

Meeting Notes



2022 California Energy Code (Title 24, Part 6)

Agenda for the Utility-Sponsored Stakeholder Meeting for:

Multifamily HVAC and Envelope

Posted April 20, 2020

Meeting Information

Meeting Date: March 25, 2020

Meeting Time: 8:30am – 11:15pm PST

Location: Adobe Connect webinar (sign-up at title24stakeholders.com/events)

Meeting Host: California Statewide Utility Codes and Standards Team

Meeting Agenda

| Start Time | Topic | Presenter |
|--------------------------|--|--|
| 10 minutes prior to call | <i>Live Attendee Poll</i> | |
| 8:30 am | Meeting Guidelines | Statewide CASE Team |
| 8:35 am | Opening Remarks from the California Energy Commission | Energy Commission Staff |
| 8:40 am | Overview and Welcome | Statewide Utility Codes and Standards Representative |
| 8:45 am | CASE Presentation I: Multifamily Indoor Air Quality | Marian Goebes (TRC) |
| 10:15 am | CASE Presentation II: Multifamily High Performance Envelope | Matthew Christie (TRC) |
| 11:15 pm | Wrap Up & Closing | Statewide CASE Team |

Meeting Attendees

Statewide Utility Codes and Standards Team – Utility Staff:

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| Ruby | Yepez | ruby.r.yepez@sce.com | Southern California Edison Company (SCE) |
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| Eric | Adair | Hearth, Patio & Barbecue Association |
| Sean | Armstrong | Redwood Energy |
| Jr | Babineau | Johns Manville |
| John | Bade | 2050 Partners |
| Amelie | Besson | MidPen Housing |
| Jeff | Boldt | IMEG Corp. |
| Jim | Boldt | Home Ventilating Institute |
| Joe | Boros | Rheem |
| Joseph | Briscar | SMXB |
| Shelley | Brock | MidPen Housing Corporation |
| Nick | Brown | Build Smart Group |
| James | Carlin | Pottorff |
| Marina | Chavez | Gabel Energy |
| Wenhao | Chen | California Dept of Public Health |
| David | Choo | Calcerts |
| Chadwick | Collins | Kellen Company |
| Marc | Connerly | RCAC |
| Shannon | Corcoran | AHRI |
| Frank | Cuaderno | Mars Air Systems, LLC |
| Thomas | Culp | Birch Point Consulting |
| Soph | Davenberry | National Energy Management Institute Committee |
| Duane | Davies | Nabco |
| Eric | Devito | SMXB Law |
| David | Dias | Sheet Metal Works Local 104 |

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| Brendan | Dineen | Malarkey |
| Sid | Dinwiddie | PABCO |
| Heather | Estes | GAF |
| Rebecca | Everman | 3M |
| Jeanne | Fricot | Center for Sustainable Energy |
| Robert | Glass | Goodman Mfg. Company |
| Aaron | Gunzner | AMCA International |
| Mahmoud | Harb | VCA Green |
| Curtis | Harrington | UC Davis WCEC |
| Armin | Hauer | ebm-papst. Inc. |
| Mike | Hodgson | ConSol |
| Marshall | Hunt | MBH Associates |
| Diane | Jakobs | Rheem |
| Tom | Kabat | Goodgridizen.org |
| Robert | Kuks | Sheet Metal Workers Local 104 |
| William | Leblanc | Systemair I |
| Mark | Lessans | Johnson Controls |
| Jeff | Mang | Hogan Lovells |
| Steve | Mann | Home Energy Services |
| Matt | Matheny | S&P USA Ventilation Systems, LLC |
| Rick | Maurer | Rick Maurer Title 24, Inc. |
| Brendan | McGovern | Trane |
| Vrushali | Mendon | Resource Refocus LLC |
| Mike | Moore | Newport Partners LLC |
| Peter | Mustacich | 2050 Partners |
| George | Nesbitt | Environmental Design / Build |
| Patrick | Nielsen | Broan-NuTone |
| Ken | Nittler | Enercomp, Inc. |
| Tom | Paine | ConSol |
| John | Park | AHAM |
| Laura | Petrillo-Groh | AHRI |
| Tom | Phillips | Healthy Building Research, CHPS.net, ROCIS.org, CDPH.ca.gov |
| Neil | Placer | EnerNex |
| Curt | Rich | NAIMA |
| Gina | Rodda | Gabel Energy |
| Stephen | Selkowitz | LBNL |
| Bruce | Severance | Mitsubishi Electric |
| Nehemiah | Stone | Stone Energy Associates |
| Brandon | Svitak | Systemair |

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| Mark | Terzigni | SMACNA |
| John | Thomas | IMJEI |
| Cassandra | Trester | Ei Companies |
| Martha | Vangeem | self |
| Jordan | Venters | VCA Green |
| Patrick | Villaume | Patterson-Kelley |
| Steven | Wadding | Polyglass U.S.A. Inc. |
| Andy | Wahl | Andy Wahl |
| Chris | Walker | CAL SMACNA |
| Iain | Walker | LBNL |
| Meg | Waltner | Energy 350 |
| Ying | Wang | Okapi Architecture Inc. |
| Ola | Wettergren | Systemair / Fantech |
| Bobby | Windmeyer | Home Ventilating Institute |
| David | Winningham | Lennox International |
| John | Woestman | Extruded Polystyrene Foam Association (XPSA) |
| Mike | Wolf | Greenheck |
| Pat | Wong | California Air Resources Board |
| Geoffrey | Yamaski | Katerra |
| Randy | Young | SMART Local 104 |
| Qunfang | Zhang | CARB |
| Andy | Wahl | Zehnder America |

Meeting Resources

1. [Agenda - March 25 - Multifamily HVAC and Envelope](#)
2. [Presentation - March 25 - Multifamily HVAC and Envelope](#)
3. Submeasure Summaries
 - a. [Kitchen Range Hood Capture Submeasure Summary](#)
 - b. [HRV ERV Submeasure Summary](#)
 - c. [Central Ventilation Duct Sealing Submeasure Summary](#)
 - d. [Quality Insulation Installation Submeasure Summary](#)

