

Notes from 2019 Title 24 Part 6 Code Development Cycle Utility-Sponsored Stakeholder Meeting for Residential HVAC, Residential Indoor Air Quality (IAQ) and Nonresidential IAQ Measures

Posted November 7, 2016

Meeting Information

Meeting Date: September 27, 2016
Meeting Time: 10:00 – 4:00 PM
Meeting Host: California Statewide Utility Codes and Standards Team

Attendees

First Name	Last Name	Contact	Organization
Statewide Utility Codes and Standards Team			
<i>Utility Staff</i>			
Jim	Kemper	James.Kemper@ladwp.com	Los Angeles Water Department of Water and Power (LADWP)
Marshall	Hunt	mbh9@pge.com	Pacific Gas and Electric Company (PG&E)
John	Barbour	JBarbour@semprautilities.com	San Diego Gas and Electric Company (SDG&E)
Randall	Higa	Randall.higa@sce.com	Southern California Edison (SCE)
Daniela	Garcia	DGarcia3@semprautilities.com	Southern California Gas (SoCalGas)
Christopher	Goff	CGoff@semprautilities.com	Southern California Gas (SoCalGas)
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<i>Codes and Standards Enhancement (CASE) Team Members</i>			
Bill	Dakin	bldakin@davisenergygroup.com	Davis Energy Group
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Vanessa	Morelan	vmorelan@energy-solution.com	Energy Solutions
Anna	Brannon	abrannon@integralgroup.com	Integral Group
Ryan	Sit	rsit@integralgroup.com	Integral Group
California Energy Commission Participants			
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Adrian	Ownby	Adrian.Ownby@energy.ca.gov	California Energy Commission (CEC)
Mazi	Shirakh	mshirakh@energy.ca.gov	California Energy Commission (CEC)
Peter	Strait	pstrait.energy.ca.gov	California Energy Commission (CEC)
Other Participants			
Bruce	Wilcox		

Eric	Adair		Adair Concepts & Solutions on behalf of the Hearth, Patio, & Barbeque Association
Mike	Schell		AirTest Technologies, Inc.
Chris	Bradt		Bay Area Regional Energy Network (BayREN)
Darryl	DeAngelis		Belimo
Russ	King		Benningfield Group, Inc.
Peggy	Jenkins		California Air Resources Board (CARB)
Zoe	Zhang		California Air Resources Board (CARB)
Bob	Raymer		California Building Industry Association (CBIA)
Jeff	Ferrell		California Division of Occupational Safety and Health (Cal/OSHA)
Rick	Chitwood		Chitwood Energy Management, Inc.
Eric	Sikkema		Colorado Energy Group
Megan	Cordes		ConSol
Mike	Hodgson		ConSol
Brandon	De Young		De Young Properties
Armin	Hauer		EBM-Papst
Chandra	Gollapudi		Emerson Climate Technologies
Brain	Butler		EnerScore
George	Nepsitt		Environmental Design/Build
Tom	Meyer		ESCO Group
Aniruddh	Roy		Goodman Manufacturing Company, L.P.
Dan	O'Donnell		Honeywell
Sebastian	Cohn		Lawrence Berkeley National Laboratory (LBNL)
Bill	Fisk		Lawrence Berkeley National Laboratory (LBNL)
Max	Sherman		Lawrence Berkeley National Laboratory (LBNL)
Misti	Bruceri		Misti Bruceri & Associates, LLC
Doug	Tucker		Mitsubishi
Bo	White		Negawatt Consulting, Inc.
Sally	Blair		NORESCO
Roger	Hedrick		NORESCO
Kyra	Weinkle		NORESCO
Scott	Gottesman		Panasonic
Brian	Kincaid		Panasonic
Bill	Meyers		Panasonic
Mike	Miyagi		Panasonic
Ron	Pasquinelli		Panasonic
Abram	Conant		Proctor Engineering
Steve	Taylor		Taylor Engineering
Beth	Braddy		Trane
Jan-Dieter	Spalink		Truveon

Rick	Wylie		Villara Building Systems
Neil	Hettler		Owens Corning

Meeting Agenda

Time	Topic	Presenter
10:00 – 10:30	Introduction	Marshall Hunt (PG&E) (PG&E)
10:30 – 10:45	Compliance Improvement	Sally Blair (NORESKO)
10:45 – 12:15	Residential Quality HVAC Measures	David Springer (Davis Energy Group)
12:15 – 1:15	Lunch Break	
1:15 – 2:30	Residential Indoor Air Quality Measures: 1. Adoption of ASHRAE 62.2-2016 2. Increased HVAC Filter MERV 3. Kitchen Hood Ventilation	David Springer (Davis Energy Group)
2:30 – 2:45	Break	
2:45 – 3:45	Nonresidential Ventilation and Indoor Air Quality	Ryan Sit and Anna Brannon (Integral Group)
3:45 - 4:00	Wrap-up and next steps	Marshall Hunt (PG&E) (PG&E)

Key Takeaways and Action Items

1. Overview

- a. No key takeaways or action items.

2. Residential Quality HVAC

a. Fault Detection and Diagnostics

- i. May be some remaining confusion about the distinction between Fault Detection and Diagnosis (FDD) devices and the existing Fault Indicator Display (FID)
- ii. No apparent objection to a compliance credit for FDDs, but will need certification process (Title 20 or 24?)
- iii. Energy savings unknown – requires large, long-term field test that is unlikely to occur within the 2019 standards cycle, or other code readiness activity
- iv. Question about cost (~\$100 factory installed per Emerson; higher for field installation)
- v. Equipment does not outlast the building; need to consider appropriateness as a tradeoff against more permanent measures.
- vi. An FDD comp op could lower the bar for envelope quality.
- vii. HVAC contractors do not review the CF-1R's to see what they should be installing.
- viii. Licensed designers, not HVAC contractors, are increasingly completing designs and specifying equipment.
- ix. PG&E advocates code readiness activities to help identify savings
- x. PG&E would like to address improvements to the JA6 FID specification (per Marshall Hunt during de-brief.

