2018 Seattle Energy Code – Significant Amendment Proposals 8/11/2020

The 2018 Washington State Energy Code will be amended by Seattle to increase energy efficiency and reduce carbon emissions over the lifetime of new and altered Seattle buildings. Seattle intends to have its entire building and transportation sectors operating at carbon-neutral by 2050, with significant near-term emissions reductions by 2030, just 10 years from today. Therefore new and substantially-altered buildings must be built *now* to operate at that advanced level, without requiring expensive future upgrades. Seattle's innovations influence subsequent editions of city, state and national codes around the country, giving our code considerable leverage in tackling global climate issues. An excerpt from Council Resolution 31895 – the Green New Deal – reads:
"The City supports efforts to limit the construction of new fossil fuel infrastructure in Seattle and King County, and… strengthen green building standards for new construction to minimize upfront emissions while maximizing energy efficiency."

The priorities used in the development of the 2018 Seattle Energy Code proposals include:

- High-performance building envelope, minimizing heat loss and air leakage.
    - Building envelopes typically remain unchanged for generations
- Eliminate most fossil fuel combustion equipment for heating and water heating
    - Seattle can't be carbon-neutral in 2050 while still installing fossil fuel equipment today
    - Installing efficient electric equipment at time of construction is our most cost-effective opportunity to transition Seattle's buildings to carbon-neutral operations
- Make exceptionally efficient use of Seattle's clean electricity
    - Eliminate most electric resistance heating & water heating in favor of heat pumps
    - Ensure that lighting system efficiency is state of the art
- Ramp up renewable energy deployment
    - This leaves more clean grid power available for our transportation and heating needs
- Utilize the most cost-effective strategies available to achieve all of the above

2018 Code Proposals

Most significant provisions in **bold.** Details on following pages, organized by section number.
Several dozen minor corrections and clarifications are summarized in a separate document.

General

1. **C103. Intent of code includes reduction of carbon emissions**

Envelope Provisions

1. C402.1.1.2. Do not allow unlimited heat pump heating in semi-heated spaces
2. **C402.1.4.2. Thermal resistance of mechanical equipment penetrations.**
3. C402.2.9 & C402.2.10**.** Thermal bridging control for concrete balconies & window frames
4. **Table C402.4. Reduce allowable fenestration U-values**
5. C505.1. Exempt certain change of use projects with high process loads from envelope improvement requirements

Mechanical Provisions

1. **C403.1.1. TSPR – Total System Performance Ratio – add multifamily and medical office**

2. **C403.1.4. Formalize existing code restrictions on electric resistance and fossil fuel space heating. Extend to multifamily buildings.**
3. Table C403.3.2(13) Add new table from ASHRAE 90.1 – 2019 for heat-recovery chiller efficiency
4. C403.3.5.1. Require both DCV (demand control ventilation) and energy recovery for high occupancy spaces larger than 650 sf
5. C403.3.5.1 and C403.7.6. Increase energy recovery ventilation effectiveness from 50% to 60%
6. C403.7.1. Reduce DCV threshold from 25 to 15 occupants/1000 sf (per mechanical code)
7. C404. Insulation and efficiency improvements to hot water circulation systems
8. **C404.2.3. Require heat pump water heater for R-1 & R-2 buildings with central hot water (implementation delayed until Jan 1, 2022)**
9. C404.7.3.1. Service hot water circulation controls and pipe/tank insulation
10. C409.1.3. Require individual gas meter at each dwelling unit with gas appliances
11. C503.4 Clarify that cooling system alterations must comply with the economizer compliance table, both at the individual equipment level and the total system level.

Lighting & Electrical Provisions

1. C405.2. Provide LLLC (luminaire-level lighting controls) or networked lighting control system for large (>5,000 sf) open office areas
2. C405.2.5. Furniture-mounted hotel room lighting, egress pathway lighting
3. C405.4.1. Increase efficacy for "indoor horticultural lighting" to 1.6 micromoles per joule
4. **Table C405.4.2.1. Reduce interior LPAs (lighting power allowances) 10%.**
5. C405.7.1. Provide receptacles at dwelling unit gas-fired appliances, for future electric appliances
6. C411.1. Extend solar readiness requirement to multifamily buildings
7. **C412.1. Increase on-site PV from 0.07 W/sf floor area to 0.25 W/sf, based on area of all floors**

C406 Additional Efficiency Credit Provisions

1. **C406.1. Increase C406 credit requirement to 8 (from 6) credits**
2. Table C406.1. Reduce to two credits for "basic" DOAS in R-2 occupancy (double dipping)
3. Table C406.1. Disallow C406 credits for fossil fuel-fired equipment
4. C406.2. Eliminate credit for low-energy spaces with radiant heat
5. C406.2. Disallow C406 credit for fossil fuel-fired equipment
6. C406.5. Use straight 0.25 W/sf requirement instead of WA table of annual PV production
7. C406.8 & C406.9. Modify HPWH credits to coordinate with R-1 & R-2 requirements in C404.2.3
8. C406.12. Eliminate commercial kitchen equipment credit, already required by C403.9

C407 Energy Modeling Provisions

1. Table C401.3.1. Base TPP targets on ASHRAE Appendix G Building Performance Factor values, instead of the current list of target values
2. **C407.3.1. For energy modeling, prohibit envelope heat loss greater than prescriptive code**
3. **Table C407.3(2). Require BPF (building performance factor) 10% below WA Appendix G modeling values**

Special thanks to the many professionals and organizations, local and national, who contributed their time to critique and improve this set of amendment proposals. The complete list would be extremely long, but certainly would include: McKinstry, FSI Engineers, Ecotope, Rushing, MacDonald-Miller, Northwest Energy Efficiency Alliance, Pacific Northwest National Laboratory, King County Public Health, Mike Kennedy, Martin Connor, O'Brien 360, Rocky Mountain Institute, New Buildings Institute, Treasa Sweek, Seattle 2030 District, National Resources Defense Council, NYC Department of Buildings, David Baylon, Housing Development Consortium, Integral Group, Spark Lab Lighting Design, ASHRAE, LMN Architects, Seattle Office of Sustainability and Environment, and Seattle City Light.

Draft 2018 Seattle Energy Code Change Proposals from Stakeholders

Clarify carbon reduction as part of energy code intent

Summary: Section C103 Intent. Specifically mention carbon reduction as part of the SEC intent.

- Clarify that the intent of the Seattle Energy Code is both to increase energy efficiency and to minimize carbon emissions, in accordance with other City legislation.

Proposed Code Language

C101.3 Intent. This code shall regulate the design and construction of buildings for the use and conservation of energy and the reduction of carbon emissions over the life of each building. This code is intended to provide flexibility to permit the use of innovative approaches and techniques to achieve this objective. This code is not intended to abridge safety, health or environmental requirements contained in other applicable codes or ordinances.

Draft 2018 Seattle Energy Code Change Proposals from Stakeholders

Modify Target Performance Path (TPP) Target Values

Summary: Section C401.3.1 Revise Target Performance Path.

The current TPP targets (i.e.: 40 EUI for office buildings) are largely unnecessary now that the state has switched to the ASHRAE Appendix G modeling method, because the Appendix G process essentially creates a "target" for each building. If the TPP targets were to be identical to the Building Performance Factors in Table C407.3(2), there would be no motivation for projects to select the TPP compliance path. However, it can be assumed that buildings conforming to the TPP will function more efficiently than buildings using standard compliance paths. Therefore, buildings will be permitted to have a "building performance factor" 12% higher than buildings simply using the Appendix G modeling path.

Projects following the TPP compliance path together with an incentive zoning program that requires 15% better performance than code would need to be just 3% (15% - 12%) better than code, provided they follow all the rules for the TPP. Use of this pathway also stipulates that the building envelope performance is at least as good as prescriptive code, and that no fossil fuel combustion or electric resistance appliances are used for space heating or water heating.

- The "targets" created through the ASHRAE Appendix G method have a more rational basis than those of Seattle's original TPP.
- The current target values were in most cases considerably less stringent than the prescriptive code requirements.

Proposed Code Language

C401.3 Target Performance Path.

C401.3.1.1 Increased building performance factor. Each building conforming to this section is permitted to have a building performance factor (BPF) no greater than 1.12 times the maximum BPF permitted by Table C407.3(2).

C401.3.1.2 Conversion of energy use to carbon emissions. Energy use in Target Performance Path calculations shall be converted to carbon emission according to Table C407.3(1)

C401.3.2.1 Data Center Energy. Anticipated total data center energy use is permitted to be added to the overall building energy usage target in accordance with this section. The anticipated *IT energy* usage shall be multiplied by a factor of 1.45 to determine the anticipated total data center energy use. The *IT energy* usage shall be separately sub-metered in a secure manner *approved* by the *code official* and automatically exported to the *code official*

showing daily, monthly and annual totals during the operational energy use demonstration period set forth in Section C401.3.6. Actual *IT energy* shall be adjusted in accordance with Section C401.3.7.

C401.3.3 Mandatory measures. Buildings using the Target Performance Path shall:

1. Not exceed the building performance factor (BPF) permitted by Section C401.3.1.1;
2. Not use fossil fuel combustion or electric resistance appliances for purposes of space heating or domestic water heating.
3. Have a building envelope with a Proposed Total UA no greater than the Allowable Total UA as determined by Equation 4-2; and
4. Comply with the mandatory measures listed in Table C407.2.

C401.3.4 Energy modeling methodology. Energy use shall be modeled according to the requirements of Section C407, Total Building Performance:

Schedules, internal loads and other assumptions related to the operation of the building are permitted to be developed at the discretion of the design team and the energy modeler. For occupancy types listed in Appendix B of this code, where any of the following operating loads or schedules of operating hours used in modeling calculations is less than 80 percent of that listed in Appendix B, or where the occupant density in square feet per occupant is more than 120 percent of that listed in Appendix B, such deviations shall be clearly documented in the final analysis report and are subject to approval by the *code official*.

1. Occupant density and schedule
2. Lighting operation schedule
3. Receptacle loads and schedule
4. Elevator and escalator schedule
5. Water heating quantity and schedule

In addition to documenting modeling assumptions, the application documentation required by Section G1.3.2 of ASHRAE 90.1, Appendix G, shall include the following:

1. Summary of principal building characteristics that are above or below prescriptive energy code requirements.
2. Sensitivity analysis of principal internal load and other building operational assumptions that demonstrate a range of expected energy performance in the context of typical meteorological year (TMY) conditions. The following sensitivity analyses shall be reported, in tabular format:
    - 2.1. Occupant density +/- 20 percent (except residential occupancies)
    - 2.2. Lighting Power Density +/- 20 percent
    - 2.3. Miscellaneous Load Power Density +/- 20 percent
    - 2.4. Infiltration Rates +/- 20 percent
    - 2.5. Temperature Setpoints +/- 2 degrees F

Table C401.3.4
Example of Sensitivity Analysis Report Format

Allowable EUI: 45 kBTU/ft^2		
Predicted EUI: 40 kBTU/ft^2		
Input	EUI (Low Range)	EUI (High Range)
Occupant Density	35	42
Lighting Power Density	38	41
Misc. Load Power Density	35	45
Infiltration	38	44
Temperature Setpoints	36	48

The building performance factor (BPF) derived from the modeled building carbon emissions, under nominal conditions, shall be no greater than 1.12 times the BPF listed in Table C407.3(2).

C401.3.5 Energy modeler qualifications. Energy models shall be created only by persons qualified by education and training to perform such work and who have at least two years' experience modeling buildings of similar scale and complexity. The modeling documentation submitted shall be signed either by a licensed professional engineer who is qualified by training and experience to perform energy modeling or by an individual with an active certification from ASHRAE as a Building Energy Modeling Professional (BEMP).

C401.3.6 Demonstration of operating energy use. Metered energy data shall be supplied directly via automated reporting from utilities to the *code official* using Portfolio Manager, and adjusted for the percentage of the conditioned floor area intended for occupancy that is occupied during the recording period. While more than 95 percent occupied, the building shall be considered fully occupied. While no less than 75 percent occupied, the building shall operate at or below its assigned building performance factor established in Section C401.3.2 or item 8 of Section C401.3.1 for any recording period of 12 consecutive months that is completed within three years of the date of the Certificate of Occupancy, as adjusted under this Section C401.3. The owner shall notify the *code official* when this 12-month period has been successfully completed.

C401.3.6.1 Extension of demonstration period. For good cause, including conditions where less than 75 percent of the building is occupied, the *code official* may extend the three-year period for one additional year, but in no case for more than three additional one-year periods. If the building is not at least 75 percent occupied after three additional one-year periods, the *code official* shall evaluate compliance with Section C401.3.6 based on the most recent one-year period and adjusted for the actual occupancy rate during that period.

C401.3.7 Adjustment for data center energy usage. Where data center *IT energy* usage during the demonstration period, multiplied by a factor of 1.45, is higher than the total data center energy use as calculated according to Section C401.3.2.1, that additional energy shall be added to the total allowable energy use. Where data center *IT energy* use, multiplied by a factor of 1.45, is lower than the total data center energy use as calculated according to Section C401.3.2.1, that shortfall shall be subtracted from the total allowable energy use.

C401.3.8 Adjustment for change in occupancy. When the occupancy of the building or a portion of the building changes from that assumed in the permit submittal, the assigned

energy performance target shall be adjusted to reflect the new occupancy. If the new occupancy is not listed in Section C401.3.2, either the *code official* shall assign it an energy use target based on the best-performing local examples of that occupancy type, or a metering system shall be provided that excludes the energy loads for the additional occupancy.

C401.3.9 Adjustment for unusually cold years. If the heating degree days (HDD) recorded by the National Weather Service for the Seattle-Tacoma International Airport exceeds 4885 HDD for the 12-month demonstration period (4 percent above the average 4697 HDD at 65°F base), the assigned energy performance target is permitted to be increased by 1 percent for that period.

C401.3.10 Adjustment for retail operating hours. If the annual number of hours that a retail occupancy is open to the public during the 12-month recording period exceeds the hours assumed in the energy model by more than 4 percent, the annual energy use target for the retail space use only is permitted to be increased by 1 percent for each 4 percent increase in such hours. This claim shall be documented by publicly-available published hours of operation.

C401.3.11 Adjustment for commercial kitchens and other large process loads. Where the building includes a commercial kitchen, commercial laundry, hospital central sterile processing facility, or similar large process load, and where approved by the *code official*, the energy use of the process equipment and exhaust fans and relief air fans and air tempering associated with the use of that equipment is permitted to be separately sub-metered and subtracted from the overall building energy usage. Energy use of typical HVAC, lighting, and miscellaneous electrical loads within such spaces shall not be included in this adjustment. An *approved* plan shall be submitted with the permit documents detailing how the sub-metered process load energy will be automatically deducted from the total building energy use and the adjusted total reported to the *code official*.

