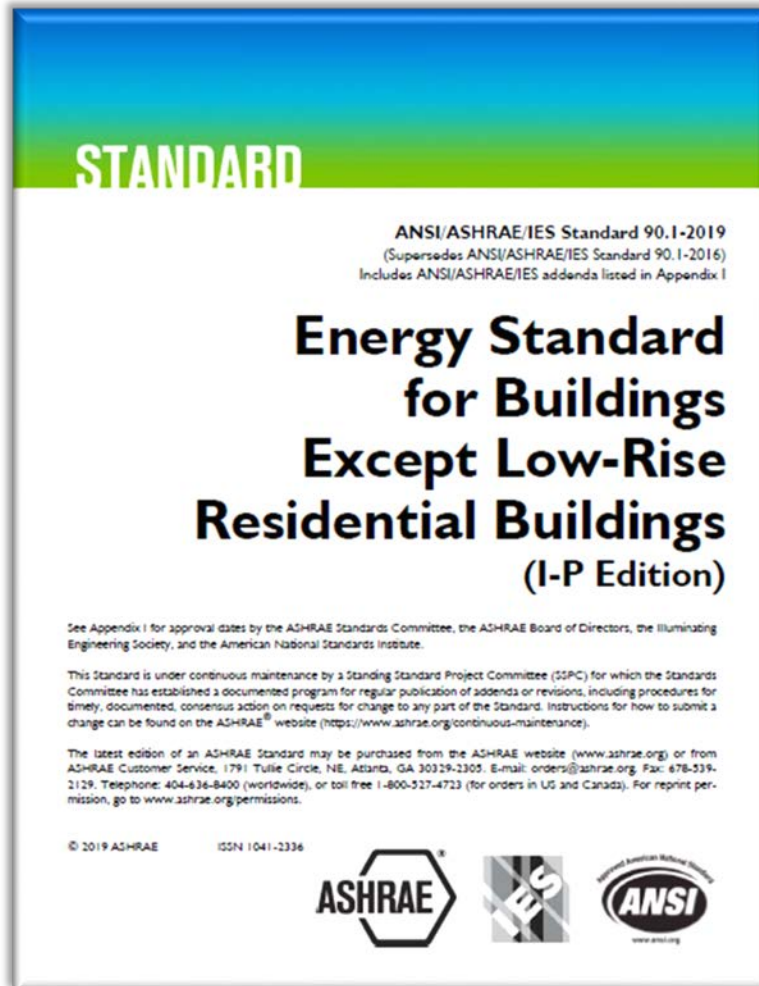


# CODE UPDATE TRAINING



## 2021 OEESC

# Commercial Energy Code for 2019 Oregon Structural Specialty Code

Based on ASHRAE Standard 90.1-2019

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Additional materials from Pacific Northwest National Laboratories  
(used with permission)

Updated: 2021

# Course Goal

- ✓ Broad view of updates in the 2021 Oregon Energy Efficiency Specialty Code (OEESC)
- ✓ Identify the significant technical changes thru the mid-cycle adoption of ASHRAE 90.1-2019 as the basis for Ch. 13 of the OSSC

# Course Questions

Please email specific technical content inquiries to:

[codechange.BCD@Oregon.gov](mailto:codechange.BCD@Oregon.gov)

Our team plans to organize and offer a “Q&A session” in the near future to address submitted inquiries regarding the 2021 OEESC significant changes. Advanced notification will be provided to our local government partners.

To ensure you receive notification, please visit our homepage and click on “Email updates” in the upper ribbon.

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# General Presentation Format

BCD revisions to Admin Document are shown as:

- ✓ Blue underline for additions
- ✓ Red ~~striketrough~~ for deletions.

ASHRAE 90.1 revisions are shown as:

- ✓ Red **bold** for revisions
- ✓ Black for unchanged

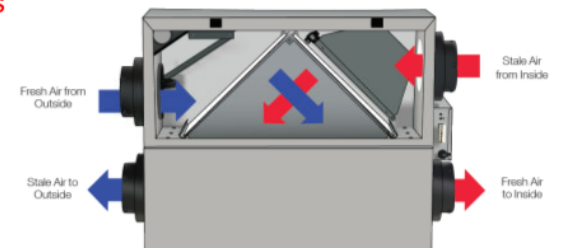
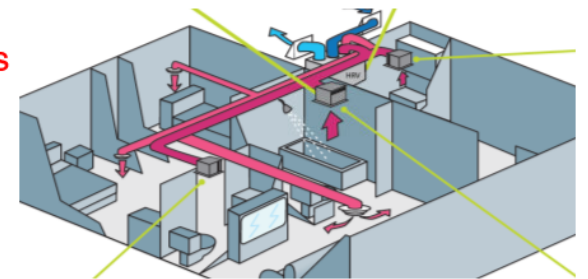
Thanks to Pacific Northwest  
Nation Laboratory for use of  
slides from 90.1-2019 training

## Mechanical – ERVs for Nontransient Dwelling Units

U.S. DEPARTMENT OF  
**ENERGY** Energy Efficiency & Renewable Energy

- New energy recovery requirements for *nontransient* dwelling units (apartments & condos)
  - Enthalpy recovery ratio (ERR) at design conditions
    - $\geq 50\%$  ERR at cooling
    - $\geq 60\%$  ERR at heating
    - Unless one of the modes is not required
    - ERR is different than AHRI efficiency rating
  - Exceptions based on unit floor area and CZs

Images courtesy of American Aldehydes



# Broad Energy Code Change Perspectives

While the energy code changes include many technical provisions, there are broad policy perspectives that are critical to recognize:

- Continue Oregon's leadership
  - Senate Bill 79
  - Executive Order 17-20
  - Executive Order 20-04

# 2021 OEESC Training Overview

## *Categories we'll review today*

1. Process of applying ASHRAE 90.1 as Chapter 13 of the OSSC
  - a. OSSC Chapter 1 Integration
2. Substantive energy code changes
  - a. Oregon amendments to ASHRAE 90.1
3. Additional resources available

Before proceeding, have these resources:

- 2021 OEESC Code Document
- 2021 OEESC Compliance Form
- Oregon COMcheck Supplement

# 2021 OEESC Document

## 2021 Oregon Energy Efficiency Specialty Code (OEESC)

- “Chapter 1” for using ASHRAE Standard 90.1-2019 with the 2019 OSSC
- Oregon amendments

### Oregon Zero Energy Ready Commercial Code

**2019 Oregon Zero Energy Ready Commercial Code**  
(Chapter 13 of the 2019 OSSC)  
Effective Oct. 1, 2019

**2021 Oregon Energy Efficiency Specialty Code (OEESC)**  
Effective April 1, 2021 | Grace period ends Oct. 1, 2021  
Based on ASHRAE Standard 90.1-2019



### 2019 OREGON ZERO ENERGY READY COMMERCIAL CODE (Chapter 13 of the 2019 Oregon Structural Specialty Code)

#### PART I COMMERCIAL ENERGY PROVISIONS

The 2019 Oregon Zero Energy Ready Commercial Code, Part I, commercial energy provisions, consists of the following:

- Chapter 1 of the Oregon Structural Specialty Code (OSSC), including specific modifications as shown below.
- ANSI/ASHRAE/IES Standard 90.1 – 2016, including specific modifications as shown below.

#### SECTION E101 GENERAL

**E101.1 Title.** These provisions are Chapter 13 of the *Oregon Structural Specialty Code (OSSC)* for commercial energy compliance and shall be referred to herein as “this code.” The OSSC is referred to herein as the “*Building Code*.” Sections E102 through E104 are specific to this code and additional to the requirements of Chapter 1 of the *Building Code*.

**E103.2 Existing structures.** Except as specified in Sections E103.2.1 through E103.2.2.3, this code shall not be used to require the removal, *alteration* or abandonment of, nor prevent the continued use and maintenance of, an existing building or building system lawfully in existence at the time of adoption of this code.

**E103.2.1 Change in space conditioning.** Where unconditioned space or semiheated space in a building is converted to a conditioned space, such conditioned space shall be brought into compliance with the applicable requirements of Standard 90.1

### 2021 OREGON Energy Efficiency Specialty CODE (Chapter 13 of the 2019 Oregon Structural Specialty Code)

#### COMMERCIAL ENERGY PROVISIONS

The 2019 Oregon Energy Efficiency Specialty Code, Part I, commercial energy provisions, consists of the following:

- Chapter 1 of the Oregon Structural Specialty Code (OSSC), including specific modifications as shown below.
- ANSI/ASHRAE/IES Standard 90.1 – 2019, including specific modifications as shown below.

#### SECTION E101 GENERAL

**E101.1 Title.** These provisions are Chapter 13 of the *Oregon Structural Specialty Code (OSSC)* for commercial energy compliance and shall be referred to herein as “this code.” The OSSC is referred to herein as the “*Building Code*.” Sections E102 through E104 are specific to this code and additional to the requirements of Chapter 1 of the *Building Code*.

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**E103.2.1 Change in space conditioning.** Where unconditioned space or semi heated space in a building is converted to a conditioned space, such conditioned space shall be brought into




# Items Needed for Today's Training

- 2021 OEESC Compliance Checklist
  - Similar to 2019 Oregon Zero Energy Ready Code form

## ASHRAE Standard 90.1

### Compliance

To demonstrate compliance with Part I of the energy code, construction documents shall include the [Oregon Zero Energy Ready Compliance Form](#) .

### 2019 Oregon Zero Energy Ready Commercial Code Compliance Form

This form provides the required information to demonstrate compliance with Part I of the Oregon Zero Energy Ready Commercial Code (Chapter 13 of the 2019 Oregon Structural Specialty Code) and must be provided to the building official at the time of submitting the plan review documents.

BUILDING INFORMATION			
Applicant name:		Phone number:	
Project name:			
Address / location:			
City:	State:	Oregon	ZIP:
Primary building use (As indicated on ZERO Code Calculator report):		Number of floors:	
Part I COMcheck information			



## ASHRAE Standard 90.1 - 2019

### Compliance

To demonstrate compliance with the energy code, construction documents shall include the following where applicable:

- [Oregon Energy Efficiency Compliance Form](#)
- [COMcheck Supplement Form](#)

### 2021 Oregon Energy Efficiency Specialty Code Compliance Form

This form provides the required information to demonstrate compliance with the 2021 Oregon Energy Efficiency Specialty Code (OEESC), Chapter 13 of the 2019 Oregon Structural Specialty Code, and must be provided to the building official at the time of submitting the plan review documents.

