Meeting Notes

Notes from 2022 Title 24, Part 6 Code Cycle
Utility-Sponsored Stakeholder Meeting for:

Posted December 4, 2019

Nonresidential Envelope 1: High Performance Envelope

Meeting Information:

Meeting Date: Thursday, October 24, 2019

Meeting Time: 8:30am – 12:30pm PST

Meeting Host: California Statewide Utility Codes and Standards Team

Meeting Agenda:

Time	Topic	Presenter
10 minutes prior to call	Live Attendee Poll	Alanna Torres (Energy Solutions)
8:30-8:35	California Energy Commission Introduction	Energy Commission Staff
8:35-8:45	Welcome and Meeting Ground Rules	Kelly Cunningham (PG&E)
8:45-11:50	**CASE Presentation I:** Air High Performance Envelope	Alamelu Brooks (Energy Solutions)
11:50-12:30	Next Steps and Wrap Up	Alanna Torres (Energy Solutions)

Meeting Attendees:

First Name	Last Name	Email	Affiliation
Statewide Utility Codes and Standards Team			
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Kelly	Cunningham	Kelly.Cunningham@pge.com	Pacific Gas & Electric
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Codes and Standards Enhancement (CASE) Team Members			
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Stakeholder Attendees			
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Carrie	Niezgocki		3M
Rebecca	Everman		3M
Michael	Malinowski		Applied Arts

Reed	Hitchcock		ARMA
Mufeed	Alshakhori		Balanced Comfort
Thomas	Culp		Birchpoint Consulting
Roy	Eads		CALcerts
Roy	Eads		CalCERTS
Mark	Harner		CertainTeed
Michael	Winkler		City of Arcata
Cindy	Strecker		CLEAResult
Marc	Connerly		Connerly Associates
Tom	Paine		Consol
Tom	Martin		Department of Housing and Community Development
Meg	Waltner		Energy 350
George	Nesbitt		Environmental Design Build
Marty	Ward		GAF
Joan	Crowe		GAFF
Urmilla	Sowell		Glass Association of North America
Michael	Adams		Glumac
Michael	Weller		Glumac
Jeff	Mang		Hogan Lovells
Jeffrey	Boldt		IMEG Corp
Inna	Dolottseva		Interface Engineering
Diana	Fisler		Johns Manville
John	Woestman		Kellen Company

JR	Babineau		Kellen Company
Chadwick	Collins		Kellen Company
Robert	Hart		LBL
Stephen	Selkowitz		LBL
Eileen	Dutton		Malarkey Roofing
Lee	Shoemaker		Metal Buildings Manufacturers Association
Daniel	Arevalo		Mobile modular
Soph	Davenberry		NEMIC
Sean	Denniston		New Building Institute
Steven	Urich		NFRC
Matt	Manning		OldCastle Building Envelope
Andre	Desjarlais		ORNL
Shawn	Mullins		Owens Corning
Andrew	Dwyer		Owens Corning
Sid	Dinwiddie		PABCO roofing
Andrea	Love		Payette
Lucas	Morton		Pete Moffat Construction
Steven	Wadding		PolyGlass USA
Michael	Hsueh		RDH Building Science
Vrushali	Mendon		Resource Refocus
Dritan	Topuzi		Schock
Brian	Selby		Selby Energy
Utaw	White		Self-employed
Randy	Young		Sheet Metal Workers

Joseph	Briscar		SMXB
Glenn	Bestor		SOPREMA
Aaron	Phillips		Tamko
Helen	Sanders		Technoform
Bruce	Severance		The Energy Experts
Kelly	Morairty		Unknown
Nasrin	Sesar		Unknown
Steve	Dubin		Unknown
Nasrin	Sesar		Unknown

Meeting Notes:

1. Welcome and Meeting Ground Rules

- *Alanna Torres (Energy Solutions, Statewide CASE Team) presented.*

2. 2022 Process Overview

- *Payam Bozorgchami (California Energy Commission) presented.*
- *Kelly Cunningham (PG&E, Statewide Utility Codes & Standards Team) presented.*

3. Meeting Materials

- *Presentation available here.*
- *Submeasure summaries available here.*

4. CASE Presentation: High Performance Envelope

4.1. Submeasure: Cool Roof

- *Alamelu Brooks (Energy Solutions, Statewide CASE Team) presented.*
- Steven Wadding (PolyGlass USA): A great misunderstanding is that use of Cool Roofs (CR) by redirecting heat upwards actually increases Urban Heat Island conditions, not reduce it.
    - Jon McHugh (McHugh Energy, Statewide CASE Team): Steven, regarding your comment about misunderstanding of cool roofs, are you saying the correct understanding is that cool roofs actually increases or decreases urban heat island conditions?
- Reed Hitchcock (ARMA): Because the Energy Commission is focused on energy savings, any discussion of cool roofs needs to take into consideration requirements for insulation as well. The relative benefit of CR vs insulation has been covered extensively in multiple areas. Tradeoffs, like you reference, are critical.

- Simon Silverberg (Energy Solutions, Statewide CASE Team): Reed, thanks for your comment. We will be sure to take into account the insulation tradeoff to make sure the best option is prioritized.
- Reed Hitchcock (ARMA): All building envelope components should be considered to ensure building owners have choices in both application and design.
- George Nesbitt (Environment Design/Build): Cool roof insulation tradeoff should require continuous insulation.
- Payam Bozorgchami (Energy Commission): George, the insulation requirement is more of an area weighted averaging and for that reason it usually require a continuous insulation. For Low-sloped roofs, most insulation is installed above the roof deck as a continuous insulation.
- Chadwick Collins (Kellen Company): How is the tradeoff a barrier? is not the point to maximize savings/reduce energy use?
- John Arent (NORESCO, Statewide CASE Team): The insulation tradeoff for aged solar reflectance is intended to be an energy-neutral option to comply prescriptively. Designers can also comply using the performance approach with approved compliance software.
- Shawn Mullins (Owens Corning): Can you clarify the insulation tradeoff? Is that an option in increase insulation to offset improved CR requirements or vice-versa?
- Simon Silverberg (Energy Solutions): The insulation tradeoff is an option to pursue if the cool roof aged solar reflectance level is not met.
- Reed Hitchcock (ARMA): John Arent - the challenge with that is the significant cost for people to engage experts in that software is a major dissuader to using that method.
- Simon Silverberg (Energy Solutions): Table 140.3 in Part 6 may be able to clear up some insulation questions.
- John Arent (NORESCO): Reed - yes, I agree that for many buildings, especially smaller ones, there should be easy means to comply. The performance approach is not for all buildings, but many, if not most, large commercial buildings go this route.
- Alamelu Brooks (Energy Solutions): We will structure the tradeoff so that both options will provide similar energy performance. For the same energy performance, we will provide recommendations on required values.
- Meg Waltner (Energy 350): To clarify this would be a prescriptive tradeoff, correct?
- Alamelu Brooks (Energy Solutions): Yes, it would be.
- Jeff Mang (Hogan Lovells): Will the tradeoff be different for existing and new?
- Alamelu Brooks (Energy Solutions): Yes, since we are making changes to this and roof alterations requirements.
- Alanna Torres (Energy Solutions): You do not need to use the software for the insulation tradeoff. We will structure both cool roofs and insulation options to ensure similar energy performance.
- Payam Bozorgchami (Energy Commission): The tradeoff would be similar to what we have currently, with updating to those values. We are not sure what exact numbers will be.
- Reed Hitchcock (ARMA): Are there other tradeoffs being considered, or just insulation? Building envelope has a lot of factors.
- Simon Silverberg (Energy Solutions): Up until now we have primarily focused on the insulation tradeoff, but we would appreciate additional ideas on what else to take into account.

