Streamlining the Process for 2021 WSEC-C Plan Review

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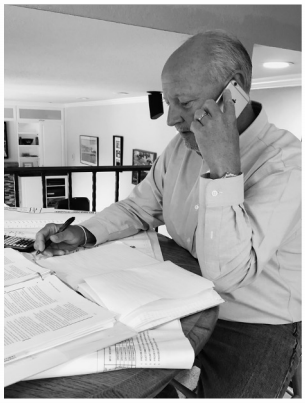
WSEC Commercial Technical Support



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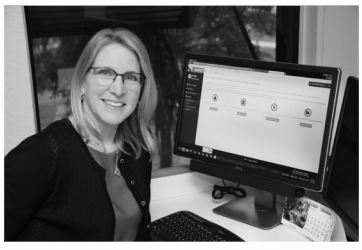
- On-call technical support thru 3 avenues
  - Telephone hot line – **360-539-5300**
  - Online form – **https://www.waenergycodes.com**
  - Email inquiries – **com.techsupport@waenergycodes.com**
- Classroom and webinar training
- We administer the technical support and compliance documentation webtool



Lisa Rosenow, ETC

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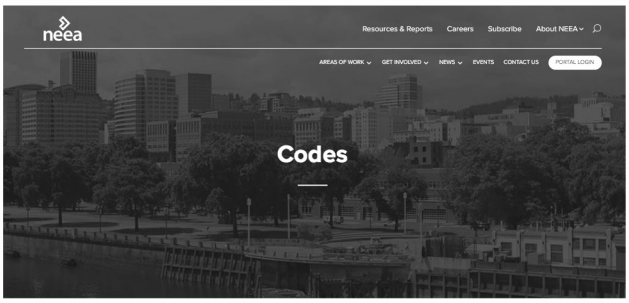

Increasing progressive effectiveness of energy codes

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/

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

www.neea.org

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Today's Presentation

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

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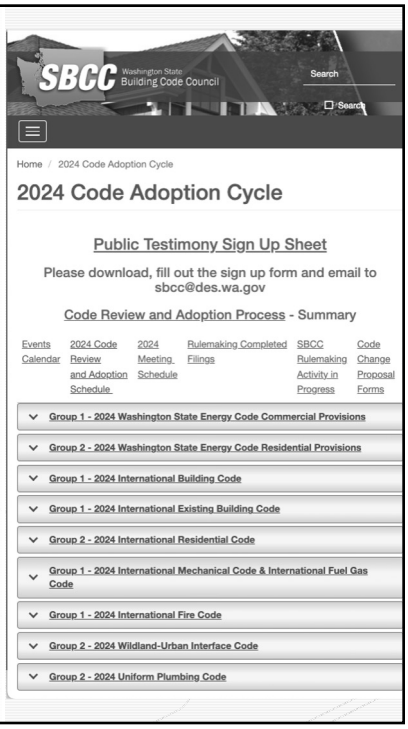
Code Development Update



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Code Filing Process & Latest Schedule

Remaining 2024 Code Adoption Cycle Schedule
1/23/2026

All Codes	Jan-26	Feb-26	Mar-26	Apr-26	May-26	Jun-26	Jul-26	Aug-26	Sep-26
CR-102 Drafting				4/3/26					
Committee Meeting for CR-102 + Economic Statements				4/10/26					
Council Meeting for CR-102 + Economic Statements				4/17/26					
CR-102 Filing Deadline					5/6/26				
Comment Period					5/6/26 through 6/12/26				
Hearings						6/9/26 through 6/12/26			
Work Shops						6/12/26 through 8/21/2026			
CR-103P Drafting							6/12/26 through 8/21/2026		
Council Meeting for CR-103 Filing (Final Adoption)								8/21/26	
CR-103P Filing									9/2/26
Code Publication									

Public Review Period - May 6th thru June 12th, 2026

Effective Date - May 2027

Implementation Date
Monday, May 3, 2027

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Building Envelope

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Building Envelope

Performance Impacts

- Unlike building systems that reach the end of their useful life and are replaced every 10-20 years, the building envelope remains for the life of the building.
- Envelope thermal performance and air leakage are a key drivers for mechanical heating & cooling system sizing and annual energy usage.
- Strategic fenestration reduces lighting annual energy usage.

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Key Envelope Details To Verify

Opaque Assemblies Thermal Performance

- Envelope prescriptive R-values and U-factors
- Various measures that mitigate thermal bridging

Fenestration Assemblies Thermal Performance

- Fenestration prescriptive U-factors and SHGCs

Overall Building Envelope

- Window-to-wall ratio (WWR) & Skylight-to-roof ratio (SRR)
- Component performance (U*A trade off) calculations
- Air barrier to control air leakage

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Space Conditioning Categories

Envelope compliance is calculated separately by category

- Installed heating & cooling capacities define the level of space conditioning.
- ***Low energy*** – Heating and/or cooling capacity is ≤ 3.4 Btu/h (1 watt) per SF
- ***Semi-heated*** – No cooling capacity, and the heating system total output capacity cannot exceed 8 btu/h per SF.
- ***Conditioned*** – Heating or cooling capacity exceeds what's allowed for low energy or semi-heated.
- Note that "conditioned" ***is not*** based on the capacity required to satisfy design heating or cooling conditions.
- Other categories include warehouse and walk-in coolers and freezers, and greenhouses (glazed spaces that are heated but not cooled).

Section C402.1.1
Section C202 Definitions

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Semi-heated Buildings & Spaces

Purpose – Exemption for wall insulation & vestibule requirements

- Exemption applies to walls separating semi-heated spaces from the exterior, or interior partitions separating semi-heated space from unconditioned or conditioned space.
- Component performance – Use the code target U-factor for the exempt wall assembly so the walls are neutral to the calculation.
- Fenestration located within walls enclosing a semi-heated space shall comply the same as for fully conditioned.

Section C402.1.1
Section C202 Definitions

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Envelope Compliance Methods

Prescriptive

- Each envelope opaque assembly type complies with either the prescriptive minimum insulation R-value or maximum allowed assembly U-factor.
- It's acceptable to mix and match (some opaque assemblies comply via R-value, some via U-factor).
- Each fenestration assembly type must comply with the maximum allowed U-factor and SHGC.
- Allowed SHGCs are higher if permanent shading is provided (PF factor).
- Overall window-to-wall ratio (WWR) does not exceed 30% prescriptive maximum allowed, or project complies with a prescriptive fenestration alternate that allows up to 40% WWR.
- Overall skylight-to-roof ratio (SRR) does not exceed 5% prescriptive max.

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Envelope Compliance Methods

Component performance triggers

- There are two calculations:
  - Opaque & fenestration – Assembly U-factors x Assembly areas (U*A)
  - Fenestration only – Assembly SHGC x Assembly areas (SHGC*A)
- One or more assemblies do not comply prescriptively.
- Window-to-wall ratio and/or skylight-to-roof ratio exceeds max allowed.
- Project includes an assembly that requires component performance.
- Project is pursuing the enhanced envelope additional energy efficiency measure (15% better U*A).

Section C402.1.5

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Prescriptive Compliance - Opaque Envelope

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-22 + R-3.5 TS + LS	R-25 + R-22 + R-3.5 TS + LS
Attic and other	R-49	R-49
~~Joist or single rafter~~	(U-factor only)	(U-factor only)
Walls, Above Grade		
Mass (above & below grade)	R-9.5ci	R-13.3ci
Metal buildings	R-13 + R-14ci	R-13 + R-14ci
Steel-framed	R-13 + R-10ci	R-19 + R-8.5ci
Wood framed and other	R-13 + R-7.5ci std R-20 + R-3.8ci std	R-13 + R-7.5ci std R-20 + R-3.8ci std or R-25 std
Concrete deck/balcony (TB)	R-10	R-10

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 (above & below)	U-0.104	U-0.078
Mass transfer deck slab	U-0.20	U-0.20
Metal buildings	U-0.050	U-0.050
Steel framed	U-0.055	U-0.055
Wood framed and other	U-0.051	U-0.051
Inter. mass floor edge	U-0.104	U-0.078
Concrete deck/balcony	U-0.089	U-0.089

- Below grade mass walls – Insulation requirements are the same as above grade walls.
- Concrete deck/balcony – U-factor is from Table A103.3.7.2 for R-10 thermal break (TB).

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Prescriptive Compliance – Opaque Envelope

Table C402.1.3 - R-Value Method

CLIMATE ZONE	5 AND MARINE 4	
	All Other	Group R
Floors		
Mass	R-30ci	R-30ci
Wood floor joist/framing	R-30	R-30
Steel floor joist/framing	R-38 + R-10ci	R-38 + R-10ci
Slab-on-Grade Floors		
Unheated slabs	R-10 for 24" below	R-10 for 24" below
Heated slabs	R-10 perimeter & under entire slab	R-10 perimeter & under entire slab

Table C402.1.4 - U-Factor Method

CLIMATE ZONE	5 AND MARINE 4	
	All Other	Group R
Floors		
Mass	U-0.031	U-0.031
Wood- or steel-floor joist/framing	U-0.029	U-0.029
Slab-on-grade Floors		
Unheated slabs	F-0.54	F-0.54
Heated slabs	F-0.55	F-0.55
Opaque Doors		
Non-swinging door	U-0.31	U-0.31
Swinging door	U-0.37	U-0.37
Garage door < 14% glazing	U-0.31	U-0.31
Garage door ≥ 14% & ≥ 25% single row glazing	U-0.44	U-0.44
Garage door ≥ 14% & ≤ 50% glazing (any # of rows)	U-0.34	U-0.34

- Steel floor joist/framing – R-value is from Table C402.1.3 Footnote e.
- Garage door w/ single row glazing – U-factor is from Table C402.1.4 Footnote i.
- All opaque doors with > 50% glazing shall be categorized as fenestration.

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Alternate R-value Equivalents

- Typical metal fasteners usually don't exceed the 0.04% allowance to qualify as CI.
- Assemblies that may exceed CI allowance include stand-off brackets, C-channels, Z-furring, continuous metal framing members.
- Stainless steel fasteners have a lower thermal bridging impact on CI.

Table C402.1.3 (j) - Continuous Insulation Equivalents

Column A	Column B	Column C
Assemblies with continuous insulation (see definition)	Alternate option for assemblies with metal penetrations that are > 0.04% and < 0.08%, OR > 0.12% and < 0.24% if fasteners are stainless steel	Alternate option for assemblies with metal penetrations that are ≥ 0.08% but < 0.12%, OR > 0.24% and < 0.48% if fasteners are stainless steel
R-9.5ci	R-11.9ci	R-13ci
R-11.4ci	R-14.3ci	R-15.7ci
R-13.3ci	R-16.6ci	R-18.3ci
R-30ci	R-38ci	R-42ci
R-38ci	R-49ci	R-53ci
R-13 + R-7.5ci	R-13 + R-9.4ci	R-13 + R-10.3ci
R-13 + R-10ci	R-13 + R-12.5ci	R-13 + R-13.8ci
R-13 + R-13ci	R-13 + R-16.3ci	R-13 + R-17.9ci
R-20 + R-3.8ci	R-20 + R-4.8ci	R-20 + R-5.3ci
Additional equivalent values available		

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Prescriptive Compliance – Fenestration

- Each fenestration assembly type shall comply with the maximum allowed U-factor and SHGC.
- Class AW windows have more stringent performance requirements.
- SHGCs are based on fixed vs. operable, and the presence of permanent shading (PF).
- All opaque doors with > 50% glazing shall comply as a fenestration entrance door, ***not*** an opaque assembly.

Table C402.4 - U-Factor & SHGC

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 U-factor	U-0.34	
Operable U-factor	U-0.36	
Entrance doors		
U-factor	U-0.60	
U-factor for all other vertical fenestration		
Fixed U-factor	U-0.26	
Operable or mulled windows with fixed & operable sections U-factor	U-0.28	
SHGC for all vertical fenestration		
	Fixed	**Operable**
PF < 0.2	0.38	0.33
0.2 ≤ PF < 0.5	0.46	0.40
PF ≥ 0.5	0.61	0.53
Skylights		
U-factor	U-0.50	
SHGC	0.35	

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High Performance Fenestration Alternate

- Allows project to comply prescriptively with up to 40% WWR.
- To qualify, all fenestration assemblies shall comply with maximum allowed high performance U-factors and SHGCs.
- High performance vertical fenestration SHGCs are 10% lower (0.90) than standard.
- U-factor area-weighting is allowed within the same fenestration product category. Area-weighting between categories is not permitted.

Section C402.4.1.1.2 - U-Factor & SHGC

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 U-factor	**U-0.31**	
Operable U-factor	U-0.36	
Entrance doors		
U-factor	U-0.60	
U-factor for all other vertical fenestration		
Fixed U-factor	**U-0.23**	
Operable or mulled windows with fixed & operable sections U-factor	**U-0.24**	
SHGC for all vertical fenestration		
	Fixed	**Operable**
PF < 0.2	**0.34**	**0.30**
0.2 ≤ PF < 0.5	**0.41**	**0.36**
PF ≥ 0.5	**0.55**	**0.48**
Skylights		
U-factor	U-0.50	
SHGC	0.35	

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Thermal Bridging Mitigation

Various sources addressed in the 2021 WSEC-C

- Mechanical equipment penetrations thru wall assembly area
- Concrete decks & balconies
- Peripheral edges of intermediate concrete floors
- Mass transfer deck slab

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Mechanical Equipment with Through-Wall Penetrations

What is required?

- U-factor penalty if total area of penetrations **exceeds 1%** of the above-grade wall area.
- Applies to equipment listed in Table C403.3.2(4).
- Includes PTACs, PTHPs, single package vertical AC & HPs (SPVAC, SPVHP) and room air conditioners.

Why is this requirement in the 2021 WSEC-C?

- Difficult to incorporate envelope insulation around penetration sleeves, even when sleeves are properly installed.
- Often causes thermal bridging in the building envelope.

Section C402.1.4.3
Table C402.1.4, Footnote k

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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**
- Maximum allowed opaque wall U-factor for wood-framed wall = **U-0.051**

Area-weighted U-factor = (0.5 * 2%) + (0.051 * 98%) = U-0.060

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Mechanical Equipment with Through-Wall Penetrations

Plan Review Check List

What to look for during plan review ~

- Calculation documenting ***% area of thru-wall penetrations*** relative to the total opaque wall area.
- U-factor penalty
  - Mechanical equipment penetrations shall be assigned a ***default U-factor of U-0.5***.
  - This default is compared to the code maximum allowed U-factor of the corresponding wall assembly (mass, steel-framed, wood-framed, metal building).
- ***Component performance calculations*** - Mechanical equipment penetration area is area-weighted with the opaque above-grade wall area using the U*A trade-off method.

Table C402.1.4, Footnote k
Section C402.1.4.3

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Concrete Decks & Balconies

What is required?

- U-factor penalty if a minimum ***R-10 thermal break***, aligned with the primary insulating layer in the adjoining wall assembly, ***is not*** provided.
- Includes all above-grade concrete slab elements that penetrate the building thermal envelope.

Why is this requirement in the 2021 WSEC-C?

