Meeting Notes

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

Posted December 4, 2019

Nonresidential HVAC and Envelope Part 2: Air Distribution, Air Efficiency, Guest Room Controls, and Reduced Infiltration Utility-Sponsored Stakeholder Meeting

Meeting Information

Meeting Date: November 5, 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	Energy Solutions
8:30	Meeting Guidelines	Energy Solutions
8:35	California Energy Commission Introduction	Payam Bozorgchami (Energy Commission)
8:40	Overview and Welcome	Kelly Cunningham (PG&E)
8:45	**CASE Presentation I:** HVAC Controls (Part 2) • Air Efficiency • Guest Room Controls	Tim Minezaki (Energy Solutions) Shaojie Wang (Energy Solutions) Ben Brannon (Arup)
9:45	**CASE Presentation II:** Air Distribution • High Performance Ducts • Fan Efficiency Index* • Duct Testing	Benny Zank (Energy Solutions) Shaojie Wang (Energy Solutions) Chad Worth (Energy Solutions) Mark Modera (WCEC) John Bade (2050 Partners) *
11:00	**CASE Presentation III:** Reduce Air Infiltration	Alamelu Brooks (Energy Solutions)
12:00	Next Steps	Energy Solutions
12:15	End	Energy Solutions

Meeting Attendees

Name	Email	Affiliation
Statewide Utility Codes and Standards Team		
Utility Staff		
Jeremy Reefe	jmreefe@sdge.com	San Diego Gas and Electric
Jim Kemper	James.Kemper@ladwp.com	Los Angeles Department of Water and Power
John Barbour	jbarbour@sdge.com	San Diego Gas and Electric
Kelly Cunningham	Kelly.Cunningham@pge.com	Pacific Gas and Electric
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Payam Bozorgchami	Payam.Bozorgchami@energy.ca.gov	California Energy Commission
Peter Strait	Peter.Strait@energy.ca.gov	California Energy Commission
Stakeholder Attendees		
John Bade		2050 Partners
Amber Ryman		ACCO Engineered Systems
Aaron Gunzner		Air Movement and Control Association
Tim Mathson		Air Movement and Control Association
Kezhen Shen		Air-Conditioning, Heating, and Refrigeration Institute
Peter Grant		Beyond Efficiency
Brendan Dineen		Brendan Dineen
Courtney Bonas		Brummitt Energy
Roy Eads		CalCerts, Inc.
Yirui Liang		California Air Resources Board
David Bohac		Center for Energy and Environment

Tom Paine		ConSol
Danuta Drozdowicz		Context Green
Skip Ernst		Daikin
Hiroshi Yoh		Daikin
Eric Shadd		Determinant
Diana Fisler		Diana Fisler
Armin Hauer		ebm-papst, Inc.
Darryl Deangelis		EBTRON
Meg Waltner		Energy 350
Christopher Farrell		Engineered Polymer Solutions
Heather Estes		GAF
George Nesbitt		George Nesbitt
Michael Weller		Glumac
David Dekold		Hartzell
David Stephens		Johnson Controls
Tom Bise		Johnson Controls
Chadwick Collins		Kellen Company
John Woestman		Kellen Company
Frank Cuaderno		Mars Air Curtains
Bruce Severance		Mitsubishi Electric
Emile Wang		Morrison Hershfield
Soph Davenberry		National Energy Management Institute Committee
Steven Urich		National Fenestration Rating Council
Phil Emory		Neudorfer Engineers

Sean Denniston		New Buildings Institute
Amandeep Singh		Nexant
Ben Lalor		NORESCO
Erica Dilello		NORESCO
Bronwyn Barry		North American Passive House Network
Michael Hsueh		RDH
Vrushali Mendon		Resource Refocus
David Dias		Sheet Metal Workers Local 104
Matt Matheny		Soler Palau
Jeff Stein		Taylor Engineering
Gary Nelson		The Energy Conservatory
Amanda Hickman		The Hickman Group
Beth Braddy		Trane
Justin Winters		Trane
Craig Bender		Ventacity
Katie Teare		Western Aero Barrier

Meeting Notes

1. Welcome and Meeting Ground Rules

- *Alanna Torres (Energy Solutions) presented*

2. 2022 Process Overview

- *Peter Strait (Energy Commission) presented*
- *Kelly Cunningham (PG&E) presented*

3. Meeting Resources

- Presentation available here.

- Submeasure summary available here:
  - Updated Economizer Requirements
  - Guest Room Controls
  - Nonresidential Air Distribution

4. HVAC Controls (Part 2)

1.1.1 Air Efficiency

- *Tim Minezaki (Energy Solutions, Statewide CASE Team) presented.*
- DOAS and VAV Minimum Airflow were presented in the HVAC 1 utility-sponsored stakeholder meeting.
- Submeaure Elements
  - Expand economizer requirements.
  - Expand integrated economizer requirements.
  - Change intake/exhaust locations.
  - Powered-modulated relief systems.
- We are attempting to update for recent technological advances.
  - Smaller packaged units have become more cost effective.
  - Advances in variable speed compressors.
  - Better separation of air intake and exhast can reduce short cycling.
- Question from Skip Ernst (Daikin): ASHRAE 62.1 has exceptions (2019 – 5.5.5.1) Are you planning to follow that?
  - Tim Minezaki (Energy Solutions): Jeff Stein from Taylor Engineering may have some thoughts on that.
  - Jeff Stein (Taylor Engineering): Can you enlighten us?
  - Skip Ernst (Daikin): Class 2, class 3 exceptions don't apply to the same outdoor air ventillation system. In my opinion, for a minimum standard, it's probably ok for someone to breathe the same air twice.
  - Jeff Stein (Taylor Engineering): ASHRAE 62.1 perview is for ventilation and health and this is for energy. While it might not be a health issue, it might be an energy issue. If we are recirulating air you may not get the best economizer benefit. We want to ensure there isn't a conflict, but we want to do the analysis to see if there is an energy benefit,
  - Skip Ernst (Daikin): This would be during the economizer process?
  - Jeff Stein (Taylor Engineering): Yes.
- Market Overview: Economizers are a very mature technology with many established manufacturers. Utility programs exist for maintenace, but not for new systems.
  - Comment from Beth Braddy (Trane): One concern about integrated economizers on the new proposed lower size threshold of 3T systems is that it requires a substantial cost add for smaller systems to comply (either with variable speed or multiple compressors). A thorough cost analysis should be performed to justify this. Alsom in light of the lower compressor displacement percentages being proposed.
    - Jeff Stein (Taylor Engineering): Agreed. That is the challenge. I believe variable capacity compressors, like digital scroll will also work.
- Energy and Cost Impacts
  - *Shaojie Wang (Energy Solutions) presented*

