CALIFORNIA ENERGY CODES & STANDARDS
A STATEWIDE UTILITY PROGRAM

Notes from 2019 Title 24 Part 6 Code Development Cycle Utility-Sponsored Stakeholder Meeting for Daylighting Topics

Posted January 26, 2017

Meeting Information

Meeting Date: December 15, 2016

Topics Discussed: Advanced Daylighting Design Topics

Meeting Time: 1:00 – 4:00

Meeting Host: California Statewide Utility Codes and Standards Team

Attendees

First Name	Last Name	Contact	Organization
Statewide Utility Codes and Standards Team			
Utility Staff			
Jim	Kemper	james.kemper@ladwp.com	Los Angeles Department of Water and Power (LADWP)
Kelly	Cunningham	KACV@pge.com	Pacific Gas and Electric Company (PG&E)
David	Roland	David.Roland@smud.org	Sacramento Municipal Utility District (SMUD)
Randall	Higa	randall.higa@sce.com	Southern California Edison (SCE)
Chris	Kuch	chris.kuch@sce.com	Southern California Edison (SCE)
David	Rivers	david.g.rivers@sce.com	Southern California Edison (SCE)
Will	Vicent	William.Vicent@sce.com	Southern California Edison (SCE)
John	Barbour	jbarbour@semprautilities.com	Southern California Gas Company (SoCalGas)
Codes and Standards Enhancement (CASE) Team Members			
Eric	Shadd	eric@determinant-ll.com	Determinant LLC
Heidi	Hauenstein	hhauenstein@energy-solution.com	Energy Solutions
Mike	McGaraghan	mmcgaraghan@energy-solution.com	Energy Solutions
Chris	Uraine	curaine@energy-solution.com	Energy Solutions
Jon	McHugh	jon@mchughenergy.com	McHugh Energy
Mudit	Saxena	MSaxena@vistar-energy.com	Vistar Energy
California Energy Commission Participants			
Payam	Bozorgchami	payam.bozorgchami@energy.ca.gov	California Energy Commission (CEC)
Mazi	Shirakh	Maziar.Shirakh@energy.ca.gov	California Energy Commission (CEC)
Peter	Strait	Peter.Strait@energy.ca.gov	California Energy Commission (CEC)
Simon	Lee	Simon.Lee@energy.ca.gov	California Energy Commission (CEC)
Gabriel	Taylor	Gabriel.Taylor@energy.ca.gov	California Energy Commission (CEC)
Other Participants			
Rocky	Shaw		3M Company
Scott	Howard		3M Company
Eric	Askeland		3M Company
Michael	Scalzo		AAA Companies
Scott	Weaver		Acuity Brands Lighting

James	Benya		Benya Burnett Consultancy
Tom	Culp		Birch Point Consulting
Jeanne	Fricot		Center for Sustainable Energy
Erik	Mar		Emar Studio
Scott	Ziegenfus		Hubbell Inc.
Eleanor	Lee		Lawrence Berkeley National Lab
Glenn	Savage		LG Electronics
Rick	Leinen		Leviton Manufacturing Company, Inc.
Craig	Casey		Lutron Electronics Co
Bill	Burke		Pacific Gas and Electric Company (PG&E) Pacific Energy Center
Joseph	Briscoe		PLC Multipoint
Kyra	Weinkle		NORESCO
Rick	Miller		RNM Engineering
Joan	Schaefer		Solatube International, Inc.
Michael	Sather		Solatube International, Inc.
Neall	Digert		Solatube International, Inc.
Todd	Maerowitz		Solatube International, Inc.
Robert	Westfall		Solatube International, Inc.
Dave	Intner		Southern California Edison (SCE)
Hanna	Scott		Sun West Distributors, Inc.
Michael	Mutmansky		TRC Energy Services
Lisa	Heschong		*Independent – no company affiliation*
Mark			
Roger	LeBrun		VELUX America LLC
Philip	Hall		
Brent	Protzman		

