2022 Energy Trust Training

Review of the Commercial Provisions of the 2021 OEESC

Nick O'Neil, P.E. – Energy 350
Blake Shelide, P.E. – ODOE



Acknowledgements

Pacific Northwest NATIONAL LABORATORY
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U.S. DEPARTMENT OF ENERGY

ASHRAE Oregon Chapter

https://www.energycodes.gov

https://www.orashrae.org/

BCD Building Codes Division
Better Buildings for Oregon

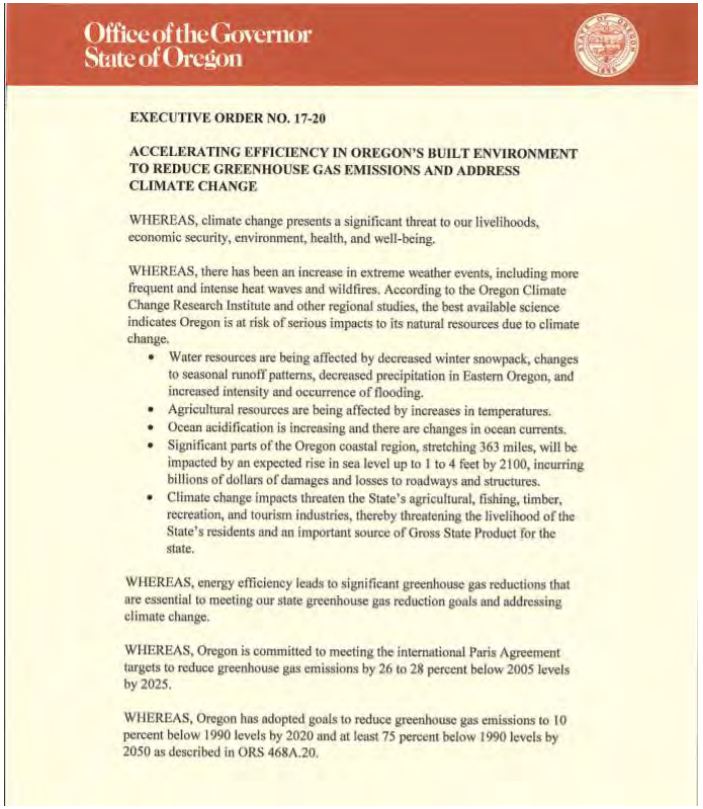
https://www.oregon.gov/bcd/codes-stand/Pages/energy-efficiency.aspx

State Energy Background: Setting the Stage

EO 17-20 (Energy Efficiency)

Three key sections:

1. Energy efficiency leadership in state owned/leased buildings – Governor directives to DAS and ODOE
2. Targets for state-wide building codes & appliance standards – Governor directives to DCBS-BCD and ODOE
3. Retrofits and affordable housing – Governor directives to PUC, HCS, ODOE



Office of the Governor
State of Oregon

EXECUTIVE ORDER NO. 17-20

ACCELERATING EFFICIENCY IN OREGON'S BUILT ENVIRONMENT TO REDUCE GREENHOUSE GAS EMISSIONS AND ADDRESS CLIMATE CHANGE

WHEREAS, climate change presents a significant threat to our livelihoods, economic security, environment, health, and well-being.

WHEREAS, there has been an increase in extreme weather events, including more frequent and intense heat waves and wildfires. According to the Oregon Climate Change Research Institute and other regional studies, the best available science indicates Oregon is at risk of serious impacts to its natural resources due to climate change.

- Water resources are being affected by decreased winter snowpack, changes to seasonal runoff patterns, decreased precipitation in Eastern Oregon, and increased intensity and occurrence of flooding.
- Agricultural resources are being affected by increases in temperatures.
- Ocean acidification is increasing and there are changes in ocean currents.
- Significant parts of the Oregon coastal region, stretching 363 miles, will be impacted by an expected rise in sea level up to 1 to 4 feet by 2100, incurring billions of dollars of damages and losses to roadways and structures.
- Climate change impacts threaten the State's agricultural, fishing, timber, recreation, and tourism industries, thereby threatening the livelihood of the State's residents and an important source of Gross State Product for the state.