    - Question from Skip Ernst (Daikin): You are proposing a ten foot separation between intake and exhast vents. I thnk you'll find that almost no rooftops currently comply, so what you are proposing is pretty revolutionary.
        - Shaojie Wang (Energy Solutions): I totally agree with you. There are many restirctions for mechanical engineers and space limitations.
        - Beth Braddy (Trane): Agree with Skip - - the ten foot separation from outside air intake to exhaust on a single rooftop unit is a huge issue. Will have to review the separate faces of the air handler unit with our design team to determine if there are any repercussions of this in rooftop unit design and will send comments if so.
        - Jeff Stein (Taylor Engineering): To clarify, the proposed language specifies ten feet of separation or positioning the exhaust and intake on different faces of the unit. This is trying to avoid scenarios when the outside air intake is stacked directly on top of the exhaust vent.
- **Poll 1:** For our energy-savings model, we plan to model systems that have less than 10ft separation between Outside Air and Exhaust Air at 30% exhaust re-entrainment. 30% is:
- **Poll 2:** Our measure intends to require power-modulated relief for design exhaust flow rates exceeding 2,000cfm. Is 2,000 cfm:
- General Discussion regarding Air Efficiency Submeasure
    - Question from Skip Ernst (Daikin): When you talk about compressor turndown based on capacity. I think cooling capacity is sometimes mixed up with compressor displacement or some other theoreticals. You certainly have to specify at which. It's very different at sixty-five ambient than at seventy-five ambient.
        - Shaojie Wang (Energy Solutions): For cooling capacity, we will keep the current (twenty-ton cooling rated capacity) requirement.
        - Skip Ernst (Daikin): At what condition?
        - Jeff Stein (Taylor Engineering): The point is that it should be clear from the ASHRAE 90.1 manual.
        - Skip Ernst (Daikin): Those documents are not so demanding. Now you're getting into something that's pretty aggressive. To get to ten-percent is a challenge. It might be doable depending on what the details are.
        - Beth Braddy (Trane): I agree with Skip - the new compressor displacement proposal pushes manufacturers to much higher cost solutions, which also may impact product footprint, in order to comply. (We) will do more study and include findings in comments.
    - Skip Ernst (Daikin): Is the thirty-percent exhaset re-entrainment based on any data?
        - Jeff Stein (Taylor Engineering): It's based on some projects we've seen, but unfortunately it's not well established at this point.
    - Skip Ernst (Daikin): It was mentioned in chat that there is more than one type of modulating compressor. So you might establish a different target for one than the other. One other suggestion: you can do good tempearature reset to achieve efficiency and maybe that could be an alternative.
        - Jeff Stein (Taylor Engineering): The focus on this meausure is not really on compressor efficiency. The focus here is really on making sure the economizer is able to do its job. The intent here is to really capture a more true economizer efficeincy. But as you say, there are compressors that are more efficient. It's worth looking into whether we can give credit for that.

        - Skip Ernst (Daikin): Yes, these are aggressive levels, so it might be good to look at providing alternatives.
        - Shoajie Wang (Energy Solutions): Thank you, for the feedback.
    - Question from Bronwyn Barry (North American Passive House Network): Preface (this is not my area of expertise) but have these economizers been looked at in comparison to energy recovery ventilation options?
        - Jeff Stein (Taylor Engineering): There is a separate measure looking at energy recovery ventilator. Analyses in past code cycles have shown economizers have much greater energy savings than energy recovery ventilators.
        - George Nesbitt: Economizer is a cooling stratagy, not a ventilation. Well, it can do both. Cooling and heat recovery would be done at different times.

1.1.2 Guest Room Controls

- *Ben Brannon (Arup, Statewide CASE Team) presnted.*
- Context and History: Currently required in ASHRAE 90.1-2016 & IgCC 2018 (ASHRAE 189.1-2017).
- Proposed Code Change Overview
- Methodolgy for Energy Impacts Analysis
    - Question from Beth Braddy (Trane): Is it your perception that the new guest room control measures are managed by a building control system or would you expect unit level controls to be able to also perform these control sequences?
    - Ben Brannon (Arup): The language is currently written with the assumption that guest rooms can have a building level control, but that most rooms have room-level control, so that building level will not be required.
- **Poll 3:** This measure proposed to retain the 5°F setup/setback currently in Title 24, Part 6, which is more strict than 90.1.Do you agree that this setup/setback is beneficial from an energy standpoint?
    - Comment from George Nesbitt: Occupancy could be viewed as two things: when it's rented, and when someone is in the room
    - Ben Brannon (Arup): That's a good point. That's what we want to consider the following two scenarios separately: 1) unrentend and unoccupied vs 2) rented and unoccupied
- **Poll 4:** Do you agree that it will be beneficial to consolidate all occupancy based sensing/measurement requirements (from all disciplines and code sections) into the same section, which would then be referenced by other sections?
- General Discussion regarding Guest Room Controls Submeasures
    - Comment from Bronwyn Barry (North American Passive House Network): Surely most cost-optimized option would be an integrated unit that provides cooling and ventilation plus localized/modulated zone control? I saw this unit in China last month. (Our product market is unfortunately immature and we're missing HUGE cost and efficiency opportunities.) See this website: www.wonderful-tc.com
    - Ben Brannon (Arup): I would agree with that. The intention is not to specify or require specific types of controls. To clarify, this comments is regarding the previous measure regarding economizers, not guest room controls?
    - John Bade (2050 Partners): A unit ventilator?
    - Bronwyn Barry (North American Passive House Network): Looks like the 'Wonderful-TC' website is still only in chineese... (Sorry about that!) I have their brochure in english and would be happy to scan and share. (email me at: bronwyn@naphnetwork.org)

- John Bade (2050 Partners): Google translated it for me.

1.1.3 Air Distribution

- *Chad Worth (Energy Solutions, Statewide CASE Team) presented.*
- All three submeasures being presented today are preseciriptive nonresidential prescriptive measures that will require software updates.
  - High Performance Ducts
  - Fan Efficiency Index
  - Duct Testing
  - **High Performance Ducts**
    - Draft Code Change Language: Defining Multi-Zone Variable Air Volume (VAV)
    - Comment from Skip Ernst (Daikin): Might be more clear to say multiple zone VAV instead of multizone
      - Tom Bise (Johnson Controls): Agreed.
      - John Bade (2050 Partners): Agreed - will make that change. Thanks.
    - Question from Skip Ernst (Daikin): Fan power regulation,
    - Chad Worth (Energy Solutions): For fan efficiency index we are proposing to roughly adopt what ASHRAE has adopted, but more information will be addressed in next measure, noted that fan efficiency index also in the pre-rulemaking stage in Title 20.
    - Skip Ernst (Daikin): I think this approach along the lines of 90.1 is the far better approach. Fan efficiency index vs. duct pressure losses, and it's best to do that all in place and not be too presectiptive and allow innovation to try and achieve it. Title 20 is a one-size-fits-all solution. Also, you can't save energy twice.
    - Alejandro (Alex) Galdamez (Energy Commission): We are in the pre-rulemaking process for Title 20.
    - Question from Alejandro (Alex) Galdamez: Does this apply to HVAC only? Fans for embedded in the units?
    - Chad Worth (Energy Solutions): This will effect all fans that are subject to the current fan power limits. We are not proposing to change the scope of type of fans of those, just the fan power limits, and the input power threshold
    - Comment from George Nesbitt: When Title 20 is changed you can't claim savings in Title 24.
    - Chad Worth (Energy Solutions): I think the next presentation will help clarify.

1.1.4 Fan Efficiency Index

- *Chad Worth (Energy Solutions) presented*
- Chad Worth (Energy Solutions): There are key differences between Title 20 pre-rulemaking proposal and Title 24, Part 6 code change proposal.

