no new luminaires added.~~

~~b. When there is a lighting alteration in the changed space or its changed space type, lighting control requirements for this space are as follows:~~

~~o §130.1(a) Manual Area Controls applies to entire space with the lighting alteration~~

~~o §130.1(b) Multi-Level Lighting Controls – this applies only to the luminaires that are altered, replaced or added.~~

~~o §130.1(d) Daylight Controls. Daylight controls are required only for luminaires that are altered.~~

~~When controls are newly installed as part of a lighting alteration, these controls must comply with the appropriate acceptance tests as required by §130.4. (§141(b)2)~~

~~TABLE 5- 1: (Table 141.0-E in the Standards) Requirements for Luminaire Alterations~~

~~Quantity of existing affected luminaires per Enclosed Space~~ [1]	~~Resulting Lighting Power for Each Enclosed Space~~	~~Applicable Mandatory Control Provisions for Each Enclosed Space~~	~~Multi-level Lighting Control Requirements for Each Altered Luminaire~~
~~Alterations that do not change the area of the enclosed space or the space type (lighting alterations where enclosed space area or type has not changed and lighting wattage not increased)~~			
~~Sum total < 10% of existing luminaires~~	~~Existing lighting power is permitted~~	~~Existing provisions are permitted~~	~~Existing controls are permitted~~
~~Sum total ≥ 10% of existing luminaires~~	~~≤ 85% of allowed lighting power per § 140.6 Area Category Method~~	~~§130.1(a), (c)~~	~~Two level lighting control~~ [2] ~~or §130.1(b)~~
	~~> 85% of allowed lighting power per § 140.6 Area Category Method~~	~~§130.1(a), (c), (d)~~ [3]	~~§130.1(b)~~
~~Alterations that change the area of the enclosed space or the space type or increase the lighting power in the enclosed space (lighting alterations accompanying changes to the enclosed space area or space type or accompanying an increase in lighting power)~~			
~~Any number~~	~~Comply with § 140.6~~	~~§130.0(d)~~ [3] ~~§130.1(a), (c), (d)~~ [3]~~, (e)~~	~~§130.1(b)~~
~~1. Affected luminaires include any luminaire that is changed, replaced, removed, relocated; or, connected to, altered or revised wiring, except as permitted by EXCEPTIONS 1 and 2 to § 141.0(b)2Iii:~~ ~~2. Two level lighting control shall have at least one control step between 30 and 70% of design lighting power in a manner providing reasonably uniform illuminations~~ ~~3. Daylight controls in accordance with § 130.0(d) are required only for luminaires that are altered.~~			

~~o §130.1(c) Automatic Shut-Off Controls - applies to space with the lighting alteration~~

5.9.6 ~~Luminaire Modifications-in-Place~~

~~*§141.0(b)2Iiii*~~

~~A. Scope – Luminaire Modifications-in-Place~~

~~1. A lighting alteration is classified as a Luminaire Modification-in-Place when luminaires are modified by one or more of the following methods:~~

~~a. Replacing lamps and ballasts with like type or quantity in a manner that preserves the original luminaire listing.~~

~~b. Changing the number or type of light source in a luminaire including: socket renewal, removal or relocation of sockets or lampholders, and/or related wiring internal to the luminaire including the addition of safety disconnecting devices.~~

~~NOTE: As described in the Luminaire Classification and Power Section above (§141.0 (b) 2 I (ii)). A screw-in lighting source replacement is not recognized for reducing the rated wattage of a luminaire nor is it considered an alteration or modification-in-place.~~

c. ~~Changing the optical system of a luminaire in part or in whole.~~

~~NOTE: A screw-based LED retrofit kit, designed to be installed directly into a recessed downlight having an incandescent socket may change the distribution of the luminaire, but this is not considered a luminaire modification in place. As described in Luminaire Classification and Power Section above (§141.0 (b) 2 I (ii)) a screw-in light source replacement is not recognized for reducing the rating wattage of a luminaire nor is it considered an alteration or modification in place.~~

d. ~~Replacement of whole luminaires one for one in which the only electrical modification involves disconnecting the existing luminaire and reconnecting the replacement luminaire.~~