C401.3.12 Financial security. The applicant shall provide a financial security to be used as a penalty for failing to achieve an operating energy use lower than the building's energy use target according to Section C401.3.6. The penalty shall be administered as provided in Section C110, except that the amount of the penalty shall be determined using Table C401.3.13 and not Section C107. The financial security shall be submitted to and *approved* by the *code official* prior to issuance of the building's Certificate of Occupancy. The financial security requirement shall be fulfilled by one of the following methods:

1. An irrevocable letter of credit from a financial institution authorized to do business in Seattle, in an amount equal to $4.00 per square foot of gross conditioned floor area.
2. A bond secured by the applicant to ensure compliance with this section, in an amount equal to $4.00 per square foot of gross conditioned floor area.
3. A binding pledge that within 3 years of receipt of the Certificate of Occupancy, adjusted as allowed under Section C401.3.6.1, the applicant will comply with the requirements of this section.
    - 3.1 A binding pledge pursuant to item 3 of this subsection shall be recorded as a covenant in the land records of King County between the applicant and the City of Seattle in a form that is satisfactory to the Seattle City Attorney. The covenant shall bind the applicant and any successors in title to pay any fines levied pursuant to this section. A lien will be placed on the property in cases of non-payment.

If the owner provides evidence that the building has operated at or below its target energy performance level as provided in Section C401.3.6, the financial security provided by the applicant shall be returned to the applicant, or the pledge and covenant shall be released, and the applicant will have no further obligations under this section.

C401.3.13 Procedure for non-compliance. If the owner fails to provide evidence that the building has operated as required under Section C401.3.6, the *code official* shall, as applicable, either:

1. Draw down on a financial security provided in the form of an irrevocable letter of credit or a bond, in whole, or in part, or
2. Levy a fine against an applicant that provided a financial security in the form of a binding pledge as set forth in Section C401.3.12(3). The fine shall be issued as a civil penalty.

The amount of the fine levied or the amount drawn down from a financial security shall be determined according to Table C401.3.13.

C401.3.14 Reimbursements. Where a financial security has been drawn down pursuant to item 1 in Section C401.3.13, or a fine has been levied pursuant to item 2 in Section C401.3.13, the *code official* shall reimburse the owner for documented expenses incurred to lower the operating energy use of the building, including commissioning, repairs or improvements to the existing energy-consuming systems, or provision of additional energy efficiency measures, up to the maximum reimbursement amounts listed in Table C401.3.13. Such expenditures shall be *approved* in advance by the *code official,* and the work shall be fully completed within one year of the date when a financial security has been drawn down pursuant to item 1 in Section C401.3.13, or a fine has been levied pursuant to item 2 in Section C401.3.13.

Table C401.3.13
Financial Security and Energy Efficiency Reimbursements

Energy use exceeding target	**Amount of fine or draw-down from financial security, per square foot of gross conditioned floor area**	**Maximum reimbursement per square foot of gross conditioned floor area for work *approved* under Section C401.3.12**
Less than 10%	$1.00	$0.50
10% to less than 20%	$2.00	$1.00
20% to less than 30%	$3.00	$1.50
30% or greater	$4.00	$2.00

Draft 2018 Seattle Energy Code Change Proposals from Stakeholders

Heating of semi-heated spaces

Summary

NEW (JULY 2020) PROPOSAL: Section C402.1.1.2 Semi-heated buildings and spaces. Do not permit spaces heated by heat pumps to automatically comply with semi-heated space rule. Strike exception 2.

Also, clarify that the radiant heating exception is for specific applications only, not for general area heating, and that it must be insulated and controlled per code.

- Having efficient heating does not mean that we should leave walls entirely uninsulated.
- Issue noted by Mike Kennedy.

Proposed Code Language

C402.1.1.2 Semi-heated buildings and spaces. The building envelope of *semi-heated* buildings, or portions thereof, shall comply with the same requirements as that for conditioned spaces in Section C402, except as modified by this section. The total installed output capacity of mechanical space conditioning systems serving a *semi-heated* building or space shall comply with Section C202, except as modified by this section. Building envelope assemblies separating conditioned space from semi-heated space shall comply with the exterior envelope insulation requirements. Semi-heated spaces heated by mechanical systems that do not include electric resistance heating equipment are not required to comply with the opaque wall insulation provisions of Section C402.2.3 for walls that separate semi-heated spaces from the exterior or low energy spaces. Fenestration that forms part of the *building thermal envelope* enclosing semi-heated spaces shall comply with Section C402.4. Semi-heated spaces shall be calculated separately from other conditioned spaces for compliance purposes.

Opaque walls in semi-heated spaces shall be calculated as fully code compliant opaque walls for both the target and proposed for the Target UA calculations for the component performance alternative in Section C402.1.5, and for the ((~~Standard Reference~~)) Baseline Building Design for Total Building Performance compliance per ASHRAE 90.1, Appendix G. The capacity of heat trace temperature maintenance systems complying with Section C404.7.2 that are provided for freeze protection of piping and equipment only, shall not be included in the total installed output capacity of mechanical space conditioning systems.

Exception: Building or space may comply as *semi-heated* when served by ((~~one or more of~~)) the following system ((~~alternatives~~)) alternative:

1. Electric infrared heating equipment for localized heating applications, but not for general area heating, insulated in compliance with Section C402.2.8 and controlled by occupant sensing devices in compliance with Section C403.11.1.

((~~2. Heat pumps with cooling capacity permanently disabled, as pre-approved by the jurisdiction.~~))

Draft 2018 Seattle Energy Code Change Proposals from Stakeholders

Through-wall mechanical equipment

Summary

NEW (JULY 2020) PROPOSAL: Section C402.1.4.2 Thermal resistance of mechanical equipment penetrations. Calculate heat loss though PTACs, PTHPs, and other through-wall mechanical equipment.

- More realistic assessment of envelope heat loss through PTACs and PTHPs in exterior walls, which is several times greater than heat loss through a code-minimum exterior wall assembly.
- From New York City code.

Proposed Code Language

C402.1.4.2 Thermal resistance of mechanical equipment penetrations. When the total area of penetrations from through-wall mechanical equipment or equipment listed in Table C403.3.2(3) exceeds 1 percent of the opaque *above-grade wall* area, the mechanical equipment penetration area shall be calculated as a separate wall assembly with a default U-factor of 0.5. Supply and exhaust ducts and louvers are not considered to be mechanical equipment for the purposes of this section.

> **Exception:** Where mechanical equipment has been tested in accordance with *approved* testing standards, the mechanical equipment penetration area is permitted to be calculated as a separate wall assembly using the U-factor determined by such test.

Table C402.1.3: Add new footnote i:

i. Where the total area of through-wall mechanical equipment is greater than 1 percent of the opaque *above-grade wall* area, use of the *R*-value method is not permitted. See Section C402.1.4.2.

Draft 2018 Seattle Energy Code Change Proposals from Stakeholders

Thermal Bridging

Summary

Sections C402.2.9 & C402.2.10 Thermal Bridging. Provide relaxed requirement for cantilevered concrete decks, include in target UA calculation. Provide requirements for control of thermal bridging around perimeter of fenestration.

Also, modify "mass transfer deck" definition, to clarify that cantilevered balconies are not mass transfer decks.

- Encourage better control of thermal bridging heat losses.
- Currently, cantilevered decks are treated as uninsulated concrete walls, and applicants have to use energy modeling or UA tradeoff to compensate. This proposed change will recognize a reduced standard for decks, which can be met using a proprietary system (such as Schock Isokorb, Armatherm FRR, or Halfen HIT Insulated Connection) alternate support methods (such as suspension rods), energy modeling, or UA tradeoffs.
- The fenestration frame proposal requires glazing and frame thermal breaks to roughly align with the opaque wall insulation, and requires any exposed rough opening area to be insulated.

Proposed Code Language

Chapter 2 Definitions.

MASS TRANSFER DECK SLAB ((~~EDGE~~)). ~~That portion of the *above-grade wall* made up of the concrete slab where it extends past the footprint of the floor above.~~)) A concrete slab designed to transfer structural load from the building perimeter wall or column line above, laterally to an offset wall or column line below, and which has conditioned or semi-heated space on the inside of the upper wall and exterior or unconditioned space on the outside of the upper wall. The area of the slab edge shall be defined as the thickness of the slab multiplied by the ((~~perimeter~~)) length of the edge condition. Examples of this condition include, but are not limited to, the transition from an above-grade structure to a below-grade structure or the transition from a tower to a podium. A cantilevered concrete balcony does not constitute a mass transfer deck slab.

C402.2.9 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, the Target 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, and shall not constitute more than 25 percent of the perimeter of any floor, measured along the perimeter edge of the conditioned space.

Exception: *Mass transfer deck slab* edges.

C402.2.10 *Vertical fenestration* intersection with opaque walls. *Vertical fenestration* shall comply with items 1, 2 and 3, as applicable:

1. Where wall assemblies include *continuous insulation*, the exterior glazing layer of *vertical fenestration* and any required thermal break in the frame shall each be aligned within 2 inches laterally of either face of the *continuous insulation* layer.
2. Where wall assemblies do not include *continuous insulation*, the exterior glazing layer of *vertical fenestration* and any required thermal break in the frame shall each be aligned within the thickness of the *wall* insulation layer and not more than 2 inches laterally from the exterior face of the outermost insulation layer.
3. Where the exterior face of the *vertical fenestration* frame does not extend to the exterior face of the opaque wall rough opening, the exposed exterior portion of the rough opening shall be covered with either a material having an *R-value* not less than R-3, or with minimum 1.5-inch thickness wood.

Table C402.1.4

Opaque Thermal Envelope Requirements[a,f]

CLIMATE ZONE	5 AND MARINE 4	
	All Other	**Group R**
Walls, Above Grade		
Mass[g]	U-0.104[d]	U-0.078
Mass transfer deck slab edge[i]	U-0.20	U-0.20
Slab penetrating thermal envelope wall[h]	U-0.10	U-0.10
Through-wall mechanical equipment[k]	U-0.50	U-0.50
Metal building	U-0.052	U-0.052
Steel framed	U-0.055	U-0.055
Wood framed and other	U-0.054	((~~U-0.054~~)) U-0.051
Walls, Below Grade		

CLIMATE ZONE	5 AND MARINE 4	
	All Other	**Group R**
Below-grade wall[b,g]	Same as above grade	Same as above grade
Floors		
Mass[e]	U-0.031	U-0.031
Joist/framing	((~~U-0.029~~)) U-0.029 steel joist U-0.025 wood joist	((~~U-0.029~~)) U-0.029 steel joist U-0.025 wood joist
Concrete column or wall penetrating thermal envelope floor [i]	U-0.55	U-0.55
Concrete slab floor directly above an electrical utility vault	N.R.	N.R.
Slab-on-Grade Floors		
Unheated slabs	F-0.54	F-0.54
Heated slabs[c]	F-0.55	F-0.55
Opaque Doors		
Swinging door	U-0.37	U-0.37
Nonswinging door	U-0.34	U-0.34
Garage door <14% glazing	U-0.31	U-0.31

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g	Peripheral edges of intermediate concrete floors are included in the above-grade mass wall category and therefore must be insulated as above-grade mass walls unless they meet the definition of Mass Transfer Deck Slab Edge. The area of the peripheral edges of concrete floors shall be defined as the thickness of the slab multiplied by the perimeter length of the edge condition. See Table A103.3.7.2 for typical default *U*-factors for above-grade slab edges and footnote [c] for typical conditions of above-grade slab edges.
h	Intermediate concrete floor slabs penetrating the building thermal envelope shall comply with Section C402.2.9. The area of such penetrating concrete floor slabs shall be defined as the thickness of the slab multiplied by the length of the

	penetration. The “exposed concrete” row in Table A103.3.7.2 shall be used for typical default *U*-factors for the penetrating concrete slab.
i	Value applies to concrete columns and concrete walls that interrupt mass floor insulation, but not to perimeter walls or columns separating interior conditioned space from exterior space.
j	A mass transfer deck, due to its configuration, is not insulated. The table value (U-0.20) shall be used as the baseline value for component performance, total building performance, or target performance path calculations. For the proposed value, the appropriate value from the top line of Table A104.3.7.2 shall be used.
k	Through-wall mechanical equipment subject to Section C402.1.4.2 is required to be calculated at this value.

Draft 2018 Seattle Energy Code Change Proposals from Stakeholders

Higher-Performance Fenestration

Summary:

Table C402.4 Fenestration U-Values. Reduce average U-values for fenestration enough that some proportion of the fenestration, but not all, would likely have to be triple glazing or equivalent. (Delete current Column A/Column B requirements & related footnotes from Table C402.4 and related language from Section C402.4.)

Also, allow slightly higher U-value for operable windows (U-0.28 instead of U-0.26), in order to provide a greater range of window choices, especially for affordable housing.

Also, adjust the fenestration U-value requirements for increased allowable fenestration area.

- U values in Seattle code would longer be related to the heating source (heat pump vs. electric resistance/fossil fuel) as has been required in the 2015 code
- Fenestration is typically responsible for approximately 2/3 of envelope heat loss.
- Our new building envelopes will remain unchanged for several decades, so we need to build them close to our 2050 standards today.
- New and less-expensive triple glazing options are appearing on the market now.
- Triple glazing also provides noise control benefits
- Will increase construction cost, especially at first
- ROI is slow in Seattle's bland climate.
- Note that the "Column A, Column B" format from the 2015 code is no longer in Seattle code.
- Requirements regarding electric vs. fossil fuel heating can be found in Section C403.1.4.

Proposed Code Language

C402.4 Fenestration. Fenestration shall comply with Sections C402.4 through C402.4.4 and Table C402.4. Daylight responsive controls shall comply with this section and Section C405.2.4.1.

Table C402.4

Building Envelope Fenestration Maximum *U*-factor and SHGC

Requirements

CLIMATE ZONE	5 AND MARINE 4
***U*-factor for Class AW windows rated in accordance with AAMA/CSA101/I.S.2/A440, vertical curtain walls and site-built fenestration products[a]**	
Fixed[b] *U*-factor	((~~U-0.38~~)) U-0.34
Operable[c] *U*-factor	((~~U-0.40~~)) U-0.36
***Entrance doors*[d]**	

CLIMATE ZONE	5 AND MARINE 4	
U-factor	U-0.60	
***U*-factor for all other vertical fenestration**		
Fixed *U*-factor	((~~U-0.30~~)) U-0.26	
Operable[c] *U*-factor	U-0.28	
SHGC for all vertical fenestration		
Orientation[e,f]	SEW	N
PF < 0.2	0.38	0.51
0.2 ≤ PF < 0.5	0.46	0.56
PF ≥ 0.5	0.61	0.61
Skylights		
***U*-factor**	((~~U-0.50~~)) U-0.45	
SHGC	((~~U-0.35~~)) U-0.32	

SDCI Informative Note: The category at the top of Table C402.4 "*U-factor for Class AW windows rated in accordance with AAMA/CSA101/I.S.2/A440, vertical curtain walls and site-built fenestration products*" includes curtain wall, storefront, ribbon wall, window wall, and similar products, but does not include typical punched-opening manufactured windows except for "Class AW" windows. Class AW is the AAMA designation for windows typically used in mid-rise and high-rise buildings to resist high wind and water intrusion loads.