Meeting Agenda

Time	Topic	Presenter
1:00 – 1:30	Introduction	Randall Higa (SCE)
1:20 – 1:30	Compliance Improvement	Javier Mariscal (SCE)
1:30 – 2:45	**Daylighting Topics Part 1** • Minimum Visible Transmittance for Tubular Daylighting Devices • Update skylit daylit zone definition	Mudit Saxena (Vistar Energy)
2:45 – 3:55	**Daylighting Topics Part 2** • Fixed slats • Daylight distribution devices • Daylight redistributing films • Automatic shades • Dynamic glazing • Clerestory windows	Eric Shadd (Determinant)
3:55 – 4:00	Review and wrap-up, next steps	Randall Higa (SCE)

Key Takeaways and Action Items

1. **Overview**
    a. No key takeaways or action items.
2. **Daylighting Topics Part 1**
    a. Stakeholders are aware that the minimum VT requirement currently prevents tubular daylighting devices (TDDs) from being used in the prescriptive method.
    b. There are some key differences related to thermal boundaries when comparing residential and commercial TDDs – some TDDs are rated with the different thermal boundaries but some are not.
        i. Solatube will provide data on this.
    c. Action items for the Utility CASE Team include:
        i. Follow up with CEC to figure out frequency of skylit daylit zone on the CEC hotline.
        ii. Follow up with Solatube for data on TDDs rated with different thermal boundaries.
3. **Daylighting Topics Part 2**
    a. Other market actors to include: Illuminating Engineering Society (IES) daylight metrics committee, NEMA daylight management council, owners, tenant improvements/facility managers for retrofit applications, California Advanced Lighting Controls Training Program-certified Acceptance Technician (CLCATTs).
    b. Power Adjustment Factors (PAFs) are not ideal, but are currently the only way to get these into the code since they are not likely cost-effective.
    c. Action items for the Utility CASE Team include:
        i. Follow up with the IES Daylight Metrics Committee (LM83) and Kevin Van Den Wymelenberg.
        ii. Include other market actors: IES daylight metrics committee, NEMA daylight management council, owners, tenant improvements/ facility managers for retrofit applications, and CLCATTs.
        iii. Contact AERC to get a realistic timeline for the implementation of their ratings.

Meeting Notes

Overview of 2019 Title 24 Development

- Randall Higa (Southern California Edison) presented.
- Presentation available here.

Comments and Feedback

1. No comments.

Daylighting Topics Part 1

- Mudit Saxena (Vistar Energy, Utility CASE Team) presented.

- Presentation available here.

