ENERGY CODE TECHNICAL ASSISTANCE LOG

Q&A and Technical Assistance provided - from June 15, 2017 - June 15, 2018

Q **For our flat roof (1/4" per foot slope membrane) our roof joists are 8" deep metal ceiling joist framing with a radiant barrier plywood with the shiny side down. On top of that, I would have tapered insulation at 1/4" per foot slope, then a membrane roof.**

My question is with regards to venting of the roof with the 1" air cavity between the top of insulation and the bottom of radiant barrier on roof sheathing.

I'm concerned that the flat roof with metal framing might not get good air flow within the 1" cavity. Would we be allowed to use close cell spray foam applied to the bottom of the roof sheathing and eliminate the roof venting all together? The foam would be sprayed to the bottom side of the roof sheathing then I would still have tapered insulation on top of the roof sheathing so no air space.

This is my first project in a tropical environment so doing lots of research on the matter!

A If I'm understanding your design correctly, it sounds like you're best off with the closed cell foam option. There are optional compliance paths, and you'd follow the model or "mainland" option which follows the 2015 IECC as is.

Only R-30 is required. Less than 5" of foam would fill the bill. Just R-3 ci on top of the roof deck satisfies the code. In addition, I'd strongly recommend a reflective membrane as it works excellently in Hawaii. If you're using a coating, I strongly recommend silicon over acrylic. Since you're using steel trusses, you need all the external protection you can get.

If you want to pursue the Tropical Code option, I'd be glad to discuss that.

Q **For the SHGC of 0.25 does Hawaii allow "simulated" values or do they have to be NFRC rated. I'm obtaining quotes for windows and doors and it appears very difficult to get NFRC rated at or below 0.25 but the vendors have what they call "simulated" values for SHGC that do meet the requirement of 0.25 or better. Thoughts? Thanks again.**

A For a custom home, the issue may be that he's looking for custom glazing rather than standard manufactured windows. I don't think it's hard to find standard windows with NFRC values below SHGC 0.25.

Site-built windows are covered by NFRC. There's a procedure for getting them rated and a certificate provided by the manufacturer of the glazing system.

Q **I was given your email address, as someone I should contact about the LED retrofit projects happening here in Hawaii. If you are not the right person to discuss energy policy with perhaps you could direct me in the right direction?**

My inquiry is about the LED retrofit projects being done throughout Oahu where fluorescent tubes are being replaced with the LED tubes. The problem I have with this process is that the fluorescent tube is being swapped for LED tubes without changing the ballast which means you are not getting the full benefit of changing to LED tubes. In addition, an old ballast may be ready to fail at any time and by installing a new LED tube that ballast could fail and lead you to believe the new LED tube has failed. I spoke with Opterra and they admitted that when they replace fluorescent tubes with LED tubes and don't change the ballast approximately 20% to 25% of the LED tubes will NOT turn on when energized because the ballast is not compatible. Their solution is to just re-install the old fluorescent tube. I just don't see where this accomplishes the energy savings needs of our city.

I believe that any retrofit should either include a ballast replacement when a new LED tube is installed or that the LED should just be direct wired to the fixture. Both ways have their pro's and con's but both are more correct than using an old ballast. There are other options for retrofits like the new Optilumen [optilumen.com] LED troffer kit, I am using this in my office. I understand that these solutions would be more cost upfront because you would need an electrician to do the change instead of a lower paid maintenance person but the long-term savings would still outweigh this extra cost.

If this email has peaked your interest please let me know, I would enjoy the opportunity to meet with you and discuss creating a solution that is better than what I know is being done now. Thanks upfront for your consideration.

A One point of reference is that in California a tube-only retrofit is not allowed for Title 24 energy code compliance and is not recognized as converting the fixture from fluorescent to LED. One problem is that if the fixture is not modified, then savings can be lost if someone puts fluorescent back in.