C402.4.1 Maximum area. The total building vertical fenestration area (not including opaque doors and opaque spandrel panels) shall not exceed 30 percent of the total building gross *above-grade wall* area. The skylight area shall not exceed 5 percent of the total building gross roof area (skylight-to-roof ratio).

For buildings with more than one *space conditioning category*, compliance with the maximum allowed window-to-wall ratio and skylight-to-roof ratio shall be demonstrated separately for each *space conditioning category*. Interior partition ceiling, wall, fenestration and floor areas that separate space conditioning areas shall not be applied to the window-to-wall ratio and skylight-to-roof ratio calculations.

EXCEPTION: For vertical fenestration at street level retail or for other occupancies where the Seattle Land Use Code requires street-level transparency, the fenestration area shall not exceed 75 percent of the area of the street-level wall that faces the street or that adjoins other pedestrian areas used for retail access. For the purposes of this exception, the street-level wall shall be measured from the street-level floor to the

interior ceiling level or to 20 feet above floor level, whichever is lowest. When this exception is used, separate calculations shall be performed for these sections of the building envelope, and these values shall not be averaged with any others for compliance purposes. On the street level the 75 percent fenestration area is permitted to be exceeded, if the additional fenestration area is deducted from fenestration allowances from other areas of the building.

C402.4.1.1 Vertical fenestration maximum area with high performance alternates. For buildings that comply with Section C402.4.1.1.1 or C402.4.1.1.2, the total building vertical fenestration area is permitted to exceed 30 percent but shall not exceed 40 percent of the gross above grade wall area for the purpose of prescriptive compliance with Section C402.1.4.

When determining compliance using the component performance alternative in accordance with Section C402.1.5, the total building vertical fenestration area allowed in Equation 4-2 is 40 percent of the above grade wall area for buildings that comply with the vertical fenestration alternates described in this section.

C402.4.1.1.1 Optimized daylighting. All of the following requirements shall be met:

1. Not less than 50 percent of the total conditioned floor area in the building is within a *daylight zone* that includes *daylight responsive controls* complying with Section C405.2.4.1.

2. Visible transmittance (VT) of all *vertical fenestration* in the building is greater than or equal to 1.1 times the required solar heat gain coefficient (SHGC) in accordance with Section C402.4, or 0.50, whichever is greater. It shall be permitted to demonstrate compliance based on the area weighted average *VT* being greater than or equal to the area weighted average of the minimum *VT* requirements.

EXCEPTION: Fenestration that is outside the scope of NFRC 200 is not required to comply with Item 2.

SDCI Informative Note: NFRC 200 covers almost all commonly-used glazing products. *Fenestration* products not within the scope of NFRC 200 include glass block, translucent fiberglass, curved glass, corrugated or patterned glazing, double-pane glass with shading devices between the panes, and glazing with translucent or patterned films.

C402.4.1.1.2 High-performance fenestration.

All of the following requirements shall be met:

1. All *vertical fenestration* in the building shall comply with the following *U*-factors:

a. *U*-factor for Class AW windows rated in accordance with AAMA/CSA101/I.S.2/A440, vertical curtain walls and site-built fenestration products (fixed) = ((~~0.34~~)) 0.30

b. *U*-factor for Class AW windows rated in accordance with AAMA/CSA101/I.S.2/A440, vertical curtain walls and site-built fenestration products (operable) = 0.36

c. Entrance doors = 0.60

d. *U*-factor for all other vertical fenestration = ((~~0.28~~)) 0.22

2. The SHGC of the vertical fenestration shall be no more than 0.90 times the maximum SHGC values listed in Table C402.4 ((~~less than or equal to 0.35, adjusted for projection factor in compliance with C402.4.3~~)).

An area-weighted average shall be permitted to satisfy the *U*-factor requirement for each fenestration product category listed in Item 1 of this section. Individual fenestration products from different fenestration product categories shall not be combined in calculating the area-weighted average *U*-factor.

Draft 2018 Seattle Energy Code Change Proposals from Stakeholders

TSPR (Total System Performance Ratio) Increased scope

Summary:

Section C403.1.1 HVAC total system performance ratio (HVAC TSPR). Add R-2 multifamily occupancy, based on additional work done by PNNL in the past year.

Also, add "medical office" to scope, but exempt medical office buildings complying with ASHRAE 170 (generally outpatient surgical centers) and those requiring 24/7 air handling operation.

Also, add exception from TSPR requirement for "HVAC systems serving laundry rooms, elevator rooms, mechanical rooms, electrical rooms, data centers, computer rooms, and kitchens."

- Requires good energy performance for multifamily HVAC systems
- May increase costs
- Will reduce allowable options

Proposed Code Language

C403.1.1 HVAC total system performance ratio (HVAC TSPR). For systems serving office, medical office, retail, library, and education, and the dwelling units and residential common areas within R-2 multifamily occupancies and buildings, which are subject to the requirements of Section C403.3.5 without exceptions, the *HVAC total system performance ratio* (*HVAC TSPR*) of the *proposed design* HVAC system shall be more than or equal to the *HVAC TSPR* of the *standard reference design* as calculated according to Appendix D, Calculation of HVAC Total System Performance Ratio.

EXCEPTIONS:1. Buildings with conditioned floor area less than 5,000 square feet.

2. HVAC systems using district heating water, chilled water or steam.

3. HVAC systems not included in Table D601.11.1.

4. HVAC systems with chilled water supplied by absorption chillers, heat recovery chillers, water to water heat pumps, air to water heat pumps, or a combination of air and water cooled chillers on the same chilled water loop.

5. HVAC systems served by heating water plants that include air to water or water to water heat pumps.

6. Underfloor air distribution HVAC systems.

7. Space conditioning systems that do not include *mechanical cooling*.

8. Alterations to existing buildings that do not substantially replace the entire HVAC system.

9. HVAC systems meeting all the requirements of the *standard reference design* HVAC system in Table D602.11, Standard Reference Design HVAC Systems.

10. HVAC systems serving laundry rooms, elevator rooms, mechanical rooms, electrical rooms, data centers, computer rooms, and kitchens.

11. Buildings or areas of medical office buildings that comply fully with ASHRAE Standard 170, including but not limited to surgical centers, or that are required by other applicable codes or standards to provide 24/7 air handling unit operation.

Changes to 2018 WA Appendix D ruleset to add multifamily to TSPR:

D101 Scope. This appendix establishes criteria for demonstrating compliance using the *HVAC total system performance ratio (HVAC TSPR)* for systems serving office, retail, library and education occupancies and buildings, which are subject to the requirements of Section C403.3.5 without exceptions and dwelling units and common areas within multifamily buildings. Those HVAC systems shall comply with Section C403 and this appendix as required by Section C403.1.1.

* * *

D601.2.1 Number of blocks. One or more *blocks* may be required per building based on the following restrictions:

1. Each *block* can have only one occupancy type (multifamily dwelling unit, multifamily common area, office, library, education or retail). Therefore, at least one single *block* shall be created for each unique use type.

* * *

D601.4.1 Occupancy type. The occupancy type for each *block* shall be consistent with the building area type as determined in accordance with Section C405.4.2.1. Portions of the building that are building area types other than multifamily, office, school (education), library, or retail shall not be included in the simulation.

* * *

D601.4.2 Occupancy schedule, density, and heat gain. The occupant density, heat gain, and schedule shall be for multifamily, office, retail, library, or school as specified by ASHRAE Standard 90.1 Normative Appendix C.

* * *

D601.6 Lighting. Interior lighting power density shall be equal to the allowance in Table C405.4.2(1) for multifamily, office, retail, library, or school. The lighting schedule shall be for multifamily, office, retail, library, or school as specified by ASHRAE Standard 90.1 Normative Appendix C. The impact of lighting controls is assumed to be captured by the lighting schedule and no explicit controls shall be modeled. Exterior lighting shall not be modeled.

D601.7 Miscellaneous equipment. The miscellaneous equipment schedule and power shall be for multifamily, office, retail, library, or school as specified by ASHRAE Standard 90.1 Normative Appendix C. The impact of miscellaneous equipment controls is assumed to be captured by the equipment schedule and no explicit controls shall be modeled.

Exceptions.

1. Multifamily dwelling units shall have a miscellaneous load density of 0.42 W/ft^2
2. Multifamily common areas shall have a miscellaneous load density of 0 W/ft^2

* * *

Table D601.11.2
Proposed Building System Parameters

Category	Parameter	Fixed or User Defined	Required	Applicable Systems
System Operation	Space Temperature Setpoints	Fixed	As specified in ASHRAE Standard 90.1 Normative Appendix C, except multifamily which shall use 68 deg. F heating and 76 deg. F cooling setpoints	1-11

Table D602.11
Standard Reference Design HVAC Systems

Parameter	Building Type				
	Large Office[1]	Small Office and Libraries[1]	Retail	School	Multifamily
System Type	Water-source Heat Pump	Packaged air-source Heat Pump	Packaged air-source Heat Pump	Packaged air-source Heat Pump	Packaged air-source Heat Pump

Parameter	Building Type				
	Large Office[1]	**Small Office and Libraries[1]**	**Retail**	**School**	**Multifamily**
Fan control[2]	Cycle on load	Cycle on load	Cycle on load	Cycle on load	Cycle on load
Space condition fan power (W/cfm)	0.528	0.528	0.522	0.528	0.528
Heating/Cooling sizing factor[3]	1.25/1.15	1.25/1.15	1.25/1.15	1.25/1.15	1.25/1.15
Supplemental heating availability	NA	<40°F	<40°F	<40°F	<40°F
Modeled cooling COP (Net of fan) [4]	4.46	3.83	4.25	3.83	3.83
Modeled heating COP (Net of fan) [4]	4.61	3.81	3.57	3.81	3.86
Cooling Source	DX (heat pump)	DX (heat pump)	DX (heat pump)	DX (heat pump)	DX (heat pump)
Heat source	Heat Pump	Heat Pump	Heat Pump	Heat Pump	Heat Pump
OSA Economizer[5]	No	No	Yes	Yes	Yes
Occupied ventilation source[6]	DOAS	DOAS	DOAS	DOAS	DOAS
DOAS Fan Power (W/cfm of outside air)	0.819	0.819	0.730	0.742	0.78
DOAS temperature control [7, 8]	Bypass	Wild	Bypass	Bypass	Wild
ERV efficiency (sensible only)	70%	70%	70%	70%	70%
WSHP Loop Heat Rejection	Cooling Tower [9]	NA	NA	NA	NA
WSHP Loop Heat Source	Gas Boiler [10]	NA	NA	NA	NA
WSHP Loop Temperature Control[11]	50°F to 70°F	NA	NA	NA	NA
WSHP circulation Pump W/gpm[12]	16	NA	NA	NA	NA
WSHP Loop Pumping Control[13]	HP Valves & pump VSD	NA	NA	NA	NA

Draft 2018 Seattle Energy Code Change Proposals from Stakeholders

Formalize restriction of electric resistance and fossil-fuel HVAC heating

Summary:

Section C403.1.4. Restrict the use of electric resistance and fossil fuel equipment for space heating, with a list of exceptions. This restriction is essentially already in place in Section C402.5 of the 2015 code, but this change removes the option to provide high-performance fenestration instead. (Virtually all commercial buildings have selected the heat pump option under the 2015 code thus far, so this formalizes an existing *de facto* requirement.)

An additional change includes R-2 multifamily buildings in the requirement, with certain exceptions.

Also, pointers back to this language placed in Seattle Mechanical Code, Seattle Boiler and Pressure Vessel Code & Seattle Fuel Gas Code.

Also, a modification to Section C403.4.1.1, Heat pump supplementary heat, for coordination with the new requirement.

- Can increase cost, complexity and space requirements for multifamily.
- Much of this code language, including exceptions, is relocated from the 2015 Section C402.4 requirement (the Column A/Column B fenestration section).

Proposed Code Language

C403.1.4 Use of electric resistance and fossil fuel-fired HVAC heating equipment. HVAC heating energy shall not be provided by electric resistance or fossil fuel combustion appliances. For the purposes of this section, electric resistance HVAC heating appliances include but are not limited to electric baseboard, electric resistance fan coil and VAV electric resistance terminal reheat units and electric resistance boilers. For the purposes of this section, fossil fuel combustion HVAC heating appliances include but are not limited to appliances burning natural gas, heating oil, propane, or other fossil fuels.

Exceptions.

1. Buildings or areas of buildings, other than dwelling units or sleeping units, that meet the interior temperature requirements of IBC Chapter 12 with a total installed HVAC heating capacity no greater than 8.5 BTU/h (2.5 Watts) per square foot of conditioned space are permitted to be heated using electric resistance appliances. 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 C403.2.12, need not be included as part of the HVAC heating energy calculation.

2. Dwelling or sleeping units having an installed HVAC heating capacity no greater than 2.000 Btu/h or 600 Watts in any separate habitable room with exterior fenestration are permitted to be heated using electric resistance appliances.

3. Buildings with less than 2,500 square feet of conditioned floor area are permitted to be heated using electric resistance appliances.

4. Buildings are permitted to utilize electric resistance auxiliary heating when a defrost cycle is required and is in operation.

5. Buildings are permitted to utilize electric resistance auxiliary heating to supplement heat pump heating for single-zone heat pumps with rated heating capacity no greater than 24 kBtu/hr at 47°F that meet all of the following conditions:

   a. For through-wall heat pump technology, including heat pumps listed in Table C403.3.2(3), auxiliary resistance heating is locked out when the outside air temperature is above 40°F.
   b. For split system heat pump technology, including heat pumps listed in Table C403.3.2(2), auxiliary resistance heating is locked out when the outside air temperature is above 32°F.
   c. The heat pump uses the compressor to provide heating down to 17°F.
   d. The heat pump rated heating capacity at 47°F is no less than 2 times greater than supplemental electric resistance heating capacity.

6. Buildings are permitted to utilize electric resistance auxiliary heating to supplement heat pump heating for single-zone heat pumps with rated heating capacity greater than 24 kBtu/hr at 47°F that meet all of the following conditions:

   a. Auxiliary resistance heating is locked out when the outside air temperature is above 32°F.
   b. The heat pump uses the compressor to provide heating down to 17°F.
   c. The heat pump rated heating capacity at 47°F is no less than 2 times greater than supplemental electric resistance heating capacity.

7. Buildings in which electric resistance or fossil fuel appliances, including decorative appliances, in total either provide less than 5 percent of the total building HVAC system heating capacity or serve less than 5 percent of the conditioned floor area.

8. Buildings or portions of buildings that require fossil fuel or electric resistance space heating for specific conditions *approved* by the *code official* for research, health care, process or other specific needs that cannot practicably be served by heat pump or other space heating systems. This does not constitute a blanket exception for any occupancy type.

9. Make-up air for commercial kitchen exhaust systems required to be tempered by Section 508.1.1 of the International Mechanical Code is permitted to be heated using electric resistance appliances.

