

2021 WSEC COMMERCIAL REQUIREMENTS FOR MULTIFAMILY BUILDINGS



WSEC Commercial Technical Support Team:

Lisa Rosenow - Evergreen Technology Consulting (ETC)

Duane Lewellen – Lewellen Associates, LLC

(360) 539-5300 | com.techsupport@waenergycodes.com

WSEC Commercial Technical Support


- ▶ On-call technical support thru 3 avenues
 - Telephone hot line – **360-539-5300**
 - Online form – **<https://www.waenergycodes.com>**
 - Email inquiries – **com.techsupport@waenergycodes.com**
- ▶ Classroom and webinar training
- ▶ We administer the technical support and compliance documentation webtool



Duane Lewellen

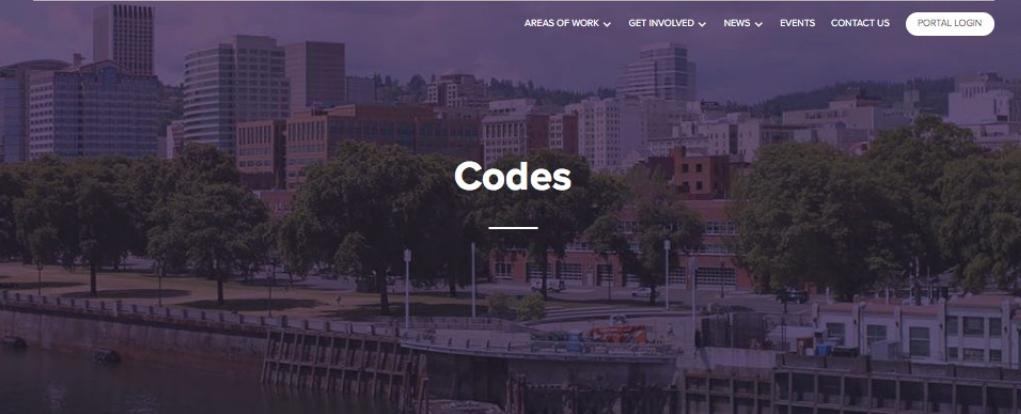


Lisa Rosenow



Resources & ReportsCareersSubscribeAbout NEEA

AREAS OF WORKGET INVOLVEDNEWSEVENTSCONTACT USPORTAL LOGIN



Codes

Increasing progressive effectiveness of energy codes


The NEEA Codes and Standards program supports regional stakeholders in the development and adoption, training and implementation of energy codes. States engage in the code development process along different cycles and code versions, but all states now use the International Energy Conservation Code (IECC) as a baseline for their commercial energy codes. All states except Oregon now use the IECC as the basis of their residential code. The adoption of codes is the responsibility of state code boards or agencies. Official state-by-state energy code information can be found on state building code websites:

Idaho - <http://dbs.idaho.gov/boards/index.html>

Oregon - <http://www.cbs.state.or.us/external/bcd/>


Washington - <https://sbcc.wa.gov/>

Montana - <http://svc.mt.gov/gov/boards/>




Idaho

David Freelove, Idaho Circuit Rider
davidfreelove@yahoo.com




Montana

Carl Little carl@ncat.org or Paul
Tschida ptschida@mt.gov



Oregon

Residential: Roger Kainu
roger.kainu@state.or.us
Commercial: Blake Shelide
blake.shelide@state.or.us



Washington

Residential:
energycode@energy.wsu.edu
Commercial:
com.techsupport@waenergycodes.com

WSEC technical support services are made possible thanks to the generous support of the Northwest Energy Efficiency Alliance

www.neea.org

Today's Presentation

- ▶ This presentation represents ETC's **unofficial** interpretation of code intent.
- ▶ Our technical support team is not an affiliate, nor do we speak for the Washington State Building Code Council (SBCC).
- ▶ The technical support we provide is advisory only and non-binding.



WSEC Commercial Technical Support Team:

Duane Lewellen – Lewellen Associates, LLC

Lisa Rosenow - Evergreen Technology Consulting (ETC)

(360) 539-5300 | com.techsupport@waenergycodes.com

Topics we'll cover in this webinar

1. Scope changes in the new residential building definition
2. Differences between 2021 WSEC-C and WSEC-R thermal envelope requirements
3. Thermal envelope requirements for decks & balconies
4. HVAC systems & equipment that are common in multifamily buildings
5. Service water heating systems & equipment that are common in multifamily buildings
6. Ventilation requirements for dwelling units & common core areas
7. Summary of additional energy efficiency & load management measures applicable to multifamily
8. Renewable energy and solar readiness requirements

Residential Building Definition

2021 WSEC-R DEFINITION

RESIDENTIAL BUILDING. For this code, the following building types are residential buildings:

1. Detached one- and two-family dwellings.
2. Multiple single-family dwellings (townhouses).
3. Group R-2 and R-3 occupancy areas in buildings three stories or less in height above grade plane whose dwelling units are **accessed directly from the exterior**.
4. Accessory structures to residential buildings.

BOTTOM LINE - All Group R-2 multi-family buildings less than 4 stories **where dwelling units are accessed from interior corridors or other spaces** (i.e. interior lobby) are no longer within the scope of the WSEC-Residential. These buildings shall now meet all applicable requirements of the **WSEC-Commercial**.

Residential Building Definition

Stand alone common areas

- Club houses, leasing centers and residential services buildings (fitness, laundry, etc) that serve a multifamily building complex
- If deemed accessory to Group R, shall comply with the WSEC-C provisions
- Confirm with AHJ





Building Thermal Envelope Performance

2021 WSEC-C – Roofs & Walls

Table C402.1.3 - R-Value Method		
CLIMATE ZONE	5 AND MARINE 4	
	All Other	Group R
Roofs		
Insulation entirely above deck	R-38ci	R-38ci
Metal buildings	R-25 + R-11 R-22 LS	R-25 + R-11 R-22 LS
Attic and other	R-49	R-49
Walls, Above Grade		
Mass	R-9.5ci	R-13.3ci
Mass transfer deck slab	R-5	R-5
Metal buildings	R-19ci or R-13 + R-13ci R-13 + R-14ci	R-19ci or R-13 + R-13ci R-13 + R-14ci
Steel framed	R-13 + R-10ci	R-19 + R-8.5ci
Wood framed and other	R-21 int or R-15 + R-5ci std R-13 + R-7.5ci std or R-20 + R-3.8ci std	R-13 + R-7.5ci std or R-20 + R-3.8ci std or R-25 std

Table C402.1.4 - U-Factor Method		
CLIMATE ZONE	5 AND MARINE 4	
	All Other	Group R
Roofs		
Insulation entirely above deck	U-0.027	U-0.027
Metal buildings	U-0.031	U-0.031
Attic and other	U-0.021	U-0.021
Joist or single rafter	U-0.027	U-0.027
Walls, Above Grade		
Mass	U-0.104	U-0.078
Mass transfer deck slab	U-0.20	U-0.20
	U-0.052	U-0.052
Metal buildings	U-0.050	U-0.050
Steel framed	U-0.055	U-0.055
	U-0.054	
Wood framed and other	U-0.051	U-0.051

