blueprint

Efficiency Division

SPRING 2000

RESIDENTIAL & NONRESIDENTIAL

QUESTIONS and ANSWERS

RESIDENTIAL

Q *I want to design and provide an energy efficient kitchen. I especially want the lighting design to provide an aesthetically pleasing appearance, sufficient light for basic kitchen tasks, and be energy efficient while also complying with the Energy Efficiency Standards. How can I achieve my goal?*

A Section 150(k) of the 1999 Energy Efficiency Standards for Residential and Nonresidential Buildings (Standards) states:

> "Luminaires for general lighting in kitchens shall have lamps with an efficacy of not less than 40 lumens per watt. General lighting must provide a sufficient light level for basic kitchen tasks and provide a uniform pattern of illumination. A luminaire(s) that is (are) the only lighting in a kitchen will be considered general lighting. General lighting shall be controlled by a switch on a readily accessible lighting control panel at an entrance to the kitchen.
>
> Additional luminaires to be used only for specific decorative effects need not meet this requirement."

...continued on page 2

WELCOME to the new blueprint!

In keeping with the optimism associated with the new century and millennium, we have developed a new format for this publication. We anticipate quarterly publication and encourage you to participate by submitting questions, information or photographs for inclusion in these pages. Our goal is to serve your needs. Please feel free to contact the Hotline or me with comments or questions regarding energy efficiency.

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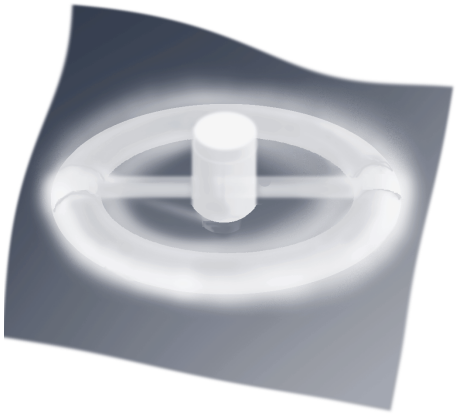


...continued from page 1

The intent of the kitchen lighting code is not to increase the number of light fixtures and/or watts used by the occupant but rather to insure the builder provides — and the occupant uses — energy efficient lighting.

General lighting — the lighting that the occupant will typically use on a regular basis — is required to be high-efficacy (normally, fluorescent lighting). "Efficacy" is defined in Section 101(b) of the Standards as, "…the ratio of light from a lamp to the electrical power consumed (including ballast losses) expressed in lumens per watt."

Section 150(k) requires that the general lighting be switched at the kitchen entrance. It also emphasizes that the high-efficacy lighting must provide sufficient light level for basic kitchen tasks and that this lighting must be uniform. The fluorescent fixtures installed may be of varying designs and shapes (i.e., recessed or surface mounted four-foot long tubes, round circline style with flat or convex plastic or glass diffusers, recessed hard-wired "can" downlights, etc.).

Energy Commission staff recommends the builder use one of the following four ways to show compliance:

1. Design and install only high-efficacy luminaires in the kitchen. This scenario meets the code requirement in the most straightforward manner.

   When kitchen lighting includes both high-efficacy sources and low-efficacy sources, the design may not meet these requirements. The second through fourth ways of showing

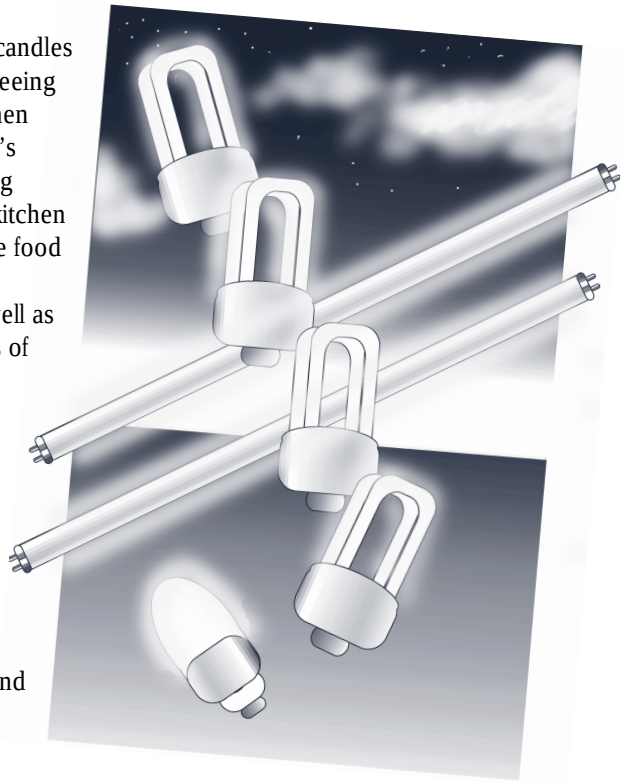
compliance apply to kitchens with both high- and low-efficacy sources.