    - Chadwick Collins (Kellen Company): Here are some tradeoff ideas: reflectance of siding, equipment, windows, life cycle (expected life cycles, fewer replacements equate to less waste).
- **Poll 4:** "Over the past 10 years, how has the availability of highly reflective roofing material changed?"
    - Andre Desjarlais (ORNL): I think that it is important to note that the Cool Roof Rating Council (CRRC) database is not a reflection of the products available in the market. Only products with high solar reflectance tend to be rated because of the cost involved.
    - Simon Silverberg (Energy Solutions): Thanks for that note about the CRRC database. We will be sure to note that in future analysis.
    - George Nesbitt (Environment Design/Build): It is important to note the fact that the CRRC data base does not reflect ALL available products, because it reflects significant availability & choice of products.
- Reed Hitchcock (ARMA): For reference, per Oke, 1987: SR of water is between .05 and .1; Coniferous forest is .07-.13; Deciduous Forest is .15-.2; Grass is .16 - .23; crops are .17 - .23; soils are .06 - .36; concrete is .25 - .4; and desert is .21 - .46. As a frame of reference compared to the natural environment. Unintended consequences are a major concern when you start going too high.
- **Poll 5: "Which of these are potential barriers? Select one or more."**
    - Andre Desjarlais (ORNL): Product availability in the steep slope market could be an issue.
    - Rebecca Everman (3M): Other barriers include visual appearance/consumer choice.
    - Sid Dinwiddie (PABCO Roofing): Product availability is strongly influenced by proprietary technology for some product types.
    - Reed Hitchcock (ARMA): There is also a serious lack of information about the building inventory in each climate zone - that is critical information to understanding the potential benefits and costs.
- Steven Wadding (PolyGlass USA): Try to think about it in terms of by reflecting/redirecting heat back from the structure directly back into the environment above the building. How does that lower the ambient temperatures above the building and surrounding?
- George Nesbitt (Environment Design/Build): Above deck insulation is not universal. I think it should be required, because it will more effectively insulate.
- Eileen Dutton (Malarkey Roofing): Comments are correct, not all the products are being produced - these were tested but may only be produced as a special project. As the different zones have different requirements, it makes it very difficult to manage inventories.
- Lee Shoemaker (MBMA): Please add Metal Building Manufacturers Association to the Market Actors list.
    - Simon Silverberg (Energy Solutions): Thanks. We will be sure to do so.

4.2. Submeasure: Thermal Bridging

- *Alamelu Brooks (Energy Solutions, Statewide CASE Team) presented.*
- Michael Weller (Glumac): Are there any proposals to address the different types of fastening strategies for continuous insulation? (horizontal Z-girts, vertical Z-girts, fiberglass clips, etc.)
    - Rahul Athalye (NORESCO, Statewide CASE Team): Hi Michael, yes, this proposal will look at fasteners and fastening strategies.

- **Poll 6: "Are thermal bridging details at interfaces incorporated in the design and construction documents?"**
- **Poll 7: "In your experience, which assembly interfaces are vulnerable to thermal bridging? Select all that apply."**
    - Eileen Dutton (Malarkey Roofing): I would say this is considered in many designs we are involved with, but that is usually roof to wall.
        - Michael Hsueh (RDH Building Science): Thermal bridging details are rarely considered because designers are not required to look at thermal continuity of the building as a whole. One way to do this is a requirement for architectural drawings to include a section showing a continuous line of thermal control.
        - Michael Weller (Glumac): I agree with Michael Hsueh (RDH Building Science) above. Intermediate floor details, roof details, etc., are rarely considered for continuing insulation because there is no incentive of the energy code to address those situations
            - Benjamin Zank (Energy Solutions, Statewide CASE Team): Thank you, we are considering a thermal bridging section of architectural drawings.
        - Steven Wadding (PolyGlass USA): It is easy to envision that to be too limiting of Thermal Bridging would greatly impact the designer's ability to execute his vision for a building. No one wants a cookie cutter commercial building.
        - Soph Davenberry (NEMIC): I think thermal bridging would need the same continuity requirements as air or vapor barrier, which also are often overlooked to the specifics needed for successful installation.
            - Benjamin Zank (Energy Solutions): Thank you for the comment. We will be addressing the air barrier during the stakeholder meeting on Nov. 5.
        - George Nesbitt (Environment Design/Build): Many sections / details on plans show thermal bridging, it is just not addressed (or recognized as a problem). Passive house addresses thermal bridging calculations too.
        - Eileen Dutton (Malarkey Roofing): Typically, we see these details when larger roof design firms are involved - I would say I have seen more in the Bay Area, so it really depends on the architectural firms used. I cannot say I see it in the many tilt ups specs we see, but then they typically utilize minimal energy, as they are typical warehouses.
            - Benjamin Zank (Energy Solutions): That is good to know. We will follow up with you offline.
- George Nesbitt (Environment Design/Build): Continuous insulation is the best way to eliminate thermal bridging, both assembly intersections as well as within assemblies.
    - Benjamin Zank (Energy Solutions): Thank you for the comment. Continuous insulation is very important when attempting to address thermal bridging. Do you have recommendations on how to do it cost effectively? We will connect offline.
    - Steve Dubin: When you ask about doing Continuous Insulation "cost-effectively" - that seems to imply there is a current method that it would be an alternative to that you are trying to closely emulate cost-wise. I am curious about those methods.
    - George Nesbitt (Environment Design/Build): I have seen a number of high-rise multifamily projects using continuous wall insulation (foam & rock wool). I have seen less in commercial. There is a spec developer in the south bay that renovates concrete tilt up to class A office, using continuous insulation. Costs less with HVAC downsizing.

- Matt Christie (TRC): A technical concern of mine; if, during compliance implementation, we introduce a new thermal-loss pathway to represent the thermal bridges then we have added HVAC load to the modeling results potentially breaking calibration between modeled and real uses. It could require re-calibration by reducing the contributions of other portions of the total load.
    - Benjamin Zank (Energy Solutions): On the other hand, the model is not accurately describing thermal bridging currently, which means currently there is a mismatch.
    - Michael Hsueh (RDH Building Science): Matt, can you explain your concern a bit more? I think increased HVAC load due to thermal bridging is part of the point of the simulation -- to also understand the energy (and energy cost) impacts of thermal bridging.
    - George Nesbitt (Environment Design/Build): If HVAC systems are not being undersized, then there is no mismatch. But that may just be because HVAC is oversized, so the mismatch is masked.
- Matt Christie (TRC): Agreed that we want to account for the total load on the building, inclusive of these thermal-bridge pathways. I suppose it hinges on if we feel our current CBECC/CSE modeling is decently calibrated and accurate to real energy use. If current modeling shows accurate load (but without any accounting for thermal bridges) that implies the current load calcs are overstating something, and we will need to tweak another load. If current modeling is below real-usage, because it is missing this thermal bridge load, then moot. Adding it in is easy.
    - Michael Hsueh (RDH Building Science): Matt, I see that makes sense. If the prototype models are based on something calibrated from real life, you would need to find a way to back calc the contribution of thermal bridging.
- Inna Dolottseva (Interface Engineering): I am mostly working with commercial and high-rise buildings. No one wants to install continuous insulation and trying to find ways out. One of the reasons I have heard is that c.i. is expansive and second that contractors do not know how to do install it. The only projects I had which care about envelope performance are NZE. During VE the envelope is the first one to go. On the other note, CBECC-COM is not the best software to see impact of thermal bridging
    - George Nesbitt (Environment Design/Build): modeling thermal bridging in THERM is difficult
    - Jeffrey Boldt (IMEG Corp): I would love to push this forward in 90.1. I live in Wisconsin, where thermal bridging is a much bigger problem because of our cold climate
    - Steve Dubin: Insulation is not as expensive as some think it is, it is more of a matter of inexperience. There are CI out there that can achieve energy needs and NFPA requirements without even using exterior gyp. Some can also qualify as Air and Weather barriers - this significantly reduces the cost of the exterior assembly. Sometimes it is thought of as expensive when it is added to the assembly they are already doing instead of removing parts of the assembly that would no longer be needed.
    - Inna Dolottseva (Interface Engineering): Steve Dubin. Thank you for input. Could you share the brand of that C.I., please?
    - George Nesbitt (Environment Design/Build): my impression is continuous roof deck insulation is removed during re-roofing. unsure about replacement. There is a market to buy used rigid insulation from roof tear offs (I have bought to insulate my house & garage)
    - Michael Malinowski (Applied Arts): Adding CI above roof deck will have significant impacts on flashing; parapet heights may no longer be code compliant; etc. This has to be viewed from a 'whole building code' perspective.

