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Document Title:	Presentation - 6-22-17, Nonresidential Advanced Daylighting and Daylighting Controls
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Daylighting and Daylighting Controls

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Pre-Rulemaking Workshop
Imbrecht Hearing Room
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Acknowledgments

California Utilities Statewide Codes and Standards Team

and

CASE Authors

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Daylighting and Daylighting Controls

- Daylighting in Building Spaces
  - Can be provided through daylighting devices such as skylights and through windows, and others
  - Skylights' requirements in Section 140.3(a)6 and 140.3(c)
- Automatic Daylighting Controls
  - Since natural daylight can supplement electric lighting in indoor spaces, a mechanism is needed to modulate these two lighting elements
  - Automatic daylighting controls' requirement in Section 130.1(d) and 140.6(d)

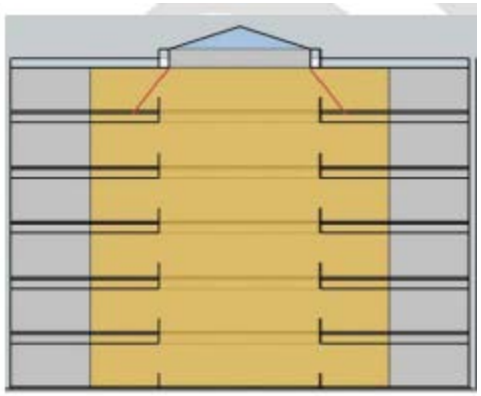
Background – Daylit Zones

- Three types of daylit zones as defined for automatic daylighting controls:
  - Skylit Daylit Zone
  - Primary Sidelit Daylit Zone
  - Secondary Sidelit Daylit Zone
- Two scenarios have been identified as difficult to assign daylit zones with definitions from existing Standards
  - Skylit daylit zone definition for atrium spaces
  - Sidelit daylit definition for very large overhangs

Background – Daylit Zones

- Skylit daylit zone definition for atrium spaces:
  - Ambiguity in how to apply the definition; different opinions on interpretations
- Sidelit daylit definition for very large overhangs:
  - Large overhangs can limit and reduce daylight available; cause loss in daylight savings

CASE Team Proposals – Daylit Zones Part 1 (Atrium Spaces)



- Analysis using Radiance modeling:
  - A building with six floors and a central atrium was modelled and simulations were run with three different skylight sizes.

CASE Findings:

- In all cases, the area below the atrium, on the first floor is well daylit.

CASE Proposed Clarifications:

- the skylight daylit zone shall include
  - the floor area directly under the atrium,
  - and the area of the top floor that is directly under the skylight
  - Plus 0.7 times the average ceiling height of the top floor, in each direction from the edge of the rough opening.

CASE Proposed Clarifications:

- Plus 0.7 times the average ceiling height of the top floor, in each direction from the edge of the rough opening.