- Question from Beth Braddy (Trane): I thought you said it earlier, but packaged equipment (or equipment already regulated on equipment efficiency in the efficiency tables) would be exempt from fan efficiency index, correct?
    - Chad Worth (Energy Solutions): Correct. This will be a little more clear when you see our exact proposal. Our proposal is not to regulate packaged equipment that is already regulated. Also, to be clear, condensor and evaporator fans are not in the proposed scope.
    - John Bade (2050 Partners): The current proposal has the same exemptions as 90.1-2019.
- Question from Meg Waltner (Energy 350): To clarify, the earlier fan power requirements would apply to packaged equipment but fan efficiency index would not as currently being proposed?
    - John Bade (2050 Partners): It depends on the packaged equipment. If the equipment is not in the effiiciency tables and does not have a 3rd party energy consumption certifications (e.g. custom air handling units not cetrtified under AHRI 430) then it would be covered under the current ASHRAE proposal.
- Comment from Skip Ernst (Daikin): Replacement fans need in some case special considerations. If there is an electric heater or seizmic certification involved, there is a good chance the exact same fan is the only one safe to use.
    - Chad Worth (Energy Solutions): This conversation has come up extensively thoughout the ASHRAE and DOE process. Do you have a good barometer on the extent to this effect at fan efficiency index = 1.0.
    - Skip Ernst (Daikin): I can understand when you might open up the scope to "Air Handlers" but then you bring this issue in to play.
    - John Bade (2050 Partners): We have to look at pure replacement vs. new construction or rennovation. If you're just replacing an existing unit, it isn't covered by Title 24. I don't believe a pure replacement would be in the scop of this.
- Question from Armin Hauer (ebm-papst, Inc.): Did you consider aiming for fan efficiency index >1.00 at the air system design duty point? - How about requiring fan efficiency index ≥ 1.00 or 1.10 at all (!) duty points? including economizing?
    - Chad Worth (Energy Solutions): When you refer to "all duty points" are you assuming if you had a variable speed drive? If that's the case, what we've seeen that the fan efficiency index will go up, assuming your design point is you max speed? Can you design and fan efficiency index of 1.0, but move to a lower fan efficiency index?
    - John Bade (2050 Partners): As you go down the system curve and as the system curve changes, you could go to an fan efficiency index that <1, but remember once you're down there your fan is losing much less power because we are following the cube law. My concern with requiring it at all points is that it adds a fair bit of complexity to the design process. Not only do you have to do more calculation, that fan could be running at many curves in different conditions. I understand where Armin is coming from, but I think we would have a tough time with that.
    - Armin Hauer (ebm-papst, Inc.): Thanks.
- Comment from Skip Ernst (Daikin): I have very little respect for the Department of Energy (DOE) work. They claim all plenum fans cost the same, difference of about $5 from most to least efficient. They only did a couple of fan tear downs and not all of them are HVAC fans. And then extrapolated that to all fan types. Other data doesn't exist – the only way to get it is to do a lot of private discussions with manufacturers and there's no way we can show that publically. Since that's not practical, we go back to DOE.

    - John Bade (2050 Partners): I hear what you're saying. Keep in mind, the way the code propsal is written, the exemptions are still the same. Frankly, I expect this to mostly effect the selection of stand-alone exhast fans. AMCA (Air Movement and Control Association) came to ASHRAE and were very supportive of this. It's not a matter of product availability when people could select a compliant fan for very nearly the same cost.
    - Skip Ernst (Daikin): I wasn't really speaking against the work you're presenting, I just can't resist pointing out how I feel about the DOE work.
    - Meg Waltner (Energy 350): I hear Skip's point, but do think the DOE NODA (notice of data availability) data is reasonable to use for what you are considering here and likely the best source of information available.
- **Poll 5:** What fan efficiency index levels should the Statewide CASE Team pursue for our proposal?
- Question from George Nesbitt: does fan efficiency index matter for single speed verses multi?
    - John Bade (2050 Partners): You bring up a good point. on the multi-speed motor. We will look at it, but I will mention that the 0.95 for variable speed is because fan efficiency index imposes a penalty for the variable frequency drive, and the 0.95 is intended to put them on an even footing with a non-speed controlled fan. Multi-speed motors don't have the same variable frequency drive penalty in fan efficiency index.

1.1.5 Duct Testing

- *Benjamin (Benny) Zank (Energy Solutions) presented*
- **Poll 6:** Which of the two testing methodologies would you use/preferfor VAV supply-air systems with ceiling plenum returns? Please elaborate in the chat.
    - George Nesbitt: You can get the ducts (only) tight, but it's also the grill connections, the air handler, etc... Duct pressurization testing is more representive of leakage than testing supply and return flows.
    - George Nesbitt: It's the tightness for the whole system at operating condition that matters, not rough construction (although this important if ducts are inaccesable).
- Market Barriers: Training for testers
    - Comment from George Nesbitt: HERS Rater is currently required for the energy code
- Technical Considerations
    - Comment from Mark Modera: The idea behind System Air Leakage (SALT) manual was to include leakage associated with portions of the system other than ducts. The idea is to get to total leakage by adding component and duct leakage

5. Reduce Air Infiltration

- *Alamelu Brooks (Energy Solutions) presented.*

1.1.6 Air Leakage

- Comment from George Nesbitt: I've been promoting air leakage in the nonresidental code for a decade. It was allowable in high-rise residential, but only if modeled by the indivual unit, but taken out in 2013?
    - Benjamin (Benny) Zank: George, I'm not familiar with that code language, was it a performance credit?

    - George Nesbitt: Yes, performance credit.
- **Poll 7:** Which air barrier compliance option is common in California?
    - George Nesbitt: other than LEED (indoor air) testing, there is virtually no big building air leakage testing. LEED was unit compartment testing
        - Benjamin Zank (Energy Solutions): George, we would like to connect offline to further discuss whole building air leakage testing if you are interested
        - George Nesbitt: I'm available to the case teams on, just contact me offline. I have a variety of MF low & High rise data) as well as SF
        - Benjamin Zank (Energy Solutions): George, great, thank you
- **Poll 8:** Did you come across any nonresidential new construction project that failed an air barrier requirement?
    - Bronwyn Barry (North American Passive House Network): Weird poll question. Air leakage is not required in CA so no reason to conduct air leakage testing.
        - Benjamin Zank (Energy Solutions): Bronwyn, the question was meant generally, not just for CA.
        - Bronwyn Barry (North American Passive House Network): Thanks for clarification, Benjamin. That makes more sense. Whole building leakage testing is more common in other states (Florida, MA, NY and MI if I recall correctly all have whole building air leakage testing requirements).
        - Bronwyn Barry (North American Passive House Network): Passive Houe certification requires whole building air leakage testing (pressurized and de-pressurized).
    - Meg Waltner (Energy 350): I don't know what compliance option is being used, but don't think whole building leakage testing is common
        - Benjamin Zank (Energy Solutions): Thanks Meg
        - Meg Waltner (Energy 350): To clarify, my comment was for non-res construction in CA.
        - Benjamin Zank (Energy Solutions): @Meg, got it, thanks for the clarification
- Market Overview
    - Comment from George Nesbitt: whole building testing requires a lot of equipment & people, set up, etc.... But has been around for decades.....
- **Discussion regarding Technical Considerations for Air Leakage Submeasure**
    - Comment from Phil Emory (Neudorfer Engineers): The Washington State Code says "shall" not "should"
        - Benjamin Zank (Energy Solutions): Phil, thank you, we will make a note of that
    - Comment from Michael Hsueh: including language that requires air barrier boundaries to be pointed out in construction documents would be valuable to make testing easier and more feasible later on
        - Benjamin Zank (Energy Solutions): Michael, thank you, we are planning to do that. It is shown in the submeasure proposal summaries
    - Comment from George Nesbitt: I wish air tightness was mandatory, too bad we have to start with a perfomance credit
        - Phil Emory (Neudorfer Engineers): George, the next WA State energy code will require to pass.
        - George Nesbitt: In CA this is a performance credit, so failure means no credit.
        - George Nesbitt: PEC lecture from a WA state tester, had failure(s) with no correction. This is an enforcement issue.