- Inna Dolottseva (Interface Engineering): Also New York City started to REALLY look at the envelope and all detail and comparing to energy models. They are asking to provide air barrier details, thermal bridge, insulation, air leakage rates and calculate all U-values. they might have a great input too.
- Steve D: Inna, I am specifically referring to polyisocyanurate, but other CI's also have options beyond just "adding" them to existing assemblies

4.3. Submeasure: Roof Alterations

- *Alamelu Brooks (Energy Solutions, Statewide CASE Team) presented.*
- Sid Dinwiddie (PABCO Roofing): Removal of exception for lifting rooftop devices, how can a cost effectiveness evaluation be enveloped for this?
  - Benjamin Zank (Energy Solutions): Do you have any cost data that you could provide?
  - Sid Dinwiddie (PABCO Roofing): The costs will be so job specific, this will trigger the considerations of practicality and enforcement. Cost data will be nearly impossible to develop or even estimate!
- Andre Desjarlais (ORNL): The code will need to address how to deal with obstructions on the roof with respect to added above deck insulation. Will roof equipment need to be moved? How are the costs of these issues factored into the requirements?
  - Sean Denniston (New Building Institute): The IECC refined the terms for various roofing projects in the 2015 edition. They drew pretty clear distinctions between re-roofing and roof replacement. Defining the activity is key to crafting requirements that will work.
  - Steven Wadding (PolyGlass USA): Adding additional insulation to existing buildings often incur many additional expenses i.e.; raising doors and window elevations, equipment, penetrations, etc. cost is rarely just the cost of adding additional insulation.
  - Lee Shoemaker (MBMA): Depends on the type of roof.
  - Benjamin Zank (Energy Solutions): Andre that is certainly true. If you have recommendations on how to consider moving equipment it would be great to connect.
  - Andre Desjarlais (ORNL): I wish I had a solution for you; installation costs for reroofing is often much higher than new roof installs because you have to deal with all of the existing conditions.
- Chadwick Collins (Kellen Company): A building that is 10 years old is less likely to have the more cost prohibitive issues for adding insulation above the deck. Those issues arise more/are more significant as the age of the building increases.
  - Chadwick Collins (Kellen Company): Cost-prohibitive issues include all the ones others have mentioned - access door thresholds, parapet height, penetrations/curb heights, fenestration details.
- Andre Desjarlais (ORNL): Roof replacement type is a function of climate. 20 years is long for most roofing systems.
- **Poll 8: "What percentage of the roof alteration market is replacement of >2000 sq. ft. or >50% of the roof?"**
  - Michael Malinowski (Applied Arts): There are many potential code/safety issues when changing thickness of the roof deck; stair risers, door thresholds, parapet height etc. This cannot be considered just from an insulation standpoint. Insulation contractors are not equipped to consider the full range of code and functional impacts.
- **Poll 9: "Is it current practice to add more insulation when the existing insulation is at least R-7?"**
- **Poll 10: "How often are roofs replaced?"**

- Steven Wadding (PolyGlass USA): For example, Existing to new, look at it not so different from other improvements, older structures were purpose designed i.e.; each room has a particular function, newer design are more "open concept" so to convert enclosed purpose design to more open and fluid comes at a great cost with often many unforeseen issues.
    - Benjamin Zank (Energy Solutions): @Steven we will look at including all relevant costs, thank you.

4.4. Submeasure: High Performance Windows

- *Alamelu Brooks (Energy Solutions, Statewide CASE Team) presented.*
- Matt Manning (OldCastle Building Envelope): These U-factors make sense for residential products but not commercial products. Can there be a delineation between the two?
    - Kiri Coakley (Energy Solutions): Matt, we are looking to evaluate mostly commercial products for this nonresidential measure. Thank you for the input.
    - Matt Manning (OldCastle Building Envelope): I know most commercial projects are simulated and do not use the default values. That being said, many out of state architects want to spend a lot more money than is needed by using the values that require thermally broken framing.
- Michael Weller (Glumac): is there a study that shows how many products are capable of achieving both the RSHGC and VT requirements? These two requirements are extremely prohibitive when combined since they are directly contradictory
    - Kiri Coakley (Energy Solutions): Michael, we are not aware of any studies showing product availability for achieving both RSHGC and VT requirements. We are looking at the relationship between these factors for this measure and can look further into potential studies.
- Thomas Culp (Birchpoint Consulting): Be careful with Energy Star - those are only for single family homes and multifamily 3 stories or less. Different type of windows, different analysis, not necessarily applicable.
    - Kiri Coakley (Energy Solutions): Thomas this is definitely a consideration of ours, regarding EnergyStar. We are referencing as there are some residential buildings that may be used in "light commercial" usage cases, such as schools.
- **Poll 11: "Should the "Curtainwall/Storefront" category be addressed in the 2022 code change proposal? Select all that apply."**
- Mazi Shirakh (Energy Commission): Some manufacturers have started building triple pane glass windows that are getting pretty good U-factors, .16 to .17. There is no reason why this would not work in nonresidential buildings especially since there is more glazing. If a building goes to a triple pane with these lower U-factors, what would the implication on perimeter heating be. This could be a decent compliance option.
    - Michael Weller (Glumac): Major glazing manufacturers just as Viracon and Vitro (PPG) have documentation about it
    - Kiri Coakley (Energy Solutions): Michael, will keep that in mind and look out for further information on the possibility of noble gas-filled leaking. These technologies do exist and are viable in reducing U-factor, but at this time we are still looking for more information regarding market viability
    - Matt Manning (OldCastle Building Envelope): Extremely low U-factor and Krypton filled windows are at a much-increased cost that the market may not be willing to bear at this time.

    - Steven Wadding (PolyGlass USA): Triple pane windows for the SFR market is possible cost bearable as they reduce cost with popularity, for commercial size constructions with increased window quantities and sizes, very significant cost increases.
    - Kiri Coakley (Energy Solutions): We are engaging with LBL to discuss and understand viability for 'skinny triple' technology. This might become a consideration for the next code cycle if data shows that the technology is not yet market ready.
    - Matt Manning (OldCastle Building Envelope): Kiri - Make sure to get with actual glazing contractors/installers and fabricators when discussing 'skinny' triple pane IG units. There is no issue making these in residential sizes but will have challenges on the commercial side.
- **Poll 12: "Should Title 24 prescriptive fenestration requirements vary by climate zone?"**
    - Matt Christie (TRC): Certainly, for SHGC, expressly for the climate zones that higher SHGC can be better (1, 3, 5, 16) due to reduced heating load.
    - George Nesbitt (Environment Design/Build): Window to wall area requirements should be added
    - Leslie Badger (VEIC): George - window to wall ratio requirements are included in the current code. Do you mean it should be added for consideration to the update? WWR is not a proposed code change for the 2022 cycle.
- Kiri Coakley (Energy Solutions): Additionally, if anyone has recommendations for additional stakeholders that we should contact regarding skinny triple, please feel free to reach out after the meeting with that list.
- Matt Manning (OldCastle Building Envelope): CR needs to be evaluated by climate zone. It is pretty meaningless in Southern California where it hardly rains.
    - Steven Urich (NFRC): NFRC and others are working on a new condensation resistance measurement. I would suggest not adding a requirement for CR until that work is done.
    - Kiri Coakley (Energy Solutions): We are currently evaluating window thermal factors. We agree that condensation resistance should be evaluated by CZ, but this is not a proposed code change for the 2022 cycle.
- Jeffrey Boldt (IMEG Corp): Have you investigated the economics of FRP windows vs. triple pane or thermally broken. Some of the new products look very good.
    - Karen Bushey (VEIC): Jeffrey thanks for your comment. We have not yet evaluated economics but will definitely keep these types in consideration.
- Michael Weller (Glumac): is this measure investigating the further incorporation of the NFRC CMAST tool into the compliance process? it would be extremely beneficial to designer/energy consultants to be able to use CMAST calculations during the design process (NFRC currently charges significant fees to be able to use it)
    - Kiri Coakley (Energy Solutions): Michael, the compliance process is still under development. We can look into incorporation of the NFRC CMAST tool, but the focus is to ensure an efficient, effective and accessible compliance process.
- Jeffrey Boldt (IMEG Corp): For cold climates, we had -29F in January in Wisconsin, if buildings are humidified a CRF of ~65 is needed even if the installation is pretty good.
- Michael Weller (Glumac): for new construction, the WWR and SHGC/VLT requirements drive almost every new construction project to Performance (commercial projects)
- George Nesbitt (Environment Design/Build): I am not as familiar with the NR code than with LRR. But it seems that 100% glazing is still possible (offices, even HR Res). Even with "high performance glazing" many experts would say 100% glazing does not make an energy efficient building. Perhaps WWA should be a mandatory requirement?