BUILDING INFORMATION			
Applicant name:		Phone number:	
Project name:			
Address / location:			
City:	State:	Oregon	ZIP:
Primary building use (As indicated on ZERO Code Calculator report):		Number of floors:	
Part I COMcheck information			

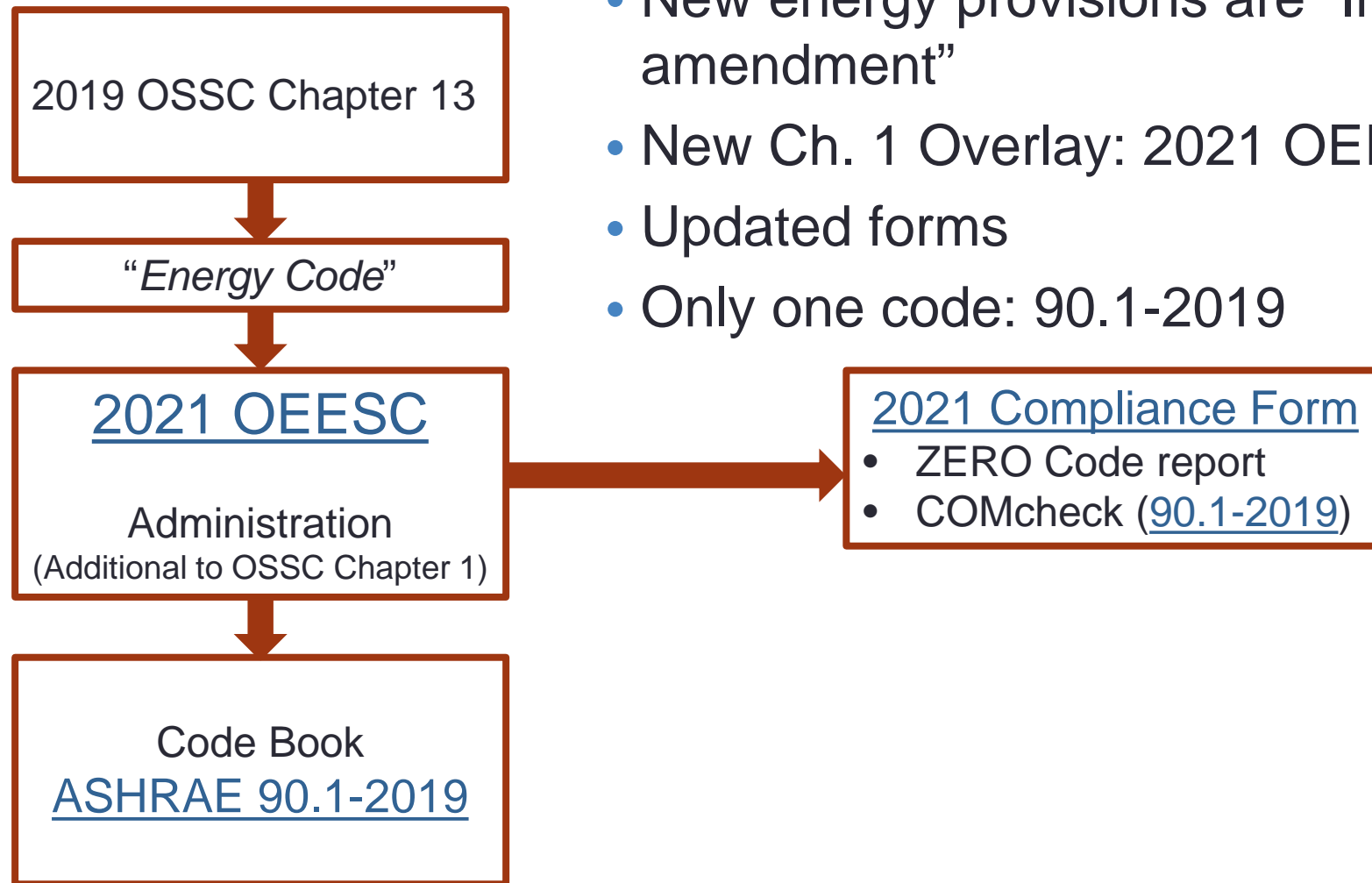


# Items Needed for Today's Training

- 2021 COMcheck Supplement Form
  - Oregon Amendments
  - Addition to COMcheck checklist
  - Where applicable or as an exception
  - Where on Plans & Specs
  - Registered Design Professional signature

Section 5: Envelope Compliance			
<b>5.1.2.3: Unconditioned space with limited radiant heating</b>		<input type="checkbox"/> Check if not applicable	
(See Oregon amendment 6.5.8.3 HVAC)			
<input type="checkbox"/> Space is identified on plans. Coverage area with limited radiant heating is identified on plans and the lesser of 500 ft <sup>2</sup> or 10% of floor area per 6.5.8.3			
<input type="checkbox"/> Automatic controls for radiant spot heating per 6.5.8.3.			
Plans and specs.: _____			
<b>5.4.3.3: Vestibules: additional exception</b>		<input type="checkbox"/> Check if not applicable	
This project shall furnish a whole-building air leakage report in lieu of providing a vestibule per the following:			
<input type="checkbox"/> Building is less than 25,000 ft <sup>2</sup> .			
<input type="checkbox"/> Reported whole-building air leakage testing per Section 5.4.3.1.1 is less than 0.30 cfm/ft <sup>2</sup> .			
<input type="checkbox"/> Plans and specifications shall identify building entry door(s) meeting this exception.			
Responsible party to provide test results: _____			
Plans and specs.: _____			
_____		_____	_____
Printed name Registered design professional	Signature	Registration number	Date

# Application of Code with 90.1-2019



- New energy provisions are “Interim amendment”
- New Ch. 1 Overlay: 2021 OEESC
- Updated forms
- Only one code: 90.1-2019

# 2021 Oregon Energy Efficiency Specialty Code

## Chapter 13 of the OSSC: *Energy Code*

- Adopted through updated rule
- 2021 'Mid-cycle' amendment

### **2021 OREGON Energy Efficiency Specialty CODE** (Chapter 13 of the 2019 Oregon Structural Specialty Code)

#### **COMMERCIAL ENERGY PROVISIONS**

The 2019 Oregon Energy Efficiency Specialty Code, Part I, commercial energy provisions, consists of the following:

- Chapter 1 of the Oregon Structural Specialty Code (OSSC), including specific modifications as shown below.
- ANSI/ASHRAE/IES Standard 90.1 – 2019, including specific modifications as shown below.

#### **SECTION E101** **GENERAL**

**E101.1 Title.** These provisions are Chapter 13 of the *Oregon Structural Specialty Code (OSSC)* for commercial energy compliance and shall be referred to herein as “this code.” The OSSC is referred to herein as the “*Building Code*.” Sections E102 through E104 are specific to this code and additional to the requirements of Chapter 1 of the *Building Code*.

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**E103.2.1 Change in space conditioning.** Where unconditioned space or semi heated space in a building is converted to a conditioned space, such conditioned space shall be brought into

# What's New in the 2021 OEESC

- All OSSC buildings use ASHRAE 90.1-2019
  - Even low-rise residential
- Better alignment of Definitions
- Updated language on compliance requirements
  - Items to be included in plans and specifications
  - Some reports are required
- Oregon amendments
  - Limited number
  - Use COMcheck Supplement Form (when applicable)

# Permit Review

## 2021 OEESC COMPLIANCE Form:

- COMcheck & Oregon COMcheck Supplement
  - ZERO Code calculator
- Plan Review (what's applicable under the code)
  - Plans and specs match the COMcheck
  - Any additional information needed
- Reports and Commissioning Requirements
  - Must be on plans and in specs
  - Commissioning, Record documents, testing

# Inspection for 2021 OEESC

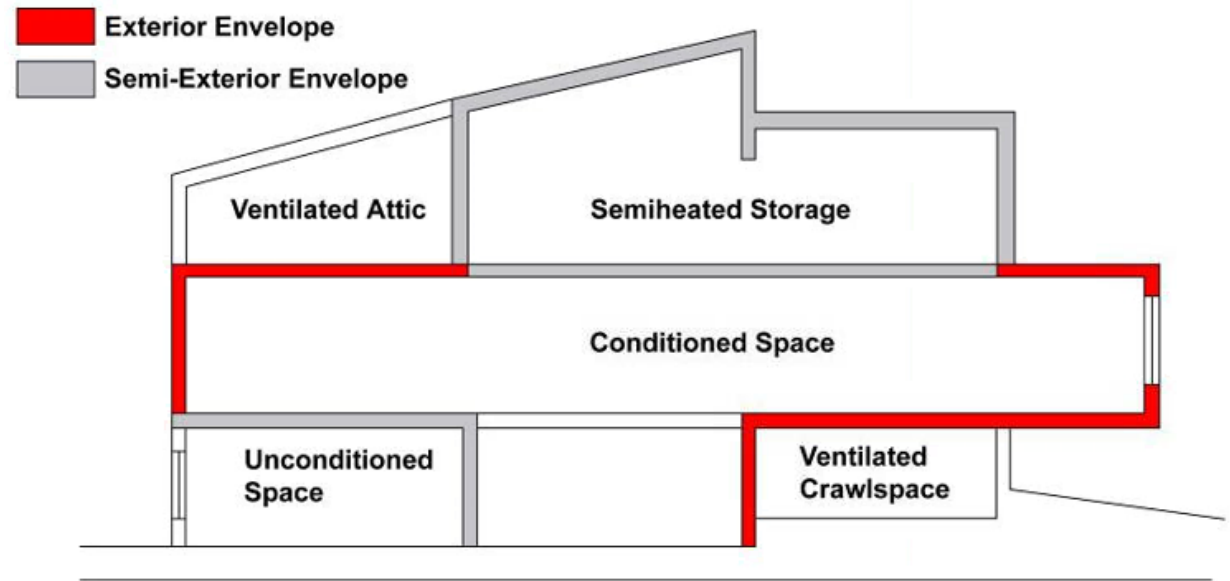
- Is the construction to plans and specs?
  - Air sealing
  - Insulation and Fenestration
  - HVAC
  - Lighting: Fixtures and controls
- Supplemental information
  - Building air leakage test

# Section 5: Envelope

Not this.....



But this.....



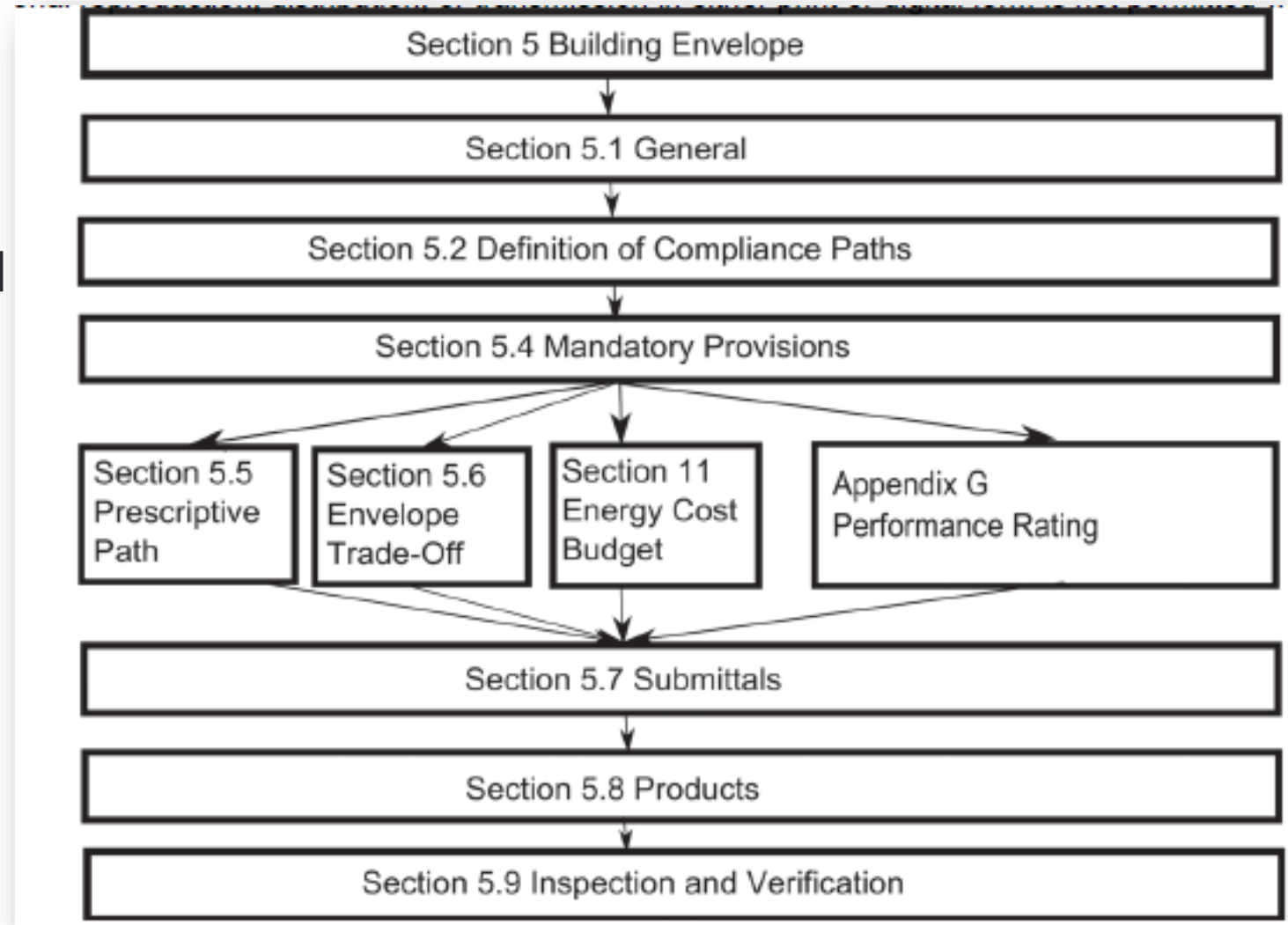
Question of the day: Why do we still need to regulate envelopes if everyone is using email?

