



2015 Washington State Energy Code

NAIOP

October 13, 2015



presented by:

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RUSHING

Presentation Outline

Topics to Cover:

- Washington State Energy Code (WSEC) Process & Goals
- 2015 WSEC Proposed Major Changes
- Efficiency Improvement
- Public Comment Period Ends Friday, 10/23
- Upcoming Public Hearing in Olympia on Friday, 10/16
- Discussion



2015 WSEC Development Timeline:

- January, 2015: 2015 WSEC “Integrated Draft” Issued
- March 1, 2015: Code Change Proposal Received
- March-June, 2015: Energy Code TAG Review Meetings
- August, 2015: Public Review Draft Issued
- September 11, 2015: Eastern WA Public Comment Meeting
- **October 16, 2015: Western WA Public Comment Meeting**
- **October 23, 2015: Public Comment Period Closes**
- November 2015: WSBCCC Issues Final Draft
- December 2015: WSBCCC Issues Report to Legislature

2015 Energy Code Adoption Date:

- July 1, 2016 (after WA Legislature Approval)

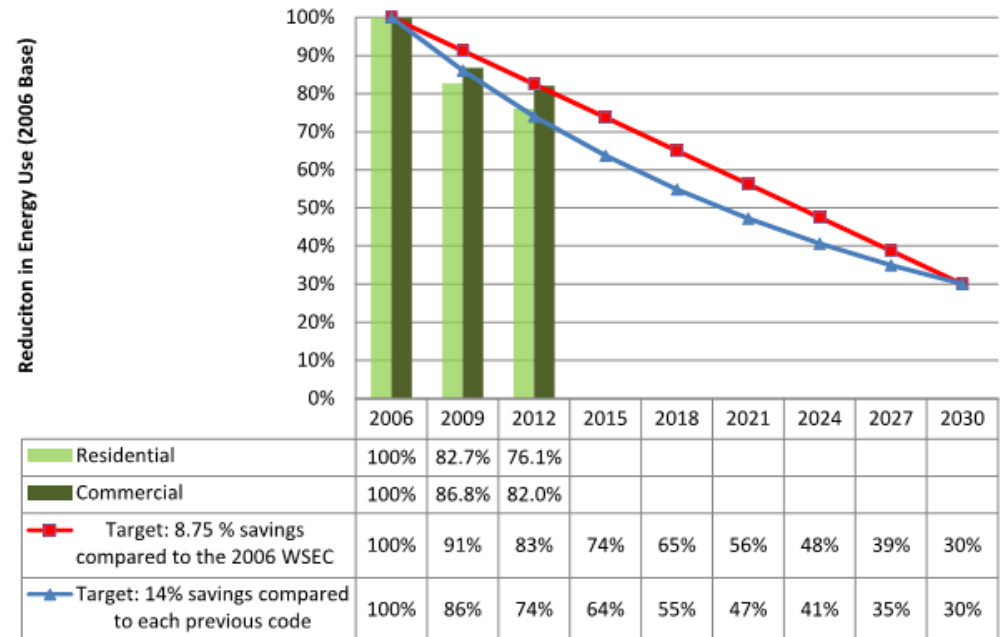
Fun Facts for 2015 WSEC:

- In Development for Past 2 Years, 12 TAG Meetings
- “Integrated Draft” best of 2012 WSEC & 2015 IECC
 - 2015 IECC: Commercial: 214 Amendments
 - 2015 IECC: Residential: 46 Amendments
- 2015 WSEC Code Change Proposals Received
 - 2012 WSEC: Commercial: 132 Proposals Received
 - 2012 WSEC: Residential: 32 Proposal Received
- **Commercial Energy Code Proposals (132 Proposals)**
 - **Approved: 37 Proposals**
 - **Approved with Modifications: 63 Proposals**
 - Denied: 15 Proposals
 - Withdrawn: 17 Proposals

RCW 19.27A: Energy Related Building Standards:

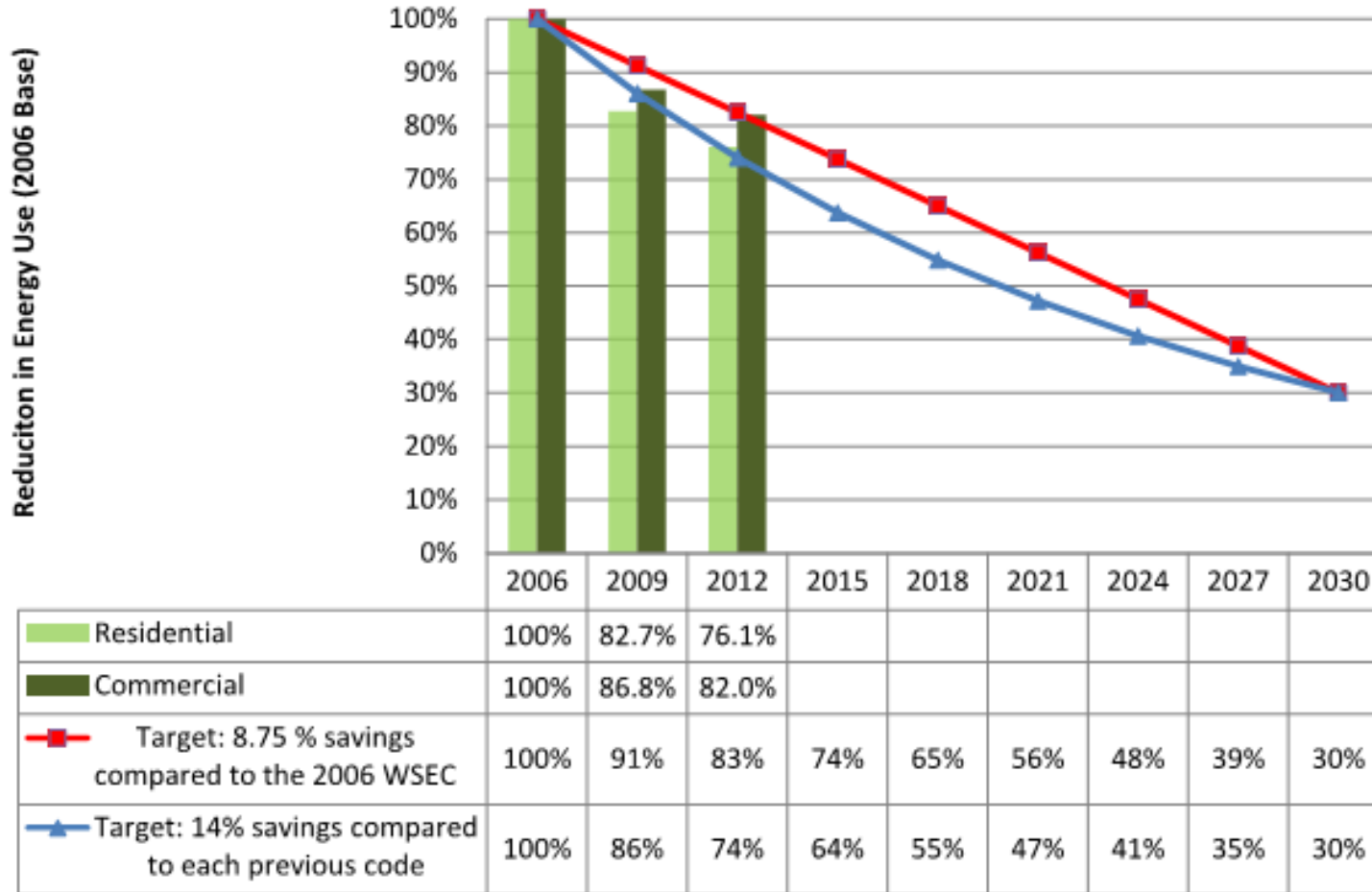
- 19.27A.160:** Residential and nonresidential construction permitted under the 2031 state energy code **must achieve a seventy percent reduction in annual net energy consumption**, using the adopted 2006 WSEC as a baseline. Last Update 2009
- 19.27A.130:** The legislature finds that energy efficiency is the **cheapest, quickest, and cleanest way** to meet rising energy needs, confront climate change, and boost our economy.
- Change required every 3 years:**
 - 8.75% over 2006 WSEC
 - 14% over previous code
- 2012 WSEC vs 2009 WSEC:**
 - Residential: ~6.6% Reduction
 - Commercial: ~4.8% Reduction

Incremental Improvement Compared to Targets





WSEC: Goals & Progress

Incremental Improvement Compared to Targets



Recap per July 2015 WSBCC MVE Committee Letter:

3. The Council must evaluate and determine the costs and the benefits
 - a. The legislature finds making homes, businesses, and public institutions more energy efficient will save money, create good local jobs, enhance energy security, reduce pollution that causes global warming, and speed economic recovery while reducing the need to invest in costly new generation
 -  b. Any new measures, standards, or requirements adopted by the Council must be technically feasible, commercially available, and cost-effective to building owners and tenants.
 - c. The Council has adopted a definition of cost-effectiveness based RCW 39.35 recommended by Department of Commerce
 -  d. Executive Order 14-04 from Washington Governor Jay Inslee directs the Council to “achieve early and widespread deployment of energy-neutral buildings prior to the 2031 statutory requirement in RCW 19.27A.160”



Recap per July 2015 WSBCC MVE Committee Letter:

3. The Council must evaluate and determine the costs and the benefits, cont.
 - e. A guide on how to evaluate cost-effectiveness is therefore defined by the Council as a code change that has a net present savings over a 50-year life-cycle of a building utilizing the Life Cycle Cost Tool (LCCT) as developed by the Washington State Office of Financial Management (OFM). The methodology of the LCCT is based on the NIST Handbook 135 methodology and utilizes specific inputs as determined by the Council with guidance from the Washington State Department of Commerce.
 - f. If the council determines that economic, technological, or process factors would significantly impeded adoption of or compliance with incremental progress towards the 70 percent reduction in annual net energy consumption, the council may defer the implementation of the proposed energy code update and shall report it findings to the legislature by December 31st of the year prior to the year in which those codes would otherwise be enacted.



Structure of WSEC and SEC

2015 WSEC:

- **Commercial “C” Buildings**
- **Residential “R” Buildings**
- **Appendices A, B, C, D**

Definitions per IECC:

RESIDENTIAL BUILDING. For this code, includes detached one- and two-family dwellings and multiple single-family dwellings (townhouses) as well as Group R-2, R-3 and R-4 buildings three stories or less in height above grade plane.

COMMERCIAL BUILDING. For this code, all buildings that are not included in the definition of "Residential buildings."



2015 WSEC Proposed Major Changes



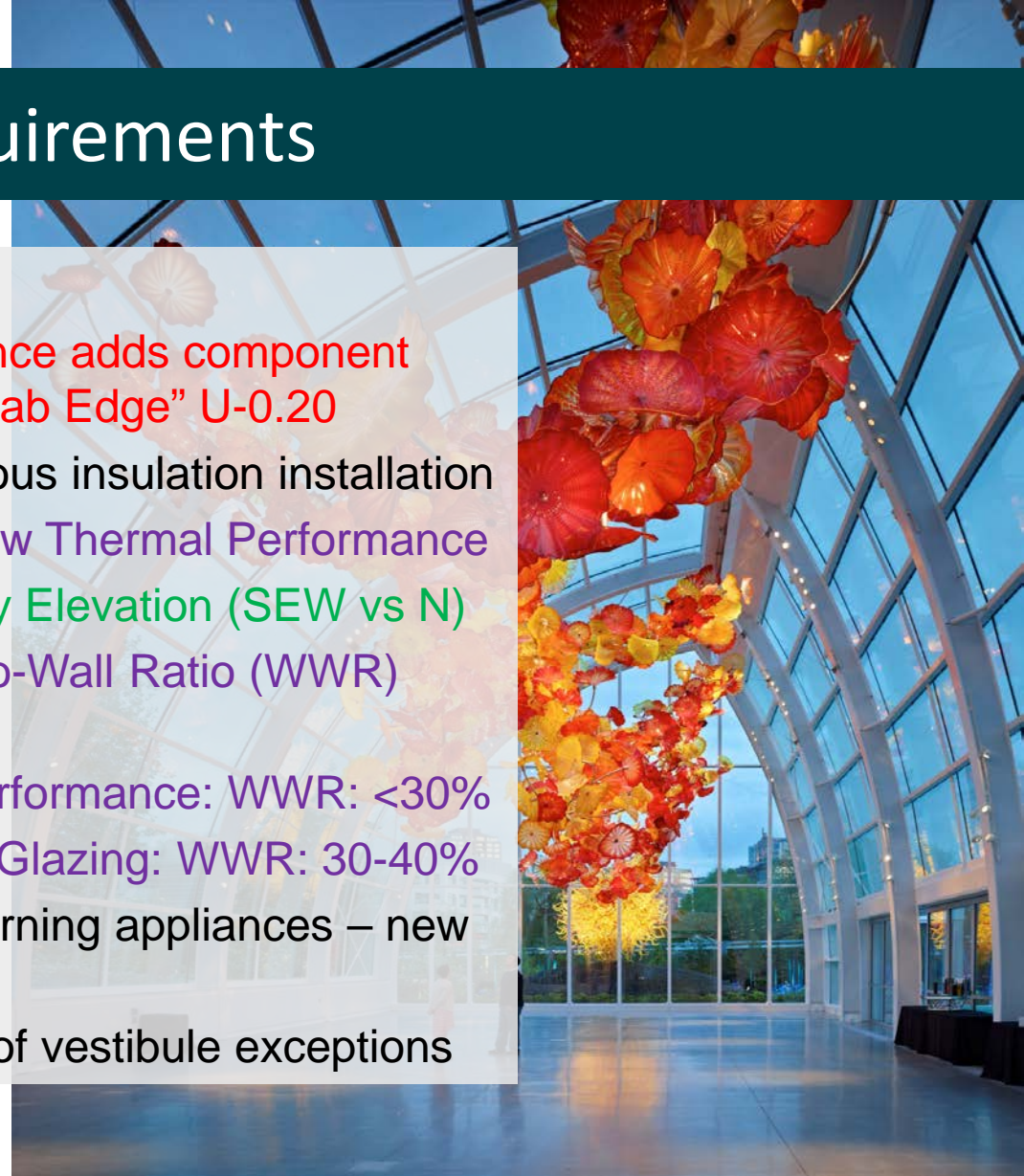
2015 WSEC Commercial Change Summary:

- C402: Building Envelope changes
- C403.2.6: Ventilation changes
- **C403.2.6.1: Dedicated Outdoor Air Systems**
- C403.3: Economizer Cooling changes
- C403.2.7.1: Kitchen Exhaust Energy efficiency changes
- C403.5: Energy Recovery changes
- C404.3: Domestic Hot Water Recirculation changes
- **C405.4: Lighting Power Density changes**
- C405.10 Controlled Receptacles in certain occupancies
- **C406: Additional Efficiency Package Options: 2 points**
- **C407: Energy Modeling Compliance Path changes**
- C408: Commissioning changes
- C409: Energy Metering clarifications
- “Capable of” changed to “Configured to” in 55 locations
- Chapter 5: Existing Buildings new chapter
- Appendix E: Renewable Energy Appendix

C402: Building Envelope Requirements

C402 Quick Recap

- Table C402.1.4: Target UA Compliance adds component category for “Mass Transfer Deck Slab Edge” U-0.20
- C402.2.1: Multiple layers of continuous insulation installation
- Table C402.4: No changes in Window Thermal Performance
- Table C402.4: SHGC & PF Varies by Elevation (SEW vs N)
- No Changes in Maximum Window-to-Wall Ratio (WWR) Paths Available
 - C402.4.1: Standard Glazing Performance: WWR: <30%
 - C402.4.1.3: High-Performance Glazing: WWR: 30-40%
- C402.5.3: Rooms containing fuel-burning appliances – new section
- C402.5.7: Vestibules: Clarifications of vestibule exceptions



C403: Mechanical Systems

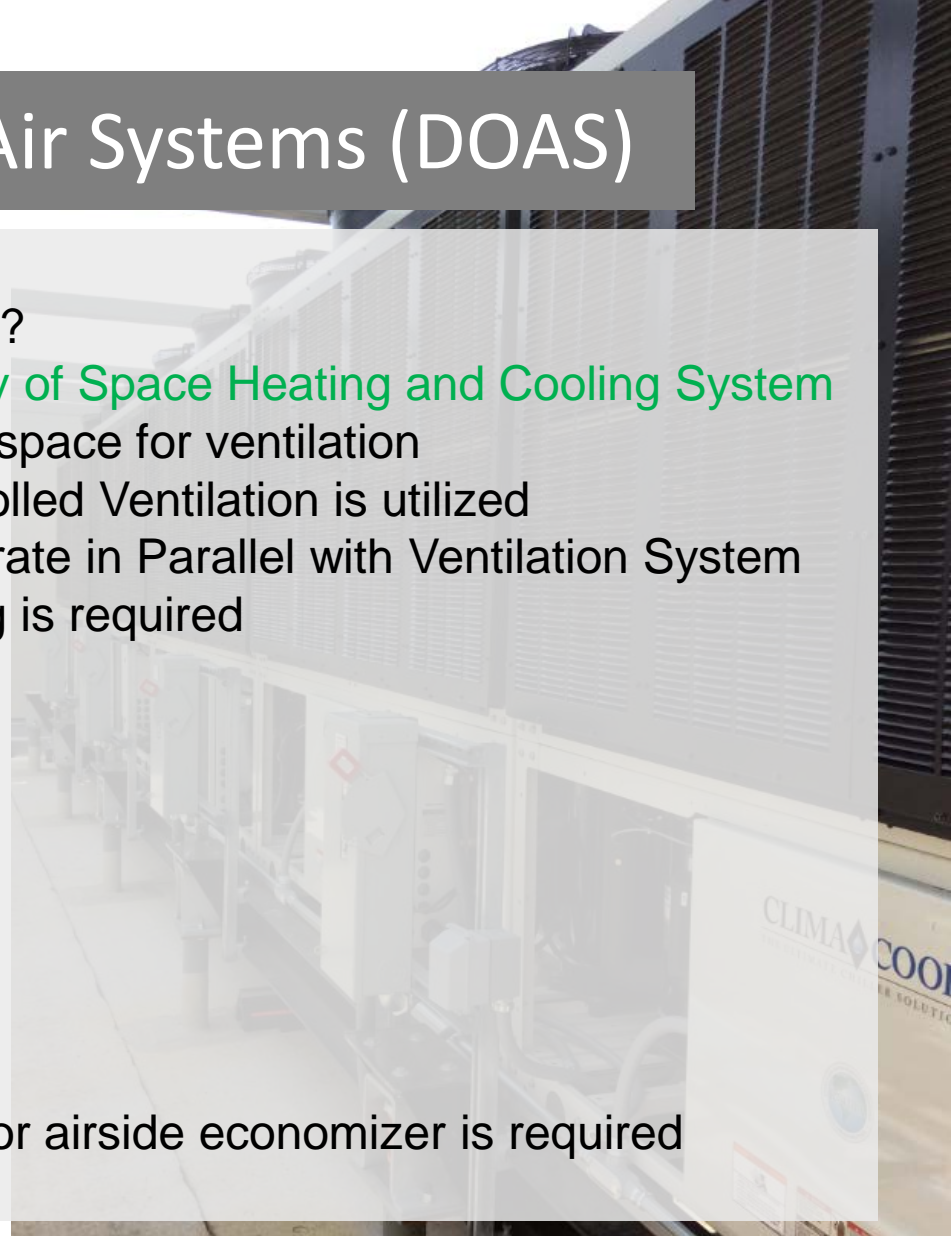
C403 Quick Recap

- Update Mechanical Equipment Efficiency Tables per 90.1-2013
- “Capable of” changed to “Configured to” in 55 locations in code
 - Temperature setpoints, deadbands, off-hour controls, etc.
- C403.2.4.1: Thermostatic controls for neighboring zones
- C403.2.4.12: Direct Digital Control Systems required for certain systems
- C403.2.6: Ventilation is capped at 150% of 2015 IMC Chapter 4
- **C403.2.6.1: Dedicated Outdoor Air Systems (DOAS)**
- C403.2.7.1: Kitchen Exhaust Systems (Variable Volume or Heat Recovery)
- C403.2.11.3: Fan Efficiency Grade not less than 67
- C403.3: Economizers – Removal of Simple Systems
- C403.5.1: Energy Recovery Ventilation Systems moved from Mandatory Section

C403.2.6.1: Dedicated Outdoor Air Systems (DOAS)

Quick Recap:

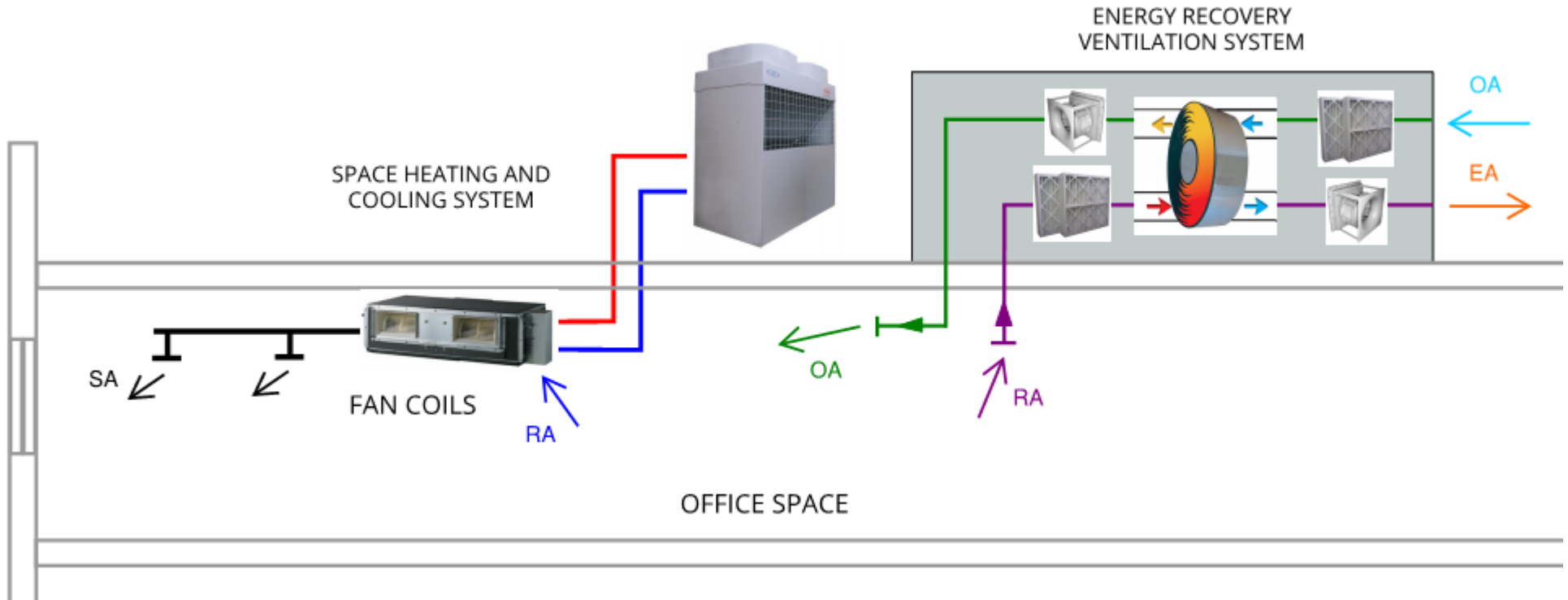
- What is a Dedicated Outdoor Air System?
 - Ventilation is supplied independently of Space Heating and Cooling System
- 100% outdoor air is delivered directly to space for ventilation
- Energy Recovery and/or Demand Controlled Ventilation is utilized
- Space heating and cooling fan coils operate in Parallel with Ventilation System and Cycle on/off when heating or cooling is required
- Required in Five Building Types:
 - Office
 - Retail
 - Education
 - Libraries
 - Fire Stations
- Simpler Systems than VAV Systems
- Airside Economizers are NOT required
- Space cooling loads must be <5 watt/sf or airside economizer is required
- Glazing: Up to 40% WWR is allowed



C403.2.6.1: Dedicated Outdoor Air Systems (DOAS)

Two independent systems:

- One system to heat and cool the building
- One system to ventilate the building



C403.2.6.1: Dedicated Outdoor Air Systems (DOAS)