Multifamily – Roofs & Walls

2021 WSEC Commercial – Dwelling units with central corridor entrances

Table C402.1.3 - R-Value Method		
CLIMATE ZONE	5 AND MARINE 4	
	All Other	Group R
Roofs		
Attic and other	R-49	R-49
Walls, Above Grade		
Steel framed	R-13 + R-10ci	R-19 + R-8.5ci
Wood framed and other	<u>R-13 + R-7.5ci std or R-20 + R-3.8ci std</u>	R-13 + R-7.5ci std or R-20 + R-3.8ci std or R-25 std

Table C402.1.4 - U-Factor Method		
CLIMATE ZONE	5 AND MARINE 4	
	All Other	Group R
Roofs		
Attic and other	U-0.021	U-0.021
Joist or single rafter	U-0.027	U-0.027
Walls, Above Grade		
Steel framed	U-0.055	U-0.055
Wood framed and other	<u>U-0.051</u>	U-0.051

2021 WSEC Residential – Dwelling units with exterior entrances (woody walk-up)

- Ceiling minimum R-value = R-60
- Wall maximum U-factor = U-0.056

Mechanical Equipment with Through-Wall Penetrations

INTENT – Reduce the impact of mechanical equipment through wall penetrations on overall building envelope thermal performance

If total area of penetrations **exceeds 1%** of the above-grade wall area ~

- ▶ Mechanical equipment penetrations area shall be assigned a default U-factor of U-0.5
- ▶ Penetration area U-factor shall be area-weighted with the opaque above-grade wall area
- ▶ Calculate the resulting overall effective wall U-factor for prescriptive or component performance compliance



**Table C402.1.4, Footnote k
C402.1.4.3**

Mechanical Equipment with Through-Wall Penetrations

Sample Area-Weighted Wall Assembly Calculation

- Percent area of mechanical equipment penetrations = **2%**
- Mechanical equipment penetrations default U-factor = **U-0.5**
- Wood-framed wall prescriptive U-factor = **U-0.051**

$$\text{Area-weighted U-factor} = (0.5 * 0.02) + (0.051 * 0.98) = \text{U-0.060}$$

Other envelope assembly elements in the building will require better than code performance to make up the delta

Table C402.1.4, Footnote k
C402.1.4.3

Fenestration

2021 WSEC-C Commercial

- New category for mulled windows with fixed & operable sections
- SHGCs now defined by fixed and operable, not orientation

2021 WSEC-R Residential

- Fenestration maximum U-factor = U-0.30
- No max SHGC requirement

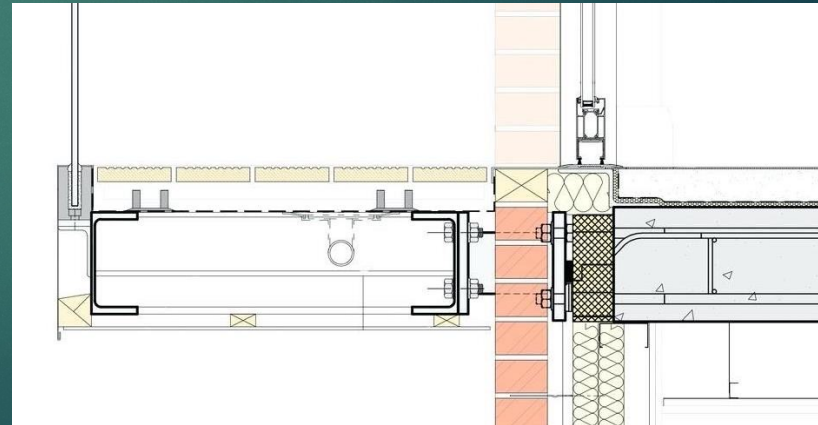
Table C402.4 - U-Factor & SHGC		
CLIMATE ZONE		5 AND MARINE 4
U-Factor for Class AW rated in accordance with AAMA/CSA101/I.S.2/A440, vertical curtain walls and site built fenestration products		
Fixed U-factor	U-0.38 <u>U-0.34</u>	
Operable U-factor	U-0.40 <u>U-0.36</u>	
Entrance doors		
U-factor	U-0.60	
U-factor for all other vertical fenestration		
<u>Fixed</u> U-factor	U-0.30 <u>U-0.26</u>	
<u>Operable or mulled windows with fixed and operable sections U-factor</u>	<u>U-0.28</u>	
SHGC for all vertical fenestration		
Orientation	SEW <u>Fixed</u>	N <u>Operable</u>
PF < 0.2	0.38	0.51 <u>0.33</u>
0.2 ≤ PF < 0.5	0.46	0.56 <u>0.40</u>
PF ≥ 0.5	0.61	0.61 <u>0.53</u>
Skylights		
U-factor	U-0.50	
SHGC	0.35	

Decks & Balconies

The thermal bridge at each balcony or deck can cause substantial heat loss, unless a thermal break is provided



SOLUTIONS



Decks & Balconies

C402.2.8 Above grade exterior concrete slabs

- ▶ Decks, balconies and other above-grade slabs shall have a minimum **R-10 thermal break** aligned with the primary insulating layer in the adjoining wall assemblies
- ▶ Stainless steel reinforcing bars are permitted to penetrate the thermal break without penalty
- ▶ Where the thermal break does not comply with these requirements:
 - Above-grade exterior concrete slab shall be assigned an exposed concrete default U-factor from **Table A103.3.7.2 Peripheral Edges of Intermediate Concrete Floors**
 - R-value of exterior concrete slabs shall be area-weighted with the adjacent wall assemblies for code compliance

Heat Pumps for Space Heating



NEW Heat Pump Prescriptive Compliance Path

Equipment type criteria for space heating

► NEW Prescriptive Path

- Section C403.1.4 requires **heat pumps** as the primary source of space heating energy capacity
- Electric resistance and fossil fuel equipment are only allowed via an exception to these provisions, or by complying with the **Fossil Fuel Compliance Path**

Dwelling Unit Space Heating Equipment & Systems



Dwelling Unit Space Heating – Ductless Heat Pumps

Single-zone
ductless heat pump



Multiple-zone
ductless heat



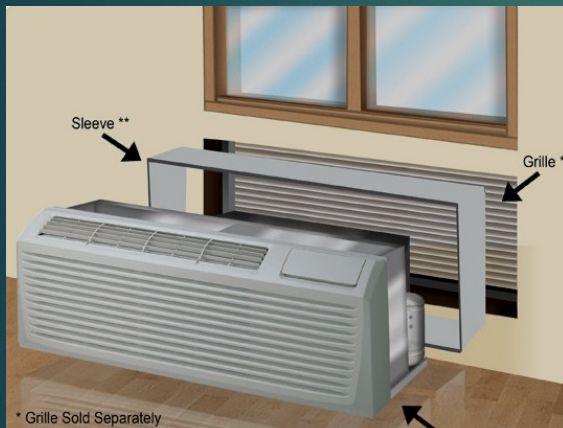
For Group R-2, split system cooling equipment shall comply with an economizer exception.

Options include high efficiency criteria or HVAC equipment paired with DOAS.