Comments and Feedback

Minimum Visible Transmittance for Tubular Daylighting Devices

1. Neall Digert (Solatube): NFRC 203 is a powerful rating because it differentiates between VT angle and VT normal which is more meaningful for users.
    a. Roger LeBrun (VELUX America): Title 24, Part 6 got ahead of the testing industry by implementing NFRC 203. Actual data didn't exist when 2016 standards were drafted.
2. Erik Mar (Emar Studio): I'm an architect and can't use tubular daylighting devices (TDDs) because the minimum visible transmittance (min VT) requirement of 0.64 in the prescriptive method is too high. I've spoken with several TDD manufacturers who said none of their TDDs met the min VT requirement. The code needs to be revised.
    a. Mudit Saxena (Utility CASE Team): We want to develop a min VT annual for TDDs that would be equivalent to min VT for traditional skylights. The credit for TDDs is not available using the performance method (modeling) which is what's preventing it from being recognized by Title 24, Part 6 and certain utility incentive programs.
3. Dave Intner (SCE): Will these metrics affect code requirements for skylight area as a percentage of roof area? You get better light quantity with TDD's with smaller area, versus traditional skylights.
    a. Mudit Saxena (Utility CASE Team): These do not directly impact the code requirements for skylight area. The code requires that product of the total skylight area and the average skylight visible transmittance is no less than 1.5% of the daylit zone area (or total skylight area is at least 3% of the daylit zone area). Using this, TDDs can qualify by having a smaller area than traditional skylights.
4. Neall Digert (Solatube): VT normal is the maximum transmittance in a window or skylight (90 degree, directly overhead). VT annual is the average over time of 18 angles that doesn't include the 90 degree overhead angle.
    a. Mudit Saxena (Utility CASE Team): We can use the CEC PIER Skylight Photometry Data (HMG 2003) to calculate the equivalent angles to use the methodology for NFRC 203 to create a VT annual.
        i. Neall Digert (Solatube): I support this approach.
2. Bob Westfall (Solatube): Is comparing skylights to TDDs really appropriate? It might be better to look for data to show TDDs are an effective way to daylight a space.
    a. Mudit Saxena (Utility CASE Team): We did the proof of skylight requirements when the 2013 Standards were adopted; this is an update.
3. Jon McHugh (McHugh Energy): There are anomalies between solar heat gain coefficient (SHGC) and U-factor when comparing skylights and TDDs. In a residential environment, TDDs thermal boundary is the ceiling, but the thermal boundary is the roof for larger TDDs (commercial).
    a. Neall Digert (Solatube): Some TDDs (ours included) get tested at both configurations – insulation at the ceiling (residential) and with insulation at the roof (commercial) and we have multiple labels with the info. We have data on this that we'd like to provide.
5. Michael Sather (Solatube): Why is daylight contribution determined by aperture rather than performance? This seems to preclude advanced technology like TDDs.
    a. Mudit Saxena (Utility CASE Team): Min VT rating is by performance of the product and not aperture.

i. Neall Digert (Solatube): We calculate number of units required to achieve desired daylighting levels (lumens), and our products can achieve with SFR of roughly 1.5%.

b. Michael Mutmansky (TRC): When skylight requirement was first developed, it was based on modeling of traditional skylights. TDDs were supposed to be outperforming at beginning and end of day (not while sun was directly overhead).

i. Mudit Saxena (Utility CASE Team): We got rid of effective aperture calculations in the 2016 Standards, and added a minimum VT requirement from skylights and windows. This update will give TDDs a more appropriate VT to qualify with prescriptive standards.

ii. Jon McHugh (McHugh Energy): Skylighting systems have lumen depreciation so we want to develop requirements that are appropriate throughout the life of the skylight.

Update to skylit daylit zone definition

1. Simon Lee (CEC): People have brought this issue up over the CEC hotline.
    a. Mudit Saxena (Utility CASE Team): I will follow up with CEC to figure out frequency of this topic on the CEC hotline.
        i. Neall Digert (Solatube): This issue warrants a code update.
        ii. Jim Benya (Benya Burnett Consultancy): I don't think this needs a CASE report because it'll be difficult to prove cost-effectiveness and impact.

Daylighting Topics Part 2

- Eric Shadd (Determinant, Utility CASE Team) presented.
- Presentation available here.

Comments and Feedback

1. Bill Burke (PG&E): I agree that slats/louvers are often used for esthetics as much as glare control.
2. Roger LeBrun (VELUX America): Are your proposed areas of crediting for Daylighting limited to vertical fenestration?
    a. Eric Shadd (Utility CASE Team): Yes, we are not considering skylights.
    b. Michael Mutmansky (TRC): Are you measuring vertical or horizontal illuminance?
        i. Eric Shadd (Utility CASE Team): The calculation is done using vertical illuminance.
3. Eleanor Lee (LBL): Is illuminance "at the wall with windows" located at the face of the window looking out the window?
    a. Eric Shadd (Utility CASE Team): Yes, grid is looking out the window.
        i. Eleanor Lee (LBL): Valuation at window will not detect glare where daylight-redirecting clerestory is the source of the glare. Think more about location of the eye.
4. Eric Shadd (Utility CASE Team): We will be doing PAF multipliers on LPDs, but also considering incorporating Radiance into CBECC-com. Radiance is already integrated with OpenStudio. Users have the choice to use either the multiplier (as with previous PAFs) on proposed LPD (quicker, less accurate); or use Radiance – similar to overhangs, and can be modeled. This option is more accurate but has a longer modeling time.

   a. Bill Burke (PG&E): If the capability isn't enabled in CBECC-com, it cannot be considered in compliance.
      i. Eric Shadd (Utility CASE Team): Since we are proposing PAFs, the PAF multipliers will be incorporated immediately in the compliance tool. We will address how to model these measures in performance approach later.