Meeting Notes

1.1 CASE Presentation I: Multifamily Indoor Air Quality (Marian Goebes, TRC)

1.1.1 Heat or Energy Recovery Ventilation (HRV or ERV)

1. Tom Kabat (Goodgridizen.org): HRV can also save an Amp (in main electrical panel sizing) per 60 CFS is because it has a high COP (coefficient of performance) at peak heating or cooling conditions.
2. George Nesbitt (Environmental Design / Build): Nonresidential does not account for air leakage (in the California Building Energy Code Compliance for Commercial/Nonresidential Buildings Software, CBECC-Com).
 - a. Alea German (Frontier Energy): George, are you referring to the infiltration?
 - b. George Nesbitt (Environmental Design / Build): Yes, nonresidential has never included air leakage, and it was removed from LRR (low-rise residential) a while ago.
 - c. Marian Goebes (TRC): Infiltration is an assumption embedded in CBECC, the user cannot adjust this. That is why we had to move to EnergyPlus to increase this assumption. The base case and proposed case use the same infiltration rate.
3. Mike Moore (Newport Partners LLC): Are the CFM (cubic feet per minute) in the efficacy term the sum of exhaust and supply or the average?
 - a. Alea German (Frontier Energy): The watts/CFM efficiency is based on the supply airflow only.
4. Amelie Besson (MidPen Housing): What is the assumption for the minimum efficiency reporting value (MERV) 13 filter cost? Is it incremental cost over 30 years compared to MERV 11 or something?
 - a. Marian Goebes (TRC): We found that the MERV 13 filter is around \$40, which is the same for unitary ERV and fan. We chose equipment that could accommodate those filters, which are actually the more expensive models. There are cheaper HRV models with MERV 6 or MERV 8 filters for example. We assumed that replacement would be the same for base case and proposed, with replacement every few months, but since there's no difference in filter prices between base and proposed cases, it doesn't affect incremental cost.
 - b. Matt Matheny (S&P USA Ventilation Systems, LLC): \$40 cost for 30 years of MERV 13 filters?
 - i. Marian Goebes (TRC): We did not assume that. We found the cost was the same, \$40/filter, for both base case and proposed. Therefore, the incremental measure cost over 30 years is \$0. We are showing cost effectiveness but welcome any recommendations.
 - ii. Steve Mann (Home Energy Services): The incremental costs do not seem to include any savings from reduced heating/cooling loads.
5. Mike Moore (Newport Partners LLC): Do the individual bath fans dump into a central shaft?
 - a. Marian Goebes (TRC): For the unitary case – assumed for low-rise and midrise, no. For the central system (assumed for high-rise), for the proposed case the bathrooms have pick-ups that are driving air into a central shaft. For the base case for the central system, it's unitary exhaust for the bathrooms

6. Tom Phillips (Healthy Building Research, CHPS.net, ROCIS.org, CDPH.ca.gov): Where would range hoods exhaust to? Regarding numbers of new MFAM, which climate zones (CZs) are expected to have the bulk of new units.
 - a. Cassandra Trester (Ei Companies): I agree, the majority of our new construction occurs in the CZ 3-10. What is the proposed compliance credit?
 - b. Marian Goebes (TRC): We are not looking at range hoods for this measure. The intermittent or demand-controlled range hoods are not included, since these are not continuous. On the climate zone comment: we agree most construction is in CZ 3-10, but we're not finding the measure to be cost effective in those climate zones.
7. Meg Waltner (Energy 350): Marian, could you please comment on what you thought Steve's question was? Why not include reduced first costs from reduction in peak capacity?
 - a. Steve Mann (Home Energy Services): I was thinking of total cost over time, but first cost of MEP (minimum energy performance) is also relevant. I think that would make this measure even more cost effective.
 - b. Alea German (Frontier Energy): Steve, we did look at capacity reductions for the prototype models, they were marginal for a particular home and not enough to justify reducing the system capacity down the next nominal size.
8. Andy Wahl (Zehnder America): Requesting HRV/ERV's are accepted when they are Passivehaus Institute (PHI) listed and accept the PHI recovery efficiency in addition to the Home Ventilating institute (HVI) list. Will there be a duct leakage test required?
 - a. Marian Goebes (TRC): Not for this measure. We will be discussing ducts in later submeasures. A duct would need to be sealed if providing continuous airflows – we will discuss further in the relevant submeasure presentation.
 - b. Tom Phillips (Healthy Building Research, CHPS.net, ROCIS.org, CDPH.ca.gov): what are specifications for 1) proximity of HRV intakes to other exhaust vents and 2) access and maintenance for filters?
 - i. Alea German (Frontier Energy): This is in the mechanical code – minimum of 10 feet between intake and outtake, or three feet if exhaust is three feet below intake.
 - c. Andy Wahl (Zehnder America): On the savings I see this is per dwelling, I was thinking about the building cost to install on the previous slide.
9. George Nesbitt (Environmental Design / Build): Multifamily heating and cooling loads are small, so equipment & installation savings may be little or none. Also, assuming the Mechanical Engineer did a proper load calculation and sizing.
10. Iain Walker (LBNL): Language should specify that H/ERVs are certified to meet the 67 percent - e.g., using HVI (possibly Association of Home Appliance Manufacturers and others). Also - there should be a requirement to meet the 0.6 W/CFM performance requirement.
11. William LeBlanc (Systemair I): Sensible Recovery Effectiveness is not the same as Sensible Recovery Efficiency.
- 12. Poll: In the climate zones where this will apply, how do you think your projects will most often meet the proposed requirement for multifamily units WITHOUT common corridors (“garden-style”)? Select one.**
- 13. Poll: In the climate zones where this will apply, how do you think your projects will most often meet the proposed requirement for multifamily units WITH common corridors? Select one.**

14. Andy Wahl (Zehnder America): How many companies units have bypass and on HVI?
- Marian Goebes (TRC): Not many that have unitary bypass. This is much more expensive. There is a lot of central equipment with a bypass function.