- b. Fan Efficiency
 - i. Could be challenging to align federal requirements with real in-the-field operating conditions (static pressure, etc.). Need to be careful where the limit is set; the industry is not at the DOE level yet.
 - ii. Duct sizing is critical, and brushless permanent magnet motors help to improve efficacy.
 - iii. Should consider expanding W/cfm requirement to all equipment, including mini-split heat pumps.
 - iv. Should consider making the values in Tables 150.0-B and 150.0-C (the allowed alternative to airflow measurement under Section 150.1(c)7Aib) more realistic.
 - v. Changing fan efficacy requirements could require life cycle cost analysis to demonstrate cost-effectiveness (Wilcox). Fan efficacy levels will be a separate action from the CASE report (Strait).
- c. Duct Leakage to Outside & Delta-Q
 - i. Having tight ducts is more important than measuring leakage to outside, because air should be delivered to the intended zone, not leaked to other zones
 - ii. Most HERS raters don't carry blower doors (needed for leakage to outside measurements)
 - iii. Other costs for running Delta-Q uncertain (equipment & software)
- d. Other HVAC
 - i. Add HERS providers to market actors – they train the raters
 - ii. Does the HERS data registry support the process?
 - iii. For existing homes, only need to apply measures where there are full equipment replacements
 - iv. About 80% of alterations are done without permit
 - v. IAPMO (UMC) code (not IECC) applies in CA, and a recent code change proposal to prohibit flex ducts for runs longer than 5' could have an impact if it passes (in 3-month comment period)
- e. **Action Item: The Utility CASE Team will follow-up Bob Raymer to get more information on the IAPMO flex duct decision.**

3. Residential Indoor Air Quality

- a. ASHRAE 62.2-2016 Adoption
 - i. Homeowners will turn off fans, especially if they move more air and are noisy
 - ii. Could put stickers on fan switches, but cleaning crews will remove them
 - iii. There are circular references to ventilation requirements in the CMC and Title 24 – there is an opportunity to break that cycle with the 2019 standards
 - iv. Should completely get rid of CMC (UMC) Chapters 4 & 5 to eliminate confusion
- b. MERV 11 Filters & Labeling
 - i. Concern about higher MERV ratings and furnace fans that can't handle the static pressure
 - ii. AHRI Standard 680 ratings based on particle efficiency instead of MERV rating; new ISO rating method is also coming
 - iii. Particulate air pollutants most harmful to health (morbidity, mortality, asthma)

- iv. Brett Singer’s project showing good results and airflow resistance not a major issue
 - v. Cost difference between MERV 6 and MERV 11 minimal
 - vi. Filters manufactured after 1/1/17 must be labeled but manufacturers can sell off existing stock; will include MERV or particle efficiency information (ISO rating is also coming)
 - vii. Rick Wylie indicated that homeowners will not maintain filters; energy impacts will be > 5%. Need to address the lowest common denominator
 - viii. Or... should not base decisions on lowest common denominator – need new solutions
 - ix. No benefit for ductless systems – current filter requirement only applies to ducted systems
 - x. Portable air cleaners work
 - xi. Post-meeting follow-up email from Max Sherman: “Improving filter efficiency by itself does nothing.... I would recommend NOT upgrading the MERV 6 requirement.”
- c. Unvented Gas Appliances
- i. Unvented appliances haven’t been allowed in CA for 20 years; concern about reopening issue
 - ii. CALGreen already prohibits them, but is it enforced?
 - iii. ASHRAE 62.2-2010 explicitly excluded unvented appliances from the scope; 62.2-2016 includes but does not prohibit them and its adoption might lead to confusion
 - iv. California-adopted version of 62.2-2016 could exclude them
 - v. Need compliance manual cleanup

4. Nonresidential HVAC and Indoor Air Quality

- a. There are multiple references to mechanical and natural ventilation requirements in Title 24 Part 02, Part 04, and Part 06. These multiple references should be revised or deleted where appropriate for clarity.
- b. The language in Title 24 Part 04 (California Mechanical Code) 401.1 states that “this chapter contains requirements for ventilation air supply, exhaust, and makeup requirements...” but 402.1 only addresses ventilation air supply. These references should be revised so it is clear where Title 24 Part 06 (California Energy Code) applies, and where Title 24 Part 04 applies.
- c. Create and distribute survey to other mechanical design engineers and firms to gauge how they perform ventilation rate calculations for permitting (i.e., Title 24 Part 04, Title 24 Part 06, or the greater of these two rates).
- d. Consider the impact of adjusted ventilation rates on both energy savings and health-related performance.
- e. **Action Item: Utility CASE Team will schedule a follow-up call to discuss ventilation and CO₂ concentration allowances with LBNL (Dr. Bill Fisk), Taylor Engineering (Steve Taylor), and CARB (Peggy Jenkins).**

Meeting Notes

Overview of 2019 Title 24 Development

1. Marshall Hunt (PG&E) and Sally Blair (NORESKO) presented on behalf of the Statewide Utility Codes and Standards Team.
2. Presentations available [here](#).