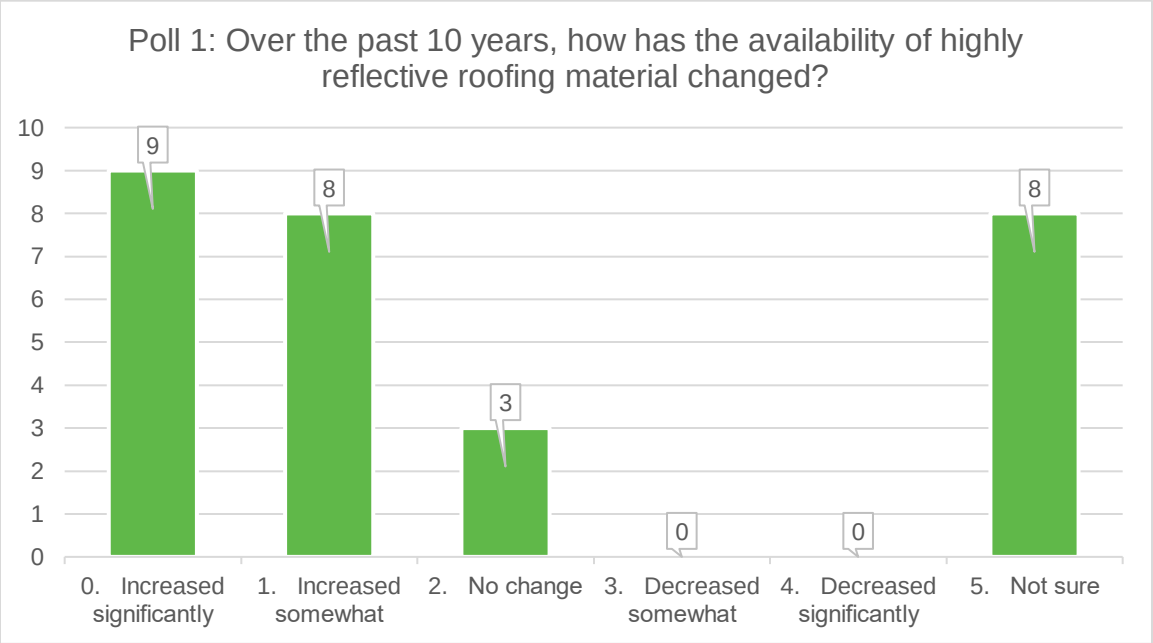
- Matt Christie (TRC): George there is a 40% WWA ratio limit for most NR building types.
- Michael Hsueh (RDH Building Science): The 40% WWR limit is on prescriptive path only
- Matt Christie (TRC): Michael - yes, the limit is, but there is a significant performance penalty for crossing that threshold in modeling
- Michael Hsueh (RDH Building Science): Matt -- The performance penalty is still generous enough such that many new buildings with 90-100% WWR continue to be permitted and built. That seems to be a disconnect from the state energy goals, but I think that is a question that begs further analysis

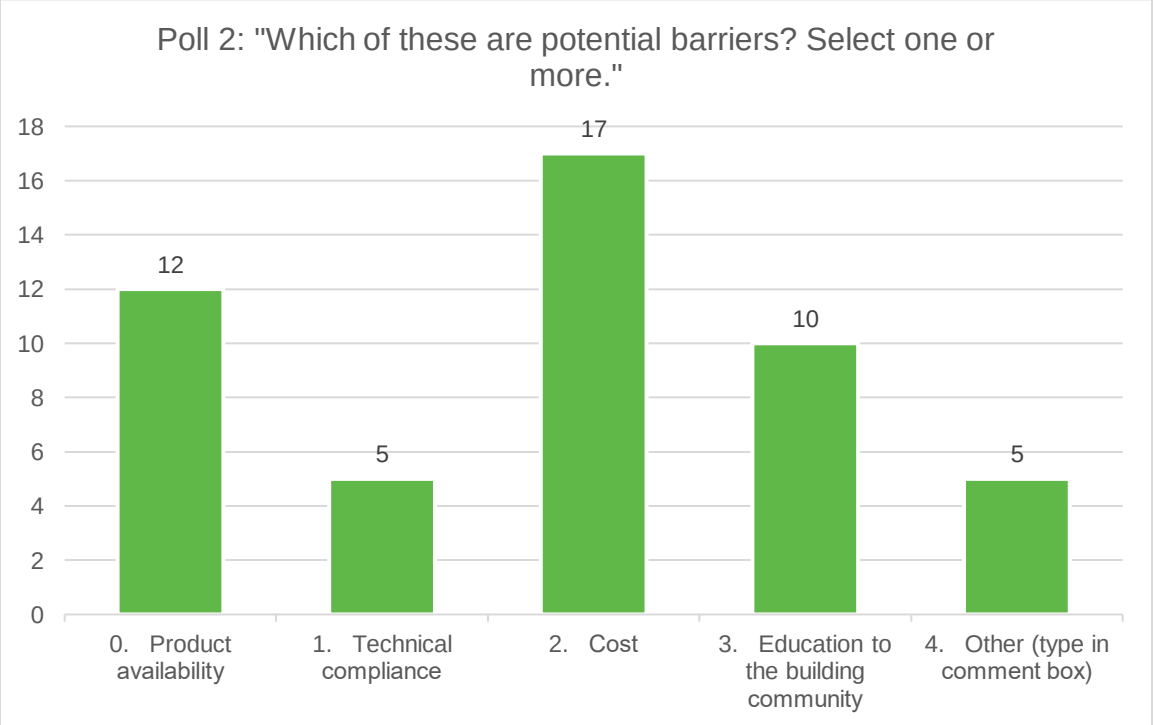
4.5. Submeasure: Opaque Envelope

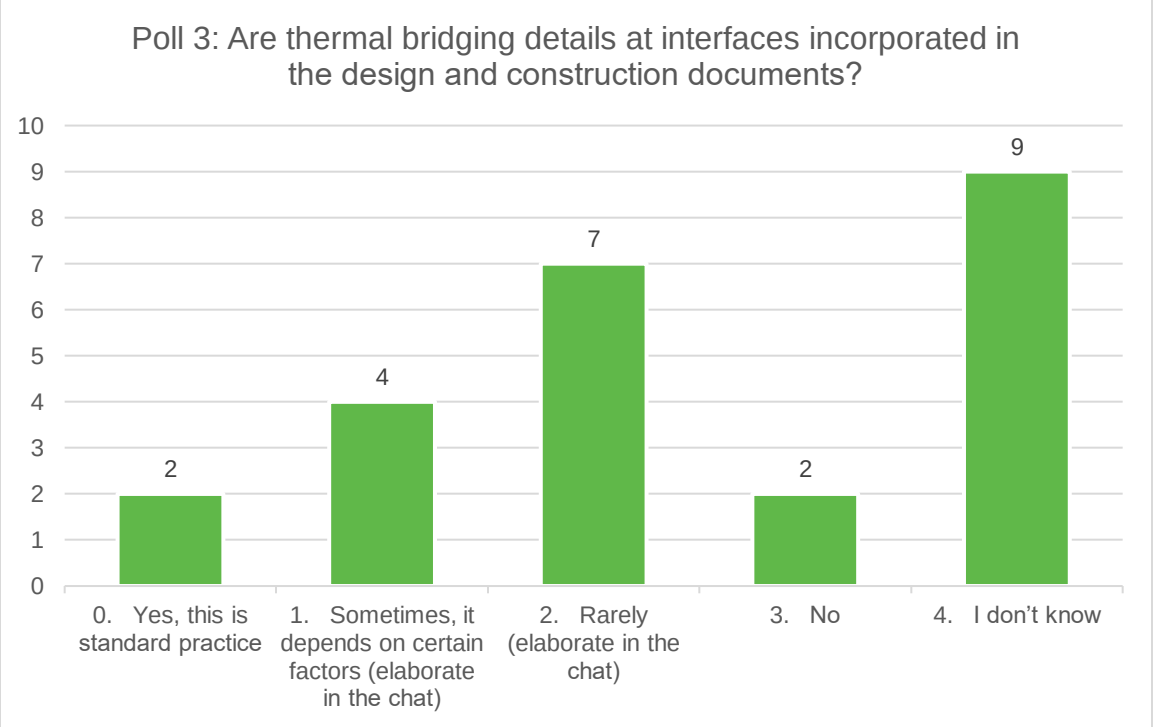
- *Alamelu Brooks (Energy Solutions, Statewide CASE Team) presented.*
- **Poll 13: "Which Compliant method is widely used in California?"**
- Jon McHugh (McHugh Energy): Interesting that poll results show the fraction of performance requirements used is at odds with my interviews with Gina Rodda
- Robert Hart (LBL): Has there been any thought of considering the envelope performance as a whole, and not dividing into individual pieces such as window/wall/etc.?
    - Kiri Coakley (Energy Solutions): Yes. We have divided the envelope into these submeasures in order to evaluate part performance at a more granular level, and then plan on evaluating envelope performance as a whole with CBECC-com
    - Jeffrey Boldt (IMEG Corp): I think overally UA would be a good approach. There is glazing available today with R-20, but it is expensive.
    - Michael Weller (Glumac): @robert/jeffrey - the "envelope tradeoff" method was eliminated back in 2013 (I think) with the theory that this type of calculation was able to be done in a performance model. You can even do "envelope-only" energy modeling on the Nonresidential side
    - Jeffrey Boldt (IMEG Corp): 90.1 allows the UA method. I am not sure about T24. People seldom use it though because the windows are pretty expensive.
- **Poll 14: "Should Title 24 have Total UA (Component Performance Alternative) like Washington State Code or IECC?"**
    - Kiri Coakley (Energy Solutions): If you respond "No" to this poll, please respond in chat with your reasoning.
    - Matt Christie (TRC): I responded n. the Energy Commission removed this method in 2013 o to the UA alternative - my reasoning being that it has not been used as a method in other codes very effectively and is a departure from current T24 norms. but I would not die on this hill either. Just an opinion. A lot of work to build an alternate pathway that may not be used.
    - Robert Hart (LBL): It is not just UA, SHGC should be considered as well
    - Kiri Coakley (Energy Solutions): Thank you for the input. At this time, we are not set on (just) the UA method, so we appreciate any feedback that could indicate how to improve on that approach.
    - Michael Weller (Glumac): I answered "I Don't Know" but you should look at Section 143(b) of the 2008 standards which was called "Overall Envelope TDV Energy Approach" which was essentially UA method
    - Kiri Coakley (Energy Solutions): @Michael Weller (Glumac), thank you. We have looked at the 2008 code and can further review its relevance regarding evaluation of the UA method for the 2022 proposed changes.