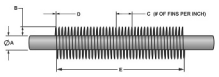

Image courtesy of Durafin Tube

- Protruding concrete slabs act like a finned tube radiator, a method that ***increases*** heat transfer.
- This thermal bridge at each balcony or deck can cause substantial heat loss.

Section C402.2.8

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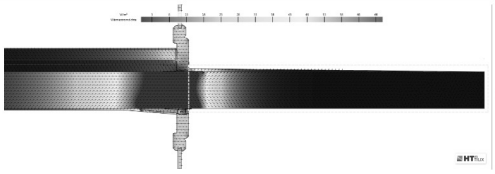
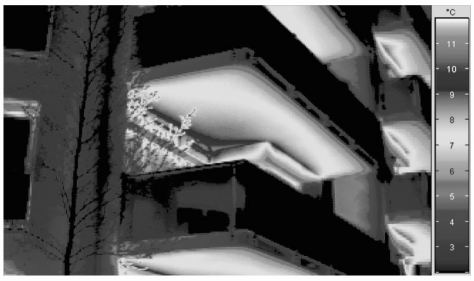
Concrete Decks & Balconies

* Heat flux is the rate of heat energy transfer per unit area, representing how quickly heat moves through a surface.



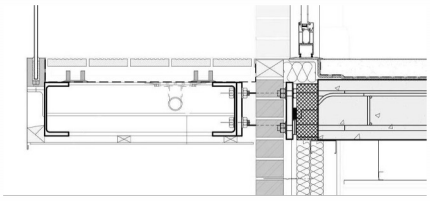
* Heat flux reading - Balcony without thermal break

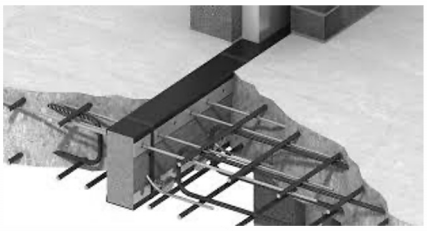
Image courtesy of HT Flux



The Construction Specifier

SOLUTIONS





Stainless steel reinforcing bars are permitted to penetrate thermal break without penalty.

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Concrete Decks & Balconies

Plan Review Check List

What to look for during plan review ~

- Evidence of at minimum R-10 thermal break.
- If thermal break is not provided, ***component performance calculations*** are required.
- Cross-section SF area of all balconies & decks in the project is required for U*A calculations.
- U-factor penalty
  - Proposed U-factor in component performance calculations must be for exposed concrete from Appendix A Table A103.3.7.2.
  - Code target with thermal break is U-0.089.

Table A103.3.7.2
Default U-factors for Peripheral Edges of Intermediate Concrete Floors[a, b, c]

Slab Edge Treatment	Average Thickness of Wall above and below			
	6 inches	8 inches	10 inches	12 inches
Exposed Concrete	0.816	0.741	0.678	0.625
R-5 Exterior Insulation	0.161	0.157	0.154	0.152
R-6 Exterior Insulation	0.138	0.136	0.134	0.132
R-7 Exterior Insulation	0.122	0.120	0.118	0.116
R-8 Exterior Insulation	0.108	0.107	0.106	0.104
R-9 Exterior Insulation	0.098	0.097	0.095	0.094
R-10 Exterior Insulation	0.089	0.088	0.087	0.086
R-11 Exterior Insulation	0.082	0.081	0.080	0.079
R-12 Exterior Insulation	0.076	0.075	0.074	0.074
R-13 Exterior Insulation	0.070	0.070	0.069	0.068
R-14 Exterior Insulation	0.066	0.065	0.065	0.064
R-15 Exterior Insulation	0.062	0.061	0.061	0.060

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Other Mass Elements

Peripheral edges of mass floors – What is required?

- To comply prescriptively, slab edge shall be insulated to the same level as the adjoining wall.
- The cross-section of all mass floor edges is accounted for as a wall assembly type.
- Code target U-factor is the same as the adjoining wall type.
- Similarly to concrete decks & balconies, if un-insulated the proposed U-factor in component performance calculations must be for exposed concrete from Appendix A Table A103.3.7.2.

Table C402.1.4, Footnote g

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Other Mass Elements

Mass transfer deck slab – What is it?

- Concrete slab that extends past the footprint of the floor above and there is space (conditioned or unconditioned) below the slab.
- Due it's configuration, it is not insulated.
- U-factor penalty
  - Proposed U-factor in component performance calculations must be for exposed concrete from Appendix A Table A103.3.7.2.
  - Code target for this element is U-0.20.

Table C402.1.4, Footnote j

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Controlling Air Leakage

All these WSEC-C requirements address building envelope air leakage

- Continuous air barrier
- Sealing and gasketing requirements
- Low-leakage motorized dampers
- Vestibules
- Building enclosure testing

Courtesy of Neudorfer

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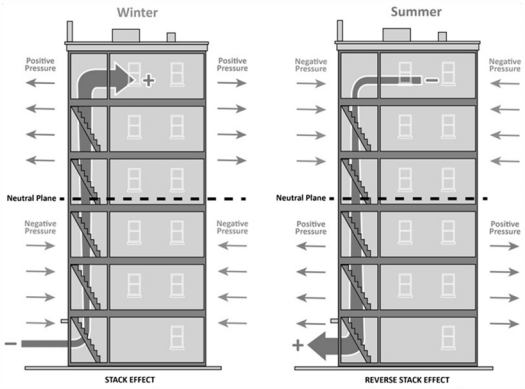
Air Barrier Durability

Air barrier construction

- Sealing at joints, seams, penetrations and between different air barrier materials shall allow for expansion and contraction from wind, stack affect and from mechanical vibration.



C402.5.1.1

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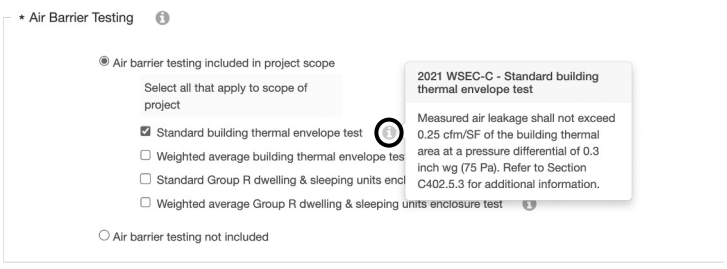
Building Enclosure Testing Criteria

- Measured air leakage shall not exceed ***0.25 cfm/SF*** (based on air barrier enclosure area) tested at 75 Pa.
- Identify testing method - measured standard or weighted average.
- Test procedure shall be per ASTM, ANSI/RESNET or other approved standard.
- A report that demonstrates a ***passing result of the air leakage test*** shall be provided to the Code Official and building owner.



C402.5.1.2

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Applicability by Building Types

- **New construction** – Building enclosure testing requirements apply to all new buildings and building additions.
- **Low energy buildings & spaces** – Exempt from the building thermal envelope provisions of the code, including building enclosure testing.
- **Semi-heated buildings & spaces** – Shall comply with the same requirements as fully conditioned spaces, thus building enclosure testing **is** required.
- **Alteration, renovation or repair** that includes envelope assemblies – The building enclosure testing provision is ***not intended*** to apply to alterations, renovations or repairs, provided the alteration does not include a change of space conditioning or change of occupancy.

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What if the building initially fails the building enclosure test?

If standard measured or weighted-average air leakage rate exceeds 0.25 cfm/SF….

- Conduct inspection of all air barrier elements.
- Corrective action shall be taken to seal leaks in the air barrier.
- **Retest** and continue corrective actions until the ***building passes*** the 0.25 cfm/SF maximum allowed leakage rate.

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Envelope Plan Review

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Opaque Assemblies Prescriptive Compliance

Plan Review Check List

What to look for during plan review ~

- Compare R-values, U-factors and F-factors information provided in the project plans with these same values in calculations and output reports to verify they match.
- Check U-factor and F-factor source information used to demonstrate prescriptive compliance.
- If roof or wall assembly types have multiple requirements, confirm all compliance parameters are addressed.
- If continuous insulation is required, check whether method of fastening includes stand-off brackets, C-channels, Z-furring or other forms on continuous metal framing members (triggers alternate R-values).
- For opaque garage doors with fenestration, % fenestration calculations for each door are required (defines required U-factor).

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Opaque Assemblies Prescriptive Compliance

Plan Review Check List

What to look for during plan review ~

- ***Confirm ALL performance parameters for all opaque assemblies comply with code target requirements***.
- If multi-story project includes intermediate concrete floors:
  - Confirm peripheral slab edge insulation is provided.
  - If project includes concrete decks or balconies, confirm an R-10 or higher thermal break is provided and aligned with the wall insulation.
- If project includes packaged HVAC equipment with thru-wall penetrations, locate calculations that verify the total SF area of wall penetrations ***does not*** exceed 1%.
- Confirm project does not include a mass transfer deck.

If any of these conditions *ARE NOT TRUE*, then the project shall comply via *component performance*.

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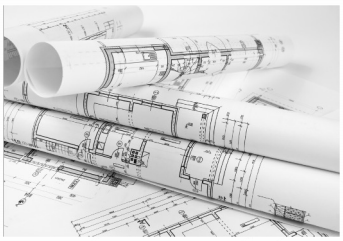
Fenestration Assemblies Prescriptive Compliance

Plan Review Check List

What to look for during plan review ~

- Compare U-factors, SHGCs and fixed/operable information provided in the project plans with these same values in calculations and output reports to verify they match.
- Check if specified vertical fenestration assemblies are ***Class AW*** rated. If not, then the more stringent U-factors apply.
- Identify if permanent shading devices are being claimed for higher allowed SHGCs, and if so, confirm projection factor (PF) calculations are provided and match applied SHGCs.



36

Fenestration Assemblies Prescriptive Compliance

Plan Review Check List

What to look for during plan review ~

- ***Confirm ALL performance parameters for all fenestration assemblies comply with code target requirements.***
- WWR and SRR calculations are provided and:
  - WWR is ≤ 30%, OR
  - WWR is ≤ 40% ***AND*** project complies with a prescriptive fenestration alternate (high performance glazing or enhanced daylighting)
  - SRR is ≤ 5%

If any of these conditions *ARE NOT TRUE*, then the project shall comply via *component performance*.

37

Component Performance Compliance

Plan Review Check List

What to look for during plan review ~

- Confirm ***ALL*** opaque and fenestration assemblies are included in the U*A and SHGC*A calculations.
- Confirm source information is provided for all U-factors, F-factors and SHGCs used in the calculations.
- If WWR and/or SRR exceeds maximum allowed, confirm target area adjustments are applied in the U*A and SHGC*A calculations.
- Enhanced envelope additional energy efficiency measure:
  - If claimed, confirm a 15% better than code multiplier (0.85) is applied to the U*A and SHGC*A calculations.
  - If claimed for a change of space conditioning or occupancy project, required multiplier is only 5%. (+10% UA allowance - 15% = 0.95)

38

Air Barrier Requirements

Plan Review Check List

What to look for during plan review ~

- Confirm continuous air barrier boundary is included in the project documents.
- Verify Architect of Record has calculated the total sf area of the air barrier boundary, used for test calculations.
- Building enclosure testing is included in the project general requirements.

What to look for during field inspection ~

- Verify presence of air barrier materials in envelope assembly. Too often not installed at all.
- Look for continuity, sealed material transitions & penetrations.
- Request building enclosure test results that include tested surface area, floor area, air by volume, stories above grade, and leakage rates.

39

Lighting Systems

40

Lighting Systems

History of LPAs

- LED technology has been a key driver for reductions in lighting power allowances over successive energy code cycles.
- Following industry trends, general lighting power allowances (LPA) are balanced with specific application lighting allowances.
- Greater emphasis on more granular occupancy-based lighting controls.

41

Key Lighting Details To Verify

Lighting Power

- Interior lighting power allowance compliance method applied.
- Exterior lighting zone (categorizes building exteriors based on surrounding brightness) that exterior lighting power allowances are based on.
- Total proposed lighting wattage ***does not exceed*** total lighting power allowance. LPA test is applied to interior lighting systems and exterior lighting systems separately.

Lighting Controls

- Occupancy-based automatic shut-off controls and manual controls.
- Automatic light reduction and/or dimming controls based on available daylight and occupancy.

42

Interior Lighting Power Allowance Methods

Building Area Method

- Simplified list of building use types
- Each building area must comply independent of other building areas (no wattage trading allowed between areas)
- No additional lighting power allowances
- Typically provides less generous overall allowance

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

Building Area Type	LPD(w/ft²)
Automotive facility	0.64
Convention center	0.64
Court house	0.79
Dining: Bar lounge/leisure	0.79
Dining: Cafeteria/fast food	0.72
Dining: Family	0.71
Dormitory	0.46
Exercise center	0.67
Fire station	0.54
Gymnasium	0.75
Health care clinic	0.70
Hospital	0.84
Hotel/motel	0.56
Library	0.83
Manufacturing facility	0.82
Motion picture theater	0.44
Multiple family	0.41
Museum	0.55
Office	0.64
Parking garage	0.14
Penitentiary	0.65
Performing arts theater	0.84
Police station	0.66
Post office	0.65
Religious building	0.67
Retail	0.84
School/university	0.70
Sports arena	0.62
Town hall	0.69
Transportation	0.50
Warehouse	0.40
Workshop	0.91

Table C405.4.2(1)

43

Interior Lighting Power Allowance Methods

Space-by-Space Method

- Building may be divided into multiple space types
- 101 space types available
- Total LPA of all spaces in the project may be distributed across the entire project area
- Additional specific application lighting allowances available
- More effort to calculate, however often provides a more generous overall allowance

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

Common Space-by-Space Types[a,j]	LPD (w/ft²)
Atrium - Less than 20 feet in height	0.39
Atrium - 20 to 40 feet in height	0.48
Atrium - Above 40 feet in height	0.60
Audience/seating area - Permanent[l]	
In an auditorium	0.61
In a gymnasium	0.23
In a motion picture theater	0.27
In a penitentiary	0.67
In a performing arts theater	1.16
In a religious building	0.72
In a sports arena	0.33
Otherwise	0.23
Banking activity area[l]	0.61
Breakroom (see lounge/breakroom)	
Classroom/lecture hall/training room	
In a penitentiary	0.89
Otherwise[h]	0.71
Computer room, data center	0.94
Conference/meeting/multipurpose	0.97
Confinement cell	0.70
Copy/print room	0.31
Corridor	
In a facility for the visually impaired (and not used primarily by the staff)[b]	0.71
In a hospital	0.71
In a manufacturing facility	0.41
Otherwise[c,l]	0.41
Courtroom[c]	1.20

Table C405.4.2(2)

44

Interior Additional Allowance LPAs

Space-by-Space Method Additional Allowances

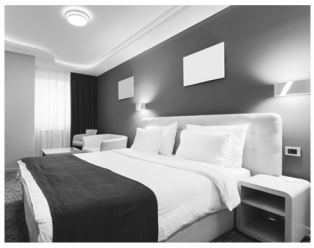
1. Lighting in sales areas to highlight retail merchandise
   - Additional base site allowance = 500 watts
   - Retail 1 & 2 = 0.45 w/sf; Retail 3 = 1.05 w/sf; Retail 4 = 1.87 w/sf
2. Lighting to highlight art & exhibits – 0.2 watt/sf
3. Directional lighting for classroom white/chalkboard – 4.5 watts/lf
4. Ornamental lighting for decorative purposes – 0.15 w/sf

Use it or lose it allowances – Additional allowances can only be applied to installed fixtures, cannot carry over unused wattage allowance to other spaces.