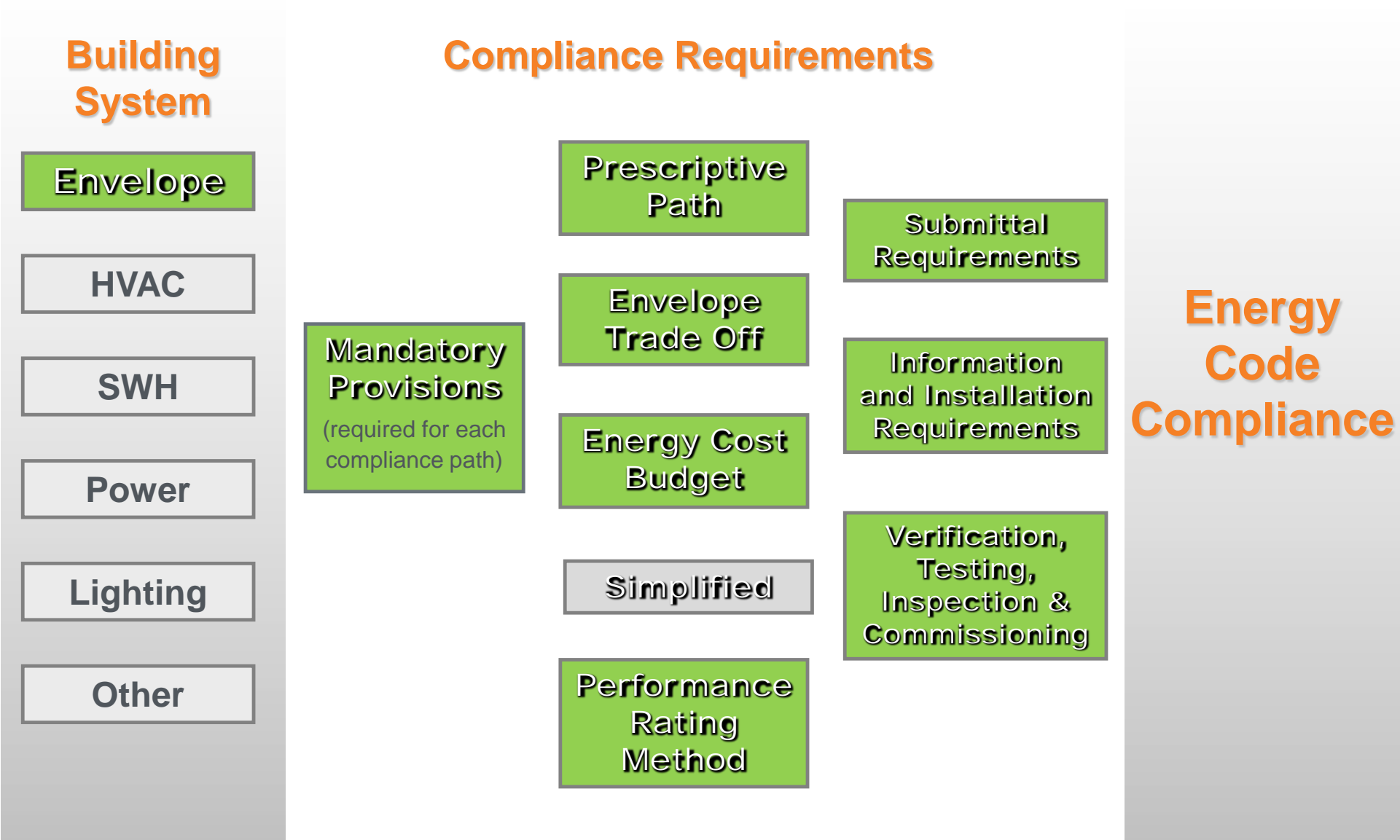


# Envelope Compliance

1. Prescriptive Path
2. Envelope Trade Off
3. Energy Cost Budget
4. Performance Rating Method

Compliance with Sections 5.7, 5.8, & 5.9 requirements in construction documents





Language describing air-leakage requirements for materials, assemblies and the whole building was updated



Materials:  
0.004 cfm/ft<sup>2</sup>



Assemblies:  
0.04 cfm/ft<sup>2</sup>



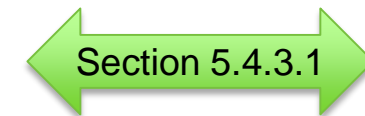
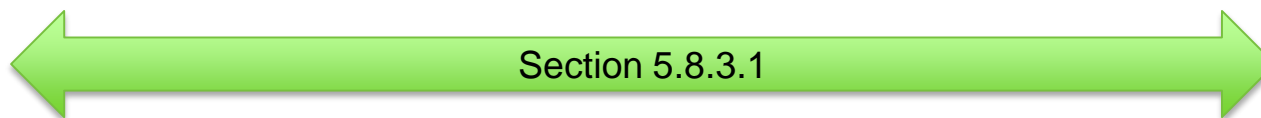
Fenestration:  
0.06 – 0.3 cfm/ft<sup>2</sup>



Doors:  
1.0 – 1.3 cfm/ft<sup>2</sup>



Whole Building:  
0.4 cfm/ft<sup>2</sup>



# Criteria Changes

## Fenestration

<i>Fenestration</i>	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC
<i>Vertical Fenestration, 0% to 40% of Wall</i>			
<i>Fixed</i>	0.36	0.36	1.10 (for all types)
<i>Operable</i>	0.45	0.33	
<i>Entrance door</i>	0.63	0.33	

Fenestration performance requirements are now based on fenestration type not on frame material.

<i>Fenestration</i>	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC
<i>Vertical Fenestration, 0% to 40% of Wall</i>		(for all frame types)	
<i>Nonmetal framing, all</i>	0.31	0.36	1.10
<i>Metal framing, fixed</i>	0.38		
<i>Metal framing, operable</i>	0.46		
<i>Metal framing, entrance door</i>	0.68		



# U-factors and SHGC

**Change Summary:** Fenestration values independent of material

U-Factor Change for a Fixed, Metal Framed Window									
U-factor	0	1	2	3	4	5	6	7	8
2016	0.50	0.57	0.54	0.45	0.38	0.38	0.36	0.33	0.29
2019	0.50	0.50	0.45	0.42	0.36	0.36	0.34	0.29	0.26

Example of stringency improvements –  
*note this comparison is based on both a window type and frame material*

## Other fenestration revisions:

- Operable metal reduced from 0.46 to 0.45
- 2016 U-factor for operable and fixed non-metal: U-0.31
  - -2019 Non-metal fixed: U-0.36
  - -2019 Non-metal operable: U-0.45
- SHGC requirement now varies by fenestration type
  - SHGC for fixed fenestration did not change
  - Operable and doors require reduced SHGC

### Air curtains allowed in lieu of vestibules for some building entrances

#### Requirements

- ANSI/AMCA 220 Compliant
- Design Jet Velocity of 6.6 ft/s
- Angle to door < 20 deg
- Commissioned
- Automatic controls

**5.4.3.-43.3 Vestibule envelope.** The exterior surfaces of both conditioned vestibules and unconditioned vestibules shall comply with the *continuous air barrier* requirements.

#### Exceptions to 5.4.3.3

1. *Doors not intended to be used as a building entrance.*
2. *Doors opening directly from a dwelling unit.*
3. *Building entrances in buildings located in Climate Zone 1 or 2.*
4. *Doors opening into ~~semiheated~~ spaces.*
5. *Enclosed elevator lobbies for building entrances directly from parking garages.*
6. *Building entrances in buildings that are located in Climate Zone 3, where the building is less than four stories above grade, and less than 10,000 ft<sup>2</sup> (1000 m<sup>2</sup>) in gross conditioned floor area.*
7. *Building entrances in buildings that are located in Climate Zones 0, 4, 5, 6, 7, or 8 and the building is ~~are~~ less than 1000 ft<sup>2</sup> (100 m<sup>2</sup>) in gross conditioned floor area.*
8. *Doors that open directly from a space that is less than 3000 ft<sup>2</sup> (300 m<sup>2</sup>) in area and is separate from the building entrance.*
9. *Self-closing doors in buildings in Climate Zones 0, 3, and 4 that have an air curtain complying with Section 10.4.5.*
10. *Self-closing doors in buildings 15 stories or less in Climate Zones 5 thru 8 that have an air curtain complying with Section 10.4.5.*

# Additional Vestibule Exception (Oregon)

**Change Summary:** Exception from vestibule

## Section 5.4.3

### Exceptions to 5.4.3.3

...

11. Buildings under 25,000 ft<sup>2</sup> meeting the requirements of Section 5.4.3.1.1 with a leakage rate less than 0.30 cfm/ft<sup>2</sup>.

Where the building air-leakage testing is 25% better than minimum, a vestibule not required for the building entrance. Limited to structures under 25,000 square feet.