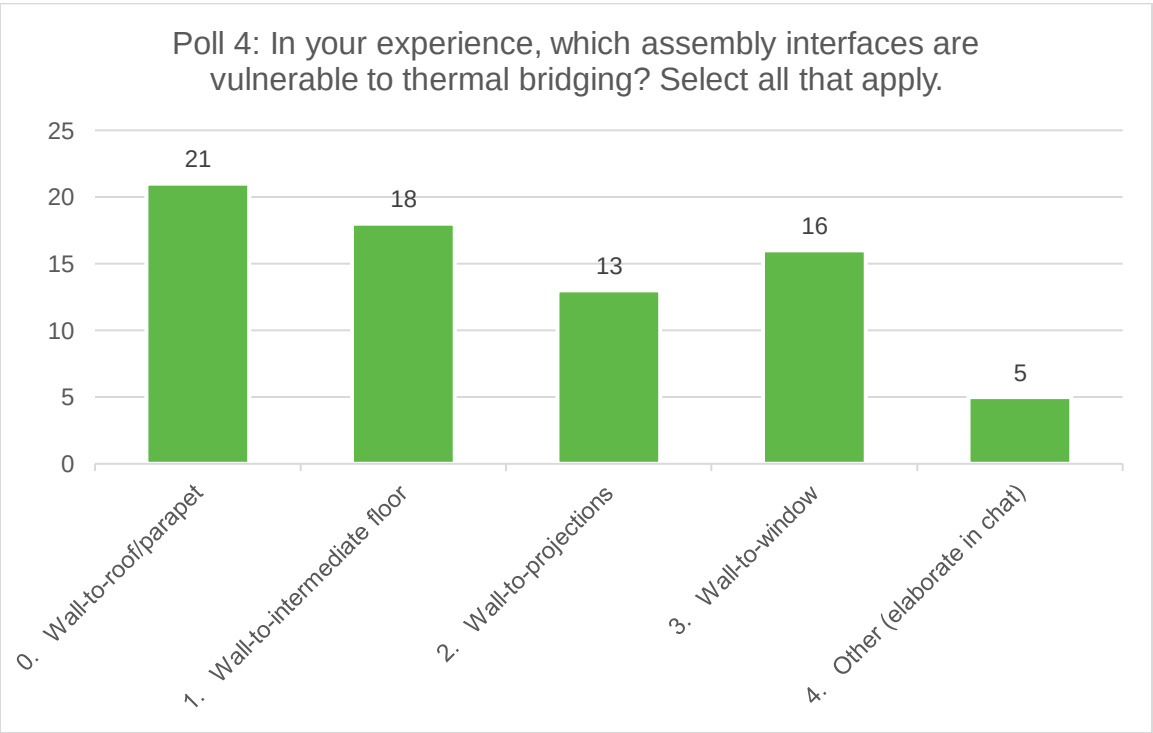
- George Nesbitt (Environment Design/Build): WWA is a perfect example of the problem with tradeoffs. You can "suffer" a large energy penalty by trading off assembly u-values & window areas (going over 40%), but because we allow you credit for "more efficient" other systems (HVAC, water, lighting) you can do it.
- Michael Winkler (City of Arcata): electrification and elimination of end-uses of natural gas has become increasingly important.
    - Kiri Coakley (Energy Solutions): @Michael Winkler, there are other measures for the 2022 code cycle that consider electrification in further detail than this measure, NR opaque envelope. For example, I would recommend looking at Multi-family all-electric pathway if this is of interest to you.
    - Michael Winkler (City of Arcata): Our company, Redwood Energy, has been the CEA company and HERS Rater for more than 200 all-electric large multi-family housing projects. Less than 20 of these have been high-rise. We are least familiar with acceptance test requirements for both the residential areas of our high-rise projects and the common areas for all our projects.
- **Poll 15: "Should title 24 continue tradeoffs between envelope and non-envelope measures in the performance compliance method?"**
    - George Nesbitt (Environment Design/Build): Building enclosures have longer lives and cost more to upgrade. Equipment have shorter lives, have to be replaced, and have more cost-effective opportunities to improve efficiency.
    - Shawn Mullins (Owens Corning): Envelope is the foundation of the performance of the home. Tradeoffs against this are counterproductive.
    - Daniel Arevalo (Mobile Modular): giving a designer options for path to compliance also serves the owner as well.
    - George Nesbitt (Environment Design/Build): the reason many want all EE measures tradeoff-able is that they can do what they want
    - Brian Selby (Selby Energy): The performance approach provides flexibility for compliance and restricting envelope performance to tradeoff on only envelope measures reduces that flexibility. May as well use prescriptive approach if this changes.
    - Inna Dolottseva (Interface Engineering): or we only should do envelope tradeoff within the envelope.
    - Helen Sanders (Technoform): While some tradeoffs make sense, to allow higher Window area, it is important to remember that the envelope impacts occupant comfort as well as energy. Allowing fenestration thermal performance o be lower than the prescriptive values when higher performance products are available may deprive occupants of a comfortable perimeter zone.
    - Kiri Coakley (Energy Solutions): @Helen, agreed. We understand that the thermal factors under consideration for the high-performance windows measure can greatly affect occupancy comfort, and this is definitely a consideration.
    - George Nesbitt (Environment Design/Build): passive house requires you to meet a maximum demand for heating & cooling, no tradeoffs allowed
    - Sean Denniston (New Building Institute): Late answer to an earlier question: T24 should maintain the envelope tradeoff flexibility, but it should be paired with more aggressive backstops to prevent the tradeoff of too much envelope efficiency.
- Andre Desjarlais (ORNL): Why is airtightness not being considered in the code update.
    - Alamelu Brooks (Energy Solutions): This is addressed in the next Envelope meeting.