Section C405.4.2.2.2
Table C405.4.2(2) Footnotes

45

Interior lighting power additional energy efficiency measures



Reduced interior lighting power options

- Total connected interior lighting power within the project area is ***10% or 20% lower*** compared to the WSEC lighting power allowance (LPA).
- Applies to projects complying via the Building Area Method or Space-by-space Method.

Lamp efficacy in Group R-1 & R-2

- Lamps within permanently installed lighting fixtures shall have a minimum efficacy of 90 lumens per watt. Applies to ≥ 95% of fixtures.
- Applies to dwelling units and sleeping units within Group R-1 and Group R-2 occupancies.

Section C406.2.3.1
Section C406.2.3.2
Section C406.2.3.3

46

Exterior Lighting Power Allowance LPAs

Exterior Surface Allowances

- Lighting zone for the building establishes the base site allowance and all the exterior lighting power allowances.
- Two categories of exterior lighting allowances
  1. General exterior surface allowances (parking, building grounds, areas under exterior canopies, etc)
  2. Allowances for specific exterior elements and locations (entrance lighting, loading areas, ATMs, building façade lighting)

Section C405.5.3
Table C405.5.3(1), (2) & (3)

47

Exterior Lighting Power Allowance LPAs

Table C405.5.3(2)
Lighting Power Allowances for Building Exteriors

	Lighting Zones			
	Zone 1	Zone 2	Zone 3	Zone 4
Base Site Allowance	160 W	280 W	400 W	560 W
Uncovered Parking Areas				
Parking areas and drives	0.015 W/ft^2	0.026 W/ft^2	0.037 W/ft^2	0.052 W/ft^2
Building Grounds				
Walkways and ramps less than 10 feet wide	0.04 W/ft^2	0.07 W/ft^2	0.10 W/ft^2	0.14 W/ft^2
Walkways and ramps 10 feet wide or greater, plaza areas, special feature areas	0.04 W/ft^2	0.07 W/ft^2	0.10 W/ft^2	0.14 W/ft^2
Dining areas	0.156 W/ft^2	0.273 W/ft^2	0.390 W/ft^2	0.546 W/ft^2
Stairways	Exempt	Exempt	Exempt	Exempt
Pedestrian tunnels	0.063 W/ft^2	0.110 W/ft^2	0.157 W/ft^2	0.220 W/ft^2
Landscaping	0.014 W/ft^2	0.025 W/ft^2	0.036 W/ft^2	0.050 W/ft^2
Building Entrances and Exits				
Pedestrian and vehicular entrances and exits	5.6 W/linear foot of opening	9.8 W/linear foot of opening	14.0 W/linear foot of opening	19.6 W/linear foot of opening
Entry canopies	0.072 W/ft^2	0.126 W/ft^2	0.180 W/ft^2	0.252 W/ft^2
Loading docks	0.104 W/ft^2	0.182 W/ft^2	0.260 W/ft^2	0.364 W/ft^2

Table C405.5.3(1)
Exterior Lighting Zones

Lighting Zone	Description
1	Developed areas of national parks, state parks, forest land, and rural areas
2	Areas predominantly consisting of residential zoning, neighborhood business districts, light industrial with limited nighttime use and residential mixed use areas
3	All other areas not classified as lighting zone 1, 2, or 4
4	High-activity commercial districts in major metropolitan areas as designated by the local land use planning authority

Section C405.5.3
Table C405.5.3(1), (2) & (3)

48

Interior Lighting Controls Compliance Paths

Lighting systems shall comply with all mandatory interior lighting controls requirements including:

Occupant Sensing	Daylight Responsive	LTG Power Reduction	Automatic Shut Off

OR

Comply with requirements for
Luminaire Level Lighting Controls

Section C405.2.1

49

Lighting Controls Fundamentals

On/off and step control

Lighting power reduction

- All luminaires not required to have some form of automatic control shall be controlled with ***manual lighting power reduction controls***.
- Functionality shall uniformly reduce overall lighting power within the lighting zone to ≤ 50% power.

- Luminaires provided with manual control shall also be provided with ***time switch control*** that shuts off all lighting when the building is unoccupied.
- Various exceptions include spaces where lighting is intended for continuous operation, spaces with very low lighting wattage, and where manual operation would endanger occupant safety or security.

Section C405.2.4
Section C405.2.6

50

Occupant Sensing Controls

Daylight responsive automatic controls are required for *general lighting* luminaires located within specific space types

- Setpoints and control function requirements vary by space type.
- Daylight sensing and specific application lighting control requirements may also apply.

Section C405.2.1

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Occupant Sensor Controls

Table C405.2.1
Occupant Sensor Compliance Requirements for Space Types

Space Type	Comply with Section
Classrooms/lecture/training rooms	C405.2.1.1
Conference/meeting/multipurpose rooms	C405.2.1.1
Copy/print rooms	C405.2.1.1
Lounge/breakrooms	C405.2.1.1
Enclosed offices	C405.2.1.1
Open plan office areas	C405.2.1.3
Restrooms	C405.2.1.1
Storage rooms	C405.2.1.1
Locker rooms	C405.2.1.1
Other spaces 300 square feet (28 m^2) or less that are enclosed by floor-to-ceiling height partitions	C405.2.1.1
Warehouse storage areas	C405.2.1.2
Library stacks	C405.2.1.2
Enclosed fire rated stairways	C405.2.1.5
Corridors	C405.2.1.6

Also Parking garages and covered vehicle entrances shall comply with C405.2.10

52

Daylight Responsive Controls

Daylight responsive automatic controls are required for *general lighting* luminaires located within spaces with access to natural daylight

- Refer to Sections C405.2.5.2 through C405.2.5.4 for daylight zone diagrams and definitions
- Provide daylight responsive controls ***in addition to*** occupancy sensing, light reduction and time switch controls, where required.

Section C405.2.5

53

Daylight Responsive Control Functions

Criteria for occupant sensing & daylight responsive combined controls

- When occupant sensing controls have reduced lighting power to the unoccupied setpoint, daylight responsive controls shall continue to reduce the lighting power level in response to available daylight.

Section C405.2.5.1

54

Specific Applications

Specific application lighting shall be controlled ***independently from*** general area lighting

- Additional lighting controls applications include:
  - Lighting for visual purposes other than general area lighting
  - Lighting for non-visual applications
  - Vacancy controls in sleeping units
  - Means of egress illumination
- Specific application lighting control requirements ***do not supersede*** mandatory lighting control requirements.

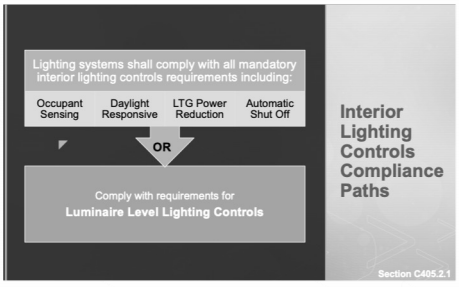
Section C405.2.6

55

Advanced Interior Lighting Controls

When are advanced interior lighting controls required?

- ***Mandatory*** for contiguous open office areas > 5,000 sf
- Projects complying via the LLLC compliance path
- Projects complying with the enhanced digital lighting controls additional energy efficiency measure.



Section C405.2.8
Section C405.2.1
Section C406.2.4.2

56

Advanced Interior Lighting Controls

Advanced control systems encompass all of the mandatory lighting control requirements in an optimized manner to enhance overall lighting system performance

- Advanced control methods include:
  - Networked lighting control (NLC)
  - Luminaire level lighting controls (LLLC)
- Both methods require all luminaires in the system to be configured with continuous full range dimming and high-end trim (or task tuning) for lighting power management.

Section C405.2.8.1
Section C405.2.8.2
Section C405.2.8.3

57

Luminaire Level Lighting Controls

Without LLLC:

Dimming Driver

Wired Installation

Occupancy and Daylight Sensors

With LLLC:

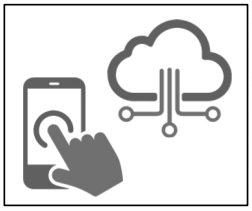
Image courtesy of Cree, Inc.

Each luminaire has embedded lighting control logic, occupancy & ambient light sensors, and local override switching capability, eliminating the need for separate devices.

Section C405.2.8.1

58

Enhanced interior lighting control additional energy efficiency measures



Enhanced digital interior lighting controls measure

- Lighting systems in at least 50% of the project floor area are provided with NLC or LLLC lighting controls with high end trim.

Group R-2 lighting controls measure

- In each dwelling or sleeping unit in a Group R-2 occupancy, provide a master control switch by the main entrance that turns off all lights and switched receptacles in the unit.
- Measure includes additional requirements for switched receptacles.

Section C406.2.4.1
Section C406.2.4.2

59

Exterior Lighting Control Functions

Daylight and occupancy-based control requirements

- Exterior lighting control function categories include:
  - Building façade & landscape lighting
  - Outdoor parking area lighting
  - All other exterior lighting surfaces
- Exterior lighting controls shall automatically turn off lighting when daylight is present and light level is sufficient to satisfy the lighting needs.
- Exterior lighting time switch control function requirements also apply.

Exempt exterior lighting:

- Covered vehicle entrances/exits for eye adaptation, safety or security
- Lighting controlled from within dwelling units

Section C405.2.9

60

Lighting Plan Review

61

Interior & Exterior Lighting Power

Plan Review Check List

What to look for during plan review ~

Interior Lighting

- Identify which interior lighting compliance method is being applied.

Both Interior & Exterior Lighting

- Confirm that all interior building areas or space types, and all exterior lighting surfaces, in the project are accounted for in the lighting power allowance calculations.
- Check that all interior lighting fixtures listed in the lighting fixture schedules in the project plans, are accounted for in the total proposed lighting wattage for the interior & exterior lighting compliance calculations.

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Interior Lighting Power

Plan Review Check List

What to look for during plan review ~

Building Area Method

- Compliance for each building area is calculated separately.
- No additional lighting power allowances have been applied.
- ***Confirm that the total proposed lighting wattage in each building area is ≤ the lighting power allowance for each building area.***

Space-by-Space Method

- Additional lighting allowance wattage is only used for fixtures installed for allowed uses within eligible spaces. (Un-used wattage is ignored.)
- ***Confirm that the total proposed lighting wattage for the project is ≤ the total allowed lighting wattage of all spaces in the project.***

63

Exterior Lighting Power

Plan Review Check List

What to look for during plan review ~

Exterior lighting compliance

- Verify that the correct exterior lighting zone is applied to the lighting power allowance calculations.
- Additional exterior lighting allowance wattage is only used for fixtures installed for eligible specific applications. (Un-used wattage is ignored.)
- ***Confirm that the total proposed exterior lighting wattage for the project is ≤ the total allowed lighting wattage of all exterior surfaces and specific applications in the project.***

64

Lighting Controls

Plan Review Check List

What to look for during plan review ~

- Lighting controls are indicated in the electrical floor plans and lighting fixture schedules.
- Identify overall compliance path applied for lighting controls
  - Luminaire level lighting controls, OR
  - Complying with all applicable prescriptive requirements
- Occupant sensing controls are noted in spaces that required them.
- Daylight sensing controls are noted for fixtures located within sidelit and toplit daylit zones.

65

Mechanical Systems

66

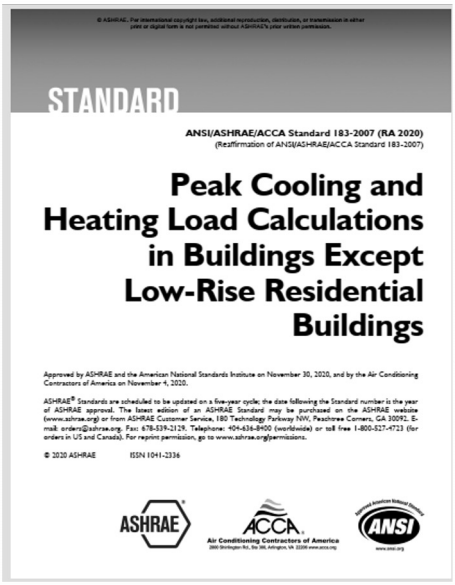
Heating & Cooling Load Calculations

- HVAC system sizing calculations ***are required*** for new construction, and for mechanical alterations that replace existing equipment or install new systems.
- Loads shall be adjusted to account for energy recovery equipment, if included in the project.
- Building envelope R-values, U-factors, F-factors, SHGCs and assembly SF areas are needed to determine thermal envelope loads.
- For mechanical alterations, envelope parameters shall be per record documents or existing conditions.
- If accurate record documents are not available, it's OK to use envelope parameters from the edition of the WSEC that was in effect when the building was permitted (buildings constructed after 1994).

C403.1.2

67

Load Calculations



Chvac - Full Commercial HVAC Loads Calculation Program
Mechanical Contractor, LLC
Lynnwood, WA 98037

Elite Software Development, Inc.
RTU Replacement Project
Page 7

Building Summary Loads

Building peaks in August at 2pm.