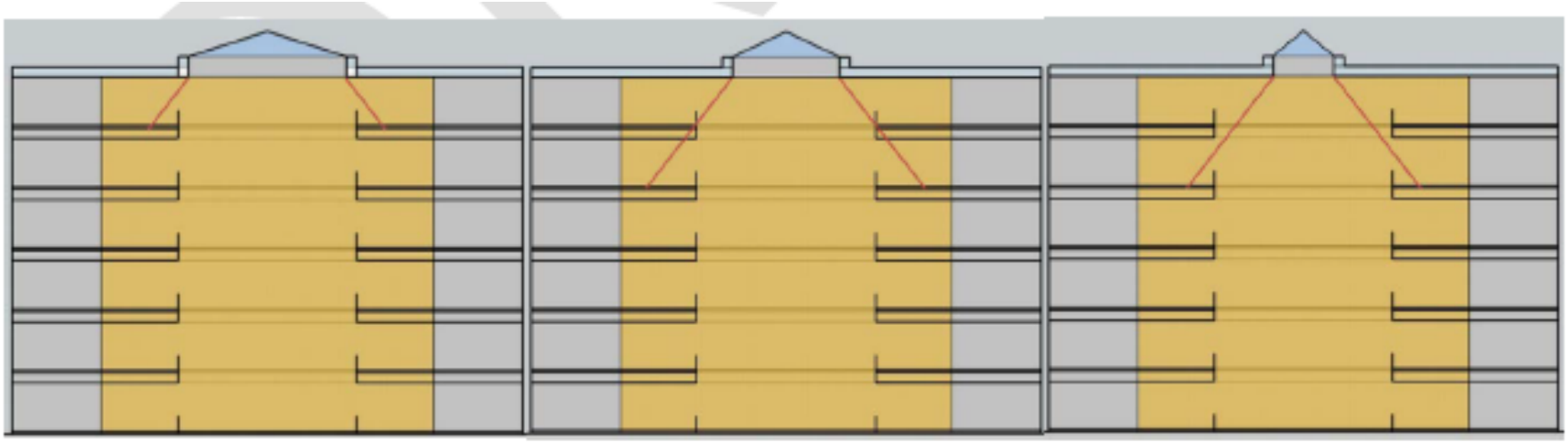
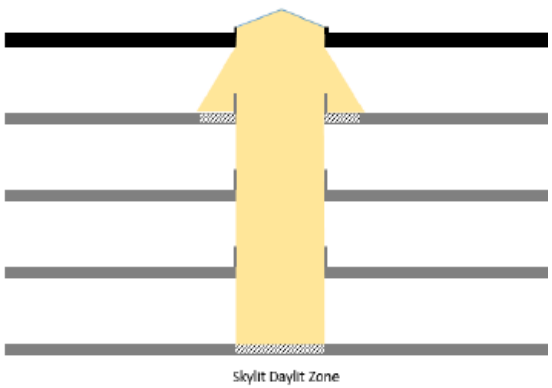
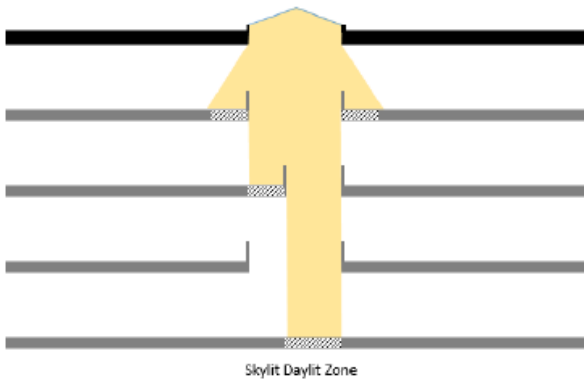
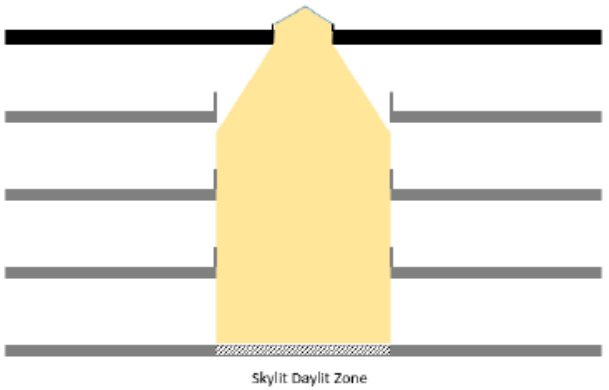


Figure 23: Skylit daylit zone analysis for atrium cases (a), (b) and (c)

More atrium variations as follows:





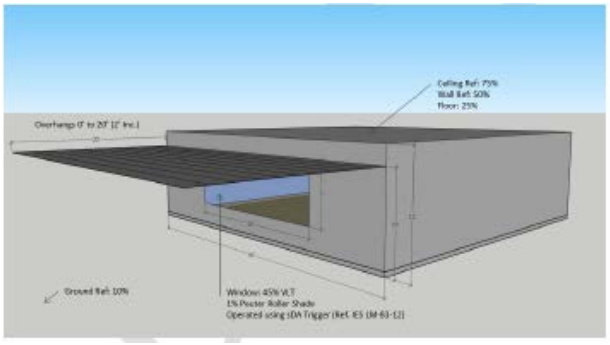


Proposed Language

For skylight(s) located in an atrium, the skylit daylit zone shall include the floor area directly under the atrium, and the area of the top floor that is directly under the skylight, plus 0.7 times the average ceiling height of the top floor, in each direction from the edge of the rough opening of the skylight, minus any area on a plan beyond a permanent obstruction that is taller than one-half the distance from the top floor to the bottom of the skylight.