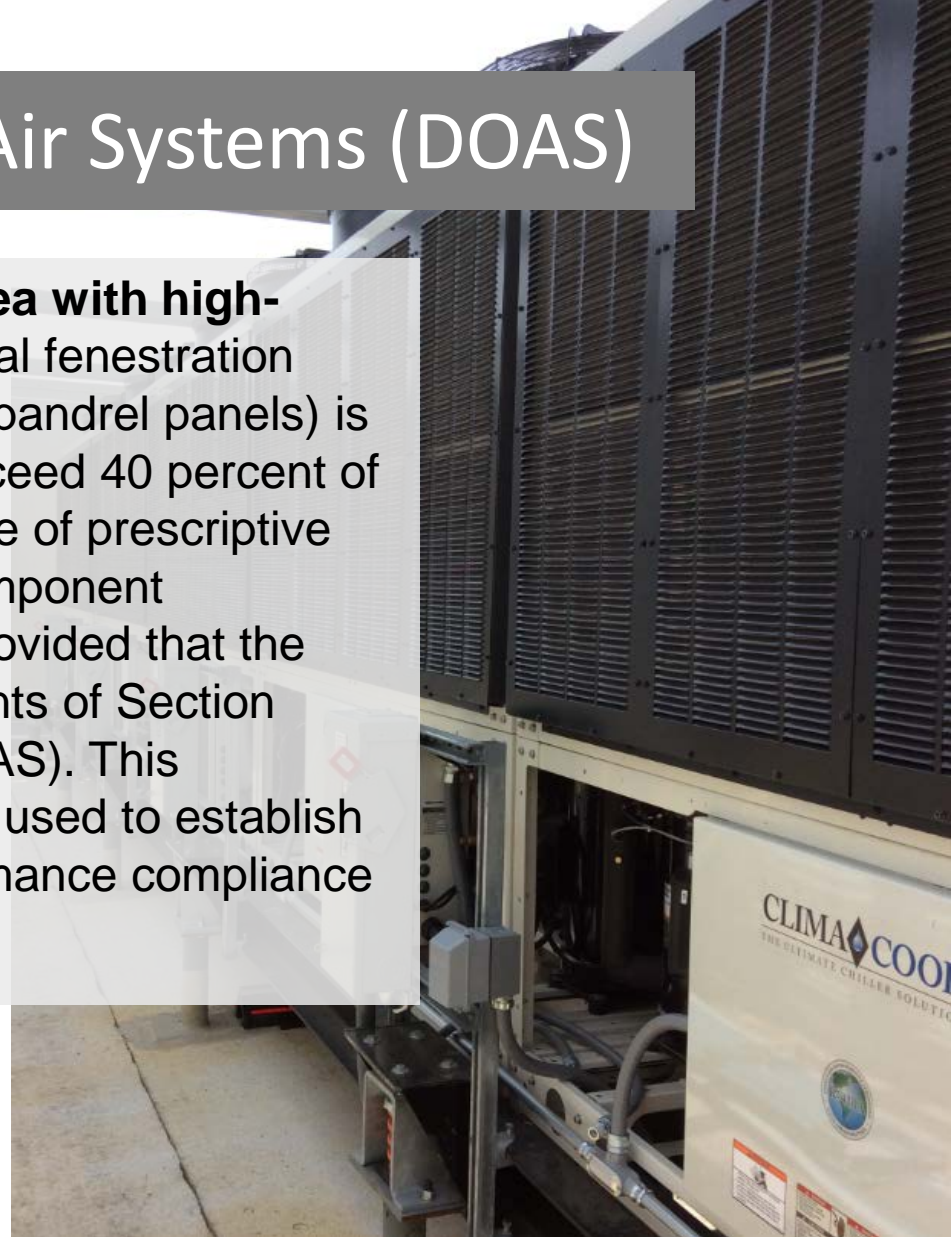
C403.2.6.1 Dedicated outdoor air systems (DOAS). For office, retail, education, libraries and fire stations, outdoor air shall be provided to each zone by a dedicated outdoor air system (DOAS) which delivers 100 percent outside air without requiring operation of the heating and cooling system fans for ventilation air delivery. The DOAS shall include either energy recovery ventilation and/or demand control ventilation.

C403.2.6.1.2 Heating/cooling system fan controls. For systems meeting the requirements of Section C403.2.6.1 dedicated outdoor air systems, equipment and controls shall be configured to cycle off zone heating and cooling equipment fans and/or pumps, primary cooling air, heating and cooling coils, and parallel heating fans when there is no call for heating or cooling in the zone.

C403.3 Economizers Exception 1. Systems complying with Section C403.2.6.1 Dedicated outdoor air systems (DOAS) with year-round cooling loads from lights and equipment of less than 5 watts per square foot.

C403.2.6.1: Dedicated Outdoor Air Systems (DOAS)

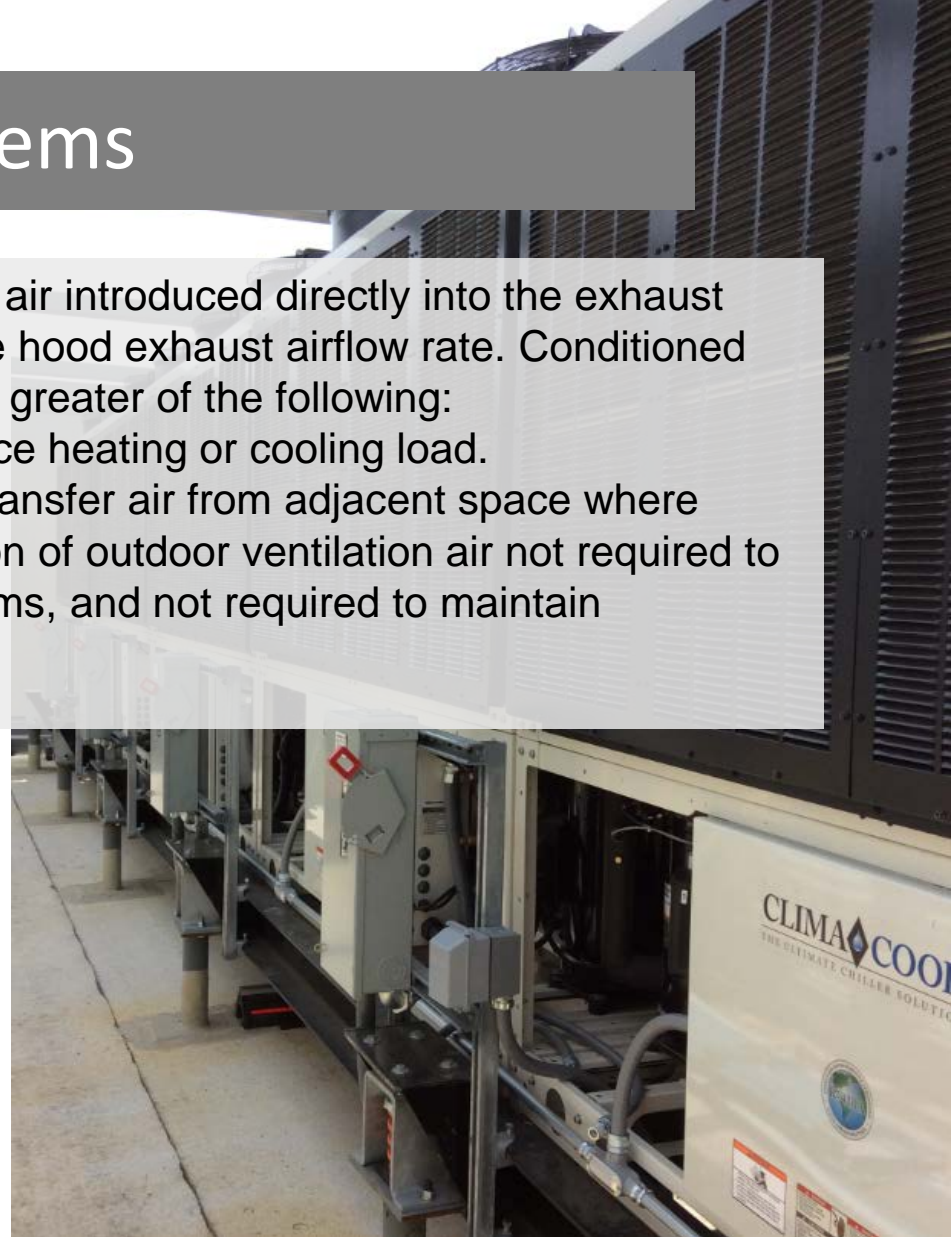
C402.4.1.4 Increased vertical fenestration area with high-performance mechanical systems. The vertical fenestration area (not including opaque doors and opaque spandrel panels) is permitted to exceed 30 percent but shall not exceed 40 percent of the gross above-grade wall area, for the purpose of prescriptive compliance with Section C402.1.4 or for the component performance alternative in Section C402.1.5, provided that the mechanical system complies with all requirements of Section C403.2.6.1 Dedicated outdoor air systems (DOAS). This increased glazing fraction is not permitted to be used to establish the reference case for the Total Building Performance compliance path in Section C407.



C403.2.7.1: Kitchen Exhaust Systems

C403.2.7.1 Kitchen exhaust systems. Replacement air introduced directly into the exhaust hood cavity shall not be greater than 10 percent of the hood exhaust airflow rate. Conditioned supply air delivered to any space shall not exceed the greater of the following:

1. The ventilation rate required to meet the space heating or cooling load.
2. The hood exhaust flow minus the available transfer air from adjacent space where available transfer air is considered that portion of outdoor ventilation air not required to satisfy other exhaust needs, such as restrooms, and not required to maintain pressurization of adjacent spaces.

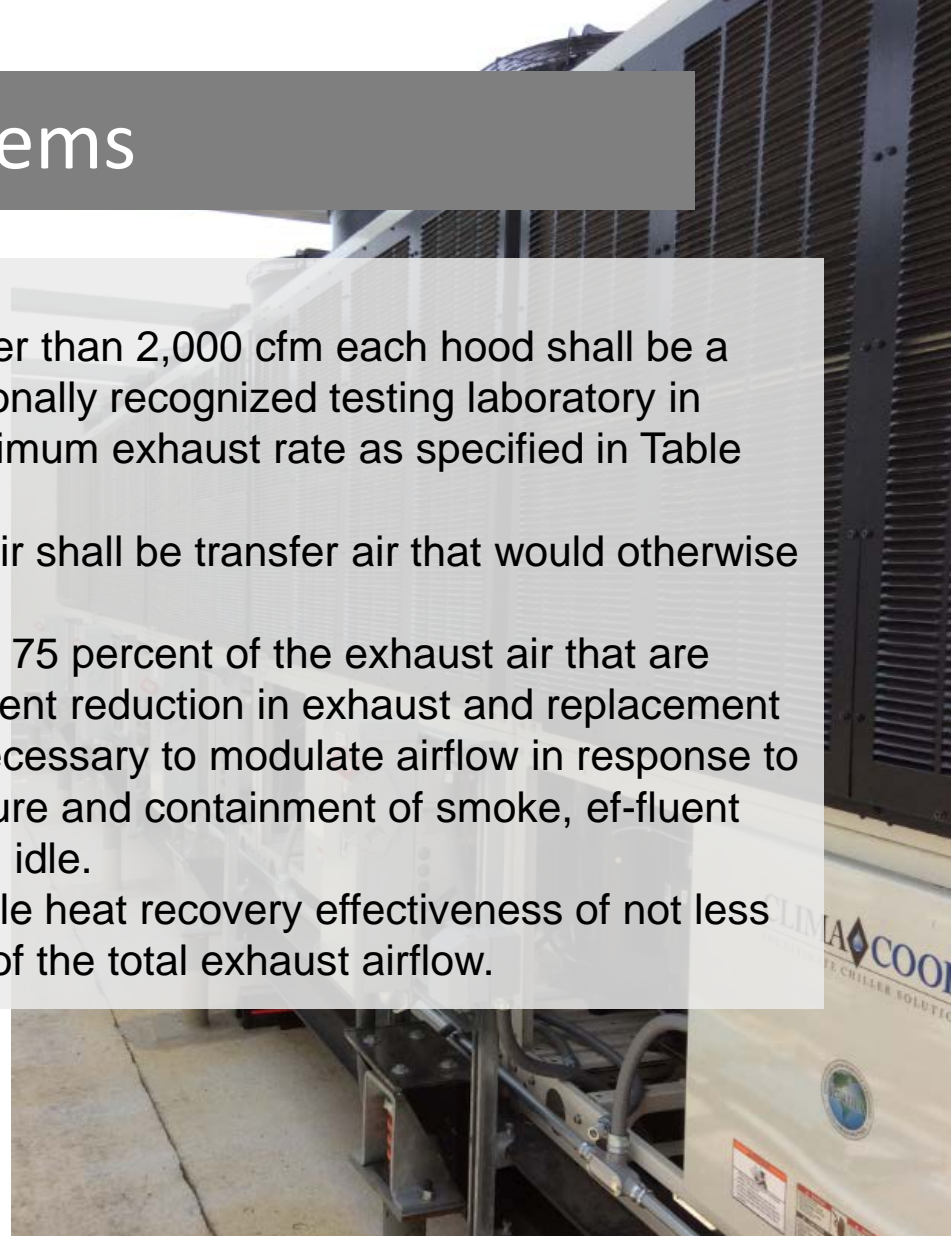


C403.2.7.1: Kitchen Exhaust Systems

C403.2.7.1 Kitchen exhaust systems.