Bldg Load Descriptions	Area Quan	Sen Loss	%Tot Loss	Lat Gain	Sen Gain	Net Gain	%Net Gain
Roof	1,050	1,550	9.15	0	250	250	0.95
Wall	720	1,830	10.81	0	1,574	1,574	5.94
Glass	84	3,100	18.31	0	10,042	10,042	37.91
Floor Slab	67	1,483	8.76	0	0	0	0.00
Skin Loads		7,963	47.03	0	11,866	11,866	44.79
Lighting	1,260	0	0.00	0	4,299	4,299	16.23
Equipment	1,260	0	0.00	0	4,299	4,299	16.23
Pool Latent	0	0	0.00	0	0	0	0.00
People	8	0	0.00	1,500	1,875	3,375	12.74
Partition	0	0	0.00	0	0	0	0.00
Cool. Pret.	0	0	0.00	0	0	0	0.00
Heat. Pret.	0	0	0.00	0	0	0	0.00
Cool. Vent.	101	0	0.00	-43	1,199	1,156	4.36
Heat. Vent.	101	4,386	25.91	0	0	0	0.00
Cool. Infil.	105	0	0.00	-70	1,277	1,207	4.56
Heat. Infil.	105	4,583	27.07	0	0	0	0.00
Draw-Thru Fan	0	0	0.00	0	289	289	1.09
Blow-Thru Fan	0	0	0.00	0	0	0	0.00
Reserve Cap.	0	0	0.00	0	0	0	0.00
Reheat Cap.	0	0	0.00	0	0	0	0.00
Supply Duct	0	0	0.00	0	0	0	0.00
Return Duct	0	0	0.00	0	0	0	0.00
Misc. Supply	0	0	0.00	0	0	0	0.00
Misc. Return	0	0	0.00	0	0	0	0.00
Building Totals		16,932	100.00	1,387	25,105	26,492	100.00

Building Summary	Sen Loss	%Tot Loss	Lat Gain	Sen Gain	Net Gain	%Net Gain
Ventilation	4,386	25.91	-43	1,199	1,156	4.36
Infiltration	4,583	27.07	-70	1,277	1,207	4.56
Pretreated Air	0	0.00	0	0	0	0.00
Room Loads	7,963	47.03	1,500	22,340	23,840	89.99
Plenum Loads	0	0.00	0	0	0	0.00
Fan/Duct/Misc Loads	0	0.00	0	289	289	1.09
Building Totals	16,932	100.00	1,387	25,105	26,492	100.00

Check Figures		
Total Building Supply Air (based on a 20° TD):	1,103	CFM
Total Building Vent. Air (9.11% of Supply):	101	CFM
Total Conditioned Air Space:	1,050	Sq.ft
Supply Air Per Unit Area:	1.0503	CFM/Sq.ft
Area Per Cooling Capacity:	475.6	Sq.ft/Ton
Cooling Capacity Per Area:	0.0021	Tons/Sq.ft
Heating Capacity Per Area:	16.13	Btuh/Sq.ft
Total Heating Required With Outside Air:	16,932	Btuh
Total Cooling Required With Outside Air:	2.21	Tons

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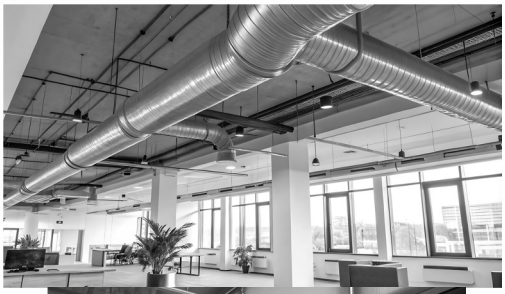
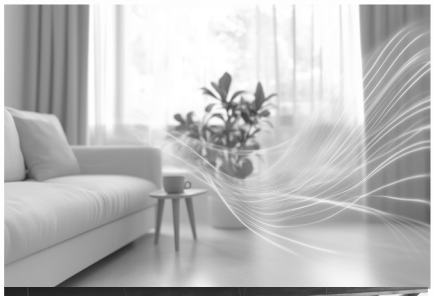
Ventilation

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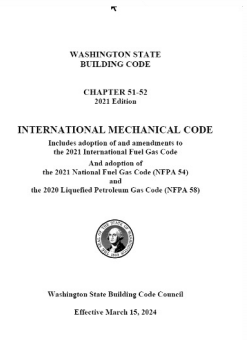
Applicable Codes & Standards

- 2021 IMC with WA State Amendments (WAC 51-52)
- 2021 Washington State Energy Code – Commercial (WAC 51-11C)
- 2022 ASHRAE Standard 62.1 – Ventilation & Acceptable Indoor Air Quality
- Additional sections of the Washington Administrative Code (WAC)

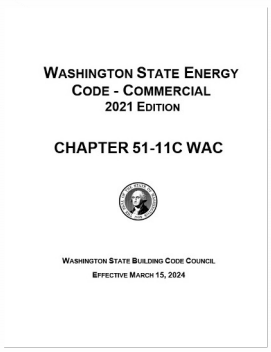

WASHINGTON STATE
BUILDING CODE

CHAPTER 51-52
2021 Edition

INTERNATIONAL MECHANICAL CODE
Includes adoption of and amendments to
the 2021 International Fuel Gas Code
And adoption of
the 2021 National Fuel Gas Code (NFPA 54)
and
the 2020 Liquefied Petroleum Gas Code (NFPA 58)

Washington State Building Code Council

Effective March 15, 2024


WASHINGTON STATE ENERGY
CODE - COMMERCIAL
2021 EDITION

CHAPTER 51-11C WAC

WASHINGTON STATE BUILDING CODE COUNCIL
EFFECTIVE MARCH 15, 2024


STANDARD

ASHRAE

ANSI/ASHRAE Standard 62.1-2022
(Supersedes ANSI/ASHRAE Standard 62.1-2019)
Includes ANSI/ASHRAE addenda listed in Appendix Q

Ventilation
and Acceptable
Indoor Air Quality

70

IMC Ventilation General Requirements

IMC 401 – When & where fresh air ventilation is required

- ***Every occupied space is required to be ventilated during all occupied periods***, including during periods of inclement weather, peak outdoor temperatures and unhealthy outdoor air quality.
- For most occupancies, ventilation may be provided mechanically per IMC 403 or by natural means per IMC 402.
- Occupancies where ***mechanical ventilation is required*** include:
  - Group R occupancies per IMC 403.4
  - Buildings that encounter vehicle exhaust (enclosed parking, vehicle repair) per IMC 401.2
  - Ambulatory care facilities and Group I-2 occupancies per IMC 401.2.2
- Additional ventilation-related requirements for other occupancies may apply per the Washington Administrative Code (WAC).

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Mechanical Ventilation System Sizing

Outdoor Airflow Rate

- **IMC 403.3.1.1** – Mechanical ventilation system shall be designed to provide the minimum outdoor airflow rate to each space per Table 403.3.1.1.
- **WSEC C403.2.2.1** – The system shall be configured to provide no greater than 150% of the minimum outdoor air CFM required by Chapter 4 of the IMC or other applicable code or standard, ***whichever is greater.***

TABLE 403.3.1.1—continued MINIMUM VENTILATION RATES

OCCUPANCY CLASSIFICATION	OCCUPANT DENSITY #/1000 FT^{2a}	PEOPLE OUTDOOR AIRFLOW RATE IN BREATHING ZONE R_p CFM/PERSON	AREA OUTDOOR AIRFLOW RATE IN BREATHING ZONE R_a CFM/FT^{2a}	EXHAUST AIRFLOW RATE CFM/FT^2
Hotels, motels, resorts and dormitories				
Bathrooms/toilets—private[g]	—	—	—	25/50[f]
Bedroom/living room	10	5	0.06	—
Conference/meeting	50	5	0.06	—
Dormitory sleeping area	20	5	0.06	—
Gambling casinos	120	7.5	0.18	—
Lobbies/prefunction	30	7.5	0.06	—
Multipurpose assembly	120	50	0.06	—

NOTE: If occupant density is known, for example the number of dining room chairs, can use that number of people in the calculations.

72

Dedicated Outside Air Systems (DOAS)

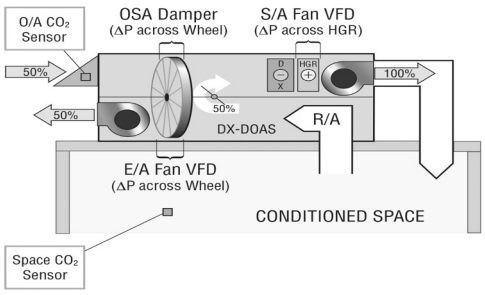
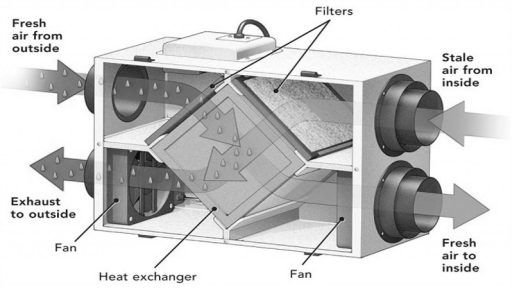


Figure 11 - VFD Control of Fans Using Pressure Sensors



73

Dedicated Outside Air Systems (DOAS)

TABLE C403.3.5
OCCUPANCY CLASSIFICATIONS REQUIRING DOAS

Occupancy Classification[a]	Inclusions	Exempted
A-1	All occupancies not specifically exempted	Television and radio studios
A-2	Casinos (gaming area)	All other A-2 occupancies
A-3	Lecture halls, community halls, exhibition halls, gymnasiums, courtrooms, libraries, places of religious worship	All other A-3 occupancies
A-4, A-5		All occupancies excluded
B	All occupancies not specifically exempted	Food processing establishments including commercial kitchens, restaurants, cafeterias; laboratories for testing and research; data processing facilities and telephone exchanges; air traffic control towers; animal hospitals, kennels, pounds; ambulatory care facilities.
F, H, I, R, S, U		All occupancies excluded
E, M	All occupancies included	

a. Occupancy classification from the *International Building Code* Chapter 3.

74

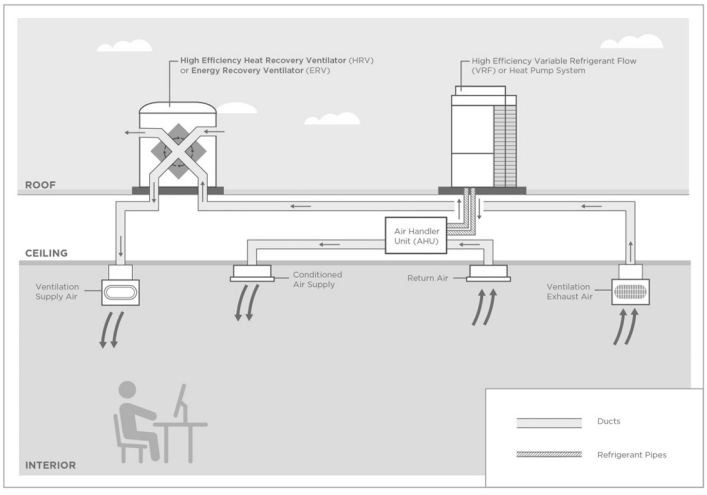
DOAS Ventilation

- The DOAS system shall be equipped with heat recovery and sized to meet the ventilation requirements of Chapter 4 of the IMC.
- Requires minimum heat recovery effectiveness of 68% sensible recovery or 60% enthalpy recovery ratio.
- Exceptions:
  - Spaces meeting the natural ventilation requirements of IMC 402.
  - High efficiency multiple zone variable air volume (VAV) systems that comply with C403.6.10.
  - High efficiency single zone VAV systems serving Group A-1, A-2, A3 that comply with C403.12.

C403.3.5

75

Decoupled Ventilation Supply Air



NEEA & Betterbricks High Performance DOAS Initiative

DOAS supply air shall be delivered directly to the occupied space, or downstream of the terminal heating and/or cooling coils.

C403.3.5.4

76

Tempering DOAS Supply Air

Supplemental Heating

- C403.7.3 Ventilation air heating control – ***Ventilation supply air supplemental heating*****,** that operates in conjunction with zone heating & cooling systems, to ***temper supply air to up to 55°F (13°C).***
- Refer to Section C403.1.4 for additional information regarding DOAS auxiliary/supplemental heating equipment type allowances.

Supplemental Cooling

- ***Ventilation supply air cooling is permitted only for the purpose of maintaining supply air relative humidity or zone relative humidity.***
- Cooling coil shall be sized for peak dehumidification at design outdoor temperatures, and no larger.

C403.3.5.5
C403.7.3
C403.1.4

77

Ventilation Energy Recovery

All commercial spaces (other than Group R-2 dwelling units)

- Energy recovery is required where the total system supply airflow rate exceeds the values listed in Tables C403.7.6(1) and C403.7.6(2), based on climate zone and % of outdoor airflow rate at design conditions.

TABLE C403.7.6.1(2)
ENERGY RECOVERY REQUIREMENT
(VENTILATION SYSTEMS OPERATING NOT LESS 8,000 HOURS PER YEAR)

CLIMATE ZONE	PERCENT (%) OUTDOOR AIR AT FULL DESIGN AIRFLOW RATE							
	≥ 10% and < 20%	≥ 20% and < 30%	≥ 30% and < 40%	≥ 40% and < 50%	≥ 50% and < 60%	≥ 60% and < 70%	≥70% and < 80%	≥ 80%
	DESIGN SUPPLY FAN AIRFLOW RATE (cfm)							
4C	NR	≥ 19500	≥ 9000	≥ 5000	≥ 4000	≥ 3000	≥ 1500	≥120
5B	≥ 2500	≥ 2000	≥ 1000	≥ 500	≥ 140	≥ 120	≥ 100	≥ 80

NR = not required

C403.7.6.2

78

Group R-2 Ventilation with Balanced Flow

IMC 403.4.4.1 & WSEC C403.7.6.1 – Whole house ventilation in Group R-2

- Dwelling and sleeping units in Group R-2 occupancies shall be served by a whole house mechanical ventilation system.
- Whole house ventilation system shall include heat or energy recovery with ≥ 60% sensible recovery effectiveness.
- Natural ventilation in lieu of a whole house system ***is not permitted***.
- Supply and exhaust fans shall have airflow that is within ***10% of each other*** per IMC 403.4.6.3 balanced flow requirements.
- The ventilation system shall operate continuously at the minimum ventilation rate.
- Outdoor air shall be provided directly into each habitable space.
- OK to use transfer air to ventilate adjoining or adjacent interior spaces.

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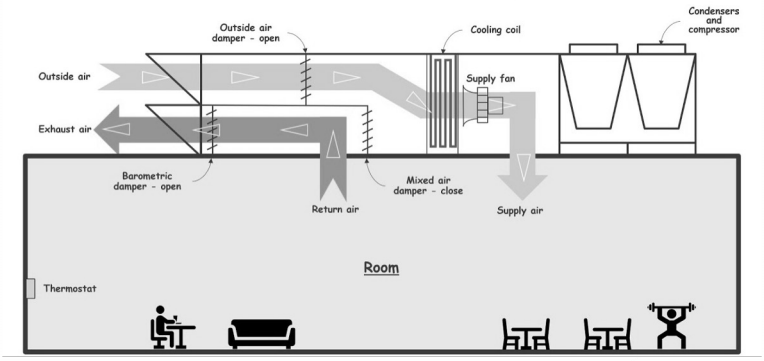
Economizer Cooling & DOAS

- Economizer cooling **IS NOT** a ventilation strategy - it's a cooling strategy.
- HVAC systems required to have economizer cooling shall use outside air as the first stage of cooling when available.



C403.5

80

Economizer & DOAS

Economizer Cooling

- Economizer **IS** required whether or not a DOAS ventilation system is installed in the following applications:
  - Package air conditioners and heat pump units installed on the roof, at grade level, or wall mounted.
  - Indoor air conditioners and heat pump air handling units installed in a mechanical room adjacent to outdoors (split system fan-coils and central station air handlers).
- Economizer **IS NOT** required in the following applications:
  - **Exception #1** – DOAS is installed, and the AC system does not have ready access to 100% outdoor air intake (ductless units, fan-coils and air handling units not installed in a mechanical room adjacent to outdoors).
  - **Exceptions #2 thru #11** – Various other exceptions by equipment type and application.

C403.5

81

Equipment Efficiency

Code-compliant and Better-than-code Equipment Efficiency

- Minimum efficiency requirements for most mechanical equipment are federal standards defined by the US Dept of Energy under the Energy Policy and Conservation Act (EPCA).
- However, various energy code requirements and exceptions require better-than-code efficiency.
- ***Examples*** – C406 HVAC and SWH energy efficiency measures; high efficiency VAV systems (single & multiple zone); economizer exceptions
- Resources are available to calculate better-than-code efficiency for all applicable performance parameters of the mechanical equipment.

Section C403.3.2

82

Total System Performance Ratio

What is TSPR?

- TSPR score provides a ***whole building seasonal efficiency rating*** for the overall building and HVAC systems.
- TSPR analysis tool compares the score of a proposed building to a reference building, as defined in 2021 WSEC-C Appendix D.
- Analysis tool is a resource within DOE's (free) Asset Score Tool.
- Time required to complete a TSPR report is ~ 10% of a full customized energy model.