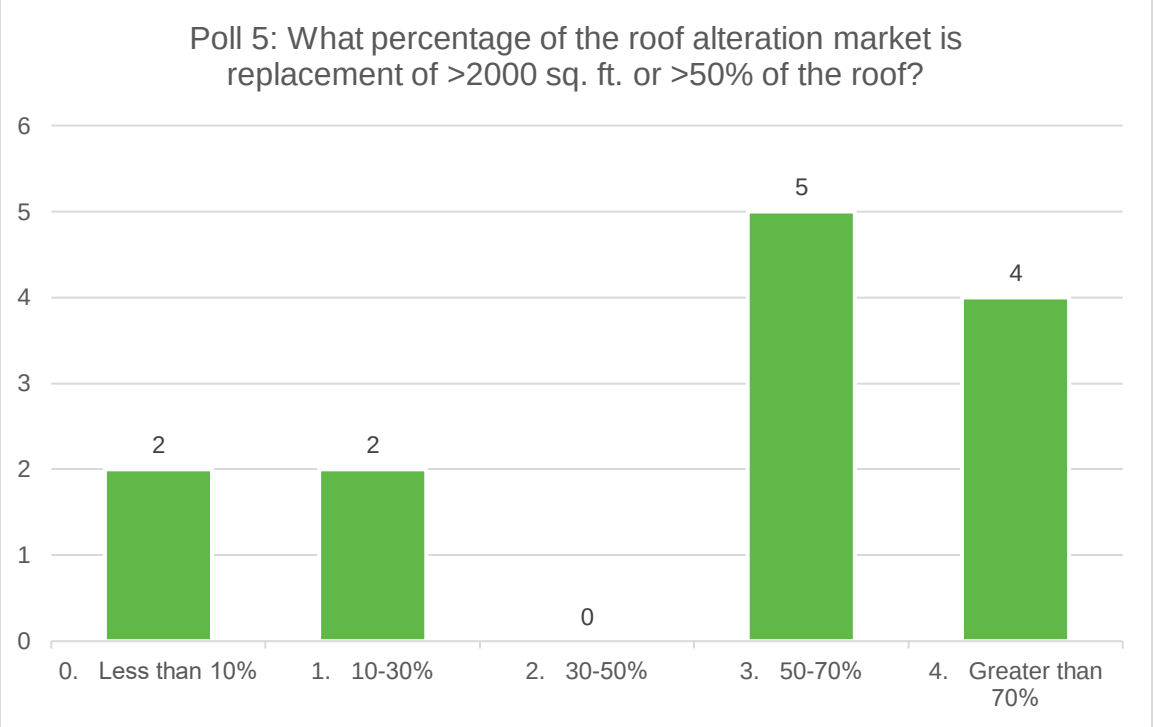
Poll Results:

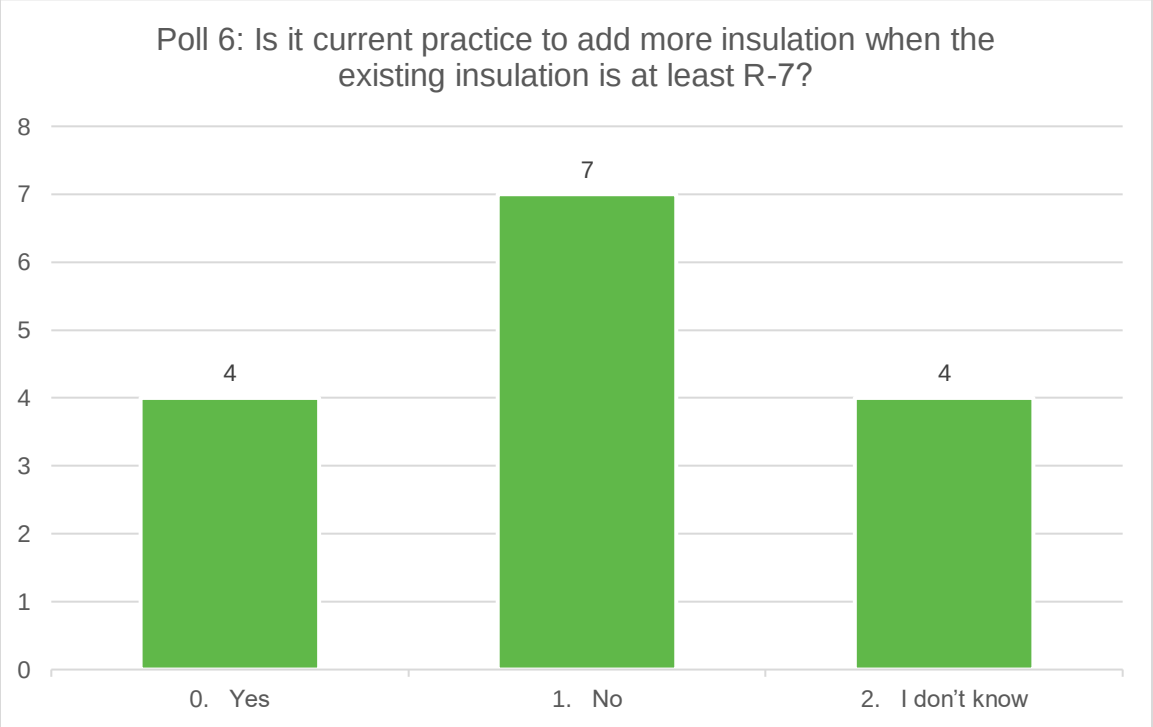


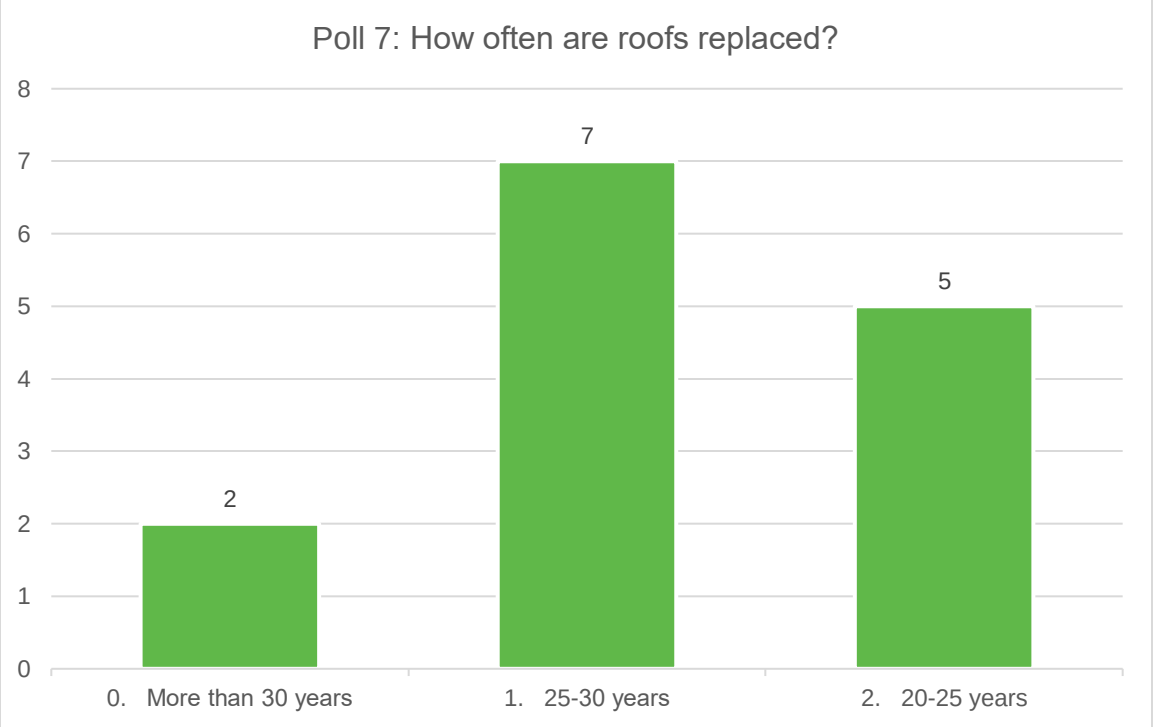


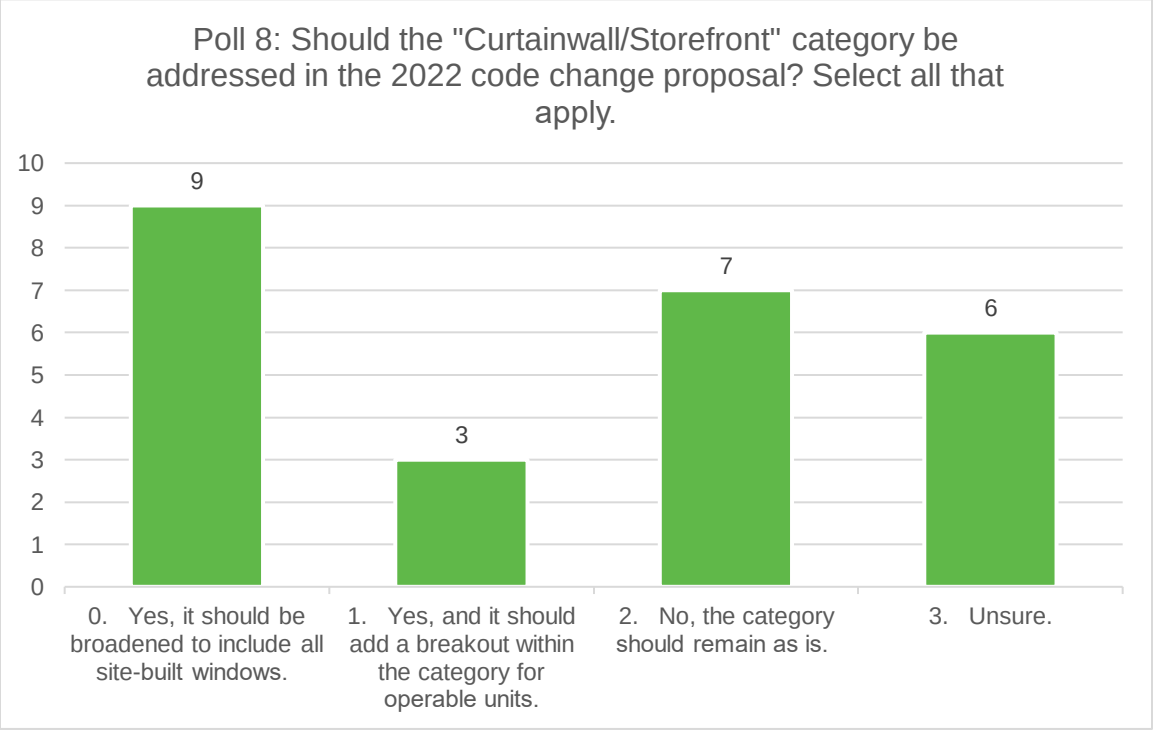


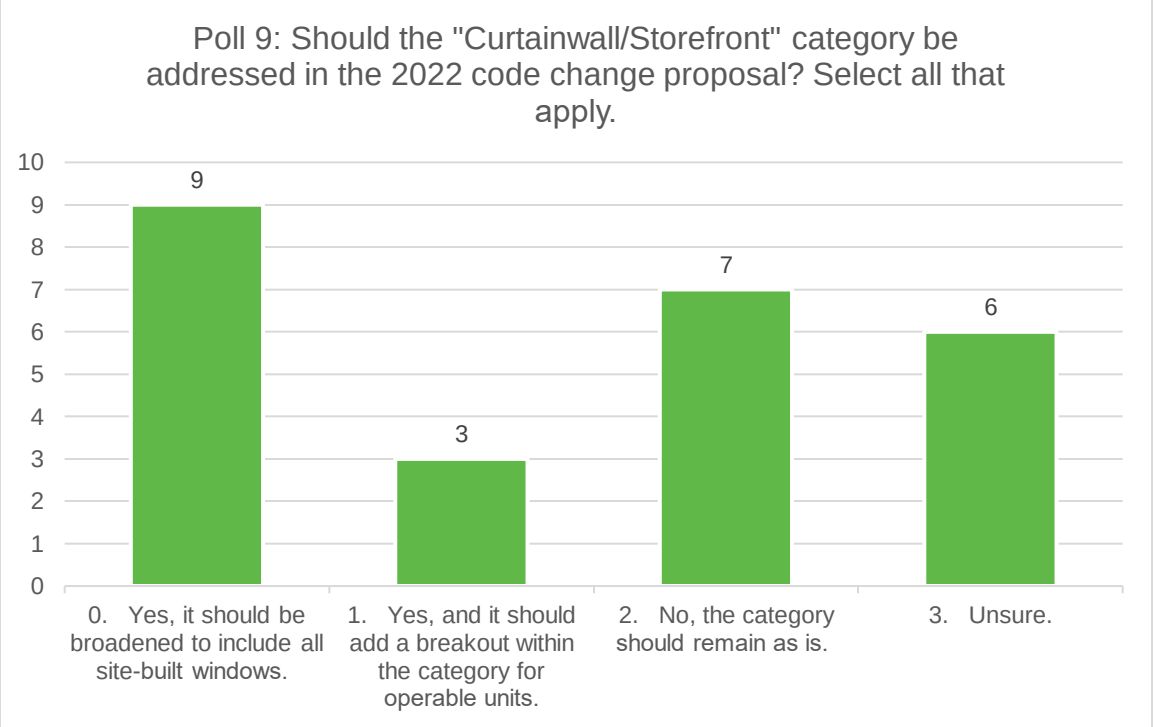


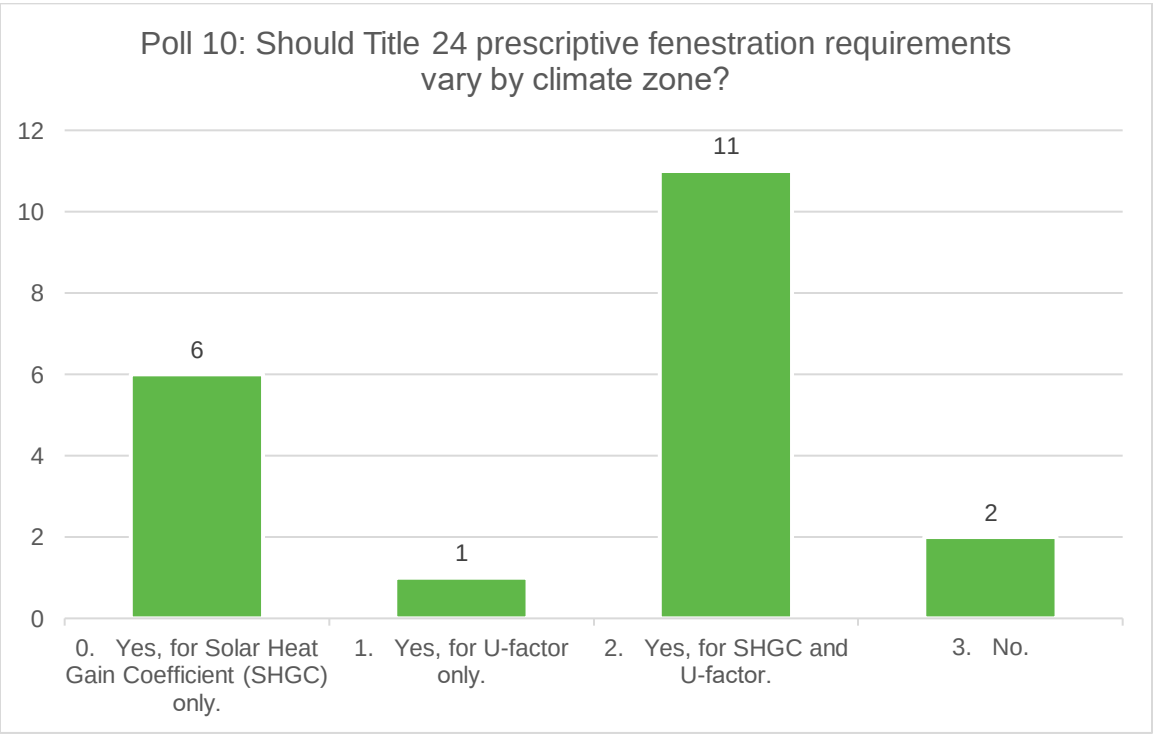

Poll 5: What percentage of the roof alteration market is replacement of >2000 sq. ft. or >50% of the roof?
6
5
4
3
2
1
0
2
2
0
5
4
0. Less than 10%
1. 10-30%
2. 30-50%
3. 50-70%
4. Greater than 70%