Images courtesy of LG

Dwelling Unit Space Heating – Packaged Terminal Heat Pumps

Packaged terminal
heat pump (PTHP)



High efficiency packaged
terminal heat pump



Image courtesy of Ephoca

High efficiency PTHP features:

- Integrated energy recovery ventilation (ERV)
- ECM fans
- Optimized controls
- Combo intake/exhaust louvers (for condenser & ventilation air) are compact & sealed to minimize air leakage through the building envelope

Packaged VPTHP & Split System Heat Pump Air Handlers

Ducted split system heat pump



Image courtesy of Trane

Vertical packaged terminal heat pump



Image courtesy of AMANA

For Group R-2, cooling equipment with indoor supply fans and $< 54,000$ Btu/h capacity are exempt from economizer if rated cooling efficiency exceeds code minimum by 15%



Water Source and Ground Source Heat Pump Systems

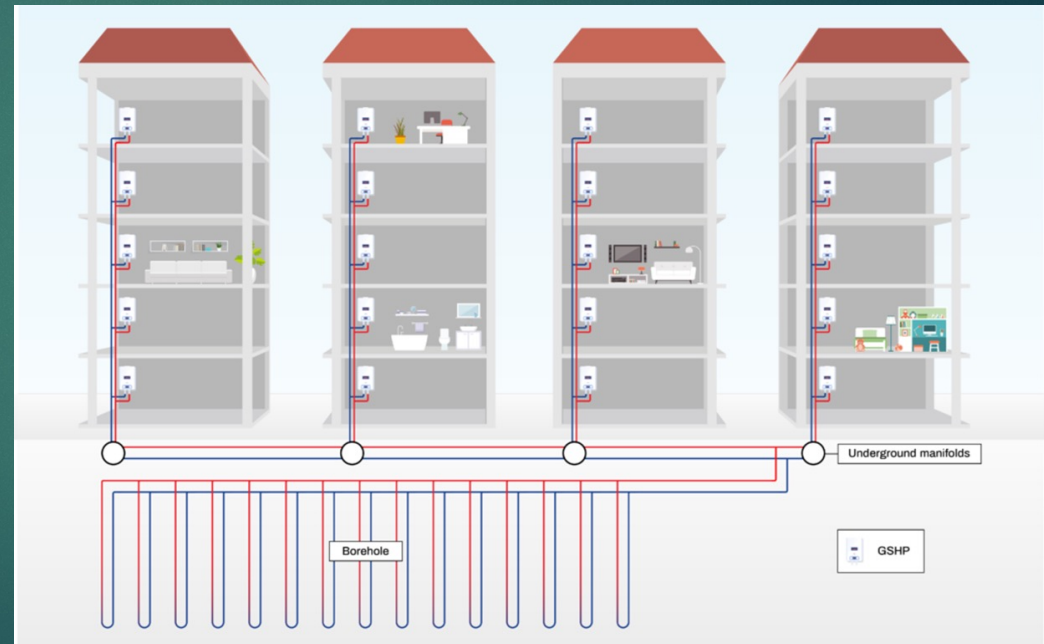
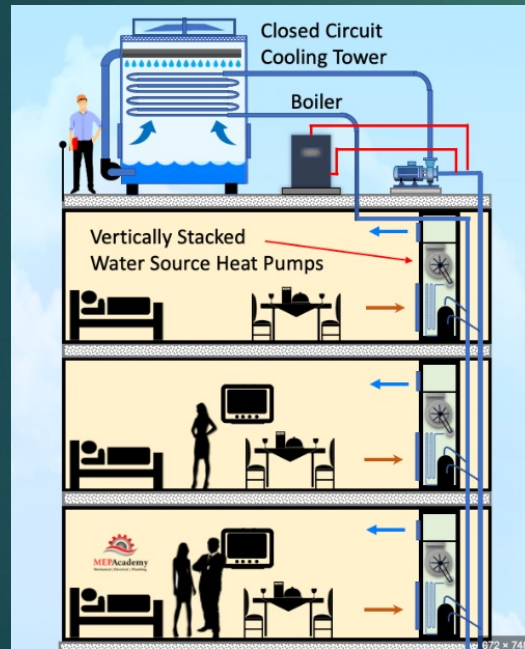


Diagram courtesy of MEP Academy

Dwelling Unit Space Heating – Electric Resistance Appliances

Although heat pumps are the basis of prescriptive compliance, there are **EXCEPTIONS** applicable to multifamily that allow electric resistance (**ER**) and/or fossil fuel (**FF**) space heating equipment

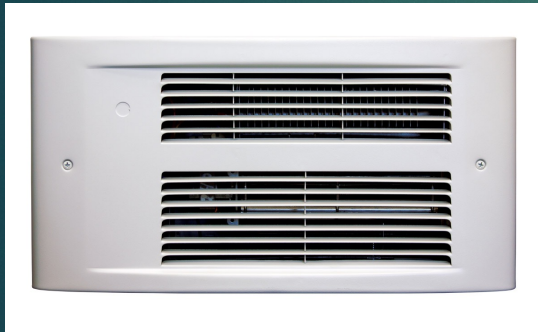
- **Dwelling & sleeping units** – **ER** heating appliances are permitted within ALL habitable spaces

Habitable Space Type	Climate Zone 4	Climate Zone 5
Each space with fenestration	750 watts	1,000 watts
Each space with fenestration facing two cardinal orientations (corner units, etc)	1,000 watts	1,300 watts
Each space with exterior walls and no fenestration	250 watts	250 watts
Additional allowance per each space with fenestration, if located in cold climate areas*	250 watts	250 watts

* Climate Zone 5 with lower than 4°F (-16°C) winter outdoor design temperature for heating

Dwelling Unit Space Heating – Electric Resistance Appliances

Electric resistance wall heater



Electric resistance baseboard



Electric resistance cove heater



Images courtesy of King Electric

Prescriptive Space Heating

Additional EXCEPTIONS that allow electric resistance and/or fossil fuel heating

- ▶ **Small systems** – ER and/or FF space heating is permitted in small areas such as vestibules, stairwells & mech/elec rooms if:
 - Total combined capacity of all small **ER & FF** equipment is < 5% of total building space heating capacity, or
 - **ER & FF** equipment serves < 5% of the total conditioned floor area (includes decorative appliances)
- ▶ Other areas where **ER** space heating is permitted:
 - **Small conditioned buildings** that are < 2,500 SF
 - **Semi-heated** spaces – Parking, storage areas
 - Spaces requiring **freeze protection**

Prescriptive Space Heating

Other allowed ALTERNATIVE sources of space heating energy

- ▶ **Pre-existing district energy** – Steam or hot water district energy systems that serve multiple buildings, that utilize **FF** equipment as the primary source of heat energy. Must be pre-existing to the effective date of the 2021 WSEC-C.
- ▶ **Low carbon district energy** – Systems serving multiple buildings that comply with the 2021 WSEC-C system performance criteria (Chapter 2)
- ▶ **On-site & off-site renewable energy** – Heat energy derived from renewable energy sources

