



2018 Washington & Seattle Energy Codes

C408,

Public Meeting #6



Seattle Department of
Construction & Inspections

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The question is *how* we'll reach these targets



Washington state:

70% less building energy use by 2030

- Zero-carbon buildings
- Gov says move faster

Washington state:

45% reduction in GHG emissions by 2030

- 95% reduction by 2050

Seattle:

Carbon-neutral buildings & transportation by 2050

- ...or sooner with Green New Deal

Seattle amendments: Guiding Principles

1. Build great envelope
 - Dependable energy savings for decades
2. Eliminate combustion
 - Carbon neutral today, won't need change later
3. Use electricity wisely
 - Don't waste on electric resistance heat
4. Generate power
 - Plus "solar readiness" for bigger future system



Build so no major envelope or system type changes needed for 2050

...and do it economically

New energy code provisions should be:

- ...**necessary** for meeting the City's goals...
- ...and **as cost-effective as possible** for owners and tenants
 - Higher-performing systems often cost more
 - But costs often moderate after new code becomes "business as usual."



September 10 Agenda (a): C406 Credits

1. **C406.1**. Increase C406 credit requirement to 8 (from 6) credits
2. Table C406.1. Reduce to two credits for “basic” R-2 DOAS (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. C406.5. Use straight 0.25 W/sf requirement instead of annual PV production
6. C406.8 & C406.9. Modify HPWH credits to coordinate with R-1 & R-2 requirements in C404.2.3
7. C406.12. Eliminate C406 credit for commercial kitchen equipment

September 10 Agenda (b): C407 Modeling

1. Table C407.3(2). Require BPF (building performance factor) 10% below WA Appendix G modeling values
2. Table C401.3.1. Base TPP (Target Performance Path) targets on Appendix G BPF values, instead of a set list of values
3. **C407.3.1. Prohibit envelope heat loss greater than allowed by prescriptive code**

C406 Efficiency Package Credits

- WA: Now a “points-based” table
 - 2 (old) credits = 6 (new) credits
- WA: 6 credits required
 - 3 credits for low-energy occupancies
- **Seattle: Require 8 credits**
 - **Instead of 6**
- **Seattle: Gas equip doesn't qualify**

	R1	R2	B	E	M	Other
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

C406 Credits, Popularity Contest

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	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	5.0	NA	NA	NA	8.0
9. High performance service water heating in multi-family buildings in accordance with Section C406.9	7.0	8.0	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.

^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.

Best options for apartments?

One engineer's ranking

Best

- #2 (1 credit) Reduced lighting
- #9 (8 credits before 1/1/22)
Advanced Heat Pump Water Heater
 - (5 credits after 1/1/22)

Second Best

- #5 (3 credits, max) Rooftop solar
- #6 (2 credits) DOAS – Dedicated Outdoor Air System
- #7 (4 credits) High-perform DOAS
- #11 (2 credits) Reduced air leakage

Getting to 8 Credits (after 1/1/22)		
No.	Credits	Description
#2	1	Lighting
#9	5	Advanced HPWH
#11	<u>2</u>	<u>Reduced air leakage</u>
	8	Total

TABLE C406.1

Partial credit for standard DOAS & high-performance water heating

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) <u>2.0^d</u>	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 <u>NA after 1/1/2022</u>	5.0 <u>NA after 1/1/2022</u>	NA	NA	NA	8.0
9. High performance service water heating in ((multi-family)) R-1 and R-2 buildings in accordance with Section C406.9	<u>7.0 prior to 1/1/2022</u> <u>5.0 after 1/1/2022</u>	<u>8.0 prior to 1/1/2022</u> <u>5.0 after 1/1/2022</u>	NA	NA	NA	NA

Disallow C406 credits for fossil fuel-fired equipment

- **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.
- **Same for:**
 - HVAC system selection
 - High-performance DOAS
 - Service water heating

Eliminate credit for low-energy spaces w/ radiant heat

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.))~~

Straight 0.25 W/sf for renewable credit

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.

Eliminate Commercial Kitchen Credit

~~((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 C403.15.

C403.15 Commercial food service. The following types of equipment within the scope of the applicable Energy Star program shall comply with the energy-efficiency and water-efficiency criteria required to achieve the Energy Star label:

1. Commercial fryers: Energy Star Program Requirements for Commercial Fryers.
2. Commercial hot food holding cabinets: Energy Star Program Requirements for Hot Food Holding Cabinets.
3. Commercial steam cookers: Energy Star Program Requirements for Commercial Steam Cookers.
4. Commercial dishwashers: Energy Star Program Requirements for Commercial Dishwashers.