My understanding is that the tube-only retrofits that retain the fluorescent ballast need to be specified properly for either rapid-start or instant-start ballasts. So someone needs to know the type of fluorescent ballast in order to choose the right retrofit option.

I don't have experience with the reliability of tube-only retrofits. But there are a number of resources out there that discuss options. Retrofit kits are generally more efficient and more likely to provide persistent savings:

USDOE fact sheet has a good summary of the linear LED retrofit options with a table of pros and cons.

https://energy.gov/sites/prod/files/2017/03/f34/led_troffer_retrofit_guide.pdf

PG&E brochure:

https://www.pge.com/includes/docs/pdfs/mybusiness/energysavingsrebates/rebatesincentives/ref/lighting/lightemittingdiodes/Linear_LED_BuyersGuide.pdf

A few years old, but a retrofit guide from the California Lighting Technology Center:

http://cltc.ucdavis.edu/publication/led-retrofit-options-linear-fluorescent-luminaires

Q **Energy Efficiency Codes Coordination (EECC) Meeting, hosted by Hawaii Energy**

A Provided input regarding California standards for LED lighting

As you may have seen in the voluntary program doc, California has appliance efficiency standards, often referred to as Title 20. Among other things, LEDs are included in the standards and must meet efficiency and performance requirements in order to be sold in the state. Perhaps that's a path for Hawaii. The voluntary standards are a step ahead of the Title 20 requirements.

The UC Davis Lighting Technology Center has some summary information about the standards for LEDs: http://cltc.ucdavis.edu/publication/title-20-lighting-appliance-efficiency.

http://www.energy.ca.gov/appliances/2016-AAER-04/

Q **We are removing the existing roofing system down to the deck but not removing the deck to expose the roof cavity. It seems 503.1 Exception "4. Construction where the existing roof, wall or floor cavity is not exposed." would apply to our project. But following that, 503.3.1 Roof Replacement, also seems to require that the new roofing system comply.**

Your help with clarification appreciated.

A My interpretation of the 2015 IECC is that the roof surface does not need to comply with reflectance requirements in a roof replacement project. Section C503.3 states that "new building envelope assemblies that are part of the alteration..." need to comply. But a new assembly would be an entirely new roof, not just a new membrane. The only requirement, I believe, would be the basic requirement in C503.1 that the alteration cannot increase energy use. Therefore, the new membrane would need to be at least as reflective as the existing membrane.

The roof insulation requirements would apply to a roof replacement project in specific cases. Section C503.3.1 says that the roof needs to meet insulation requirements during a roof replacement project if the existing roof has insulation above deck (section C503.3.1), so insulation might need to be upgraded. And the Hawaii state amendments modify that requirement so that it applies whenever the existing roof is uninsulated (pasted below). So any currently uninsulated roof would need to receive insulation as part of a roof replacement project, as long as it was enclosing habitable space. But the reflectance requirements aren't mentioned.

This should be simpler than it is, but the code is well written in this regard. There is a clear exception for "roof recover" in section C503.1, but that's defined as a project where the existing covering is not removed. For roof replacements, the code is open to some interpretation. As you noted, the introductory section C503.1 seems to call for any altered component to meet the new construction requirements. So there's also a reasonable argument that membranes do need to comply.

Q Energy Efficiency Codes Coordination (EECC) Meeting, hosted by Hawaii Energy

A Provided references regarding benchmarking programs

Evaluation of U.S. Building Energy Benchmarking and Transparency Programs: Attributes, Impacts, and Best Practices

https://emp.lbl.gov/sites/default/files/lbnl_benchmarking_final_050417_0.pdf

https://emp.lbl.gov/sites/default/files/benchmarking_progress_webinar_7.31.2017.pdf

https://emp.lbl.gov/

Q An ME called to say that many mainland designers with Hawaii jobs specify reheat. He feels this is counterproductive and unnecessary. He brings in

waste heat whenever possible. He can't find any section of the 2015 IECC which bans or even discourages this.