Section C403.1.1

83

Total System Performance Ratio

When is this provision required?

- Building conditioned floor area in ≥ 5,000 sf.
- Applies to HVAC systems serving ***office (including medical office), retail, library and education*** occupancies that are subject to the DOAS requirements, without exceptions.
- HVAC systems serving dwelling units and residential common areas within ***Group R-2 multi-family*** buildings.

TSPR is not required when ~

- HVAC systems match the TSPR standard reference design for the occupancy, as defined in Appendix D Table D602.11.
- Space conditioning systems do not include cooling (heating only).
- Other various exceptions apply.

Section C403.1.1

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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	Cycle 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 percent	70 percent	70 percent	70 percent	70 percent
WSHP Loop Heat Rejection	Cooling Tower[i]	NA	NA	NA	NA
WSHP Loop Heat Source	Gas Boiler [j]	NA	NA	NA	NA
WSHP Loop Temperature Control[k]	50°F to 70°F	NA	NA	NA	NA
WSHP Circulation Pump W/gpm[l]	16	NA	NA	NA	NA
WSHP Loop Pumping Control[m]	HP Valves & Pump VSD	NA	NA	NA	NA

TSPR score is not required if proposed system design matches or is better than the Standard Reference Design parameters

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BUILDING ENERGY TOTAL SYSTEM PERFORMANCE RATIO
U.S. DEPARTMENT OF ENERGY

Washington State TSPR Analysis

1

Total System Performance Ratio for HVAC

BUILDING INFORMATION

TSPR Example Retail: PSZHP + DOAS; 2021 WSEC; CZ 4C
20201 Cedar Valley Road
Lynnwood, WA 98036

Building Type: **Retail**
Gross Floor Area: **10,000 ft²**
Year of Construction: **N/A (New)**

Analysis Date: **02/16/2026**
Building ID #: **27325**
Software Release: 2024.1.0.388

Whole Building Total System Performance Ratio

Proposed Building TSPR: 28.8
Baseline Building TSPR: 25.9

Larger number = Better score

The Proposed Building TSPR exceeds the Target Building TSPR and thereby complies with 2021 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 cost of energy consumption (USD) from the building's HVAC systems.

SUBMITTED BY

Name	Example
Organization	Example
Email	example@gmail.com
Phone Number	

ANALYSIS PARAMETERS

Energy Code	2021 Washington State Energy Code
ASHRAE Climate Zone	4C, Mixed - Marine
Weather Station	Hartford Bradley Intl Ap CT USA TMY3 WMO#=725080

The Total System Performance Ratio Analysis has been performed in accordance with the 2021 Washington State Energy Code.

To comply, Proposed building score must be equal to or higher than the Baseline building score.

86

Mechanical Plan Review

87

Mechanical Equipment

Plan Review Check List

What to look for during plan review ~

- ***Load calculation*** documentation is provided for all heating & cooling equipment in the project.
- ***Ventilation CFM calculations*** are provided identifying minimum required ventilation for all occupied spaces (per IMC 401 & WSEC-C C403.2.2.1).
- Ventilation is provided by DOAS equipment with energy recovery, in occupancies that are required to comply with this requirement.
- For Group R-2 buildings, whole house ventilation equipment with energy recovery is provided for all dwelling units.
- ***TSPR report*** is provided if project is subject to this requirement (based on conditioned floor area, occupancy type and mechanical system types). Confirm resulting TSPR score complies.

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Mechanical Equipment

Plan Review Check List

What to look for during plan review ~

Mechanical Equipment Schedule Details

- Heating & cooling equipment information includes ***efficiency values*** for all required performance criteria, including % better-than-code, if applicable.
- Cooling equipment information indicates whether ***economizer*** is provided, and if not, exception applied.
- ***Ventilation supply air CFM*** required is noted for each air handler.
- ***DOAS equipment*** information includes required ventilation CFM, % energy recovery effectiveness, and HVAC system(s) the DOAS is paired with.
- ***Whole house ventilation*** equipment information includes CFM and % energy recovery.

89

Space Heating & Service Water Heating

90

Heat Pump Prescriptive Compliance

Equipment type criteria for space heating & service water heating

2021 WSEC-C Prescriptive Path

- Section C403.1.4 requires ***heat pumps*** as the primary source of space heating energy capacity.
- Section C404.2.1 requires ***heat pump water heaters (HPWH)*** as the primary source of SWH energy capacity for at least 50% of the calculated peak demand.

- Electric resistance and fossil fuel equipment are only allowed via an exception to these provisions, or by complying with the **Fossil Fuel Compliance Path.**

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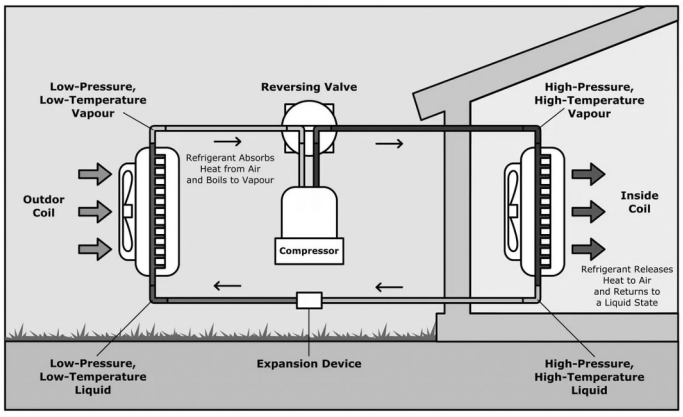
Why Heat Pumps?



Heat pumps use phase change to move heat from one place to another by taking advantage of the energy released when refrigerant changes state from a low temp liquid to a high temp vapor.

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Equipment Efficiency Comparison

	COP
FOSSIL FUEL SPACE HEATING	**0.80 - 0.90**
ELECTRIC RESISTANCE SPACE HEATING	**1.0**
ELECTRIC HEAT PUMP SPACE HEATING	**2.0 - 5.0**

COP = Energy Output/Energy Input

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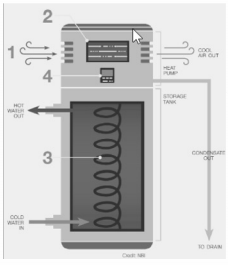
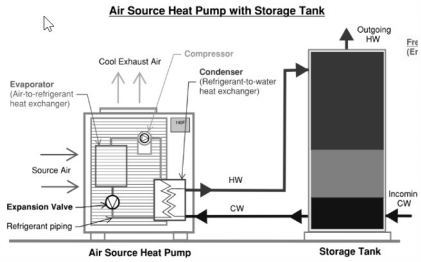
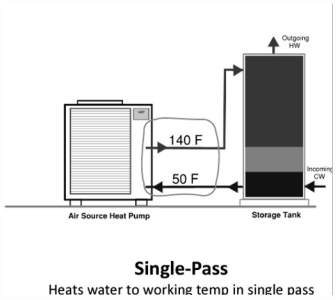
HPWH Types





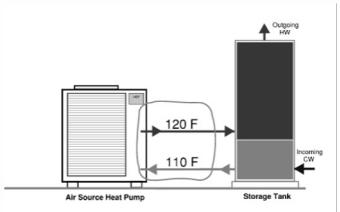


Single-Pass

Heats water to working temp in single pass

Visit the Lighting Design Lab website for course recordings and handouts on the design, operation and maintenance of commercial HPWH systems.

https://www.lightingdesignlab.com/course-recordings-and-handouts



Multi-Pass

Heats water to working temp in multiple passe

94

Which project types do the heat pump prescriptive compliance path apply to?

- Space heating systems in new buildings and additions.
- New space heating systems added to an existing building.
- Spaces where there is a change of occupancy per C505.3:
  - Group F, S or U converted to another occupancy
  - Commercial use converted to a Group R dwelling unit
  - Group R dwelling unit converted to a commercial use or occupancy
- Buildings when there is a change in space conditioning from low-energy or semi-heated to fully conditioned.

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Heat Pump Space Heating

Prescriptive Compliance

- Heat pumps are required as the primary source of space heating energy capacity.
- However, there are several ***exceptions*** that allow electric resistance (ER) and/or fossil fuel (FF) heating equipment, as well as approved alterative sources of heat energy.

King Electrical

C403.1.4

96

Heat Pump Space Heating

Sampling of *Exceptions* to heat pump space heating requirement ~

- Small conditioned buildings < 2,500 SF (ER)
- Dwelling & sleeping units – ER wattage limitations apply
- Specific essential facilities and conditioned areas where heat pumps cannot practicably serve the space heating needs (ER and/or FF).
- Small systems (ER and/or FF) – Total capacity of all eligible systems combined is < 5% of total building heating capacity (or serves < 5% of the total conditioned floor area).
- Freeze protection systems (spaces with ≤ 45°F (7°C) indoor design temp)
- Serves heat pump defrost cycle
- Auxiliary/supplemental heating for heat pumps and DOAS equipment (specific design parameter apply)

C403.1.4

97

Heat Pump Service Water Heating

Prescriptive Compliance

- HPWHs are required as the primary source of SWH energy capacity for at least 50% of the calculated peak demand.
- However, there are several ***exceptions*** that allow electric resistance (ER) and/or fossil fuel (FF) water heating equipment, as well as approved alterative sources of heat energy.

Hatco Dishwasher Booster Heater

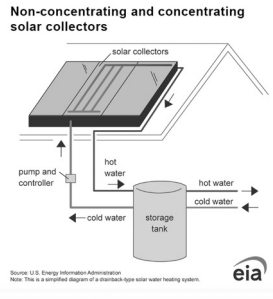

Image courtesy of the US Energy Information Administration

C403.1.4
C404.2.1

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Heat Pump Service Water Heating

***Exceptions* to HPWH requirement ~**

- Up 24 kW plus, 0.1 watts of building SF area, of electric resistance water heating capacity is permitted.
- Electric booster heaters for commercial dishwashers, food service equipment and other approved process equipment.
- Back-up (redundant) SWH systems for essential facilities.

C404.2.1

99

Alternative Heat Energy Sources

Approved sources in lieu of heat pumps & HPWHs

- Recovered waste heat from other systems.
- On-site & off-site renewable energy – Heat energy derived from renewable energy sources.
- Pre-existing district energy (FF) – 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 – Complies with WSEC-C definitions for low-carbon district energy exchange systems.

C403.1.4

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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 AEM credits are required per Table C401.3.3
  - New construction – Additional AEM credits are in addition to the number of AEM credits required in C406.2.
  - Alterations – Only Additional AEM credits are required.
- Number of Additional AEM credits is based on the capacity fraction of fossil fuel equipment relative to non-fossil fuel equipment.
- Use adjusted AEM credit values in Table C406.2**(2)** for the fossil fuel compliance path, *do not* use Table C406.2**(1)** credit values.

C403.1.4
C404.2.1

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Fossil Fuel Compliance Path

TABLE C401.3.3
ADDITIONAL CREDITS REQUIRED

Measure Title	Applicable Section	Occupancy Group					
		Group R-1	Group R-2	Group B	Group E	Group M	All Other
New building - Additional efficiency credits required for space heating systems using the fossil fuel pathway	C401.3.3.1	7	24	101	38	111	56
New building - Additional efficiency credits required for service water heating systems using the fossil fuel pathway	C401.3.3.2	198	212	27	17	79	107
Building additions - Additional efficiency credits required for space heating systems using the fossil fuel pathway	C401.3.3.1	4	12	51	19	56	28
Building additions - Additional efficiency credits required for service water heating systems using the fossil fuel pathway	C402.3.3.2	99	106	14	9	40	54

Number of additional required credits is based on the project type, occupancy group ***and*** **heating system type**

Sample Project - Retail with Semi-heated Warehouse

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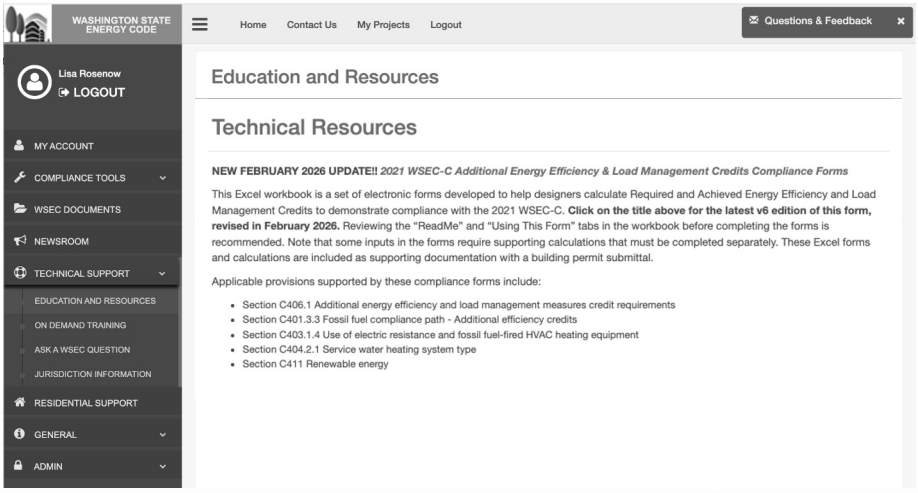
Fossil Fuel Path Calculator



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C406 Additional Energy Efficiency & Load Management Credit Calculation — **C406-CALC**

2021 Washington State Energy Code Compliance Forms for Commercial Buildings as defined in Chapter 2 — Revised Oct 2025

Project Title: Sample Department Store — Date: 12/1/25

Additional Energy Efficiency & Load Management Measures - Required Credits

Occupancy/Discrete Area List								Additional Energy Efficiency Measure Credits					Load Management Measure Credits	
						Capacity Fraction Requiring C401.3.3 Compliance[NOTE 3]								
Area ID	Occupancy Group	Special Occ Case (Only for Occ. Group M and All Other)[NOTE 1]	Special Conditioning Case[NOTE 2]	Description	Floor Area	Space Heating	Water heating	Base Credits Req'd	Fossil Fuel Path Credits Req'd	C411 Exception Credits Req'd	Total Req'd	Proposed	Total Req'd	Proposed
Retail	Group M	None	None	Retail	50,000	0	0.38	74	30.02	0	104.0	128.0	13.0	16.3
Wrhs	All Other	None	None	Warehouse	5,000	1	0	49	56	0	105.0	0.0	26.0	0.0
Credits Entered by Whole Project Measures[NOTE 4]												0.00		0.00
Project Total					55000	0.09	0.35				104.11	116.36	14.18	14.80

C406 Additional Energy Efficiency & Load Management Credit Calculation — **C406-CALC**

2021 Washington State Energy Code Compliance Forms for Commercial Buildings as defined in Chapter 2 — Revised Oct 2025

Project Title: Sample Department Store — Date: 12/1/25

Proposed Additional Energy Efficiency Measures

Area ID [NOTE 5]	Floor Area	Measure	Input for Calculated Credits (if applicable)[NOTE 6] Input Description	User Input	Base Credits	Earned Credits
Retail	50000	2. Improved HVAC TSPR	% better than code (0-100)	20	22	88
Retail	50000	10. 20% reduced lighting power			40	40

Proposed Load Management Measures

Area ID [NOTE 5]	Floor Area	Measure	Input for Calculated Credits (if applicable)[NOTE 6] Input Description	User Input	Base Credits	Earned Credits
Retail	50000	4. Electric energy storage	Storage Cap Wh/sf	2.2	37	16.28

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Capacity fraction of fossil fuel equipment

SPACE HEATING EQUIPMENT AND SYSTEMS FUEL TYPE AND CODE PATH — **SPC-EQ-DET**

2021 Washington State Energy Code Compliance Forms for Commercial Buildings as defined in Chapter 2 — Revised Oct 2025

Project Title: **Sample Department Store** — Date: 12/1/25

These tables are provided to calculate the fraction of space heat capacity that must comply via C401.3.3 and capacity weighted over code efficiency percentage for use in C406-CALC. Results are not automatically assigned and must be applied to the appropriate C406-CALC areas by the user. These can be used to calculate the code fuel path and/or the improved heating efficiency. Values can be entered for the whole building and used for all areas, or entered for each area. When calculating inputs for areas heated by equipment located in other areas enter the capacity of the terminal equipment. Equipment of similar type may be lumped for the fuel type calculation, equipment similar type and capacity category may be lumped for the Improved Heating Efficiency Credits. Indicate equipment counts in the Eq Desc field and enter total heating capacity for all the equipment..