Comments and Feedback

1. No comments or questions.

Residential HVAC

- David Springer (Davis Energy Group, Utility CASE Team) presented.
- Presentation available [here](#).

Comments and Feedback – Indoor

1. Max Sherman (LBNL): Delta Q does not require sealing the registers. (slide 7)
 - a. David Springer (Utility CASE Team): Thank you.
2. Mazi Shirakh (CEC): If there is a fault, would the occupant be notified?
 - a. David Springer (Utility CASE Team): Let me distinguish between Fault Isolation Detection (FID) and Fault Detection Diagnostics (FDD). FID systems are fairly sophisticated and generally include displays within the house, so occupants are notified of faults can fix the fault themselves or call their service companies to get support. Service companies can also be notified directly. They provide instantaneous feedback, so they can be used as an alternate to refrigerant charge verification. They are more expensive than FDD. Currently there are no products available that meet the JA6 specification for FID's. FDD systems are much simpler and less expensive. They serve the need of long-term monitoring for service providers, and are not intended to provide building occupants with information. They make it easier for service providers to identify and diagnose problems.
3. Mike Hodgson (ConSol): What is the estimated cost?
 - a. David Springer (Utility CASE Team): It does not require that they be tied to a refrigerant system. There is a sensor that measures compressor current and runtime and detects high/low pressure switch faults. It is a simple installation.
 - b. Mike Hodgson (ConSol): Are FIDs more expensive?
 - c. David Springer (Utility CASE Team): Yes. FIDs provide more information. They also need to collect more information about the system operation. The specification in JA6 calls for them to do a temperature split diagnosis, measure flow rates, and diagnose temperatures in and out of the system.
 - d. Marshall Hunt (PG&E): This is something we will want to do a code-readiness project on.
4. George Nesbitt (Environmental Design/Build): You mentioned federal preemption. We have a 0.82 EF requirement for water heating. Meaning, we managed to get around federal preemption for water heating, so maybe we should not be as concerned about preemption. There is no reason why you would not install a condensing furnace that exceeds the minimum DOE efficiency

levels. We need to think about how to structure trade-offs in the performance approach. Higher-efficiency equipment should not be allowed to trade against envelope measures, for example.

- a. David Springer (Utility CASE Team): Are you saying we should think about a work around for HVAC equipment similar to what is in place for water heating?
 - b. George Nesbitt (Environmental Design/Build): I am more interested in making sure that we are not trading equipment efficiency against envelope measures.
 - c. Marshall Hunt (PG&E): The water heating meeting will be held on 10/26. There is some history on the water heating requirements that we do not want to get into now, but we can discuss during the water heating meeting.
5. Marshall Hunt (PG&E): It is important to have alignment with products that are offered, and the technology manufacturers will be implementing is brushless permanent magnet with constant torque. Duct size is also critical.
6. Bob Raymer (CBIA): California bases fire codes off International Code Council (ICC) fire code. California bases plumbing and mechanical on IAPMO standards – the Uniform Plumbing Code and the Uniform Mechanical Code. IAPMO just voted to prohibit the use of flex ducts at lengths greater than 5 feet. It is not clear how California will respond to the IAPMO decision. This could have significant implications. The California Department of Housing and Community Development (HCD) and CEC will need to think about whether they will adopt this requirement in California.
- a. David Springer (Utility CASE Team): There is concern about flex ducts when there is no access between floors. I do not know how it will impact this standard effort, but it should be looked at. If you can provide more info, thanks.
 - b. Brian Kincaid (Panasonic): There is a full article in last month's IHACI News, which is available [here](#).
 - c. **Action Item: The Utility CASE Team will follow-up Bob Raymer to get more information on the IAPMO flex duct decision.**
7. Rick Wylie (Villara Building Systems): I am concerned about fan efficacy. DOE requirements are 0.23 W/CFM, but we are also seeing application wattage of 0.365 W/CFM. California has recognized 0.58 is a challenge. Are we vetting the application wattage or DOE values?
- a. David Springer (Utility CASE Team): We are more interested in the application. DOE values are based on lab testing without normal house conditions.
 - b. Marshall Hunt (PG&E): The technology is not the issue. We can install a brushless magnet motor and get to the appropriate efficiency level.
8. Bruce Wilcox: I do not understand how you can say fan efficacy does not have impact on efficiency or lifecycle costs. What Rick said earlier, if they are testing static at a standard 1.5-inch water column, it does not translate to field applications? It will be complicated to translate, even if you drop a component. BPM motors: are watts considered? If we are changing fan efficiency requirements, that will have lifecycle cost implications and CEC cannot adopt unless the new requirements are cost effective.
- a. David Springer (Utility CASE Team): The objective is not to make the requirements more stringent, but to align with DOE.
 - b. Marshall Hunt (PG&E): DOE standards require a BPM motor. We were successful in adopting a static pressure of 0.5 in the federal standards.
 - c. Peter Strait (CEC): We are not including a cost effectiveness analysis on fan efficiency in this CASE Report. The fan efficiency levels will be a separate action.