Fossil Fuel Compliance Path

Additional energy credits

- ▶ Alternative compliance path for project areas that are served by fossil fuel or electric resistance space heating and/or service water heating (SWH) appliances
- ▶ Additional Efficiency credits are required by discipline per Table C401.3.3, which is in addition to the number of Additional Energy Efficiency Measure (AEM) credits required in Section C406

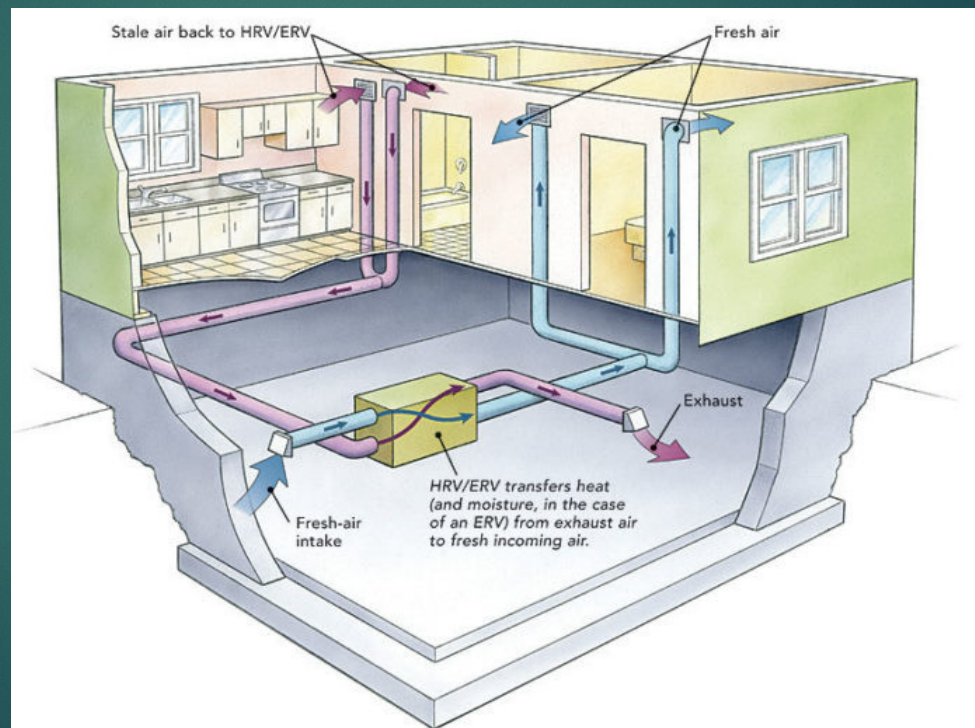
Interested in learning more about the Fossil Fuel Compliance Path and the Additional Energy Credits required?

Check out the Additional Energy Efficiency & Load Management Measure webinar via the **On Demand Training** page of the WSEC Compliance Documentation website - https://waenergycodes.com/online_training

Table C401.3.3
Table C406.2(2)

Dwelling Unit Ventilation

**Dwelling units
require a
balanced flow
ventilation
system**



*Image courtesy of Green
Building Advisor*

Balanced Flow Ventilation

Balanced Flow – Supply CFM & Exhaust CFM are within 10%

- ▶ Outdoor air shall be provided directly to each habitable space via a balanced ventilation system with heat recovery
- ▶ Delivered outdoor air CFM shall comply with the 2021 IMC
- ▶ HRV/ERV sensible energy recovery effectiveness shall be $\geq 60\%$
- ▶ System shall be configured so the ventilation airflow rate in each habitable space can be commissioned (Cx)
- ▶ Rated efficiency per HVI 920 based on adjusted sensible recovery effectiveness (ASRE) is permitted

Dwelling Unit - ERVs & HRVs

Whole house (or dwelling unit)
energy recovery ventilators (ERV)



Image courtesy of Greenheck

Ceiling mounted,
low CFM spot ERVs



Image courtesy of Panasonic

Common Area Ventilation

- Applies to all common spaces within a multifamily building
- Includes lobbies, corridors, stairways, lounges, game rooms, fitness centers, central laundry facilities and meeting rooms



Corridor & Common Area Ventilation

- ▶ Ventilation system shall be sized to provide **not more than 150%** of the minimum outdoor air required by Chapter 4 of the IMC or other applicable code or standard (whichever is greater)
- ▶ Energy recovery **may be** required depending on the total design outdoor air CFM (refer to Tables C403.7.6 (1) & (2))
- ▶ Ventilation air systems that are required to have energy recovery shall provide \geq **68%** sensible recovery effectiveness or **60%** enthalpy recovery ratio

C403.2.2.1

C403.3.5

Tables C403.7.6

C403.7.6.2

Dedicated Outside Air Systems

Rooftop DX-DOAS heat pump
with energy recovery

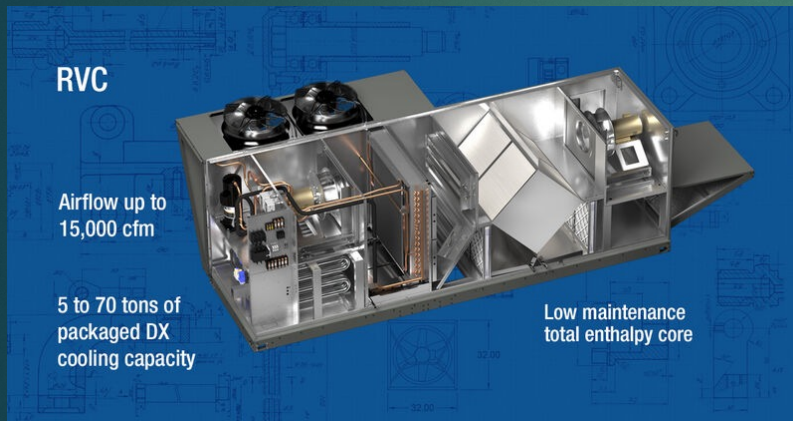


Image courtesy of Greenheck

High efficiency DOAS with
energy recovery (ERV)



*Image
courtesy of
Ventacity*

- DOAS is not required for multifamily - If provided, then eligible for additional efficiency credits
- Heating & cooling capacity shall not exceed what is required for outside air tempering and dehumidification

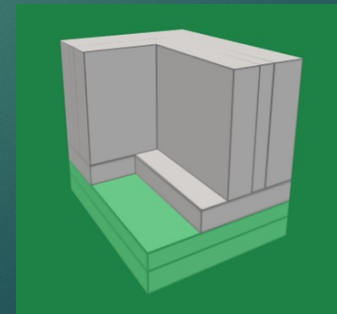
What is TSPR?

$$\text{TSPR Score} = \frac{\text{Annual HVAC Loads}}{\text{Annual HVAC Carbon Emissions}}$$



Whole building seasonal HVAC efficiency rating

- ▶ TSPR energy analysis tool
- ▶ Compares score of the proposed building to a reference building as defined in 2021 WSEC-C Appendix D
- ▶ Uses default loads and schedules



Runs a simplified energy model

TSPR Score Verification

Whole Building Total System Performance Ratio

Proposed Building TSPR:

16.9

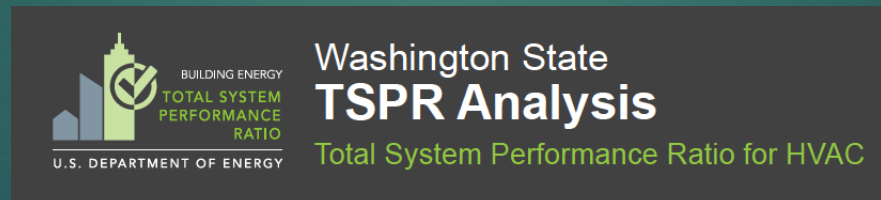
Baseline Building TSPR:

12

← **Larger number = Better score**

The Total System Performance Ratio complies with the 2018 Washington State Energy Code.