Suggestions on how he can discourage the practice, other than saying, "Hawaii has a goal of 100% clean energy my 2045 and reheat is not a path to realizing that goal"?

A Reheat is not prohibited, but section C403.4.4 (Requirements for complex mechanical systems serving multiple zones) puts a limit on simultaneous heating and cooling. It requires that cooling airflow be reduced to a minimum flow before reheat is engaged. This essentially prohibits constant-volume reheat systems, requiring VAV systems when reheat is to be used.

The ME is right that there are efficient strategies to minimize or eliminate the need for reheat in most cases in Hawaii.

Q Can you comment on the AC vs. DC debate going on? I believe transmission losses are more in the 3% - 10% range…depending on distance from power plant and condition of lines.

A I'm not familiar with the idea in the video, so I can't comment on it one way or the other.

For long distance electricity transmission, losses in DC are lower than AC. I don't know the exact numbers, but I know there are some long-distance DC lines where there's a conversion from AC to DC at one end and back from DC to AC at the other. Obviously, most transmission lines are still AC because the conversion is expensive.

There's work going on regarding DC distribution systems in buildings. The idea is that many of our devices need DC power so we could potentially avoid a bunch of power converters. And for buildings with PV power we could avoid a conversion from DC to AC back to DC.

I haven't studied the details, but I heard an engineer speak a few months ago about the topic. He works for a large engineering firm and has worked on the design of DC systems for a few buildings. His main point was that it's not likely to save a large amount of energy, at least not with current systems, because there are still DC-DC voltage conversions needed. The big savings in his view is lower labor cost for low-voltage distribution systems because an electrician is not needed. The wiring is basically like data wiring that can be installed by anyone.

Q **Energy Efficiency Codes Coordination (EECC) Meeting, hosted by Hawaii Energy**

A Provided references to examples of energy code informational materials

Why Energy Codes Matter brochures

http://bcapcodes.org/why-energy-codes-matter-resources-for-advocates-consumers-and-policymakers/

BCAP Consumer Portal

http://bcapcodes.org/consumer-portal/

Title 24 stuff (from this page: http://www.energy.ca.gov/title24/orc/overview/2016_overview.html)

Infographic

http://www.energy.ca.gov/title24/2016standards/rulemaking/documents/2016_Building_Energy_Efficiency_Standards_infographic.pdf

FAQ

http://www.energy.ca.gov/title24/2016standards/rulemaking/documents/2016_Building_Energy_Efficiency_Standards_FAQ.pdf

Q **I am a lighting designer working on a home in-Hawaii that was permitted in 2016. I see from your 2015 IECC Residential Lighting presentation available online that the Hawaii Energy code requires recessed lights to be IC rated. Can you confirm for me if this is still required for fixtures that are in non-insulated, interior soffits? We have a few soffits in the home where we would typically not use IC housings (since no insulation contact & no exterior exposure) unless you tell us they are necessary.**

A IC rated fixtures are required when they are installed in the building thermal envelope. They would not be required if the ceiling is not a boundary between conditioned space and unconditioned space. They would not need to be IC rated if they are inside of the air barrier and the insulation. The question in this case would be where is the air barrier.

Q **An engineer is under contract to conduct a ventilation study, including how it relates to 2015 IECC. Please lend your expertise. My comments are:**

- **Conditioned homes must be ventilated; tropical homes don't need mechanical ventilation**
- **ASHRAE 62.2: The authority may determine on the need for mechanical ventilation. He has jurisdiction and may make the call.**

- **Infiltration credit. Yes, additional mechanical ventilation is required—unless the local jurisdiction rules otherwise**
- **Local exhaust—can kitchen and bathroom fans count toward ACH ratings?**

A My reading is that you are correct, I think.

Tropical path.

- No ventilation required per IECC.

Other paths.

- If dwelling has AC, then mechanical ventilation required (per 62.2).
- If dwelling does not have AC then the code official can decide that windows are enough (per 62.2).

