DOCKETED

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VELUX - Residential ACM Reference Manual (CEC-400-2015-024-SD-REV)

Additional submitted attachment is included below.

2.1.1   Proposed Design

The building configuration is defined by the user through entries for floor areas, wall areas, roof and ceiling areas, vertical fenestration areas, and skylightdoor areas. Each is entered along with performance characteristics such as U-factors, SHGC, thermal mass, etc. Information about the orientation and tilt is required for walls, fenestration and other elements. The user entries for all of these building elements are consistent with the actual building design and configuration. If the compliance software models the specific geometry of the building by using a coordinate system or graphic entry technique, the data generated is consistent with the actual building design and configuration.

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2.1.2   Standard Design

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The basis of the standard design is prescriptive Package A (from §150.1(c) of the standards, Table 150.1-A). Package A requirements vary by climate zone. Reference Joint Appendix JA2, Table 2-1, contains the 16 California climate zones and their representative cities. The climate zone can be found by city, county and zip code in JA2.1.1. Applicable exceptions to Package A requirements are accounted for.

2.2 The Building

PROPOSED DESIGN

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The input file will include entries for floor areas, wall, door, roof and ceiling areas, and vertical fenestration and skylight areas, as well as the water heating, space conditioning, ventilation, and distribution systems.

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STANDARD DESIGN

To determine the standard design for low-rise buildings, a building with the same general characteristics (number of stories, attached garage, climate zone) with wall and window areas are distributed equally between the four main compass points (north, east, south and west) is created by the software. Energy features are set to be equal to §150.1(c) and Table 150.1-A, with consideration for applicable exceptions. For additions and alterations, the standard design for the existing building shall have the same wall and fenestration areas and orientations as the proposed building. The details are described below.

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2.5.3.3   Free Ventilation Area

Free ventilation area is the operable window and skylight vent area adjusted to account for bug screens, window framing and dividers, and other factors.

PROPOSED DESIGN

Free ventilation area for the proposed design is calculated as 5 percent of the fenestration area (rough opening), assuming all windows are operable.

STANDARD DESIGN

The standard design value for free ventilation area is the same as the proposed design.

VERIFICATION AND REPORTING

Free ventilation is not reported on the CF1R.

2.5.3.4 Ventilation Height Difference

Ventilation height difference is not a user input. [This should be a user input for the proposed design when operable skylights are used]

PROPOSED DESIGN

The default assumption for the proposed design is 2 feet for one-story buildings or one-story dwelling units and 8 feet for two or more stories (as derived from number of stories and other zone details). These distances may be increased by 8 feet when operable skylights are used.

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2.5.3.7 Natural Ventilation

Natural ventilation (from operable windows and skylights) is available during cooling mode when needed and available as shown in Table 2-19. The amount of natural ventilation used by computer software for natural cooling is the lesser of the maximum potential amount available and the amount needed to drive the interior zone temperature down to the natural cooling setpoint. When natural cooling is not needed or is unavailable no natural ventilation is used.

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2.5.6.6 Fenestration

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PROPOSED DESIGN

The compliance software allows users to enter individual vertical fenestration or window skylight types, the U-factor, SHGC, area, orientation, and tilt.

Performance data (U-factors and SHGC) is from NFRC values or from the Energy Commission default tables from §110.6 of the standards. In spaces other than sunspaces, solar gains from windows or skylights use the CSE default solar gain targeting.

Skylights are a fenestration with a slope of 60 degrees or more. Skylights are modeled as part of a roof.

STANDARD DESIGN

If the proposed design total fenestration area is less than 20 percent of the conditioned floor area, the standard design fenestration areas are is set equal to the proposed design fenestration areas.

Otherwise, the standard design total fenestration area is set equal to 20 percent of the conditioned floor area and is proportioned between vertical fenestration and skylights equal to the proposed design proportions. The standard design vertical fenestration area is distributed equally between the four main compass points— north, east, south and west.

The standard design has no skylights when the proposed design has no skylights.

The net wall area on each orientation is reduced by the vertical fenestration area (and door area) on each facade.

The net roof area is reduced by the skylight and tubular daylighting device area on each slope.
[Commenter note 1: The prescriptive method contains provisions allowing for fenestration other than windows and doors, and the performance method should treat such permitted fenestration in a similar manner. The method as currently structured is biased against non-vertical fenestration and tubular daylighting devices, which have been proven to give net energy savings when deployed appropriately. Designers who learn to optimize their designs for daylighting should be rewarded for finding these savings.]

The U-factor and SHGC performance factors for the standard design are taken from the §150.1(c) and Table 150.1-A (Package A), with consideration for applicable exceptions. Where Package A has no requirement, the SHGC is set to 0.50.
[Commenter note 2: When skylight exceptions allowing a limited area to have higher U-Factor and SHGC are applicable, the standard design needs to specifically provide for area-weighting of the overall requirements for those parameters.]

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2.5.6.8 Interior Shading Devices
For both the proposed and standard design, all windows are assumed to have draperies and skylights are assumed to have no interior shading, unless provided by the skylight manufacturer for any skylights . Window medium drapes and any skylights sold with preinstalled shades are closed at night and half open in the daytime hours. Interior shading is not a compliance variable and is not user editable.

[Commenter note 3: NFRC certifies ratings for integrally shaded fenestration products as a dynamically glazed assembly, when shades are pre-installed by the fenestration product manufacturer. This is a common product on European roof windows, and they are now readily available on certain skylights designed for the US and Canada. There is no reason the CEC should disallow the proper consideration for using such assemblies, especially when the allowance assumed for windows is so generous.]
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2.10 Additions/Alterations

2.10.2 Addition Alone Approach

The proposed addition alone is modeled the same as a newly constructed building except that the internal gains are prorated based on the size of the dwelling. None of the exceptions included for prescriptive additions, which are implemented in the existing plus addition compliance approach (see Section 2.10.3) are given to the addition alone approach (see Standards §150.2(a)2.B.) However, all exceptions in Standards §150.1(b) are available, as applicable, for the proposed addition. The addition complies if the proposed design uses equal or less space heating, space cooling, and water heating TDV energy than the standard design.

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2.10.3 Existing + Addition + Alteration Approach

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2.10.3.3 Fenestration

Table 2-25: Addition Standard Design for Fenestration (in Walls and Roofs)

[Commenter note 4: In this table, "no skylight area" is allowed for the standard design for additions. There is no basis for this restriction, as we explain above in note 1 for newly constructed buildings. If new skylight area is part of the design for proposed addition, that area should be included in the standard design. Furthermore, the first 16 square feet of addition skylight area is assigned a U-factor of 0.55 and SHGC of 0.30 in the standard design, with the balance as indicated in the table.]