## Section 5 – 5.4.3.1.1

### Whole-Building Air Leakage – Exceptions

Buildings > 50,000 sf (exception)

May comply using partial testing if:

- a) Test entire floor area of all stories with; any space under a roof, a building entrance or a loading dock.
- b) Test representative above-grade wall sections totaling at least 25% of wall area enclosing remaining conditioned space, cannot include areas tested under (a)

All Buildings

Comply by  
testing entire  
building

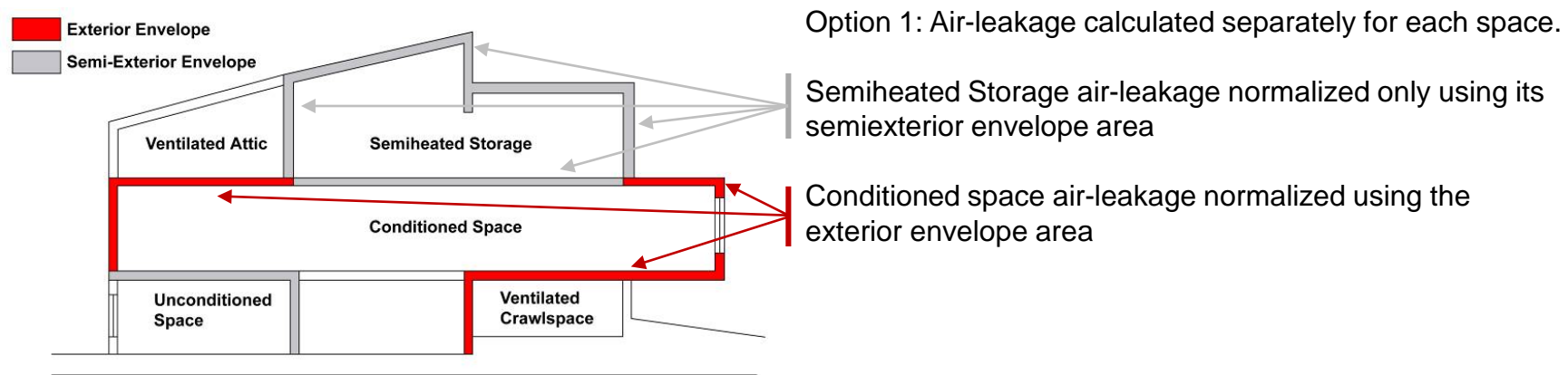
1. Building complies if measured air leakage rate is less than 0.40 cfm/ft<sup>2</sup> at 0.30 in. of water
2. If measured air leakage rate is greater than 0.40 cfm/ft<sup>2</sup> but less than 0.60 cfm/ft<sup>2</sup>
  - Perform diagnostic evaluation (smoke tracer, infrared imaging, etc.) and seal identified leaks
  - Perform visual inspection of air barrier and seal identified leaks
  - Submit report to code official and building owner identifying corrective actions taken to seal leaks
3. Testing not required when meeting continuous air barrier design and installation verification program in accordance with Section 5.9.1.2 (design review and construction inspection and verification)

## Section 5 – 5.4.3.1.1

### Whole-Building Air Leakage

When a building has both conditioned space and semiheated space, compliance can be demonstrated using one of two methods

1. Separately for each space condition type
  - Air-leakage of conditioned space normalized by exterior building envelope area
  - Air-leakage of semiheated space normalized by area of semiexterior building envelope
2. Both space conditioning types together,
  - Air-leakage rate for both space types normalized by sum of exterior building envelope area and semiexterior building envelope area minus semiexterior building envelope area separating conditioned and semiheated spaces



#### *Continuous air barrier* compliance requires:

- Component and component positions in envelope assemblies to be clearly identified on construction documents
- Joints, interconnections, and penetrations to be detailed on construction documents
- Extension over all surfaces of the *building envelope* and identified as continuous on construction documents
- A design that resists positive and negative pressures from wind, stack effect, and mechanical ventilation and allow for anticipated movements
- The following areas to be wrapped, sealed, caulked, gasketed, or taped in an approved manner
  - Joints around fenestration and door frames
  - Junctions between all wall, floor and roof assembly transitions including building corners
  - Penetrations through roofs, walls, and floors
  - Building assemblies used as ducts or plenums
  - Joints, seams, connections between planes, and other changes in air barrier materials

## 5.9.1.2: Continuous Air Barrier Verification

New “Optional” path when selecting to not provide whole building air leakage testing per Exception 3. to Section 5.4.3.1.1.

- An independent party performs a design review during preparation of the design documents to verify and document compliance with Sections 5.4.3 and 5.8.3.2
- Periodic field inspections are performed on the continuous air barrier; inspection while still exposed and able to be repaired
- Commissioning report to the Owner

High rise or complex structures where an envelope consultant is hired.

# Section 5 – 5.5.1

## Opaque

Table 5.5-4 Building Envelope Requirements for Climate Zone 4 (A,B,C)\*

Opaque Elements	Nonresidential		Residential		Semiheated	
	Assembly Maximum	Insulation Min. R-Value	Assembly Maximum	Insulation Min. R-Value	Assembly Maximum	Insulation Min. R-Value
<b>Roofs</b>						
<i>Insulation Entirely above Deck</i>	U-0.032	R-30 c.i.	U-0.032	R-30 c.i.	U-0.093	R-10 c.i.
<i>Metal Building</i>	U-0.037	R-19+R-11 Ls or R-25+R-8 Ls	U-0.037	R-19+R-11 Ls or R-25+R-8 Ls	U-0.082	R-19
<i>Attic and Other</i>	U-0.021	R-49	U-0.021	R-49	U-0.034	R-30
<i>other</i>		or R-20		or R-20		
<b>Wall, below Grade</b>						
<i>Below-grade wall</i>	C-0.119	R-7.5 c.i.	C-0.092	R-10 c.i.	C-1.140	NR
<b>Floors</b>						

Reference Table 5.5-4 on page 62 in 90.1-2019

# Indoor Radiant Heating Allowance

**Change Summary: Spaces with limited radiant heating considered “unconditioned”**

## Section 5.1.2.3

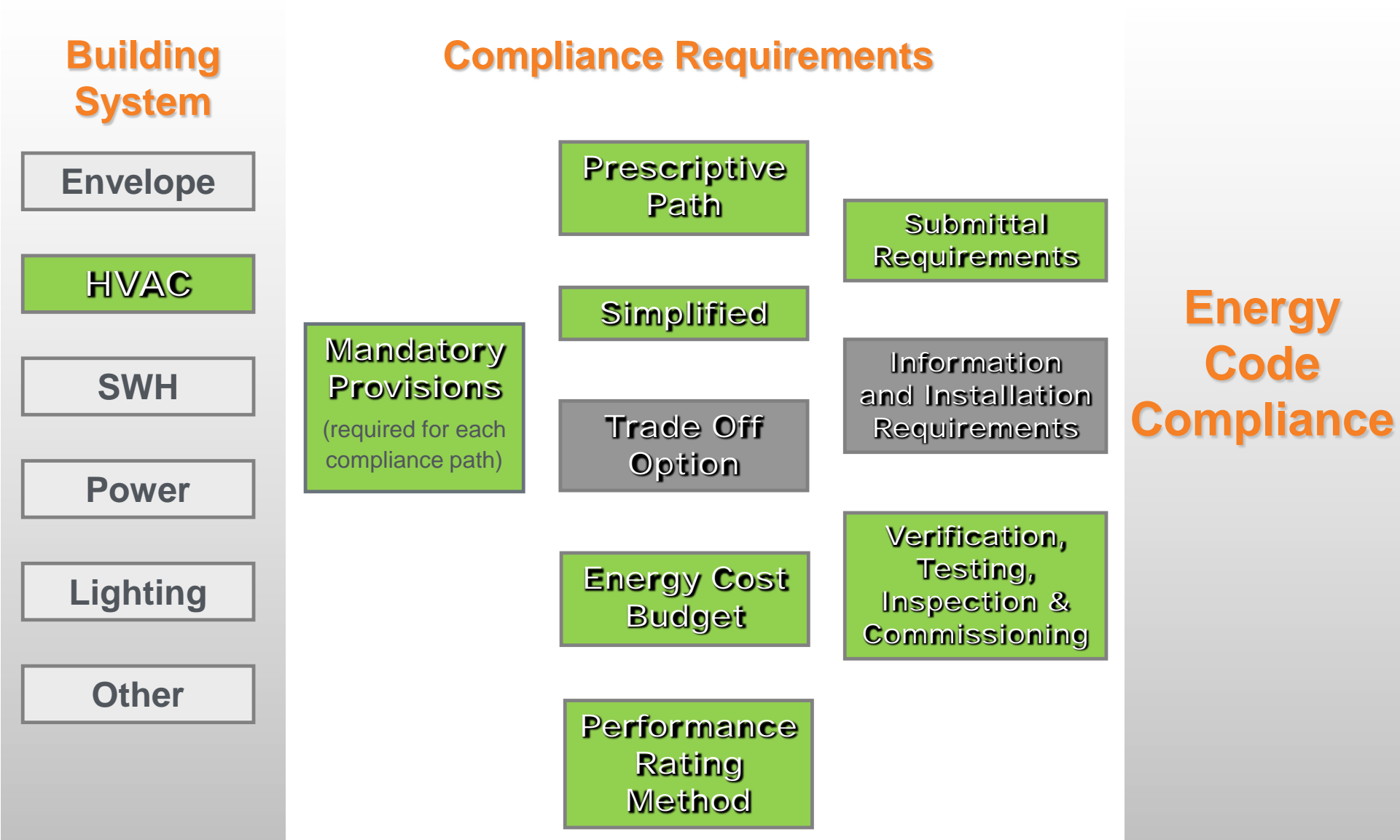
### Exception to 5.1.2.3

1. A space may be designated as either a *semiheated space* or an *unconditioned space* only if approved by the *building official*.
2. A space with limited radiant heating system meeting the requirements of Section 6.5.8.3 shall be considered an *unconditioned space*.

### Section 6.5.8.3 Radiant Heating for Enclosed Unconditioned Spaces

Overhead radiant heating systems shall be allowed in *unconditioned spaces* for spot heating of occupied areas. Spot heating shall be limited to 500 ft<sup>2</sup> (5 m<sup>2</sup>) or 10 percent of the space floor area, whichever is greater. Control shall be automatic complying with either Section 6.4.3.3.1 (b) or 6.4.3.3.1 (c).

Brings forward previous allowance for limited radiant heating over occupied space locations without triggering envelope requirements for conditioned spaces. Heating over limited amount of space and must have automatic control for when the space is occupied: manually operated time-switch or occupancy sensor.





- New requirements to allow the option of using ANSI/ASHRAE Standard 90.4-2019, Energy Standard for Data Centers, instead of ASHRAE Standard 90.1 in computer rooms that have an IT equipment load larger than 10 kW
  - Took years to work out wording
  - Definition of computer room
  - Essentially big data centers follow 90.4
    - 90.4 has more electrical efficiency requirements
    - Smaller data rooms in a building follow 90.1
  - Computer Room =  $> 20 \text{ W/sf}$  and  $\geq 10 \text{ kW}$  of comp load and/or IT equipment



# Data Center HVAC

**Change Summary:** Compliance with 90.4 for all data centers

## Exceptions to 6.2.2(b)

1. Data Centers in new buildings shall comply with ASHRAE Standard 90.4 for the HVAC Systems serving the heating, cooling or ventilating needs of the data center.
2. New HVAC systems added to existing buildings serving only the heating, cooling or ventilating needs of a data center shall meet the requirements of ASHRAE Standard 90.4 in accordance with Section 6.5.12.

## Section 6.5.11 Data Center Systems

HVAC systems only serving the heating, cooling, or ventilating needs of a data center shall comply with ASHRAE Standard 90.4, Energy Standard for Data Centers.

## Section 12

ANSI/ASHRAE Standard 90.4-2019 Energy Standard for Data Centers

HVAC systems for data centers in new buildings shall be per Standard 90.4 (not optional).

Also clarifying in the normative reference standards list that 90.4-2019 is the required version of 90.4

Definitions align 90.1 with 90.4 for data centers and computer rooms

# Parking Garage Ventilation

**Change Summary:** Exemption from controlled ventilation deleted

## Section 6.4.3.4.5 Enclosed Parking Garage Ventilation

Enclosed parking garage *ventilation systems* shall *automatically* detect contaminant levels and stage fans or modulate fan airflow rates per Section 404 of the Mechanical Code ~~to 50% or less of design capacity~~, provided acceptable contaminant levels are maintained.