However, the IECC does allow "other approved means of ventilation" in R403.6, so that says to me that the Counties can decide that windows are enough for all cases if they want to, whether or not there is AC. I cannot say whether they should make that allowance for AC homes because there can be IAQ issues.

Regarding kitchen and bath exhaust fans, I believe that it's ok to use them to serve as the whole house ventilation fan if they meet the low noise specs and have appropriate controls for continuous operation (or automatic on/off that provides required time-averaged ventilation rate).

Q We are trying to get some interpretation and clarification on the following note below for C402.1.1 Low Energy Building. Can you please let us know if the peak design rate of energy usage includes only the air conditioning equipment or also includes lighting and plug loads?

A The 1 W/sf is energy for space conditioning: fans, pumps, compressors, etc.

Q Energy Efficiency Codes Coordination (EECC) Meeting, hosted by Hawaii Energy

A Discussed proposed energy code compliance blocks, signed forms intended for plans.

Q We are interested to know more about fenestration requirements currently specified for Hawaii State. The website mentions that "Until each county adopts the 2015 IECC, the counties of Hawaii, Maui and Honolulu enforce the 2006 IECC; Kauai, the 2009 IECC. However, the prevailing codes are a minimum, and designers and builders may follow the 2015 IECC"

We just need to confirm what is the current code used and Is IECC 2015 applicable to both residential and commercial buildings.

We are mainly interested to know whether Dynamic Glazing is spec'd in for Hawaii Energy Codes as only IECC 2012 and later codes specify dynamic glazing.

Also, are there any specific tax incentives for dynamic glazing usage in buildings?

A Your assessment of HI's position re IECC 2006 and 2015 is correct. We expect the counties to commence adoption of the IECC 2015, residential and commercial, in the very near term. The process is already underway on Kauai.

In the 2015 IECC, section C 402,4,3,3 specifically permits dynamic glazing.

Re incentives for dynamic glazing, I am cc'ing Ramsey Brown of Hawaii Energy, the entity that incentivizes energy efficiency technologies, for his assessment.

Q One of the production builders here is proposing to switch from fiberglass to open-cell foam not only because of enhanced energy performance, but because of the prospect that foam virtually ensures a successful blower door test AND exemption from duct blaster tests. The rationale might be that, even if a duct is leaky, that air is confined well-sealed environment.

Apparently, that's what WA State thinks, as they exempt the duct blasting requirement given foam sealing.

Is this true? Does it make sense?

A Duct blaster is not required per the 2015 IECC if the ducts are located within the thermal envelope (I'm pretty sure). So yes, the idea is that leaks are not as detrimental if they occur in a sealed attic.

Q Proposed amendment C402.1.3 Page 1, footnote g. Some felt that instead of this being another footnote, this issue could be resolved using the Alternative Materials section. Your opinion?

A The proposed amendment currently reads, "g. Hawaii applicants may apply for reduced insulation levels as commercial buildings must have CRRC-compliant reflective roofs which significantly reduces the need for insulation in Hawaii's mild climate. Reducing required insulation significantly reduces construction costs."

I agree that this language is not necessary and the issue could be handled via the existing language in C102.

Q **Proposed amendment C402.4.1.2 Page 1, skylights. It was suggested that the title should be changed from "Increased skylight area with daylight…" to "Option to skylight requirements." Your opinion.?**

A "Minimum skylight fenestration area" is still an appropriate title. There are several exceptions, but if none of those exceptions apply when the project must include the minimum skylight area. It is not an option.

Q **Proposed amendment C406.8, EV requirements. The GCA/BIA suggested that the specific infrastructure requirements be deleted and substituted with words to the effect of "add capacity to accommodate projected load due to EV's. Your opinion?**

A The proposed revision seems reasonable, but it is suggested that it be reviewed by electric vehicle advocates. Since this proposed amendment is included in Section 406, "Additional efficiency package options", it would not be required of all buildings and there would be seven options. One potential issue is that the proposed change would not guarantee that electric vehicle charging could be measured separately from other building loads.