1.1.2 Kitchen Range Hood Minimum Capture

15. George Nesbitt (Environmental Design / Build): Does kitchen exhaust apply with electric cooking?
- David Springer (Frontier Energy): Yes.
 - George Nesbitt (Environmental Design / Build): some people think they do not need exhaust with electric cooking.
16. Andy Wahl (Zehnder America): In tight units 250 CFM may not really exhaust 250 CFM. The 250 CFM is at laboratory and not in tight dwelling units.
- Steve Mann (Home Energy Services): As Andy points out, efficiency correlates with airtightness. Did you consider including a makeup air provision?
 - Matt Matheny (S&P USA Ventilation Systems, LLC): Andy Wahl- I believe the lab is sealed per the ASTM (American Society for Testing and Materials) standard.
 - Marian Goebes (TRC): That 250 CFM is tied to a 0.1 static pressure, which is likely lower than in the field. We want to strike a balance between what the industry can provide, and what is acceptable air quality.
17. Zoe Zhang (CARB): Cooking itself emits pollutants.
- Randy Young (SMART Local 104): Thank you, Zoe.
18. George Nesbitt (Environmental Design / Build): Kitchen exhaust ducting is usually restricted, not more than a six-foot duct, elbow, etc. and higher flows are not achieved, and higher flows depressurize more.
19. Cassandra Trester (Ei Companies): Is there a proposed HERS verification similar to low-rise single-family that was implemented in 2019 code on the kitchen hood vents?
20. Tom Phillips (Healthy Building Research, CHPS.net, ROCIS.org, CDPH.ca.gov): Regarding depressurization, any requirements for make-up air?
- Marian Goebes (TRC): We are not including a makeup air provision here. There was a step towards that in the 2019 Title 24, Part 6 code, but we are not pursuing that here. It would be great to have a makeup air requirement, but it does not seem like the industry is ready for that change yet.
21. Mike Moore (Newport Partners LLC): What data set was used to correlate range hood capture efficiency to airflow?
- David Springer (Frontier Energy): Mike Moore, Texas A&M lab tested four range hoods at 0.1: and 0.25". Marian will probably show results.
 - Marian Goebes (TRC): We will get to this dataset, as David mentioned.
22. Scott Blunk (SMUD): Is there going to be testing on the range hoods yet?
23. Mike Moore (Newport Partners LLC): Suggest that "currently compliant" products comply with the prescriptive duct sizing table of ASHRAE 62.2 at 0.25" w.c. Or, have extra cost for in-situ flow rate verification to comply with 62.2.
24. Andy Wahl (Zehnder America): Matt. I live in a home that is 192 CFM50 if my range hood would do 250CFM my home would go more than 50 pascals (pa) negative.
25. Scott Blunk (SMUD): Does it matter if the range is gas vs. electric, require less ventilation for electric vs. gas?

- a. David Springer (Frontier Energy): Requirements would be the same regardless of range type. Cooking generates PM2.5 and other pollutants regardless of burner type.
- 26. Tom Phillips (Healthy Building Research, CHPS.net, ROCIS.org, CDPH.ca.gov): Regarding sones chart: why are those over 3 sones still compliant?
 - a. David Springer (Frontier Energy): Tom Phillips, there are two levels of compliance, 3 sones at 100 CFM and either capture efficiency or airflow at any sone level.
- 27. Poll: For multifamily dwelling units, do you typically install range hoods using a horizontal or vertical configuration?**
- 28. Tom Phillips (Healthy Building Research, CHPS.net, ROCIS.org, CDPH.ca.gov): Regarding hood layout: what are specifications for hood height, and burner coverage?
 - a. David Springer (Frontier Energy): Range hoods were tested at 24" and over-the-ranges (OTRs) at 18", consistent with manufacturer installation instructions.
- 29. Mike Moore (Newport Partners LLC): OTR range hood capture efficiency looks especially low. Would like to see more data points at higher flow rates to see performance at the upper end of the curve.
 - a. David Springer (Frontier Energy): Texas A&M only tested at 0.1" and 0.25". We hope to have access to more test data later. We have one other OTR on order that will be tested.
- 30. David Springer (Frontier Energy): HVI will begin to list capture efficiency values on a voluntary basis in October 2020 and this will become mandatory in 2021.
 - a. Tom Phillips (Healthy Building Research, CHPS.net, ROCIS.org, CDPH.ca.gov): Sorry, I was referring to installed equipment and compliance specifications.
- 31. George Nesbitt (Environmental Design / Build): HERS Raters should be allowed to do the High-Rise Verifications. That is Rater with a Capital R.
 - a. Elizabeth McCollum (TRC): George and Randy: Can you please elaborate on why HERS Raters should not verify in high-rise buildings. We would like to capture your thoughts for this topic, as well as the restructuring topic.
 - b. George Nesbitt (Environmental Design / Build): I think HERS Raters SHALL be allowed to do the kitchen fan, indoor air quality (IAQ), and shaft sealing, as well as quality insulation installation (QII) and other HERS req or credits from LRR.
 - c. Randy Young (SMART Local 104): High-rise systems are typically more complex, having a Rater verify after construction is complete would not allow you to properly fix any issues.
 - d. George Nesbitt (Environmental Design / Build): As a HERS Rater I have been on High-Rise for over 15 years, Acceptance Testers do not have to be independent 3rd Parties, HERS Raters are required to be.
 - e. Cassandra Trester (Ei Companies): If HERS Raters are used appropriately they are doing testing and verification throughout the process not just at the end. I believe they should start to use a 3rd party verification as a requirement.
 - f. Duane Davies (Nabco): All of the projects that I have been associated with the HERS Rater has used our equipment and just witnessed our testing. We as an Associated Air Balance Council (AABC) certified and Testing, Adjusting and Balancing Bureau (TABB) firm with many ATT's (acceptance testing technicians) employed are the ones best suited to perform leakage testing. We are already an independent third party on the project.

- g. Elizabeth McCollum (TRC): Thank you for the comments on HERS/ATT. We will review these and consider your feedback in our final proposals.
 - h. Armando Ramirez (CEC): Compromise: HERS Rater on first three residential floors, ATT on anything higher.
 - i. Duane Davies (Nabco): Keep in mind that a TABB/AABC certified test and balance technician serves a 5-year apprenticeship which has them trained in all aspects of system installation and operational aspects. This is much more education and certification than a one or two day certification for HERS.
32. Mike Hodgson (ConSol): What version of ASHRAE 62.2?
- a. Marian Goebes (TRC): 62.2-2016, this is called out in the current 2019 code.
33. Tom Paine (ConSol): Does this measure have a net effect on energy consumption? Seems like Title 24 is the wrong way to establish a code requirement that only relates to IAQ and not energy consumption.
- a. Marian Goebes (TRC): We looked at watts per CFM of compliant vs noncompliant equipment and did not find a statistically significant difference. It is true that the proposal calls for a higher CFM, and when CFM goes up there is higher energy use. However, Lawrence National Laboratory has showed that people will use a range hood when they think it is needed. So, they are likely to run a hood with better capture efficiency for a shorter time, and if a range hood is not working well, they will run it for longer.
34. Matt Matheny (S&P USA Ventilation Systems, LLC): Suggest to include "vented to outside" to the code language as I believe "vented" alone could be interpreted as a re-circulating OTR "vented" to the indoor space.
35. Mike Moore (Newport Partners LLC): How was the minimum flow rate for a downdraft established?
36. George Nesbitt (Environmental Design / Build): Downdraft requires higher flow because its less effective fighting heat rising.
- a. Marian Goebes (TRC): We did not find any new information on this, so we left the language as is.
 - b. Tom Paine (ConSol): Not an unreasonable hypothesis, but that seems like an issue that should be resolved before a new requirement is put in place.