- d. Marshall Hunt (PG&E): We need to consider filters. CARB is interested in MERV 11 requirements with higher ratings.
9. Participant: DOE does mention 0.5, but they also mention a range of 0.65 and 0.70 depending on the type of installation. Higher statics are allowed.
 - a. David Springer (Utility CASE Team): That is new to me. They will be updating fan efficacy with static.
 - b. Marshall Hunt (PG&E): This is an example of the stakeholder input we need.
10. George Nesbitt (Environmental Design/Build): Our current static pressure requirements are realistic for non-ECM motors with relatively decent duct design. Much lower numbers are possible with non-ECM motors with better duct design. You may want to think about ductless heat pumps and their fans. Unless you turn the thermostat all the way off, the fan runs so the temperature rating can be achieved.
11. George Nesbitt (Environmental Design/Build): I have done a lot of duct testing. My preference is tight ducts, which get the air where you want it to go. A tight duct standard is what we want to accomplish. It takes a little effort to accomplish, but it is worth it. You can have leaky ducts and no leakage to the outside if ducts are in a conditioned space, but that is not necessarily a good thing. I have not done Delta Q, but I have done lots of pressure / de-pressure tests. It takes time, and it is complicated.
 - a. Marshall Hunt (PG&E): Energy efficiency advocates did not like that DOE only covered furnaces. From the DOE's standards perspective, the heat pump air handlers were included in the HSPF calculation, we do not agree with that. Still we should ensure a W/CFM criterion.
12. Mazi Shirakh (CEC): In Section 150.1 we have a prescriptive alternative to fan watt and air flow requirements. It has to do with the sizing of the grill. Is anybody using it? Would it make sense to look at that prescriptive alternative to make it more appealing to builders?
 - a. Bob Raymer (CBIA): No, nobody is using it because of the size of the grill.
 - b. David Springer (Utility CASE Team): Good suggestion. We will be talking about filters later today.
13. Rick Chitwood (Chitwood Energy Management, Inc.): I do not think we have enough data on how we are going to meet 0.2 W/CFM. It is not difficult, but it is not where we are as an industry right now.
 - a. Marshall Hunt (PG&E): We have the choice to keep working on our options and see where we end up and what might make sense in the 2019 Standards.
14. Marc Hoeschele (Davis Energy Group): HERS Raters should be added as a market actor.
 - a. Sally Blair (NORESKO): The HERS providers, who train HERS raters, should also be on this list. If there is a change to the HERS testing requirements, we will need to work with the HERS providers to make sure the change is communicated to HERS raters.
15. Sally Blair (NORESKO): Do you anticipate that there will be challenges with the purchaser buying the correct FDD equipment?
 - a. George Nesbitt (Environmental Design/Build): Installing contractors never see a CF1R. What is specified in the CF1R is not included on plans. There are always miscommunications between what is required by code and what actually gets purchased / specified / installed.
 - b. Sally Blair (NORESKO): Then we need to think about the information about what needs to be purchased is communicated clearly.

16. Rick Wylie (Villara Building Systems): According to specifications, there is no mechanical designer. More and more there is a licensed designer that is not a contractor.
17. Marshall Hunt (PG&E): We need to think about how the requirements apply to alterations. This is something we need to consider both for the standards and the compliance process.
 - a. Randall Higa (SCE): We do not have the building owner and/or tenant identified as a market actor. This is important for alterations. Success criteria for the occupant is the retrofit minimizes. There is a hassle factor, not just for inspection by HERS, but also for obtaining a permit, and final inspection.
18. Sally Blair (NORESO): Would the HERS rater have to purchase additional equipment (hardware or software) to complete the Delta Q method. You had also mentioned that Delta Q may not be best if it is windy. Can a HERS rater make the decision on the fly if they do the Delta Q test or the blower door test?
 - a. David Springer (Utility CASE Team): We need to do some more work to identify appropriate wind conditions for the Delta Q test. As far as equipment, I am not sure of the percentage that carry blower doors.
 - b. George Nesbitt (Environmental Design/Build): Not many people use the blower door credit. Software is typically free, maybe some hardware costs. It would be whether you have blower door or not, probably \$3000.
 - c. David Springer (Utility CASE Team): It is on the HERS rater to decide if there are cost savings to justify purchasing a blower door, as opposed to a conventional pressuring duct approach.
19. CEC: Comment on market actors, you mentioned we should add HERS raters. You should also consider the data registry. That is the entity that is responsible for providing the required documentation.
20. Mike Hodgson (ConSol): I was thinking that this would mostly impact residential new construction. If the market actors you presented in this presentation are supposed to cover both new construction and alterations, you should add the homeowner to the list of market actors. About 80 percent of alterations do not get permits.
21. Aniruddh Roy (Goodman Manufacturing Company): PSEs would be replaced by ECMs for 2019 onward. This would be true for new construction? It would be more complicated for alterations.
 - a. David Springer (Utility CASE Team): Good point. There would need to be another requirement.
 - b. Mark Alatorre (CEC): Alterations do not have to comply with fan efficiency requirements unless it is a full duct replacement.

Residential Indoor Air Quality

- David Springer (Davis Energy Group, Utility CASE Team) presented.
- Presentation available [here](#).

Comments and Feedback

1. George Nesbitt (Environmental Design/Build): When we look at data submitted, it is different than what we see in the field.
2. Bill Meyers (Panasonic): Can you explain the infiltration credit? ASHRAE 62.2 has 0.03 CFM/SF, but California uses 0.1 CFM/SF?
 - a. David Springer (Utility CASE Team): California uses Addenda N of 0.03 CFM/SF, but not all jurisdictions adopt all addenda.