WHEREAS, energy efficiency leads to significant greenhouse gas reductions that are essential to meeting our state greenhouse gas reduction goals and addressing climate change.

WHEREAS, Oregon is committed to meeting the international Paris Agreement targets to reduce greenhouse gas emissions by 26 to 28 percent below 2005 levels by 2025.

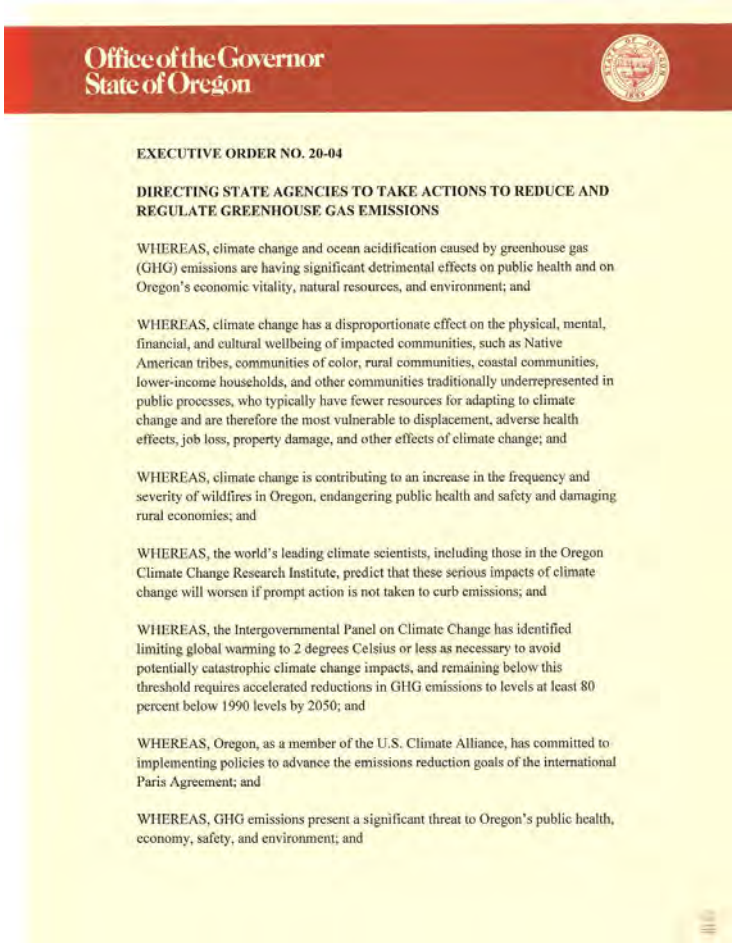
WHEREAS, Oregon has adopted goals to reduce greenhouse gas emissions to 10 percent below 1990 levels by 2020 and at least 75 percent below 1990 levels by 2050 as described in ORS 468A.20.

EO available: http://www.oregon.gov/gov/Documents/executive_orders/eo_17-20.pdf

EO 20-04 (Greenhouse Gas Emissions)

Additional directives for state agencies, including BCD and ODOE to take action to reduce GHG emissions

- Directive 6: 60% reduction in new building annual site consumption of energy (excluding transportation and appliances) by 2030, from a 2006 baseline



Office of the Governor
State of Oregon

EXECUTIVE ORDER NO. 20-04

DIRECTING STATE AGENCIES TO TAKE ACTIONS TO REDUCE AND REGULATE GREENHOUSE GAS EMISSIONS

WHEREAS, climate change and ocean acidification caused by greenhouse gas (GHG) emissions are having significant detrimental effects on public health and on Oregon's economic vitality, natural resources, and environment; and

WHEREAS, climate change has a disproportionate effect on the physical, mental, financial, and cultural wellbeing of impacted communities, such as Native American tribes, communities of color, rural communities, coastal communities, lower-income households, and other communities traditionally underrepresented in public processes, who typically have fewer resources for adapting to climate change and are therefore the most vulnerable to displacement, adverse health effects, job loss, property damage, and other effects of climate change; and