EXCEPTION 1 to 130.1(d)1A: Areas under skylights where it is documented that existing adjacent structures or natural objects block direct sunlight for more than 1,500 daytime hours per year between 8 a.m. and 4 p.m.

CASE Team Proposals – Daylit Zones Part 2 (Overhangs)



- Radiance simulations for a room with window and overhang.
  - Overhang depth parametrically varies from 0 feet to 20 feet in depth.
  - Simulates for both primary and secondary daylit zones.
  - Blinds operated based on direct sun penetration trigger.

- CASE Analysis Findings
  - At overhang projection/window head height ratio of 1, savings in primary daylit zone reduced by about 50% in N, E, W orientations.
  - In S orientation, decrease in daylight level is much lower with deeper overhangs.

CASE Team Proposal

- Propose an exception to sidelit daylit zone requirement when the overhang is extending too far out.
- Proposed Draft Language:

  "EXCEPTION to 130.1(d)1B&C: Areas adjacent to vertical glazing with overhangs and no vertical glazing above the overhang, where the ratio of the overhang projection to the window head height is greater than 1.0."

Background – Tubular Daylighting Devices (TDDs)

- *"Tubular daylighting devices use cylindrical light pipes with very high specular reflectance material permitting daylight transmission through the space below ceiling."* (paraphrased from IES RP-5-13)
  - Minimum Visible Transmission (Min VT) requirement for plastic skylights (Table 140.3-C)
  - Visible Transmittance requirement in Section 110.6(a)4

CASE Team Proposal - Tubular Daylighting Devices

- Propose a change to align Title 24 requirements with the new NFRC 203 procedure (2014) for determining Visible Transmittance (VT) of TDDs
  - NFRC is National Fenestration Rating Council
  - NFRC 203 is already a part of Title 24 Part 6 and under Section 110.6 for fenestration products

CASE Team Proposal - Tubular Daylighting Devices

- Visible Transmittance requirement in Section 110.6(a)4

  "The fenestration product's VT shall be rated in accordance with NFRC 200 or ASTM E972, for tubular skylights VT shall be rated using NFRC 203."

CASE Team Proposed Changes

- Add a minimum Visible Transmittance (VT) rating value, 0.38, for TDDs in the prescriptive envelope criteria table, Table 140.3-C
- Update the reference documents to the current version (2014) of the NFRC 203 document for the testing methodology
- The Min VT criteria in the prescriptive criteria is meant for plastic, curb mounted skylights and not meant for TDD's

Proposed Table 140.3-B

				Fixed Window	Operable Window	Curtainwall or Storefront	Glazed Doors[2]
Envelope	Fenestration	Vertical	Area-Weighted Performance Rating	Max U-factor	0.36	0.46	0.41	0.45
				Max RSHGC	0.25	0.22	0.26	0.23
				Min VT	0.42	0.32	0.46	0.17
			Maximum WWR%	40%				
		Skylights			Glass, Curb Mounted	Glass, Deck Mounted	Plastic, Curb Mounted	Tubular Daylighting Devices (TDDs)
			Area-Weighted Performance Rating	Max U-factor	0.58	0.46	0.88	0.88
				Max RSHGC	0.25	0.25	NR	NR
				Min VT (Min VT_{manual} for TDDs)	0.49	0.49	0.64	0.38
			Maximum SRR%	5%				

CASE Proposal – Advanced Daylighting Devices

Notes to stakeholders and Consultants:

- New proposal for Power Adjustment Factors (PAF) for certain technologies installed pertinent to vertical fenestration of the buildings
- The technologies include:
  - fixed slats (louvers)
  - daylight redirection technologies
  - clerestories
- Seek inputs and comments on this proposal

Comments/Questions

- Submit written comments by July 14, 2017
  - E-file: https://efiling.energy.ca.gov/EComment/EComment.aspx - Docket # 17-BSTD-01
  - E-mail: docket@energy.ca.gov – include the docket number in the subject line

- I can be contacted directly simon.lee@energy.ca.gov or 916-651-3005