2. ~~Lighting alterations not qualifying as a Luminaire Modification-In-Place shall comply with the applicable lighting alteration requirements in §141.0(b)2I(ii). To qualify as a Luminaire Modification-in-Place, the alteration shall NOT be:~~

a. ~~Part of or the result of any general remodeling or renovation of the enclosed space in which they are located.~~

b. ~~The result of, or involve any changes to the panelboard or branch circuit wiring, including line voltage switches, relays, contactors, dimmers and other control devices, providing power to the lighting system.~~

- ~~EXCEPTION. Circuit modifications strictly limited to the addition of occupancy or vacancy sensors and class two lighting controls are permitted for Luminaire Modifications-in-Place~~

3. ~~For compliance with the Luminaire-Modification-in-Place requirements, a building space is defined as any of the following:~~

a. ~~A complete single story building~~

b. ~~A complete floor of a multi floor building~~

c. ~~The entire space in a building of a single tenant under a single lease~~

d. ~~All of the common, not leasable space in single building~~

4. ~~There are two thresholds that, once met, require compliance with the Luminaire-Modifications-in-Place requirements:~~

a. ~~40 Luminaire-Modifications-in-Place per year in a building space, as defined above, plus~~

b. ~~When the sum total ≥ 10% of existing luminaires in the enclosed space are Luminaire-Modifications-in-Place.~~

~~These two thresholds are used to classify the difference between minor repairs and regulated alterations.~~

~~Once the 40 Luminaire-Modifications-in-Place per year threshold has been met, any room in which ≥ 10% of existing luminaires in the enclosed space are Luminaire-Modifications-in-Place, the enclosed space shall meet the requirements in Table 141.0-F of the Standards (see table 5-13). As long as the wattage in the space is not being increased, any rooms in which <10% of existing luminaires in the enclosed space are Luminaire-Modifications-in-Place are not required to comply. (See Table 5-12).~~

~~TABLE 5- 2 Thresholds for Luminaire-Modifications-in-Place requirements~~

~~**Number of Luminaire-Modifications-in-Place**~~		~~**Is compliance required for that enclosed space?**~~
~~**Per annum per building space**~~	~~**In an enclosed space**~~	
~~< 40 in number~~	~~< 10%~~	~~No~~
~~< 40 in number~~	~~≥ 10%~~	~~No~~
~~≥ 40 in number~~	~~< 10%~~	~~No~~
~~≥ 40 in number~~	~~≥ 10%~~	~~Yes~~

5. ~~Lighting control requirements only apply to enclosed spaces for which there are Luminaire Modifications-in-Place requiring compliance with the Standards~~
6. ~~Following is a summary of the requirements in Table 5-13:~~
   a. ~~When the sum total of < 40 Luminaires per building space are modified in place per annum (per year):~~
      - ~~The existing lighting power is permitted, and~~
      - ~~The existing lighting control provisions are permitted~~
   b. ~~When the sum total of ≥ 40 Luminaires per building space are modified in place per annum, and the installed lighting power density after the alteration is ≤ 85% of the allowed lighting power per § 140.6 using the Area Category Method, the lighting controls requirements are as follows:~~
      - ~~§130.1(a) Manual Area Controls for the entire space. This applies to all luminaires in the space, not only the modified luminaires. Therefore, area controls may need to be added to existing circuits.~~
      - ~~§130.1(b) Multi-Level Lighting Controls for general lighting, or have a two level lighting control with at least one control step between 30 and 70% of design lighting power in a manner providing reasonably uniform illumination. This only applies to the modified general lighting luminaires, so existing luminaires do not need to be modified or re-circuited to meet this requirement.~~
      - ~~§130.1(c) Automatic Shut-Off Controls. This applies to all luminaires in the space, not only the modified luminaires. Therefore, shut-off controls may need to be added to existing circuits.~~
   c. ~~When the sum total of ≥ 40 Luminaires per building space are modified in place per annum, and the installed lighting power density after the alteration is > 85% of the allowed lighting power per § 140.6 using the Area Category Method, the lighting requirements are as follows:~~
      - ~~§130.1(a) Manual Area Controls for the entire space, as above.~~
      - ~~§130.1(b) Multi-Level Lighting Controls for all modified luminaires, as above.~~
      - ~~§130.1(c) Automatic Shut-Off Controls for the entire space, as above.~~
      - ~~§130.1(d) Daylight Controls. Daylight controls are required only for luminaires that are modified-in-place.~~
   a. ~~When controls are newly installed as part of a luminaire modification in place, these controls must comply with the appropriate acceptance tests as required by §130.4. (§141(b)2).~~