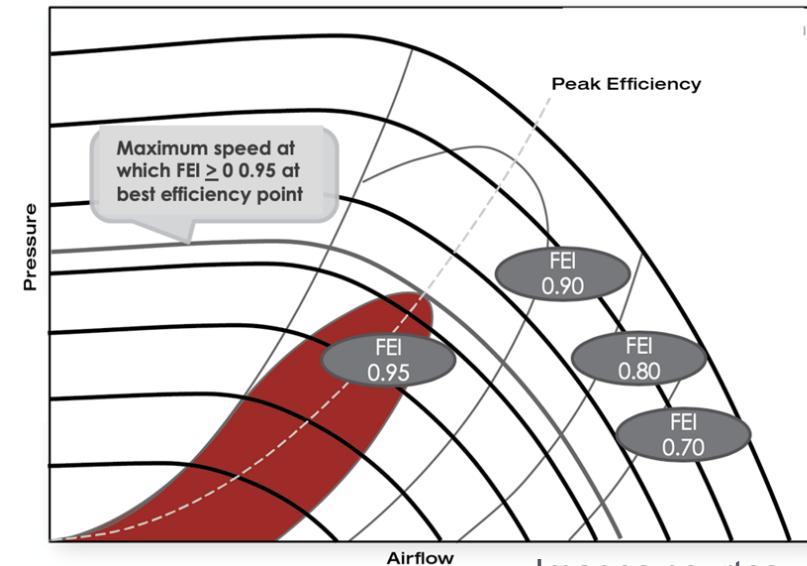
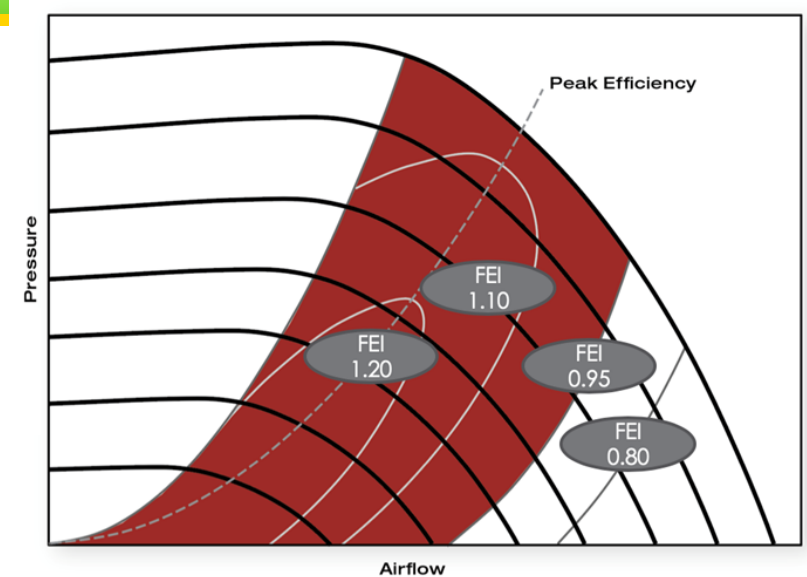
### Exceptions to 6.4.3.4.5

1. Garages less than 30,000 ft<sup>2</sup> with *ventilation systems* that do not utilize *mechanical cooling* or mechanical heating.
- ~~2. Garages that have a garage area to ventilation system motor nameplate horsepower ratio that exceeds 1500 ft<sup>2</sup>/hp and do not utilize mechanical cooling.~~
- ~~3.~~2. Where not permitted by the *authority having jurisdiction*.

Aligning with addendum to be in 90.1-2022, as well as 2014 OEESC: no exception for fan HP ratings. And alignment with OSSC and OMSC ventilation for parking garages.

# Mechanical – Fan Energy Index (FEI)

- Replaced Fan Efficiency Grade (FEG) efficiency metric with Fan Energy Index (FEI)
- FEG mainly requires good fan peak efficiency; does not concentrate as much on good selections
- FEI mainly requires good fan selections
  - kW input must be below a calculated value AT THE SCHEDULED OPERATING POINT
  - So the fan must be fairly good too
  - Manufacturers selection software should tell you “Compliant with FEI” or NOT or just not list non-compliant products
- Exceptions for embedded fans, safety fans, ceiling fans, fans outside scope of AMCA 208
  - No exception for powered roof ventilators
- Power threshold lowered from 5 HP to 1 HP



Images courtesy of AMCA

MANY tables were updated

- Typical for every cycle
- Added pump definitions, requirements, and efficiency tables to the standard for the first time
  - Match DOE Pump Energy Index (PEI)
  - Requires  $PEI \leq 1.0$
- PEI for pumps = similar to FEG
  - Also, lower numbers are better in FEI

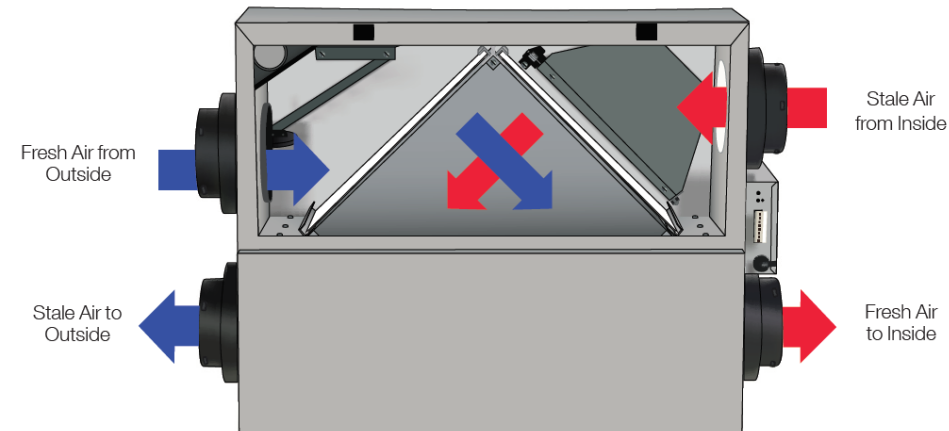
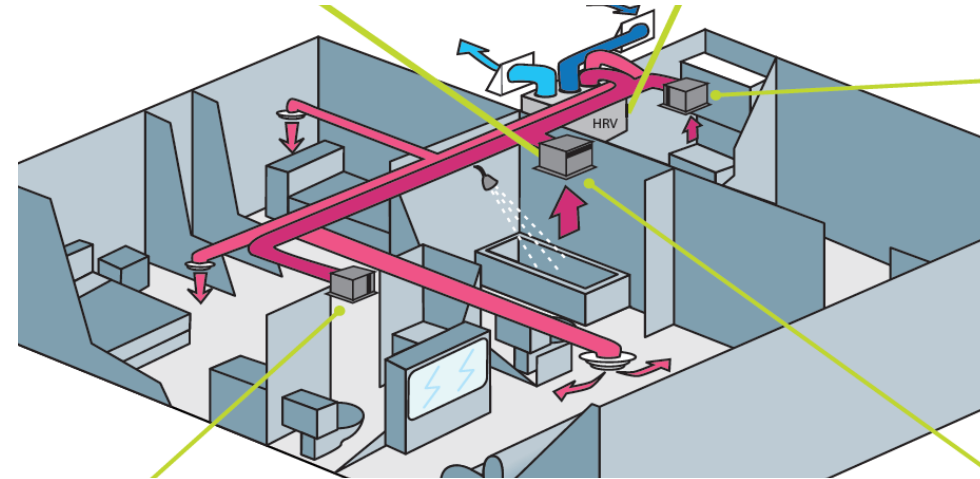


Image courtesy of  
Grundfos



- New energy recovery requirements for *nontransient* dwelling units (apartments & condos)
  - Enthalpy recovery ratio (ERR) at design conditions
    - ~~$\geq 50\%$  ERR at cooling~~
    - $\geq 60\%$  ERR at heating
    - ~~Unless one of the modes is not required~~
    - ERR is different than AHRI efficiency rating
  - Exceptions based on unit floor area and CZs

Images courtesy of  
American Aldes



# Mechanical – ER Chillers for Hospitals

## Section 6.5.6.3

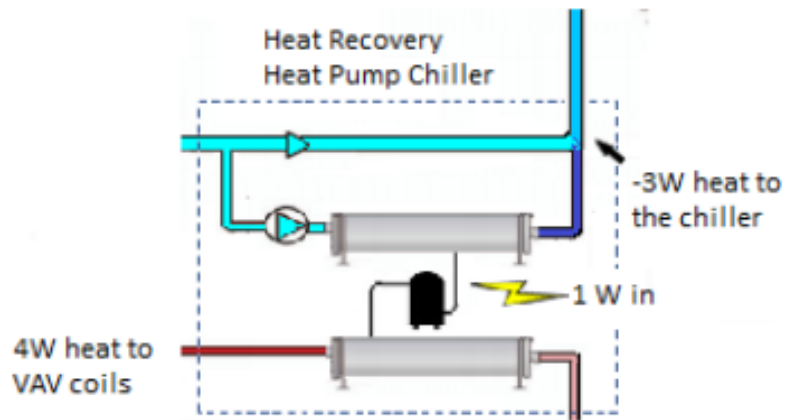
- Energy Recovery Chillers for Hospitals
  - Limited to:
    - Acute Inpatient
    - 24 hr operation
    - Chilled water capacity at design conditions >300 tons
    - Has simultaneous heat and cooling above 60F
  - Exceptions:
    - $\geq 60\%$  of reheat energy from on-site renewables or site recovered energy
    - ~~Climate Zones 5C, 6B, 7, & 8~~
  - Capacity of  $\geq 7\%$  of cooling capacity at design conditions (i.e. not standby chillers)