Area Id	Retail	Area (sf)	50000	Description	Retail Sales Floor, Offices & Employee Lounge				
			C403.1.4 / C401.3.3 Compliance			C406.2.2.3 Improved Heating Efficiency Credits			
Equipment Id	Eq Desc	Total Heating Output Capacity (Btu/hr)	Primary Heating Fuel Type	Code path	C403.1.4 HP Equipment Exception #	Proposed Efficiency	Efficiency Units	Code Efficiency	Percent Above Code
HP-1	Retail - Packaged Heat Pump	135,000	Heat Pump	C403.1.4 Heat pump		4.1	COP	3.4	20.6%
HP-2	Retail - Packaged Heat Pump	65,000	Heat Pump	C403.1.4 Heat pump		7.8	COP	6.7	16.4%
HP-3	Retail - Packaged Heat Pump	65,000	Heat Pump	C403.1.4 Heat pump		7.8	COP	6.7	16.4%
VRF-1	Offices - VRF Multi-Split System	72,000	Heat Pump	C403.1.4 Heat pump		4	COP	3.3	21.2%
					Capacity fraction = 0%				
	Total Heating Capacity	337,000		Fossil Fuel Fraction	0.00		Percent Better than Code		19.1%

Area Id	Wrhs	Area (sf)	5000	Description	Semi-heated Product Storage Warehouse				
			C403.1.4 / C401.3.3 Compliance			C406.2.2.3 Improved Heating Efficiency Credits			
Equipment Id	Eq Desc	Total Heating Output Capacity (Btu/hr)	Primary Heating Fuel Type	Code path	C403.1.4 HP Equipment Exception #	Proposed Efficiency	Efficiency Units	Code Efficiency	Percent Above Code
Boiler	Warehouse Radiant Floor - Condensing Boiler	180,000	Fossil Fuel	C401.3 Fossil Fuel	None	92	AFUE	82	12.2%
	Total Heating Capacity	180,000		Fossil Fuel Fraction	1		Percent Better than Code		12.2%

Capacity fraction = 100%

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Capacity fraction of fossil fuel equipment

SWH EQUIPMENT AND SYSTEMS FUEL TYPE AND CODE PATH — **SWH-EQ-DET**

2021 Washington State Energy Code Compliance Forms for Commercial Buildings as defined in Chapter 2 — Revised Oct 2025

Project Title: **Sample Department Store** — Date: 12/1/25

These tables are provided to calculate the fraction of service water heat capacity that must comply via C401.3.3 for use in C406-CALC. Results are not automatically assigned and must be applied to the appropriate C406-CALC areas by the user. Values can be entered for the whole building and used for all areas, or entered for each area. When calculating inputs for areas heated by equipment located in other areas enter the capacity of the terminal equipment. Equipment of similar type may be lumped for the fuel type calculation, indicate equipment counts in the Eq Desc field and enter the total capacity of all of the lumped equipment. Areas that do not directly use SWH but whose occupants go to adjacent areas for hot water should use the fossil fuel fraction for those adjacent areas.

Area Id	Retail	Area (sf)		Description	
			C404.2.1 / C401.3.3 Compliance		
Equipment Id	Eq Desc	Total Heating Output Capacity (Btu/hr)	Primary Heating Fuel Type	Code path	C404.2.1 HP Equipment Exception #
WH-1	HPWH	62,500	Air Source Heat Pump	C404.2.1.1 Heat pump	
WH-2	Electric Point of Use	37,500	Other	C404.2.1.1 Allowed Non-HP	
WH-3	Electric Point of Use	45,000	Electric Resistance	C401.3 Fossil Fuel	
WH-4	Electric Point of Use	37,500	Electric Resistance	C401.3 Fossil Fuel	
WH-5	Electric Point of Use	37,500	Electric Resistance	C401.3 Fossil Fuel	
	Total Water Heat Capacity	220,000	Fraction requiring C401.3.3 compliance		0.38

Capacity fraction = 38%

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Fossil Fuel Compliance Path - Total Credits Required

Credits Calculation Example

Building Area-Weighting
- Retail = 91% of Bldg Area
- Warehouse = 9% of Bldg Area

Fossil Fuel Capacity-Weighting
- 38% of SWH is provided by fossil fuel equipment

Total Required Credits = 104.11
Area-Weighting &
Capacity-Weighting Applied

Area List				Additional Energy Efficiency Measure Cre			
		Capacity Fraction Requiring C401.3.3 Compliance NOTE 3					
Description	Floor Area	Space Heating	Water heating	Base Credits Req'd	Fossil Fuel Path Credits Req'd	C411 Exception Credits Req'd	Total Req'd
Retail	50,000	0	0.38	74	30.02	0	104.0
Warehouse	5,000	1	0	49	56	0	105.0
	55000	0.09	0.35				104.11

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Space Heating & SWH Plan Review

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Mechanical Space Heating

Plan Review Check List

What to look for during plan review ~

- Compare mechanical equipment schedule information with values entered into the fossil fuel compliance calculator, and mechanical compliance webtool output report, to confirm they match. (Capacities, equipment efficiencies)
- If fossil fuel and/or electric resistance space heating equipment is included in the project, confirm capacity-weighting calculations are provided.
- If fossil fuel path exceptions are applied, confirm required documentation supporting eligibility is provided.

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Service Water Heating

Plan Review Check List

What to look for during plan review ~

- Compare capacities provided in service water heating equipment schedule with values entered into the fossil fuel compliance calculator to confirm they match.
- If fossil fuel and/or electric resistance service water heating equipment is included in the project, confirm capacity-weighting calculations are provided.
- If fossil fuel path exceptions are applied, confirm required documentation supporting eligibility is provided.

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Additional Energy Efficiency and Load Management

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How many base credits are required for additional energy efficiency?

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

Number of required credits is based upon the project scope and the occupancy group.

C406.1

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How many base credits are required for additional energy efficiency?

- **Exceptions** reduce the minimum required number of **AEM credits by 50%** for the following spaces:
  - Unconditioned and low energy spaces
  - Equipment buildings
  - Open and enclosed parking garages
  - Building additions with < 1,000 SF of conditioned floor area
- Credit weighting for unconditioned building areas is based on the ”All Other” occupancy category, regardless of actual occupancy.

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How many credits are required for load management?

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

Number of required credits is based upon the project scope and the occupancy group.

C406.1

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Which project types are required to comply with load management?

- **New buildings greater than 5,000 SF**
- Does **NOT** apply to:
  - First occupancy build-out of a tenant space (initial TI)
  - Building additions
  - All alterations, including spaces undergoing a change in space conditioning or occupancy
  - Unconditioned and low energy spaces
  - Equipment buildings
  - Open and enclosed parking garages
  - Warehouses

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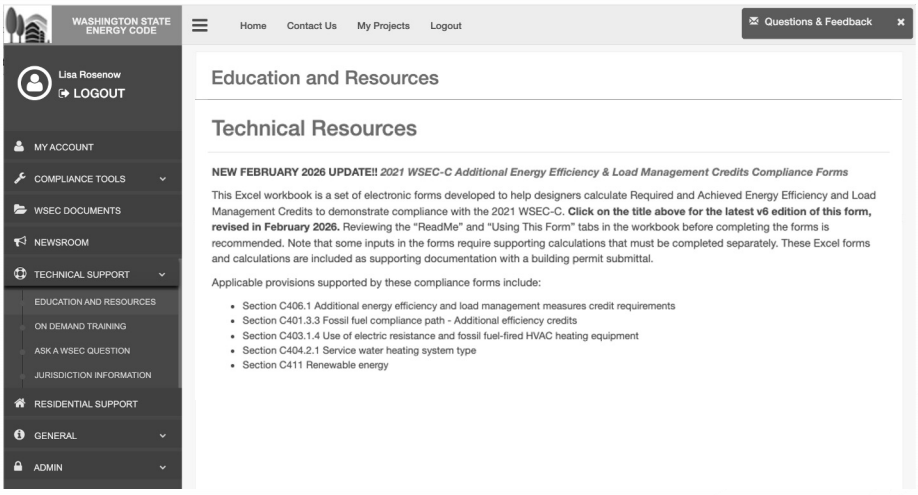
Additional Energy Efficiency and Load Management Measures



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C406 Compliance Status Summary

C406, C411 Summary — C406-C411-SUM

2021 Washington State Energy Code Compliance Forms for Commercial Buildings as defined in Chapter 2 — Revised Oct 2025

Project Info

Project Title:	**Sample Department Store**	Date **12/3/25**
Applicant Information. Provide contact information for individual who can respond to inquiries about compliance form information provided.		For Building Dept. Use
Company Name:	**WSEC Webtool Technical Support**	
Company Address:		
Applicant Name:	**ABC Construction**	
Applicant Phone:	**360-539-5300**	
Applicant Email:	**com.techsupport@waenergycodes.com**	

Project Type & Area

Select one construction type per form. For projects that include multiple construction types, separate forms must be completed.

Project Type: New Construction
Project Floor Area: 55,000
Project Conditioned Floor Area: 55,000

Space and Water Heating Fuel

Space heating must be provided by equipment complying with C403.1.4 or C401.3.3. Service hot water must be provided by equipment complying with C404.2.1 or C401.3. Complinace with C401.3 requires that additional C406.2 energy efficiency credits be achieved.

Is any space heat in the project area provided by equipment that does not comply with C403.1.4? No
Is any service hot water used in the project provided by equipment that do not comply with C404.2.1? No

C411 Summary

Values in this section are auto-filled from the RE-CALC worksheet and are write-protected. RE-CALC is required for all new construction, addition, change of conditioning, and change of use projects with conditioned floor area larger than 10000sf .

C411.1 Compliance: **COMPLIES**
On-site Renewable Capacity (kW): 27.50
On-site Renewable Capacity (W/CFA): 0.50
Applicable C411.1 Exception: None
Extra C406 Energy Credits Required for C411 Compliance:

C406 Summary

Compliance results indicate whether the proposed number of credits complies with C406 required number of credits including additional credits required by C401.3.3 and C411.

C406.2 Additional Energy Efficiency Measure Credit Compliance: **COMPLIES**
C406.3 Load Management Measure Credit Compliance: **COMPLIES**

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C406 Additional Energy Efficiency & Load Management Credit Calculation — C406-CALC

2021 Washington State Energy Code Compliance Forms for Commercial Buildings as defined in Chapter 2 — Revised Oct 2025

Project Title: **Sample Department Store** — Date **12/1/25**

Additional Energy Efficiency & Load Management Measures - Required Credits

Occupancy/Discrete Area List								Additional Energy Efficiency Measure Credits					Load Management Measure Credits	
						Capacity Fraction Requiring C401.3.3 Compliance[NOTE 3]								
Area ID	Occupancy Group	Special Occ Case (Only for Occ. Group M and All Other)[NOTE 1]	Special Conditioning Case[NOTE 2]	Description	Floor Area	Space Heating	Water heating	Base Credits Req'd	Fossil Fuel Path Credits Req'd	C411 Exception Credits Req'd	Total Req'd	Proposed	Total Req'd	Proposed
Retail	Group M	None	None	Retail	50,000	0	0.38	74	30.02	0	104.0	128.0	13.0	16.3
Wrhs	All Other	None	None	Warehouse	5,000	1	0	49	56	0	105.0	0.0	26.0	0.0
Credits Entered by Whole Project Measures[NOTE 4]												0.00		0.00
Project Total					55000	0.09	0.35				104.11	116.36	14.18	14.80

C406 Additional Energy Efficiency & Load Management Credit Calculation — C406-CALC

2021 Washington State Energy Code Compliance Forms for Commercial Buildings as defined in Chapter 2 — Revised Oct 2025

Project Title: **Sample Department Store** — Date **12/1/25**

Proposed Additional Energy Efficiency Measures

Area ID[NOTE 5]	Floor Area	Measure	Input for Calculated Credits (if applicable)[NOTE 6] Input Description	User Input	Base Credits	Earned Credits
Retail	50000	2. Improved HVAC TSPR	% better than code (0-100)	20	22	88
Retail	50000	10. 20% reduced lighting power			40	40

Proposed Load Management Measures

Area ID[NOTE 5]	Floor Area	Measure	Input for Calculated Credits (if applicable)[NOTE 6] Input Description	User Input	Base Credits	Earned Credits
Retail	50000	4. Electric energy storage	Storage Cap Wh/sf	2.2	37	16.28

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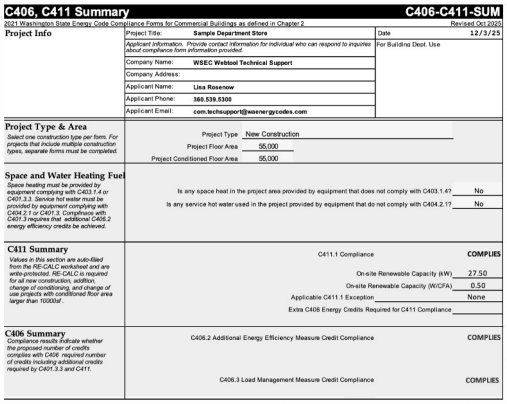
Envelope Additional Energy Efficiency and Load Management Measures

Plan Review Check List

What to look for during plan review ~

- Verify required documentation for claimed measures are included in project documents.
- Refer to Sections C406.2 and C406.3 for additional energy efficiency and load management measures eligibility requirements.



C406, C411 Summary — C406-C411-SUM

2021 Washington State Energy Code Compliance Forms for Commercial Buildings as defined in Chapter 2 — Revised Oct 2023

Project Info

Project Title:	Sample Department Store
Applicant Information. Provide contact information for individual who can respond to inquiries about compliance form information provided.	
Company Name:	WSEC Webtool Technical Support
Company Address:	
Applicant Name:	Lisa Rosenow
Applicant Phone:	360.539.5300
Applicant Email:	com.techsupport@wsenergycodes.com

Date: 12/3/25 — For Building Dept. Use

Project Type & Area

Select one construction type per form. For projects that include multiple construction types, separate forms must be completed.