WHEREAS, climate change is contributing to an increase in the frequency and severity of wildfires in Oregon, endangering public health and safety and damaging rural economies; and

WHEREAS, the world's leading climate scientists, including those in the Oregon Climate Change Research Institute, predict that these serious impacts of climate change will worsen if prompt action is not taken to curb emissions; and

WHEREAS, the Intergovernmental Panel on Climate Change has identified limiting global warming to 2 degrees Celsius or less as necessary to avoid potentially catastrophic climate change impacts, and remaining below this threshold requires accelerated reductions in GHG emissions to levels at least 80 percent below 1990 levels by 2050; and

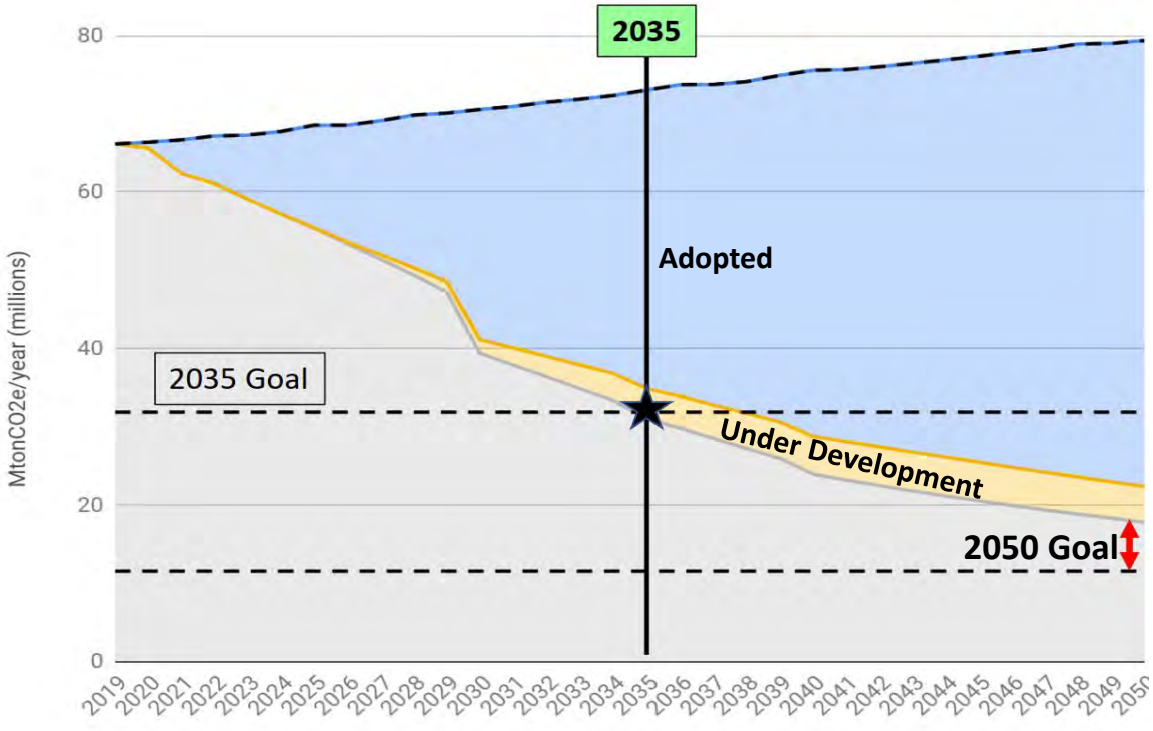
WHEREAS, Oregon, as a member of the U.S. Climate Alliance, has committed to implementing policies to advance the emissions reduction goals of the international Paris Agreement; and