Where total kitchen hood exhaust airflow rate is greater than 2,000 cfm each hood shall be a factory built commercial exhaust hood listed by a nationally recognized testing laboratory in compliance with UL 710. Each hood shall have a maximum exhaust rate as specified in Table C403.2.7.1 and shall comply with one of the following:

1. Not less than 50 percent of all replacement air shall be transfer air that would otherwise be exhausted.
2. Demand ventilation systems on not less than 75 percent of the exhaust air that are configured to provide not less than a 50-percent reduction in exhaust and replacement air system airflow rates, including controls necessary to modulate airflow in response to appliance operation and to maintain full capture and containment of smoke, ef-fluent and combustion products during cooking and idle.
3. Listed energy recovery devices with a sensible heat recovery effectiveness of not less than 40 percent on not less than 50 percent of the total exhaust airflow.



C403.2.7.1: Kitchen Exhaust Systems

C403.2.7.1 Kitchen exhaust systems.

Where a single hood, or hood section, is installed over appliances with different duty ratings, the maximum allowable flow rate for the hood or hood section shall be based on the requirements for the highest appliance duty rating under the hood or hood section.

Exceptions:

1. Where not less than 75 percent of all the replacement air is transfer air that would otherwise be exhausted.
2. Certified grease extractor hoods that require a face velocity no greater than 60 fpm.

Table C403.2.7.1
Maximum Net Exhaust Flow Rate,
CFM Per Linear Foot of Hood Length

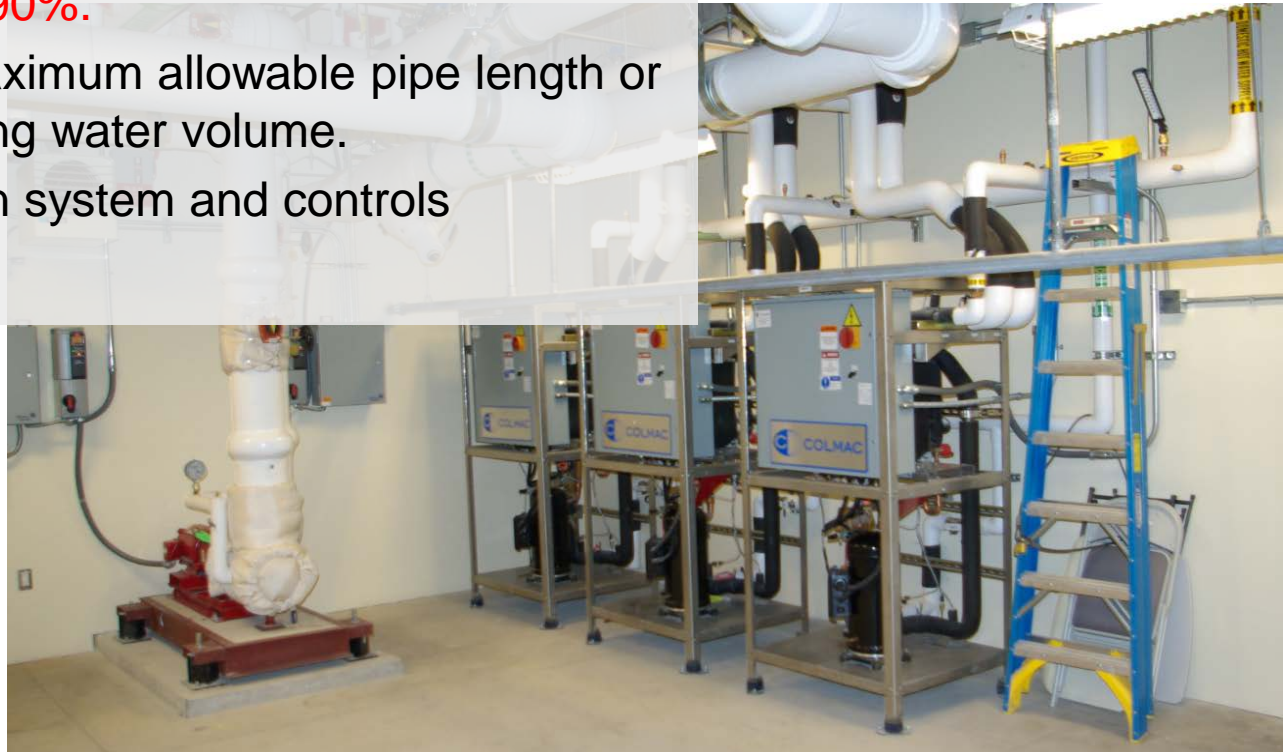
<u>TYPE OF HOOD</u>	<u>LIGHT-DUTY EQUIPMENT</u>	<u>MEDIUM-DUTY EQUIPMENT</u>	<u>HEAVY-DUTY EQUIPMENT</u>	<u>EXTRA-HEAVY-DUTY EQUIPMENT</u>
<u>Wall-mounted canopy</u>	<u>140</u>	<u>210</u>	<u>280</u>	<u>385</u>
<u>Single island</u>	<u>280</u>	<u>350</u>	<u>420</u>	<u>490</u>
<u>Double island (per side)</u>	<u>175</u>	<u>210</u>	<u>280</u>	<u>385</u>
<u>Eyebrow</u>	<u>175</u>	<u>175</u>	<u>NA</u>	<u>NA</u>
<u>Backshelf/pass-over</u>	<u>210</u>	<u>210</u>	<u>280</u>	<u>NA</u>

For SI: 1 cfm = 0.4719 L/s; 1 foot = 305 mm
NA = Not allowed

C404: Service Water Heating

C404 Quick Recap

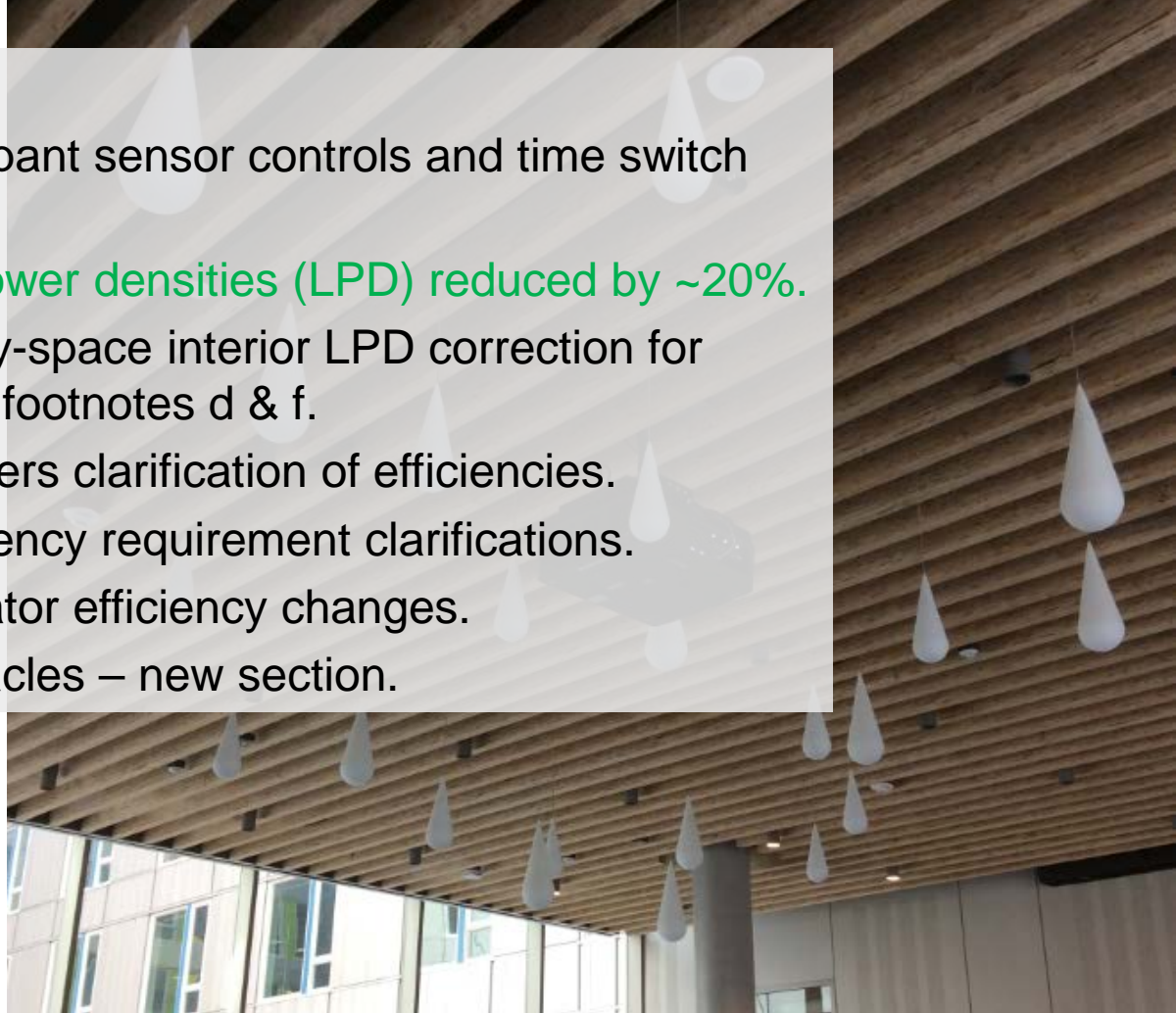
- C404.2.1: High input-rated service water heating systems (>1,000,000 BTUH) shall have a thermal efficiency not less than 90%.
- C404.3: DHW piping maximum allowable pipe length or volume to minimize piping water volume.
- C404.7: DHW circulation system and controls requirements.



C405: Electrical, Power, and Lighting Systems

C405 Quick Recap

- C405.2.1 & C405.2.2: Occupant sensor controls and time switch controls sections revised.
- **C405.4.2: Interior lighting power densities (LPD) reduced by ~20%.**
- Table C402.4.2(2): Space-by-space interior LPD correction for ceiling height reinstated per footnotes d & f.
- C405.6: Electrical transformers clarification of efficiencies.
- C405.8: Electric motor efficiency requirement clarifications.
- C405.9: Elevator and escalator efficiency changes.
- C405.10: Controlled receptacles – new section.



C405.5.2: Lighting Power Density

Section C405.5.2:
Lighting power densities reduced by 20% from 2012 WSEC allowances.

2015 WSEC: Interior Lighting Power Density: Space by Space

Space Type	2012 WSEC	2012 SEC	2015 WSEC	2015 SEC	2015 IECC	90.1-2013
TABLE C405.5.2(2)						
Office, Enclosed	1.11	1.11	0.89	TBD	1.11	1.11
<i>% Change from 2012 WSEC</i>	-	0%	-20%		0%	0%
Office, Open Plan	0.98	0.98	0.78	TBD	0.98	0.98
<i>% Change from 2012 WSEC</i>	-	0%	-20%		0%	0%
Conference, Meeting	1.23	1.23	0.98	TBD	1.23	1.23
<i>% Change from 2012 WSEC</i>	-	0%	-20%		0%	0%
Lobby, otherwise	0.90	0.90	0.72	TBD	0.90	0.90
<i>% Change from 2012 WSEC</i>	-	0%	-20%		0%	0%
Sales Area	1.68	1.68	1.27	TBD	1.59	1.44
<i>% Change from 2012 WSEC</i>	-	0%	-24%		-5%	-14%
Food Preparation	0.99	0.99	0.79	TBD	1.21	1.21
<i>% Change from 2012 WSEC</i>	-	0%	-20%		22%	22%

C406: Additional Efficiency Package Options

C406 Quick Recap

- 2015 WSEC: Pick **Two** of the Eight Options
- Each option is worth **~3% or more** of a building energy usage
- C406 **was NOT adopted** for the 2012 WSEC or 2012 SEC
- Differences from 2015 IECC
 - 2015 IECC only required to do **One** of the Six Options
 - 2015 WSEC modifies the options to make them more stringent
 - 2015 WSEC requires two options

C406: Additional Efficiency Package Options

C406.1 Requirements. Buildings shall comply with **no less than two** of the following:

1. More efficient HVAC performance in accordance with [Section C406.2](#).
2. Reduced lighting power in accordance with [Section C406.3](#).
3. Enhanced lighting controls in accordance with [Section C406.4](#).
4. On-site supply of renewable energy in accordance with [Section C406.5](#).
5. Provision of a dedicated outdoor air system for certain HVAC equipment in accordance with [Section C406.6](#).
6. High-efficiency service water heating in accordance with [Section C406.7](#).
7. Enhanced envelope performance in accordance with [Section C406.8](#).
8. Reduced air infiltration in accordance with [Section C406.9](#).

C406.1.1 Tenant spaces. Tenant spaces shall comply with [Section C406.2](#), [C406.3](#), [C406.4](#), or [C406.7](#), where applicable. Where an entire building complies with [Section C406.5](#), [C406.8](#) or [C406.9](#), tenant spaces within the building shall be deemed to comply with this section.