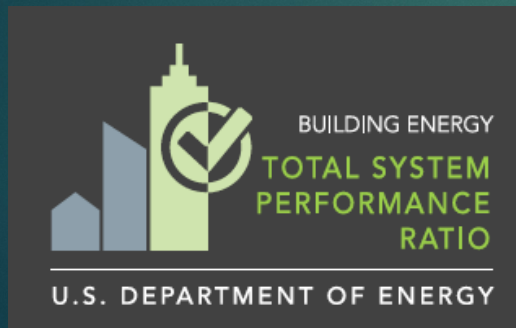
Total System Performance Ratio (TSPR) is the ratio of the sum of a building's annual heating and cooling load in thousands of BTUs to the sum of the annual carbon emissions in pounds from energy consumption of the building HVAC systems.



Proposed building score must be equal to or higher than the Baseline building score

Scope of TSPR provision has expanded to include Group R-2 multifamily

- ▶ TSPR analysis is only required for spaces provided with **mechanical cooling**
- ▶ **Does not apply** to buildings where the total SF area of all spaces that are required to comply with TSPR is **less than 5,000 SF**



Standard
reference design
HVAC system
criteria added for
multifamily
buildings
(Appendix D)

**TABLE D602.11
STANDARD REFERENCE DESIGN HVAC SYSTEMS**

Parameter	Building Type				
	Large Office ^a	Small Office and Libraries ^a	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
Fan control ^b	Cycle on load	Cycle on load	Cycle on load	Cycle on load	Cycles on load
Space condition fan power (W/cfm) Proposed < MERV 13	0.528	0.528	0.522	0.528	0.528
Space Condition Fan Power (W/cfm) Proposed ≥ MERV 13	0.634	0.634	0.634	0.634	0.634
Heating/Cooling sizing factor ^c	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) ^d	4.46	3.83	4.25	3.83	3.83
Modeled heating COP (Net of fan) ^d	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
Number of Stages of Cooling	Single	Single	Two	Single	Single
OSA Economizer ^e	No	No	Yes	Yes	Yes
Occupied ventilation source ^f	DOAS	DOAS	DOAS	DOAS	DOAS
DOAS Fan Power (W/cfm of outside air)	0.819	0.819	0.730	0.742	0.780
DOAS Fan Power (W/cfm) Proposed ≥ MERV 13	1.042	1.042	0.928	0.944	0.944
DOAS temperature control ^{g, h}	Bypass	Wild	Bypass	Bypass	Wild
ERV efficiency (sensible only)	70%	70%	70%	70%	70 percent

Reminder:

If an HVAC system is designed to meet or exceed the standard reference design requirements, the system is exempt from TSPR

A modern multi-story building with a blue and brown facade and large glass windows. The building has multiple balconies and a flat roof with some mechanical equipment. The text "Heat Pump Service Water Heating" is overlaid in white on the left side of the image.

Heat Pump Service Water Heating

NEW Heat Pump Prescriptive Compliance Path

Equipment type criteria for service water heating (SWH)

► NEW Prescriptive Path

- Section C404.2.1 requires **air-source heat pump water heaters (HPWH)** as the prescriptive primary source of SWH energy capacity for at least 50% of the calculated peak demand for domestic hot water
- Remaining 50% primary capacity can be HPWHs, **ER** and/or **FF** equipment
- **ER** and/or **FF** equipment are allowed for the initial 50% primary capacity if the project complies with the **Fossil Fuel Compliance Path**
- Supplemental heating – Capacity allowance for temp maintenance; compressor coil defrost; freeze protection; back-up heating capacity for low ambient temp conditions and equipment failure

C401.3
C404.2.1
C404.2.1.4

Prescriptive Service Water Heating

Utilizing waste heat energy

- ▶ Waste heat energy capacity may be used to offset a portion or all of the required 50% primary HPWH capacity
- ▶ Sources of waste heat energy
 - Wastewater heat recovery (shower drain and other sources)
 - Energy recovery from water-source and ground-source heat pump systems
 - Condenser heat recovery for service water heating
 - Steam condensate heat recovery system
 - Other sources of waste heat energy, pre-approved by the Code Official

C404.2.1 Exception 2

C403.9.2.1

C403.9.2.2

Prescriptive Service Water Heating

Utilizing renewable energy

- ▶ Solar thermal energy systems may be used to offset a portion or all of the required 50% primary HPWH capacity



C404.2.1 Exception 2

Prescriptive Service Water Heating

Electric resistance (ER) allowance

- ▶ Up to **24 kW plus 0.1 watts/SF** of **ER** service water heating capacity is allowed per building
- ▶ This base allowance is taken off the top before the required primary HPWH capacity is calculated

ER Base Allowance

50% primary HPWH capacity

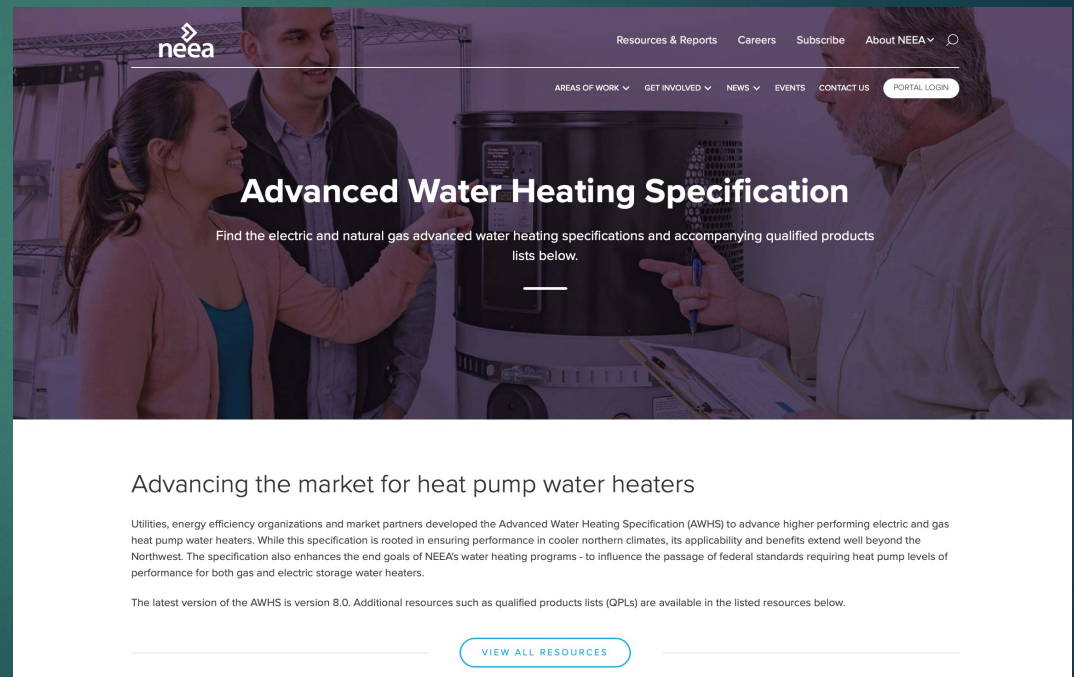
+ 50% primary capacity of any SWH equipment type