Project Type: New Construction
Project Floor Area: 55,000
Project Conditioned Floor Area: 55,000

Space and Water Heating Fuel

Space heating must be provided by equipment complying with C403.1.4 or C401.3.3. Service hot water must be provided by equipment complying with C404.2.1 or C401.3. Compliance with C401.3 requires that additional C406.2 energy efficiency credits be achieved.

Is any space heat in the project area provided by equipment that does not comply with C403.1.4? No
Is any service hot water used in the project provided by equipment that do not comply with C404.2.1? No

C411 Summary

Values in this section are auto-filled from the RE-CALC worksheet and are write-protected. RE-CALC is required for all new construction, addition, change of conditioning, and change of use projects with conditioned floor area larger than 10000sf.

C411.1 Compliance: COMPLIES
On-site Renewable Capacity (kW): 27.50
On-site Renewable Capacity (W/CFA): 0.50
Applicable C411.1 Exception: None
Extra C406 Energy Credits Required for C411 Compliance:

C406 Summary

Compliance results indicate whether the proposed number of credits complies with C406 required number of credits including additional credits required by C401.3.3 and C411.

C406.2 Additional Energy Efficiency Measure Credit Compliance: COMPLIES
C406.3 Load Management Measure Credit Compliance: COMPLIES

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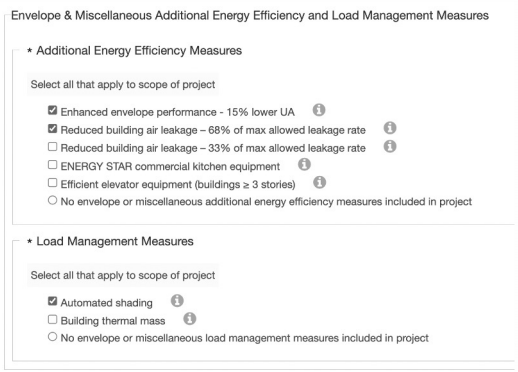
Building Envelope Measures

Plan Review Check List

What to look for during envelope plan review ~

- Reduced envelope U*A measure requires component performance UA calculations with 0.85 multiplier applied.
- Reduced air leakage target shall be stated in the project scope.
- Refer to Sections C406 for documentation requirements for other envelope measures.



Envelope & Miscellaneous Additional Energy Efficiency and Load Management Measures

* Additional Energy Efficiency Measures

Select all that apply to scope of project

- ☑ Enhanced envelope performance - 15% lower UA
- ☑ Reduced building air leakage – 68% of max allowed leakage rate
- ☐ Reduced building air leakage – 33% of max allowed leakage rate
- ☐ ENERGY STAR commercial kitchen equipment
- ☐ Efficient elevator equipment (buildings ≥ 3 stories)
- ○ No envelope or miscellaneous additional energy efficiency measures included in project

* Load Management Measures

Select all that apply to scope of project

- ☑ Automated shading
- ☐ Building thermal mass
- ○ No envelope or miscellaneous load management measures included in project

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U x A Calculation	NEW BUILDING - FULLY CONDITIONED				DOES NOT COMPLY		
Opaque Envelope Assemblies		PROPOSED			TARGET		
Roof/Ceiling	**Assembly ID**	**Roof/Ceiling Assembly U-Factor**	**Net Area (SF)**	**U x A**	**Roof/Ceiling Assembly U-Factor**	**Net Area (SF)**	**U x A**
Insulation entirely above deck	Roof-1	0.027	49,000.0	1,323.0	0.027	49,000.0 (1)	1,323.0
Walls	**Assembly ID**	**Wall Assembly U-factor**	**Net Area (SF)**	**U x A**	**Wall Assembly U-factor**	**Net Area (SF)**	**U x A**
Steel-framed - Commercial	Wall-1	0.056	14,000.0	784.0	0.055	14,000.0 (1)	770.0
Slab on Grade Floors		PROPOSED			TARGET		
Slab-on-grade Floors	**Assembly ID**	**F-Factor**	**Perimeter Length (LF)**	**U x A**	**F-Factor**	**Perimeter Length (LF)**	**U x A**
Unheated slab	Slab-1	0.54	900.0	486.0	0.54	900.0 (1)	486.0
Fenestration Assemblies		PROPOSED			TARGET		
Vertical Fenestration	**Assembly ID**	**Fenestration U-Factor**	**Assembly Rough Opening (SF)**	**U x A**	**Fenestration U-Factor**	**Assembly Rough Opening (SF)**	**U x A**
Fixed - Class AW or site built	Window-1	0.33	3,750.0	1,237.5	0.34	3,750.0 (1)	1,275.0
Glazed Doors	**Assembly ID**	**Glazed Door U-Factor**	**Assembly Rough Opening (SF)**	**U x A**	**Glazed Door U-Factor**	**Assembly Rough Opening (SF)**	**U x A**
Sliding entrance door	Glazed Entry	0.60	250.0	150.0	0.60	250.0 (1)	150.0
Skylights	**Assembly ID**	**Skylight U-Factor**	**Assembly Rough Opening (SF)**	**U x A**	**Skylight U-Factor**	**Assembly Rough Opening (SF)**	**U x A**
All types	Skylight-1	0.50	1,000.0	500.0	0.50	1,000.0 (1)	500.0

	Proposed Area	Proposed UxA	Target Area	Target UxA	Target UxA with Adjustment
Project Totals	**68,900**	**4,481**	**68,900**	**4,504**	**3,828**

NOTE: Enhanced envelope credit applied - 0.85 multiplier has been applied to the Total Target UxA for exterior areas only. Refer to Target UxA with Adjustment.

0.85 multiplier applied

Target UxA	Target UxA with Adjustment
4,504	3,828

SHGC x A Calculation	NEW BUILDING - FULLY CONDITIONED					COMPLIES		
Fenestration Assemblies			PROPOSED			TARGET		
Glazed Doors	**Assembly ID**	**PF**	**Glazed Door SHGC**	**Assembly Rough Opening (SF)**	**SHGC x A**	**Glazed Door SHGC**	**Assembly Rough Opening (SF)**	**SHGC x A**
Sliding entrance door	Glazed Entry	PF < 0.2	0.33	250.0	82.5	0.33	250.0 (1)	82.5
Horizontal	**Assembly ID**	**PF**	**Skylight SHGC**	**Assembly Rough Opening (SF)**	**SHGC x A**	**Skylight SHGC**	**Assembly Rough Opening (SF)**	**SHGC x A**
Skylights	Skylight-1		0.35	1,000.0	350.0	0.35	1,000.0 (1)	350.0
Vertical Fenestration	**Assembly ID**	**PF**	**Fenestration SHGC**	**Assembly Rough Opening (SF)**	**SHGC x A**	**Fenestration SHGC**	**Assembly Rough Opening (SF)**	**SHGC x A**
Fixed - Class AW or site built	Window-1	PF < 0.2	0.38	3,750.0	1,425.0	0.38	3,750.0 (1)	1,425.0

	Proposed Area	Proposed SHGC x A	Target Area	Target SHGC x A
Project Totals	**5,000**	**1,858**	**5,000**	**1,858**

Component Performance Calculations Report With 15% Target UA Adjustment

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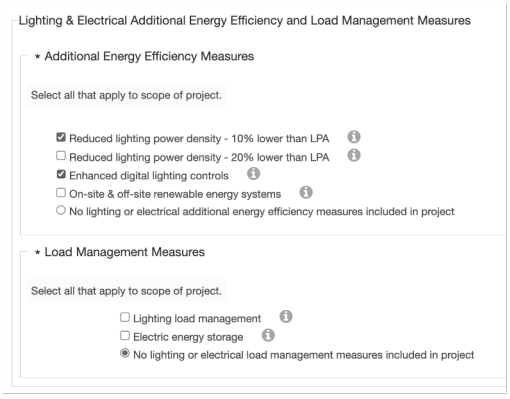
Lighting & Electrical System Measures

Plan Review Check List

What to look for during lighting & electrical plan review ~

- Reduced lighting power measures require LPA-LPD calculations with 0.90 or 0.80 LPA multiplier applied.
- Enhanced controls measure requires that ≥ 50% of gross floor area has luminaires with either LLLC or NLC controls.
- Refer to Sections C406 for documentation requirements for other lighting & electrical measures.



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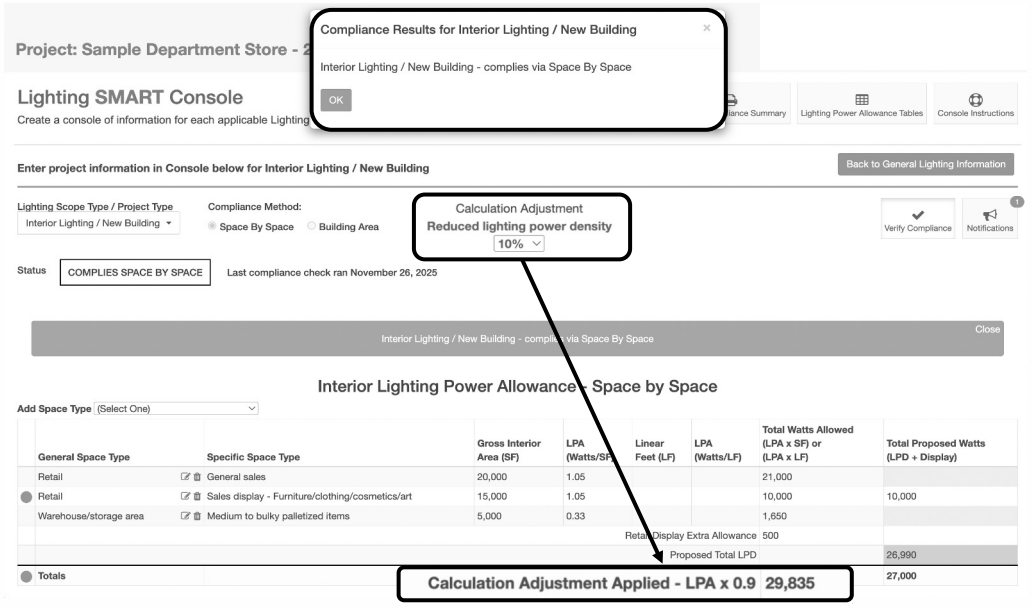
Lighting Power Density 10-20% Lower Than LPA

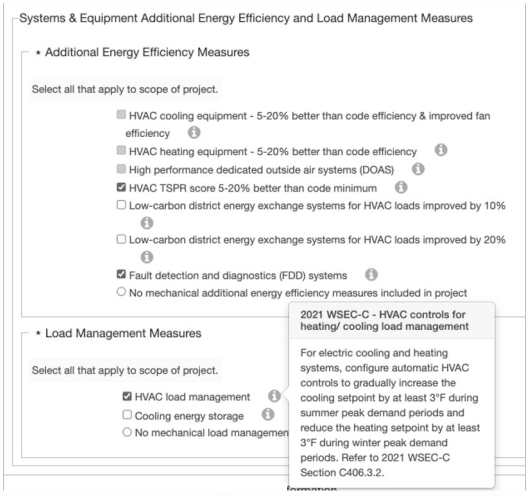


Mechanical System Measures

Plan Review Check List

What to look for during mechanical plan review ~

- Better-than-code efficiency measures require capacity-weighted average calculations showing % better efficiency for all applicable efficiency parameters.
- TSPR measure requires report showing % better score.
- DOAS measure requires ≥ 90% of conditioned floor area has ventilation provided by high performance DOAS equipment.
- Refer to Section C406 for documentation requirements for other mechanical measures.



COOLING EQUIPMENT OVERCODE PERFORMANCE — C406-AC-EFF

2021 Washington State Energy Code Compliance Forms for Commercial Buildings as defined in Chapter 2 — Revised Oct 2025

Project Title: **Sample Department Store** — Date: 12/1/25

Area Id		Area		Description		
Space Cooling Equipment / Systems						
			C406.2.2.2 Improved Cooling Efficiency Credits			
Equipment Id	Eq Desc	Cooling Output Capacity (Btu/hr)	Proposed Cooling Efficiency	Cooling Efficiency Units	Code Cooling Efficiency	Percent Above Code
HP-1	Packaged Heat Pump	120,000	12.2	EER	11	10.9%
HP-2	Packaged Heat Pump	60,000	15	SEER2	13.4	11.9%
HP-3	Packaged Heat Pump	60,000	15	SEER2	13.4	11.9%
VRF-1	VRF Mulit-Split System	72,000	13	EER	11	18.2%
	Total	312,000		Percent Better than Code		13.0%

5-20% Better-Than-Code Equipment Efficiency

SPACE HEATING EQUIPMENT AND SYSTEMS FUEL TYPE AND CODE PATH — SPC-EQ-DET

2021 Washington State Energy Code Compliance Forms for Commercial Buildings as defined in Chapter 2 — Revised Oct 2025

Project Title: **Sample Department Store** — Date: 12/1/25

These tables are provided to calculate the fraction of space heat capacity that must comply via C401.3.3 and capacity weighted over code efficiency percentage for use in C406-CALC. Results are not automatically assigned and must be applied to the appropriate C406-CALC areas by the user. These can be used to calculate the code fuel path and/or the improved heating efficiency. Values can be entered for the whole building and used for all areas, or entered for each area. When calculating inputs for areas heated by equipment located in other areas enter the capacity of the terminal equipment. Equipment of similar type may be lumped for the fuel type calculation, equipment similar type and capacity category may be lumped for the Improved Heating Efficiency Credits. Indicate equipment counts in the Eq Desc field and enter total heating capacity for all the equipment..

Area Id	Retail	Area (sf)	50000	Description	Retail Sales Floor, Offices & Employee Lounge				
			C403.1.4 / C401.3.3 Compliance			C406.2.2.3 Improved Heating Efficiency Credits			
Equipment Id	Eq Desc	Total Heating Output Capacity (Btu/hr)	Primary Heating Fuel Type	Code path	C403.1.4 HP Equipment Exception #	Proposed Efficiency	Efficiency Units	Code Efficiency	Percent Above Code
HP-1	Packaged Heat Pump	135,000	Heat Pump	C403.1.4 Heat pump		4.1	COP	3.4	20.6%
HP-2	Packaged Heat Pump	65,000	Heat Pump	C403.1.4 Heat pump		7.8	COP	6.7	16.4%
HP-3	Packaged Heat Pump	65,000	Heat Pump	C403.1.4 Heat pump		7.8	COP	6.7	16.4%
VRF-1	VRF Multi-Split System	72,000	Heat Pump	C403.1.4 Heat pump		4	COP	3.3	21.2%
	Total Heating Capacity	337,000		Fossil Fuel Fraction	0.00	Percent Better than Code			19.1%

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5-20% Better Than Code TSPR Score

BUILDING ENERGY TOTAL SYSTEM PERFORMANCE RATIO — U.S. DEPARTMENT OF ENERGY

Washington State TSPR Analysis

Total System Performance Ratio for HVAC

1

BUILDING INFORMATION

TSPR Example Retail: PSZHP + DOAS; 2021 WSEC; CZ 4C
20201 Cedar Valley Road
Lynnwood, WA 98036

Building Type: **Retail**
Gross Floor Area: **10,000 ft²**
Year of Construction: **N/A (New)**

Analysis Date: **02/16/2026**
Building ID #: **27325**
Software Release: 2024.1.0.388

Whole Building Total System Performance Ratio

Proposed Building TSPR: 28.8
Baseline Building TSPR: 25.9

Larger number = Better score

The Proposed Building TSPR exceeds the Target Building TSPR and thereby complies with 2021 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 cost of energy consumption (USD) from the building's HVAC systems.