2. Provide at least 1.2 Watts per square foot (total square feet of the accessible kitchen floor and countertop areas) of light from high-efficacy sources, and insure that, in the judgment of the building department plan checker, the lamps in those fixtures produce a substantially uniform pattern of lighting on kitchen work surfaces (Please note that this is not a code requirement but is a Commission staff recommendation).

3. Make sure that at least 50 percent of the kitchen lighting wattage is high-efficacy, and that, in the judgment of the building department plan checker, the lamps in those fixtures produce a substantially uniform pattern of lighting on kitchen work surfaces (Please note that this is not a code requirement but is an option recommended by Commission staff).

4. If you wish to be certain you have provided an "energy efficient kitchen…an aesthetically pleasing appearance…sufficient light for basic kitchen tasks…while also complying with the Energy Efficiency Standards," the Energy Commission staff recommends you use the same procedures used by professional lighting designers (staff does not intend that these procedures become a standard part of builder submittals, but rather that they are used to provide the best possible solutions for builders who wish to provide high quality lighting designs).

These procedures account for the characteristics of the room and the design and location of the specific high-efficacy luminaires that will be installed as the best method to determine if there is both sufficient and uniform light. A recognized lighting authority, the Illuminating Engineers Society (IES), provides guidelines for good lighting design in their *Lighting Handbook, Reference & Application, 8th Edition.*



IES guidelines recommend that at least 30 footcandles of light be provided for seeing tasks in kitchens. Seeing tasks include, but are not limited to, the basic kitchen tasks that are described in the Energy Commission's *Residential Manual* as preparing meals and washing dishes. These tasks typically occur on accessible kitchen countertops, the tops of ranges and in sinks, where food preparation, recipe reading, cooking, cleaning and related meal preparation activities take place, as well as at the front of kitchen cabinets so that the contents of the cabinet are discernable.

To clearly demonstrate compliance with the Standards to a building department, the builder may provide a lighting layout design that includes a point-by-point illuminance grid for the high-efficacy lighting. To do this properly, this grid must account for the room geometry, fixture placement, coefficient of utilization (CU) of the fixtures, lamp lumens, lamp lumen depreciation, and reflectivity of all of the surfaces in the kitchen.

Uniform lighting assures that the minimum amount of light is available on all the work surfaces used in meal preparation and cleanup. Although the design should achieve 30 footcandles on most counter-height, horizontal work surfaces, there may be a few work surfaces where the lighting levels fall below this value and the fronts of kitchen cabinets may also be below this value. Even in these locations, the lighting level provided by the high-efficacy source should not fall below the IES-recommended lower value for non-critical seeing tasks of 20 footcandles. Parts of counters that are not work surfaces, such as a corner underneath a cabinet, may have a lighting level below 20 footcandles and still meet the requirements of the standard, because meal preparation is unlikely to occur in those areas.

Manufacturers and lighting fixture representatives can often provide such a grid for a specified design. Electrical engineers who do lighting designs and professional lighting designers also often provide designs with a point-by-point illuminance grid.

The plans should identify the type of luminaire and maximum Underwriters Laboratory (UL)-rated lamp watts for each luminaire and should include dimensions and tolerances of each luminaire so that the installer, plan checker, and field inspector can all determine when the lighting installation matches the plan checker's judgement. When calculating the kitchen lighting wattage, the builder should be certain to use the maximum UL-rated wattage for each fixture.

Energy Commission staff hopes that this information provides homeowners/builders, designers, builders, and building department personnel a better understanding of how to provide high quality kitchen lighting.

RES 00-1-Lighting

Q A Q A Q A

When replacing an electric resistance heating unit, the Standards seems to indicate that I have to install one that is more efficient. Can't I use the same type and size?

Yes, you can replace an electric resistance heating unit with one of the same type and size. However, if the size is increased, load calculations are required. The words "or the existing fuel type" in Section 152(b)1Bii apply to replacement of an electric resistance heater.

RES 00-2-HVAC

How do I model (in the CALRES computer compliance approach) the heat distribution of a non-central space heater? Do I select the choice "R4.2 in the attic"? Do I select "Ducts in conditioned space"? Do I select "Special" or "Crawl Space" or "Basement"?