10. Steam or hot water district energy systems that utilize fossil fuels as their primary source of heat energy, that serve multiple buildings, and that were already in existence prior to the effective date of this code, including more energy-efficient upgrades to such existing systems, are permitted to serve as the primary heating energy source.

11. Heat tape is permitted where it protects water-filled equipment and piping located outside of the *building thermal envelope*, provided that it is configured and controlled to be automatically turned off when the outside air temperature is above 40°F.

12. Temporary electric resistance heating systems are permitted where serving future tenant spaces that are unfinished and unoccupied, provided that the heating equipment is sized and controlled to achieve interior space temperatures no higher than 40°F.

13. Emergency generators.

C403.4.1.1 Heat pump supplementary heat. Unitary air cooled heat pumps shall include microprocessor controls that minimize supplemental heat usage during start-up, set-up, and defrost conditions. These controls shall anticipate need for heat and use compression heating as the first stage of heat. Controls shall indicate when supplemental heating is being used through visual means (e.g., LED indicators). Heat pumps equipped with supplementary heaters shall comply with all conditions of Section C403.1.4, Exception 5 or Exception 6. ~~be installed with controls that prevent supplemental heater operation above 40°F (4.4°C).~~

~~((**Exception:** Packaged terminal heat pumps (PTHPs) of less than 2 tons (24,000 Btu/hr) cooling capacity provided with controls that prevent supplementary heater operation above 40°F.~~))

Draft 2018 Seattle Energy Code Change Proposals from Stakeholders

Add new ASHRAE table for heat recovery chillers

Summary: Add 2019 ASHRAE 90.1 table that clarifies efficiency values for heat recovery chillers.

Table C403.3.2(13) (next page)

Table C403.3.2(13)

Heat Pump and Heat Recovery Chiller Packages – Minimum Efficiency Requirements

Equipment Type	Size Category (tons~~R~~)	Cooling only Operation Cooling Efficiency[a] (Air ~~Cooled~~ EER FL/IPLV-Btu/W-h) Water Source Power Input per Capacity FL/IPLV-(kW/tonR)		Heating Operation									Test Procedure
				Heating Source Conditions (Entering/ leaving water) or OAT (db/wb) (°F)	Heat Pump Heating Full Load Efficiency (COP_H)[ab,] (W/W[)				Heat Recovery Chiller Full Load Efficiency Full Load Efficiency (COP_{HR})[b,c,] (W/W) Simultaneous Cooling and Heating Full Load Efficiency (COP_{SHC})[b,] (W/W)				
					Leaving Heating Water Temperature				Leaving Heating Water Temperature				
					Low	Medium	High	Boost	Low	Medium	High	Boost	
		Path A	Path B		105 °F	120 °F	140 °F	140 °F	105 °F	120 °F	140 °F	140 °F	
Air Source	All sizes	≥9.595 FL ≥13.02 IPLV.IP	-≥9.215 FL ≥15.01 IPLV.IP	47 db 43 wb[d]	≥3.290	≥2.770	≥2.310	NA	NA	NA	NA	NA	AHRI 550/590
		≥9.595 FL ≥13.30 IPLV.IP	≥9.215 FL ≥15.30 IPLV.IP	17 db 15 wb[d]	≥2.230	≥1.950	≥1.630	NA	NA	NA	NA	NA	
Water Source electrically operated positive displacement	< 75	≤0.7885 FL ≤0.6316 IPLV.IP	≤0.7875 FL ≤0.5145 IPLV.IP	54/44[e]	≥4.640	≥3.680	≥2.680	NA	≥8.330	≥6.410	≥4.420	NA	AHRI 550/590
				75/65[e]	NA	NA	NA	≥3.550	NA	NA	NA	6.150	
	≥75 and <150	≤0..7579 FL ≤0.5895 IPLV.IP	≤0.7140 FL ≤0.4620 IPLV.IP	54/44[e]	≥4.640	≥3.680	≥2.680	NA	≥8.330	≥6.410	≥4.420	NA	
				75/65[e]	NA	NA	NA	≥3.550	NA	NA	NA	6.150	
	≥150 and <300	≤0.6947 FL ≤0.5684 IPLV.IP	≤0.7140 FL ≤0.4620 IPLV.IP	54/44[e]	≥4.640	≥3.680	≥2.680	NA	≥8.330	≥6.410	≥4.420	NA	
				75/65[e]	NA	NA	NA	≥3.550	NA	NA	NA	6.150	
	≥300 and <600	≤0.6421 FL ≤0.5474 IPLV.IP	≤0.6563 FL ≤0.4305 IPLV.IP	54/44[e]	≥4.930	≥3.960	≥2.970	NA	≥8.900	≥6.980	≥5.000	NA	
				75/65[e]	NA	NA	NA	≥3.900	NA	NA	NA	6.850	
	≥600	≤0.5895 FL ≤0.5263 IPLV.IP	≤0.6143 FL ≤0.3990 IPLV.IP	54/44[e]	≥4.930	≥3.960	≥2.970	NA	≥8.900	≥6.980	≥5.000	NA	
				75/65[e]	NA	NA	NA	≥3.900	NA	NA	NA	6.850	
Water source electrically operated centrifugal	< 75	≤0.6421 FL ≤0.5789 IPLV.IP	≤0.7316 FL ≤0.4632 IPLV.IP	54/44[e]	≥4.640	≥3.680	≥2.680	NA	≥8.330	≥6.410	≥4.420	NA	AHRI 550/590
				75/65[e]	NA	NA	NA	≥3.550	NA	NA	NA	6.150	
	≥75 and <150	≤0.5895 FL ≤0.5474 IPLV.IP	≤0.6684 FL ≤0.4211 IPLV.IP	54/44[e]	≥4.640	≥3.680	≥2.680	NA	≥8.330	≥6.410	≥4.420	NA	
				75/65[e]	NA	NA	NA	≥3.550	NA	NA	NA	6.150	
	≥150 and <300	≤0.5895 FL ≤0.5263 IPLV.IP	≤0.6263 FL ≤0.4105 IPLV.IP	54/44[e]	≥4.640	≥3.680	≥2.680	NA	≥8.330	≥6.410	≥4.420	NA	
				75/65[e]	NA	NA	NA	≥3.550	NA	NA	NA	6.150	
	≥300 and <600	≤0.5895 FL ≤0.5263 IPLV.IP	≤0.6158 FL ≤0.4000 IPLV.IP	54/44[e]	≥4.930	≥3.960	≥2.970	NA	≥8.900	≥6.980	≥5.000	NA	
				75/65[e]	NA	NA	NA	≥3.900	NA	NA	NA	6.850	
	≥600	≤0.5895 FL ≤0.5263 IPLV.IP	≤0.6158 FL ≤0.4000 IPLV.IP	54/44[e]	≥4.930	≥3.960	≥2.970	NA	≥8.900	≥6.980	≥5.000	NA	
				75/65[e]	NA	NA	NA	≥3.900	NA	NA	NA	6.850	

a. Cooling only rating conditions are standard rating conditions defined in AHRI 550/590 table 1
b Heating Full Load Rating conditions are at rating conditions defined in AHRI 550/590 table 1
c For water cooled heat recovery chillers that have capabilities for heat rejection to a heat recovery condenser and a tower condenser the COP_{HR} applies to operation at full load with 100% heat recovery (no tower rejection). Units that only have capabilities for partial heat recovery shall meet the requirements of table 6.8.1-3
d Outdoor air entering dry bulb (db) temperature and wet bulb (wb) temperature
e Source water entering and leaving water temperature

Draft 2018 Seattle Energy Code Change Proposals from Stakeholders

Require both energy recovery and demand control from high-occupancy spaces with DOAS

Summary: Section C403.3.5.1 Provide both demand control and energy recovery for auditoriums, classrooms, conference rooms and similar spaces that are larger than 650 sf.

- The existing exception allows spaces with DCV to not provide energy recovery. This proposal limits that exception to rooms smaller than 650 sf.
- Also adjust 25 occupants per sf provision to 15 occupants, to coordinate with Section C403.7.1
- Original proposal from Morgan Heater, Ecotope

Proposed Code Language

C403.3.5.1 Energy recovery ventilation with DOAS. The DOAS shall include *energy recovery ventilation*. The energy recovery system shall have a ((~~60 percent minimum sensible recovery effectiveness or have~~ ~~50~~)) 60 percent enthalpy recovery effectiveness in accordance with Section C403.7.6. For DOAS having a total fan system motor nameplate hp less than 5 hp, total combined fan power shall not exceed 1 W/cfm of outdoor air. For DOAS having a total fan system motor hp greater than or equal to 5 hp, refer to fan power limitations of Section C403.8.1. This fan power restriction applies to each dedicated outdoor air unit in the permitted project, but does not include the fan power associated with the zonal heating/cooling equipment. The airflow rate thresholds for energy recovery requirements in Tables C403.7.6.1(1) and C403.7.6.1(2) do not apply.

Exceptions:

1. Occupied spaces with all of the following characteristics:
   a. complying with Section C403.7.6,
   b. served by equipment less than 5000 cfm,
   c. with an average occupant load ((~~greater than 25~~)) 15 people or greater per 1000 square feet (93 m^2) of floor area (as established in Table 403.3.1.1 of the *International Mechanical Code*),
   d. that include demand control ventilation configured to reduce outdoor air by at least 50% below design minimum ventilation rates when the actual occupancy of the space served by the system is less than the design occupancy, and
   e. smaller than 650 square feet.
2. Systems installed for the sole purpose of providing makeup air for systems exhausting toxic, flammable, paint, or corrosive fumes or dust, dryer exhaust, or commercial kitchen hoods used for collecting and removing grease vapors and smoke.

Draft 2018 Seattle Energy Code Change Proposals from Stakeholders

Eliminate Seattle economizer exception allowing lower-performing PTAC/PTHP

Summary:

Section C403.5 Eliminate earlier Seattle exception that required only 4% improvement, rather than the 15% required in WA code and for all other equipment types in Seattle code.

- Other equipment types are available that can meet the 15% requirement.
- This was one of the only aspects of the Seattle code that was weaker than the state code.

Proposed Code Language

5. For Group R occupancies, cooling units installed outdoors or in a mechanical room adjacent to outdoors with a total cooling capacity less than 20,000 Btu/h and other cooling units with a total cooling capacity less than 54,000 Btu/h provided that these are high-efficiency cooling equipment with IEER, CEER, SEER, and EER values more than 15 percent higher than minimum efficiencies listed in Tables C403.3.2(1) through (3), in the appropriate size category, using the same test procedures. ~~PTAC and PTHP units with capacities no greater than 8,300 Btu/h are permitted for the purposes of this exception if they have EER values a minimum of 4 percent higher the minimum efficiencies listed in Table C403.2.3(3), in the appropriate size category, using the same test procedures.~~ Equipment shall be listed in the appropriate certification program to qualify for this exception. For split systems, compliance is based on the cooling capacity of individual fan coil units.

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Draft 2018 Seattle Energy Code Change Proposals from Stakeholders

Threshold for DCV (Demand Control Ventilation)

Summary:

Section C403.7.1 Demand control ventilation. Reduce threshold from 25 occ/1000 sf down to 15 occ/1000 sf.

This change to 15 occupants per 1000 sf adds a few additional space types (coin-op laundries, art and shop classrooms, guard stations, retail sales rooms, game rooms, and dorm sleeping areas), so the main impact will be on retail sales floors, which do have occupancy levels that vary greatly over time.

- Exempt dormitory sleeping areas.
- Includes re-wording of the "restaurant transfer air" exception.
- Reduces ventilation air flow and conditioning when spaces have light or no occupancy.
- Moderate increase in cost and complexity of systems.

Proposed Code Language

C403.7.1 Demand control ventilation. Demand control ventilation (DCV) shall be provided for spaces larger than 500 square feet (46.5 m) and with an average occupant load of ((~~25~~)) 15 people or greater per 1,000 square feet (93 m) of floor area (as established in Table 403.3.1.1 of the International Mechanical Code) and served by systems with one or more of the following:

1. An air-side economizer.

2. Automatic modulating control of the outdoor air damper.

3. A design outdoor airflow greater than 3,000 cfm (1416 L/s).

Exceptions:

1. Systems with energy recovery complying with Section C403.7.4.

2. Multiple-zone systems without direct digital control of individual zones communicating with a central control panel.

3. Multiple-zone systems with a design outdoor airflow less than 750 cfm (354 L/s).

4. ((~~Spaces where the supply airflow rate minus any makeup or outgoing transfer air requirement is less than 1,200 cfm (566 L/s).~~)) Spaces, including but not limited to dining areas, where more than 75 percent of the space design outdoor airflow is transfer air required for makeup air supplying an adjacent commercial kitchen.

5. Ventilation provided only for process loads.

6. Spaces with one of the following occupancy categories (as defined by the International Mechanical Code): Correctional cells, daycare sickrooms, science labs, barbers, beauty and nail salons, and bowling alley seating.

7. Dormitory sleeping areas.

Draft 2018 Seattle Energy Code Change Proposals from Stakeholders

Improve air-to-air heat recovery effectiveness

Summary:

Section C403.7.6 Energy recovery ventilation systems. Increase the efficiency requirement from 50% up to 60% of indoor/outdoor temp difference.

- Hospital and lab buildings exempted, because their intake and exhaust systems have to be separated by substantial distances, making it difficult to utilize anything other than a runaround loop.
- Decreases heating for ventilation air.
- Could increase costs.
- Original proposal for 70% effectiveness was judged to be too difficult in earlier public meetings

Proposed Code Language

C403.7.6 Energy recovery ventilation systems. Any system with minimum outside air requirements at design conditions greater than 5,000 cfm or any system where the system's supply airflow rate exceeds the value listed in Tables C403.7.6(1) and C403.7.6(2), based on the climate zone and percentage of outdoor airflow rate at design conditions, shall include an energy recovery system. Table C403.7.6(1) shall be used for all ventilation systems that operate less than 8,000 hours per year, and Table C403.7.6(2) shall be used for all ventilation systems that operate 8,000 hours or more per year. The energy recovery system shall have the capability to provide a change in the enthalpy of the outdoor air supply of not less than ((~~50~~)) 60 percent of the difference between the outdoor air and return air enthalpies, at design conditions. Where an air economizer is required, the energy recovery system shall include a bypass of the energy recovery media for both the outdoor air and exhaust air or return air dampers and controls which permit operation of the air economizer as required by Section C403.5. Where a single room or space is supplied by multiple units, the aggregate ventilation (cfm) of those units shall be used in applying this requirement. The return/exhaust air stream temperature for heat recovery device selection shall be 70°F (21°C) at 30 percent relative humidity, or as calculated by the registered design professional.

Exceptions: 1. The energy recovery systems for occupancy type I-2 hospitals, medical office buildings, and buildings that primarily consist of technical laboratory spaces, are permitted to provide a change of enthalpy of the outdoor air and return air of not less than 50 percent of the difference between the outdoor air and return air enthalpies, at design conditions. These occupancies are also permitted to utilize exception #3.