    - Comment from George Nesbitt: I tested a 4 unit MF PH in Ca, 4 fans, ethernet cables, computer, etc... full day afair for at least 2 people.
        - Benjamin Zank (Energy Solutions): @George that is good to know. That was for compartmentalization or the whole building?
- **Poll 9**: What should happen if a building fails the whole-building leakage test?
    - Emile Wang (Morrison Hershfield): I voted - other; we recommend investigate, mitigate, and retest if the leakage was significant.
        - Benjamin Zank (Energy Solutions): Thanks Emile!
- **Poll 10:** Is there enough information readily available in the construction documents or in the field for air barrier verification?
    - Bronwyn Barry (North American Passive House Network): Advice to CASE teams: allocate some budget to pay air-leakage testers for their time to collect and share their info with you. Most of them are self-employed and their time is valuable. They should be compensated for taking their time to share this valluable data with CASE.
        - Benjamin Zank (Energy Solutions): @Bronwyn, we are working with testing professionals, thank you
        - Bronwyn Barry (North American Passive House Network): Thanks. Great to hear.
        - Benjamin Zank (Energy Solutions): Bronwyn, who is performing the testing for Passive House in CA? HERS Raters?
        - Bronwyn Barry (North American Passive House Network): yes. HERS raters can do PH testing. There is a small group who typically do most of the PH projects in CA... (George is one.)
        - Benjamin Zank (Energy Solutions): @Bronwyn, are there an nonresidential buildings meeting those requirements in CA that have testing?
        - Bronwyn Barry (North American Passive House Network): Not that I'm aware of.... PH still very small in CA. Other parts of the country and Vancouver have more robust examples of non-res PH's.
        - Benjamin Zank (Energy Solutions): @Bronwyn, thank you.
- **Discussion regarding Cost-effectiveness for Air Leakage Submeasure**
    - Bronwyn Barry (North American Passive House Network): Costs of air-tightness come down over time as the market becomes more experienced. Best to look at costs in more mature markets. Vancouver should be able to provide some good data by now. Try RDH too as they have been doing this work in Seattle too.
        - Benjamin Zank (Energy Solutions): @Bronwyn, thank you, we are working with Morrison Hershfield and have had conversations with RDH, both have been very helpful
        - Benjamin Zank (Energy Solutions): @Brownwyn, we will consider costs coming down, thank you for pointing that out
    - Comment from George Nesbitt: cost effectiveness idealy is more mature market cost, not the learning curve
- **Discussion regarding current testing practices**
    - David Bohac (Center for Energy and Environment): Easier to test common entry buildings. I know a company in Minnesota that does whole building air leakage testing of 40-50 unit low-rise MF buildings with 2-3 fans, one person, a few hours.
        - Benjamin Zank (Energy Solutions): @David, that is good to know, thank you

    - Phil Emory (Neudorfer Engineers): Currently that is correct. If "pracitcal" they are to mitgate but retest is not required.
    - George Nesbitt: There is a learning curve, many standard practices just (might) don't cut it
        - Benjamin Zank (Energy Solutions): @George, that is why we are considering something similar to ASHRAE 90.1, where retesting is only required above 0.6.
- **Discussion regarding Compliance Verification Process for Air Leakage Submeasure**
    - Comment from Bronwyn Barry (North American Passive House Network): Architects need to be re-trained. Their details and assemblies are critical to contractor success.
    - David Bohac (Center for Energy and Environment): It is often difficult to determine whether a penthouse mechanical room is intended to be in or outside of the air barrier
        - Benjamin Zank (Energy Solutions): @David, does that become clear when it is required to detail the air barrier on construction documents?
        - David Bohac: Yes, that should be noted on the construction documents.
    - Benjamin Zank (Energy Solutions): @David and @Bronwyn, we understand that having architects onboard and having the details on the documents is critical for this to work
    - George Nesbitt: There are relevent (air leakage) details on plans, just not usually purposefull. And dispite what's on the plans, it's what's built and how in the end
        - Benjamin Zank (Energy Solutions): @George, are you saying there is a gap between the drawings and the construction? How would you recommend addressing that gap?
    - George Nesbitt: Not following details on the plan, or codes, or best practice, is a huge problem. Not that details are always correct either
        - Simon Silverberg: @George, thanks for your comment. We plan to coptinue reaching out to stakeholders bearing in mind those complinace issues you mentioned.
- General comment from Bronwyn Barry (North American Passive House Network): Thanks for pushing this effort forward. It's critical in California - particularly with our new regular wildfire reality...
    - Benjamin Zank (Energy Solutions): @Bronwyn, thank you for the support

1.1.7 Vestibule Infiltration Submeasure

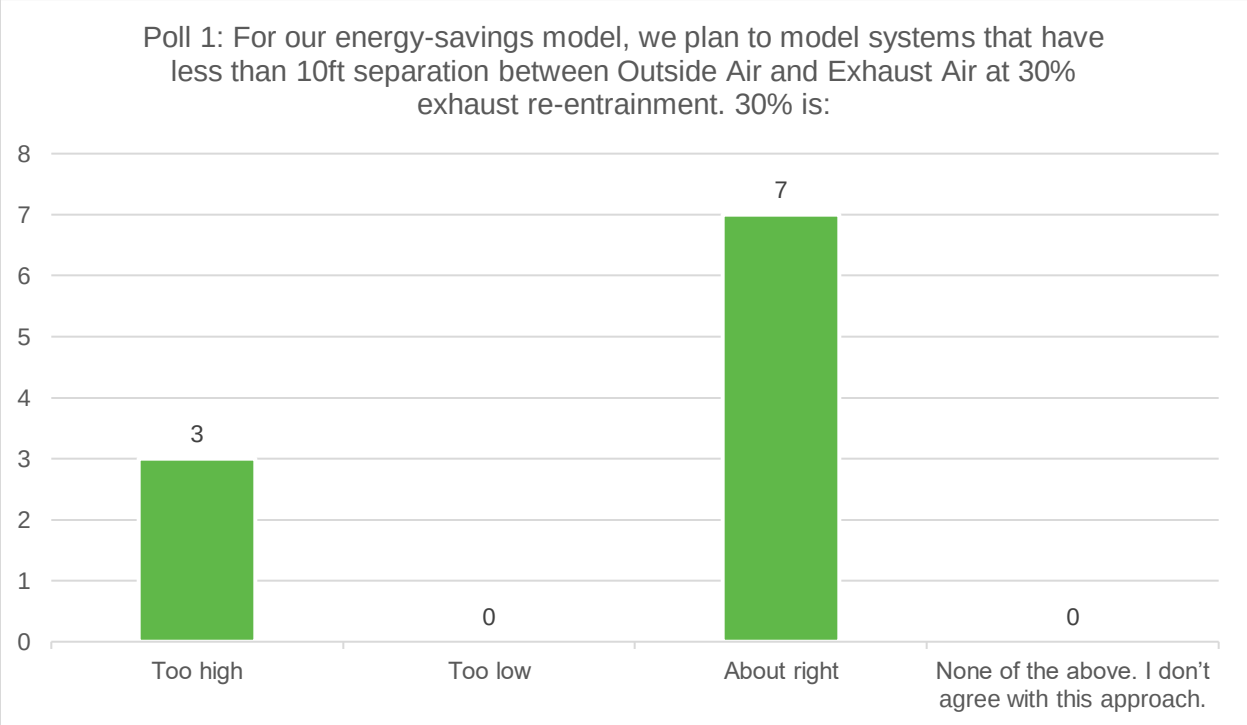
- **Poll 11:** Are you involved in any design or building projects in CA state that included vestibules, revolving doors or air curtains
- **General discussion regarding Vestibule Infiltration Submeasure**
    - Question from Bronwyn Barry (North American Passive House Network): Requiring vestibules is a complicated way of trying to improve leakage. It creates a design constraint that not all buildings will be able to meet. Why not simply stick to a performance target and allow teams to meet the target in the best way for each project?
        - Bronwyn Barry (North American Passive House Network): It also allows doors to remain leaky and does not drive product improvement. Let the market figure out best way to decrease building leakage either via vestibules, or better products.
        - Simon Silverberg (Energy Solutions): @Bronwyn, thanks for your note. We are trying to fully understand the complications in vestibule design and installations. We will be sure to reach out to get some more