When specifying a non-central heating system, "None" should be entered as the selection for the "HVAC System Distribution Schedule" in CALRES. The type of system and efficiency should also be changed to reflect the non-central space heater being installed. R4.2 ducts in the attic should be modeled for non-central cooling systems.

RES 00-3-HVAC

How do I model (in a compliance approach) a door with a large amount of glass in it?

You must model either the square feet of the door itself, or the square feet of glass plus an area that includes a two inch frame extension on all sides of the glass. All glazing in doors must have either an NFRC label or use the default U-value and Solar Heat Gain Coefficient from Tables 1-D and 1-E in Section 116 of the Energy Efficiency Standards. The area to be considered a "fenestration product"

Q A

is either the whole door or the glass area plus a two inch frame extension area on all sides.

RES 00-4-Glass

I am converting a garage into a room addition. The new floor will consist of two-inch sleepers directly on the existing slab, plywood, carpet padding, and carpeting. How would the new floor be modeled in a computer program?

This type of floor assembly is not found in Table G-13, which lists materials acceptable as exposed mass. Therefore, the floor would be considered a covered slab construction. The construction assembly, as it will be built, should be modeled in the computer program using the U-value for each material. You must prepare a Form 3 showing the assembly and calculate a U-value for the total assembly. Also, be sure to check with your local building department regarding the Uniform Building Code requirements for wood on concrete and for other life-safety issues.

RES 00-5-Addition

Q A

Is the volume of a small water heater (rated input less than or equal to 75,000 Btu/hr) required in a residential computer method?

Yes. In performance methods, the volume is one of the required inputs.

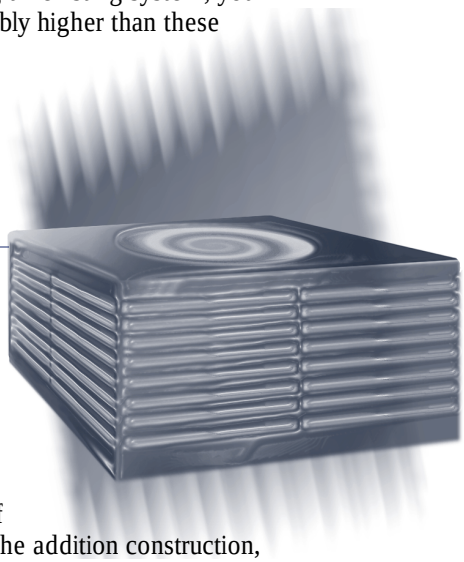
RES 00-6-Water heater

Q A

I want to replace my central gas heating system with a central electric heat pump. Section 152 (b) of the standards includes some limitations on electric systems. Am I allowed to install a heat pump? What must I do to show that I comply with the Energy Efficiency Standards?

Yes, you can replace your gas furnace with a central electric heat pump having a minimum HSPF of 6.6 (single package) or 6.8 (split system). Minor repairs such as replacement of the fan motor need not meet the requirements of Section 152(b). If you are replacing an existing system, you may find it beneficial to install a heat pump with an efficiency considerably higher than these minimums. To perform properly, heat pumps need to move substantially more air than a furnace to provide the same amount of heat. This may require a larger duct system than was originally used for a gas furnace. Contact your local building department, mechanical engineer or contractor for more advice.

RES 00-7-Heat pump



Q A

When an existing central heating unit will also serve a new addition to a home, how would the existing central heating unit be modeled, using the "existing plus addition" computer compliance method?

You should model the equipment using a 78 percent AFUE central furnace and a 10 SEER air conditioner with R-4.2 ducts in the attic, in the "existing" and "existing plus addition" computer runs, regardless of actual conditions. However, if the HVAC unit is being replaced during the addition construction, credit is gained by using the values from Table 7-3 (Default Assumptions for Existing Buildings) to establish the existing efficiencies if they are unknown for the existing home calculation. Then the new unit's efficiency would be used in the "existing plus addition" calculation.

RES 00-8-HVAC

NONRESIDENTIAL

Q

In the Nonresidential Manual, page 5-42, it states the wattage for track lighting is calculated using "…45 watts per foot, which is 50 percent of the lighting power rating by the National Electric Code (90 watts per foot)." If the California Energy Commission adopted the 1996 NEC values for track lighting which is now 150 watts per two feet instead of 180, this would change the Energy Commission default value of 45 to 37.5 watts/linear foot of track. Which values should be used?

