Energy Code Testimony
Summary of Proposed Modifications
2021 Code Adoption Cycle
March 2022

LEGEND FOR 4/1/22 TAG MEETING:

3 – TAG Review	Higher priority topics for TAG technical input (to discuss first)
3 – TAG Review	Medium priority topics to discuss only if initiated by TAG member, else not planned for discussion
All Others	Review and discuss as desired, but not prioritized for TAG meeting

IMPORTANT NOTE: If the recommendation in the "recommendation" column says "refer to notes in linked document," click on the link in the "Testimony from" column to open a separate document with more comments and items for review.

Testimony From	Summary	Recommendation	Comments
Mike Moore, Broan-NuTone	DEDICATED OUTDOOR AIR SYSTEM (DOAS). A ventilation system that supplies 100 percent outdoor air primarily for the purpose of ventilation ~~and is a separate system from the zone~~ without requiring operation of a space conditioning system fan for outdoor air delivery. *Rationale: Modifications to the proposed definition are intended to clarify that an outdoor air ventilation system's duct work can be integrated with a heating or cooling system's duct work and still be considered a DOAS, provided that the operation of the heating or cooling system's fan is not interlocked with the operation of the outdoor air ventilation system. An example of such a system is an HRV or an ERV that is ducted to the supply trunk of a dwelling unit's space conditioning system, whose operation does not automatically trigger the operation of the space conditioning system's air handler. This configuration can be used to assist with outdoor air distribution while minimizing fan energy use and first-costs of ducting.*	**3 – TAG Review** **If No Action by TAG, retain as in CR102**	
	DEMAND CONTROL KITCHEN VENTILATION (DCKV). A system that provides automatic, continuous control over exhaust hoot and, where provided, makeup air fan speed in response to ~~temperature, optical, or infrared (IR)~~one or more sensors that monitor cooking activity or through direct Communications with cooking appliances. *Rationale: Modifications to the proposed definition are intended to make the definition less prescriptive and more broadly applicable for its intended purpose. For example, some DCKV systems operate while using TVOC sensors or other air quality sensors that are not listed in the definition. Rather than list all of the sensor types that could be used in the definition, the definition could simply address "one or more sensors that monitor cooking activity." The modification also recognizes that not all DCKV systems are necessarily provided with makeup air. Makeup air requirements are determined within the mechanical code and should not be triggered by application of a definition within the energy code.*	**2 – Clarification** **Discussed in 3/17/22 MVE Meeting. Recommendation is to adopt as shown with modification: "where provided" changed to "where required"**	

Testimony From	Summary	Recommendation	Comments
	C403.3.5.2 DOAS fan power. For a DOAS that does not have at least one fan or fan array with fan electrical input power ≥ 1 kW, the total combined fan power shall not exceed 1 watt per cfm of outdoor air as calculated in accordance with Equation 4-10 using design maximum airflows and external static pressures. For a DOAS with at least one fan or fan array with fan electrical input power ≥ 1 kW, the DOAS shall comply with the fan power limitations of Section C403.8.1. DOAS total combined fan power shall include all supply, exhaust and other fans utilized for the purpose of ventilation. This fan power restriction applies to each DOAS in the permitted project, but does not include the fan power associated with the zonal heating and cooling equipment. Exception: DOAS complying with Section C403.8.4. *Rationale: This exception is needed to avoid conflict with Section C403.8.4, which establishes minimum fan efficacy requirements for low-capacity ventilation fans.*	**3 – TAG Review** **If No Action by TAG, retain as in CR102**	
	C403.4.1.7 Demand responsive controls. ~~All thermostatic~~ Thermostatic controls for heating or cooling systems shall be provided with demand responsive controls capable of increasing the cooling setpoint and decreasing the heating setpoint by no less than 4°F (2.2°C). The thermostatic controls shall be capable of performing all other functions provided by the control when the demand responsive controls are not available. Systems with direct digital control of individual zones report to a central control panel shall be capable of remotely increasing the cooling setpoint and decreasing. *Rationale: This modification would clarify that thermostatic controls on ventilation systems need not comply with this provision. An example is a smart ventilation system control that modulates the ventilation airflow based on outdoor temperatures with the objective of shifting ventilation operation away from the peak load conditions to save energy while maintaining acceptable indoor air quality.*	**2 – Clarification** **Adopt edit as shown**	

Testimony From	Summary	Recommendation	Comments
Kevin Kajita Jonathan Lewis Chelene Whiteaker David Streeter **WA Hospital Assoc.**	Add exception for critical facilities required to have emergency backup power to HP requirements in both new and existing facilities. 18. **Essential facilities.** Including but not limited to I-2 occupancies and related medical facilities that by regulation are required to have in place redundant emergency backup systems. 8. **Essential facilities.** Including but not limited to I-2 occupancies and related medical facilities that by regulation are required to have in place redundant emergency backup systems.	**3 – TAG Review** **If No Action by TAG:** **-- Adopt language for new C403.1.4 exception as shown** **-- Adopt language for C404.2.1 Option 2 as shown with modification that new suggested language for C404.2.1 is numbered exception 6**	
Jonny Kocher, RMI	Modify Sections C403.1.4 and C503.4.6, and C404.2.1 and C503.3 to add an exception for Group I-2 *After consulting with members of the Washington State Hospital Association and Providence Health & Services, I would like to offer the following modest changes to the Heat Pump Proposals 103 and 136 as currently drafted in the CR102. The purposes of these modifications are to allow a specific and narrow exemption of Group I-2 buildings (hospitals and other healthcare facilities) from the requirements of the heat pump proposals.* C403.1.4: Add Exception 18. Group I-2 occupancy buildings or areas of buildings. Option 2, C503.4.6: Add Exception 8. Addition or replacement of mechanical heating equipment that serves Group I-2 occupancy buildings or areas of buildings. Option 2, C404.2.1: Add Exception 6. Service water heating systems that serve Group I-2 occupancy buildings or areas of buildings. COMBINE OPTIONS 1 & 2 FOR C503.5 C503.5 Service ((hot)) water heating systems. All new service ((hot)) water heating systems ((that are part of the alteration)), equipment and components of existing systems that are altered or replaced shall comply with Sections C404, C408.3, C409.5 and C501.6. Additions or alterations shall not be made to an existing service water heating system that will cause the existing system to become out of compliance. EXCEPTIONS: 4. Addition or replacement of service water heating systems that serve Group I-2 occupancy buildings or areas of buildings.	**3 – TAG Review** **If No Action by TAG, do not adopt suggested changes for C403.1.4, C503.4.6 or C404.2.1 as these are covered by similar language from WSHA** **For C503.5, keep separate options but adopt suggestion to modify Option 2 to use same charging paragraph as Option 1 (similar comment made by Mike K). Do not add new exception #4 as this is covered by proposed exceptions in C404.2.1**	