1.1.3 Central Ventilation Duct Sealing

37. Andy Wahl (Zehnder America): Will duct testing be required?
- a. Marian Goebes (TRC): Yes, likely by a third-party like HERS or ATT.
38. Duane Davies (Nabco): This should be a requirement for all buildings as we see leakage on most if not all buildings we balance. It should be done during the construction not at a later date.
- a. Andy Wahl (Zehnder America): Duane, I agree.
39. Duane Davies (Nabco): ASHRAE 92 is not the method to use as architectural finishes will have to be potentially torn apart to repair leakage.
40. Mark Terzigni (SMACNA): Leakage should not be tested as a percent to flow. The data does not support this. In this case you are locking down the test pressure which is good to show. Why not use a leakage class that is well-documented – CFM per surface area, so it accounts for the ductwork and size of the system? Why the 10 percent?

- a. Duane Davies (Nabco): Fan pressurization is the way to go. Why 10 percent, that seems excessive and equates to 30 percent more break horse power required?
 - b. Randy Young (SMART Local 104): All ducts regardless of designation, supply, return, exhaust, etc. should always be sealed to Seal Class A and properly tested during construction.
 - c. Marian Goebes (TRC): We had several discussions with other folks at Sheet Metal & Air Conditioning Contractors' National Association (SMACNA). This was raised, and for these simple duct systems we came to the agreement that a simple fan pressurization test was fine for those simple duct systems. For more complex systems, Benny Zank from the nonresidential team is your point of contact to discuss that more complicated test method.
 - d. Mark Terzigni (SMACNA): Looking at 10 percent, that is a high percentage at this low pressure. You might want to use leakage testing. We have a free app, it is not that complicated. There are also graphic ways to do this with table and charts that SMACNA provides. If the goal is saving energy, looking at these systems there are not many components. Would you put fire or smoke dampeners in these? Regardless, for the ductwork.
 - i. Marian Goebes (TRC): This is a good comment. We will take a look at the metric another time.
 - e. Mark Terzigni (SMACNA): I would suggest you allow leakage testing as at least an alternative. I would also encourage seal class A, which is the most stringent short of fully sealing a system. Our data shows that seal class A allows you to achieve well below 10 percent at this pressure.
41. Tom Phillips (Healthy Building Research, CHPS.net, ROCIS.org, CDPH.ca.gov): Regarding air intake location at side of building, I suggest you set some minimum heights to avoid emissions from traffic and prevent access from terrorists. New York City and perhaps others have such guidelines.
42. Andy Wahl (Zehnder America): Has any testing been done in high-rise and stack to be sure all floors actually get the correct ventilation at different temperature form inside to outside changes?
- a. Marian Goebes (TRC): There is a requirement for supply ventilation that teams should be verifying supply air, delivered at the required ventilation rates.
43. Marshall Hunt (MBC Associates): I recommend that attendees look at the California Mechanical Code Section 603.10.1 which was effective 01/01/20. It makes duct testing and sealing mandatory.
44. David Dias (SMW104): ATT's should do testing on high rise.
- a. George Nesbitt (Environmental Design / Build): Sampling should be the first system, and then one in x, y, or z.
 - b. Marian Goebes (TRC): Typically, can use standard duct blaster. 40 CFM per dwelling unit on average. If 20 units, 800 CFM total. Relatively small airflow that can usually be tested by duct blaster.
45. Duane Davies (Nabco): Keep in mind that a TABB/AABC certified test and balance technician serves a 5-year apprenticeship which has them trained in all aspects of system installation and operational aspects. This is much more education and certification than a one or two day certification for HERS.

46. Chris Walker (SMACNA): We should stay focused on quality and not lure the market into a farce to the bottom. Technician education and competency should be rewarded not discouraged by any future requirements.
47. Mark Terzigni (SMACNA): The water gauge mark was put in to focus testing on commercial systems between air handlers and variable air valve boxes. We have supported language, including that in the California mechanical building code (CMC). We do not want to recommend all ducts, rather a sample of ducts be tested. If an initial test shows issues, you use incremental testing and can get up to 100 percent. As far as pressure is concerned, the 3 part is going away. We have supported language change that has been adopted in the California mechanical building code.
 - a. Marian Goebes (TRC): In the CMC 603.10.1 language that calls out the duct testing requirements, residential buildings are explicitly excluded, and it calls back to Title 24, Part 6. The testing requirements do not come through for residential buildings as the CA mechanical code is currently written.
48. George Nesbitt (Environmental Design / Build): If you do not test 100 percent, especially with a new measure, then you will have many failures, and it will cost a lot to fix the ducts.
49. Elizabeth McCollum (TRC): We appreciate the discussion about inspections and training. We are recording these to inform the multifamily restructuring proposal as well as other multifamily measures including a verification component.

1.2 CASE Presentation 2: Multifamily High Performance Envelope (Matthew Christie and Julianna Wei, TRC)

1.2.1 Quality Insulation Installation

50. Andy Wahl (Zehnder America): Recommend QII on all buildings.
 - a. Cassandra Trester (Ei Companies): Fully agree with Andy! Even after multiple years on single family it is still our number one item we have to work with to ensure proper steps in single family.
 - b. Matthew Christie (TRC): We have been coordinating with the nonresidential team about including aspects of QII, but this discussion is just covering multifamily.
51. Andy Wahl (Zehnder America): Quality of installation is nearly always more important than the material chosen
52. George Nesbitt (Environmental Design / Build): I have never seen a nonresidential, multifamily, or otherwise, that the insulation did not look as bad as in single family / multifamily low rise. And failure rates for QII in LRR have been high (100 percent), even with contractors that claim to do it. The things I have seen in high-rise multifamily, ugly, air barrier and fire containment issues, etc.
 - a. Julianna Wei (TRC): Thank you for the data point.
 - b. George Nesbitt (Environmental Design / Build): 100 percent verification is not that hard, either a whole building or a whole floor are available at a time.
53. Payam Bozorgchami (CEC): Snapshot QII, is for cavity insulation only?
 - a. Julianna Wei (TRC): @Payam: Snapshot QII is intended to cover both air sealing and insulation installation of the wall assembly types that have cavity insulation (including wall cavity, floor, ceiling, as well as continuous rigid). It does not cover metal building/curtainwall assemblies.