2. The energy recovery systems for R-1 and R-2 occupancies shall have a 60 percent minimum sensible heat recovery effectiveness, in lieu of 60 percent enthalpy recovery effectiveness. The return/exhaust air stream temperature for heat recovery device selection shall be 70°F (21°C), or as calculated by the registered design professional.

SDCI Informative Note: In Seattle, the energy recovery effectiveness is determine typically by the winter heat recovery condition. See example below for how the minimum supply air enthalpy leaving the energy recovery media is calculated for the winter condition:

1. In Seattle, the winter outdoor design air temperature is 24°F as specified in Appendix C. The registered design professional shall determine the coincident winter wetbulb temperature or percent relative humidity at the anticipated design conditions. Based on these conditions the outdoor design air enthalpy is determined from a psychrometric chart.

2. Determine the return/exhaust air stream enthalpy from a psychrometric chart based on the 70°F (21°C) at 30 percent relative humidity.

3. Calculate the 60% difference between the outside air and return air enthalpies at design winter conditions.

4. See example below:

   a. OA Enthalpy at 24°F / 23°F (drybulb / wetbulb) = 8.2 BTU/LB

   b. RA/EA Enthalpy at 70°F and 30% RH = 21.9 BTU/LB

   c. SA Enthalpy Minimum Leaving Energy Recovery Media

   = (8.2 + (21.9 – 8.2)*60%)

   = 18.06 BTU/LB

Draft 2018 Seattle Energy Code Change Proposals from Stakeholders

Heat Pump Water Heating for Hotel and Multifamily

Summary:

Section C404.2.3 Group R-1 and R-2 occupancies with central water-heating systems. Require that R-1 & R-2 occupancies use heat pump water heaters.

- Delayed implementation, until Jan 1, 2022, to allow designers, contractors and suppliers sufficient time to prepare.
- Significant reduction in water heating energy for hotel and multifamily.
- Costs more than a gas water heater
- Requires more space for equipment and storage tanks than conventional water heating
- Requires special expertise to design, build, and commission, and therefore extensive outreach and training activities will be required in the interim.
- This Seattle amendment supersedes the preceding section on large Group R-1 and R-2 water heating systems, so that section is stricken.

Proposed Code Language

((~~**C404.2.2 High input-rated service water heating system for Group R-1 and R-2 occupancies.** In new buildings with over 1,000,000 Btu/h installed service water heating capacity serving Group R-1 and R-2 occupancies, at least 25 percent of annual water heating energy shall be provided from any combination of the following water heating sources:~~

1. ~~Renewable energy generated on site that is not being used to satisfy other requirements of this code; or~~
2. ~~Site-recovered energy that is not being used to satisfy other requirements of this code.~~

~~**Exception:** Compliance with this section is not required if the combined input-capacity-weighted average equipment rating for each service water heating fuel source type is not less than the following:~~

1. ~~Electric Resistance: An electric resistance water heater water with a rating of 105% of the rated efficiency of Table C404.2.~~
2. ~~Electric Heat Pump (10 CFR Part 430): A heat pump water heater rated in accordance with 10 CFR Part 430 with a rating of 105% of the rated efficiency of Table C404.2.~~
3. ~~Electric Heat Pump (not listed in accordance with 10 CFR Part 430): A heat pump water heater not rated in accordance with 10 CFR Part 430 shall have a COP of not less than 2.0. For air-source heat pump equipment the COP rating will be reported at the design leaving heat pump water temperature with an entering air temperature of 60°F (15.6°C) or less. Supplemental water heaters not meeting the above criteria that function as auxiliary heating only when the outdoor temperature is below 32°F (0°) or when a defrost cycle is required are not required to have a rated COP of 2.0. Such systems shall be sized and configured to lock out electric resistance or fossil fuel heating from operation when the outdoor temperature is above 32°F (0°C) unless the system is in defrost operation.~~
4. ~~Fossil Fuels: A rated E_t of not less than 90% as determined by the applicable test procedures in Table C404.2.~~
5. ~~Hot water heat exchangers used to provide service water heating from a district utility (steam, heating hot water).~~))

C404.2.3 Group R-1 and R-2 occupancies with central service water heating systems. In buildings with central service water heating systems serving four or more Group R-1 or R-2 dwelling or sleeping units, the primary water heating equipment shall not use fossil fuel combustion or electric resistance. Service hot water shall be provided by an air-source heat pump water heating (HPWH) system meeting the requirements of this section. Supplemental service water heating equipment is permitted to use electric resistance in compliance with Section C404.2.3.4.

Exceptions.

1. Permits applied for prior to January 1, 2022.
2. Solar thermal, wastewater heat recovery, other *approved* waste heat recovery, ground source heat pump, water-source heat pump system utilizing waste heat, and combinations thereof, are permitted to offset all or any portion of the required HPWH capacity where such systems comply with this code and the Seattle Plumbing Code.
3. Systems meeting the requirements of the Northwest Energy Efficiency Alliance (NEEA) Advanced Water Heater Specifications for central service water heating systems.

SDCI Informative Note: As of the publication of this code, publication of the NEEA AWHS for central service water heating systems is still pending. See https://neea.org/resources/advanced-water-heating-specification for updated information.

C404.2.3.1 Primary heat pump system sizing. The system shall include a primary service minimum output of 2,400 Btu/hr at 40°F outdoor air temperature for each *sleeping unit*, *dwelling unit* bedroom, or studio apartment, or as calculated using an *approved* methodology. Heat pumps shall be sized to deliver no less than 50 percent of the primary output capacity when entering air temperature is 17°F.

> **Exception**. 50 percent sizing at 17°F is not required for heat pumps located in a below-grade enclosed parking structure or other ventilated and unconditioned space that is not anticipated to fall below 40°F at any time.

C404.2.3.2 Primary hot water storage sizing. The system shall provide 12 gallons of hot water storage volume at 120°F, for each *sleeping unit*, *dwelling unit* bedroom, or studio apartment, or as calculated using an *approved* methodology.

> **Exception**. When the service hot water is stored at a temperature greater than 120°F, the storage volume calculated using the assumptions above is permitted to be reduced by 1 percent for each 1°F increase in the storage temperature.

C404.2.3.3. System Design. The service water heating system shall be configured to conform to one of the following provisions.

1. For *single-pass* HPWHs, *temperature maintenance* heating provided for reheating return water from the building's heated water circulation system shall be physically decoupled from the primary service water heating system storage tank(s) in a manner that prevents destratification of the primary system storage tanks. *Temperature maintenance* heating is permitted to be provided by electric resistance or a separate dedicated heat pump system.
2. For *multi-pass* HPWHs, recirculated *temperature maintenance* water is permitted to be returned to the primary water storage tanks for reheating.

C404.2.3.3.1 Mixing valve. A thermostatic mixing valve capable of supplying hot water to the building at the user temperature set point shall be provided, in compliance with requirements of the Seattle Plumbing Code and the HPWH manufacturer's installation guidelines. The mixing valve shall be sized and rated to deliver tempered water in a range from the minimum flow of the *temperature maintenance* recirculation system up to a total of 0.15 gallons per minute for each sleeping unit, dwelling unit bedroom, and studio apartment plus the *temperature maintenance* recirculation system flow.

C404.2.3.4. Supplemental Water Heaters. Total supplemental electric resistance water heating equipment shall not have an output capacity greater than the primary water heating equipment at 40˚F entering air temperature. Supplemental electric resistance heating is permitted for the following uses:

1. *Temperature maintenance* of heated-water circulation systems, physically separate from the primary service water heating system. *Temperature maintenance* heating capacity shall be no greater than the primary water heating capacity at 40°F.
2. Defrost of compressor coils.
3. Heat tracing of piping for freeze protection or *temperature maintenance* in lieu of recirculation of hot water.
4. Backup or low ambient temperature conditions, where all of the following are true:
    a. The supplemental heating capacity is no greater than the primary service water heating capacity at 40°F.
    b. During normal operations the supplemental heating is controlled to operate only when the entering air temperature at the air-source HPWH is below 40°F, and the primary HPWH compressor continues to operate together with the supplemental heating when the entering air temperature is between 17°F and 40°F.

c. The primary water heating equipment cannot satisfy the system load due to equipment failure or entering air temperature below 40°F.

5. Supplemental heating downstream from a *multi-pass* HPWH system.

6. Stand-alone electric water heaters serving single zones not served by the central water heating system.

C404.2.3.5 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.

TABLE C406.1

EFFICIENCY PACKAGE CREDITS

Code Section	Commercial Building Occupancy					
	Group R-1	Group R-2	Group B	Group E	Group M	All Other
	Additional Efficiency Credits					
1. High-efficiency service water heating in accordance with Sections C406.8.1 and C406.8.2	4.0 NA for R-1 & R-2 after 1/1/2022	5.0 NA for R-1 & R-2 after 1/1/2022	NA	NA	NA	8.0
2. High performance service water heating in ((~~multi-family~~)) Group R-1 and R-2 buildings in accordance with Section C406.9	7.0 prior to 1/1/2022 5.0 after 1/1/2022	8.0 prior to 1/1/2022 5.0 after 1/1/2022	NA	NA	NA	NA

C406.8 Reduced energy use in service water heating. Buildings with service hot water heating equipment that serves the whole building, building *addition* or tenant space shall comply with Sections C406.8.1 and C406.8.2. No service water heating systems incorporating fossil fuel-fired equipment, or heat from district energy systems that are primarily heated by fossil fuel combustion, are permitted to utilize this credit.

C406.8.1 Building type. Not less than 90 percent of the *conditioned floor area* of the whole building, building *addition* or tenant space shall be of the following types:

1. Group R-1: Boarding houses, hotels or motels. (Not applicable after 1/1/2022)
2. Group I-2: Hospitals, psychiatric hospitals and nursing homes.
3. Group A-2: Restaurants and banquet halls or buildings containing food preparation areas.
4. Group F: Laundries.
5. Group R-2. (Not applicable after 1/1/2022)
6. Group A-3: Health clubs and spas.
7. Buildings with a service hot water load of 10 percent or more of total building energy loads, as shown with an energy analysis as described in Section C407 or as shown through alternate service hot water load calculations showing a minimum service water energy use of 15 k/Btu per square foot per year, as approved by the building official.

…

C406.9 High performance service water heating in hotel and multifamily buildings. For a whole building, building *addition*, or tenant space with not less than 90 percent of the *conditioned floor area* being Group R-1 or R-2 occupancy, not less than 90 percent of the annual building service hot water energy use shall be provided by a heat pump system ((~~with a minimum COP 3.0.~~)) meeting the requirements of Section C404.2.3 plus the following:

1. The refrigerant used in the heat pump system shall have a global warming potential (GWP) of no greater than 675.
2. No electric resistance heating capacity shall be provided.

   Exceptions to item 2:
   1. Electric resistance heating is permitted for circulating system *temperature maintenance* and heat tracing of piping.
   2. On-demand electric resistance water heaters for hand washing facilities are permitted in public toilet rooms.

Draft 2018 Seattle Energy Code Change Proposals from Stakeholders

Service hot water circulation controls and pipe/tank insulation

C404.7.1.3 Electronic thermostatic mixing valve (TMV). Where a heated water circulation system utilizes an electronic TMV to control the temperature of hot water supplied to the building, the TMV shall be configured so that it either reverts closed (fully COLD) or maintains its current valve position upon power failure or cessation of circulation flow.
C404.7.1.4 Thermostatic balancing valve. For heated water circulation systems that have multiple risers and use a variable flow circulation pump, each riser shall have a self-actuating thermostatic balancing valve.

C404.7.3.1 Pipe insulation. For heated water circulation systems, both supply and return pipe insulation shall be at minimum 1.0" thicker than that required by Table C403.10.3.

> **Exception**. Where piping is centered within a wall, ceiling, or floor framing cavity with a depth at least 4" greater than the diameter of the pipe and that is completely filled with batt or blown-in insulation, additional pipe insulation is not required.

Draft 2018 Seattle Energy Code Change Proposals from Stakeholders

Interior LPA (Lighting Power Allowance) reduction

Summary:

Table C405.4.2.1 Interior lighting power. Reduce all interior lighting table values by 10%, except health care facilities, penitentiaries, and facilities for visually impaired.

- The 2019 ASHRAE LPA values copied in the 2018 WA code were derived from 2018 fixture efficacy research. Efficacy continues to improve at about 5% per year, so the industry will have already caught up to the 2018 values when the WA code goes into effect. In addition, the ASHRAE values included an extra 10% "just because," so this 10% was already effectively accounted for. Buildings constructed under this code will still be building out lighting systems in 2025, seven years after the baseline research for the ASHRAE values.
- Takes advantage of continuing improvements in LED lighting efficacy.
- Concerning to lighting designers.
- Corresponds to the same provision in the 2015 SEC
- Note footnotes m through p for additional lighting allowances, especially footnote n that allows up to an additional 0.30 w/sf for ornamental lighting that's controlled by separate switching. These allowances are intended to allow design flexibility for important spaces. From CA code.

Proposed Code Language

> **Table C405.4.2(1) Interior Lighting Power Allowances—Building Area Method**

Building Area Type	~~LPD (w/ft²)~~	LPD (w/ft²)
Automotive facility	~~0.64~~	0.58
Convention center	~~0.64~~	0.58
Court house	~~0.79~~	0.71
Dining: Bar lounge/leisure	~~0.79~~	0.71
Dining: Cafeteria/fast food	~~0.72~~	0.65
Dining: Family	~~0.71~~	0.64
Dormitory[a,b]	~~0.46~~	0.41
Exercise center	~~0.67~~	0.60
Fire station[a]	~~0.54~~	0.49
Gymnasium	~~0.75~~	0.68
Health care clinic	~~0.70~~	0.63
Hospital[a]	~~0.84~~	0.84
Hotel/motel[a,b]	~~0.56~~	0.50
Library	~~0.83~~	0.75
Manufacturing facility	~~0.82~~	0.74
Motion picture theater	~~0.44~~	0.40
Multifamily[c]	~~0.41~~	0.37
Museum	~~0.55~~	0.50
Office	~~0.64~~	0.58
Parking garage	~~0.14~~	0.13
Penitentiary	~~0.65~~	0.65
Performing arts theater	~~0.84~~	0.76
Police station	~~0.66~~	0.60
Post office	~~0.65~~	0.59
Religious building	~~0.67~~	0.60
Retail	~~0.84~~	0.76

Building Area Type	~~LPD (w/ft²)~~	LPD (w/ft²)
School/university	~~0.70~~	0.63
Sports arena	~~0.62~~	0.54
Town hall	~~0.69~~	0.62
Transportation	~~0.50~~	0.45
Warehouse	~~0.40~~	0.36
Workshop	~~0.91~~	0.82

[a] Where sleeping units are excluded from lighting power calculations by application of Section R404.1, neither the area of the sleeping units nor the wattage of lighting in the sleeping units is counted.