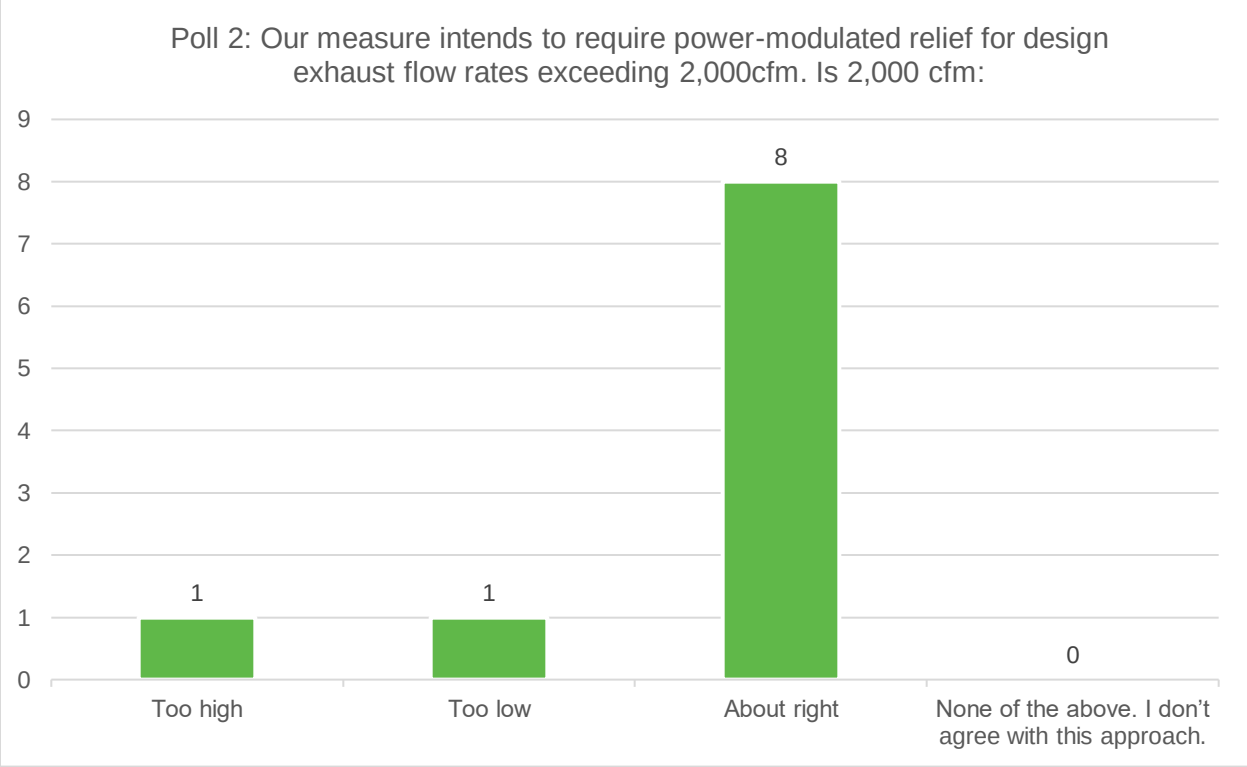
        - John Bade (2050 Partners): @Bronwyn - the vestibule requirement, at least in ASHRAE 90.1 is not in lieu of meeting leakage requirements. It is mostly intended to prevent infiltration of cold air when doors are opened
        - Bronwyn Barry (North American Passive House Network): @John. Understood. I'm not opposed to vestibules per se, but am opposed to them being required when alternate solutions could achieve similar performance outcomes.
        - John Bade (2050 Partners): Other than revolving doors or air curtains, what are other alternate solutions?
    - Comment from George Nesbitt: Vestibule should be about not loosing conditioned air.
    - Comment from Frank Cuaderno (Mars Air Curtains): Please see language for 90.1, IGCC/189.1 and IECC. the requirements you mentioned have been addressed.
- **Poll 12:** Which one do you recommend for California?
    - Bronwyn Barry (North American Passive House Network): Alternate vote: none of the above.
- **Poll 13:** Should air curtains be an exception for vestibule installation in California?
- General comment Bronwyn Barry (North American Passive House Network): Great to see CASE supporting whole building air leakage testing. It's a steep learning curve, but with BIG payoffs.