54. Cassandra Trester (Ei Companies): I disagree with exempting CZ 7, The thermal envelope of your house is always important for more than energy and our climate is changing and homeowners/residents do not get to "redo" their envelope often.
- It will be a performance option in CZ 7, just not a prescriptive requirement due to it failing to prove cost effective,
55. George Nesbitt (Environmental Design / Build): Insulation without air tightness is just an air filter.
- Andy Wahl (Zehnder America): George, agreed.
- 56. Poll: At what size multifamily building does staged-construction practices begin to make full QII prohibitively difficult to conduct?**
- Steven Wadding (Polyglass U.S.A. Inc.): Depends on the type and configuration of the insulation used.
 - Soph Davenberry (National Energy Management Institute Committee): Whole building/ floor testing would be performance, I think topic right now is prescriptive. Agree that whole building/ floor effective for testing air tightness, but not thermal.
 - George Nesbitt (Environmental Design / Build): When they have failed enough sampling, you are doing 100 percent anyway.
- 57. Poll: What is your reaction to the logistics of scheduling the site visit for snapshot QII?**
- George Nesbitt (Environmental Design / Build): Interior (or exterior) corridor, is easy to walk every unit on a floor. Exterior individual unit entry, flats, or townhome, is a little harder to walk around, because you cannot always go through the walls to get to another unit.
- 58. Poll: What is the likelihood of seeing enough wall area at each inspection stage (framing and insulation) to meet the proposed 20 percent back-stops in one visit?**
- Sid Dinwiddie (PABCO): Where the insulation is also a vapor barrier, inspection needs to be much higher.
 - Steven Wadding (Polyglass U.S.A. Inc.): A reality, no design cannot eliminate or overcome bad or improper installation, oversight/inspection during construction, in my opinion, will always result in higher quality and compliance of construction.
59. Julianna Wei (TRC): We moved quickly through the costs, and we value your input on the assumptions. Please chat in your comments or contact us later.
60. Amelie Besson (MidPen Housing): Acknowledging that this is done at the state scale, I just wanted to throw out there that hourly rate seems low for Bay Area projects (might also apply to other metropolises).
- Steven Wadding (Polyglass U.S.A. Inc.): Labor rates likely 30 percent low for a majority of main metro areas.
 - Matthew Christie (TRC): The \$80 was a benchmark for CZ 12 (Sacramento). We adjusted by region using multipliers derived from RS Means. That method led to a substantially higher (15 percent) rate in the Bay Area, and ran those for climate zone 3. but not to the 30 percent you quote.
61. George Nesbitt (Environmental Design / Build): We need to ban steel framing without exterior insulation for all building types (single family, multifamily, low-rise, high-rise, nonresidential).