- b. Jeff Miller (CEC): ASHRAE 62.2 has an alternate pathway that begins at 0.03 CFM/SF then allows you to get some credit for infiltration.
 - c. David Springer (Utility CASE Team): People do not know about the infiltration credit, but they will after this presentation
 3. Jeff Miller (CEC): The California version that incorporates Addenda N has an alternate path that allows you to begin with 0.03 SFM/SF and then calculate the infiltration credit. Both methods of compliance are available for current standards.
 4. Bill Meyers (Panasonic): Can you explain the number of bedrooms metric presented on slide 5?
 - a. David Springer (Utility CASE Team): Add one person to the number of bedrooms.
 5. Brian Kincaid (Panasonic): Are you allowing a representative sample, or are you requiring a blower door in every home?
 - a. David Springer (Utility CASE Team): Sampling is not allowed.
 - b. Brian: It may not be allowed, but it is happening. Are you relying on the HERS raters to complete the blower door test and to sign off on compliance documents?
 - i. David Springer (Utility CASE Team): Yes. The HERS rater is responsible for signing off on blower door tests for each house.
 6. Jeff Miller (CEC): David is describing changes to ASHRAE 62.2, but the CASE Team is proposing requirements in California that are a little bit different than the 62.2 requirements.
 7. George Nesbitt (Environmental Design/Build): I am trying to understand the assumption of 2ACH50 for IAQ rate. That seems low. (slide 8)
 - a. Bruce Wilcox: The tighter the house, the bigger the fan has to be. If the house is leaky, you can use a smaller fan.
 - b. George Nesbitt (Environmental Design/Build): I tested an 80 unit 3-story multifamily building last year that had an average of about 3ACH50.
 8. Rick Wylie (Villara Building Systems): All of this is good intention, but the fan is never on.
 - a. David Springer (Utility CASE Team): That would be really good feedback for the 62.2 committee to hear, the intention of the committee is to ensure public health is preserved.
 9. Mazi Shirakh (CEC): There is a labeling requirement that says “this fan should remain on all the time to maintain indoor air quality”.
 - a. Brian Kincaid (Panasonic): The label is being installed, but it is removed at some point after installation.
 10. George Nesbitt (Environmental Design/Build): My concern with going to the 2016 version of ASHRAE 62.2 is requiring more airflow when we already have trouble with the current requirements. More airflow requires bigger ducts, and this is not happening. Commenting on the infiltration credit, most of the time you cannot do blow door tests until the building is done. Unless you are installing a fan with multiple speeds and cannot adjust fan speeds after that, then it is too late to make a decision on fan sizing. I do like that the 62.2 is including high-rise residential. I think all multi-family belongs in residential and not in nonresidential. These assumptions are too high and the credit for blow door is too low. (slide 8)
 - a. David Springer (Utility CASE Team): 0.02 cfm per square foot of infiltration is roughly equivalent to 5ACH50.
 11. Mike Hodgson (ConSol): Currently we are installing 75 CFM in a 2,500 SF house. What would you anticipate we would be installing if we adopt the 2016 version of ASHRAE 62.2? Where is the air coming from?

- a. David Springer (Utility CASE Team): If you are building a tighter home, you should be ventilating more. I think you are asking if we can supply enough air in the tight homes. See slide 9 for answer to your question about the sizing of fans to meet the 2016 ASHRAE 62.2 requirements. You should be ventilating more for health and safety. What you are asking is, will the fan be able to deliver the amount of air given the building envelope and the resistance?
 - b. Mike Hodgson(ConSol): If there is so much resistance that we cannot get the air, then we need to address that.
 - c. David Springer (Utility CASE Team): This is particularly important for multi-family.
12. Brian Kincaid (Panasonic): I have a number of designers in Southern California who are designing balanced systems. It includes using a MERV 13 filter. Are you going to address the MERV rating?
- a. David Springer (Utility CASE Team): We will be talking about MERV 11. Again, we are following ASHRAE 62.2, so it is up to that committee to decide what the MERV rating will be. There is someone on the committee who is advocating strongly for balanced systems.
13. Brian Kincaid (Panasonic): How are you accounting for equipment that is being added?
- a. David Springer (Utility CASE Team): This is particularly important with the range hood. That is more of an issue with multi-family. That is a separate issue compared to continuous ventilation and is certainly a problem worth considering.
14. David Springer (Utility CASE Team): Does the Panasonic system use a heat exchanger or is it direct? (slide 11)
- a. Brian Kincaid (Panasonic): Direct.
15. George Nesbitt (Environmental Design/Build): Regarding makeup air requirements: I have seen single family, max 600 CFM, depressurized to -63pa. I have had baseline pressures that are really low. The lowest I have seen was -53pa. This is a problem with the availability of makeup air. ASHRAE 62.2 mentions makeup air in the context of kitchen exhaust. Buildings are tight enough and air is being drawn out of the house from a number of sources. We need to make sure we are asking builders to ensure there is sufficient makeup air.
- a. David Springer (Utility CASE Team): There are also concerns about tempering make up air.
 - b. Brian Kincaid (Panasonic): For IECC 2015 and ASHRAE, if you are using a 400 CFM range hood, you have to demonstrate where the makeup air is coming from.
16. Bruce Wilcox: We put water heaters in garages. We need to look out for situations where water heaters are located within the house.
17. Bob Raymer (CBIA): I have no empirical data to dispute this, but I have heard people complain about air filter labels, which shows people are trying to install air filters with the correct labels. It definitely shows awareness. We agree the cost between MERV 11 and MERV 6 is a minimal cost difference. (slide 13)
18. Bob Raymer (CBIA): When is the labeling requirement taking effect?
- a. Jeff Miller (CEC): Air filter labels manufactured after January 1, 2017 must meet the Title 20 labeling requirements. Manufacturers / retailers can sell through the existing stock that does not have labels until they run out.
19. George Nesbitt (Environmental Design/Build): If we are changing the basis of the ventilation rates in Part 6, are we also going to change the requirements in the mechanical code?
- a. David Springer (Utility CASE Team): Part 6 supersedes the mechanical code.