A

45 Watts /linear foot of track is the formal interpretation of the Energy Commission as published in its Nonresidential Manual; therefore, 45 watts per linear foot should be used.
Note that the Nonresidential Manual (page 5-42) also states:

> Tracks serviced through permanent, installed transformers for low voltage lighting may use the volt ampere (VA) rating of the transformer as the Actual Lighting Power of the track. Standard voltage tracks equipped with current limiters may use the actual volt-ampere (VA) rating of the current limiter as the Actual Lighting Power of the track if (a) The current limiter is an integral part of the track and can only be replaced by manufacturer authorized technicians, and (b) The VA rating of the current limiter is clearly marked on the track and is readily available for the building officials' field inspection without opening the fixture or panels.

NONRES 00-1-Lighting

Q

What energy code comes into effect for tents, if any? Does this conditioned space still invoke Title 24? Does the fire marshal handle this?

A

If the building official considers the tent to be an occupancy within the scope of Section 100 (a) of the standards and the tent is conditioned, then it must comply with the requirements of the energy code. Note that exception 2 to Section 100(a) states: Building departments, at their discretion, may exempt temporary buildings or structures erected in response to a natural disaster. Temporary buildings or structures shall be completely removed upon the expiration of the time limit stated in the permit.

NONRES 00-2-Tents

Q

Can a building department plan checker or inspector ask for further documentation and additional information (other than standard forms) to verify compliance with the Standards?

A

Section 10-103(a)3.B states: "The enforcement agency may require the person with overall responsibility for the construction to provide any reasonable information to determine that the building as constructed is consistent with approved plans and specifications and complies with Part 6" (of the Standards). Section 10-103(a)2.B. states: "If any characteristic is materially changed before final construction and installation, such that the building may no longer comply with Part 6, the building must be brought back into compliance, and so indicated on amended plans, specifications, and Certificate(s) of Compliance and shall be submitted to the enforcement agency."

NONRES 00-3-Compliance

Q

How do I model (for compliance with the Standards) Residential Care Facilities for the Elderly (R2) buildings having both residential and nonresidential components?

A

Section 100(e) states: "When a building is designed and constructed for more than one type of occupancy, the space for each occupancy shall meet the provisions of Title 24, Part 6, applicable to that occupancy." Exception to Section 100(e) states: "If one occupancy constitutes at least 90

percent of the conditioned floor area of the building, the entire building may comply with the provisions of Title 24, Part 6, applicable to that occupancy, provided that the applicable mandatory measures in Sections 110 through 139, and 150, are met for each occupancy."

NONRES 00-1-Lighting

DID YOU KNOW?

- The new guide for Residential Additions, "Six Steps to an Energy Efficient Addition" is now available from the Hotline 1-800-772-3300, or from our Web Site at <www.energy.ca.gov/title24>.

- CALRES version 1.34 has been updated to version 1.35 and the fix is available from our Web Site.

- EZ-Frame has an updated version available on the Energy Commission's Web Site. The update corrects a problem EZ-Frame has traditionally had running on fast processors. If your version is functional, an upgrade is not required.

Go to: <www.energy.ca.gov/pub/efftech/Ezframe>.

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- Nonresidential Manual and Energy Efficiency Standards…….$12.00
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CORRECTIONS /TYPOS

Nonresidential Manual

1. Tables 3-20 and 3-21: In the section for skylights there are two rows for 'Transparent' skylights. The 'Transparent' row lower on the page in both Tables should read 'Translucent.' The Standards are correct.

2. In the Overall Envelope Method ENV-2, Part 1: In the section for WINDOW AREA TEST; Entry 2. IF LESS THAN C, the first blank is supposed to be MINIMUM STANDARD AREA.

Building Efficiency Standards

1. Standards Table 1-L, Sec 146(a)2: The Window Wall Ratio for VLT ≥ 60 percent and Window Wall Ratios of 20 percent to 40 percent should have the decimal point shifted to the right so that the correct value is 0.30/0.40.

2. In Section 100 (d) 2. D., EXCEPTION 1 and EXCEPTION 2 refer to Section 100 (d) 2. D. ii. **b.** only.

3. The residential prescriptive requirement table for CZ 5. Maximum Glazing U-value for Package D should be 0.75, not 0.7

4. The residential prescriptive requirement table for CZ 10. Maximum Glazing U-value for Package D should be 0.75, not 075

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The nonresidential compliance forms are now available in AUTOCAD format. They can be down loaded from our web site at www.energy.ca.gov/title24

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