C406.2: HVAC Option

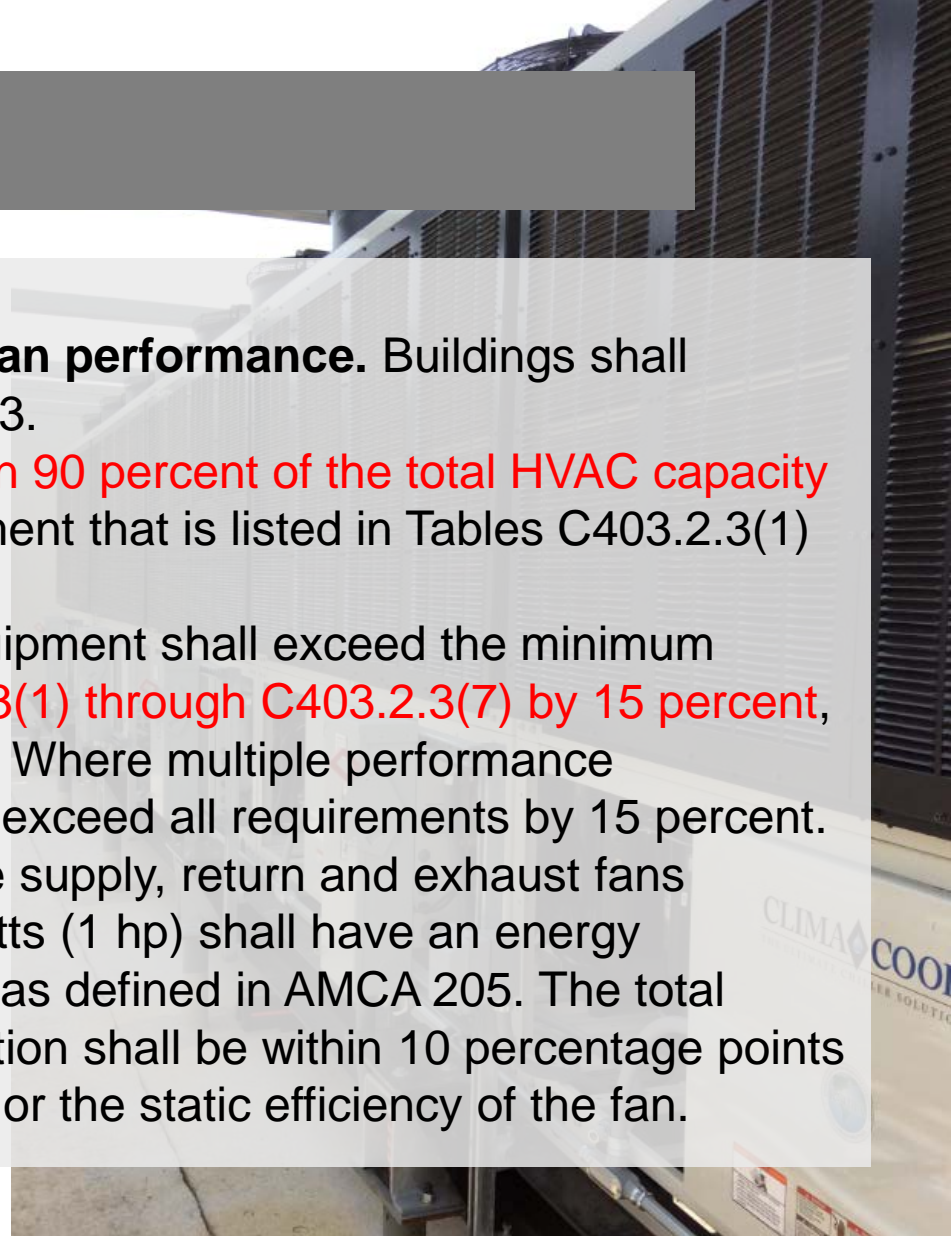
Section C406.2: HVAC option.

C406.2 More efficient HVAC equipment and fan performance. Buildings shall comply with Sections C406.2.1 through C406.2.3.

C406.2.1 HVAC system selection. No less than 90 percent of the total HVAC capacity serving the building shall be provided by equipment that is listed in Tables C403.2.3(1) through C403.2.3(9) or a combination thereof.

C406.2.2 Minimum equipment efficiency. Equipment shall exceed the minimum efficiency requirements listed in Tables C403.2.3(1) through C403.2.3(7) by 15 percent, in addition to the requirements of Section C403. Where multiple performance requirements are provided, the equipment shall exceed all requirements by 15 percent.

C406.2.3 Minimum fan efficiency. Stand-alone supply, return and exhaust fans designed for operating with motors over 750 watts (1 hp) shall have an energy efficiency classification of not less than FEG 71 as defined in AMCA 205. The total efficiency of the fan at the design point of operation shall be within 10 percentage points of either the maximum total efficiency of the fan or the static efficiency of the fan.



C406.3: Lighting Power Density Option

Section C406.3: LPA option.

C406.3 Reduced lighting power. Buildings shall comply with Sections C406.3.1 and, where applicable, C406.3.2.

C406.3.1 Reduced lighting power density. The total interior lighting power (watts) of the building shall be determined by **using 75 percent of the lighting power values** specified in Table C405.4.2(1) times the floor area for the building types, or **by using 75 percent of the interior lighting power allowance** calculated by the Space-by-Space Method in Section C405.4.2.

C406.3.2 Lamp fraction. Not less than **95 percent of the interior lighting power** (watts) from lamps in permanently installed light fixtures in dwelling units and sleeping units shall be provided by lamps with a **minimum efficacy of 60 lumens per watt**.



C406.3: Lighting Power Density Option

Section C406.3: LPA option.

By using 75 percent of the interior lighting power allowance calculated by the Space-by-Space Method in Section C405.4.2.

2015 WSEC: Interior Lighting Power Density: Space by Space

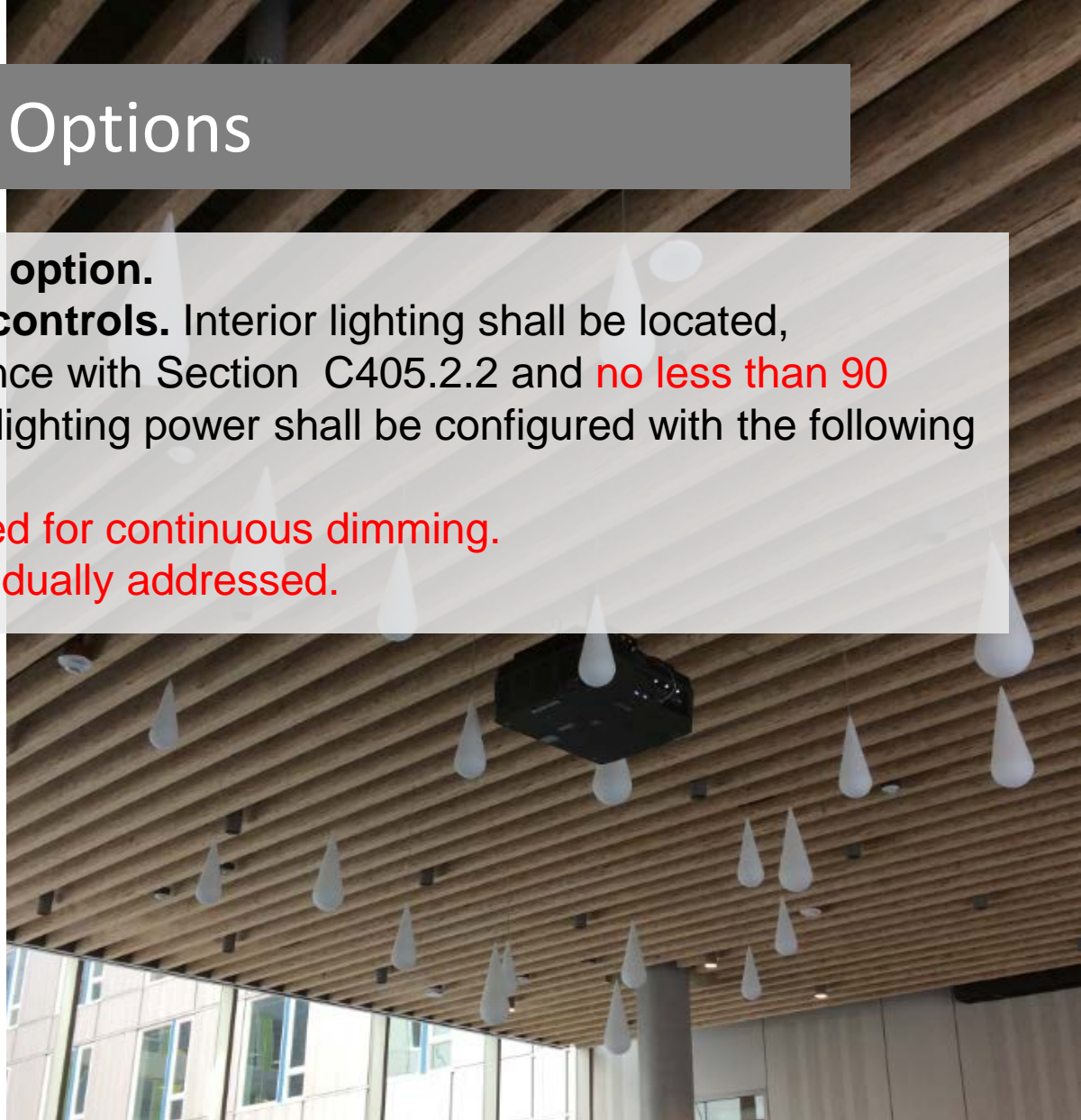
Space Type	2012 WSEC C405.5.2(2)	2015 WSEC C405.5.2(2)	2015 WSEC C406
TABLE C405.5.2(2)			
Office, Enclosed	1.11	0.89	0.67
<i>% Change from 2012 WSEC</i>	-	<i>-20%</i>	<i>-40%</i>
Office, Open Plan	0.98	0.78	0.59
<i>% Change from 2012 WSEC</i>	-	<i>-20%</i>	<i>-40%</i>
Conference, Meeting	1.23	0.98	0.74
<i>% Change from 2012 WSEC</i>	-	<i>-20%</i>	<i>-40%</i>
Lobby, otherwise	0.90	0.72	0.54
<i>% Change from 2012 WSEC</i>	-	<i>-20%</i>	<i>-40%</i>
Sales Area	1.68	1.27	0.95
<i>% Change from 2012 WSEC</i>	-	<i>-24%</i>	<i>-43%</i>
Food Preparation	0.99	0.79	0.59
<i>% Change from 2012 WSEC</i>	-	<i>-20%</i>	<i>-40%</i>

C406.4: Lighting Controls Options

Section C406.4: Lighting controls option.

C406.4 Enhanced digital lighting controls. Interior lighting shall be located, scheduled and operated in accordance with Section C405.2.2 and **no less than 90 percent** of the total installed interior lighting power shall be configured with the following enhanced control functions.

1. **Luminaires shall be configured for continuous dimming.**
2. **Each luminaire shall be individually addressed.**



C406.5: On-Site Renewable Energy Option

Section C406.5: On-site renewable energy option.

C406.5 On-site renewable energy. Buildings shall be provided with on-site renewable energy systems with a total system rating per square foot of conditioned floor area of the building of not less than the value specified in Table C406.5.

<u>Building Area Type</u>	<u>kBTU</u>	<u>kWh</u>
<u>Assembly</u>	<u>1.8</u>	<u>0.53</u>
<u>Dining</u>	<u>10.7</u>	<u>3.14</u>
<u>Hospital</u>	<u>3.6</u>	<u>1.06</u>
<u>Hotel/Motel</u>	<u>2.0</u>	<u>0.59</u>
<u>Office</u>	<u>0.82</u>	<u>0.24</u>
<u>Other</u>	<u>2.02</u>	<u>0.59</u>
<u>Retail</u>	<u>1.31</u>	<u>0.38</u>
<u>School/University</u>	<u>1.17</u>	<u>0.34</u>
<u>Supermarket</u>	<u>5.0</u>	<u>1.47</u>
<u>Warehouse</u>	<u>0.43</u>	<u>0.13</u>

Note: Table is per 8/7/2015 Errata to CR102 filed rule.