Q **R404.2 EV Capability. The GCA/AIA suggest deleting the requirement for EV charging station rough-ins and substitute words to "require 35A breaker panel to accommodate addition of EV charging station" Your opinion?**

A Seems like a reasonable change. Having the electrical capacity is the first priority. A rough in might not be in a location desired by the future homeowner.

Q **Here are my thoughts on the Draft Amendments to the 2015 IECC that was distributed during last month's meeting:**

1. Current Draft Amendment to add C406.8:

C406.8 Electric vehicle infrastructure. A separate electrical transformer, switchboard, distribution panel and circuit panel shall be installed in no less than one, or ten percent of parking stalls, whichever is greater.

GCA and BIA suggestion:

C406.8 Electrical vehicle infrastructure. Provide capacity within the building's electrical distribution system including conduits and raceways individual parking spaces to serve electric vehicle chargers for no less than one, or ten percent of parking stalls, whichever is greater.

2. Current Draft Amendment to add C404.2:

R404.2 Electric Vehicle Capability. A rough-in for an electric vehicle charging station shall be installed for each residence.

GCA and BIA suggestion:

R404.2 Electric Vehicle Capability. Provide capacity in the electrical service and Main panel for an electric vehicle charging station for each residence.

A [This was a comment, no response required]

Q We are working on the conversion of an existing two-story, wood-framed building to offices and the building will be gutted down to its structure (columns, slabs, and roof) and rebuilt. ~10% of the roof will need to be replaced due to reconfiguration, but we are hoping to keep the rest. It also currently has exposed insulation (see attached photo) on the interior which we'd like to replace/re-do.

1. Can you please advise if this existing roof will be required to meet current energy code? If yes, can you please advise which "type" it would be considered?

- Insulation entirely above roof deck - our roof is to remain, so we will not be able to insulate above the roof deck

- Metal building - Our building is wood-framed

- Attic and other - Is this us?

2. We assume that if we re-build the walls we will need to comply will "wood-framed" and will make them R-20

A 1. Yes, the roof is required to meet the current energy code. The roof type would be considered "attic and other" if insulation is installed below the deck. The requirement in the current code is R-30 and in the 2015 IECC will increase to R-38. For future reference, "metal building" category applies to the construction type where a metal roof membrane is attached directly to metal structural framing.

2. Re-built walls would also need to comply with the code, and the current requirement for both wood and metal-framed walls is R-13 insulation. In the 2015 IECC the requirement for wood framed walls will increase and either R-20 or R-13 plus R-3.8 continuous insulation is required.

Q May a house without air conditioning use the simulation method to demonstrate compliance? My interpretation of the IECC 2015 is that the simulation method is for houses that are conditioned, which is described as

heated or cooled. May we simulate both the baseline and design cases without active/mechanical cooling?

On a side note, I understand that the unconditioned house may follow the prescriptive or Tropical Zone path.

A Yes, the simulation method may be used for a home without a cooling system, but both the proposed design home and the standard design home must be modeled with a cooling system that meets minimum federal efficiency requirements. See Table 405.5.2(1), footnote (f).

Q What is the current ASHRAE 90.1 energy code requirement in Hawaii for new construction? Is it 90.1-2007 or 90.1-2010?

A ASHRAE Standard 90.1-2004 is the alternative within the 2006 IECC. That alternative will change to ASHRAE Standard 90.1-2013 when the 2015 IECC is adopted.

Q Is any code requirement for an outside air duct having to be screened, and a certain distance from the ground? I have an installation which is about 24" off the ground and has no screen. It does not appear to be Code compliant, and I have searched codes and cannot find anything specific. Do you have anyone you could refer me to?

Please let me know.

A That is an IRC rather than an energy matter. The State Building Code Council person in charge is James Reinhardt, AIA.