1.3 Poll Data

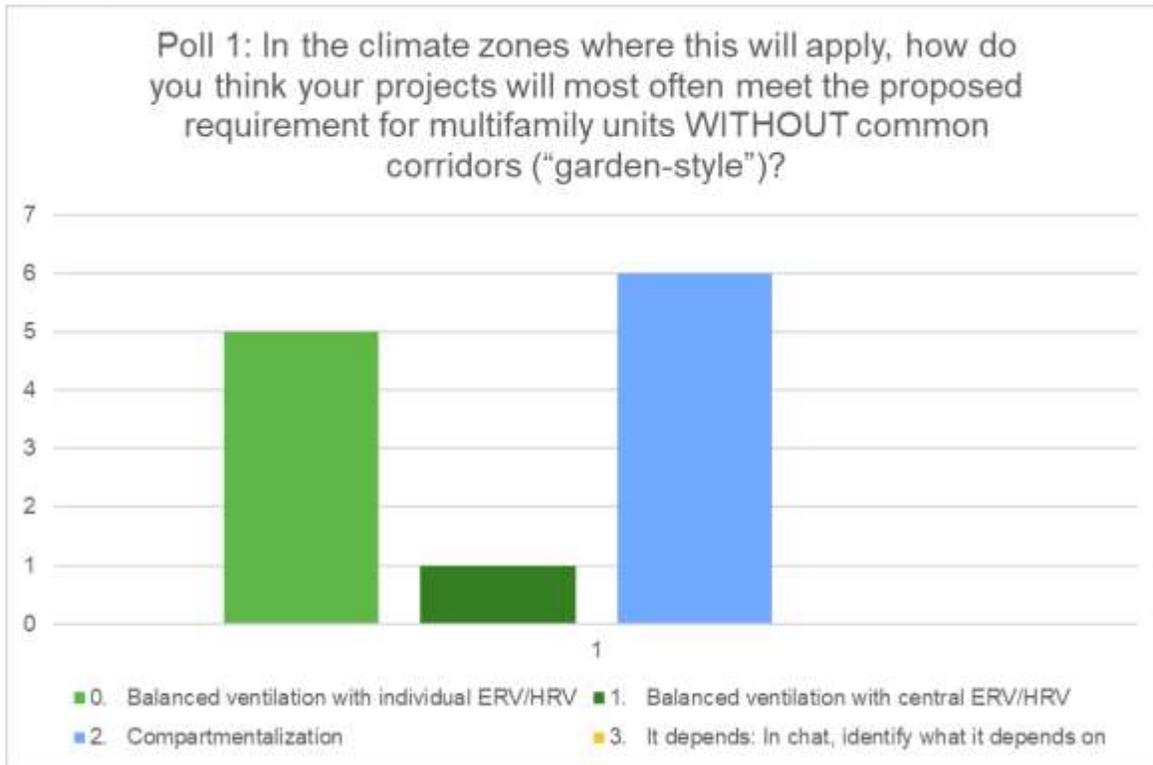


Figure 1: Results of Poll 1, Single Answer

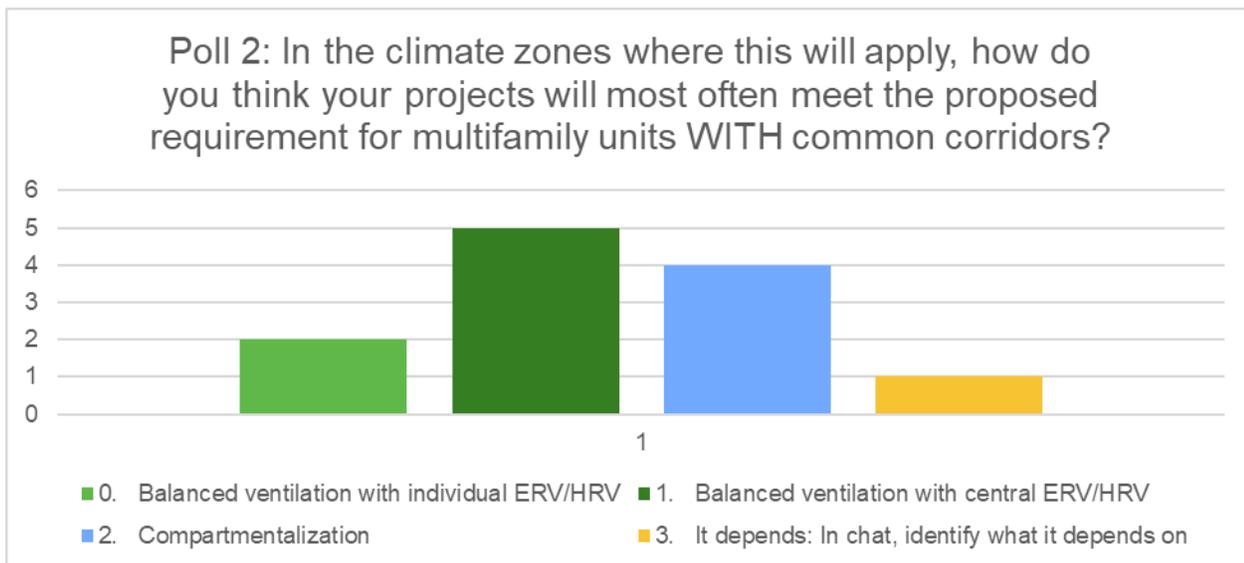


Figure 2: Results of Poll 2, Single Answer

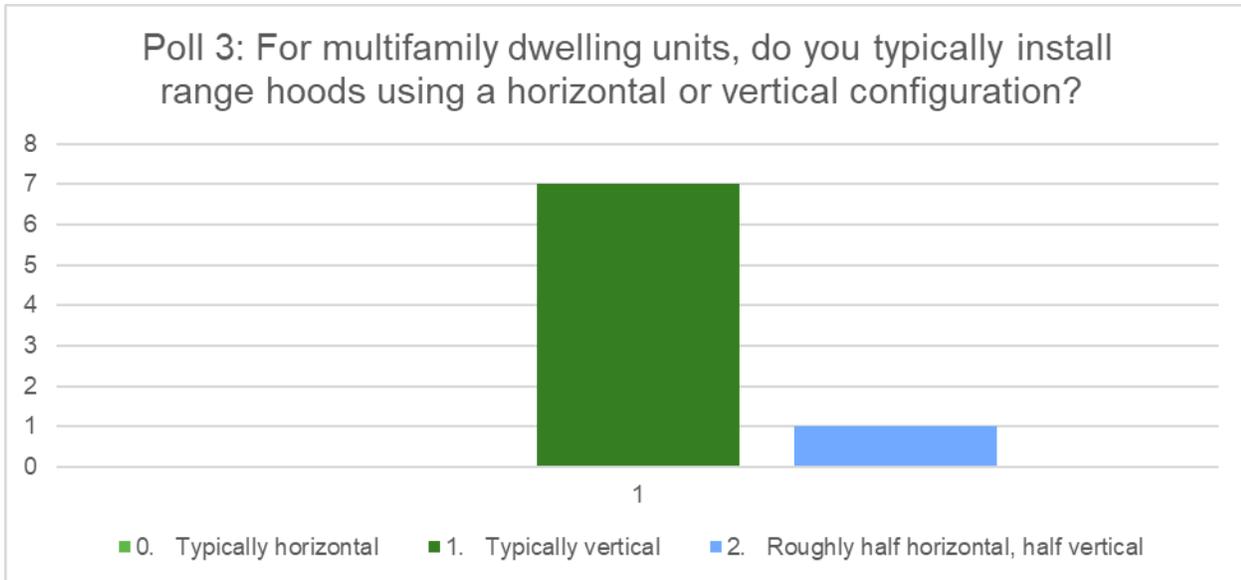


Figure 3: Results of Poll 3, Single Answer