Testimony From	Summary	Recommendation	Comments
Andi Burnham	Modifications to Table C407 for correlation with other changes: Add Section C403.1.4 (if 103 passes) to require HP space heating Exempt Sections C403.8.1 and C403.8.4: This requires all fans >1 kW comply with the fan power budget, no option to "trade" fan power in the energy model. Should the fan power budgets be excluded from the mandatory requirements of C407 to allow design flexibility?	**1 – Editorial/Staff** Adopt edit as shown in comments to fix omission in CR102 **3 – TAG Review** If No Action by TAG, do not adopt suggested changes	
Eric Vander Mey, Rushing	Various editorial changes throughout the document. C103.2, C402.2.6, C402.2.7 C402.5.11, C403.2.3, Table C403.3.2(15)*, C403.5.1, C403.3.5.5, C403.5, C403.7.6.1, C403.7.6.2, C403.8.4, C404.2.1, C404.2.2, C404.2.1.5, C405.7.1, C406.1.1, C406.1.1.1, C406.1.2, Table C406.2, C406.2.2, C406.2.2.4, C406.2.2.4.2, C406.2.2.5.2, Equation 4-17, C406.2.6.1, C406.2.6.2, C406.2.13.3, C406.2.15*, C406.2.16*, C406.2.17*, C406.2.18, C406.3.4, C406.3.5, Table C407.5, C407.3, C407.3.3.1, C407.3.3.2, Table C407.3(3), C411.1.1.2*, C411.3, C411.3.1 *These proposals go beyond editorial **High Priority (Green Category) Items:**	Refer to notes in linked document **3 – TAG Review** If No Action by TAG, address changes as shown in linked document	
	Recommend removing this section as this is not an energy code requirement and is not required for non heat pump service water heating: ~~**C404.2.1.5 Alarms.** The control system shall be capable of and configured to send automatic error alarms to building or maintenance personnel upon detection of equipment faults, low leaving water temperature from primary storage tanks, or low hot water supply delivery temperature to building distribution system~~.	If No Action by TAG, retain language as is in CR102	
	C407.3: Recommend allowing renewable energy to count towards PCI targets. At a minimum renewable energy in excess of C411.1 requirements should be included, or verify that final/revised BPF targets with adjusted electricity carbon factor do not account for any renewable energy in the targets 2.1. Carbon emissions target. The carbon emissions target is focused on regulated load energy efficiency, thus shall be met only via regulated load savings without consideration of the contribution of on-site or off-site renewable energy or unregulated load savings. Adjustments to the PCI, to account for the contribution of renewable energy found in ANSI/ASHRAE/IESNA 90.1 Section 4.2.1.1 shall not be used. References to energy cost in Section 4.2.1.1 and Appendix G	If No Action by TAG, retain language as is in CR102 Confirmed that BPFs do not include renewable energy. On-site (not off-site) renewable energy up to that amount mandated by C411 for C407 projects could be	

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	shall be replaced by carbon emissions calculated by multiplying site energy consumption by the carbon emission factor from Table C407.3(1). The building performance factors in Table 4.2.1.1 of ANSI/ASHRAE/IESNA 90.1 shall be replaced with those in Table C407.3(2). Recommend editorial addition to clarify what a nonresidential building as this is not a defined term, or clarify if this is meant to refer to commercial buildings by removing the word "nonresidential". **C411.3 Solar readiness.** A solar zone shall be provided on nonresidential buildings (buildings with more than 50 percent of the conditioned floor area that is other than Group R occupancies) that are 20 stories or less in height above grade plan. The solar zone shall be located on the roof of the building or on another structure elsewhere on the site. The solar zone shall be in accordance with Sections C411.2 through C411.8 and the *International Fire Code*.	**included in the proposed model for the carbon emissions target if the TAG recommends. This would add flexibility to carbon emissions target.** **If No Action by TAG, adopt edit as submitted to clarify definition.**	
Eric Vander Mey, Rushing	Add new exception 1b to Section C403.5, Economizers, for Group R-2 that comply with a higher ERV effectiveness, and editorial corrections to exception 5. • Option #1: Delete added reference to "For other than Group R-2 occupancies" of Exception 2. • Option #2: Add an additional exception for Group R-2 that install ERV with higher ERV effectiveness that base Group R-2 requirements of 60% sensible heating. See proposed language below. **C403.5 Economizers.** Air economizers shall be provided on all new cooling systems including those serving computer server rooms, electronic equipment, radio equipment, and telephone switchgear. Economizers shall comply with Sections C403.5.1 through C403.5.5. Exceptions: 1.a. For other than Group R-2 occupancies, cooling system((s)) where the supply fan is not installed ((~~outdoors~~)) outside the *building thermal envelope* nor in a *mechanical room* adjacent to outdoors, and is installed in conjunction with DOAS complying with Section C403.3.5 and serving only spaces with year-round cooling loads from lights and equipment of less than 5 watts per square foot. 1.b. For Group R-2 occupancies, cooling system((s)) where the supply fan is not installed outside the *building thermal envelope* nor in a *mechanical room* adjacent to outdoors, and is installed in conjunction with DOAS complying with Section C403.3.5, where the ERV/HRV a minimum 68% sensible recovery or 60% enthalpy recovery heating effectiveness (Exception 3 of Section C403.3.5.1	**2 – Clarification** **Discussed in 3/17/22 MVE meeting. Recommendation is to adopt Option 1b (Option #2)**	