- b. Jeff Miller (CEC): There are some circular references between the mechanical code and the energy code. The energy code takes precedent.
 - c. Steve Taylor (Taylor Engineering): Existing code does not clearly state that both supply and exhaust ventilation rates are dictated by Part 6. Currently, it is clear that Part 6 dictates supply ventilation requirements. I think the mechanical code still dictates exhaust rates.
 - d. Mark Alatorre: We are going to be talking about the exhaust ventilation requirements in ASHRAE 62.1 in the next presentation (NR IAQ).
20. Bob Raymer (CBIA): When the new Title 20 air filter labeling requirements takes effect, are we going to see the MERV rating on the label?

- a. Jeff Miller (CEC): You will see the MERV rating if the ASHRAE 52.2 test procedure was used, If the AHRI 680 test procedure is used, the label will present particle efficiency. An example label can be found here:

MERV	(µm)	0.3-1.0	1.0-3.0	3.0-10	Airflow CFM	[value 1]	[value 2]	[value 3]	[value 4]	[value 5]	* Max rated airflow
[value]	PSE %	[value]	[value]	[value]	Initial Resistance (IWC)	[value]	[value]	[value]	[value]	[value]	

- i.
 - ii. Bob Raymer (CBIA): Consumers will have a hard time understanding the difference between the two tests.
- b. David Springer (Utility CASE Team): It sounds like we need to do some work to minimize confusion if the Title 24 requirement is based on MERV, but filters labeling displays MERV ratings or particle efficiency.
 - c. Max Sherman (LBNL): There will be a new ISO standard for filter rating that should be allowed
 - i. David Springer (Utility CASE Team): So, there are three ratings.
21. George Nesbitt (Environmental Design/Build): Why would we require a MERV rating? Higher MERV filters use more energy and it makes it harder to push air to spaces. What do we want: more filtration, reduced ventilation, more energy use?
- a. Peggy Jenkins (CARB): We are interested in higher MERV filters because particle air pollution is by far the most harmful to our health. With higher particle concentrations, we see increases in morbidity and mortality, and increased asthma rates. We have studies that indicate significant reductions in adverse health effects if you use higher MERV filters. Brett Singer (LBNL) completed a study looked at 8 variations of ventilation systems. The report is available [here](#). The air flow difference associated with using a higher MERV filter is less than 5 percent, so higher MERV filters should not have a significant energy penalty. If people let their filter fill up and do not replace it, there is a problem. Our ambient particle levels are lower than they used to be, but we still exceed threshold levels in most urban areas.
 - b. Tom Meyer (ESCO Group): I understand the intent of higher MERV filters, but I agree with George. It comes down to real world. You are assuming that the home owner is going to replace the filter with the correct MERV. Once the filter is not maintained, we add all sorts of energy issues that increase energy use more than 2-5 percent. The equipment is not as permanent as the envelope. When we add 2-5 percent resistance, we need bigger equipment. We all know of a neighbor who does not take down the Christmas tree until February – and we expecting that home owner to change their filter?

- c. Peggy Jenkins (CARB): We should not compromise on what is the correct thing to do for health reasons because we are concerned that some people are not going to change their filter.
 - d. Tom Meyer (ESCO Group): All of this is good in theory, but we have to remember the reality of the world.
 - e. Peggy Jenkins (CARB): We are suggesting it can be done in variety of new ways.
 - f. David Springer (Utility CASE Team): Equipment does not necessarily need to be sized larger to accommodate higher MERV filters.
22. Steve Taylor (Taylor Engineering): What is the scenario for people who are using ductless systems?
- a. Bruce Wilcox: The filter requirement only applies if you have ducted systems.
 - b. David Springer (Utility CASE Team): That does not answer the question of how you address indoor air quality issues on non-ducted systems.
 - c. Peggy Jenkins (CARB): Portable air filters are an option. Brett studied the whole range, and mostly prefers a higher MERV central system combined with low flow rate/variable power motor so it is not running all the time. LBNL also looked at cost tradeoffs.
 - d. David Springer (Utility CASE Team): Brett Singer will be doing a presentation on the LBNL research during a DOE webinar. Visit this site for more information about the upcoming [webinar](#).
23. Rick Wylie (Villara Building Systems): One of our major businesses is heating and air. We are the guys who go out to the houses and try to educate homeowners/occupants about the importance of replacing filters, and how to actually replace filters. It is like a doctor saying you should exercise more. We all know we should do it, but not everybody does it. People are not going to change their filter – even if they know they should. We cannot just regulate health, and that is what we are trying to do here.
- a. David Springer (Utility CASE Team): Is there a compromise? In commercial applications there are signals that alert when the filter needs to be switched.
 - b. Rick Wylie (Villara Building Systems): If a person that does not want to maintain their home, the signal is not going to make a difference.
 - c. David Springer (Utility CASE Team): What if the builder was asked to supply 5 replacement filters?
 - i. Rick Wylie (Villara Building Systems): That might make my 1-year warranty more bearable.
24. Sally Blair (NORESO): We have been talking about compliance throughout the discussion. Here is what I have heard we can do to help improve compliance: 1) capture cost of upsizing fans needed to overcome increased resistance from filters; 2) address confusion about air filter performance and the forthcoming Title 20 labeling requirements; and 3) there is a need to address building operation and maintenance.
25. Mike Hodgson (CBIA): For clarification, we have two product categories: vented gas furnaces and decretive fireplaces. Are the requirements supposed to cover both decretive and vented gas furnaces? (slide 27)
- a. David Springer (Utility CASE Team): The intention was to cover both.
 - b. Mike Hodgson (CBIA): CALGreen includes a mandatory requirement that specifies any fireplace must be a sealed combustion unit, that implies they must be vented.
 - c. David Springer (Utility CASE Team): Sealed combustion means they do not use inside air for combustion. We are trying to regulate unvented gas appliances.