WHEREAS, GHG emissions present a significant threat to Oregon's public health, economy, safety, and environment; and

https://www.oregon.gov/gov/Documents/executive_orders/eo_20-04.pdf

Oregon's GHG Reduction Goals

2022 Analysis, "Roadmap to 2035"

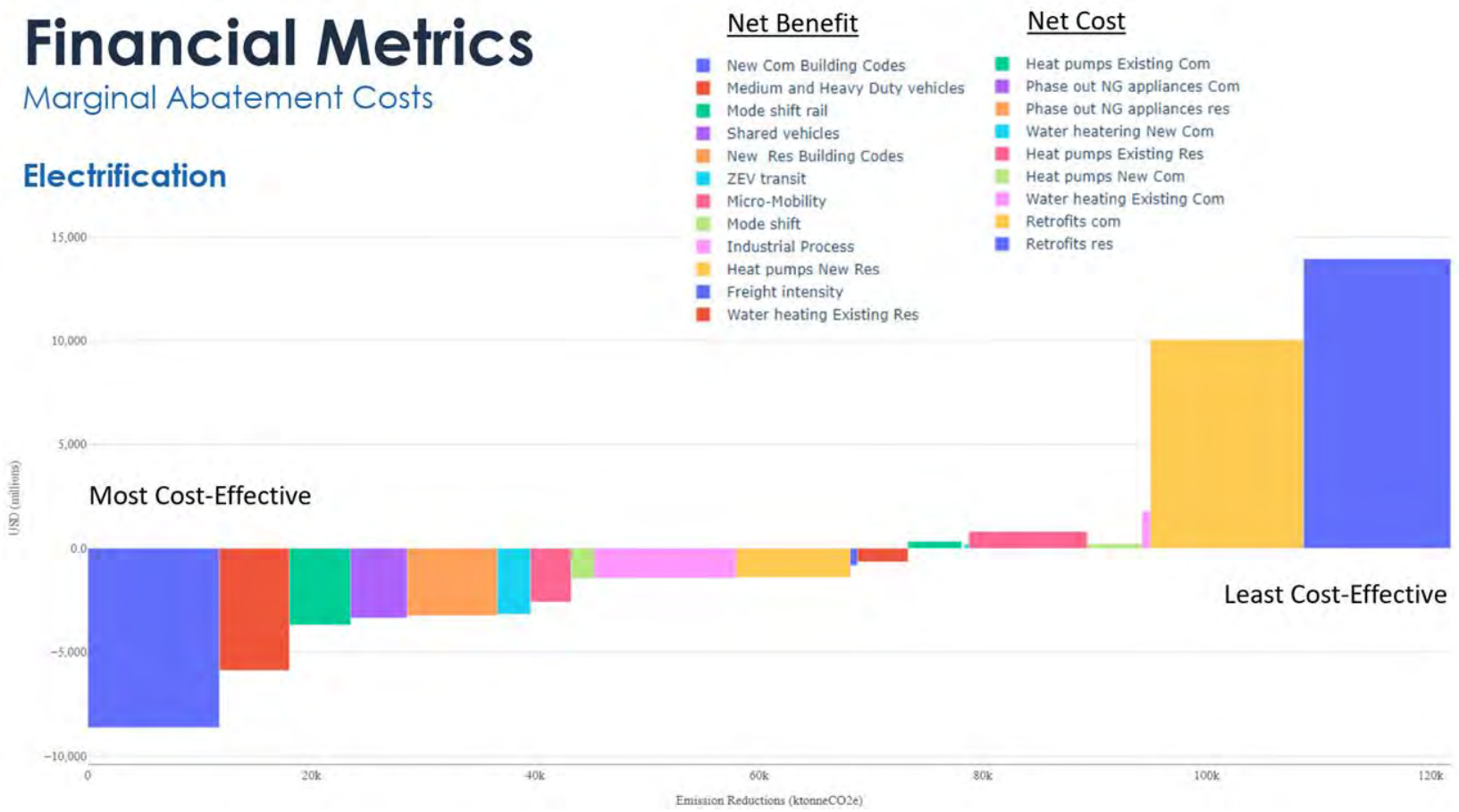


July 13, 2022 Oregon Global Warming Commission Meeting, https://www.keeporegoncool.org/meetings

Recent years have seen enactment of significant energy and GHG reduction policies, including:

- **Climate Protection Program**
- **Oregon HB 2021 – 100% clean electricity**
- **Building energy code advancements**
- Product efficiency standards
- Solar + Storage rebate program
- Heat pump rebate program
- Community Renewable Energy Program
- Clean Fuels Standard

Oregon's GHG Reduction Goals

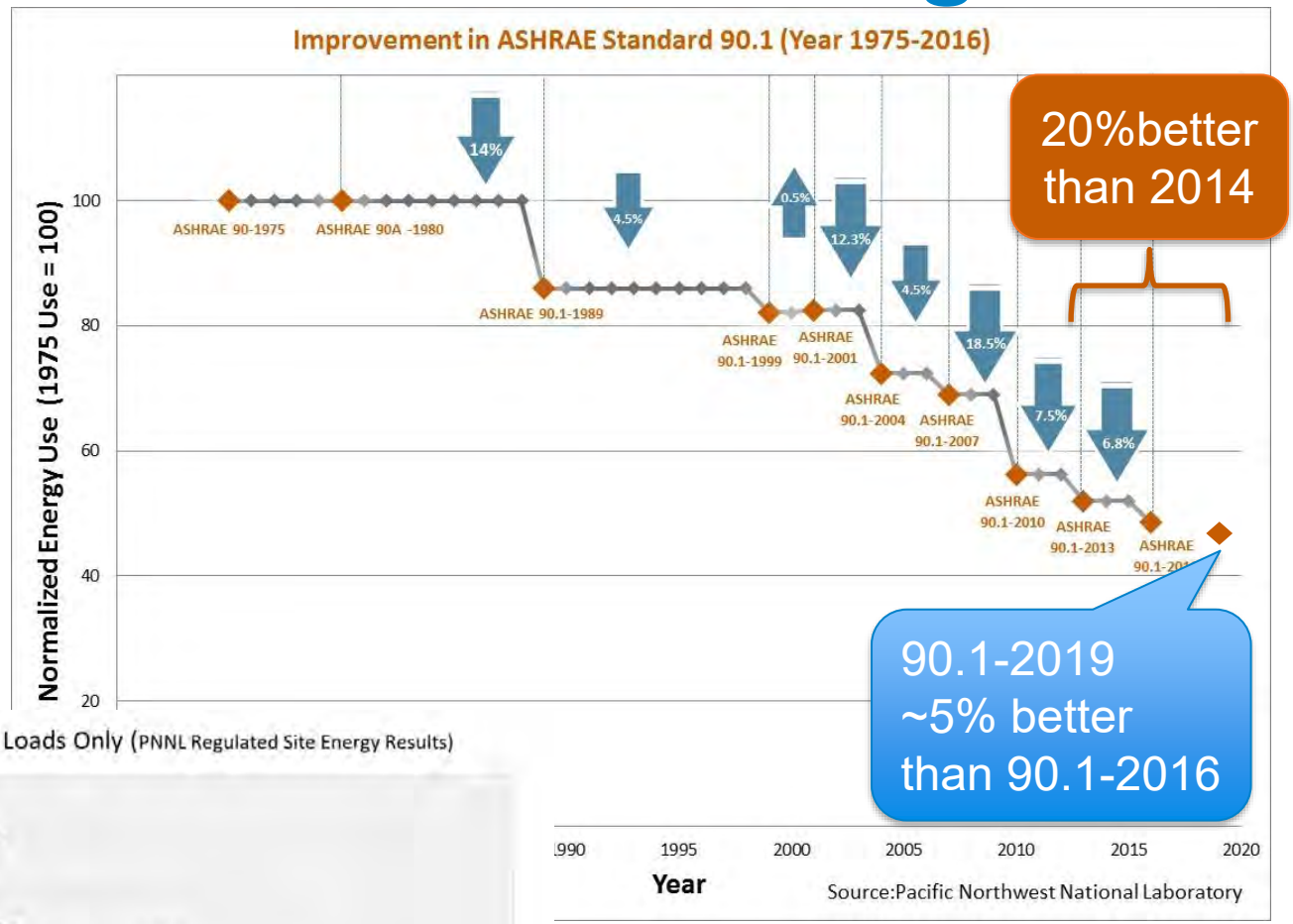


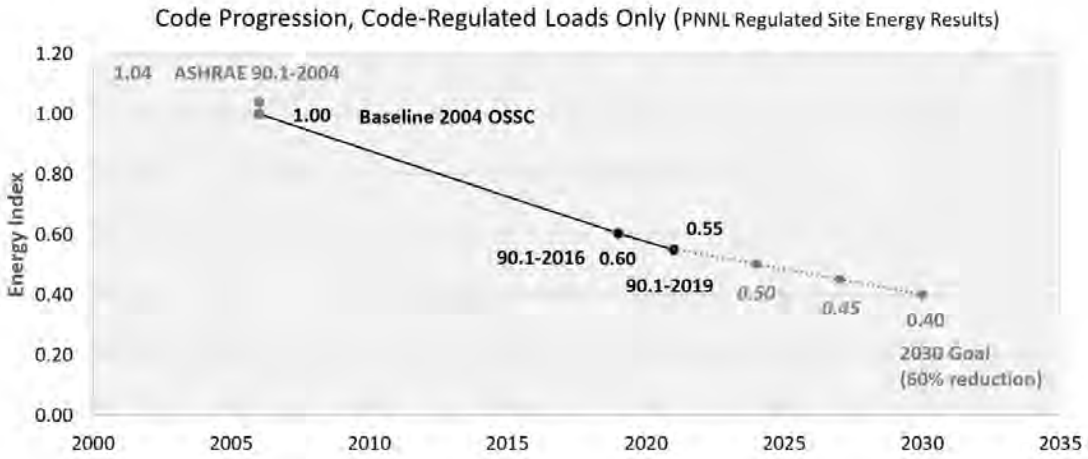
July 13, 2022 Oregon Global Warming Commission Meeting, https://www.keeporegoncool.org/meetings

Why Change to ASHRAE 90.1?

- Repeatable 3-year updates validated by DOE
- Few Oregon state amendments to transfer each cycle
- Consensus based process for updating ASHRAE with technical committees and working groups
- Keeps Oregon an efficiency leader by putting plan in place to update with ASHRAE 90.1
- Lessens time burden on officials to adopt new code
- Supported by DOE COMcheck without modification