Take 5

WA – Modeling: Appendix G & carbon metric

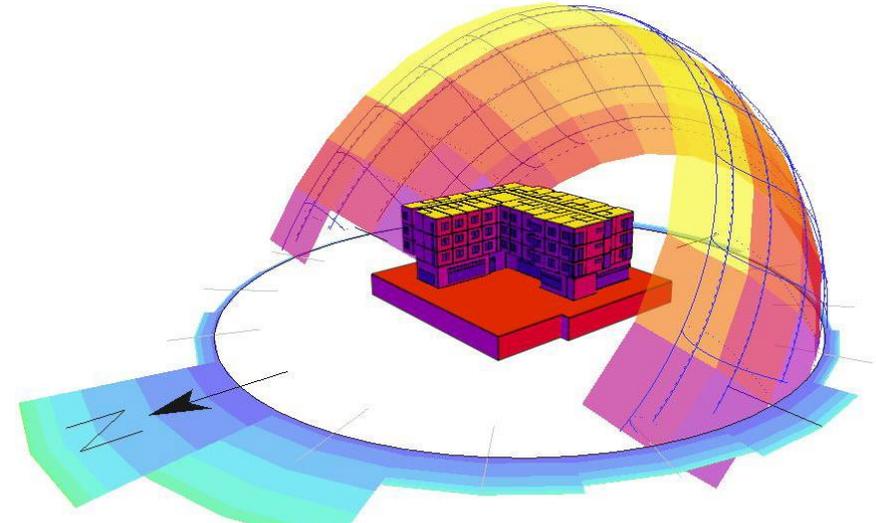
- Switch to ASHRAE Appendix G method
 - Allowable emissions compared to a 2004 ASHRAE baseline
 - See table below
- Switch from “site energy” to “carbon” metric
 - Advantages heat pump
 - Disadvantages electric resistance
 - Carbon content of electricity = 0.70#/kwh



Building Area Type	Multi family	Health care	Hotel	Office	Rest.	Retail	School	Ware house	Others
Building Performance Factor	0.56	0.54	0.64	0.54	0.70	0.47	0.36	0.48	0.54

C407 TBP – Total Building Performance

- BPF (Building Performance Factor)
 - Percent lower carbon emissions than 2004 ASHRAE 90.1
- **Seattle: 10% lower than WA code**
 - To align with more stringent prescriptive Seattle Energy Code



SEATTLE 10% lower									
Building Area Type	Multi family	Health care	Hotel	Office	Rest.	Retail	School	Ware house	Others
Building Performance Factor	0.56 <u>0.50</u>	0.54 <u>0.49</u>	0.64 <u>0.58</u>	0.54 <u>0.49</u>	0.73 <u>0.66</u>	0.47 <u>0.42</u>	0.36 <u>0.32</u>	0.48 <u>0.43</u>	0.54 <u>0.49</u>