SUBMITTED BY

Name		Example
Organization		Example
Email		example@gmail.com
Phone Number		

10% better TSPR score

ANALYSIS PARAMETERS

Energy Code	2021 Washington State Energy Code
ASHRAE Climate Zone	4C, Mixed - Marine
Weather Station	Hartford Bradley Intl Ap CT USA TMY3 WMO#=725080

The Total System Performance Ratio Analysis has been performed in accordance with the 2021 Washington State Energy Code.

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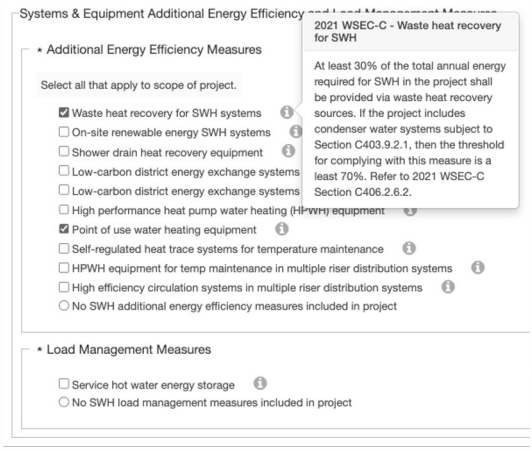
Service Water Heating System Measures

Plan Review Check List

What to look for during SWH plan review ~

- Measures include pre-heating SW using sources of waste heat, solar hot water heating, and high efficiency SWH equipment, temperature maintenance and distribution systems.
- Refer to Section C406 for documentation requirements for claimed SWH measures.



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Renewable Energy

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Renewable Energy Systems

On-Site Systems

- Minimum 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.
- 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 for buildings with limited available roof area or where a substantial portion of the roof area is shaded.

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Renewable Energy Systems

Off-Site Alternatives

- Energy sources that are delivered or credited to the building.
- Renewable energy multiplier factor applies depending on the source.
- Approved options include:
  - Self-generation via an off-site renewable energy system owned by the building project owner.
  - Community renewable energy facility systems
  - Renewable power purchase agreement (PPA)

Community solar system at Greenbank Farm, Whidbey Island - Image courtesy of Greenbank Farm

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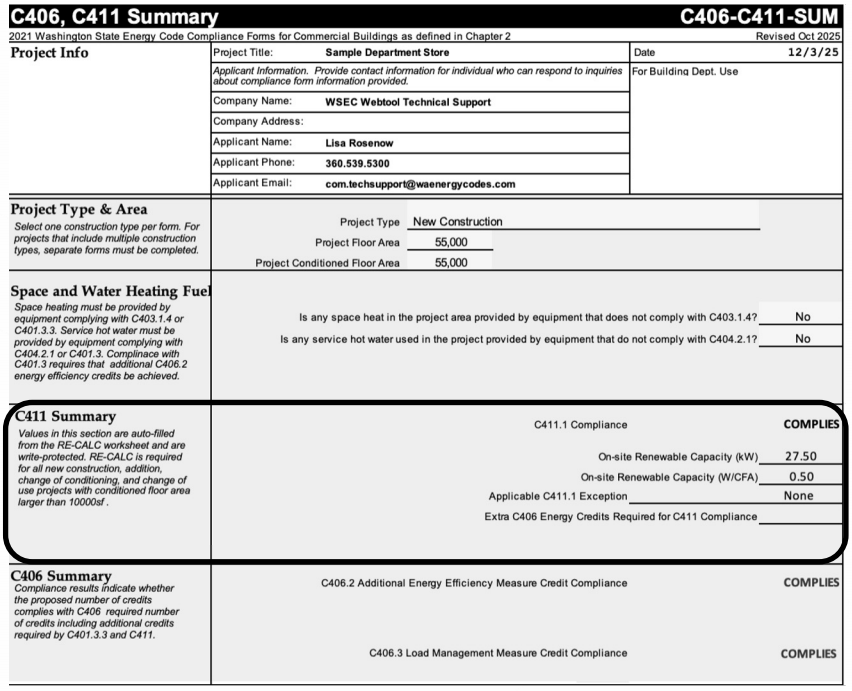
C411 Compliance Status Summary



C406, C411 Summary — C406-C411-SUM

2021 Washington State Energy Code Compliance Forms for Commercial Buildings as defined in Chapter 2 — Revised Oct 2025

Project Info

Project Title:	Sample Department Store	Date 12/3/25
Applicant Information. Provide contact information for individual who can respond to inquiries about compliance form information provided.		For Building Dept. Use
Company Name:	WSEC Webtool Technical Support	
Company Address:		
Applicant Name:	Lisa Rosenow	
Applicant Phone:	360.539.5300	
Applicant Email:	com.techsupport@waenergycodes.com	

Project Type & Area

Select one construction type per form. For projects that include multiple construction types, separate forms must be completed.

Project Type: New Construction
Project Floor Area: 55,000
Project Conditioned Floor Area: 55,000

Space and Water Heating Fuel

Space heating must be provided by equipment complying with C403.1.4 or C401.3.3. Service hot water must be provided by equipment complying with C404.2.1 or C401.3. Complinace with C401.3 requires that additional C406.2 energy efficiency credits be achieved.

Is any space heat in the project area provided by equipment that does not comply with C403.1.4? No
Is any service hot water used in the project provided by equipment that do not comply with C404.2.1? No

C411 Summary

Values in this section are auto-filled from the RE-CALC worksheet and are write-protected. RE-CALC is required for all new construction, addition, change of conditioning, and change of use projects with conditioned floor area larger than 10000sf .

C411.1 Compliance: COMPLIES
On-site Renewable Capacity (kW): 27.50
On-site Renewable Capacity (W/CFA): 0.50
Applicable C411.1 Exception: None
Extra C406 Energy Credits Required for C411 Compliance:

C406 Summary

Compliance results indicate whether the proposed number of credits complies with C406 required number of credits including additional credits required by C401.3.3 and C411.

C406.2 Additional Energy Efficiency Measure Credit Compliance: COMPLIES
C406.3 Load Management Measure Credit Compliance: COMPLIES

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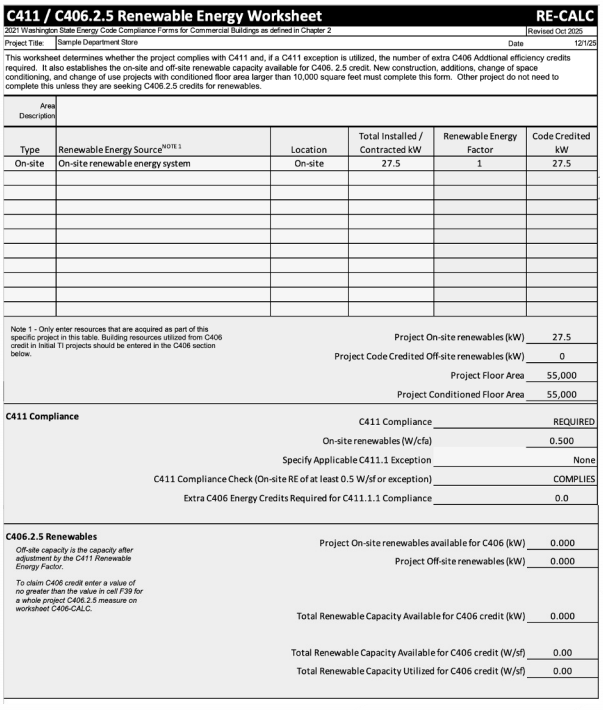
C411 On-Site & Off-Site Renewable Energy Summary



C411 / C406.2.5 Renewable Energy Worksheet — RE-CALC

2021 Washington State Energy Code Compliance Forms for Commercial Buildings as defined in Chapter 2 — Revised Oct 2025

Project Title: Sample Department Store — Date 12/1/25

This worksheet determines whether the project complies with C411 and, if a C411 exception is utilized, the number of extra C406 Addtional efficiency credits required. It also establishes the on-site and off-site renewable capacity available for C406. 2.5 credit. New construction, additions, change of space conditioning, and change of use projects with conditioned floor area larger than 10,000 square feet must complete this form. Other project do not need to complete this unless they are seeking C406.2.5 credits for renewables.

Area Description:

Type	Renewable Energy Source[NOTE 1]	Location	Total Installed / Contracted kW	Renewable Energy Factor	Code Credited kW
On-site	On-site renewable energy system	On-site	27.5	1	27.5

Note 1 - Only enter resources that are acquired as part of this specific project in this table. Building resources utilized from C406 credit in Initial TI projects should be entered in the C406 section below.

Project On-site renewables (kW): 27.5
Project Code Credited Off-site renewables (kW): 0
Project Floor Area: 55,000
Project Conditioned Floor Area: 55,000

C411 Compliance

C411 Compliance: REQUIRED
On-site renewables (W/cfa): 0.500
Specify Applicable C411.1 Exception: None
C411 Compliance Check (On-site RE of at least 0.5 W/sf or exception): COMPLIES
Extra C406 Energy Credits Required for C411.1.1 Compliance: 0.0

C406.2.5 Renewables

Off-site capacity is the capacity after adjustment by the C411 Renewable Energy Factor.

To claim C406 credit enter a value of no greater than the value in cell F39 for a whole project C406.2.5 measure on worksheet C406-CALC.

Project On-site renewables available for C406 (kW): 0.000
Project Off-site renewables (kW): 0.000
Total Renewable Capacity Available for C406 credit (kW): 0.000
Total Renewable Capacity Available for C406 credit (W/sf): 0.00
Total Renewable Capacity Utilized for C406 credit (W/sf): 0.00

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Commissioning

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Value of Commissioning

The job of the commissioning professional is to conduct functional performance testing to verify that all building systems required to be commissioned are installed and function interactively:

- As defined in the owner's design specifications, AND
- ***Comply with all applicable code requirements.***

Key details evaluated during commissioning include:

- Required ***system controls*** are installed and accurately configured (mechanical, service water heating, lighting, metering, refrigeration).
- HVAC systems are properly ***balanced and satisfy design setpoints***.

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When is commissioning required?

- Mechanical – Total HVAC equipment capacity in the project is ≥ 180,000 Btu/h (15 tons) cooling or ≥ 240,000 Btu/h heating.
- Service water heating project scope includes:
  - Distribution system with circulation pump & controls
  - Largest SWH system capacity is ≥ 200,000 btu/h
  - Project includes HPWHs (except small, packaged unit serving single dwelling unit)
  - Project includes solar thermal water heating, and/or permanent pools/spas
- Lighting – Total installed lighting wattage in the project is ≥ 10 kW or lighting with automatic controls is ≥ 5 kW.
- Remote refrigeration systems (not self-contained units).

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Commissioning

Plan Review Check List

What to look for during plan review ~

C408.1.1 Commissioning in construction documents. Construction documents shall clearly indicate provisions for commissioning process. The construction documents shall minimally include the following:

1. A narrative description of the activities that will be accomplished during the commissioning process. At a minimum, the commissioning process is required to include:
   1.1. Development and execution of the commissioning plan, including all subsections of Section C408.1.2;
   1.2. The *certified commissioning professional's* review of the building documentation and close out submittals in accordance with Section C103.6; and
   1.3. The commissioning report in accordance with Section C408.1.3.
2. Roles, responsibilities, and required qualifications of the *certified commissioning professional*.
3. A listing of the specific equipment, appliances, or systems to be tested.

C408.1.4.1 Commissioning compliance. Buildings, or portions thereof, shall not be considered acceptable for a final inspection pursuant to Section C104.2.6 until the *code official* has received a letter of transmittal from the building owner acknowledging that the building owner or owner's authorized agent has received the Commissioning Report. Completion of Commissioning Compliance Checklist (Figure C408.1.4.1) is deemed to satisfy this requirement. Phased acceptance of Commissioning Compliance Checklist for portions of the work specific to the trade that is being inspected is permissible where accepted by the *code official* and where the *certified commissioning professional* remains responsible for completion of the commissioning process. If there are unresolved deficiencies when the final inspection is scheduled, the Commissioning Report shall be submitted and shall describe the unresolved deficiencies.

C408.1.4.2 Copy of report. The *code official* shall be permitted to require that a copy of the Commissioning Report be made available for review by the *code official*.

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FIGURE C408.1.4.1
COMMISSIONING COMPLIANCE CHECKLIST

Project Information	**Project Name:** **Project Address:** **Certified Commissioning Professional:** **Type of ISO Certification and Number:**
Supporting Documents	❑ **Manuals, record documents and training have been completed or are scheduled** (Section C103.6) • Building operations and maintenance information (C103.6.2) have been submitted to the owner or scheduled date: _____ • Manuals (C103.6.2.1) have been submitted to the owner or scheduled date: _____ • Compliance documentation (C103.6.3) has been provided to owner or scheduled date: • System operation training (C103.6.4) has been provided to owner or scheduled date:
Commissioning Plan	❑ **Commissioning Plan was used during construction** (Section C408.1.2)
Commissioning Report	❑ **Commissioning Report has been submitted** (Section C408.1.3)
Commissioned Systems	❑ **Mechanical Systems were included in the commissioning process** (Section C408.2) ❑ Testing, adjusting and balancing is complete (Section C408.2.2) ❑ There are unresolved deficiencies with the mechanical systems. These are described in the attached Commissioning Report submitted to the Owner. ❑ **Service Water Heating Systems were included in the commissioning process** (Section C408.3) ❑ There are unresolved deficiencies with the service water heating systems. These are described in the attached Commissioning Report submitted to the Owner. ❑ **Controlled receptacles and lighting control systems were included in the commissioning process** (Section C408.4) ❑ There are unresolved deficiencies with the electrical power and/or automatic lighting controls. These are described in the attached Commissioning Report submitted to the Owner. ❑ **Additional systems were included in the commissioning process** (Section C408.5) ❑ There are unresolved deficiencies with systems required by C406 or C407. These are described in the attached Commissioning Report submitted to the Owner. ❑ **Metering systems were included in the commissioning process** (Section C408.6) ❑ There are unresolved deficiencies with the metering system. These are described in the attached Commissioning Report submitted to the Owner. ❑ **Refrigeration systems were included in the commissioning process** (Section C408.7) ❑ There are unresolved deficiencies with systems required by Section C410. These are described in the attached Commissioning Report submitted to the Owner.
Certification	❑ I hereby certify that requirements for Section C408 System Commissioning have been completed in accordance with the Washington State Energy Code, including all items above. _____ *Certified Commissioning Professional* Date ❑ I hereby certify that requirements for Section C408 System Commissioning have been completed in accordance with the Washington State Energy Code, including all items above. _____ Building Owner or Owner's Representative Date

Checklist submitted to building owner or owner's representative after commissioning is completed.

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Streamlining the Process for 2021 WSEC-C Plan Review

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