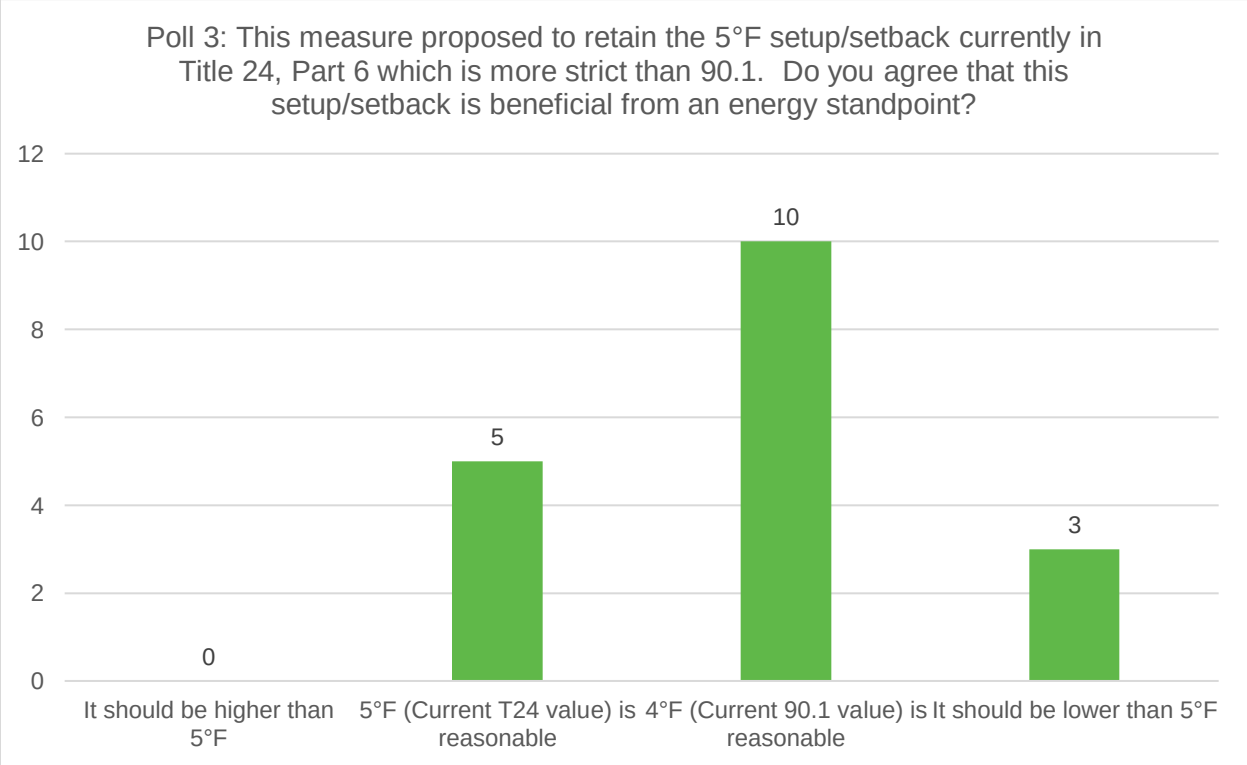
6. Closing Polls and Next Steps

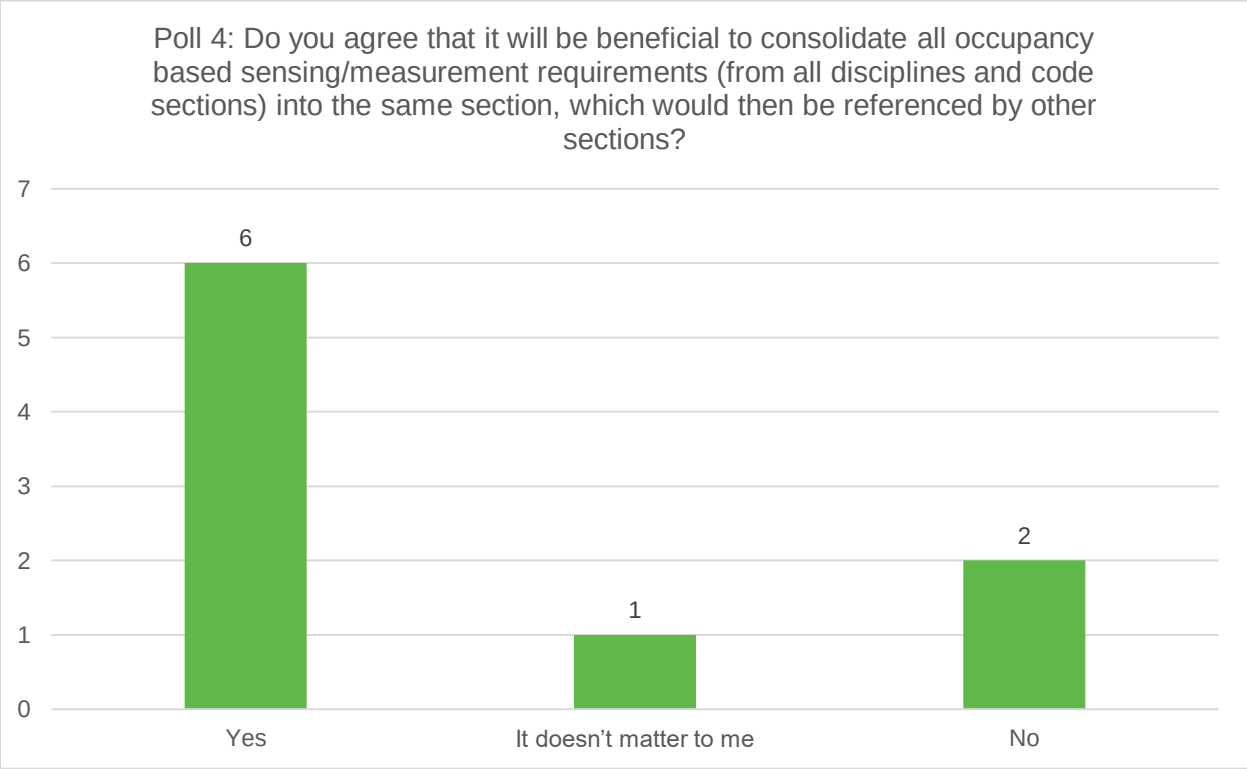
- *Alanna Torres (Energy Solutions) presented.*