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	is not utilized), and serving only spaces with year-round cooling loads from lights and equipment of less than 5 watts per square foot.		
Michael Hedrick, McKinstry	The CR102 specifically requests input on elements of the code where options are provided; regarding C402.2, we prefer Option 2. Broadly, the proposed recommendations below address: • Control of electric resistance heat for defrost or supplemental heating in air-to-air heat pumps. • Clarity of sizing requirements for air-to-air heat pumps. • Guidance for coil sizing in light of application specific and common manufacturer limitations. • Control strategies for heat pump domestic hot water heaters. • Clarifying compliance options for gas fired hot water boiler replacements. • Adding an heating energy storage option for C406 load management credits.	Refer to notes in linked document **3 – TAG Review** If No Action by TAG, address changes as shown in linked document	
Mike Kennedy	Various suggestions on modifications: This submission also contains the results of a cover to cover read of the code to locate areas where the code was in ambiguous, unclear, or in error. The items are classified and prioritized, and are mostly not critical. A number of the items are simple issues that staff is likely to be able to correct without deliberation but a number will require Council or TAG deliberation. I have tried to provide suggested language. Most of the comments are contained in the following table. Given the length of the code there are definitely cases where I have misread code and for sure missed issues. And in some cases I'm not familiar enough with the topic to definitively declare a problem, and can just note that it is confusing. I recommend that these issues be checked with subject matter experts and the resulting work reviewed. **High Priority (Green Category) Items:**	Refer to notes in linked document **3 – TAG Review** If No Action by TAG, address changes as shown in document	

Testimony From	Summary	Recommendation	Comments
	There is exception for mass transfer decks but they are not exempt. They have to do TBP or C402.1.5. Delete exception. **C402.2.8 Above-grade exterior concrete slabs.** Above-grade concrete slabs that penetrate the *building thermal envelope* including, but not limited to, decks and balconies, shall each include a minimum R-10 thermal break, aligned with the primary insulating layer in the adjoining wall assemblies. Stainless steel (but not carbon steel) reinforcing bars are permitted to penetrate the thermal break. If the total building performance path or the component performance alternative in Section C402.1.5 is utilized and the thermal break required by this section is not provided where concrete slabs penetrate the *building thermal envelope*, the sectional area of the penetration shall be assigned the default *U*-factors from the "exposed concrete" row of Table A103.3.7.2. **Exception**: *Mass transfer deck slabs*.	**If No Action by TAG, retain language as is in CR102**	
	Section **C402.5.2,** Enclosure testing…, Item 3, second para reads: "Where the measured air leakage rate exceeds 0.25 cfm/ft2 (2.0 L/s x m2) corrective action shall be taken to seal leaks in the air barrier. Post-corrective action testing and repeated corrective action measures will be taken until the required air leakage rating is achieved. Final passing air leakage test results shall be submitted to the code official. " Should clarify that corrective action needs to occur to the whole building not just the tested units. Maybe: "in all units exceeding code and all untested units"	**If No Action by TAG, retain language as is in CR102**	
	Section **C403.1.4**, Use of electric resistance and fossil fuel-fired HVAC heating equipment, **Exception 1**, 2nd sentence reads in part: " For the purposes of this exception, overhead or wall-mounted radiant heating panels installed in an unheated or semi-heated space, insulated in compliance with Section C402.2.8 and controlled by occupant sensing devices in compliance with Section C403.11.1 need not be included as part of the HVAC heating energy calculation." Since semi-heated spaces are limited to 8 Btuh/sf and include the capacity of the radiant panels there is no way to have a semiheat space to which the first sentence in the exception doesn't apply. The 2nd sentence covers a case that is impossible, a semi-heat space, with more than 8.5Btu/sf heating. It is not needed and should be deleted. If not deleted, then address these issues: 1) How can an unheated space have heat? - replace "unheated" with "low energy" 2) “Heating energy calculation” should be “heating capacity calculation” 3) Does a semi-heated space qualify as meeting the interior temperature requirements of chapter 12? Typically, this would be in an FHSU occupancy that would meet the requirements by virtue	**If No Action by TAG, adopt edit suggestion to delete second sentence of this exception for clarity.**	

Testimony From	Summary	Recommendation	Comments
	of being excepted within chapter 12. Assuming this is here because the thought is FHSU occupancies do not comply with chapter 12 then this sentence needs to be expanded or better yet turned into a standalone exception. Leading off with "for purposes of this exception" and then discussing only the capacity, leaves the IBC chapter 12 requirement in place Section **C403.1.4**, **Exception 2.1:** "Corner rooms. A room within a dwelling or sleeping unit that has two primary walls facing different cardinal directions, each with exterior fenestration, is permitted to have an installed HVAC heating capacity no greater than 1000 watts in Climate Zone 4, and 1300 watts in Climate Zone 5. Bay windows and other minor offsets are not considered primary walls. For buildings in locations with exterior design conditions below 4°F (-16°C), an additional 250 watts above that allowed for Climate Zone 5 is permitted." Exception 2 is clearly talking about the unit; all the rooms have to comply for the unit to be exempt. Exception 2.1, being a subsection, might be the same but it is worded like it is always okay heat corner rooms with 750 watts electric resistance when the room complies even if the unit doesn't. Maybe replace 2.0 and 2.1 with: Exception 2. "Dwelling or sleeping units are permitted to be heated using electric resistance appliances as long as the installed HVAC heating capacity in any separate ~~habitable room with exterior fenestration~~ space is no greater than: 1: 750 watts in Climate Zone 4, and 1000 watts in Climate Zone 5 in ~~rooms~~ each habitable space with fenestration 2: 1000 watts in Climate Zone 4, and 1300 watts in Climate Zone 5 for ~~rooms that have~~ each habitable space that has two primary walls facing different cardinal directions, each with exterior fenestration, Bay windows and other minor offsets are not considered primary walls. 3. 250 watts in spaces adjoining the *building thermal envelope* but without fenestration. For the purposes of this section, habitable space is as defined in the *International Building Code*. For buildings in locations with exterior design conditions below 4°F (-16°C), an additional 250 watts above that allowed for Climate Zone 5 is permitted in each ~~room~~ space with fenestration. ~~Rooms without fenestration are not allowed electric resistance capacity.~~"	**If No Action by TAG, adopt edit with modifications shown at left.** **These modifications help clarify what is meant by habitable space as well as the quantity of electric resistance permitted by space type.**	