Total Primary SWH Capacity

Prescriptive Service Water Heating

HPWH Compliance Alternative

- ▶ Northwest Energy Efficiency Alliance (NEEA) Commercial Electric Advanced Water Heating Specification (AWHS)
- ▶ Performance specs are based on system configuration
- ▶ Includes Qualified Products List (QPL) for commercial and residential HPWHs
- ▶ Comply with AWHS criteria in lieu of C404.2.1 requirements



C404.2.1 Exception 3

SWH Equipment Types

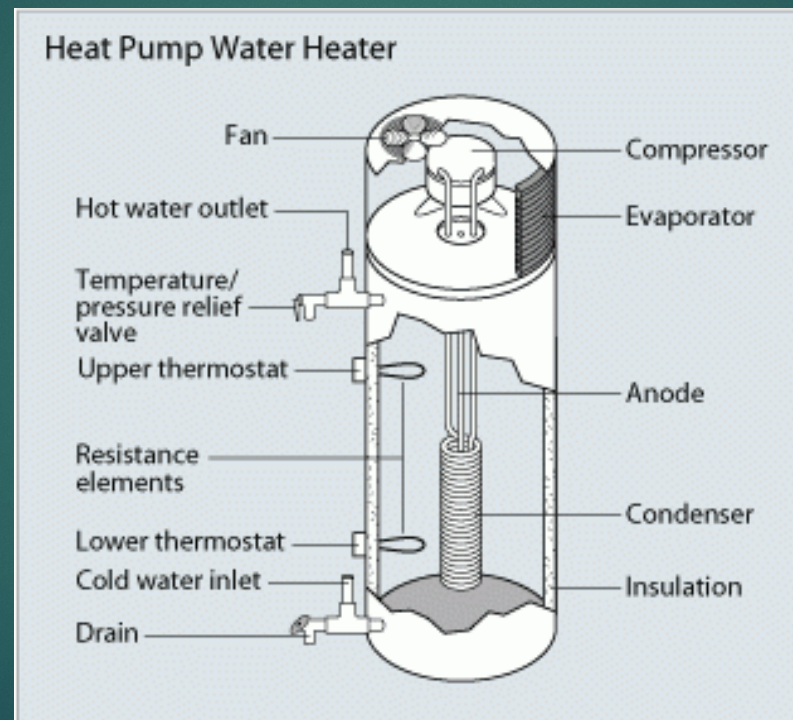


Image courtesy of US DOE – Energy Saver

Dwelling Units – HPWH

Single packaged unitary HPWH

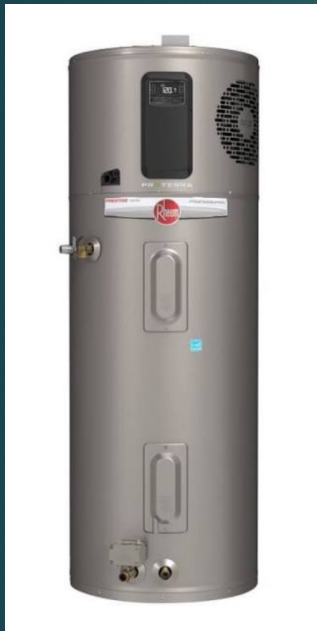


Image courtesy of Rheem

Split system HPWH

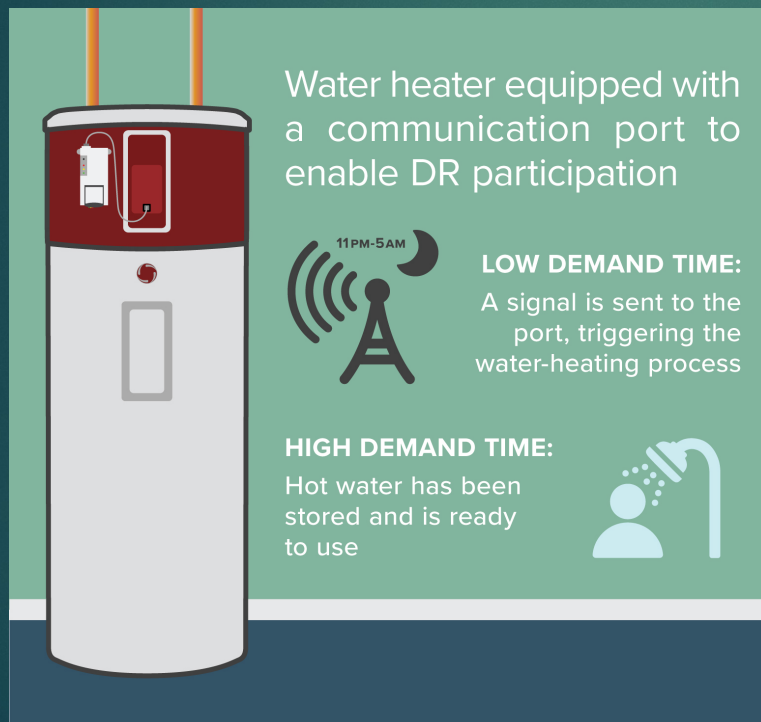


Image courtesy SANCO2

HPWH Types

- **Packaged unitary** – Heat pump with storage tank is located within a vented storage closet either on a balcony or other location adjacent to the dwelling
- **Split system** – Storage tank is located within the dwelling unit, condensing unit is located outdoors on the roof, mounted to the exterior, or on-grade

Dwelling Units – Electric Tank Type Water Heater



Electric resistance water heater

- Equipment is located within the dwelling unit
- Allowed for remaining 50% SWH capacity or via Fossil Fuel Compliance Path

Optional Demand Response (DR)

- Equipped with a (DR) communication port
- Provides future opportunity for electric service providers to reduce peak system demand and keep energy rates low