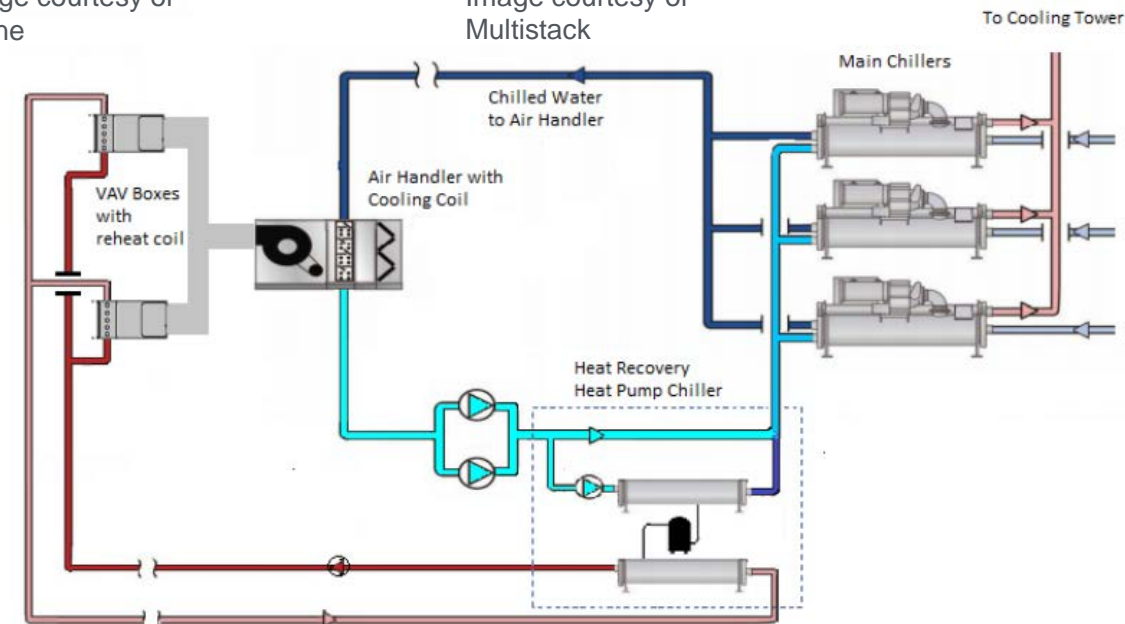
Image courtesy of Trane



Image courtesy of Multistack

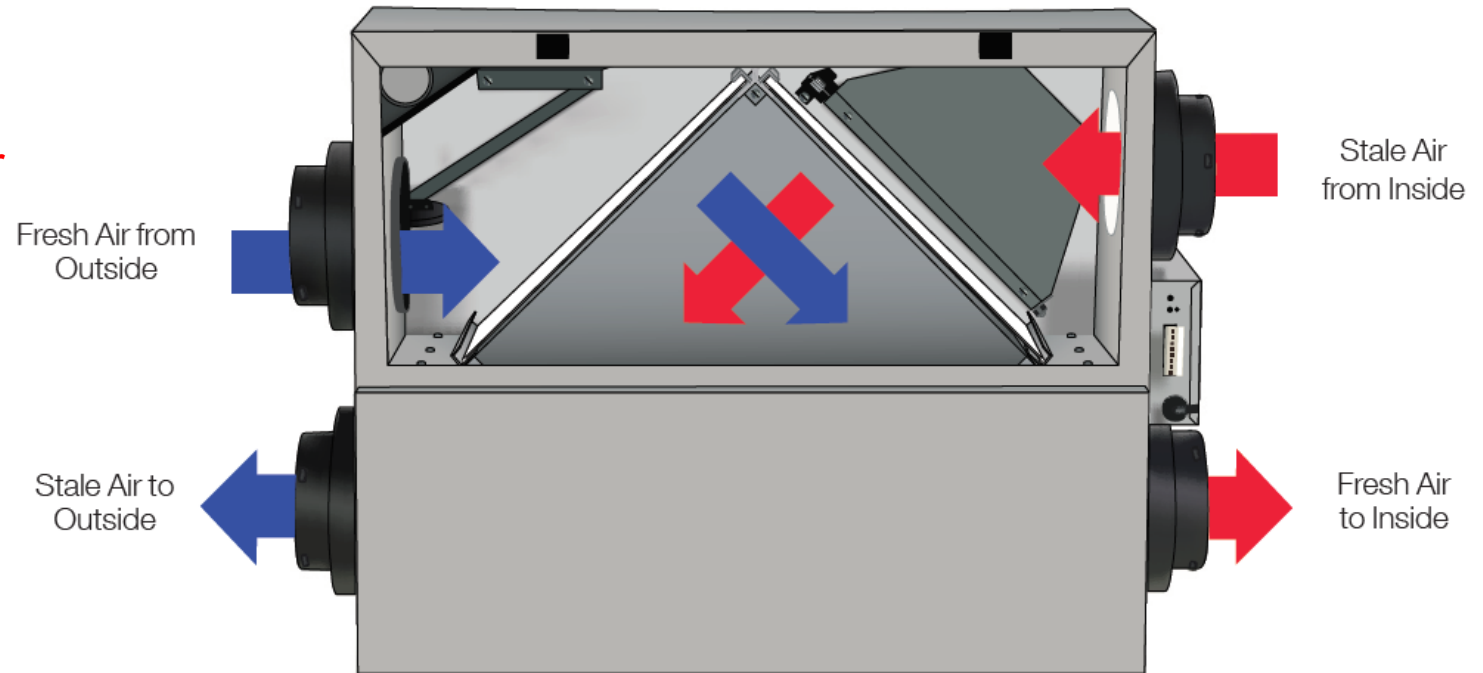


Images courtesy of 2050 Partners





- Added indoor pool dehumidifier energy recovery: (6.5.6.4)
  - 50% EA sensible recovery, or
  - Condenser pool heating, or
  - 50% EA enthalpy recovery
- Air Curtains
  - **NOT MECHANICAL** – but affects MEs
- Motor selection
  - Simplified in 6.5.3.1.2
  - Made more tolerant of motors not rated in BHP



## Section 6 – 6.5.3.8

### Occupied-Standby Controls

Zones serving rooms required to have automatic partial OFF or automatic full OFF controls per 9.4.1.1 where Standard 62.1 occupancy category permits ventilation air to be reduced to 0 when space is in *occupied-standby mode* and when using Ventilation Rate Procedure, to meet the following within 5 minutes of all rooms in that zone entering *occupied-standby mode*

- a. Active heating set point setback at least 1 degree F
- b. Active cooling set point setup at least 1 degree F
- c. All supplied airflow to be shut off whenever space temperature is between active heating and cooling set points

#### **Exception:**

Multiple zone systems without automatic zone flow control dampers

#### **Notes:**

1. *Occupied-standby mode* is when a space is vacant during scheduled occupancy
2. Cooling and heating setpoint adjustments in addition to required 5°F deadband

## Section 6 – 6.5.4.8

### Buildings with High-Capacity Space-Heating Gas Boiler Systems

New buildings with gas hot-water boiler systems for space heating with a total system input of at least 1,000,000 Btu/h but not more than 10,000,000 Btu/h to comply with 6.5.4.8.1 and 6.5.4.8.2

#### Exceptions

- Where 25% of annual space heating requirement is provided by on-site renewable energy, site-recovered energy, or heat recovery chillers
- Space heating boilers installed in individual dwelling units
- Where 50% or more of design heating load is served using perimeter convective heating, radiant ceiling panels, or both
- Individual gas boilers with input capacity less than 300,000 Btu/h shall not be included in calculations of the total system input or total system efficiency

## Section 6 – 6.5.4.8

### Buildings with High-Capacity Space-Heating Gas Boiler Systems (con't)

#### Boiler efficiency

- Gas hot-water boilers to have minimal thermal efficiency of 90% when rated per Table 6.8.1-6
  - Multiple boiler systems can meet this if space-heating input provided by equipment with thermal efficiency above and below 90% provides an input capacity-weighted average thermal efficiency of at least 90%
  - For boilers rated only for combustion efficiency, the calculation for input capacity-weighted average thermal efficiency to use combustion efficiency value

#### Hot-Water Distribution System Design

- Coils and other heat exchanges selected so at design conditions the hot-water return temperature entering boilers is 120°F or less
- Under all operating conditions, water temperature enter the boiler is 120°F or less, or the flow rate of supply hot water that recirculates directly into return systems, such as by three-way valves or minimum flow bypass controls, to be no greater than 20% of design flow of the operating boilers

## Section 6 – 6.8.1

### Minimum Efficiency Requirement Listed Equipment – Standard Rating and Operating Conditions

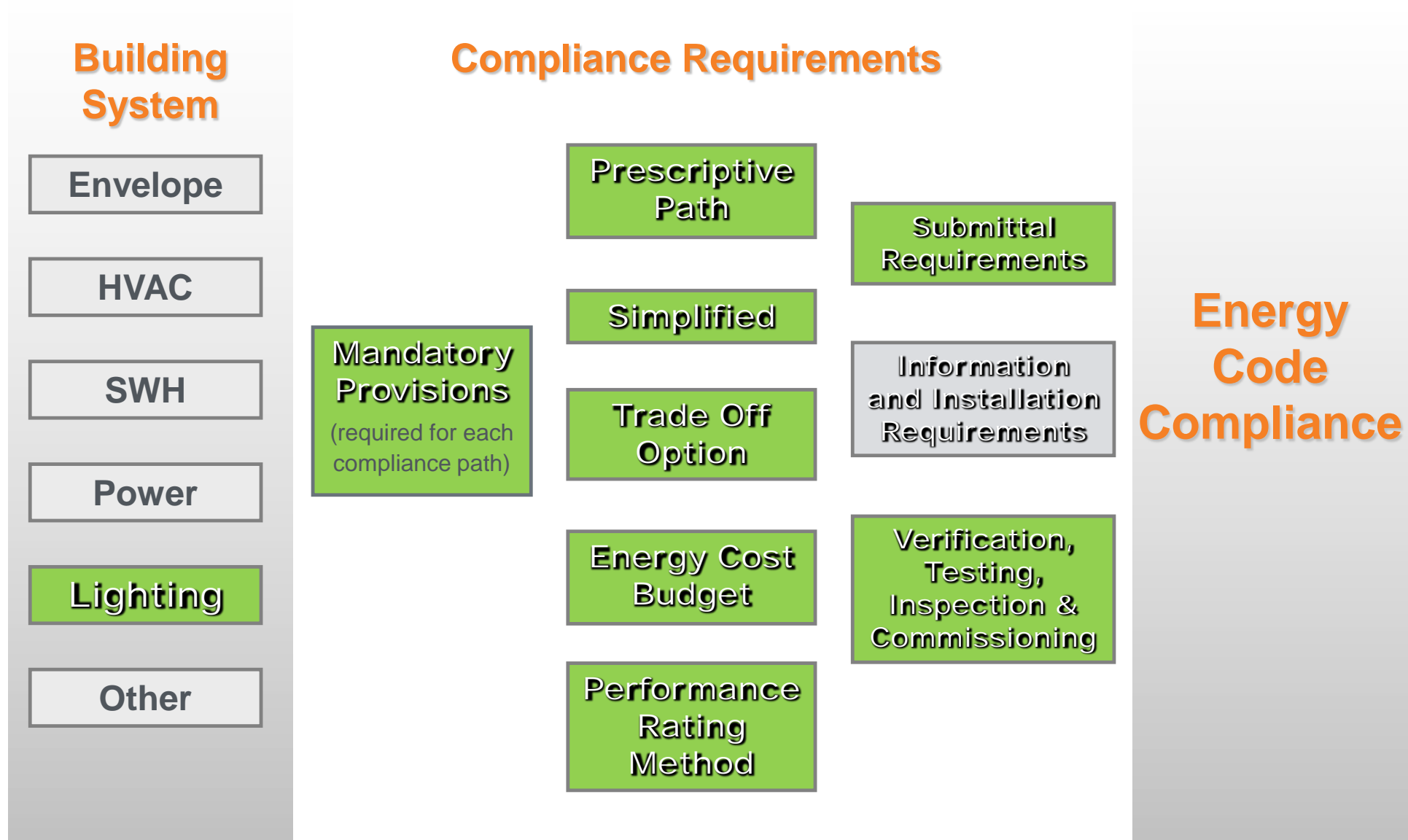
Several changes were made to the equipment efficiency requirements defined in section 6.4.1.1 and in Tables 6.8.1-1 to 6.8.1-20

Table	Name	Change
6.8.1-1	Electrically Operated Unitary Air Conditioners and Condensing Units	Values or metrics change 1/1/2023
6.8.1-2	Electrically Operated Air-Cooled Unitary Heat Pumps	New Values 1/1/2023
6.8.1-3	Water-Chilling Packages—Minimum Efficiency Requirements	No change
6.8.1-4	Electrically Operated Packaged Terminal Air Conditioners, Packaged Terminal Heat Pumps, Single-Package Vertical Air Conditioners, Single-Package Vertical Heat Pumps, Room Air Conditioners, and Room Air Conditioner Heat Pumps	Format change for PTAC & PTHP, same requirements; some others have change
6.8.1-5	Warm-Air Furnaces and Combination Warm-Air Furnaces/Air-Conditioning Units, Warm-Air Duct Furnaces, and Unit Heaters	Some values change now or 1/1/2023; add electric furnace
6.8.1-6	Gas- and Oil-Fired Boilers	Some new values 3/2/2022
6.8.1-7	Performance Requirements for Heat Rejection Equipment	Some new values
(6.8.1-8)	Heat Transfer Equipment	Table removed

## Section 6 – 6.8.1

### Minimum Efficiency Requirement Listed Equipment – Standard Rating and Operating Conditions

Table	Name	Change
6.8.1-8	Electrically Operated Variable-Refrigerant-Flow Air Conditioners	No change
6.8.1-9	Electrically Operated Variable-Refrigerant-Flow and Applied Heat Pumps	No change
6.8.1-10	Air Conditioners and Condensing Units Serving Computer Rooms	Revised size ranges and some values
6.8.1-11	Commercial Refrigerator and Freezers and Refrigeration	Values change
6.8.1-12	Vapor Compression Based Indoor Pool Dehumidifiers	No change
6.8.1-13	Electrically Operated DX-DOAS Units, Single-Package and Remote Condenser, without Energy Recovery	No change
6.8.1-14	Electrically Operated DX-DOAS Units, Single-Package and Remote Condenser, with Energy Recovery	No change
6.8.1-15	Electrically Operated Water-Source Heat Pumps	New Table
6.8.1-16	Heat Pump and Heat Recovery Chiller Packages	New Table
6.8.1-17	Ceiling-Mounted Computer-Room Air Conditioners	New Table
6.8.1-18	Walk-In Cooler and Freezer Display Door	New Table
6.8.1-19	Walk-In Cooler and Freezer Nondisplay Door	New Table
6.8.1-20	Walk-In Cooler and Freezer Refrigeration System	New Table