Testimony From	Summary	Recommendation	Comments
	Section **C503.5**, Service water heating systems (option 2): The exception list exempts the listed replacement equipment from all compliance. No need to check efficiency. This should be limited to the new heat pump section. The charging sentence also limits the scope the equipment where the option 1 path is equipment and systems. If option 2 selected this needs to be reworked to require compliance with Table C404.2 and all the systems stuff. Make it a single exception: Exception: The following equipment does not need to comply with C404.2.1: . .	**If No Action by TAG, adopt edit as shown to clarify that exceptions only except equipment from C404.2.1 (not all of C404)**	
	Definitions: Multipass is a potentially used in other contexts say in heat exchangers. Defined term should be specific, say: Multi-pass HPWH	**If No Action by TAG, update definitions and all references to "multi-pass heat pump water heater" and "single-pass heat pump water heater"**	
	Section C402.5.2, Enclosure testing for dwelling units: Second sentence of item 2: "For each tested unit that initially exceeds the maximum air leakage rate, an additional two units shall be tested, including a mixture of testing unit types and locations. " This could be ambiguous. Is it units not passing on the first test or the final test? Based upon where it occurs in the text it means the initial test. Insert the word "initially" before exceeds	**If No Action by TAG, retain language as is in CR102**	
	Section **C403.7.6,** Energy recovery ventilation systems, Reads: "Energy recovery ventilation systems shall be provided as specified in ~~either~~ Section C403.7.6.1 and~~or~~ C403.7.6.2." There is no choice here. "either" should be struck and the "or" should be "and". Or better still. "as specified in this section". The subsection references are getting out of control.	**If No Action by TAG, adopt the last proposed edit as shown ("as specified in this section")**	
	Section **C403.10.4,** Insulation of HVAC system refrigerant piping Reads: "Field installed HVAC refrigerant piping, other than piping factory installed in HVAC equipment, shall have insulation as listed below, at a conductivity rating of 0.21 to 0.26 Btu × in/(h × ft2 × °F) with a mean temperature rating of 75°F. Piping insulation exposed to weather shall be protected from damage, including that due to sunlight, moisture, physical damage and wind, and shall provide shielding from solar radiation that can cause degradation of the material. Adhesive tape shall not be permitted. Manufacturer's required minimum pipe insulation shall be maintained. Then items 1 - 3 are listed	**If No Action by TAG, retain language as is in CR102** **Unclear if proposed layout improves clarity**	

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	Odd layout with minor technical issue. I would delete the other than piping factory installed in HVAC equipment but could be an exception rather than making for an extra long sentence. Rest could be simplified as well. Reference to insulation "below" is sort of non-standard. It would typically be a table. And we really want to say someone can't install insulation with a lower conductivity? I don't get it. Suggested language: Field installed HVAC refrigerant piping shall be insulated as required by this section. Piping insulation exposed to weather shall be protected from damage, including that due to sunlight, moisture, physical damage and wind, and shall provide shielding from solar radiation that can cause degradation of the material. Adhesive tape shall not be permitted. The insulation shall have a maximum conductivity rating of 0.26 Btu × in/ (h × ft2 × °F) at a mean temperature rating of 75°F. The minimum insulation thickness shall be: Then items 1-3 Where the manufacturer's required minimum pipe insulation is greater it shall be maintained. Section **C409.4.3**, Energy display, Reads in part: The display shall numerically provide the current energy consumption rate and energy consumption total for each whole building energy source and each end use category. The energy display shall also graphically and numerically display logged data from the data acquisition system for energy consumption and energy consumption rate for each whole building energy source and each end use category for any selected day, week, month, or year. This requires logging of energy consumption rate for each source and enduse category but the meters section only requires consumption rate for electrical meters not for other sources. Is this an issue? Consumption over an hour can be a rate just not the 10 minute variety talked about in meters so maybe this is okay. If not then could edit last two sentences to be Delete "and energy consumption rate". Add "and electrical energy consumption rate for whole building electrical use and enduses" category for energy consumption ~~and energy consumption rate~~ for each whole building energy source and energy consumption rate for whole building electrical use and each end use"	**If No Action by TAG, retain language as is in CR102** **See proposal 223**	