ASHRAE Historic Savings





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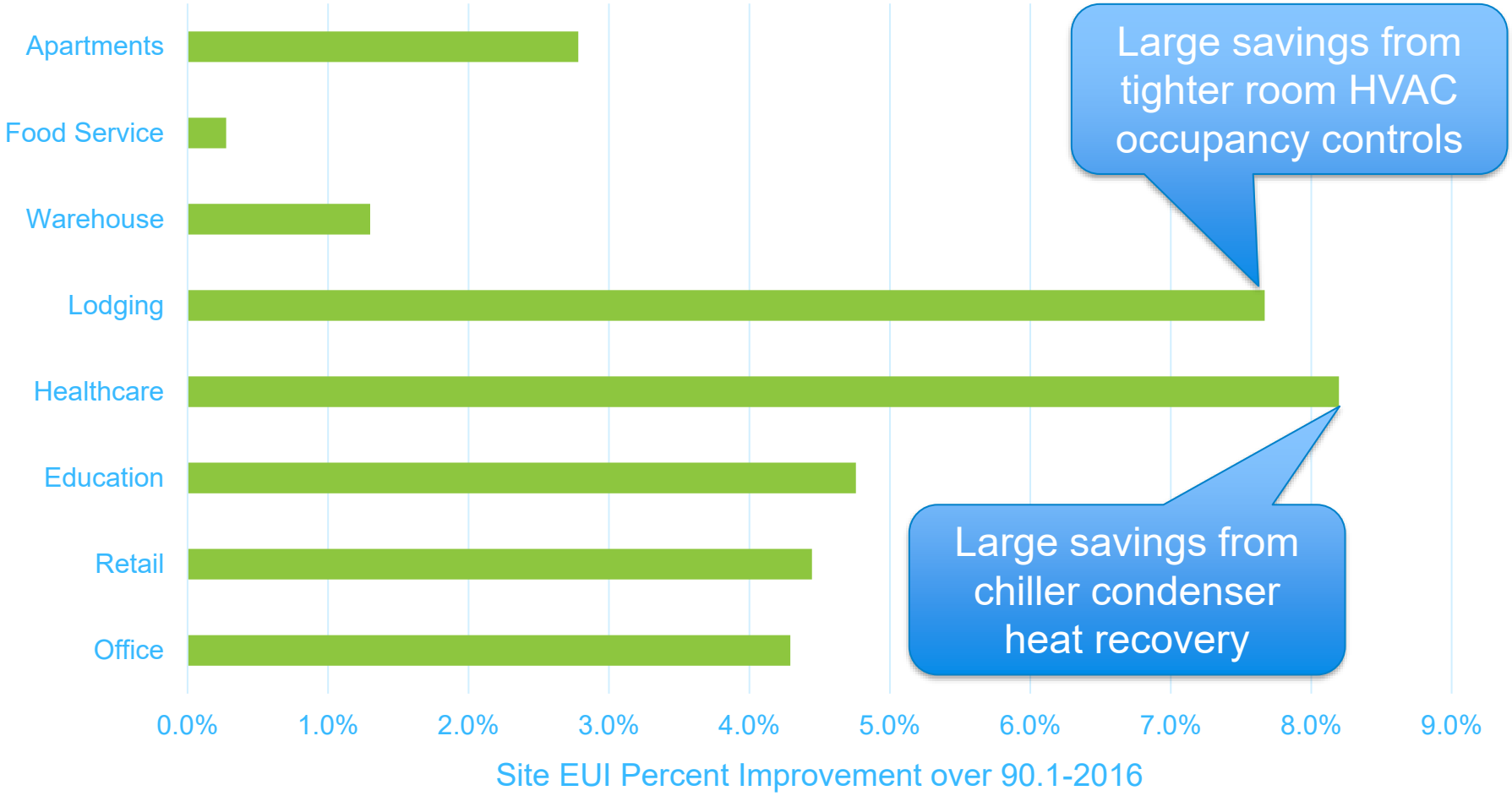
Which Building Types Improved Most?



Current Oregon Energy Code

2021 Oregon Energy Efficiency Specialty Code (OEESC)

Chapter 13 of the Oregon Structural Specialty Code (OSSC)

- Effective April 1, 2021
- Phase-in period ends Oct. 1, 2021
- Based on ASHRAE Standard 90.1-2019
- Significant changes summary

R-2,3,4 structures are subject to this code. The ORSC applies mainly to 1-2 family dwelling units & townhomes ≤ 3 stories

- https://www.oregon.gov/bcd/codes-stand/Pages/energy-commercial-compliance.aspx
- Read only versions of 90.1 are available