## Updated:

- Lighting model for LPD calculations
- LPD allowances (9.5.1, 9.6.1)
- Interior and exterior lighting wattage (9.1.4)
- Parking garage lighting control requirements (9.4.1.2)
- Special applications lighting and controls (9.4.1.2)
- Daylighting control requirements (9.4.1.1)
- Daylighting zones [3.2, 9.4.1.1(e)]
- LPDs for non-typical exterior areas (9.4.2)

## New:

- Simplified lighting method for select buildings up to 25,000 ft<sup>2</sup> (9.3)



# New Compliance Method for Lighting in Simple Buildings

- Intended for contractors who design or renovate office, school, and retail buildings up to 25,000 sq. ft.
- Single interior and exterior LPD targets that cover the entire building, LPAs are lower than other methods
- Requires occupancy sensor lighting control in most spaces with some exemption where life safety concerns apply
- All power from all lights must be counted towards the Interior Lighting Power Allowance ILPA **No Exemptions** ←

Addendum BG

# New Compliance Method for Lighting in Simple Buildings

**Table 9.3.1-3 Simplified Building Method for School Buildings**

Interior Space Type	Interior Lighting Power Allowance	Controls <sup>a</sup>
All spaces in school buildings other than parking garages, stairwells, and corridors	0.70 W/ft <sup>2</sup>	All lighting shall be <i>automatically</i> controlled to turn off when the <i>building</i> is either unoccupied or scheduled to be unoccupied. ( <b>Exception:</b> Lighting load not exceeding 0.02 W/ft <sup>2</sup> multiplied by the gross lighted area of the <i>building</i> shall be permitted to operate at all times.)  Each <i>space</i> shall have a <i>manual control</i> device that allows the occupant to reduce lighting power by a minimum of 50% and to turn the lighting off.
Classrooms, offices spaces, conference rooms, meeting rooms, library, storage rooms, and break rooms	0.70 W/ft <sup>2</sup>	These <i>spaces</i> shall also be controlled by <i>manual-on occupant sensors</i> .
Gymnasiums and cafeterias	0.70 W/ft <sup>2</sup>	These <i>spaces</i> shall also be controlled by <i>occupant sensors</i> .
Restrooms	0.70 W/ft <sup>2</sup>	These <i>spaces</i> shall also be controlled by <i>occupant sensors</i> .
Stairwells and corridors in school buildings and parking garages	0.70 W/ft <sup>2</sup>	These <i>spaces</i> shall also be controlled by <i>occupant sensors</i> that reduce the lighting power by a minimum of 50% when no activity is detected for not longer than 20 minutes and be controlled to turn off when the <i>building</i> is either unoccupied or scheduled to be unoccupied.
Parking garages	0.13 W/ft <sup>2</sup>	All lighting shall be <i>automatically</i> controlled to turn off during garage nonoperating hours. Lighting shall also be controlled by <i>occupant sensors</i> . <i>Controls</i> shall reduce the power by a minimum of 50% when no activity is detected for not longer than 20 minutes. No device shall control more than 3600 ft <sup>2</sup> .

a. All lights in the space shall be controlled.

# New Compliance Method for Lighting in Simple Buildings

Table 9.3.2 Simplified Building Method for *Building* Exteriors

Exterior Area Type	Exterior Lighting Power Allowance <sup>a,b</sup>	Controls <sup>c</sup>
Base allowance	200 W	<i>Luminaires</i> shall be turned off or the power reduced by a minimum of 75% during nonoperating hours.
Façade lighting and special feature areas, walkways, plazas	0.10 W/ft <sup>2</sup>	<i>Luminaires</i> shall be turned off or the power reduced by a minimum of 75% during nonoperating hours.
Landscape	0.04 W/ft <sup>2</sup>	<i>Luminaires</i> shall be turned off or the power reduced by a minimum of 75% during nonoperating hours.
Entry doors	14 W/linear foot	<i>Luminaires</i> shall be turned off or the power reduced by a minimum of 75% during nonoperating hours.
Stairs and ramps	0.7 W/ft <sup>2</sup>	No additional <i>controls</i> required.
Parking lots and drives	0.05 W/ft <sup>2</sup>	<i>Luminaires</i> mounted 25 ft or less above grade shall be controlled to reduce the power by at least 50% when no activity is detected for not longer than 15 minutes.
All other areas not listed	0.20 W/ft <sup>2</sup>	<i>Luminaires</i> shall be turned off or the power reduced by a minimum of 75% during nonoperating hours.

a. To calculate the exterior allowance, multiply the *space* or area square footage by the allowed W/ft<sup>2</sup> and sum the exterior allowances and the base allowance. Façade lighting shall be calculated separately by multiplying the façade area by the allowed W/ft<sup>2</sup>. Façade allowance shall not be traded with other exterior areas or between separate *façade areas*.

b. For *buildings* in Lighting Zone 2, as defined in Table 9.4.2-1, decrease exterior allowances by 20%. For *buildings* in Lighting Zone 4, as defined in Table 9.4.2-1, increase exterior allowances by 25%.

c. All exterior lighting shall be automatically controlled by either a photocell or an astronomical time switch to shut off the lighting when daylight is available.

# Dwelling Unit Lighting

**Change Summary:** Dwelling unit lighting without using Lighting Power Allowance

## Section 9.4.3 Dwelling Units

Not less than ~~75%~~100% of the permanently installed lighting fixtures shall use lamps with an efficacy of at least 55 lm/W or have a total luminaire efficacy of at least 45 lm/W. No other provisions of Section 9 apply to dwelling units. Dwelling unit floor area shall be excluded from total building floor area under the Building Area Compliance Method (9.5.1).

Dwelling units that are excluded from the building lighting power allowance requirements must have 100% high-efficacy fixtures.

Any multifamily structure built under the OSSC must comply with 90.1, regardless of number of floors

#### Applies to Section 9.6.2, Additional Interior Lighting Power

- In order to use allowance for additional lighting power, the fixtures using this allowance must be controlled per 9.4.1.1 (j)
- No other controls required for these fixtures

#### Lights scheduled off at end of business hours using either

- Time-of-day control automatically turns lighting off as programmed
- OR
- Signal from another automatic control or alarm/security system

Any manual, override control to not turn lighting on > 2 hours during scheduled off

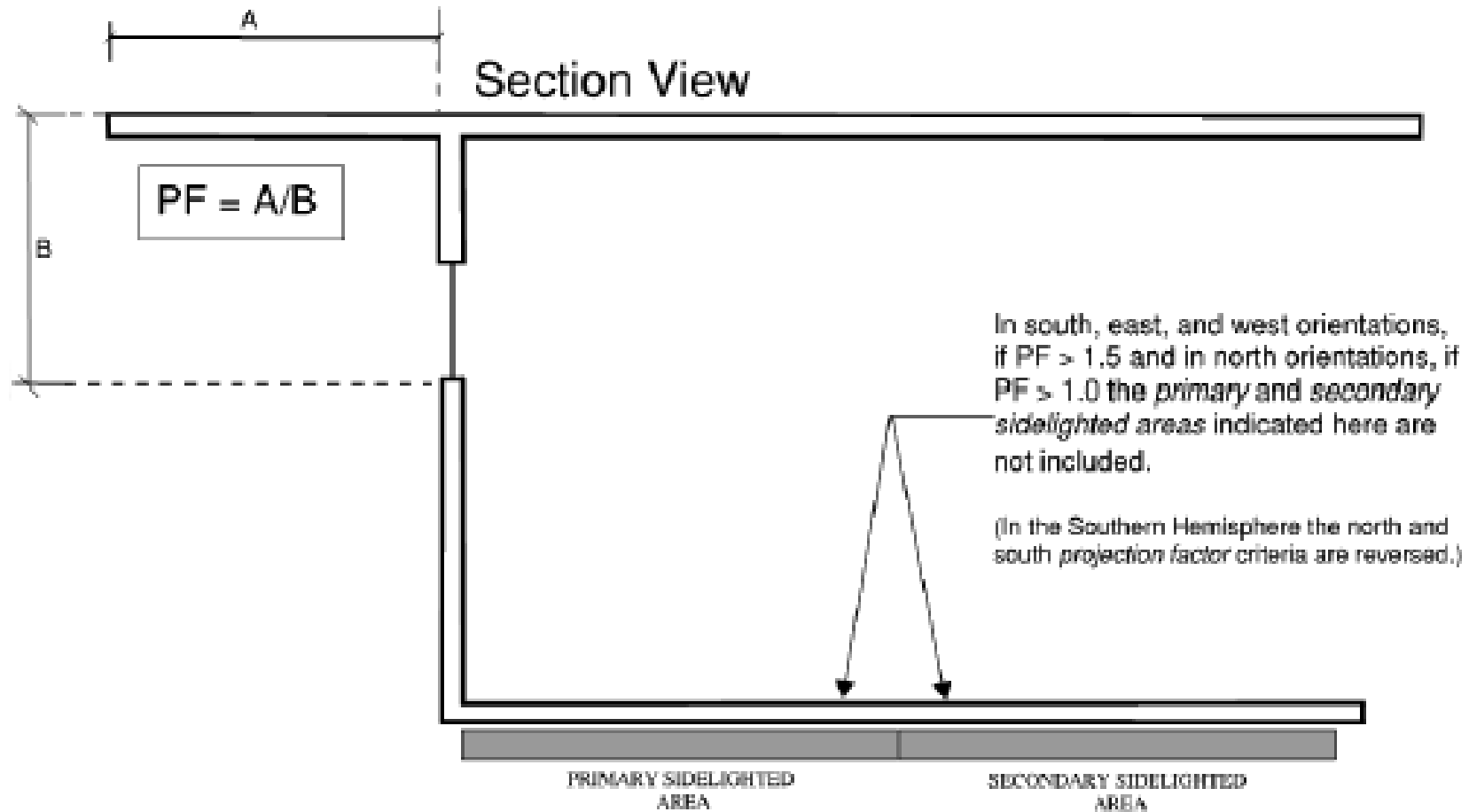
- Apply photocontrols if the combined input power of all general lighting completely or partially within:
  - primary sidelighted areas is  $\geq 150$  W
  - primary and secondary sidelighted areas is  $\geq 300$  W
  - general lighting in secondary sidelighted area controlled independently of general lighting in primary sidelighted area
- Control system must have following characteristics
  - Calibration adjustment located  $\leq 11$ ft above finished floor (no person needed at sensor while processing)
  - Reduce electric lighting in response to available daylight using continuous dimming to  $\leq 20\%$  and off
  - When automatic partial OFF control has reduced to unoccupied set point, daylight responsive control to adjust electric light in response to available daylight (but not above unoccupied set point)

## Exceptions

- Primary sidelighted areas where top of any existing adjacent structure is **at least** twice as high above the windows as its **horizontal** distance away from the windows
- Sidelighted areas where total glazing area is  $< 20 \text{ ft}^2$
- Retail spaces
- **Primary sidelighted areas adjacent to vertical fenestration with external projections and no vertical fenestration above projections, where projection has projection factor (PF)**
  - **$> 1.0$  if north oriented or**
  - **$> 1.5$  for all other orientations**

## Section 9 – 9.4.1.4

### Daylight Zone Definition – Project Factor



© 2019, ASHRAE, ANSI/ASHRAE/IES Standard 90.1-2019, Figure 3.2-6



- Increased the stringency of setback in parking garages – % reduction & time period
- Updated control requirements for transition lighting
- Continuous daylight dimming down to 50% required for luminaires within 20 ft. of wall openings
- **NEW** exemptions for permanent architectural screens or architectural elements that obstruct more than 50% of the opening and where the top of and existing adjacent structures or natural objects is at least twice as high above the openings as its horizontal distance from the opening.