Testimony From	Summary	Recommendation	Comments
	Section C503.4.3, Alteration or replacement of existing cooling systems, reads in part: "System alterations or replacement shall comply with Table C503.4.3 when either the individual cooling unit capacity or the building total capacity of all cooling equipment without economizer does not comply with Section C403.3.5 or C403.5" DOAS is no longer uniformly exempt from economizer so this formulation no longer reflects the new building code. This should probably be reframed. Also, I don't see C403.3.5 having capacity limits and even as worded it is awkward in terms of C403.5. I would reframe to something like: "System alterations or replacement shall comply with Table C503.4.3 when either the individual cooling unit capacity or the building total capacity of all cooling equipment without economizer does not comply with exceptions in C403.5", OR better yet: "System alterations or replacement shall comply with Table C503.4.3 when the cooling equipment without economizers does not qualify for exceptions in C403.5." , OR,	**If No Action by TAG, adopt the first version (highlighted) of edit as shown to improve clarity**	
Mike Kennedy	Modifications to Section C403.3.4 Boiler requirements. *These changes reflect changes made to the same proposal during the 2024 IECC code collaboration process where it received considerable scrutiny. This language has not been through the IECC public review but it is a general improvement in the language and is likely to be very nearly the same as the 2024 IECC. The changes include:* • *Clear separation between process and non-process boilers* • *Language clean-up with better incorporation with the existing Boiler System definition* • *One substantive new exception from oxygen controls for multifamily buildings.* *The new exception was a concern raised by the IECC subcommittee that because these controls were found to be not cost-effective in apartments according to the Title 24 case study, they should be exempt from IECC. The proposed language covers the majority of potentially non cost-effective building types in the committee's opinion*	**Refer to notes in linked document** **3 – TAG Review** **(see pp. 1 and 3)** **If No Action by TAG, address changes as shown in document**	

<table>
<tr><th>Testimony From</th><th>Summary</th><th>Recommendation</th><th>Comments</th></tr>
<tr><td>Mike Kennedy</td><td>Table C404.2, Minimum Performance of Water Heating Equipment
Revisions here primarily result for review by many people as part of the IECC process. They include:
adding footnote describing tabletop and grid enabled water heaters and
adding footnote indicating to look in C404.2.1 for further requirements.
Footnotes are reordered to be in order of occurrence
Referenced standards are updated
A few small changes to footnotes</td><td>Refer to notes in linked document
3 – TAG Review
If No Action by TAG, retain as in CR102</td><td></td></tr>
<tr><td>Mike Kennedy</td><td>Section C406 edits:
Suggested changes to this section address all discovered issues except the do not fully address the allowed heat pump type and associated sizing sections in C406.2.6.

Table C406.2 – Efficiency Measure Credits (p. 6)<table><tr><th rowspan="2">Measure Title</th><th rowspan="2">Applicable Section</th><th colspan="6">Occupancy Group</th></tr><tr><th>Group R-1</th><th>Group R-2</th><th>Group B</th><th>Group E</th><th>Group M</th><th>All Other</th></tr><tr><td>21. High performance service hot water temperature maintenance system</td><td>C406.2.9</td><td>TBD</td><td>TBD</td><td>TBD</td><td>TBD</td><td>TBD</td><td>TBD</td></tr></table>Option 1/2 for Section C406.2.6.3.1 (pp. 20, 23): Air-source vs. water-source heat pumps

C406.3.5 (p. 32): Peak electrical prices vs. peak building demand</td><td>Refer to notes in linked document
3 – TAG Review
(see TBD items on pp. 6, 20, 23 &32)
If No Action by TAG, address changes as shown in document</td><td></td></tr>
<tr><td>Mike Kennedy</td><td>Suggested edits to C407 -Table C407.2: Add Renewables and Compressed Air Systems; C407.3: I’m proposing to delete the bit in C411 that says “and subtracted from the proposed site energy use”. This is to keep C411 okay for reference from other sections such as C406. Text added here now</td><td>Refer to notes in linked document
3 – TAG Review
If No Action by TAG, address changes as shown in document</td><td></td></tr>
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Testimony From	Summary	Recommendation	Comments
Mike Kennedy	Section C411 Edits: *This file contains proposed changes to C411.1, C411.2, and the first paragraph of 411.3.* *The issues in C411.1 are potentially significant and in working with a few people it was not possible to come to consensus on one set of suggested language. This file presents C411.1 issues and then presents 3 possible revisions to address them:* • ***Option 1 Require On-site – Add exception for buildings not qualifying for exception 2 that don't have room for all the solar, so they don't have to model. Change additional efficiency credits to an 0.5W/sf offsite. This is probably closest to the original intent.*** • ***Option 2 – would be to keep the existing proposed language mostly intact. Buildings with not qualifying for exception 2 that cannot install the required solar will need to comply via C407. If the 18 extra credits are unchanged buildings qualifying for the exceptions would only need 0.15W/sf to 0.30W/sf of renewables to meet the extra credits value. This would also be close to the original intent.*** • ***Option 3 – deal with all issues by allowing off-site. The simplest fix as all exceptions as well as addition efficiency credits (and the problems that were in that section) can be deleted. It also resolves fairness issue with C407 which can use offsite instead of on-site (depending upon interpretation of C411 – solar readiness]. But it is clearly not the TAG intent*** *The issues in C411.2 are also significant, but the fixes were not controversial.*	Refer to notes in linked document **3 – TAG Review** If No Action by TAG, address changes as shown in document	

Testimony From	Summary	Recommendation	Comments
Ian Robinson	Revise carbon emission factor for natural gas in Table C407.3(1) from 11.7 to 19.0, and adjust Table C407.3(2) to correlate. *A Carbon Emissions Factor of 11.7 lb/therm for natural gas represents only the point-of-use CO2 emissions of complete combustion of natural gas. It does not include any of the carbon emissions associated with production, transmission, leakage, or incomplete combustion of natural gas, and is therefore a vast underestimate of the climate impact of natural gas energy use. The warming effect of fugitive emissions of natural gas during production and distribution is of particular concern, due to the high global warming potential of Methane as a greenhouse gas. Methane has a 20-year global warming potential of 84.0. The 2011 EPA greenhouse gas inventory placed the US natural gas leakage rate at 2.4% from well to city, according to analysis published in the Proceedings of the National Academy of Sciences and recent studies from the Environmental Defense Fund indicate that methane emissions from the US oil and gas industry may be 60% higher than EPA estimates. Using this 2.4% estimate and the 20-year GWP of methane to reflect the urgency of the climate emergency, a more appropriate carbon emissions factor for natural gas would be 19.0 lbm CO2e/Therm. Using the 80-year GWP of methane would reduce the impact of fugitive emissions, however given the urgency of the climate crisis the 20-year GWP seems more appropriate.*	**3 – TAG Review** **If No Action by TAG, do not adopt suggested changes. This seems like a new code proposal**	
Laurel Schandelmier, Glumac	• C403.1.1, HVAC TSPR: recommend clarifying that only the stated building types that require DOAS, and that are ventilated, are applicable to this section. • C406: I recommend either clarifying or adding another column for lab buildings that might be Group B, since their strategies are going to be different from typical office buildings. • C406: Overall, it seems there are far more available credits to residential occupancies than to commercial building types. Suggest adding more options for commercial (especially Group B) as the available strategies may be very limited in terms of viable collections of pathways. • C407: I recommend adding a separate BPF for lab buildings that is higher than that of All Others. • C411.2: I recommend clarifying/adding that C407 TBP projects can avoid this PV via a reduced BPF. • C411: Buildings over 20 stories are exempt from solar readiness requirements. Should that exception be applied to renewable energy requirements as well?	**No Action** **General comments and potential ideas for next code cycle updates**	