[b] Where dwelling units are excluded from lighting power calculations by application of Section R404.1, neither the area of the dwelling units nor the wattage of lighting in the dwelling units is counted.

[c] Dwelling units are excluded. Neither the area of the dwelling units nor the wattage of lighting in the dwelling units is counted.

Table C405.4.2(2) Interior Lighting Power Allowances—Space-by-Space Method

Common Space-by-Space Types[a]	~~LPD (w/ft2)~~	LPD (w/ft2)
Atrium - Less than 20 feet in height	~~0.39~~	0.35
Atrium - 20 to 40 feet in height	~~0.48~~	0.43
Atrium - Above 40 feet in height	~~0.60~~	0.54
Audience/seating area - Permanent		
In an auditorium	~~0.61~~	0.55
In a gymnasium	~~0.23~~	0.21
In a motion picture theater	~~0.27~~	0.24
In a penitentiary	~~0.67~~	0.67
In a performing arts theater	~~1.16~~	1.04
In a religious building	~~0.72~~	0.65

Common Space-by-Space Types[a]	~~LPD (w/ft2)~~	LPD (w/ft2)
In a sports arena	~~0.33~~	0.30
Otherwise	~~0.23~~	0.21
Banking activity area[n]	~~0.61~~	0.55
Breakroom (see lounge/breakroom)		
Classroom/lecture hall/training room		
In a penitentiary	~~0.89~~	0.89
Otherwise[m]	~~0.71~~[m]	0.64
Computer room, data center	~~0.94~~	0.85
Conference/meeting/multipurpose	~~0.97~~	0.87
Confinement cell	~~0.70~~	0.63
Copy/print room	~~0.31~~	0.28
Corridor		
In a facility for the visually impaired (and not used primarily by the staff)[b]	~~0.71~~	0.71
In a hospital	~~0.71~~	0.71
In a manufacturing facility	~~0.41~~	0.37
Otherwise[c]	~~0.41~~	0.37
Courtroom[c]	~~1.20~~	1.08
Dining area		
In a penitentiary	~~0.42~~	0.42
In a facility for the visually impaired (and not used primarily by the staff)[b]	~~1.27~~	1.27
In a bar/lounge or leisure dining[n]	~~0.86~~	0.77
In cafeteria or fast food dining	~~0.40~~	0.36

Common Space-by-Space Types[a]	~~LPD (w/ft2)~~	LPD (w/ft2)
In a family dining area[n]	~~0.60~~	0.54
Otherwise	~~0.43~~	0.39
Electrical/mechanical	~~0.43~~	0.39
Emergency vehicle garage	~~0.52~~	0.47
Food preparation	~~1.09~~	0.98
Guest room[a,b]	~~0.41~~	0.37
Laboratory		
In or as a classroom	~~1.11~~	1.00
Otherwise	~~1.33~~	1.20
Laundry/washing area	~~0.53~~	0.48
Loading dock, interior	~~0.88~~	0.79
Lobby[c]		
In a facility for the visually impaired (and not used primarily by the staff)[b]	~~1.69~~	1.69
For an elevator	~~0.65~~	0.59
In a hotel	~~0.51~~	0.46
In a motion picture theater	~~0.23~~	0.21
In a performing arts theater	~~1.25~~	1.13
Otherwise	~~0.84~~	0.76
Locker room	~~0.52~~	0.47
Lounge/breakroom[n]		
In a health care facility[n]	~~0.42~~	0.42
Otherwise[n]	~~0.59~~	0.53
Office		
Enclosed ≤ 250	~~0.74~~	0.67

Common Space-by-Space Types[a]	~~**LPD (w/ft2)**~~	**LPD (w/ft2)**
Enclosed > 250	~~0.66~~	0.59
Open plan	~~0.61~~	0.55
Parking area, interior	~~0.15~~	0.14
Pharmacy area	~~1.66~~	1.66
Restroom		
In a facility for the visually impaired (and not used primarily by the staff)[b]	~~1.26~~	1.26
Otherwise[n]	~~0.63~~	0.57
Sales area	~~1.05~~	0.95
Seating area, general	~~0.23~~	0.21
Stairway (see space containing stairway)		
Stairwell[n]	~~0.49~~	0.44
Storage room		
< 50 ft^2	~~0.51~~	0.46
50-100 ft^2	~~0.38~~	0.34
All other storage	~~0.38~~	0.34
Vehicular maintenance	~~0.60~~	0.54
Workshop	~~1.26~~	1.13

Building Specific Space-by-Space Types[a]	~~**LPD (w/ft2)**~~	**LPD (w/ft2)**
Automotive (see vehicular maintenance)		
Convention center - Exhibit space	~~0.61~~	0.55
Dormitory living quarters[a,b]	~~0.50~~	0.45
Facility for the visually impaired[b]		

Building Specific Space-by-Space Types[a]	~~**LPD (w/ft2)**~~	**LPD (w/ft2)**
In a chapel (and not used primarily by the staff)[b]	~~0.70~~	0.70
In a recreation room (and not used primarily by the staff)[b]	~~1.77~~	1.77
Fire stations[g]		
Sleeping quarters	~~0.23~~	0.21
Gymnasium/fitness center		
In an exercise area	~~0.90~~	0.83
In a playing area	~~0.85~~	0.77
Health care facility		
In an exam/treatment room	~~1.40~~	1.40
In an imaging room	~~0.94~~	0.94
In a medical supply room	~~0.62~~	0.62
In a nursery	~~0.92~~	0.92
In a nurse's station	~~1.17~~	1.17
In an operating room	~~2.26~~	2.26
In a patient room[g]	~~0.68~~	0.68
In a physical therapy room	~~0.91~~	0.91
In a recovery room	~~1.25~~	1.25
Library		
In a reading area[n]	~~0.96~~	0.86
In the stacks	~~1.10~~	0.99
Manufacturing facility		
In a detailed manufacturing area	~~0.80~~	0.72

Building Specific Space-by-Space Types[a]	~~**LPD (w/ft2)**~~	**LPD (w/ft2)**
In an equipment room	~~0.76~~	0.68
In an extra high bay area (greater than 50-foot floor-to-ceiling height)	~~1.42~~	1.28
In a high bay area (25 - 50-foot floor-to-ceiling height)	~~1.24~~	1.12
In a low bay (< 25-foot floor-to-ceiling height)	~~0.86~~	0.77
Museum		
In a general exhibition area	~~0.31~~	0.28
In a restoration room	~~1.10~~	0.99
Performing arts theater dressing/fitting room	~~0.41~~	0.37
Post office - Sorting area	~~0.76~~	0.69
Religious buildings		
In a fellowship hall[n]	~~0.54~~	0.49
In a worship/pulpit/choir area[n]	~~0.85~~	0.77
Retail facilities		
In a dressing/fitting room	~~0.51~~	0.46
In a mall concourse	~~0.82~~	0.74
Sports arena - Playing area		
For a Class 1 facility[i]	~~2.94~~	2.94
For a Class 2 facility[j]	~~2.01~~	2.01
For a Class 3 facility[k]	~~1.30~~	1.30
For a Class 4 facility[l]	~~0.86~~	0.86
Transportation		

Building Specific Space-by-Space Types[a]	~~LPD (w/ft2)~~	LPD (w/ft2)
In a baggage/carousel area	~~0.39~~	0.35
In an airport concourse	~~0.25~~	0.23
At a terminal ticket counter[n]	~~0.51~~	0.46
Warehouse - Storage area		
For medium to bulky palletized items	~~0.33~~	0.30
For smaller, hand-carried items	~~0.69~~	0.62

(No changes to footnotes)

For SI: 1 foot = 304.8 mm, 1 watt per square foot = 11 W/m^2.

[a] In cases where both a common space type and a building area specific space type are listed, the building area specific space type shall apply.

[b] A facility for the visually impaired is a facility that is licensed or will be licensed by local or state authorities for senior long-term care, adult daycare, senior support or people with special visual needs.

[c] For spaces in which lighting is specified to be installed in addition to, and controlled separately from, the general lighting for the purpose of highlighting art or exhibits, provided that the additional lighting power shall not exceed 0.5 W/ft^{2}of such spaces.

[d] Reserved.

[e] Reserved.

[f] Reserved.

[g] Where sleeping units are excluded from lighting power calculations by application of Section R404.1, neither the area of the sleeping units nor the wattage of lighting in the sleeping units is counted.

[h] Where dwelling units are excluded from lighting power calculations by application of Section R404.1, neither the area of the dwelling units nor the wattage of lighting in the dwelling units is counted.

[i] Class I facilities consist of professional facilities; and semiprofessional, collegiate or club facilities with seating for 5,000 or more spectators.

[j] Class II facilities consist of collegiate and semiprofessional facilities with seating for fewer than 5,000 spectators; club facilities with seating between 2,000 and 5,000

spectators; and amateur league and high school facilities with seating for more than 2,000 spectators.

k Class III facilities consist of club, amateur league and high school facilities with seating for 2,000 or fewer spectators.

l Class IV facilities consist of elementary school and recreational facilities; and amateur league and high school facilities without provisions for spectators.

m For classrooms, additional lighting power allowance of 4.50 W/lineal foot of white or chalk boards for directional lighting dedicated to white or chalk boards.

n Additional lighting power allowance of 0.30 W/ft^2 for ornamental lighting. Qualifying ornamental lighting includes luminaires such as chandeliers, sconces, lanterns, neon and cold cathode, light emitting diodes, theatrical projectors, moving lights and light color panels when any of those lights are used in a decorative manner that does not serve as display lighting or general lighting. Ornamental lighting shall be controlled separately from general lighting.

o For scientific laboratories, additional lighting power allowance of 0.35 W/ft^2 for specialized task work - lighting that provides for small-scale, cognitive or fast performance visual tasks, lighting required for operating specialized equipment associated with pharmaceutical/laboratorial activities.

p For offices, additional lighting power allowance of 0.20 W/ft^2 for portable lighting, which includes under shelf or furniture-mounted supplemental task lighting qualifies when controlled by a time clock or an occupancy sensor.

Draft 2018 Seattle Energy Code Change Proposals from Stakeholders

LLLC fixtures or networked lighting controls required for open office

Summary:

Section C405.2 Open office lighting controls. Large open office spaces would require LLLC (luminaire-level lighting controls) or a networked lighting control system for general lighting.

- LLLC fixtures provide onboard occupancy sensor controls, daylight sensor controls, time switch controls, and wireless controls.
- Networked lighting controls provide a more flexible solution, and can utilize any LED fixtures, rather than only that limited selection of fixtures available with LLLC sensors onboard.
- Significant lighting energy reductions occur when light fixtures dim or turn off during time periods when the occupants in the immediate vicinity are away from their desks, such as in meetings, at lunch, or on vacation.
- LLLC fixtures cost more than standard fixtures, although the controls, wiring and commissioning will be less expensive. LLLC costs may come down as those fixtures go into wider use nationally.

Proposed Code Language

C405.2 Lighting controls. Lighting systems shall be provided with controls that comply with one of the following:

1. Lighting controls as specified in Sections C405.2.1 through C405.2.7. In addition, any contiguous open office area larger than 5,000 square feet shall have its general lighting controlled by either:

   a. An enhanced digital lighting control system conforming to the requirements of Section C406.4.

   b. Luminaire-level lighting controls (LLLC) conforming to the requirements in Item 2 of this subsection, or;

2. *Luminaire level lighting controls (LLLC)* for all areas and lighting controls specified in Sections C405.2.1, C405.2.3 and C405.2.5. The *LLLC ((~~luminaire~~)) luminaires* shall be independently configured to:

   2.1. Monitor occupant activity to brighten or dim lighting when occupied or unoccupied, respectively.

   2.2. Monitor ambient light, both electric and daylight, and brighten or dim artificial light to maintain desired light level. A maximum of 8 fixtures are permitted to be controlled together to maintain uniform light levels within a single daylight zone.

   2.3. For each control strategy, be capable of configuration and re-configuration of performance parameters including: bright and dim set points, timeouts, dimming fade rates, sensor sensitivity adjustments, and wireless zoning configuration.

Exception to Section C405.2: Except for specific application controls required by Section C405.2.5, lighting controls are not required for the following:

1. Areas designated as security or emergency areas that are required to be continuously lighted.
2. Means of egress illumination serving the exit access that does not exceed ((~~0.02~~)) 0.01 watts per square foot of building area is exempt from this requirement..
3. Emergency egress lighting that is normally off.
4. Industrial or manufacturing process areas, as may be required for production and safety.

Draft 2018 Seattle Energy Code Change Proposals from Stakeholders

Furniture-mounted hotel room lighting, egress pathway lighting

Summary:

Section C405.2.5 Since many hotel room light fixtures are integrated into furnishings, this section applies the same rules to furniture-mounted lighting as to other hotel room lighting.

The current rule for "exit access" pathway lighting that is allowed to remain on 24/7 is much larger than necessary, allowing for several dozen fixtures to remain lighted on a typical building floor.

- Original proposal from Ben Scott, SDCI

Proposed Code Language

C405.2.5 Additional lighting controls. Specific application lighting shall be provided with controls, in addition to controls required by other sections, for the following:

1. The following lighting shall be controlled by an occupant sensor complying with Section C405.2.1.1 or a time switch control complying with Section C405.2.2.1. In addition, a manual control shall be provided to control such lighting separately from the general lighting in the space:

1.1. Display and accent.

1.2. Lighting in display cases.

1.3. Supplemental task lighting, including permanently installed under-shelf or under-cabinet lighting.

1.4. Lighting equipment that is for sale or demonstration in lighting education.

2. *Sleeping units* shall have control device(s) or systems configured to automatically switch off all permanently installed luminaires and switched receptacles, including those installed within furniture, within 20 minutes after all occupants have left the unit.

EXCEPTIONS:1. Lighting and switched receptacles controlled by card key controls.

2. Spaces where patient care is directly provided.

3. Permanently installed luminaires within dwelling units shall be provided with controls complying with either Section C405.2.1.1 or C405.2.2.2.

4. Lighting for nonvisual applications, such as plant growth and food warming, shall be controlled by a dedicated control that is independent of the controls for other lighting within the room or space. ((~~Each control zone shall be no greater than the area served by a single luminaire or 4,000 square feet, whichever is larger~~.))

5. Luminaires serving the exit access and providing means of egress illumination required by Section 1006.1 of the *International Building Code*, including luminaires that function as both normal and emergency means of egress illumination shall be controlled by a combination of listed emergency relay and occupancy sensors, or signal from another building control system, that automatically shuts off the lighting when the areas served by that illumination are unoccupied.

EXCEPTION: Means of egress illumination serving the exit access that does not exceed ((~~0.02~~)) 0.01 watts per square foot of building area is exempt from this requirement.

Draft 2018 Seattle Energy Code Change Proposals from Stakeholders

Lighting efficacy for "indoor horticulture"

Summary:

Section C405.4.1 Increases the efficacy requirement for indoor grow facilities, based on national standard.