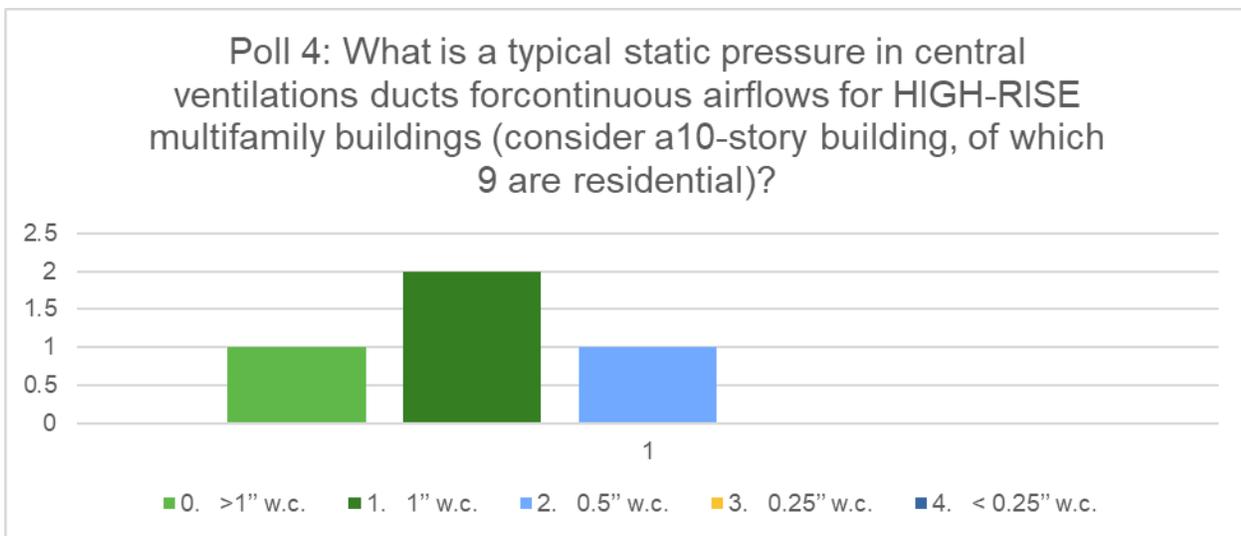


Figure 4: Results of Poll 4, Single Answer

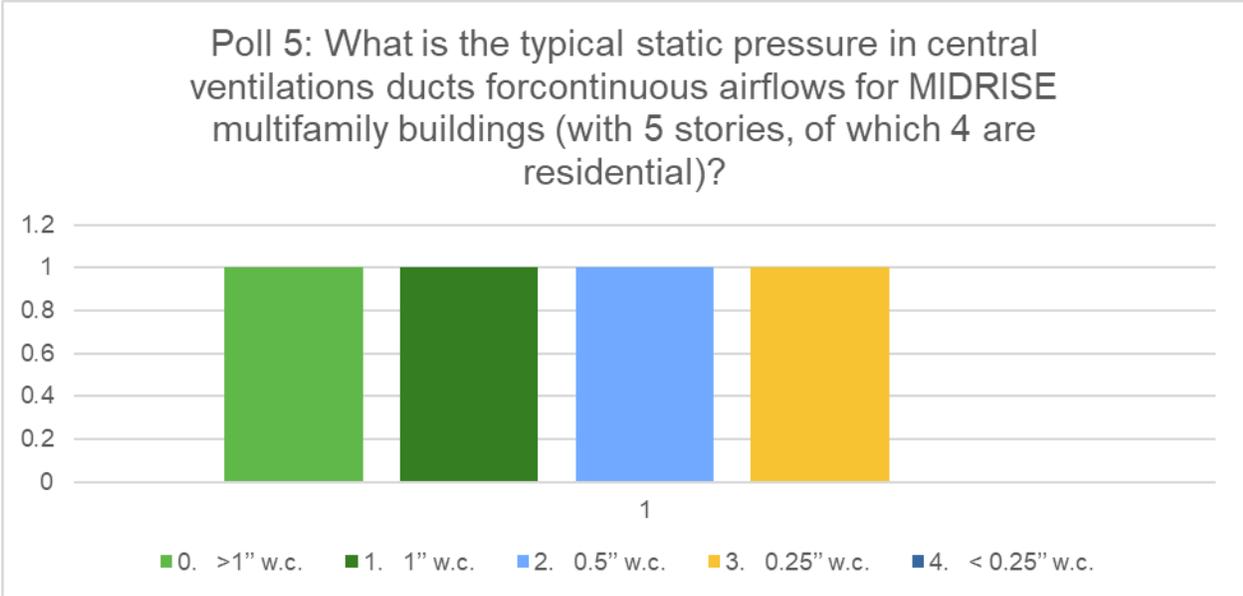


Figure 5: Results of Poll 5, Single Answer

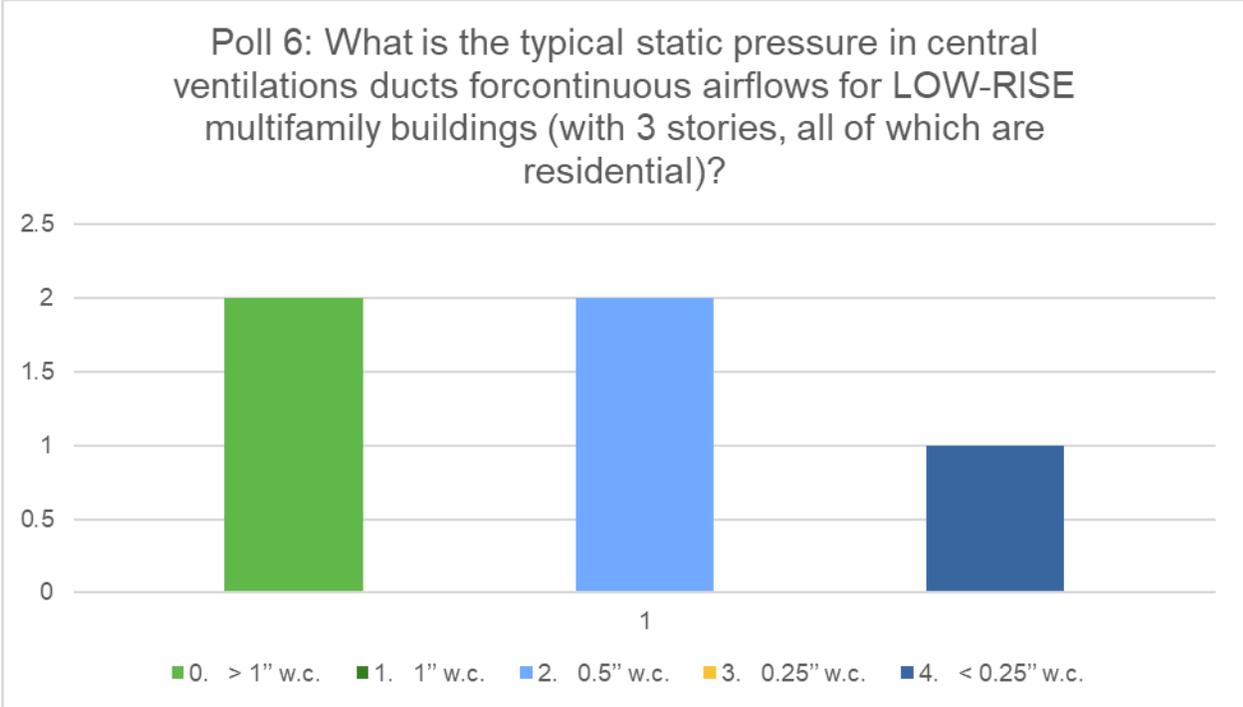
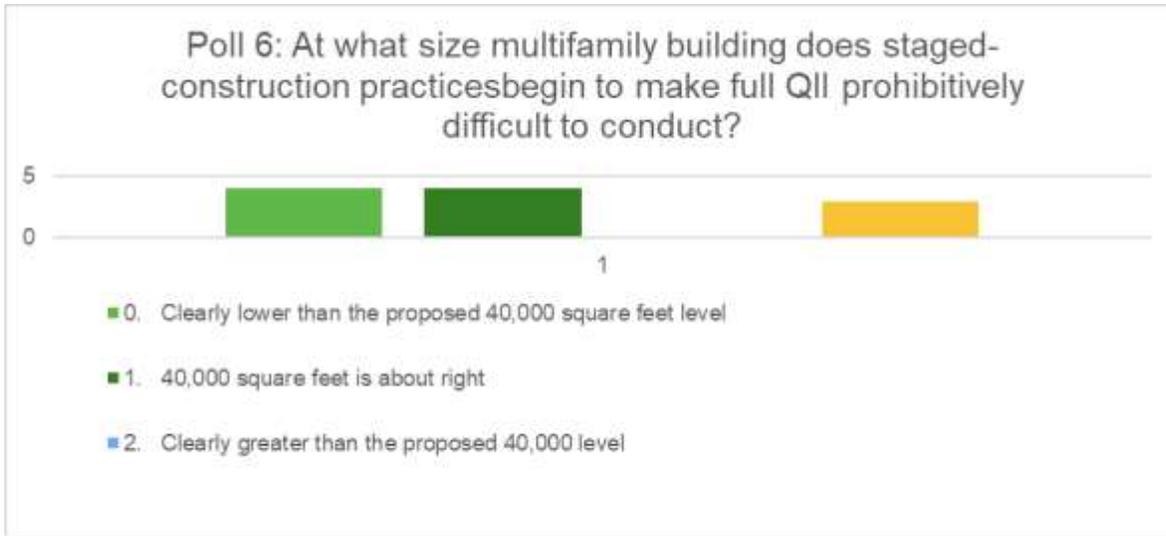