~~Note: Lighting power densities shall not be greater than allowed according to §140.6.~~

~~TABLE 5-3 (Table 141.0-F in the Standards) Requirements for Luminaire Modifications-in-Place~~

5.9.7 ~~Lighting Wiring Alterations~~

~~*§141.0(b)2Iiv*~~

~~A. Lighting Wiring Alterations~~

~~Lighting Wiring Alterations shall meet the applicable requirements in the following sections of the Standards:~~

~~a. §110.9 Mandatory requirements for lighting control devices and systems, ballasts, and luminaires.~~

~~b. §130.1, Indoor lighting controls (Area, Multi-Level, Automatic Shut-OFF, Daylighting, and Demand Responsive).~~

~~c. §130.4. Acceptance Testing and Certificates of Installation.~~

~~1. Lighting Wiring Alterations include the following:~~

~~a. Adding a circuit feeding luminaires.~~

~~b. Modifying or relocating wiring to provide power to new or relocated luminaires.~~

~~c. Replacing wiring between a switch or panelboard and luminaire(s).~~

~~d. Replacing or installing a new panelboard feeding lighting systems.~~

~~EXCEPTION Lighting Wiring Alterations allowed for Luminaire Modifications-in-Place in accordance with §141.0(b)2Iiii~~

~~**Example 5-**30 Threshold for lighting alterations requirements~~

~~**Question**~~

~~There are 60 lighting fixtures in an existing office space. We are replacing and relocating five fixtures without increasing the connected lighting load or rewiring any of the fixtures. Which Standards requirements must we comply with?~~

~~**Answer**~~

~~Because less than 10% of the existing luminaires in the enclosed space are affected, and the installed lighting power is not being increased, the space may maintain its existing installed lighting power and controls provisions.~~

~~**Example 5-**31 Rewiring of replacement luminaires~~

~~**Question**~~

~~If in the example above, the five replaced luminaries are also being rewired, which Standards requirement must be complied with?~~

~~**Answer**~~

~~If the modification involves a wiring alteration, the applicable mandatory control requirements in §110.9, §130.1 and §130.4 must be met.~~

~~**Example 5-32** Standards for lighting alterations~~

~~**Question**~~

~~If in the example above, 20 fixtures were being replaced, then which Standards requirements must be complied with?~~

~~**Answer**~~

~~Because more than 10 percent of the fixtures are being replaced, the total lighting power in the space must not exceed the lighting power allowance for open offices, of 0.75 W/ square foot, as described in §140.6. In addition, the space must also meet the mandatory control requirements, depending on the installed lighting power. If the installed power is 85% or less of the lighting power allowance of 0.75W/ square foot, the space must meet the mandatory requirements in §130.1(a) and §130.1(c), and must have either two level lighting control, or must meet the requirements in §130.1(b). If the installed power is more than 85% of allowed 0.75W/ square foot, the space must meet the mandatory requirements in §130.1(a), §130.1(b), and §130.1(c), and all altered luminaires must meet the applicable daylighting requirements of §130.1(d).~~

~~**Example 5-**33Threshold for modifications-in-place~~

~~**Question**~~

~~If in the example above, 20 fixtures were being replaced with fixture kits that only required disconnecting the existing luminaires, and reconnecting the new luminaires, which Standards requirements apply?~~

~~**Answer**~~

~~Because this alteration is considered a modification-in-place, and less than 40 fixtures are being modified, the space may maintain its existing installed lighting power and controls provisions.~~

~~**Example 5-**34 Standards for luminaire modifications-in-place~~

~~**Question**~~

~~If in the example above, 50 fixtures were being replaced with fixture kits, which Standards requirements must be complied with?~~

~~**Answer**~~

~~Because more than 40 fixtures are being modified, the altered lighting must not exceed the lighting power allowance for open offices, of 0.75 W/ square foot, as described in §140.6. In addition, the space must also meet the mandatory control requirements, depending on the installed lighting power. If the installed power is 85% or less of the lighting power allowance of 0.75W/ square foot, the space must meet the mandatory requirements in §130.1(a) and §130.1(c), and must have either two level lighting control, or must meet the requirements in §130.1(b). If the installed power is more than 85% of allowed 0.75W/ square foot, the space must meet the mandatory requirements in §130.1(a), §130.1(b), and §130.1(c), and all altered luminaires must meet the applicable daylighting requirements of §130.0(d) and §130.1(d35 Lighting power allowances for additions~~**Example 5-31 Entire Luminaire Alteration Options**

Question

All light fixtures are being replaced in one enclosed room of a commercial tenant space. The entire tenant space ~~currently~~ has a total of 25 light fixtures. The altered room will receive a total of eight new light fixtures. ~~How much lighting power is allowed for the new lighting~~Which Energy Standards requirements must we comply with?