C406.5: On-Site Renewable Energy Option

Example 1: PV Array for:

- 5-story 150,000 SF Office Building with 10,000 SF of Retail

<i>On-site Renewable Energy</i>	2012 SEC Renewable	2015 WSEC Renewable	
Area	150,000	150,000	SF
<i>Required On-site Renewable Energy:</i>	70	NA	watt/1000 SF
<i>Retail Renewable Production</i>	NA	0.38	kWH/SF
<i>Office Renewable Production</i>	NA	0.24	kWH/SF
<i>PV Array Capacity:</i>	10.50	38.56	kW
<i>Estimated Unit Cost of PV Array</i>	\$ 6	\$ 5	\$/watt
<i>Estimated Cost of PV Array</i>	\$ 63,000	\$ 192,784	
<i>Quantity of Solar World 270W Panels</i>	43	158	

C406.5: On-Site Renewable Energy Option

Example 2: PV Array for:

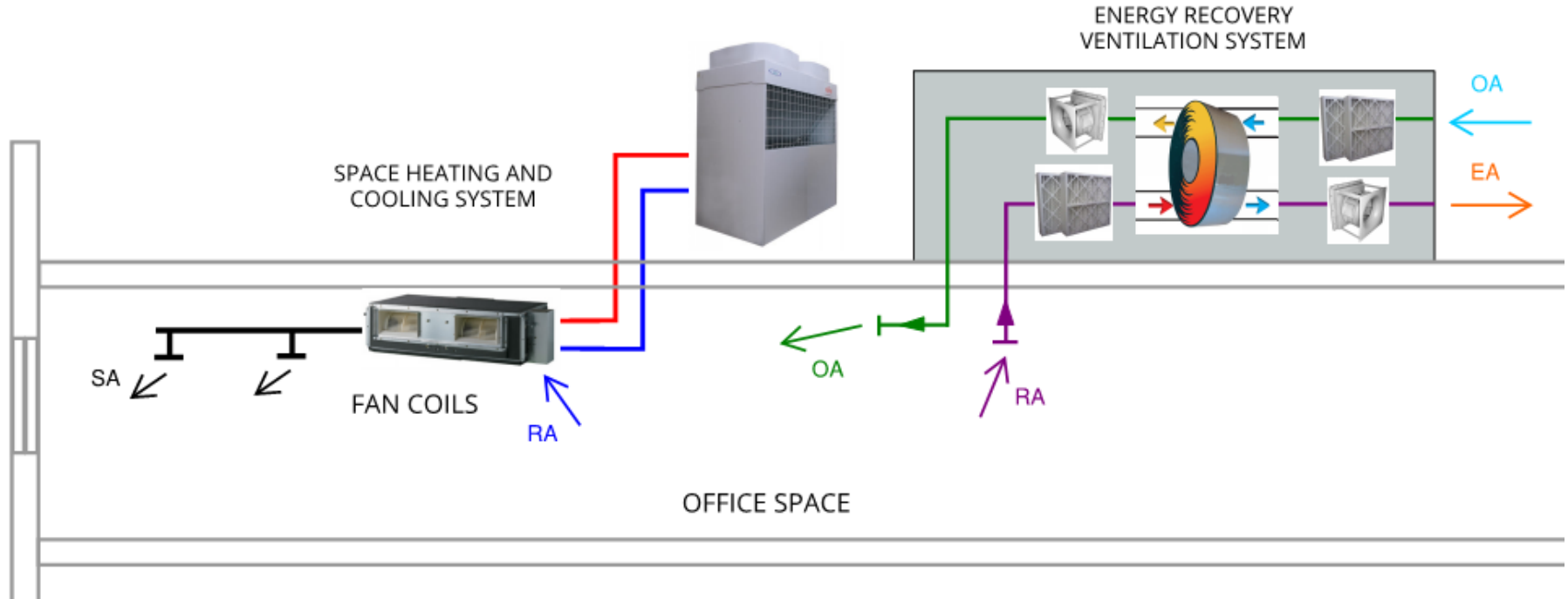
- 10-story 300,000 SF Office Building with 10,000 SF of Retail

<i>On-site Renewable Energy</i>	2012 SEC Renewable	2015 WSEC Renewable	
Area	150,000	300,000	SF
<i>Required On-site Renewable Energy:</i>	70	NA	watt/1000 SF
<i>Retail Renewable Production</i>	NA	0.38	kWH/SF
<i>Office Renewable Production</i>	NA	0.24	kWH/SF
<i>PV Array Capacity:</i>	10.50	75.67	kW
<i>Estimated Unit Cost of PV Array</i>	\$ 6	\$ 5	\$/watt
<i>Estimated Cost of PV Array</i>	\$ 63,000	\$ 378,351	
<i>Quantity of Solar World 270W Panels</i>	43	309	

C406.6: DOAS Option

Section C406.6: DOAS option.

C406.6 Dedicated outdoor air system (DOAS). For buildings **not subject** to the provisions of Section C403.2.6.1, provide DOAS in accordance with Section C403.2.6.1.



C406.7: Service Water Heating Option

Section C406.7: Service water heating option.

C406.7 Reduced energy use in service water heating. Buildings shall comply with Sections C406.7.7 and C406.7.2.

C406.7.1 Building type. **Not less than 90 percent** of the conditioned floor area shall be of the following types:

1. Group R-1: Boarding houses, hotels or motels.
2. Group I-2: Hospitals, psychiatric hospitals and nursing homes.
3. Group A-2: Restaurants and banquet halls or buildings containing food preparation areas.
4. Group F: Laundries.
5. Group R-2: Buildings with residential occupancies.
6. Group A-3: Health clubs and spas.
7. Buildings with a service hot water load of 10 percent or more of total building energy loads, as shown with an energy analysis as described in Section C407.

C406.7: Service Water Heating Option

Section C406.7: Service water heating option.

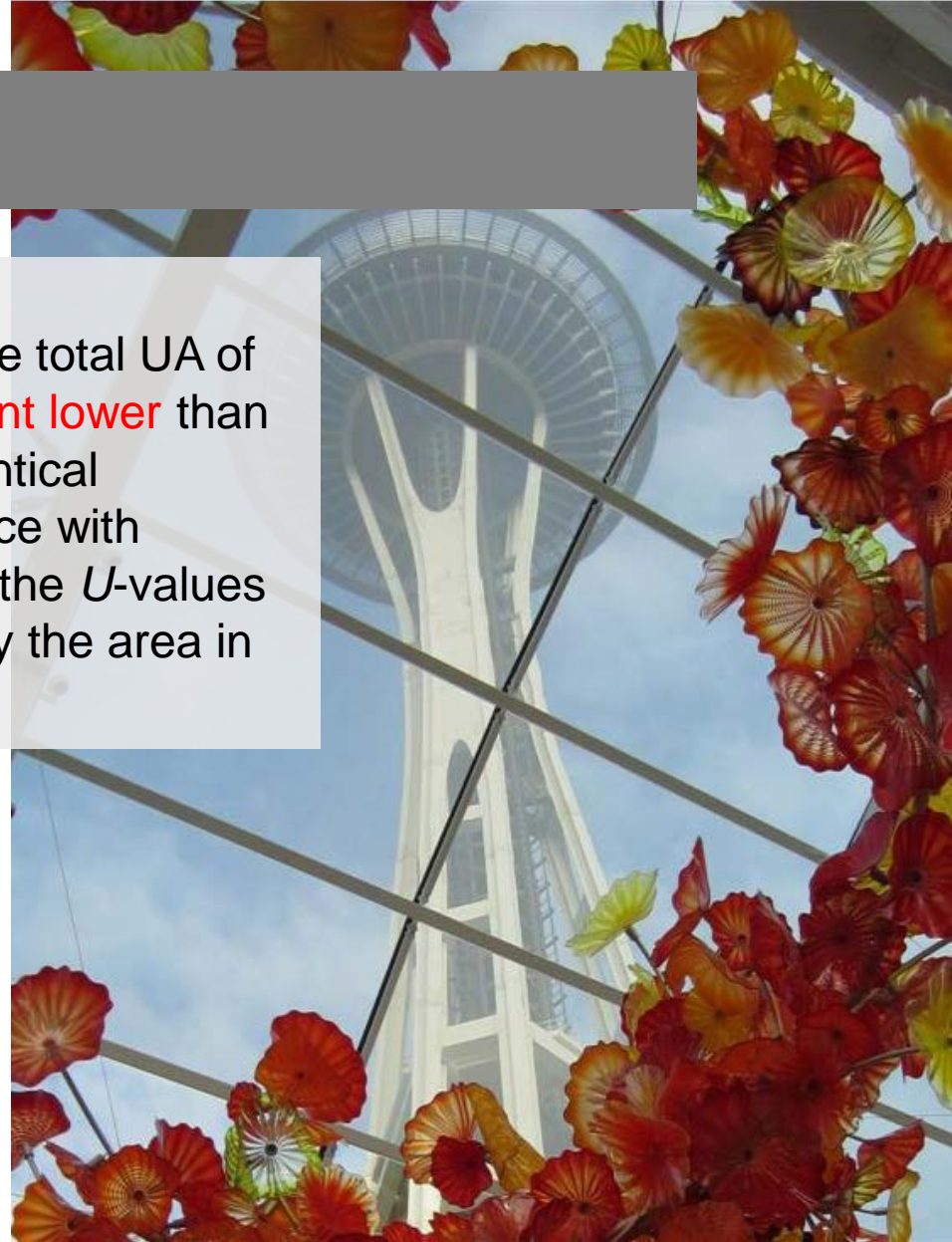
C406.7.1 Load fraction. Not less than 60 percent of the annual building service hot water energy use, or not less than 100 percent of the annual building service hot water heating energy use in buildings subject to the requirements of Section C403.6.4, shall be provided by one or more of the following:

1. Service hot water system delivering heating requirements using heat pump technology with a minimum COP of 3.0.
2. Waste heat recovery from service hot water, heat recovery chillers, building equipment, process equipment, a combined heat and power system, or other approved system.
3. Solar water-heating systems.

C406.8: Envelope Option

Section C406.8—Envelope option.

C406.8 Enhanced envelope performance. The total UA of the building thermal envelope **shall be 15 percent lower** than the maximum allowable UA for a building of identical configuration and fenestration area in accordance with Section C402.1.4, where UA equals the sum of the *U*-values of each distinct envelope assembly multiplied by the area in square feet of that assembly.



C406.9: Air Infiltration Option

Section C406.9—Air infiltration option.

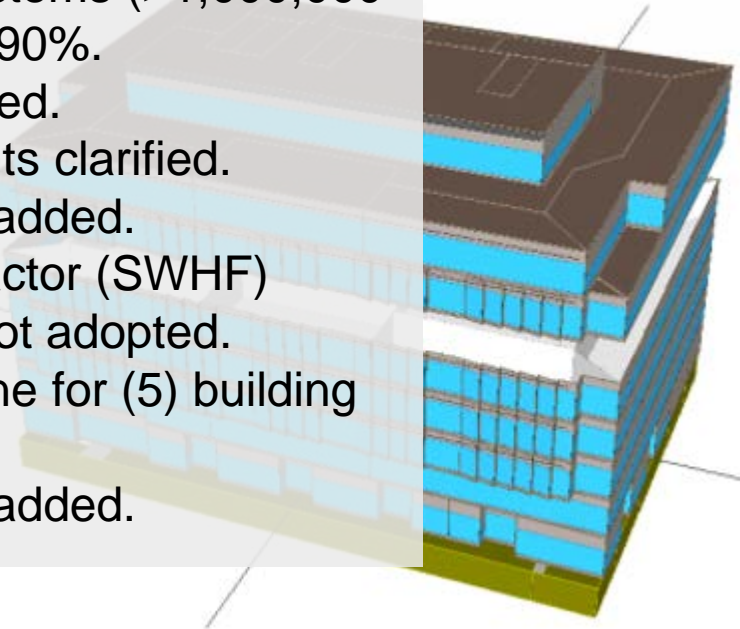
C406.9 Reduced air infiltration. Air infiltration shall be verified by whole building pressurization testing conducted in accordance with ASTM E779 or ASTM E1827 by an independent third party. The measured air leakage rate of the *building envelope shall not exceed 0.25 cfm/ft²* (2.0 L/s•m²) under a pressure differential of 0.3 in. water (75 Pa), with the calculated surface area being the sum of the above and below grade *building envelope*. A report that includes the tested surface area, floor area, air by volume, stories above grade, and leakage rates shall be submitted to the code official and the building owner.

Exception: Where the *conditioned floor area* of the building is not less than 250,000 ft² (25,000 m²), air leakage testing shall be permitted to be conducted on representative above grade sections of the building provided the *conditioned floor area* of tested areas is no less than 25 percent of the *conditioned floor area* of the building and are tested in accordance with this section

C407: Total Building Performance (TBP)

C407 Quick Recap

- C401.2: Proposed building energy consumption shall be equal to or less than **87% of the standard reference design building**.
- **When complying with C407 compliance with C406 is NOT required.**
- Compliance with C404 is mandatory therefore required to comply with C404.2.1: High input-rated service water heating systems (>1,000,000 BTUH) shall have a thermal efficiency not less than 90%.
- Table C407.5.1(1): Air infiltration requirements clarified.
- Table C407.5.1(1): Outdoor airflow rates requirements clarified.
- Table C407.5.1(1): DOAS fan system requirements added.
- Table C407.5.1(1): Service Water Heat Recovery Factor (SWHF) correction for proposed building IECC language is not adopted.
- Table C407.5.1(2): DOAS fan system are the baseline for (5) building types where DOAS is the prescriptive system.
- Table C407.5.1(4): DOAS fan system requirements added.