Testimony From	Summary	Recommendation	Comments
Eric Truskoski, Bradford White	**New definitions.** Single-pass should be defined as single-pass heat pump water heater, and multi-pass should be defined as multi-pass heat pump water heater. **C404.2.1.3** The WSCEC has laid out installation requirements that are overly prescriptive. We recommend the SBCC defer to the installation requirements specified by manufacturers of commercial HPWHs. The proposed requirements may force an installation, which may not be the best solution; does not comply with the manufacturer's installation and operation manual; and/or may limit improvements in known and unknown technologies. **C404.2.1.5** This section refers to alarm and/or control requirements of the system. If applicable, we suggest such requirements to be more appropriate in the Mechanical Code than the Energy Code. Do not adopt changes in 103 (heat pump space heating), 136 (heat pump water heating). Do not adopt 206 (load management) until finalized by ASHRAE 90.1. Do not change the gas-fired and oil-fired boiler minimum efficiency requirements in Table C403.3.2(6) until final appeal and DOE action.	**3 – TAG Review** **If No Action by TAG, update definitions and all references to "multi-pass heat pump water heater" and "single-pass heat pump water heater"** **3 – TAG Review** **If No Action by TAG, retain as in CR102** **3 – TAG Review** **If No Action by TAG, retain as in CR102 Note there is a similar comment on this topic in Eric Vander Mey's comments (see comment EVM21 in that document)**	

Testimony From	Summary	Recommendation	Comments
Bob Gunn, Seinergy	**Summary**: we support the proposed changes C405.3, with minor modifications to clarify that proposed 1.9 umol/j efficacy standard will be assessed at the lamp level where fixtures have serviceable lamps. *Our understanding is the WAC is trying to align with California's Title 24 energy code and with ASHRAE 90.1. However, the proposed language lacks the key components to correctly align the proposed language with California's Title 24 energy code and with ASHRAE 90.1. In the New Buildings Institute's proposal for this amendment, they state, "This efficacy requirement allows the most efficacious double-ended high pressure [sic] sodium luminaires and LED luminaires to be installed." However, the currently proposed language would limit growers to using only LED technology. As is, the proposed language would unintentionally restrict the industry and could cost $60 per square foot more than even efficacious double-ended high pressure sodium luminaires. This also threatens to undermine or eliminate utility rebates for early adopters of LED.*	**TBD**	
Nicholas Hagedorn, Hawthorne	*We agree with the Washington State building council that the (PPE) standard of 1.9 µmol/J is an acceptable strategy to create market transformation to more energy efficient lighting in the Controlled Environment Horticulture industry. Our concern is that the vague language used to express this will leave things open to interpretation by both regulators and cultivators which may negatively impact WA States goal of decreased carbon emissions in addition to potentially damaging the vulnerable WA cannabis industry:* C405.3: All permanently installed luminaires used for plant growth and maintenance shall have a photosynthetic photon efficacy of not less than 1.7 µmol/J for greenhouses and not less than 1.9 µmol/J **measured at the lamp level where luminaires have serviceable lamps** for all other indoor growing spaces	**TBD**	
Amanda Falkenhagen, Rushing	I would like to submit public review comments for the 2021 WSEC draft as noted below: **Section C405.5.1**: Suggest clarifying if the efficacy of 100 lumens/watt is based on initial lumens or delivered lumens. **Section C405.2.8.3:** Suggest removing the struck through portion below to provide greater clarity. The current working is bulky and difficult to interpret. **High end trim.** Luminaires subject to high end trim shall be initially configured with the following: 1. Programmed to limit the initial maximum lumen output or maxi-mum lighting power to 85 percent or less of full light output or full power ~~from full output~~ or to meet the target light level documented in project sequence of operations using the least amount of power.	**TBD** **3 – TAG Review** **If No Action by TAG, adopt edits as shown**	