Parking Garages		
	90.1 2016	90.1 2019
Time	20	10
Reduction	30%	50%



Addendum CV

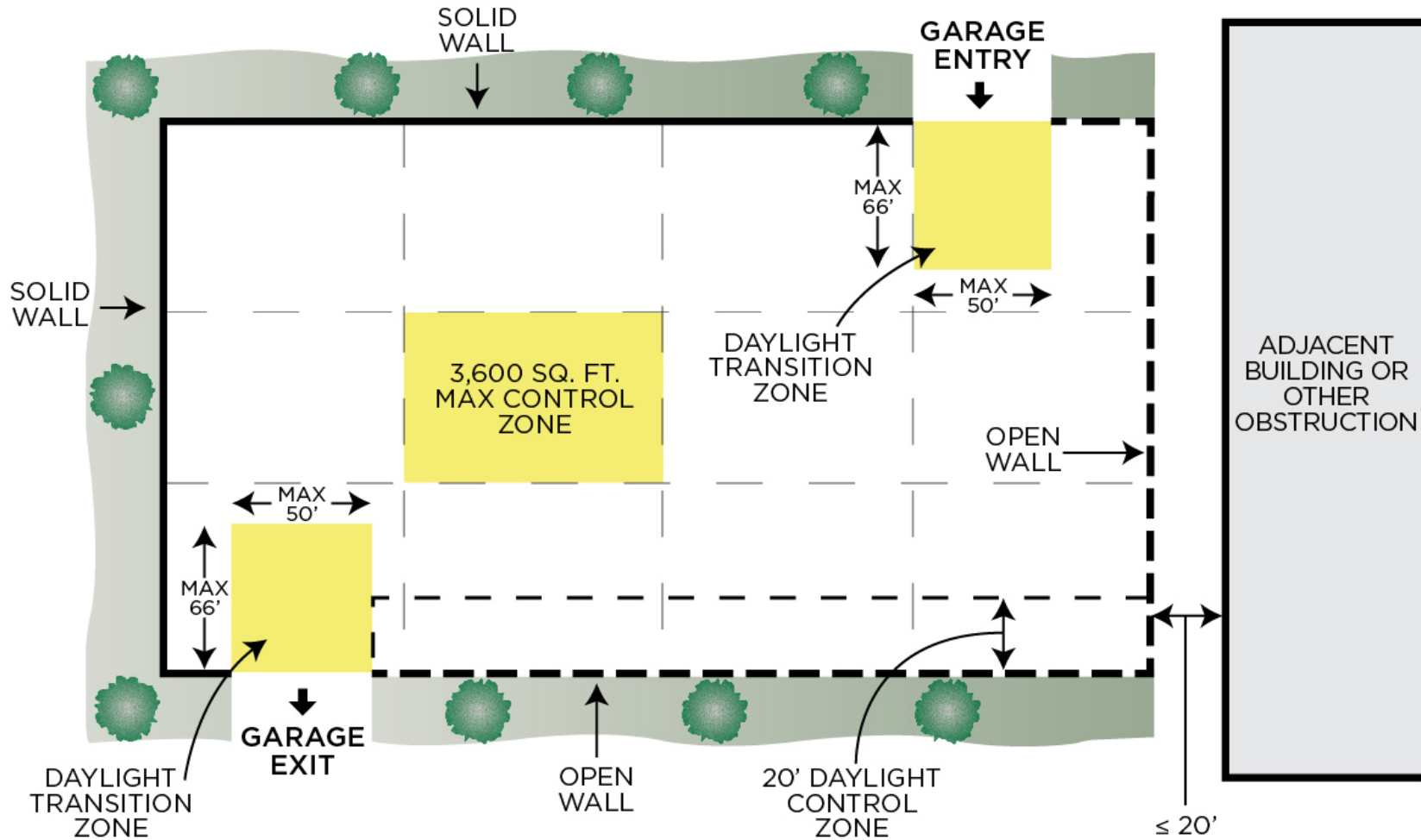
- Automatic lighting shutoff per 9.4.1.1(i)
- Must reduce lighting power by minimum of 50% when no activity is detected for 10 minutes within a lighting zone  $\leq 3,600 \text{ ft}^2$
- Parking garage daylight transition lighting exempt per Section 9.2.3.1 to be separately controlled to automatically reduce lighting to no more than general light level from sunset to sunrise
- Automatically reduce power through continuous dimming in response to daylight for luminaires within 20 ft of any perimeter wall openings totaling at least  $24 \text{ ft}^2$

#### Exceptions

- Parking garage daylight transition lighting exempt per Table 9.2.3.1
- Where permanent screens or architectural elements obstruct > 50% of opening
- Where top of any existing adjacent structure or natural object is at least twice as high above the openings as its horizontal distance from opening

## Section 9 – 9.4.1.2

### Parking Garage Lighting Control



# Data Center Power Systems

**Change Summary:** Data Centers must comply with Standard 90.4-2019

## Section 8.2.1

### Exception to 8.2.1

Power distribution *systems* and *equipment* ~~only~~ serving a *data center* ~~computer room with IT equipment load greater than 10 kW~~ shall ~~be permitted to~~ comply with Section 8.5 ~~8.6, “Alternative Compliance Path.”~~

*Data Center* power distribution shall be per Standard 90.4. No longer optional.

*A data center is a computer room with IT equipment loads greater than 10kW.*

# Controlled Outlet Exception

**Change Summary:** Increase efficiency in exchange for eliminating controlled receptacles

## Section 8.4.2

### Exceptions to Section 8.4.2

Receptacles for the following shall not require an *automatic control device*:

.....

3. The building complies with one of the following:

- a. Results of performance compliance under Section 11 or Appendix G are at least 5% better than the minimum.
- b. COMcheck envelope compliance report passes by minimum of 3%.
- c. COMcheck lighting report passes by a minimum of 5%.

Additional exception to the requirement for controlled outlets via improved efficiency in other areas:

- 5% better energy model
- 3% better envelope
- 5% better lighting

# Controlled Outlet Exception

**Change Summary:** Increase efficiency in exchange for eliminating controlled receptacles

## Section 8: Power

### 8.4.2: Receptacle Control Exception

☐ Check if not applicable

Building is not providing controlled receptacles required per Section 8.4.2. Additional efficiency provided via following method (select one)

- ☐ Performance Compliance report showing minimum 5% better performance than minimum
  - ☐ Section 11 ECB report included or
  - ☐ Appendix G report included
- ☐ COMcheck Envelope Compliance report showing minimum 3% passing or higher
  - ☐ ASHRAE 90.1-2019 COMcheck forms included
- ☐ COMcheck Lighting report showing minimum 5% passing or higher
  - ☐ ASHRAE 90.1-2019 COMcheck forms included

Printed name  
Registered design professional

Signature

Registration number

Date



# Training Resources

EnergyCodes.gov with many resources

<https://www.energycodes.gov/training>

**BUILDING ENERGY CODES PROGRAM** U.S. DEPARTMENT OF **ENERGY** Energy Efficiency & Renewable Energy

**BUILDING ENERGY CODES PROGRAM** U.S. DEPARTMENT OF **ENERGY** Energy Efficiency & Renewable Energy

**BUILDING ENERGY CODES PROGRAM** U.S. DEPARTMENT OF **ENERGY** Energy Efficiency & Renewable Energy

ANSI/ASHRAE/IES  
Standard 90.1-2019: Envelope  
May 2020 – PNNL-SA-153209

ANSI/ASHRAE/IES  
Standard 90.1-2019: HVAC  
May 2020 – PNNL-SA-153210

ANSI/ASHRAE/IES Standard  
90.1-2019: Power and Lighting  
May 2020 – PNNL-SA-153216

Prepared by Pacific Northwest  
National Laboratory for the  
U.S. Department of Energy

Three courses for Envelope, HVAC & Lighting/Power

# Other Courses at Energycodes.gov

- Basic HVAC Controls and Energy Codes
- Energy Code Compliance for Metal Buildings
- Comcheck Basics (plus other courses)
- Performance-based Compliance Documentation

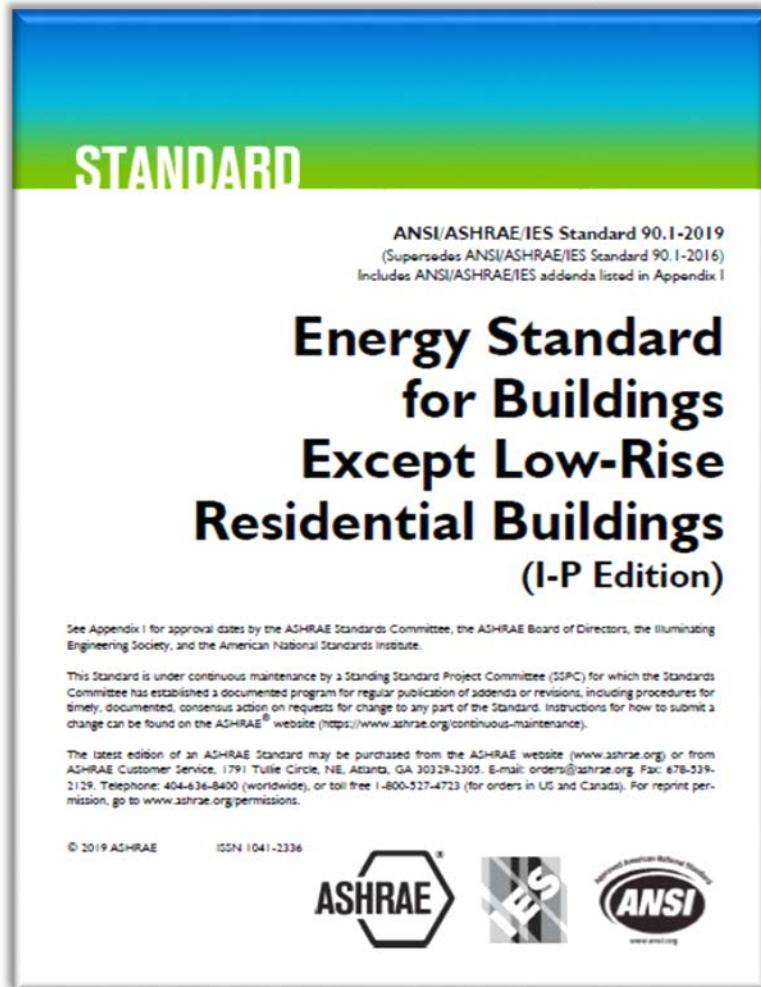
The Resource Guides page has a guide for Code Officials, as well as compliance guides for HVAC and Lighting. Based on older codes, but still applicable



# **2021 OEESC ENERGY CODE COMPLETE!**

\*\*\*\*\*

**ADDITIONAL BCD  
RESOURCES  
ON SLIDE TO FOLLOW.**



# THANK YOU FOR WATCHING

## Additional Resources:

Division website - [Oregon.gov/bcd](http://Oregon.gov/bcd)

Technical questions - [BCD.PTSPtech@oregon.gov](mailto:BCD.PTSPtech@oregon.gov)

Program contacts - <https://www.oregon.gov/bcd/Pages/contact-us.aspx>

Energy Program page -  
<https://www.oregon.gov/bcd/codes-stand/Pages/energy-efficiency.aspx>