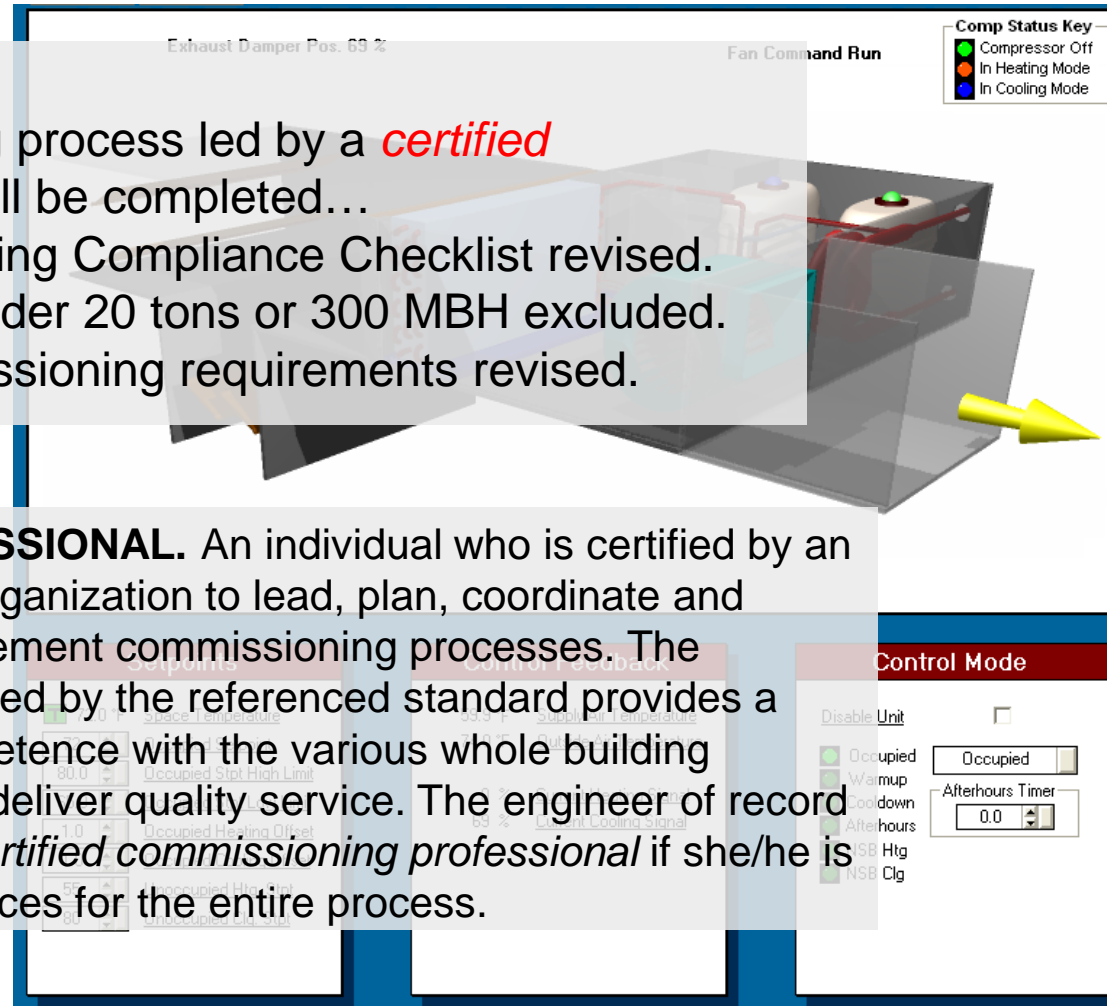


C408: Commissioning

C408 Quick Recap

- 408.1: A building commissioning process led by a *certified commissioning professional* shall be completed...
- Figure C408.1.4.2: Commissioning Compliance Checklist revised.
- C408.2: Mechanical systems under 20 tons or 300 MBH excluded.
- C408.3: Lighting system commissioning requirements revised.

CERTIFIED COMMISSIONING PROFESSIONAL. An individual who is certified by an ANSI/ISO/IEC 17024:2012 accredited organization to lead, plan, coordinate and manage commissioning teams and implement commissioning processes. The individual's accredited certification required by the referenced standard provides a measured level of experience and competence with the various whole building commissioning processes and ability to deliver quality service. The engineer of record for the project may be considered the *certified commissioning professional* if she/he is qualified to perform commissioning services for the entire process.



C409: Energy Metering

C409 Quick Recap

- C409.1: Clarified when small tenant spaces are exempt.



C501: Existing Buildings

C501 Quick Recap

- New chapter to consolidate requirements for alteration, repair, addition and change of occupancy of existing buildings and structures.



CR-102 Proposed Rule & Public Comment Process



- About SBCC
- State Codes, Regulations & Guidelines
- Resources
- Answers & Interpretations
- Technical Advisory Groups
- Meeting Schedules & Agendas

Code News

Public Hearings on 2015 Codes and Amendments

The State Building Code Council is entering a comment period on proposed rules to adopt the 2015 State Building Code. The proposed rules will be published on the Washington State Register issue 15-16. The documents are also posted on our [Rulemaking page](#). There are links provided on the Rulemaking page to submit public comment. Public hearings are scheduled for September 11 in Spokane and October 16 in Olympia. Written testimony will be accepted until October 23, 2015. View [Written Testimony](#) submitted to date.



Ask us a question >

We want to hear from you! Please click above to connect with us about:

- Any code related questions;
- Process improvement suggestions;
- Washington State amendments;
- How to submit a code change proposal.

Click the "Meeting Schedules and Agendas" tab above to see the list of past and future scheduled Council and Committee meetings.

Upcoming Meetings

Council Meeting [Documents](#) (check back often for updated links)

Oct 16 | [Council Meeting](#) / Public Hearing - 10 a.m.

The State Building Code Council is a state agency created by the legislature to provide independent analysis and objective advice to the legislature and the Governor's Office on state building code issues. The Council establishes the minimum building, mechanical, fire, plumbing and energy code requirements necessary to promote the health, safety and welfare of the people of the state of Washington, by reviewing, developing and adopting the state building code.

[SIGN UP HERE](#) to Receive SBCC Meeting and Code Information Notices By Topic

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[Rulemaking](#)

CR-102 Proposed Rule & Public Comment Process

Enterprise Services

SBCC

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The 2015 Washington State Energy Code (WSEC) is the 2015 International Energy Conservation Code with state amendments.

2015 Washington State Energy Code, [Commercial Provisions](#) ([Errata, 10/7/15](#))

2015 Washington State Energy Code, [Residential Provisions](#) ([Errata, 8/27/15](#))

[Submit written comments on the 2015 WSEC](#)

2015 Washington State Energy Code [Preliminary Cost Benefit Analysis](#) - This document addresses both the Commercial and Residential provisions

Link to [Written Testimony](#) submitted for 2015 code adoption

ASHRAE 90.1-2004 vs 90.1-2007



U.S. DEPARTMENT OF
ENERGY

Table 11.3. Estimated Percent Energy Savings with 2007 Edition – by Building Type

Building Type	Building Prototype	Building Type Floor Area Weight %	Savings in Whole Building EUI %				
			Electric	Gas	Site	Source	ECI
Office	Small Office	6.16	0.8	9.0	1.5	1.0	1.0
	Medium Office	6.64	4.6	-2.3	3.9	4.3	4.4
	Large Office	3.65	0.3	18.0	2.8	1.3	1.3
Retail	Stand-Alone Retail	16.76	8.3	11.2	9.0	8.6	8.6
	Strip Mall	6.23	5.2	15.6	8.0	6.3	6.3
Education	Primary School	5.49	2.5	15.4	6.8	4.4	4.3
	Secondary School	11.38	2.6	14.8	6.3	4.2	4.2
Healthcare	Outpatient Health Care	4.80	4.2	3.4	4.0	4.1	4.1
	Hospital	3.79	0.6	2.3	1.2	0.9	0.9
Lodging	Small Hotel	1.89	3.6	5.2	4.2	3.9	3.9
	Large Hotel	5.44	-1.0	6.3	3.0	1.2	1.2
Warehouse	Non-Refrigerated Warehouse	18.36	0.0	0.7	0.3	0.2	0.2
Food Service	Fast Food Restaurant	0.64	1.9	2.0	2.0	2.0	2.0
	Sit-Down Restaurant	0.72	1.0	1.0	1.0	1.0	1.0
Apartment	Mid-Rise Apartment	8.04	2.1	11.5	4.3	3.0	3.0
National		100	3.4	6.9	4.6	3.9	3.9



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2012 WSEC vs Federal Energy Code



Commercial Buildings:

- **ASHRAE 90.1-2010**
 - Per DOE Final Determination Quantitative Analysis Report the 2010 edition of ASHRAE 90.1 produces buildings that are **18.5% more efficient (site EUI)** than were required by the 2007 edition.
 - WSBC December 2013 Legislative Report indicates that the 2012 WSEC will fall short of this federal target for commercial construction by 1 or 2%.



ASHRAE 90.1-2007 vs 90.1-2010



U.S. DEPARTMENT OF
ENERGY

Table 7. Estimated Percent Energy Savings with 2010 Edition – by Building Type

Building Type	Building Prototype	Building Type Floor Area Weight %	Percent Savings in Whole Building Energy Use Intensity (%)		
			Site EUI	Source EUI	ECI
Office	Small Office	5.61	16.1	16.4	16.4
	Medium Office	6.05	22.1	24.4	24.4
	Large Office	3.33	22.3	21.5	21.5
Retail	Stand-Alone Retail	15.25	26.1	24.7	24.7
	Strip Mall	5.67	16.8	18.9	18.9
Education	Primary School	4.99	24.2	20.8	20.8
	Secondary School	10.36	26.7	23.3	23.2
Healthcare	Outpatient Health Care	4.37	22.6	22.2	22.2
	Hospital	3.45	24.5	20.1	20.1
Lodging	Small Hotel	1.72	5.9	7.7	7.7
	Large Hotel	4.95	11.0	10.5	10.5
Warehouse	Non-Refrigerated Warehouse	16.72	20.7	23.1	23.1
Food Service	Fast Food Restaurant	0.59	5.1	8.6	8.6
	Sit-Down Restaurant	0.66	13.5	19.3	19.4
Apartment	Mid-Rise Apartment	7.32	6.8	4.4	4.4
	High-Rise Apartment	8.97	7.2	4.5	4.5
National		100	18.5	18.2	18.2



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2012 WSEC Cost Benefit Report

Commercial Primary Prototype Buildings:

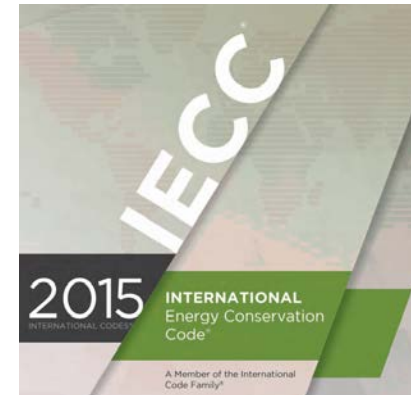
	Area (SF)	Baseline System/Fuel
Office - Large	498552	VAV - fanless terminals. Gas boiler, hot water reheat.
Office - Medium	53621	VAV - fanless terminals. Gas furnace, electric reheat.
Office - Small	5493	Split system single-zone heat pump, gas auxiliary
Retail_Strip_Mall	22500	Package single-zone, gas heat
Retail_Standalone	24696	Package single-zone, gas heat
Grocery	44998	Package single-zone, gas heat
School_Secondary	210955	VAV - fanless terminals. Gas boiler, hot water reheat. Package single-zone with gas furnace for some common areas.
School_Primary	73959	VAV - fanless terminals. Gas boiler, hot water reheat. Package single-zone with gas furnace for some common areas.
Warehouse	52050	Package single-zone, gas heat. Unit heaters.
Hospital	241500	VAV and CAV - fanless terminals. Gas boiler, hot water reheat.
Restaurant_Sitdown	5506	Package single-zone, gas heat
Restaurant_Fast_Food	2500	Package single-zone, gas heat
Hotel_Large	121700	Common areas: VAV; rooms: four pipe fan coils
Hotel_Small	42714	Common areas: package single-zone, gas heat; rooms: PTAC

2012 IECC vs 2015 IECC



Commercial Buildings:

- **2015 IECC**
 - Per DOE and PNNL Energy and Energy Cost Savings Analysis of the 2015 IECC for Commercial Buildings Report commercial buildings built under 2015 IECC are **11.1% more efficient (site EUI)** than were required by the 2012 IECC edition.
 - Analysis is for the 16 building prototypes for the commercial code.