Dwelling Units – Instantaneous Water Heaters

Tankless electric resistance water heater



Image courtesy of AO Smith

Mini-tank electric resistance water heater

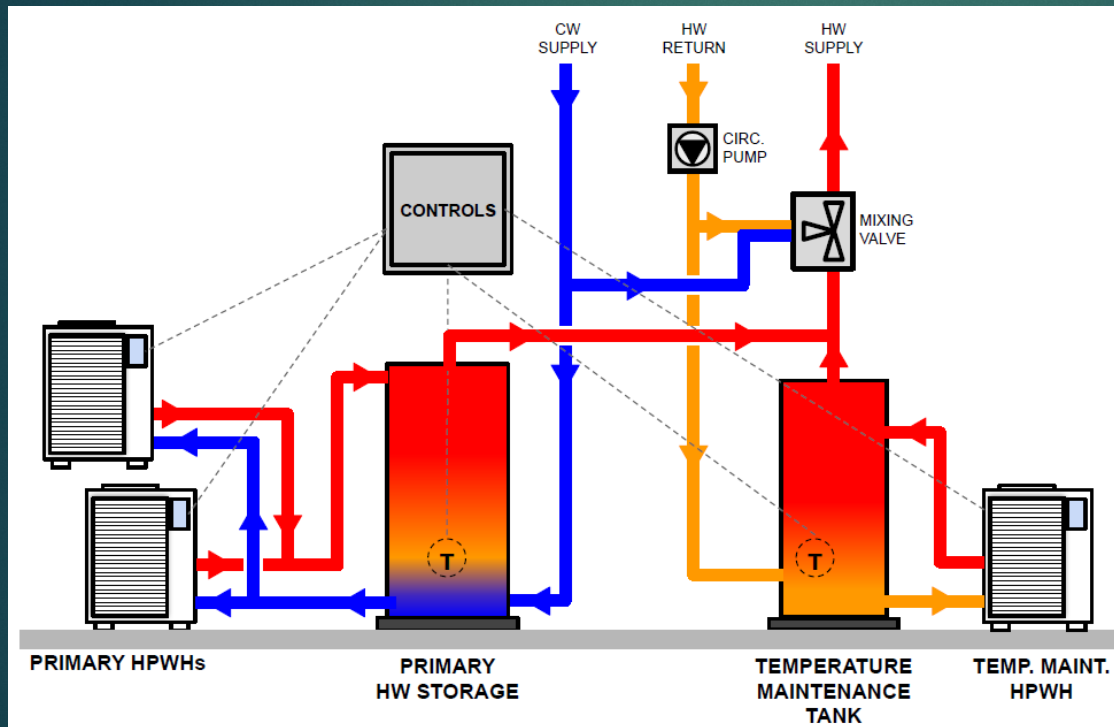


Image courtesy of Steibel Eltron

Tankless & mini-tank water heaters

- **ER** equipment is located within the dwelling unit at or near the point of use
- Service hot water produced on-demand versus being stored


Central SWH System – HPWH Plant



- Each dwelling unit is served via a SWH circulation loop
- Domestic hot water meter is required at each dwelling unit (C404.9)

SWH equipment types

- Primary HPWHs
- Standard or high-efficiency condensing boilers and water heaters

The background is a stylized, flat-design illustration of a landscape. On the left, a city skyline with various buildings is visible. In the center and right, there are rolling green hills, a body of water (lake or river), and several trees. The sky is a dark teal color with some light-colored clouds. The overall color palette is dominated by shades of green, blue, and teal.

Additional Energy Efficiency and Load Management

Additional Energy
Efficiency Credits

Which Group R-2
project types
are required to
comply with
additional
energy
efficiency
measures?

- ▶ New buildings
- ▶ Building additions
- ▶ Alterations that shall comply in the same manner as a building addition:
 - Change in space conditioning
 - Change in occupancy (as defined in C505.3) including **any space converted to a Group R dwelling unit** from another use or occupancy
- ▶ All other alterations are **NOT** required to comply with C406 per Section C503.1

C406.1
C406.1.1
C503.1
C505.1.1

Do the AEM provisions only apply to conditioned spaces?

- ▶ **NO** – AEMs apply to all levels of space conditioning including unconditioned, low energy, semi-heated and fully conditioned
- ▶ Applies to all enclosed spaces and unenclosed parking garages (categorized as low energy)
- ▶ Does not apply to **exterior building areas** such as covered canopies, courtyards under building overhangs, roof decks, unenclosed upper deck of parking structure
- ▶ Does not apply to **exterior site areas** such as surface parking, outdoor plazas, landscape areas

Which Group R-2
project types
are required to
comply with
load
management
credit
measures?

- ▶ **New buildings greater than 5,000 SF**
- ▶ Does **NOT** apply to:
 - Building additions
 - All alterations, including spaces undergoing a change in space conditioning or occupancy
 - Unconditioned and low energy spaces
 - Open and enclosed parking garages

Baseline Required Energy Measure Credits

**TABLE C406.1
ENERGY MEASURE CREDIT REQUIREMENTS**

Required Credits for Projects	Section	Occupancy Group					
		Group R-1	Group R-2	Group B	Group E	Group M	All Other
New building energy efficiency credit requirement	C406.2	54	41	42	48	74	49
Building additions energy efficiency credit requirement	C406.2	27	20	21	23	36	21
New building load management credit requirement	C406.3	12	15	27	15	13	26

There are several new measures to choose from, particularly for multifamily buildings

TABLE C406.2(1)
EFFICIENCY MEASURE CREDITS

Measure Title	Applicable Section	Prorating Flag	Occupancy Group					
			Group R-1	Group R-2	Group B	Group E	Group M	All Other
25. Enhanced envelope performance ⁹	C406.2.12	Heat	24	20	13	5	19	14
26. Base reduced air leakage ⁹	C406.2.13.2		29	24	6	3	9	11
27. Enhanced reduced air leakage ⁹	C406.2.13.3	Heat	53	44	11	5	16	20
29. Enhanced residential kitchen equipment	C406.2.15	Heat	12	19	NA	NA	NA	NA
30. Enhanced residential laundry equipment	C406.2.16	Heat	NA	6	NA	NA	NA	NA
31. Heat pump clothes dryers	C406.2.17	Heat	6	6	NA	NA	NA	NA
32. Efficient elevator equipment	C406.2.18	Heat	3	5	5	5	4	4

Envelope,
elevator,
kitchen &
laundry
equipment

Value of each AEM is based on modeled energy efficiency potential, or renewable energy benefit, by occupancy group

**TABLE C406.2(1)
EFFICIENCY MEASURE CREDITS**

Measure Title	Applicable Section	Prorating Flag	Occupancy Group					
			Group R-1	Group R-2	Group B	Group E	Group M	All Other
9. 10% reduced lighting power	C406.2.3.1	Heat	7	4	18	16	20	15
10. 20% reduced lighting power ^d	C406.2.3.2	Heat	13	8	36	32	40	29
11. Lamp efficacy improvement	C406.2.3.3	Heat	5	6	NA	NA	NA	NA
12. Residential lighting control	C406.2.4.1	Heat	NA	8	NA	NA	NA	NA
13. Enhanced lighting control	C406.2.4.2	Heat	1	1	6	6	11	6
14. Renewable energy	C406.2.5		7	12	13	13	10	11