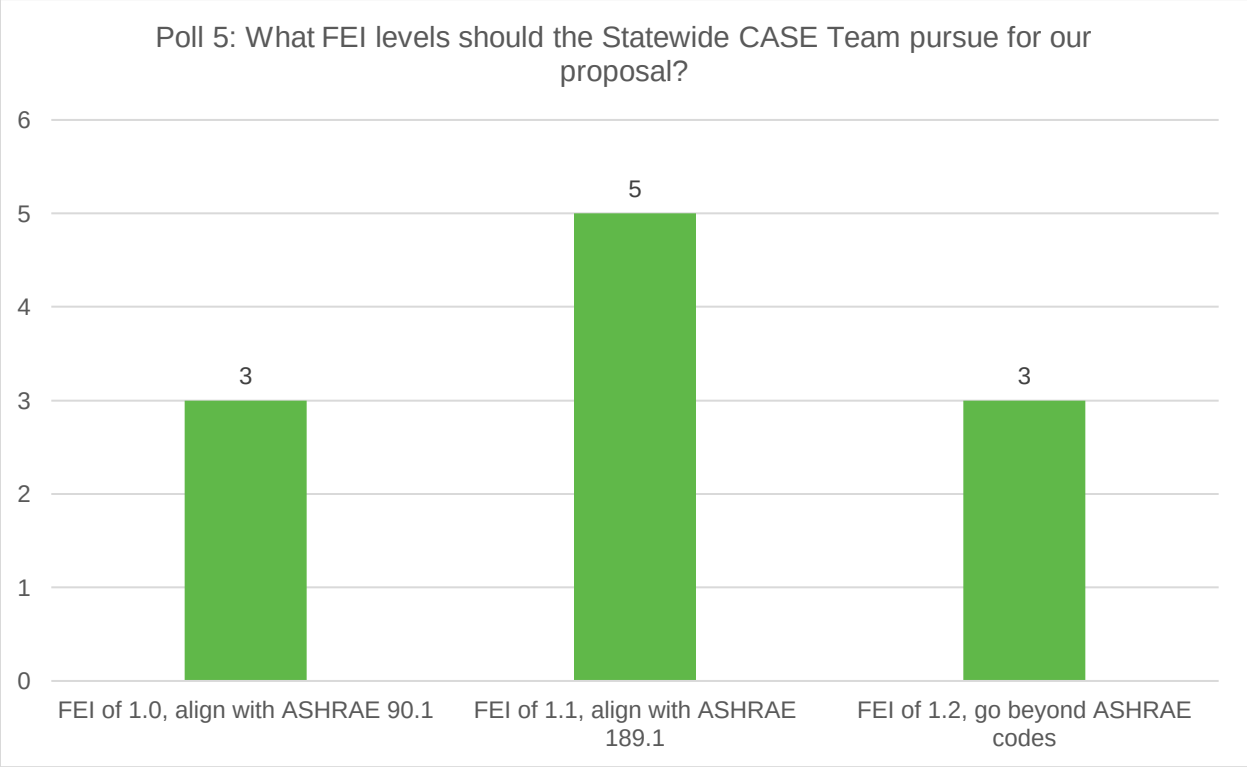
Poll Results

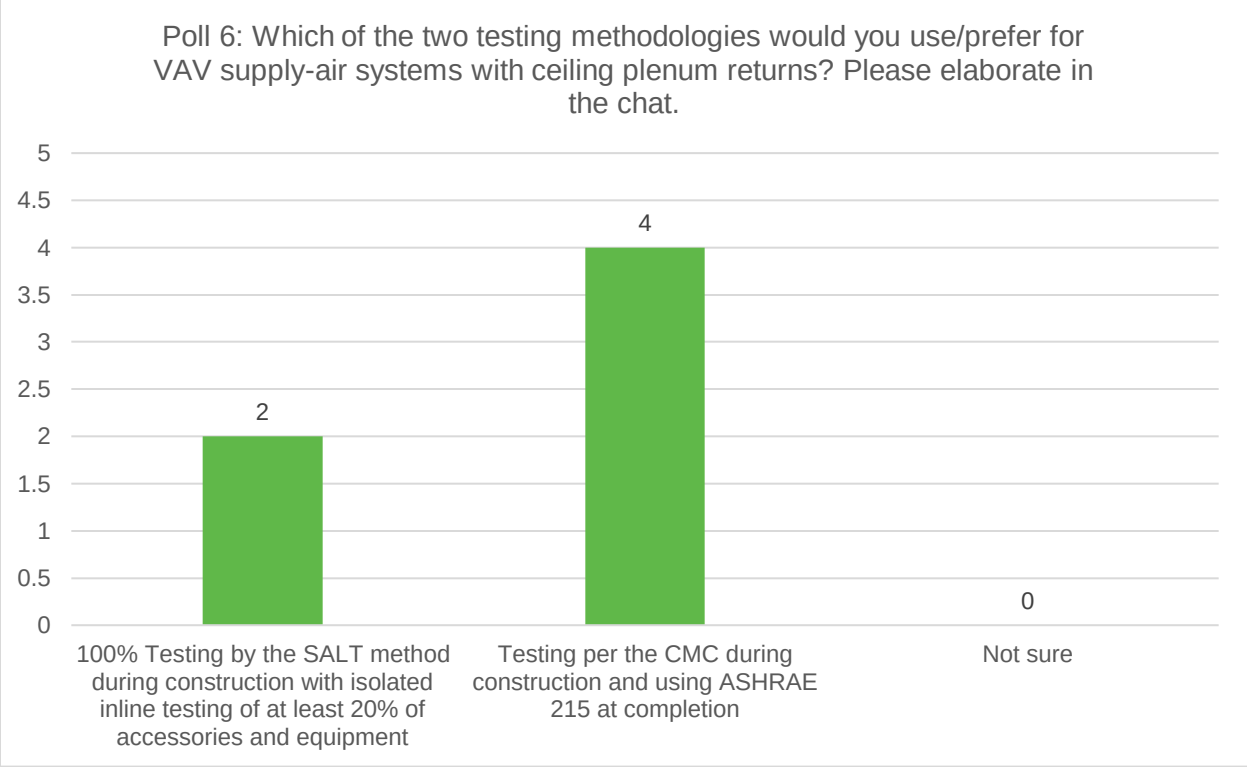


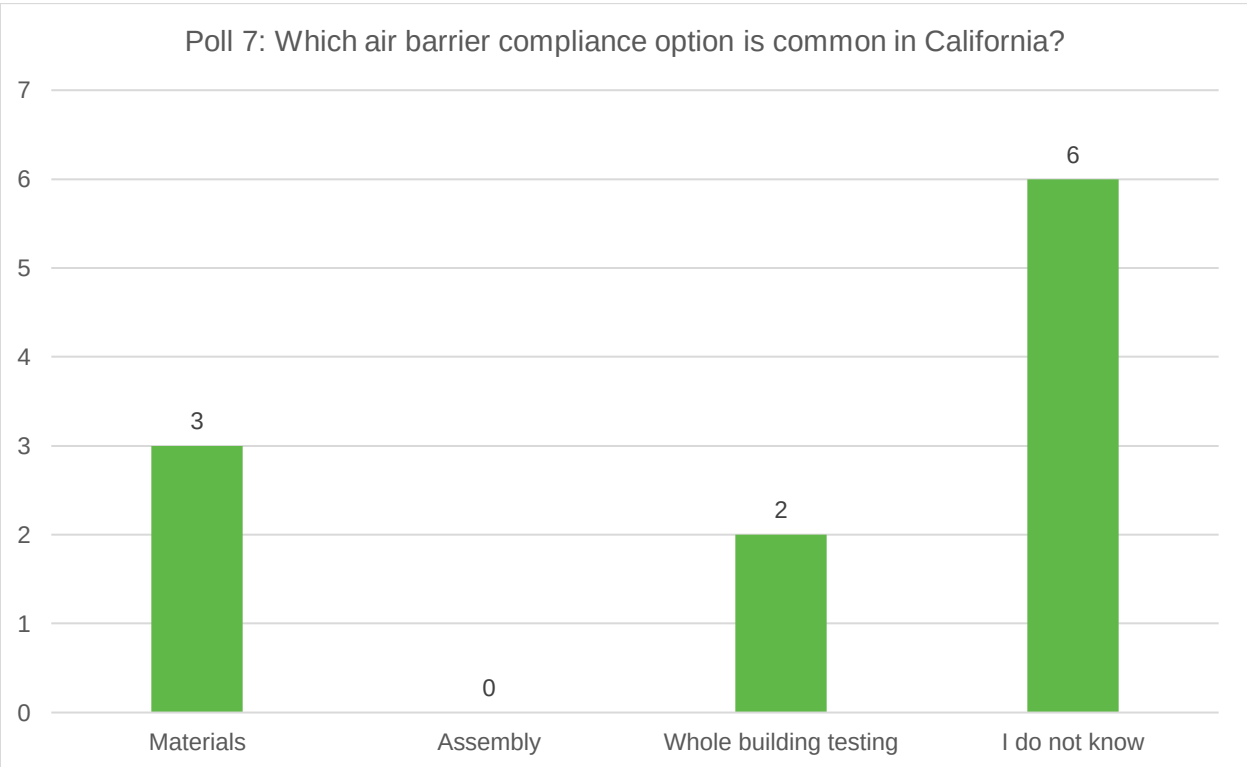

Poll 2: Our measure intends to require power-modulated relief for design exhaust flow rates exceeding 2,000cfm. Is 2,000 cfm:
9
8
7
6
5
4
3
2
1
0
1
1
8
0
Too high
Too low
About right
None of the above. I don't agree with this approach.