Answer

~~Because all lighting within the enclosed area (room) are being replaced, then more than 10 percent of the lighting in the applicable space (the enclosed room) is new. Therefore, the lighting power in this space must not exceed the allowed lighting power for the space as listed in §140.6. The space must also meet the control requirements in Table 5-11, based on the total installed lighting power in the space.~~

Since all lighting fixtures within the enclosed area (room) are being replaced and there are no alterations to walls or ceilings, it can comply with the requirement of either subparagraph i or subgraph ii of §141.0(b)2I.

Example 5-32 Threshold for entire luminaire alterations requirements (changeout example)

Question

There are 100 lighting fixtures in an existing office space. Ceilings are being replaced with new, together with replacing all the existing light fixtures with new. There is no change in the fixture layout. Which Standards requirements must we comply with?

Answer

Since the scope of work includes replacing all existing light fixtures, the project must comply with §141.0(b)2I. However, since the scope also includes ceiling replacement, it must comply specifically with subsection "i" of this section: the luminaires must meet the lighting power allowance in §140.6 and the altered luminaires must meet the applicable requirements in Table 141.0-E.

Example 5-33 Threshold for entire luminaire alterations requirements (remodel example)

Question

There are 100 lighting fixtures in an existing office space. Walls are being altered, together with a replacement of the existing light fixtures with 80 new fixtures. Which Energy Standards requirements must we comply with?

Answer

Since the scope of work includes a redesign of the lighting system along with wall alterations, it must comply with §141.0(b)2Ii. It must meet requirements include the lighting power allowance in §140.6 and applicable control requirements in Table 141.0-E.

Example 5-34 Rewiring of replacement luminaires (example compliance with lighting wiring alterations)

Question

If the lighting system is being rewired as part of a lighting alteration project, which Energy Standards requirement must be complied with?

Answer

When the alteration involves a wiring alteration, it must comply with the control requirements as specified in §141.0(b)2K. This is in addition to any applicable lighting alteration requirements. Note: ~~, however, that~~ many of the requirements for wiring alterations and lighting alterations are the same. Acceptance test requirement is triggered if controls are added to control more than 20 luminaires.

Example 5-35 Multi-floor retail project (example compliance with ~~entire luminaire~~lighting alterations)

Question

The lighting is being retrofitted in a retail building with two floors. The first floor has ~~HID~~ fixtures which are being replaced with new LED fixtures. Also on this floor are two offices with one fixture each and a conference room with two fixtures. The aggregate wattage of the new first floor fixtures is 55 percent less than the original fixture wattage. The second floor has linear fluorescent ceiling fixtures which are being retrofitted with LED conversion kits. How do the Energy Standards impact the overall project?

Answer

The retrofits on the first floor are entire luminaire alterations. The building occupancy is retail so the power reduction threshold is 50 percent; a lighting power allowance could be calculated based on square footage, but because ~~each~~the new fixtures ~~is known to~~ use less than half the power of ~~each~~the original fixtures ~~it's replacing~~, it makes sense to use the percent reduction approach. The new fixtures must comply with the controls requirements in §141.0(b)2Iii. Those applicable provisions are §130.1(c)1A through C, §130.1(c)2, §130.1(c)3, §130.1(c)4, and §130.1(c)5. However, since there are offices and conference rooms with two or fewer fixtures, per Exception 2 to §141.0(b)2I those rooms are not required to comply with control requirements. The retrofits on the second floor are luminaire component modifications~~, and in this case we don't know what the percent reduction for each fixture is~~. Luminaire component modifications have the same option to either determine the lighting power allowance based on the area type and square footage, or based on a percent reduction in the lighting power. In short, even though the two floors are using different retrofit approaches, the same options and the same requirements ultimately apply.