5. Jim Benya (Benya Burnett Consultancy): Glare is a function of luminance, not illuminance, and also adaption. Are you proposing any glare metric from Illuminating Engineering Society (IES) or International Commission on Illumination (CIE)?
   a. Neall Deigert (Solatube): We are developing a metric for this in the IES Daylight Metrics Committee (LM83). Eric should reach out to Kevin Van Den Wymelenberg and also speak with the committee.
      i. Eric Shadd (Utility CASE Team): I have looked at the various glare metrics, but I am a fan of the probability metric for operating blinds. I will speak with Kevin.
   b. Michael Mutmanksy (TRC): Defining glare for a metric has been researched extensively with no good solution. The manner proposed is not sufficient.
      i. Brent Protzman (?): There's a misunderstanding about the usage of DGP. A 20% DGP doesn't end up near 20% of people perceiving glare.
      ii. Bill Burke (PG&E): Glare control is key to good daylighting, but the challenge is their application to compliance and compliance software.
6. Lisa Heschong (no affiliation): Other market actors to include: IES daylight metrics committee, NEMA daylight management council.
   a. Eleanor Lee (LBL): Also owners, tenant improvements/ facility managers for retrofit applications
      i. Rick Miller (RNM Engineering): Also consider the impact of these items on the acceptance daylight testing as performed by the CLCATTs.
7. Lisa Heschong (no affiliation): Attachments Energy Rating Council (AERC) is a very slow boat. It is unlikely they will get around to rating the daylight performance of commercial products in time for 2020 adoption.

1. Jim Benya (Benya Burnett Consultancy): No established IES glare metrics – I don't see a solution in time for standards. It will be hard to prove cost effectiveness at 0.35 W/sf by 2020.
   a. Jon McHugh (McHugh Energy): No established glare metric in the past. I recommend we let Eric explore and try and address the issue.
2. Rick Miller (RNM Engineering): Does the modeling of the performance include the real situation, such as trees and adjacent buildings? If so, then how can this be worked into the acceptance testing procedure?
   a. Eric Shadd (Utility CASE Team): We are planning something very similar to skylight requirement's "permanent obstruction". In that case, trees are not considered permanent but buildings and terrain features are.
3. Lisa Heschong (no affiliation): Using PAFs and the mechanism for bringing this into the code is of concern – PAFs inherently increase energy budget of a building, and are valuable only to relationship of LPDs of installed lighting. As LPDs drop, so does PAFs' value. ZNE goals for 2030 can be tough with PAFs.
   a. Mazi Shirakh (CEC): These are not cost-effective so PAFs are the only way to bring them into the code. We've implemented other things into the code by starting as a PAF, such as occupancy sensors.

4. Michael Mutmansky (TRC): Regular windows and “enhanced” windows have the same relationship as skylights and TDDs. However, these “enhanced” windows are treated through a different mechanism (PAF) than TDDs. Why not use the same approach?
    a. Eric Shadd (Utility CASE Team): Key difference is you don’t stare out of a skylight, and so glare and view are the main difference.
        i. Jon McHugh (McHugh Energy): Section 140.3(C) has a skylight diffusing requirement. PAF goes beyond the mandatory lighting controls. PAF for something that cannot be modeled directly using a harmonized approach.
    b. Lisa Heschong (no affiliation): TDD and sunlight films are essentially the same daylight enhancement strategy, and should be treated in similar fashion. The problems of glare and view preservation might be better treated in the IEQ section of CalGreen.