- d. Mike Hodgson (CBIA): Be perfectly clear what you are covering. Some are already covered by CALGreen. We need to avoid conflicting standards.
26. Eric Adair (Hearth, Patio, & Barbeque Association): I echo Mike’s comment. It is not clear which gas furnaces are regulated. Sealed combustion is what we call a direct vent in the hearth industry. From a hearth standpoint, we do not want products that should not be included inadvertently grouped into the covered products.
- a. David Springer (Utility CASE Team): Our intention is to cover hearths and fireplaces.
 - b. Eric Adair (Hearth, Patio, & Barbeque Association): It is illegal to install fireplaces that are vented to the inside. This has been the case for 20 plus years. Are we trying to accomplish something that is already covered?
 - i. David Springer (Utility CASE Team): We included these products because they are covered by ASHRAE 62.2, and we wanted to make sure that Part 6 was consistent.
 - ii. Peter Strait (CEC): Our intention is to harmonize with existing requirements and minimize confusion.
 - iii. Mazi Shirakh (CEC): Does ASHRAE 62.2 allow unsealed fireplaces? We should we make it crystal clear if the California requirements vary from ASHRAE 62.2.
 - iv. Mike Hodgson (CBIA): You do not need to do this. It is already covered in CALGreen. We do not want an additional code that confuses the interpretation of existing code.
 - v. Mazi Shirakh (CEC): This may be a candidate for clarification in the compliance manual as opposed to language in Part 6 of the Standards.
 - vi. Bruce Wilcox: 62.2-2010 explicitly excluded unvented products from its scope. This has been addressed in the 2016 62.2 Standards.

Nonresidential Ventilation and Indoor Air Quality

- Ryan Sit and Anna Brannon (Integral Group, Utility CASE Team) presented.
- Presentation available [here](#).

Comments and Feedback

1. Ryan Sit (Utility CASE Team): What code requirements do mechanical engineers use when sizing ventilation systems?
 - a. Steve Taylor (Taylor Engineering): It is all very confusing. It is virtually impossible to figure out which standard takes precedent. For supply ventilation it is clear that Title 24 requirements take precedent. We use Title 24 for supply air and I think most other engineers are using Title 24. Title 24 is typically more stringent, though many local jurisdictions and/or building owners want to meet LEED requirements too. We need to clean this mess up. Natural ventilation is defined differently in three different codes in California, and mechanical ventilation is defined in two codes. Why not just present the requirements in one place? The other codes can reference the code that takes precedent.
 - b. Mark Alatorre (CEC): The intent is to remove the language from Part 4 that references ventilation. The Warren-Alquist Act gives CEC authority to regulate ventilation, and we intend to do that.
 - c. Steve Taylor (Taylor Engineering): I recommended to Building Standards Commission that they delete references to ventilation requirements from other sections of the California Building Code, but I did not have any luck. CEC might be more successful.

- d. Mazi Shirakh (CEC): Is the CASE Team proposing changes to the ventilation rates based on ASHRAE 62.1?
 - i. Ryan Sit (Utility CASE Team): Yes. We are proposing to align the Title 24 ventilation rates with the ventilation rates in ASHRAE 62.1.
2. Steve Taylor (Taylor Engineering): Did you assume ventilation efficiency in these calculations? (slides 15 and 16)
 - a. Ryan Sit (Utility CASE Team): The ventilation rates on Slide 15 consider only breathing zone, and Title 24 density assumptions. Ventilation efficiency was not considered in these preliminary calculations.
 - b. Anna Brannon (Utility CASE Team): This is our first pass. We are looking for more data to come up with representative buildings that cover more types and use.
 - c. Steve Taylor (Taylor Engineering): I do not think you can accurately assess impact using a spreadsheet and breathing zone rates. You need to do real simulations. If you are looking at cooling and heating effects, an outside air economizer can reduce load. Your model will have to do that. There is a big difference in breathing zone rates between 62.1 and Title 24.
 - d. Ryan Sit (Utility CASE Team): Thank you. Those additional portions of the ventilation that are found in ASHRAE 62.1 do include energy savings. It also adds more complexity to enforcement and compliance.
 - e. Steve Taylor (Taylor Engineering): Are you suggesting you will not adjust for two efficiencies?
 - f. Ryan Sit (Utility CASE Team): We have this on a slide later, and we are considering it.
 - g. Anna Brannon (Utility CASE Team): We do want specific feedback. That is why we are separating it out as an additional area to look at.
3. Steve Taylor (Taylor Engineering): Generally, unless you are using a dedicated outdoor air system, there is impact on heating and cooling capacity.
 - a. Ryan Sit (Utility CASE Team): In terms of fan size and costs, the fan size can be smaller if you are moving less air, which would reduce associated costs.
 - b. Steve Taylor (Taylor Engineering): Only outside systems will have a cost difference. A packaged unit will not have cost impacts. You might save time in your analysis because the 62.1 rates are generally lower energy and costs.
4. Peggy Jenkins (CARB): I do not see you are taking health costs into consideration. LBNL has published the benefit of higher ventilation rates.
 - a. Bill Fisk (LBNL): We have evaluated health-related performance impacts relative to energy consumption. Improved air quality has very clear the economic benefits. I do not think you can do the energy analysis with a spreadsheet, you have to take many factors into consideration, and this can be completed more easily with modeling tools. Buildings without economizers with increased ventilation actually save energy. More importantly, lower ventilation has substantial economic and health impacts.
5. Mazi Shirakh (CEC): I am hearing recommendations that we adopt air quality requirements that are more stringent than ASHRAE 62.1. ASHRAE 62.1 is presumably in effect in the other 49 states. Is there documentation that the other 49 states have experienced health issues?
 - a. Bill Fisk (LBNL): There is not data that looks at this directly, but you could look at metrics like student absentee rates.
 - b. Marshall Hunt (PG&E): We can post information on LBNL's studies on Title24Stakeholders.com.