Example 5-36 Example Warehouse Lighting Alteration (example compliance with the 50/35 percent lighting power reduction option)

Question

The existing metal halide luminaires in a warehouse facility are proposed to be replaced by LED luminaires (shown below). There are 100 existing metal halide luminares that use ~~458~~250 watts each, all of which will be replaced. The replacement LED luminaires use ~~104~~150 watts each; it seems easy to see that this is more than a 35 percent reduction. How is compliance determined under the new power reduction option, and what controls are required?

A lamp taken from an existing luminaire
Source: EcologyAction

Label of an existing luminaire
Source: EcologyAction

Picture of one of the new LED luminaire
Source: EcologyAction

Answer

As a warehouse is not an "office, hotel, or retail" space, the power reduction option requires a 35 percent reduction in installed lighting power. Thus, ~~you would~~ enter the number and wattage of the existing luminaires into NRCC-LTI-06, and use the form to calculate both the existing installed lighting power (100 x ~~458~~250 = ~~45,8~~25,000) and the maximum allowance based on a 35 percent reduction (~~45,800~~25,000 x 0.65 = ~~29,770~~16,250). ~~You would~~ Enter the number and wattage of the ~~your~~ new luminaires into NRCC-LTI-01, just like any other project; if this is a one-for-one replacement, then the total lighting power of the new luminaires would be under the allowance (100 x ~~104~~150 = ~~10,400~~15,000).

As the lighting power reduction exceeds 35 percent, only area on/off controls and automatic shutoff controls are mandatory as specified in Section 141.0(b)2Iii and summarized in Table 5-4.

5.9.8 Alterations - Luminaire Component Modifications

§141.0(b)2J

The followings are defined as luminaire component modifications in the 2016 Energy Standards:

1. Replacing the ballasts or drivers and the associated lamps in the luminaire;
2. Permanently changing the light source of the luminaire; or
3. Permanently changing the optical system of a luminaire.

Lamp replacement alone and ballast replacement alone is not considered a modification of the luminaire as long as the replacement lamps or ballasts are installed and powered without modifying the luminaire. In addition, the following luminaire modifications are not required to comply with §141.0(b)2J, Luminaire Component Modifications:

1. Modifications that would ~~directly~~ cause the disturbance of asbestos, unless the modifications are made in conjunction with asbestos abatement; and
2. Modification of portable luminaires, luminaires affixed to moveable partitions, or lighting excluded by §140.6(a)3.

Acceptance testing requirement of §130.4 is not required for modifications where lighting controls are added to control 20 or fewer luminaires.

Example 5-37 Threshold for luminaire component modifications

Question

There are 100 lighting fixtures in an existing office space. For 20 fixtures, the internal components are ~~were~~ being replaced with new kits that only require~~d~~ disconnecting the existing luminaires, and reconnecting the new luminaires, which Energy Standards requirements apply?

Answer

Because this alteration is considered luminaire component modifications, and less than 70 fixtures are being modified, the space may maintain its existing installed lighting power and controls provisions.

Example 5-38 Standards for luminaire component modifications

Question

If in the example above, 70 fixtures are ~~were~~ being replaced with fixture kits, which Energy Standards requirements must be complied with?

Answer

Because 70 or more fixtures are being modified, the lighting system in the space with the modifications can either comply with §140.6 or comply with the 35/50 percent lower rated power compared to the original luminaires approach. It must also comply with §130.1(a)1, 2 and 3, and §130.1(c)1A through 1C, §130.1(c)2, §130.1(c)3 through §130.1(c)6A, and for parking garages §130.1(c)7B.

Example 5-39 Luminaire Component Modification Counting

Question

If a project includes 70 or more luminaire component modifications on a floor, but a portion of those modifications are ~~in a number of~~ enclosed spaces containing two or fewer luminaires, do the luminaires in the enclosed spaces count toward the total 70 or more trigger under §141.0(b)2J?

Answer

Yes, the Exception 2 to §141.0(b)2J that exempts two or fewer luminaire component modifications in an enclosed space only exempts the luminaires in those spaces from the control requirements, but does not reduce the total luminaire count on a floor. Therefore the controls would not be required in the enclosed spaces with two or fewer luminaires, but controls would be required for the rest of the floor if the total count (including the luminaires in the enclosed spaces) were more than the 70 trigger.