Figure 6: Results of Poll 6, Single Answer



If Square footage generally should not be the basis, please share what should be:

1. Marina Chavez: Building height or number of stories.
2. Cassandra Trester (Ei Companies): Number of stories.

Figure 7: Results of Poll 7, Single Answer

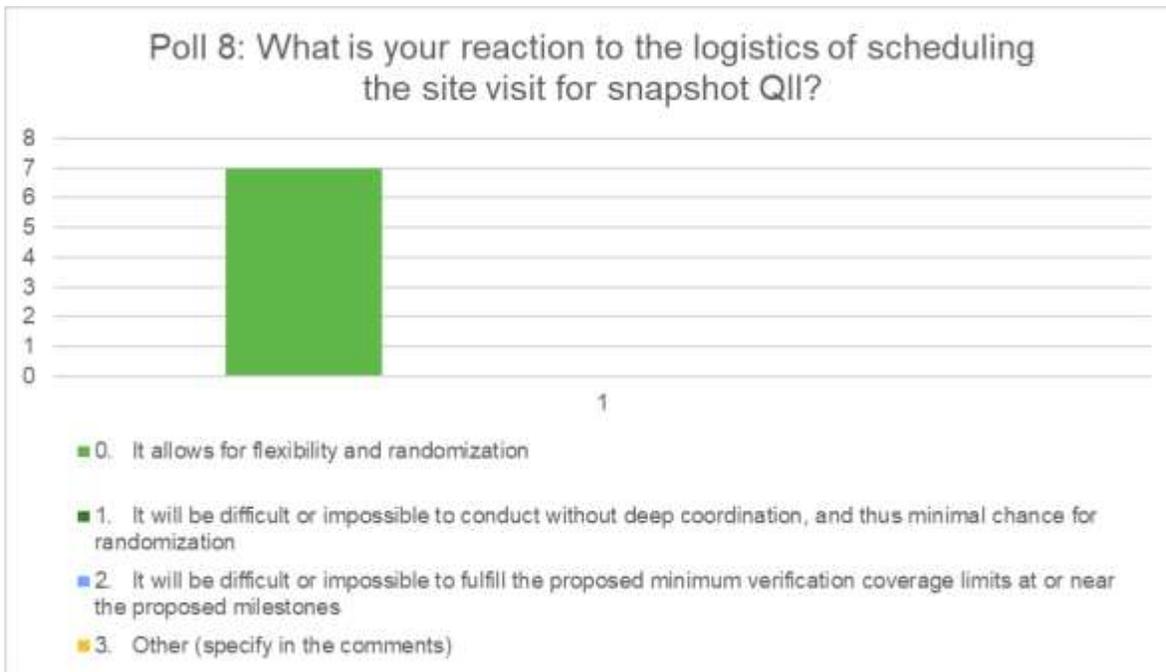


Figure 8: Results of Poll 8, Single Answer

Comments

1. Cassandra Trester (Ei Companies): There is never being ready... this is in the top two failures of inspections.

Poll 9: What is the likelihood of seeing enough wall area at each inspection stage (framing and insulation) to meet the proposed 20 percent back-stops in one visit?

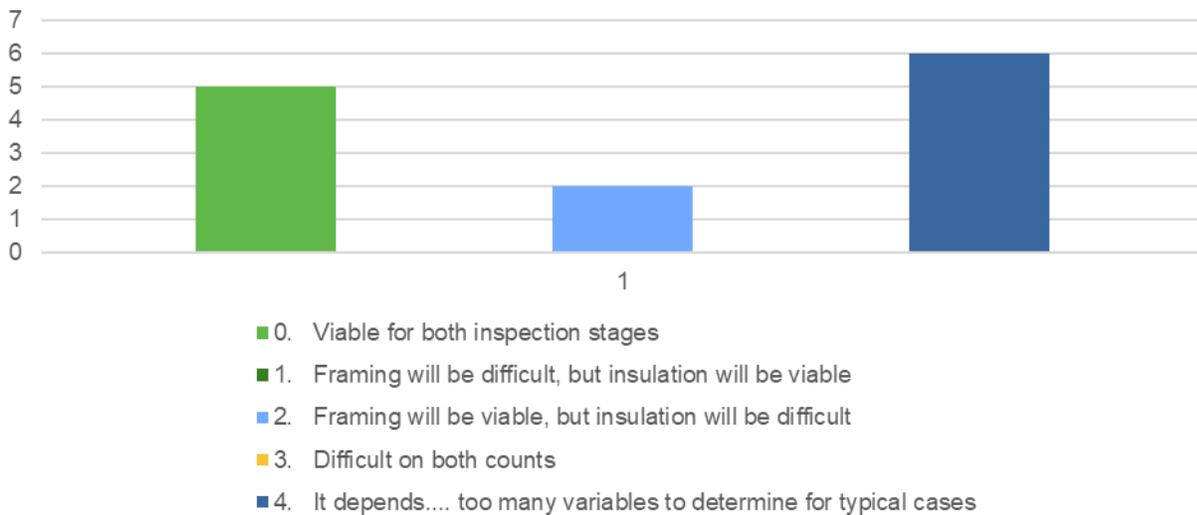


Figure 9: Results of Poll 9, Single Answer