Poll 3: This measure proposed to retain the 5°F setup/setback currently in Title 24, Part 6 which is more strict than 90.1. Do you agree that this setup/setback is beneficial from an energy standpoint?
12
10
8
6
4
2
0
0
5
10
3
It should be higher than 5°F
5°F (Current T24 value) is reasonable
4°F (Current 90.1 value) is reasonable
It should be lower than 5°F

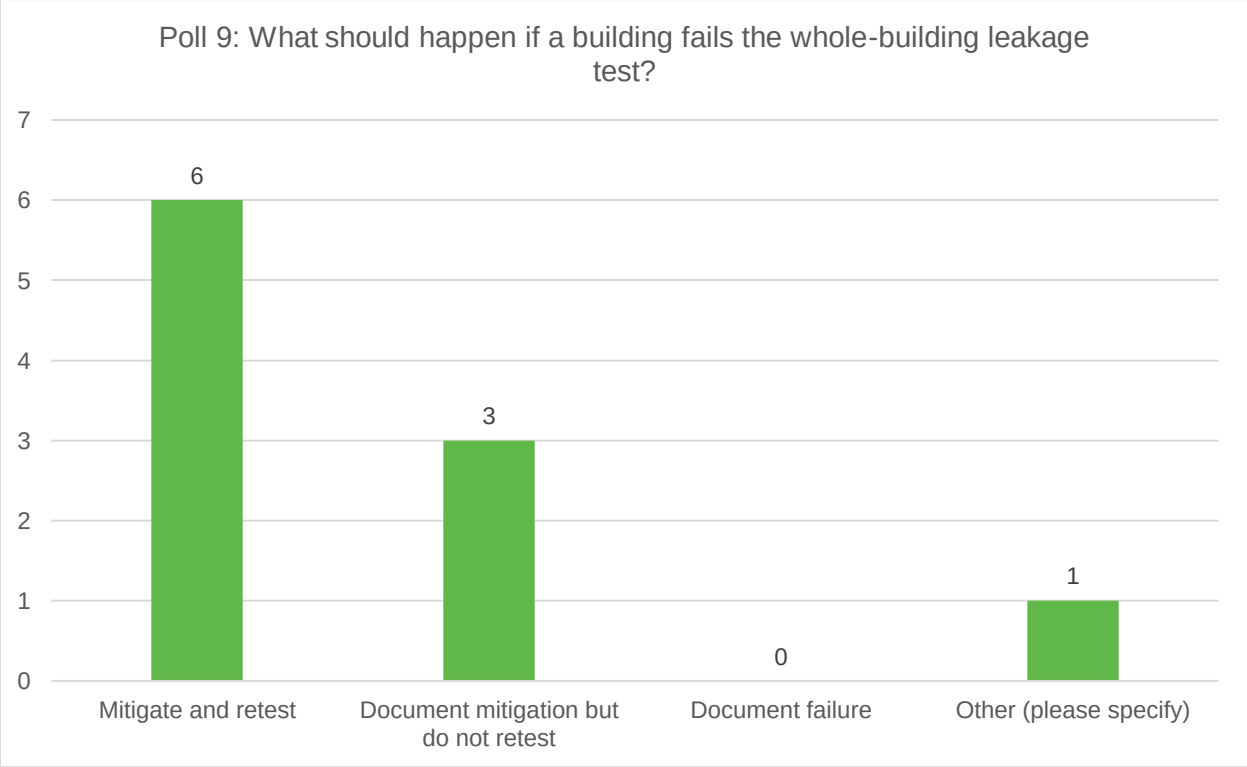

Poll 4: Do you agree that it will be beneficial to consolidate all occupancy based sensing/measurement requirements (from all disciplines and code sections) into the same section, which would then be referenced by other sections?
7
6
5
4
3
2
1
0
6
1
2
Yes
It doesn't matter to me
No

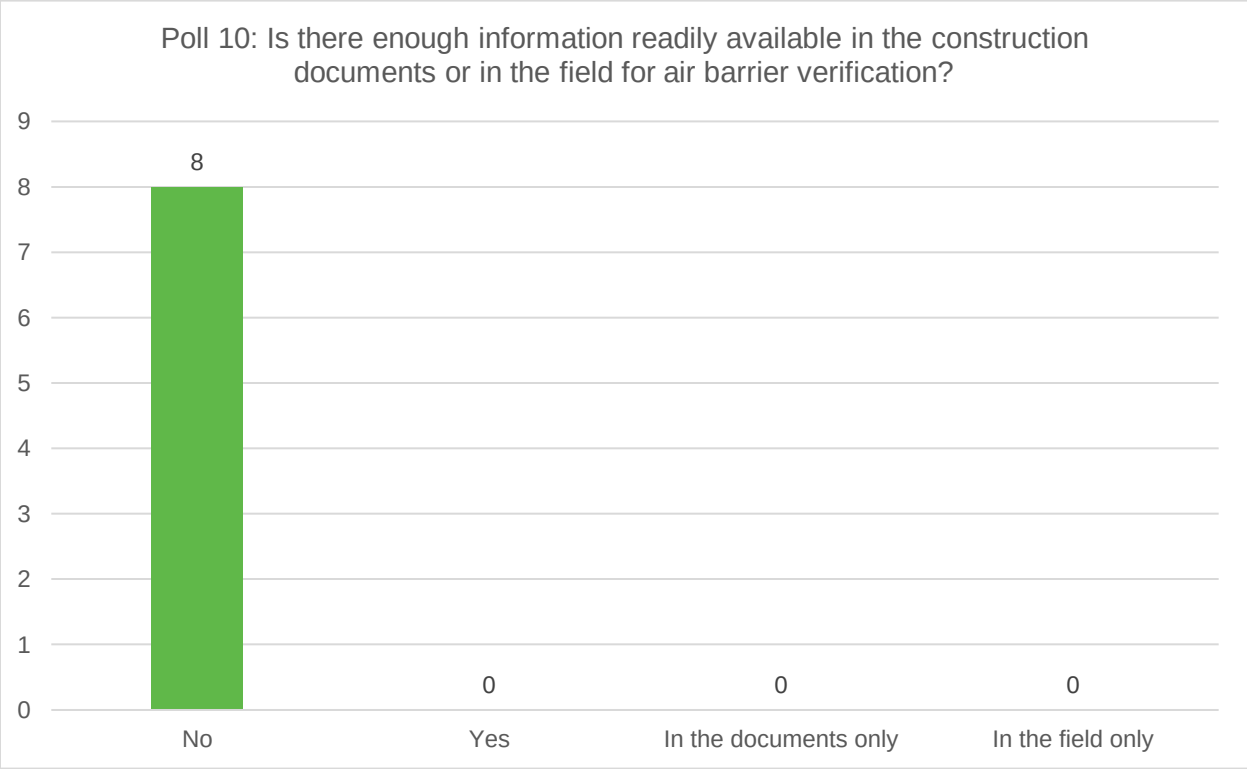

Poll 5: What FEI levels should the Statewide CASE Team pursue for our proposal?
6
5
4
3
2
1
0
3
5
3
FEI of 1.0, align with ASHRAE 90.1
FEI of 1.1, align with ASHRAE 189.1
FEI of 1.2, go beyond ASHRAE codes


Poll 6: Which of the two testing methodologies would you use/prefer for VAV supply-air systems with ceiling plenum returns? Please elaborate in the chat.
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
2
4
0
100% Testing by the SALT method during construction with isolated inline testing of at least 20% of accessories and equipment
Testing per the CMC during construction and using ASHRAE 215 at completion
Not sure


Poll 7: Which air barrier compliance option is common in California?
7
6
5
4
3
2
1
0
3
0
2
6
Materials
Assembly
Whole building testing
I do not know


Poll 8: Did you come across any nonresidential new construction project that failed an air barrier requirement?
3.5
3
2.5
2
1.5
1
0.5
0
2
2
3
1
No
Yes
There is no way of knowing it
I do not know


Poll 9: What should happen if a building fails the whole-building leakage test?
7
6
5
4
3
2
1
0
6
3
0
1
Mitigate and retest
Document mitigation but do not retest
Document failure
Other (please specify)


Poll 10: Is there enough information readily available in the construction documents or in the field for air barrier verification?
9
8
7
6
5
4
3
2
1
0
8
0
0
0
No
Yes
In the documents only
In the field only