Lighting
power &
controls,
renewable
energy

Efficiency measures applicable to dwelling unit lighting

**TABLE C406.2(1)
EFFICIENCY MEASURE CREDITS**

Measure Title	Applicable Section	Prorating Flag	Occupancy Group					
			Group R-1	Group R-2	Group B	Group E	Group M	All Other
9. 10% reduced lighting power	C406.2.3.1	Heat	7	4	18	16	20	15
10. 20% reduced lighting power ^d	C406.2.3.2	Heat	13	8	36	32	40	29
11. Lamp efficacy improvement	C406.2.3.3	Heat	5	6	NA	NA	NA	NA
12. Residential lighting control	C406.2.4.1	Heat	NA	8	NA	NA	NA	NA
13. Enhanced lighting control	C406.2.4.2	Heat	1	1	6	6	11	6
14. Renewable energy	C406.2.5		7	12	13	13	10	11

Lighting
power &
controls,
renewable
energy

Efficiency measures applicable to lighting in common core areas and parking garages

TABLE C406.2(1)
EFFICIENCY MEASURE CREDITS

Measure Title	Applicable Section	Prorating Flag	Occupancy Group					
			Group R-1	Group R-2	Group B	Group E	Group M	All Other
1. Dwelling unit HVAC control	C406.2.2	Heat	NA	7	NA	NA	NA	NA
2. Improved HVAC TSPR ^a	C406.2.2.1	Heat	NA	8	11	17	22	NA
3. Improve cooling and fan efficiency	C406.2.2.2	Heat	2	2	3	4	3	2
4. Improve heating efficiency	C406.2.2.3	Heat	2	3	3	10	16	7
5. Improved low-carbon district energy system (10% better)	C406.2.2.4		3	3	4	11	17	8
6. Improved low-carbon district energy system (20% better) ^b	C406.2.2.5		9	10	12	33	52	24
7. High performance DOAS	C406.2.2.6	Heat	31	31	21	39	40	21/ (A) 40 ^c
8. Fault detection & diagnostics (FDD)	C406.2.2.7	Heat	2	2	2	6	9	4

HVAC systems, low-carbon district energy systems

**TABLE C406.2(1)
EFFICIENCY MEASURE CREDITS**

Measure Title	Applicable Section	Prorating Flag	Occupancy Group					
			Group R-1	Group R-2	Group B	Group E	Group M	All Other
15. Shower drain heat recovery	C406.2.6.1	SWH	9	30	NA	3	NA	NA
16. Service water heat recovery	C406.2.6.2	SWH	35	111	13	14	(Grocery) 41 ^e	NA
17. Heat pump water heating	C406.2.6.3	SWH	72	54	1	13	(Grocery) 5 ^e	29 ^f
19. Heat trace system	C406.2.7.1	SWH	6	13	4	1	NA	6
21. Service hot water distribution right sizing	C406.2.8		13	42	NA	NA	NA	NA
22. High performance service hot water temperature maintenance system	C406.2.9		6	13	4	1	NA	6
23. High efficiency service hot water circulation system	C406.2.10		3	6	2	1	NA	4
24. Low flow residential showerheads	C406.2.11	SWH	3	3	NA	NA	NA	NA

Service
water
heating
equipment
& systems

**TABLE C406.3
LOAD MANAGEMENT MEASURE CREDITS**

Measure Title	Applicable Section	Occupancy Group					
		Group R-1	Group R-2	Group B	Group E	Group M	All Other
1. Lighting load management	C406.3.1	12	15	27	15	NA	NA
2. HVAC load management	C406.3.2	29	24	42	23	13	26
3. Automated shading	C406.3.3	NA	7	12	16	NA	NA
4. Electric energy storage	C406.3.4	41	50	126	72	37	65
5. Cooling energy storage	C406.3.5	13	10	14	19	NA	14
6. Service hot water energy storage	C406.3.6	31	248	59	8	5	70
7. Building thermal mass	C406.3.7	NA	NA	50	95	96	80



Renewable Energy & Solar Readiness

When do the renewable energy & solar readiness provisions apply?

	C411 Renewable Energy & Solar Readiness	Project conditioned floor area ≤ 10,000 sf *	Project conditioned floor area > 10,000 sf	Building height ≤ 20 stories	Building height > 20 stories
New Building	Renewable Energy	NA	✓	✓	✓
	Solar Readiness	✓	✓	✓	NA
Building Additions	Renewable Energy	NA	✓	✓	✓
	Solar Readiness	✓	✓	✓	NA
Change in Space Conditioning or Occupancy	Renewable Energy	NA	✓	✓	✓
	Solar Readiness	✓	✓	✓	NA
Existing Building Alterations	Renewable Energy	NA	NA	NA	NA
	Solar Readiness	NA	NA	NA	NA

* Solar readiness does not apply to projects < 500 sf

EPCA Edition
Update – C505.1.2

Renewable Energy Systems

What is required?

- ▶ Minimum renewable energy generation capacity not less than **0.5 watt/SF or 1.7 Btu/SF** multiplied by the sum of all **gross conditioned floor areas** of the building or building addition
- ▶ Includes fully conditioned and semi-heated spaces
- ▶ Renewable energy generation system may be located on or within the building or located on or within another structure elsewhere on the project site
- ▶ There are exceptions allowing reduced or no renewable energy capacity for buildings with limited available roof area or where a substantial portion of the roof area is shaded



C411.1
C505.1.2

Solar Readiness

What is required?

- ▶ Accommodations when a new building is constructed that will support the installation of future renewable energy systems
- ▶ Solar zone areas shall be designated on the architectural, electrical & structural plans
- ▶ Min required solar zone area is either:
 - **40%** of the roof area
 - 20% of the electrical service size – Calculated using 10 peak watts of photovoltaic per SF
 - Roof area = Gross roof SF area minus skylights, occupied roof decks, mech equipment including clearances, and vegetated areas
- ▶ Solar zone area does not have to be contiguous

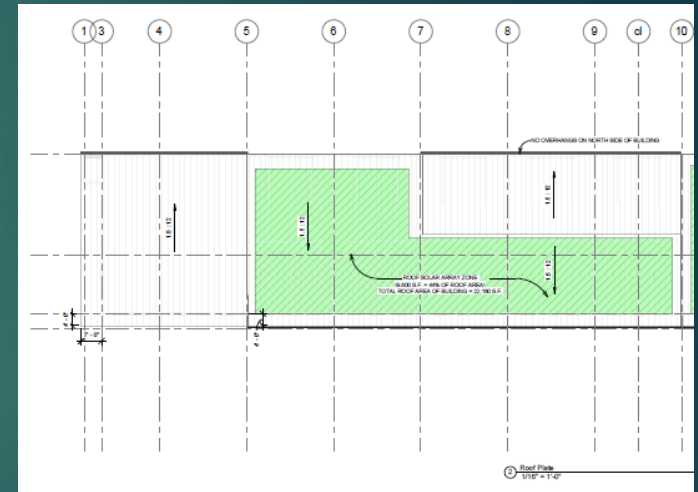


Image courtesy Lewellen Associates

2021 WSEC COMMERCIAL REQUIREMENTS FOR MULTIFAMILY BUILDINGS



WSEC Commercial Technical Support Team:

Lisa Rosenow - Evergreen Technology Consulting (ETC)

Duane Lewellen – Lewellen Associates, LLC

(360) 539-5300 | com.techsupport@waenergycodes.com