- i. Studies can be found [here](#).
 - c. Steve Taylor (Taylor Engineering): There is a LEED credit for adopting a 30% over ASHRAE 62.1 option. You will not get the energy savings, but you will be harmonized more closely with the national standards.
 - d. Mazi Shirakh (CEC): If lower ventilation rates are such a concern, is anybody lobbying ASHRAE 62.1 committee to increase their ventilation rates to match Title 24?
 - e. Steve Taylor (Taylor Engineering): Not that I know of. LEED has been so effective at reducing ventilation rates, which has been having the opposite effect.
 - f. Bill Fisk (LBNL): Although ASHRAE is intended as the minimum code, it becomes the design practice.
 - g. Mark Alatorre (CEC): A key portion of this proposal is expanding the occupancy types that are listed in Title 24. The idea is to expand occupancies and be more prescriptive about the minimum ventilation rates in each occupancy.
 - h. Bill Fisk (LBNL): ASHRAE allows you to get very low ventilation rates if you have high occupancy. I think the structure of Title 24 is a superior.
6. Jon McHugh (McHugh Energy Consultants): Title 24 has a demand control ventilation (DCV) requirement. ASHRAE 62.1 has DCV requirements different concentration levels based on a more complicated calculation. Is there an enforcement challenge in going to 62.1?
 - a. Bill Fisk (LBNL): You are correct. Moving to 62.1 does make compliance more challenging. It also allows for twice the CO₂ concentration.
 - b. Jon McHugh (McHugh Energy Consultants): Is it problematic that 62.1 allows higher CO₂ Concentrations?
 - c. Steve Taylor (Taylor Engineering): It depends how you feel about the importance of worker productivity. Bill Fisk has found that higher concentrations have a significant impact on productivity.
 - d. Marshall Hunt (PG&E): CASE Authors will schedule a follow-up call to discuss ventilation rates and CO₂ concentration allowances.
 - i. **Action Item: Utility CASE Team will schedule a follow-up call to discuss ventilation and CO₂ concentration allowances with LBNL and Taylor Engineering.**
7. Steve Taylor (Taylor Engineering): Bird Screens are in the mechanical code. The moisture (relative humidity requirement) is a not an issue in California because we do not have high humidity, so it does not make sense to codify relative humidity requirements in California. (slide 23)
8. Steve Taylor (Taylor Engineering): Spacing requirements for finned-tube coils and heat exchangers is a good measure that is not currently in Title 24 (slide 24). That is actually in mechanical code also, chapter 4. (slide 26).
9. Mark Alatorre: I wonder if this will be a concern considering there are indoor cigar lounges in California.
 - a. Marshall: That is also seen in airports.
 - b. Steve Taylor (Taylor Engineering): It would be a waste of time to do calculations. Item 3, Finned-tube coils and heat exchangers cleaning requirements, is a good requirement. I would prefer again if it was in mechanical so it is not duplicated. Item 5, Air classification and recirculation, is in mechanical. (slide 28)
10. Brian Kincaid (Panasonic): Do high density areas require MERV 13? (slide 30)

- a. Anna Brannon (Utility CASE Team): Higher MERV filters are required in some areas. It is localized. We do not want to adopt a requirement that is universal for the entire state. Jurisdictions can adopt more stringent standards as appropriate.
11. Steve Taylor (Taylor Engineering): Do you have statistics on ozone requirements throughout California?
- a. Anna Brannon (Utility CASE Team): We do have that information. We can include links in the notes or update today's presentation Many areas in CA require the filtration for ozone.
 - i. [Current Nonattainment Counties for All Criteria Pollutants](#)
 - ii. [Counties Designated "Nonattainment" for Clean Air Act's NAAQS](#)
 - b. Bill Fisk (LBNL): We often assume people are using filters with embedded carbon, not actual carbon filters. We do not have data on this to show the benefit in reducing ozone.
 - c. Roger Hedrick (NORESO): Ozone is not based on higher level assumptions that there is reduction of ozone when you travel through a system. There 62.1 applies to 3 counties in Southern California. I agree there is lack of information on what can be done with system to meet requirements. No manufacturers have provided the committee with data other than cost data.
12. Bo White (NegaWatt): There is an ASHRAE 62.1 spreadsheet tool you could use to calculate outside air per zone. Those values can then be inputs into a CBECC prototype building model. The prototype's HVAC system will determine the effectiveness values to use in the ASHRAE 62.1 spreadsheet. A baseline CBECC model could use the ventilation values calculated in Title 24. Then compare the two for energy savings.
13. Steve Taylor (Taylor Engineering): In ASHRAE 62.1, you cannot have natural ventilation on its own. You have to couple natural ventilation with mechanical ventilation.
- a. Ryan Sit (Utility CASE Team): That's right. Mechanical ventilation is required unless there is a permanent opening, or if there will be an opening during expected occupancy.