TPP – Target Performance Path

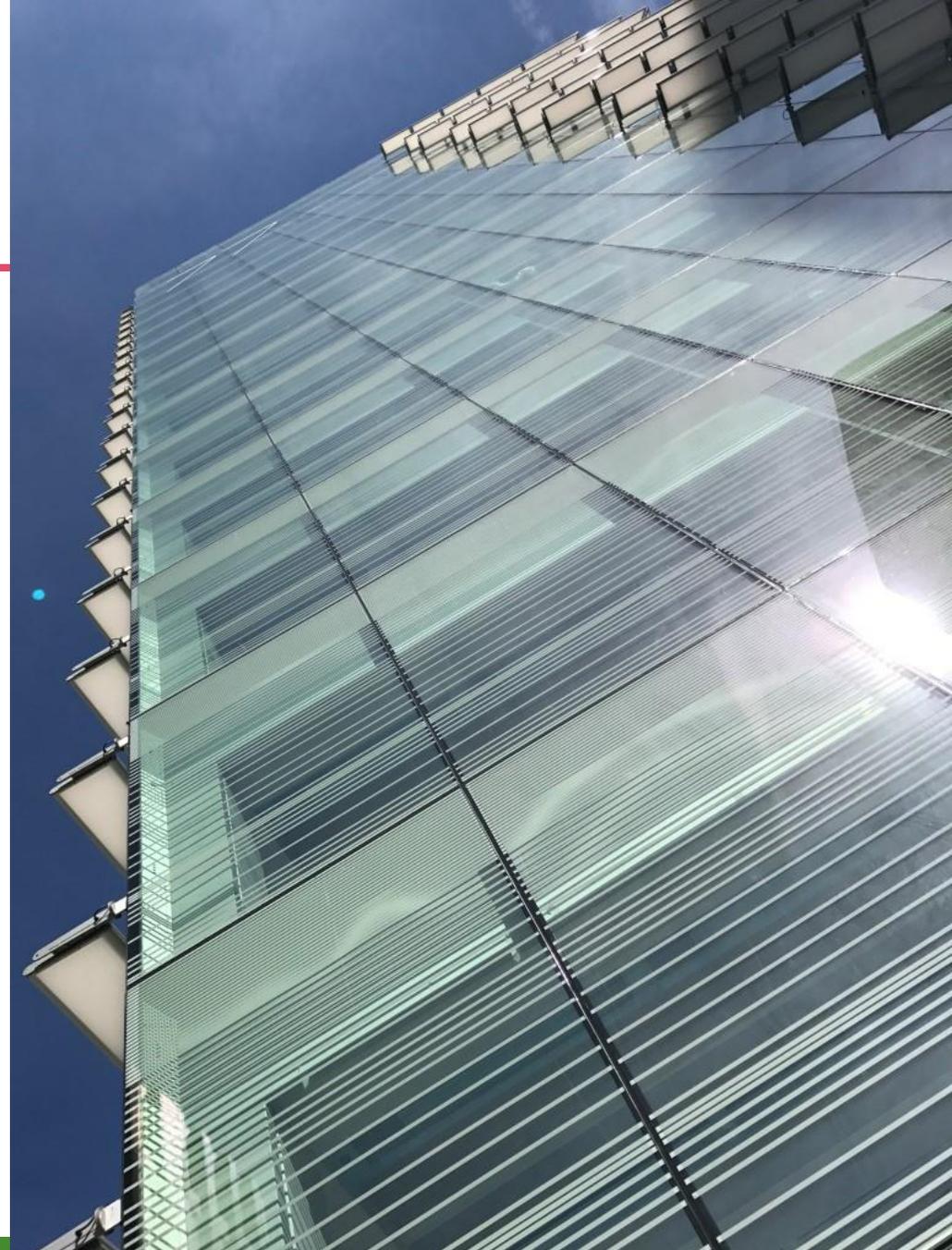
- Yes, we'll keep the TPP for now
- Targets: 12% *higher* allowable than the Seattle BPF values
 - Replacing the 2015 SEC list of EUIs
 - (such as 40 for office, 150 for hospital, etc.)

SEATTLE 10% lower									
Building Area Type	Multi family	Health care	Hotel	Office	Rest.	Retail	School	Ware house	Others
Building Performance Factor	0.56 0.50 <u>0.56</u>	0.54 0.49 <u>0.54</u>	0.64 0.58 <u>0.65</u>	0.54 0.49 <u>0.54</u>	0.73 0.66 <u>0.74</u>	0.47 0.42 <u>0.47</u>	0.36 0.32 <u>0.36</u>	0.48 0.43 <u>0.48</u>	0.54 0.49 <u>0.54</u>

Baseline glazing percentage

Tables G3.1(c) & G3.1.1-1, Appendix G

- % Varies for energy modeling
 - 40% large office (>50,000 sf)
 - 31% medium office (5,000 – 50,000 sf)
 - 27% hospital
 - 24% full-service restaurant
 - 22% School
 - 7% grocery...(etc.)
- Multifamily (& others not in table)
 - Smaller of: Proposed Design or 40%
- Prescriptive path: 30%
 - 40% w/daylight area or low-U glazing



Limits on sub-standard envelope

- WA: Modeled envelope UA cannot be more than **20% worse** than prescriptive
- Seattle: Modeled envelope UA cannot be **any worse than prescriptive**
 - Envelope energy savings are dependable, long-lasting and real
 - Mechanical energy savings are less-dependable, less long-lasting, and frequently standard practice





“That which exists,
must be possible.”
Mark Frankel

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