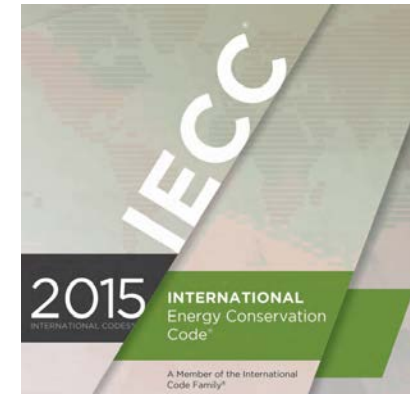
2012 IECC vs 2015 IECC



U.S. DEPARTMENT OF
ENERGY

Table ES.1. Site Energy and Energy Cost Savings between the 2012 and 2015 IECC

Building Activity	Building Prototype	Floor Area Weight (%)	Site EUI (kBtu/ft ² -yr)		Site EUI Savings (%)	ECI (\$/ft ² -yr)		ECI Savings (%)
			2012 IECC	2015 IECC		2012 IECC	2015 IECC	
Office	Small Office	5.6	31.1	29.6	4.8	0.93	0.88	4.8
	Medium Office	6.0	35.5	34.6	2.5	0.99	0.97	1.9
	Large Office	3.3	76.2	71.7	6.0	2.15	2.04	5.2
Retail	Standalone Retail	15.3	54.1	47.3	12.6	1.44	1.21	16.0
	Strip Mall	5.7	58.3	54.0	7.4	1.54	1.39	9.7
Education	Primary School	5.0	62.3	55.5	10.9	1.52	1.34	11.4
	Secondary School	10.4	51.8	42.8	17.4	1.35	1.12	16.8
Healthcare	Outpatient Healthcare	4.4	137.2	117.6	14.3	3.53	3.07	13.0
	Hospital	3.4	172.2	128.0	25.7	3.72	2.98	20.0
Lodging	Small Hotel	1.7	66.4	60.4	9.2	1.49	1.3	12.6
	Large Hotel	5.0	109.5	87.9	19.8	2.37	1.81	23.9
Warehouse	Warehouse	16.7	15.0	15.5	-3.1	0.34	0.36	-5.2
Food Service	Quick-Service Restaurant	0.6	602.5	582	3.4	9.66	8.83	8.6
	Full-Service Restaurant	0.7	405.6	373.8	7.8	7.22	6.44	10.8
Apartment	Mid-Rise Apartment	7.3	45.0	44.2	1.7	1.23	1.22	1.0
	High-Rise Apartment	9.0	49.1	47.6	3.0	1.14	1.11	3.1
National Weighted Average		100	61.4	54.5	11.1	1.49	1.31	11.5

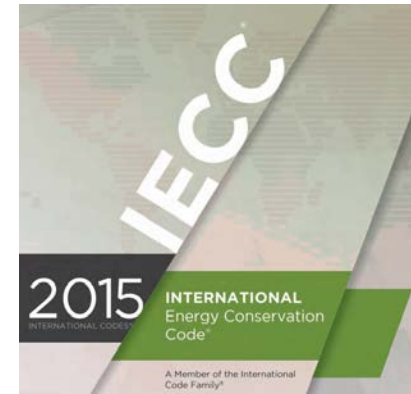


2012 IECC vs 2015 IECC



Table 4.2. Site Energy and Energy Cost Savings between the 2012 and 2015 IECC by Climate Zone

Climate Zones	Site EUI		Site EUI Savings (%)	ECI		ECI Savings (%)
	(kBtu/ft ² -yr)			(\$/ft ² -yr)		
	2012 IECC	2015 IECC		2012 IECC	2015 IECC	
1A	52.9	48.4	8.5	1.42	1.29	8.9
2A	58.1	51.5	11.4	1.50	1.33	11.4
2B	60.0	53.0	11.6	1.59	1.40	12.0
3A	59.8	52.5	12.2	1.48	1.30	12.2
3B	53.9	47.9	11.2	1.37	1.21	11.9
3C	51.4	46.2	10.2	1.28	1.15	10.5
4A	62.0	55.5	10.5	1.49	1.33	10.7
4B	64.7	56.8	12.2	1.57	1.34	14.3
4C	58.1	51.9	10.7	1.39	1.23	11.5
5A	67.1	59.8	10.9	1.52	1.34	11.7
5B	63.7	56.4	11.5	1.49	1.30	12.4
6A	74.0	65.5	11.4	1.65	1.46	11.7
6B	70.7	61.4	13.1	1.60	1.38	13.3
7	83.0	71.8	13.4	1.76	1.53	13.3
8	83.9	73.6	12.3	1.64	1.43	13.0
National Weighted Average	61.4	54.5	11.1	1.49	1.31	11.5



ASHRAE 90.1-2010 vs 90.1-2013



Commercial Buildings:

- **ASHRAE 90.1-2013**
 - Per DOE Final Determination Quantitative Analysis Report the 2013 edition of ASHRAE 90.1 produces buildings that are **7.6% more efficient (site EUI)** than were required by the 2010 edition.
- 2015 WSEC vs ASHRAE 90.1-2013 is yet to be determined
- State certifications for Standard 90.1-2013 must be submitted by September 26, 2016.



ASHRAE 90.1-2010 vs 90.1-2013



Table E.3. Estimated Percent Energy Savings between 2010 and 2013 Editions of Standard 90.1 – by Building Type

Building Type	Prototype building	Building Type Floor Area Weight (%)	Percent Savings in Whole Building Energy Use Intensity (%)		
			Site EUI	Source EUI	ECI
Office	Small Office	5.61	11.0	11.0	11.0
	Medium Office	6.05	7.4	7.5	7.5
	Large Office	3.33	1.4	2.4	2.5
Retail	Stand-Alone Retail	15.25	13.9	12.8	12.6
	Strip Mall	5.67	8.8	10.2	10.5
Education	Primary School	4.99	8.1	11.0	11.5
	Secondary School	10.36	12.6	14.1	14.4
Healthcare	Outpatient Health Care	4.37	3.6	3.9	3.9
	Hospital	3.45	5.6	6.4	6.5
Lodging	Small Hotel	1.72	5.7	7.5	7.9
	Large Hotel	4.95	8.0	10.2	10.7
Warehouse	Non-Refrigerated Warehouse	16.72	6.0	6.1	6.1
Food Service	Fast Food Restaurant	0.59	2.6	4.7	5.3
	Sit-Down Restaurant	0.66	3.0	3.9	4.2
Apartment	Mid-Rise Apartment	7.32	5.4	5.1	5.0
	High-Rise Apartment	8.97	6.9	8.4	8.7
National		100	7.6	8.5	8.7



ASHRAE 90.1-2010 vs 90.1-2013



U.S. DEPARTMENT OF
ENERGY

Table E.2. Estimated Energy Use Intensity by Building Type – Standard 90.1-2013

Building Type	Prototype building	Building Type Floor Area Weight (%)	Whole Building EUI Data for Building Population		
			Site EUI (kBtu/ft ² -yr)	Source EUI (kBtu/ft ² -yr)	ECI (\$/ft ² -yr)
Office	Small Office	5.61	29.4	89.3	\$0.88
	Medium Office	6.05	34.1	97.9	\$0.95
	Large Office	3.33	70.8	205.8	\$2.01
Retail	Stand-Alone Retail	15.25	45.9	124.6	\$1.20
	Strip Mall	5.67	55.1	147.3	\$1.42
Education	Primary School	4.99	54.2	134.4	\$1.28
	Secondary School	10.36	41.7	111.9	\$1.08
Healthcare	Outpatient Health Care	4.37	115.8	311.8	\$3.00
	Hospital	3.45	123.7	300.7	\$2.85
Lodging	Small Hotel	1.72	60.0	137.6	\$1.29
	Large Hotel	4.95	89.0	195.4	\$1.81
Warehouse	Non-Refrigerated Warehouse	16.72	17.1	40.6	\$0.38
Food Service	Fast-Food Restaurant	0.59	576.4	1001.9	\$8.78
	Sit-Down Restaurant	0.66	372.5	713.5	\$6.41
Apartment	Mid-Rise Apartment	7.32	43.9	124.8	\$1.21
	High-Rise Apartment	8.97	46.9	114.4	\$1.08
National		100	54.1	136.2	\$1.30



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ASHRAE 90.1-2013 vs 2015 IECC



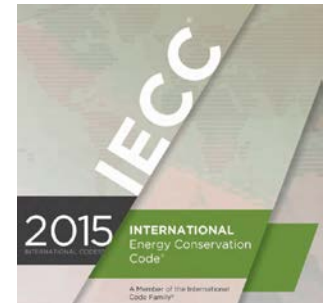
ASHRAE 90.1-2013

Table E.2. Estimated Energy Use Intensity by Building Type

Building Type	Prototype building	Building Type Floor Area Weight (%)	Whole Building
			Site EUI (kBtu/ft ² -yr)
Office	Small Office	5.61	29.4
	Medium Office	6.05	34.1
	Large Office	3.33	70.8
Retail	Stand-Alone Retail	15.25	45.9
	Strip Mall	5.67	55.1
Education	Primary School	4.99	54.2
	Secondary School	10.36	41.7
Healthcare	Outpatient Health Care	4.37	115.8
	Hospital	3.45	123.7
Lodging	Small Hotel	1.72	60.0
	Large Hotel	4.95	89.0
Warehouse	Non-Refrigerated Warehouse	16.72	17.1
Food Service	Fast-Food Restaurant	0.59	576.4
	Sit-Down Restaurant	0.66	372.5
Apartment	Mid-Rise Apartment	7.32	43.9
	High-Rise Apartment	8.97	46.9
National		100	54.1

2015 IECC

Floor Area Weight (%)	Site EUI (kBtu/ft ² -yr)	
	2012 IECC	2015 IECC
5.6	31.1	29.6
6.0	35.5	34.6
3.3	76.2	71.7
15.3	54.1	47.3
5.7	58.3	54.0
5.0	62.3	55.5
10.4	51.8	42.8
4.4	137.2	117.6
3.4	172.2	128.0
1.7	66.4	60.4
5.0	109.5	87.9
16.7	15.0	15.5
0.6	602.5	582
0.7	405.6	373.8
7.3	45.0	44.2
9.0	49.1	47.6
100	61.4	54.5



Energy Code Resources:

- **Washington State Building Code Council**
 - <https://fortress.wa.gov/ga/apps/sbcc/default.aspx>
 - <https://fortress.wa.gov/ga/apps/SBCC/Page.aspx?cid=3119>
 - <https://fortress.wa.gov/ga/apps/sbcc/Page.aspx?nid=116>
- **Washington Governor Jay Inslee Executive Order 14-04**
 - <http://www.governor.wa.gov/office/execorders/>
- **Northwest Energy Efficiency Council**
 - <http://www.neec.net/>
- **Seattle DPD**
 - <http://www.seattle.gov/dpd/codesrules/codes/energy/overview/>
- **Washington State Department of Commerce**
 - <http://www.commerce.wa.gov/Documents/Commerce-Energy-Efficiency-Building-Strategy-Update-2014.pdf>
- **US DOE Building Energy Codes Status of State Energy Code Adoption**
 - <https://www.energycodes.gov/status-state-energy-code-adoption>
- **US DOE 90.1 Determinations**
 - <https://www.energycodes.gov/determinations>

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Thank You



Eric Vander Mey
Director, Principal
ericv@rushingco.com

Seattle Green Building Program & Climate Action Plan:

- **Resolution 30280:** Date Adopted: February 12, 2001
 - These proposed amendments should seek to **achieve up to 20% enhanced energy efficiency** beyond the current version of ASHRAE/IESNA Standard 90.1.
- **Resolution 31312:** Date Adopted: October 3, 2011
 - Seattle will strive to reach net zero greenhouse gas (GHG) emissions by 2050
 - Energy Reduction in Buildings: **2020 Targets**
 - Residential: -8% reduction in energy use
 - Commercial: -5% reduction in energy use
 - Both: -15% reduction in tonnes of CO2 equivalent (CO2e) per billion BTU
 - Energy Reduction in Buildings: **2030 Targets**
 - Residential: -20% reduction in energy use
 - Commercial: -10% reduction in energy use
 - Both: -25% reduction in tonnes of CO2 equivalent (CO2e) per billion BTU