Testimony From	Summary	Recommendation	Comments
Michael Rosenberg, PNNL	As the developer of the HVAC Total System Performance Ratio (TSPR) approach in the Washington State Energy Code and the proponent of 21-GP1-61, I would like to propose several changes to improve TSPR and account for additional energy savings strategies. These changes came out of public stakeholder input that was received while TSPR proposal was evaluated for inclusion in ASHRAE Standard 90.1. The following changes have been incorporated into the free TSPR calculation tool developed by Pacific Northwest National Laboratory and will be made available to Washington State users if approved by the Council. 1. Clarifies in Table D601.11.1 that HVAC Systems 3 and 4 include split systems in addition to single packaged systems. 2. Fixes a mistake where VAV systems and DOAS systems were not included in the list of system types where number of stages for direct expansion cooling coil number of stages should be specified. 3. Fixes a mistake where packaged VAV systems and DOAS systems were not included in the list of system types where furnace efficiency should be specified. 4. Adds variable flow primary and variable flow secondary chilled and heating water plant loop configurations to those that can be credited using TSPR. 5. Heating plant loop temperature control is added as a parameter that is available for credit. 6. Water loop heat pump loop temperature control is added as a parameter that is available for credit.	**3 – TAG Review** **If No Action by TAG, adopt all edits as shown in linked document**	
Michael Rosenberg, PNNL	As the proponent of 21-GP1-36 I worked with the Energy Code TAG to modify the proposal to improve it to reach consensus among the various stakeholders. One issue that was left unresolved was how to account for potential code changes to the electricity carbon emission factors (0.7 lbs./kWh to 0.44 lbs./kWh) and limitations on fossil fuel space and water heating that could potentially end up in the 2021 Washington State Energy Code. Those changes would result in the need to adjust the Building Performance Targets **(Table C407.3(2))** and Site Energy Performance Factors **(Table C407.3(3))** that were submitted in my original proposal. At the time of TAG approval of 21-GP1-70, I committed to updating those tables once the status of those two proposals was clarified, and to submit those updates as public review comments. I also incorporated several improvements to the calculation of performance factors based on stakeholder feedback. Therefore, if the new amendments to electricity emission factors and limits to use of fossil fuels for space and water heating are advanced in the code, **please replace the two tables with those shown below**. If the emission factors are updated to some value other than what is shown in the public review draft, or if the draft is amended to exempt some building types from the limitations on fossil fuel space or water heating, I can update the values in the tables below appropriately.	**3 – TAG Review** **If No Action by TAG, adopt all edits as shown in linked document**	

Testimony From	Summary	Recommendation	Comments
Rupal Choksi, Madison Indoor Air Quality	As a manufacturer of stand-alone dehumidifiers as referenced in **Section C403.15**, we support and applaud the state of Washington's efforts to improve the efficiency of the indoor horticulture industry. The efficiencies proposed in 1.1 and 1.2 are easily achievable by any manufacturer. Even so, we have two comments for you to consider. **Comment 1:** A bit of clarification may be required, perhaps informally, on what testing conditions are to be used based on the install method of the standalone dehumidifier referenced in 1.1 and 1.2. Even so, we support the wording as it will not provide a substantial barrier to entry for any manufacturer and substantially improve the efficiency of the indoor horticulture industry. **Comment 2**: We would like to address the requirement in 2. and 3. that states, "…*with on-site heat recovery designed to fulfill at least 75 percent of the annual energy for dehumidification reheat…"* and how it compares to the requirements in ASHRAE 90.1-2019. In doing so, we suggest that the on-site heat recovery be increased to 90 percent from 75 percent-- "…*with on-site heat recovery designed to fulfill at least ~~75~~ 90 percent of the annual energy for dehumidification reheat…"*	**3 – TAG Review** **If No Action by TAG, retain as in CR102** **Optional clarification and new proposal for increased stringency**	

Mike Kennedy Written Comments Specific to Lighting

Section or Table	Description	Recommendation	Comments
Table C405.4.2(2)—Interior lighting power allowances—Space-by-space method	Footnote "I" has been applied to the entire Common Space Types table. This is not what was discussed at the TAG (at the end). "I" is also applied to some of the individual categories - this is what was decided on by the TAG. Delete the "I" footnote from the header of the common Space-by-space Types table	**TBD**	
Table C405.5.3(3) Individual Lighting Power Allowances for Building Exteriors	First row is labeled "Base site allowance". This should say "building façade" not "base site allowance". There is no base site allowance for this table.	**TBD**	
C405.1 General	Reads in part: "General lighting shall consist of all lighting included when calculating the total connected interior lighting power in accordance with Section C405.4.1 and which does not require specific application controls in accordance with Section C405.2.65~~5~~." This reads like a definition, but the code already has one of those. It doesn't seem like a correct place and it's confusing having two definitions. Also, lighting	**TBD**	

Section or Table	Description	Recommendation	Comments
	in the egress path is definitely general lighting by the C202 definition but not by this section. Section reference C405.2.5 should be C405.2.6 and the section title is "Additional lighting controls" though the first sentence is "specific application controls". Hopefully the title of C405.2.6 will be changed to specific application controls (specified in another comment) Exception reads: Energy using equipment used by a manufacturing, industrial or commercial process other than maintaining comfort and amenities for the occupants are exempt from all Section C405 subsections except Sections C405.3 and C405.8. Data center and computer room HVAC equipment is not covered+E118 by this exemption. plant growth lighting should probably be added to this as it is not about maintaining comfort or amenities for the occupants		
C405.2.2 Time switch controls	Reads in part: "Each area of the building that is not provided with occupant sensor controls complying with Section C405.2.1.1 shall be provided with time switch controls" Full off controls are required everywhere not just the areas covered by C405.2.1.1. Perhaps reword to: "Each area of the building that is not provided with occupant sensor controls configured to turn the lighting full off shall be provided with time switch control"	**TBD**	
C405.2.5.2 Sidelit daylight zone	Item 2 defines the secondary sidelit zone and reads in part: "and longitudinally from the edge of the fenestration to the nearest full height wall or up to 2 feet, whichever is less, as indicated in Figure C405.2.5.2(1)." The primary zone has 0.5 times the window head height rather than 2 feet and this should too. This was error in the initial print of the 2021 IECC. The figure was also in error. See most current 2021 IECC. Rather than "up to 2 feet" it should be "up to 0.5 times the height from the floor to the top of the fenestration".	**1 – Editorial/Staff** Revise per 2021 IECC Errata	
Figure C405.2.5.2(1)	Second figure here indicating 2 ft. is in error it should be 0.5 x H.	**1 – Editorial/Staff** Revise per 2021 IECC Errata	