- LED plant growth lighting lasts much longer than many conventional lighting types, so the long-term cost of ownership is lower. The selected efficacy threshold also permits double-ended HID lamps.
- Growers are strongly resistant to anything that increases up-front costs, since they don't have access to normal financing.
- Original proposal from NBI

Proposed Code Language

C405.4.1 Total connected interior lighting power (exception 12 for indoor horticultural lighting)

12. ((~~Task lighting~~)) Lighting for plant growth or maintenance where the lamp ((~~efficacy is not less than 90 lumens per watt~~)) has a tested photosynthetic photon flux (PPF) per watt of not less than ((~~1.20~~)) **1.60** micromoles per joule.

Draft 2018 Seattle Energy Code Change Proposals from Stakeholders

Electric receptacle at each gas appliance in multifamily dwelling units

Summary:

Section C405.7.1 Require receptacle and circuit at each dwelling unit gas appliance to enable replacement with electric appliances in the future.

- Original proposal by Jonlin, revision by Ben Scott

Proposed Code Language

C405.7.1 Electric receptacles at dwelling unit gas appliances. Where dwelling unit appliances are served by natural gas, an electrical receptacle and circuit shall be provided at each gas appliance with sufficient capacity to serve a future electric appliance in the same location. The receptacles and circuits shall be included in the electrical service load calculation and shall meet the requirements of items 1 – 3 below. The receptacle for each gas appliance shall be located within 12 inches of the appliance and without obstructions between the appliance and the outlet. An electric receptacle is not required for a decorative gas fireplace.

1. Each gas range, cooktop, or oven location shall be served by a dedicated 240/208-volt, 40-amp receptacle connected to the dwelling unit electric panel with a 3-conductor branch circuit complying with 210.19(A)(3) of the Seattle electrical code and a minimum included load of 9600 VA.
2. Each gas clothes dryer location shall be served by a dedicated 240/208-volt, 30-amp receptacle connected to the dwelling unit electric panel with a 3-conductor branch circuit and a minimum included load of 5000 VA.
3. Each gas domestic water heater location shall be served by a dedicated 240/208 volt, 30-amp outlet connected to the dwelling unit electrical panel with a 3-conductor branch circuit and a minimum included load of 4500 VA.

Draft 2018 Seattle Energy Code Change Proposals from Stakeholders

Increase required C406 credits from 6 credits to 8 credits

Summary:

Section C406.1 Additional energy efficiency credit requirements. Increase required credits from 6 credits to 8 credits for new buildings and new tenant spaces. Increase required credits for low-energy spaces from 3 credits to 4 credits.

Proposed Code Language

C406.1 Additional energy efficiency credit requirements. New buildings and changes in space conditioning, change of occupancy and building *additions* in accordance with Chapter 5 shall comply with sufficient packages from Table C406.1 so as to achieve a minimum number of ((~~six~~)) 8 credits. Each area shall be permitted to apply for different packages provided all areas in the building comply with the requirement for ((~~six~~)) 8 credits. Areas included in the same permit within mixed use buildings shall be permitted to demonstrate compliance by an area weighted average number of credits by building occupancy achieving a minimum number of six credits.

Exceptions:

1. Low energy spaces in accordance with Section C402.1.1.1 and equipment buildings in accordance with Section C402.1.2 shall comply with sufficient packages from Table C406.1 to achieve a minimum number of ((~~three~~)) 4 credits.
2. Building *additions* that have less than 1,000 square feet of *conditioned floor area* shall comply with sufficient packages from Table C406.1 to achieve a minimum number of ((~~three~~)) 4 credits.

C406.1.1 Tenant spaces. Initial tenant improvement shall comply with sufficient packages from Table C406.1 to achieve a minimum number of ((~~six~~)) 8 credits. In buildings with multiple tenant spaces, each tenant space is permitted to apply for different packages provided all areas in the building comply with the requirement for ((~~six~~)) 8 credits.

Draft 2018 Seattle Energy Code Change Proposals from Stakeholders

Reduce C406 credit for "basic" DOAS in R-2 multifamily

Summary:

Table C406.1 Efficiency Package Credits. Reduce credits for "basic" DOAS in R-2 occupancy buildings. (This currently allows full double-dipping in 2015 State code.)

- The requirements for balanced flow and heat recovery capability in the following mechanical code section effectively require all apartments to have a system that would meet the requirements of the C406 DOAS section, thus the C406 credit constitutes double-dipping. However, 2.0 credits will still be allowed.

Note this excerpt from the 2018 WA mechanical code:

403.8.4.1. Ventilation in R-2 occupancies: The mechanical ventilation system shall be a balanced system sized in accordance with Equation 4-9. Balanced systems shall have a sensible heat recovery capability as prescribed in section C402.5.1.2 of the WSEC. The ventilation system shall operate continuously.

Proposed Code Language

Table C406.1

Efficiency Package Credits

Code Section	Commercial Building Occupancy					
	Group R-1	Group R-2	Group B	Group E	Group M	All Other
	Additional Efficiency Credits					
1. More efficient HVAC performance in accordance with Section C406.2	2.0	3.0	3.0	2.0	1.0	2.0
2. Reduced lighting power: Option 1 in accordance with Section C406.3.1	1.0	1.0	2.0	2.0	3.0	2.0
3. Reduced lighting power: Option 2 in accordance with Section C406.3.2[a]	2.0	3.0	4.0	4.0	6.0	4.0
4. Enhanced lighting controls in accordance with Section C406.4	NA	NA	1.0	1.0	1.0	1.0
5. On-site supply of renewable energy in accordance with C406.5	3.0	3.0	3.0	3.0	3.0	3.0

Code Section	Commercial Building Occupancy					
	Group R-1	Group R-2	Group B	Group E	Group M	All Other
	Additional Efficiency Credits					
6. Dedicated outdoor air system in accordance with Section C406.6[b]	4.0	((~~4.0~~)) 2.0[d]	4.0	NA	NA	4.0
7. High performance dedicated outdoor air system in accordance with Section C406.7	4.0	4.0	4.0	4.0	4.0	4.0
8. High-efficiency service water heating in accordance with Sections C406.8.1 and C406.8.2	4.0 NA for R-1 & R-2 after 1/1/22	5.0 NA for R-1 & R-2 after 1/1/22	NA	NA	NA	8.0
9. High performance service water heating in ((~~multi-family~~)) Group R-1 and R-2 buildings in accordance with Section C406.9	7.0 before 1/1/22 5.0 after 1/1/22	8.0 before 1/1/22 5.0 after 1/1/22	NA	NA	NA	NA
10. Enhanced envelope performance in accordance with Section C406.10[c]	3.0	6.0	3.0	3.0	3.0	4.0
11. Reduced air infiltration in accordance with Section C406.11[c]	1.0	2.0	1.0	1.0	1.0	1.0
12. Enhanced commercial kitchen equipment in accordance with Section C406.12	5.0	NA	NA	NA	5.0	5.0 (Group A-2 only)

a Projects using this option may not use Item 2.

b This option is not available to buildings subject to the prescriptive requirements of Section C403.3.5 or C403.6.

c Buildings or building areas that are exempt from the thermal envelope requirements in accordance with Sections C402.1.1 and C402.1.2, do not qualify for this package.

d 4.0 credits, instead of 2.0 credits, are permitted to be applied to areas of R-2 occupancy buildings other than dwelling units, including corridors, lobbies and tenant amenity spaces, where those areas comply with the requirements for this credit.

Draft 2018 Seattle Energy Code Change Proposals from Stakeholders

Eliminate "warehouse exception" from C406 HVAC credit

Summary:

Section C406.2 HVAC Credit. Eliminate the exception that gives HVAC credit to low-energy (largely unheated) buildings that provide most of their heating with radiant heaters.

- This exception does not appear to make sense, A large unheated warehouse could simply install one radiant heater and claim the entire credit. Radiant heaters don't save energy.

Proposed Code Language

C406.2 More efficient HVAC equipment and fan performance. No less than 90 percent of the total HVAC capacity serving the total *conditioned floor area* of the entire building, or tenant space in accordance with Section C406.1.1, shall comply with Sections C406.2.1 through C406.2.3. ((~~For~~)) In addition, systems required to comply with Section C403.1.1, HVAC total system performance ratio, shall exceed the ((~~minimum requirement~~)) HVAC TSPR of the *standard reference design* by 10 percent.

((~~**Exception:** In low energy spaces complying with Section C402.1.1 and semi-heated spaces complying with Section C402.1.1.2, no less than 90 percent of the installed heating capacity is provided by electric infrared or gas-fired radiant heating equipment for localized heating applications. Stand-alone supply, return and exhaust fans shall comply with Section C406.2.3.~~))

Draft 2018 Seattle Energy Code Change Proposals from Stakeholders

C406 credits not permitted for systems w/ fossil fuel equipment

Summary:

Sections C406.2, C406.7, C406.8 Disallow C406 additional efficiency credits for fossil fuel equipment.

- To align with Seattle decarbonization priorities.

Proposed Code Language

C406.2.1 HVAC system selection. Equipment installed shall be types that are listed in Tables C403.3.2(1) through ((~~C403.3.2(12)~~)) C403.3.2(13) or a combination thereof. Electric resistance heating does not meet this requirement. No HVAC systems incorporating fossil fuel-fired equipment, or heat from district energy systems that are primarily heated by fossil fuel combustion, are permitted to utilize this credit.

Exception: Allowed equipment not listed in Tables C403.3.2(1) through C403.3.2(12):

1. Air-to-water heat pumps.
2. ((~~Heat recovery chillers.~~))

C406.6 Dedicated outdoor air system (DOAS). Not less than 90 percent of the total conditioned floor area of the whole building, building *addition* or tenant space, excluding floor area of unoccupied spaces that do not require ventilation per the *International Mechanical Code*, shall be served by DOAS installed in accordance with Section C403.3.5. This option is not available to buildings subject to the prescriptive requirements of Section C403.3.5. No HVAC systems incorporating fossil fuel-fired equipment, or heat from district energy systems that are primarily heated by fossil fuel combustion, are permitted to utilize this credit.

C406.7 High performance dedicated outdoor air system (DOAS). A whole building, building addition or tenant space which includes a DOAS complying with Section C406.6 shall also provide minimum sensible effectiveness of heat recovery of 80 percent and DOAS total combined fan power less than 0.5 W/cfm of outdoor air. For the purpose of this section, total combined fan power includes all supply, exhaust, recirculation and other fans utilized for the purpose of ventilation. No HVAC systems incorporating fossil fuel-fired equipment, or heat from district energy systems that are primarily heated by fossil fuel combustion, are permitted to utilize this credit.

C406.8 Reduced energy use in service water heating. Buildings with service hot water heating equipment that serves the whole building, building *addition* or tenant space shall comply with Sections C406.8.1 and C406.8.2. No service water heating systems incorporating fossil fuel-fired equipment, or heat from district energy systems that are primarily heated by fossil fuel combustion, are permitted to utilize this credit.

Draft 2018 Seattle Energy Code Change Proposals from Stakeholders

C406 renewables, straight 0.25 W per sf of conditioned space

Summary:

Section C406.5 This proposal carries forward and enlarges an existing Seattle amendment. Change C406.5 from referring to the State table that requires a different amount of PV for each occupancy type, to a flat 0.25 W per square foot (up from 0.07 W) of conditioned floor area.

Also, clarify that this credit would be based on the area of the addition or tenant space when being applied to a building addition or TI project, rather than on the area of the whole building.

Proposed Code Language

C406.5 On-site renewable energy. ((~~A~~)) In addition to the renewable energy required by Section C412 and to renewable energy used to comply with any other requirement of this code, a whole building, building *addition* or tenant space shall be provided with on-site renewable energy systems with a rated peak renewable energy generating capacity ((~~an annual production per square foot~~)) of no less than ((~~the value specified in Table C406.5~~)) 0.25 watts (or 0.85 BTU/h) per square foot of *conditioned floor area* based on the total *conditioned floor area* of the whole building, building *addition* or tenant space. The on-site renewable energy ((~~used in~~)) provided to comply with this option shall be separate from on-site renewables ((~~used as part of Section C406.7~~)) provided to comply with C406.8 or used to qualify for any exception in this code.

(Table C406.5 is stricken.)

Draft 2018 Seattle Energy Code Change Proposals from Stakeholders

Modify C406 HPWH options for R-1 & R-2 occupancies

Summary:

Section C406.8 & C406.9. Modify C406.8 and C406.9 options for R-1 and R-2 (hotel and multifamily) because Section C404.2.3 of the proposed 2018 Seattle code requires heat pump water heating in R-1 and R-2 sleeping units and dwelling units in buildings with central water heating systems.

Proposed Code Language

C406.8 Reduced energy use in service water heating. Buildings with service hot water heating equipment that serves the whole building, building *addition* or tenant space shall comply with Sections C406.8.1 and C406.8.2. No service water heating systems incorporating fossil fuel-fired equipment, or heat from district energy systems that are primarily heated by fossil fuel combustion, are permitted to utilize this credit.

C406.8.1 Building type. Not less than 90 percent of the *conditioned floor area* of the whole building, building *addition* or tenant space shall be of the following types:

1. Group R-1: Boarding houses, hotels or motels. (Not applicable after 1/1/2022)
2. Group I-2: Hospitals, psychiatric hospitals and nursing homes.
3. Group A-2: Restaurants and banquet halls or buildings containing food preparation areas.
4. Group F: Laundries.
5. Group R-2. (Not applicable after 1/1/2022)
6. Group A-3: Health clubs and spas.
7. Buildings with a service hot water load of 10 percent or more of total building energy loads, as shown with an energy analysis as described in Section C407 or as shown through alternate service hot water load calculations showing a minimum service water energy use of 15 k/Btu per square foot per year, as approved by the building official..

C406.8.2 Load fraction. Not less than 60 percent of the annual service hot water heating energy use, or not less than 100 percent of the annual service hot water heating energy use in buildings with water-cooled systems subject to the requirements of Section C403.9.5 or qualifying for one of its exceptions, shall be provided by one or more of the following:

1. Service hot water system delivering heating requirements using heat pump technology with a minimum COP of 3.0. For air-source equipment, the COP rating will be reported at the design leaving heat pump water temperature with an entering air temperature of 60°F (15.6°C) or lower. For water-source equipment, the COP rating will be reported at the design leaving load water temperature with an entering water temperature of 74°F (23.3°C) or lower.
2. Waste heat recovery from service hot water, heat recovery chillers, building equipment, process equipment, or other *approved* system. Qualifying heat recovery must be above and beyond heat recovery required by other sections of this code.

3. On site renewable energy water-heating systems, where those systems are in addition to the renewable energy required by Section C412 and any renewable energy used to comply with other requirements of this code.

C406.9 High performance service water heating in hotel and multifamily buildings. For a whole building, building *addition*, or tenant space with not less than 90 percent of the *conditioned floor area* being Group R-1 or R-2 occupancy, not less than 90 percent of the annual building service hot water energy use shall be provided by a heat pump system ((~~with a minimum COP 3.0.~~)) meeting the requirements of Section C404.2.3 plus the following:

1. The refrigerant used in the heat pump system shall have a global warming potential (GWP) of no greater than 675.
2. No electric resistance heating capacity shall be provided.