Example 5-40 Lamp replacements as part of a project

Question

A single-story retail store has 60 T12 linear fluorescent strip fixtures and two sections of track lighting. One of the tracks has 10 screw-in incandescent flood lights and the other track has 10 pin-based halogen PAR lamps. The linear fixtures are being retrofitted with T8 lamps and premium ballasts and in the track fixtures the screw-in and pin-based incandescent lamps are being replaced with equivalent screw-in and pin-based LED lamps. What are the Energy Standards requirements for this job?

Answer

The Energy Standards are not triggered for this project because fewer than 70 fixtures are being modified. Even though a total of 80 fixtures are included in the project, the 20 incandescent fixtures do not count toward the 70 threshold because they are simple lamp replacements that do not count as modifications (per §141.0(b)2J).

Example 5-41 Compliance documentation

Question

A warehouse project has 100 existing HID high bay fixtures which are being converted to third ~~3rd~~ generation T8 high bays. The building occupancy is warehouse so the savings threshold is 35 percent. The aggregate wattage of the new replacement fixtures is 45 percent below the original fixture wattage, so the controls requirements in 141.0(b)2Iii apply. How is the 45 percent wattage delta between the existing fixtures and the new fixtures documented for compliance purposes?

Answer

Documentation is the same as for an Entire Luminaire Alteration, as described in Example 5-36~~7~~: you will complete the NRCC-LTI-06 form to record the number and wattage of the original fixtures, and calculate both the total existing wattage and the allowed lighting power based on a 35 percent reduction. The newly modified lighting will be documented on the NRCC-LTI-01, just like any other project. As the lighting power reduction exceeds 35 percent, only area on/off controls and automatic shutoff controls are mandatory as specified in Section 141.0(b)2Iii and summarized in Table 5-4.

5.9.9 Alterations - Lighting Wiring Alterations

§141.0(b)2K

Lighting Wiring Alterations are defined in the 2016 Energy Standards as one of the following:

1. Adding a circuit feeding luminaires;
2. Replacing, modifying, or relocating wiring between a switch or panelboard and luminaires;
3. Replacing lighting control panels, panelboards, or branch circuit wiring.

Changes to wiring not listed above are not considered to be “lighting wiring alterations” as the term is used in the Energy Standards, and it is not mandatory to comply with §141.0(b)2K requirement.

Note: Alterations that include adding, removing, or replacing walls or ceilings resulting in redesign of the lighting system must meet the requirements of Table 141.0-E, as specified in §141.0(b)2I.

The following wiring alterations are not required to comply with §141.0(b)2K, Lighting Wiring Alterations:

1. Alterations strictly limited to addition of lighting controls.
2. In an enclosed space where wiring alterations involve only two of fewer luminaires.
3. Alterations that would ~~directly~~ cause the disturbance of asbestos, unless the alterations are made in conjunction with asbestos abatement.

Acceptance testing requirement of §130.4 is not required for wiring alterations where lighting controls are added to control 20 or fewer luminaires.

Example 5-~~36Skylit zone in renovations~~42 Standards for Lighting Wiring Alterations

Question

If occupancy sensing controls are added to a suite of office spaces, does this addition trigger the requirements of §141.0(b)2K (Lighting Wiring Alterations)?

Answer

No, since the alterations are limited to the addition of occupancy sensing controls, it does not trigger any of the requirements of §141.0(b)2, including Lighting Wiring Alterations.

Example 5-43 Skylights

Question

A 30,000 ft² addition has a 16,000 ft² space with an 18 ft high ceiling and a separate 14,000 ft² space with a 13 ft high ceiling. The lighting power density in this building is 1 W/ft². Do skylights have to be installed in the portion of the building with 18 ft ceiling?

Answer

Yes. §140.3(c) requires skylights in enclosed spaces that are greater than 5,000 ft² directly under a roof with a ceiling height over 15 ft. In this example the area with a ceiling ~~of~~height greater than 15 ft is 16,000 ft~~²~~,²; therefore there are mandatory skylight requirements. (Note: skylight requirements do not apply in climate zones 1 and 16~~)~~).

Example 5-~~37~~44 Skylighting requirements for alterations

Question

A pre-existing air-conditioned 30,000 ft² warehouse with a 30 ft ceiling and no skylights will have its general lighting system replaced as part of a conversion to a big box retail store. Are skylights prescriptively required?

Answer

No. The general lighting system is being replaced and is not “installed for the first time.” Thus, §141.~~9~~0(b)2F does not apply and therefore does not trigger the requirements in §140.3(c) for skylighting.