Section or Table	Description	Recommendation	Comments
C405.2.6 Additional lighting controls	Item 5. Exit access. Are these luminaires exempt from all controls or not?	**TBD**	
C405.2.10 Parking garage lighting control	The 1.5 FC exception was eliminated so all garages will need this control even if they have very low light levels. I still don't like the FC limit since it can't be plan checked and would reward a poor design but there could be an LPD limit or a limit on the percent reduction so that lighting would not need to be turned down below 0.05W/SF or some level. IECC discussions convinced me that there needs to be something	**TBD**	
C405.4.1 Total connected interior lighting power	Item 12 exempts > 90l/W plant growth TASK lighting from LPD calculation. New plant growth section, C405.3, regulates permanent lighting. Should item 12 here be changed to complying with C405.3 rather than > 90l/W or is task lighting here something else?	**TBD**	
C405.2.1.1 Occupant sensor control function	Reads in part: "Occupant sensor controls for the space types ~~listed in~~ required to comply with this section by Section C405.2.1 shall comply with all of the following". The space type list has moved to Table C405.2.1 has many types listed that do not need to comply with this section. To be pedantic one could say something like “in spaces required to comply with this section by Table C405.2.1”. Or possibly "by Section C405.2.1". There is a note the material in C405.2.1 of the CR-102 file is not correct. This comment should be reviewed against the correct language.	**TBD**	
C405.2.1.2 Occupant sensor control function in warehouse	Item 3 reads:"3. Lights which are not turned off by occupant sensors shall be turned off by time schedule sweep to turn lighting off within 20 minutes of all occupants leaving the space, or comply with Section C405.2.2 to turn lighting off when the building is vacant." What is "time schedule sweep" that is supposed to turn the lighting off within 20 minutes? I think this should read: "Lights which are not turned off by occupant sensors shall be turned off by time switch controls complying with Section C405.2.2 when the building is vacant"	**TBD**	
C405.2.1.2 Occupant sensor control function in warehouse(	New item 5 requires manual control. This is a slippery slope as all lighting requires manual control. Why is it called out only here?	**TBD**	

Section or Table	Description	Recommendation	Comments
C405.2.4 Light-reduction controls	Exception 2 refers to "special application controls", special should be "specific"	**1 – Editorial/Staff**	
C405.2.5 Daylight responsive controls	Nearly every time the primary sidelit, secondary sidelit, or toplit daylight zone is mention it is not followed by "complying with Section C405.2.5.2" or C405.2.5.3 for toplit. These sections merely define where the zones are. The phrase is odd, repetitive, missing in a few places, and sometimes uses "complying" and other times "in accordance with". Suggest changing the charging section and then removing the following from the subsequent subsections: complying with C405.2.5.2, complying with C405.2.5.3, in accordance with C405.2.5.2, in accordance with C405.2.5.3 Possible new charging language: "Primary and secondary sidelit zones shall be determined in accordance with C405.2.5.2. Top daylit zones shall be determined in accordance with C405.2.5.3. Daylight responsive controls complying with Section C405.2.5.1 shall be provided to control the general lighting within daylight zones in the following spaces:" If charging sentence not changed then: 1) exception 2 needs a complying with xxx inserted. 2) C405.2.5.3 item 2 needs a complying with xxx inserted 3) Also, there is "complying with" and "in accordance with". C405.2.5.2 and 3 just define the daylighting zone. It would be much clearer English to say "defined by" but in any case it seems like these should be standardized on one term.	**TBD**	

Section or Table	Description	Recommendation	Comments
C405.2.6 Additional lighting controls	Reads in part: "C405.2.6 ~~Additional lighting~~ Specific application controls. Specific application lighting shall be provided with controls~~, in addition to controls required by other sections,~~ for the following:" Title "Additional Lighting controls" was chosen along with the phrase "in addition to controls . . " to emphasis that these are additional controls. But this section is called specific application controls in all references and in the IECC. Now that item 1 explicitly specifies other controls it doesn't seem like there are other control requirements and the above clarifications become confusing. Title should be changed back to Specific Application controls and ", in addition to controls required by other sections," deleted unless there are other controls.	**TBD**	
C405.2.10 Parking garage lighting control	Proposal 21-GP1-127 set these values at 50 percent and 10 minutes but document has the original value 30 percent and 20 minutes	**TBD**	
C405.4.2.1 Building area method	Reads in part: "For each building area type inside the building, ". The word inside is not appropriate since one building area is not inside in the traditional sense. Replace “inside” with “in”.	**TBD**	
Table C405.4.2(1) Interior Lighting Power Allowances—Building Area Method	Multifamily has been changed to "Multiple family. Multifamily is used in 16 other places in this code. I would revert this to multifamily or change everywhere. Also, I’m unclear why these clarifying footnotes were removed from this table. They seemed very useful. I would undelete them and revise to: "Where dwelling or sleeping units do not comply with C405.1.1 .	**TBD**	
C405.4.2.2 Space-by-Space Method	This section that is about the space-by-space method leads off with: "Where a building has a space designated as unfinished, neither the area nor the lighting power in the space shall be calculated as part of the LPA. ". The first sentence should really be about the main section topic not some edge case. This should be moved to the end after item 3.	**TBD**	

Section or Table	Description	Recommendation	Comments
C405.4.2.2 Space-by-Space Method	Reads in part: "If an entire space has multiple functions that necessitate a higher lighting power allowance in order to serve one of the primary functions, the higher allowance is permitted to be used" The intent of this is common practice but as written will be assumed by some to allow lumping of areas with differing uses that are in a single room. I think this is something that should be deleted but if kept try to reword. Better might be: If there are multiple primary functions for the same space that qualify as different space types, using the type with the higher allowance is permitted. This does not allow adjacent spaces with differing types to be combined.	**TBD**	
Table C405.4.2(2) Interior lighting power allowances—Space-by-space method	Footnote c states "additional power shall be" in two places. IMO this should be "additional power allowance shall be"	**TBD**	
Table C405.5.3(3) Individual Lighting Power Allowances for Building Exteriors	Consider changing title to distinguish this table from C405.5.3(2). Suggest: Individual Lighting Power Allowances for Specific Exterior Uses	**TBD**	