Exceptions to item 2:

1. Electric resistance heating is permitted for circulating system *temperature maintenance* and heat tracing of piping.
2. On-demand electric resistance water heaters for hand washing facilities are permitted in public toilet rooms.

Draft 2018 Seattle Energy Code Change Proposals from Stakeholders

Eliminate option for Energy Star commercial kitchen appliances

Summary:

Section C406.12. Strike C406.12 option because Seattle code (C403.9) already requires enhanced commercial kitchen equipment.

Proposed Code Language

((~~**C406.12 Enhanced commercial kitchen equipment.** For buildings and spaces designated as Group A-2, or facilities whose primary business type involves the use of a commercial kitchen with at least one gas or electric fryer, all fryers, dishwashers, steam cookers and ovens shall comply with all of the following:~~

1. ~~Achieve the ENERGY STAR label in accordance with the specifications current as of January 1, 2018.~~
2. ~~Be installed prior to the issuance of the certificate of occupancy.~~
3. ~~Have the ENERGY STAR qualified model number listed on the construction documents submitted for permitting.~~))

SDCI Informative Note: Energy Star commercial kitchen equipment is required for all commercial kitchen projects by Section C403.9.

Draft 2018 Seattle Energy Code Change Proposals from Stakeholders

Eliminate trading substandard envelope UA for above-code systems

Summary:

C407.3.1 Limits on ((~~nonmandatory measures~~)) substandard building envelopes. In energy modeling, the thermal envelope UA of the proposed design will not be permitted to be any higher than the prescriptive UA.

- In addition, Section C407.3 is slightly modified to increase the amount of renewable energy that is tradeable, reflecting the additional Seattle prescriptive requirement for PV.
- Long-term reliable savings
- Nobody is going to upgrade the envelope of a new Seattle building for the next 50 years. We have to prevent substandard envelope performance today.
- High-rise buildings typically use energy modeling to enable envelope performance reductions, using larger glazing areas and reduced slab edge insulation. (Note however that the new Appendix G modeling method sets 40% as the baseline glazing percentage for high-rise office and high-rise residential, as opposed to 30% in the 2015 code modeling path.)

Notes

- When energy modeling is used for code compliance, it inevitably results in a worse-performing building. The baseline used in modeling presumes that every system in the building is the least-efficient allowable by code, which is never the case in prescriptive buildings. Lighting power, fan power, boiler efficiency, and many other components are typically better than code in prescriptive buildings, often much better. Under our current system, these elements which were going to be installed anyway are then "traded" for a degraded building envelope. Also, the systems in the proposed building are presumed to be functioning perfectly, which is rarely the case in real buildings, and these high efficiencies are "traded" for a degraded building envelope, which typically continues to perform as designed for the life of the building. Finally, the envelope is not likely to be upgraded for generations, if ever, whereas building systems have the opportunity to periodically be replaced with higher-performing systems.

Proposed Code Language

C407.3 Performance-based compliance. Compliance with this section requires compliance with ASHRAE Standard 90.1 Appendix G, Performance Rating Method, in accordance with Standard 90.1 Section 4.2.1 with the following modifications:

1. The mandatory requirements of Section G1.2.1a of Standard 90.1 are not required to be met.

2. The reduction in annual carbon emissions of the proposed building design associated with on-site renewable energy shall not be more than 3 percent of the total carbon emissions of the baseline building design, in addition to the renewable energy required by Section C412.

3. References to energy cost in Section 4.2.1.1 and Appendix G shall be replaced by carbon emissions calculated by multiplying site energy consumption by the carbon emission factor from Table C407.3(1).

4. The building performance factors in Table C4.2.1.1 shall be replaced with those in Table C407.3(2).

C407.3.1 Limits on ((~~nonmandatory measures~~)) substandard building envelopes. The Proposed Total UA of the proposed building shall be no ((~~more than 20 percent~~)) higher than the Allowed Total UA as defined in Section C402.1.5. For the purposes of this section, the fenestration area for the Allowed Total UA shall be the same as that shown in Table G3.1.1-1 in ASHRAE 90.1 Appendix G for building types listed in the table. For building types not listed in the table, the fenestration area for the Allowed Total UA shall be the fenestration area of the proposed building, or 40 percent of gross *above-grade wall* area, whichever is less.

Draft 2018 Seattle Energy Code Change Proposals from Stakeholders

Building Performance Factor (Targets for ASHRAE Appendix G modeling method)

Summary:

Table C407.3(2) Building Performance Factors (BPF) to be used for Compliance with Section C407.3. Reduce building performance factors by 10% from WA state factors.

- For example, a BPF of 50% of baseline in State code would become 45% of baseline in Seattle code.
- The 10% reduction is an approximation, based on the historic difference between Seattle and WA energy codes.
- Without this modification, modeled building energy use would not reflect Seattle's more-stringent prescriptive code.

Proposed Code Language

Table C407.3(2)

Building Performance Factors (BPF) to be used for

Compliance with Section C407.3

Building Area Type	Building Performance Factor
Multifamily	((~~0.58~~)) 0.52
Healthcare/hospital	((~~0.54~~)) 0.49
Hotel/motel	((~~0.64~~)) 0.58
Office	((~~0.56~~)) 0.51
Restaurant	((~~0.70~~)) 0.63
Retail	((~~0.47~~)) 0.43
School	((~~0.36~~)) 0.32
Warehouse	((~~0.48~~)) 0.43
All others	((~~0.54~~)) 0.49

Draft 2018 Seattle Energy Code Change Proposals from Stakeholders

Individual meters for fossil gas service to each dwelling unit

Summary:

Section C409.1.3 Provide individual gas meter for each dwelling unit in a multifamily building, just as is currently required for hot water and electricity. Individual meters increase occupant awareness of fuel usage.

- Original proposal from Jon Heller, Ecotope

Proposed Code Language

C409.1.3 Dwelling units. See Sections C404.9 and C405.7 for additional metering requirements for Group R-2 dwelling units.

C409.1.3.1 Dwelling unit gas meter. Each dwelling unit served by natural gas shall be provided with a separate meter. The meter shall include a wired or wireless data connection to a central data collection and display system.

Draft 2018 Seattle Energy Code Change Proposals from Stakeholders

Solar readiness also required for multi-family buildings

Summary:

Section C411.1 (formerly C412.1) Strike exemption for multifamily buildings

- Proposal from Colin Grist at Ecotope
- Note that the solar zone is 40% of *net* roof area, which excludes any planted areas, occupied decks, skylights and mechanical equipment.

Proposed Code Language

C411.1 General. ((~~A~~)) In addition to the requirements of Section C412, a solar zone shall be provided on ((~~nonresidential~~)) buildings 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*.

Draft 2018 Seattle Energy Code Change Proposals from Stakeholders

Expand scope of renewable energy requirement

Summary:

Section C412.1 On-site renewable energy systems. Require 0.25 watts/sf (instead of 0.07 Watts/sf) of renewable energy, and require it for the full height of the building, rather than only the five largest floors. (note section renumbering)

- Exceptions where more additional energy credits are provided or where Building Performance Factor is reduced. Also, affordable housing is categorically exempted.
- This matches recent ASHRAE 90.1 amendment requiring 0.25 W/sf of renewable energy.

Proposed Code Language

SECTION C412

RENEWABLE ENERGY

C412.1 On-site renewable energy systems. Each new building or *addition* larger than 5,000 square feet of gross *conditioned floor area* shall include a renewable energy generation system consisting of not less than 0.25 Watts rated peak photovoltaic energy production per square foot of *conditioned space*.

Exceptions:

1. Increased additional energy credits. Where 3.0 additional energy credits are provided in addition to those required by other sections of this code, the on-site renewable energy generation system is not required.

1.1. Where 1.0 additional energy credits is provided in addition to those required by other sections of this code, the size of the on-site renewable energy generation system is permitted to be reduced by 1/3.

1.2. Where 2.0 additional energy credits are provided in addition to those required by other sections of this code, the size of the on-site renewable energy generation system is permitted to be reduced by 2/3.

2. Reduced Building Performance Factor. For projects utilizing the Section C407 Total Building Performance compliance path, the on-site renewable energy generation system is not required where the building performance factor (BPF) is not less than 3 percent lower than the BPF maximum BPF permitted cumulatively by all other sections of this code.

> **Example:** To use this exception, a building with a required BPF of 50 would instead be required to provide a BPF of (50 x 0.97 =) 48.5.

2.1 Where the BPF is not less than 1 percent lower than the BPF required cumulatively by other sections of this code, the size of the on-site renewable energy generation system is permitted to be reduced by 1/3.

2.1 Where the BPF is not less than 2 percent lower than the BPF required cumulatively by other sections of this code, the size of the on-site renewable energy generation system is permitted to be reduced by 2/3.

3.Transfer to an *affordable housing* project. Where approved by SDCI, all or part of the required on-site renewable energy generation system is permitted to be replaced by construction of a system that is 50 percent of the required system size when located on an existing *affordable housing* project within the City of Seattle, or 75 percent of the required system size when located on a new construction *affordable housing* project within the City of Seattle. Documentation demonstrating that the renewable energy generation system has been installed on the affordable housing project site, the system is fully operational, and ownership has been transferred to the owner of the *affordable housing* project, must be submitted prior to issuance of the certificate of occupancy.

SDCI Informative Note: Option 3 will only be available if an affordable housing project is available to accept the renewable energy system. There is no assurance that such a project location will be available. It is the owner's responsibility to locate and coordinate with the affordable housing project, and to ensure that the installation is completed in a timely manner.

4. Transfer to a Washington state agency program. Where approved by SDCI, all or part of the required renewable energy generation system is permitted to be replaced by a contribution of $2,500.00 for each required kilowatt of installed capacity, or portion thereof, to a solar energy fund managed by a Washington state agency that will provide solar energy installations for affordable housing projects. Documentation demonstrating that the contribution has been received by the state agency must be submitted prior to issuance of the certificate of occupancy.

SDCI Informative Note: Option 4 will only be available if a solar energy fund for affordable housing is created by the Housing Trust Fund or another state agency program, for which the project is qualified to participate. There is no assurance that such a program will be available.

5. Affordable housing. The on-site renewable energy generation system is not required for *affordable housing* projects.

((~~For buildings over 5 stories in height, the conditioned area for this calculation shall be based on the conditioned area of the largest 5 above-grade stories in the building~~.))

New Definition: Affordable Housing

Affordable Housing. Affordable housing for the purposes of this code shall include buildings which; a) receive or have received public funding or an allocation of federal low-income housing tax credits; and

b) are subject to a regulatory agreement, covenant, or other legal instrument recorded on the property title, and enforceable by the City of Seattle, Washington State Housing Finance Commission, State of Washington, King County, U.S. Department of Housing and Urban Development, or other similar entity as approved by the Seattle Director of Housing, that either:

1) Restricts at least 40 percent of the units to occupancy by households earning no greater than 60 percent of median income, and controls the rents that may be charged, for a minimum period of 40 years; or

2) Restricts initial and subsequent sales of at least 40 percent of the residential units to households with incomes no greater than 80 percent of median income, for a minimum period of 50 years. The sale price for sales subsequent to the initial sale shall be calculated to allow modest growth in homeowner equity while maintaining long-term affordability for future buyers.

Draft 2018 Seattle Energy Code Change Proposals from Stakeholders

Threshold for use of Table 503.4 economizer requirements

(New proposal August 2019)

Summary:

Section C503.4.3 Clarify that cooling systems must comply with the economizer compliance table, both at the individual equipment level and the total system level.

- Proposal from Mike Kennedy technical review

Proposed Code Language

C503.4.3 Alterations or replacement of existing cooling systems. Alterations to, or replacement of, existing mechanical cooling systems shall not decrease the building total economizer capacity unless the system complies with either Section C403.3.5 or C403.5. System alterations or replacement shall comply with Table C503.4 when either the individual cooling unit capacity ((~~and~~)) or the building total capacity of all cooling equipment without economizer ((~~do~~)) does not comply with Sections C403.3.5 or C403.5.

TABLE C503.4

ECONOMIZER COMPLIANCE OPTIONS FOR MECHANICAL ALTERATIONS

(Table unchanged)

Draft 2018 Seattle Energy Code Change Proposals from Stakeholders

Envelope exemption for high "process load" building change of use

Summary:

Section C505 Conversion of an existing building to a commercial kitchen, bakery or laundry would not require envelope improvements if it uses Energy Star equipment and doesn't use gas-fired equipment.

- Original proposal from Gia Mugford, Ecotope

Proposed Code Language

C505.1 General. Spaces undergoing a change in occupancy shall be brought up to full compliance with this code in the following cases:

1. Any space that is converted from an F, S or U occupancy to an occupancy other than F, S or U.

2. Any space that is converted to a Group R dwelling unit or portion thereof, from another use or occupancy.

3. Any Group R dwelling unit or portion thereof permitted prior to July 1, 2002, that is converted to a commercial use or occupancy.

A change in occupancy project shall be deemed to comply with this code if the project area alone complies or if the existing building and the project area combined comply with this code as a whole building.

EXCEPTION: Buildings or spaces that were permitted prior to the 2009 WSEC may comply with this section as follows:

1. Where the component performance alternative in Section C402.1.5 is used to demonstrate compliance with this section, the Proposed Total UA is allowed to be up to 110 percent of the Allowable Total UA. This exception may be applied to the project area alone, or to the existing building and project area combined as a whole building.

2. Where total building performance in Section C407 is used to demonstrate compliance with this section, the total annual carbon emissions from energy consumption of the proposed design is allowed to be 110 percent of the annual carbon emissions from energy consumption allowed by Section C407.3. This exception may be applied to the project area alone, or to the existing building and project area combined as a whole building.

3. Where the building or space is altered to become a bakery, commercial kitchen or commercial laundry, and the proposed design uses only all-electric Energy Star-rated process equipment and code compliant all-electric HVAC equipment, improvements to the building envelope immediately adjoining the spaces containing that use shall not be required. For the purposes of this exception, no fossil fuel burning equipment of any kind may be utilized or installed within the building or space undergoing the change of occupancy.

Compliance shall include the provisions of Section C406, applied only to the portion of the building undergoing a change of occupancy or use. Where the use in a space changes from one use in Table C405.4.2 (1) or (2) to another use in Table C405.4.2 (1) or (2), the installed lighting wattage shall comply with Section C405.4.

Significant Issues that were debated but not included in the 2018 Seattle code proposals.

- Embodied carbon – requirements to utilize lower-carbon concrete and steel.
- Refrigerants – particularly for VRF systems, grocery store systems and the like that include very long pipe lengths and site-built connections.
- Grid management strategies such as energy storage, both battery and thermal, and demand response capability for energy end uses with flexible schedules, such as water heating, EV charging, and bins of phase change materials.
- Curtain wall heat loss calculations