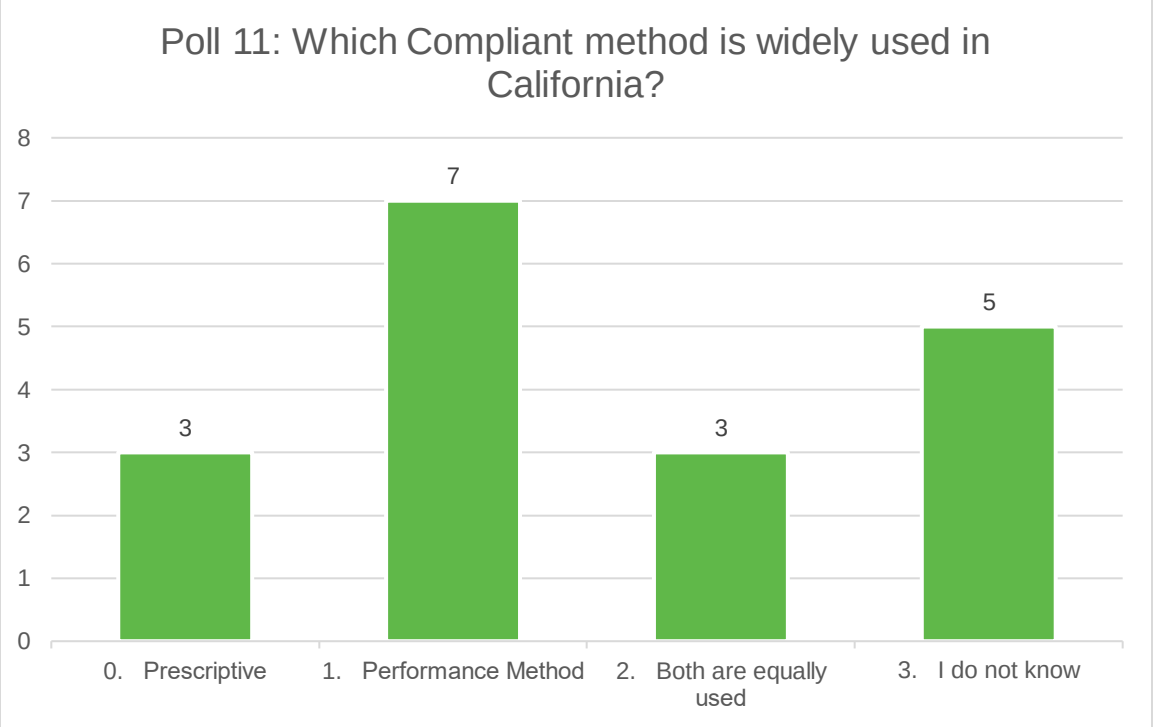

Poll 6: Is it current practice to add more insulation when the existing insulation is at least R-7?
8
7
6
5
4
3
2
1
0
4
7
4
0. Yes
1. No
2. I don't know

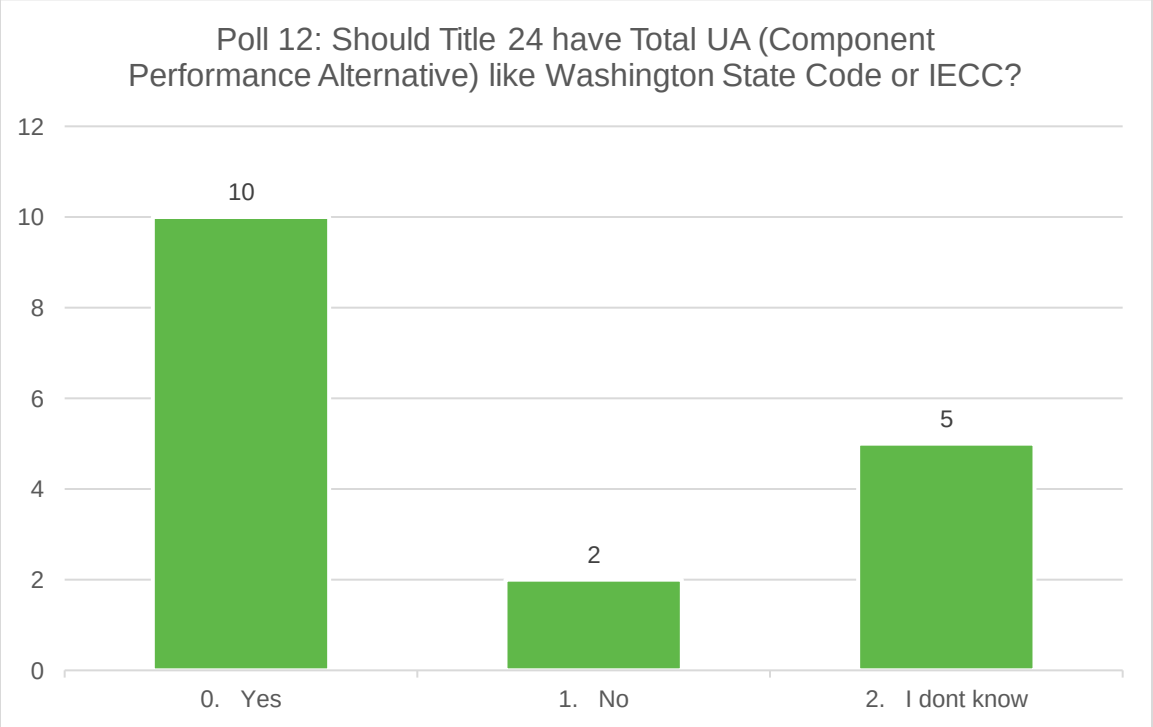


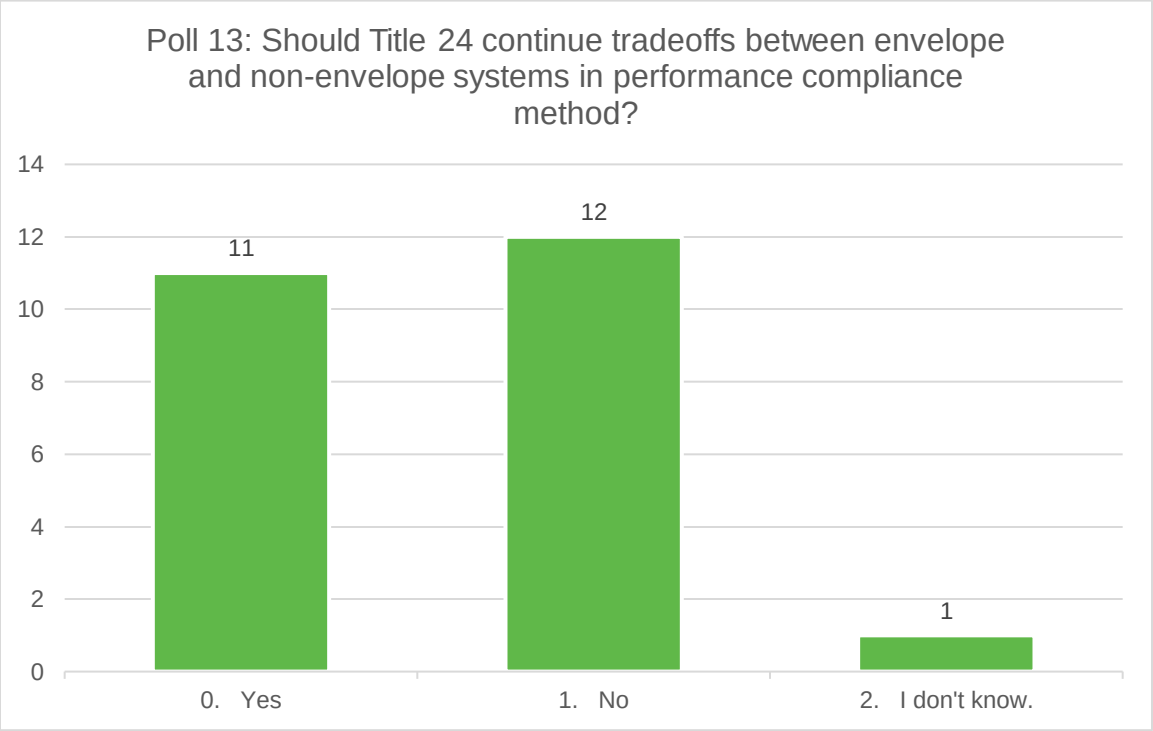



Poll 9: Should the "Curtainwall/Storefront" category be addressed in the 2022 code change proposal? Select all that apply.
10
9
8
7
6
5
4
3
2
1
0
9
3
7
6
0. Yes, it should be broadened to include all site-built windows.
1. Yes, and it should add a breakout within the category for operable units.
2. No, the category should remain as is.
3. Unsure.


Poll 10: Should Title 24 prescriptive fenestration requirements vary by climate zone?
12
10
8
6
4
2
0
6
1
11
2
0. Yes, for Solar Heat Gain Coefficient (SHGC) only.
1. Yes, for U-factor only.
2. Yes, for SHGC and U-factor.
3. No.


Poll 11: Which Compliant method is widely used in California?
8
7
6
5
4
3
2
1
0
3
7
3
5
0. Prescriptive
1. Performance Method
2. Both are equally used
3. I do not know


Poll 12: Should Title 24 have Total UA (Component Performance Alternative) like Washington State Code or IECC?
12
10
8
6
4
2
0
10
2
5
0. Yes
1. No
2. I dont know


Poll 13: Should Title 24 continue tradeoffs between envelope and non-envelope systems in performance compliance method?
14
12
10
8
6
4
2
0
11
12
1
0. Yes
1. No
2. I don't know.