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Compliance Pathways

OR Code Compliance Pathways

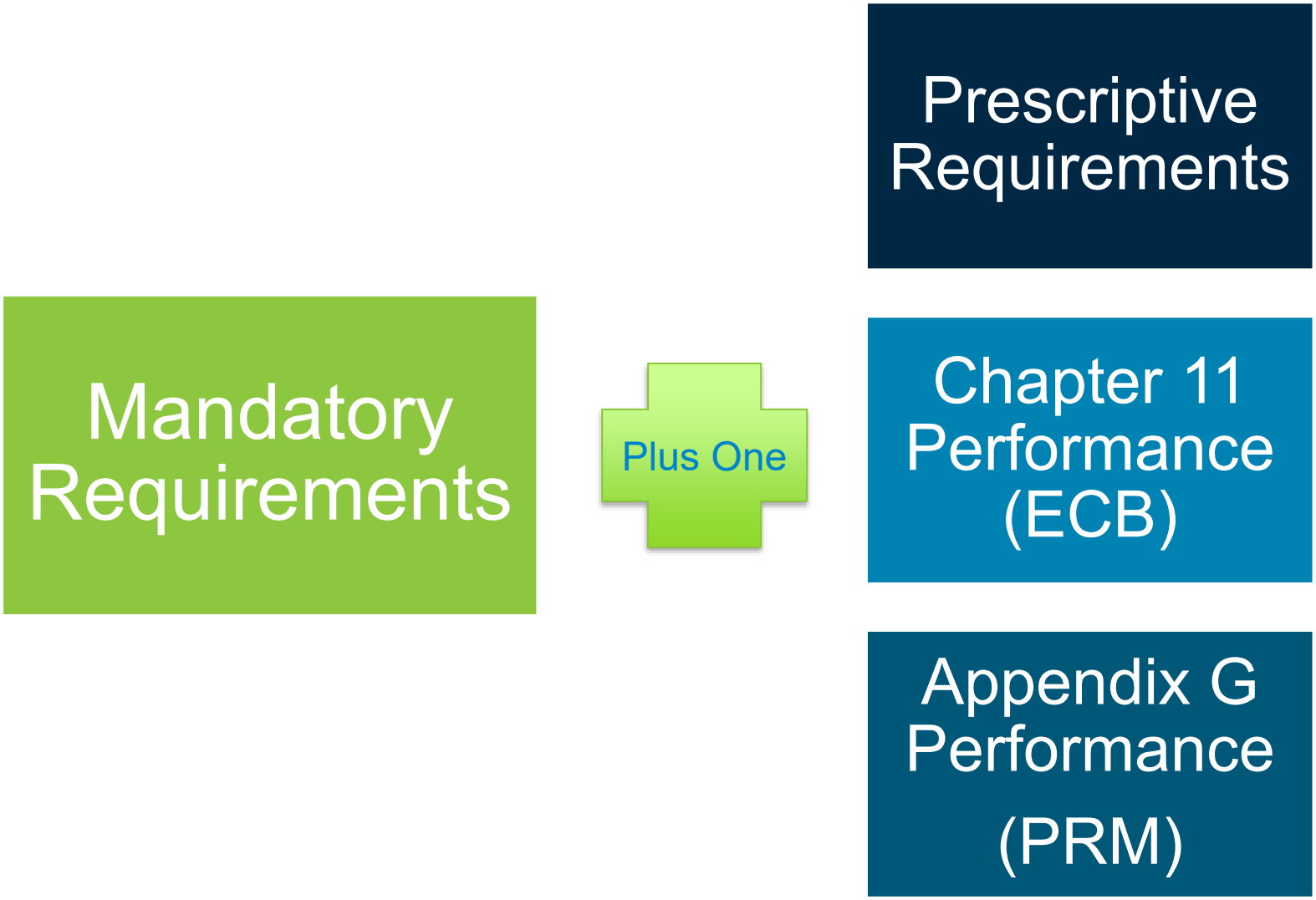
2021 OEESC

(based on 90.1-2019 with OR state amendments)

Important: Oregon modifies the scope of 90.1 to align with state building requirements. A building permitted under the OSSC follows the 2021 OEESC

Became effective April 1,2021 (with 6-month grace period for projects)
Mandatory beginning October 1, 2021

Three Paths Through OEESC 2021



Performance Pathways

- Previous 2014 Oregon code contained Section 506 Whole Building Approach, based on 90.1 Ch. 11 Energy Cost Budget
- ASHRAE 90.1 includes two performance paths for code compliance, Ch.11 and Appendix G

Two Performance Paths

Chapter 11 Performance (ECB)

- **Energy Cost Budget Method (ECB) - Chapter 11**
  - Used for minimum code compliance for buildings that do not meet 90.1 prescriptive requirements
  - Requires no greater energy cost than a building that meets those prescriptive requirements

Appendix G Performance (PRM)

- **Performance Rating Method - Appendix G**
  - Previously used to rate building performance "beyond code".
    - » LEED, EPACT tax credits, utility programs, ASHRAE Standard 189.1, IgCC
  - % improvement = 100 x (baseline – proposed) ÷ baseline

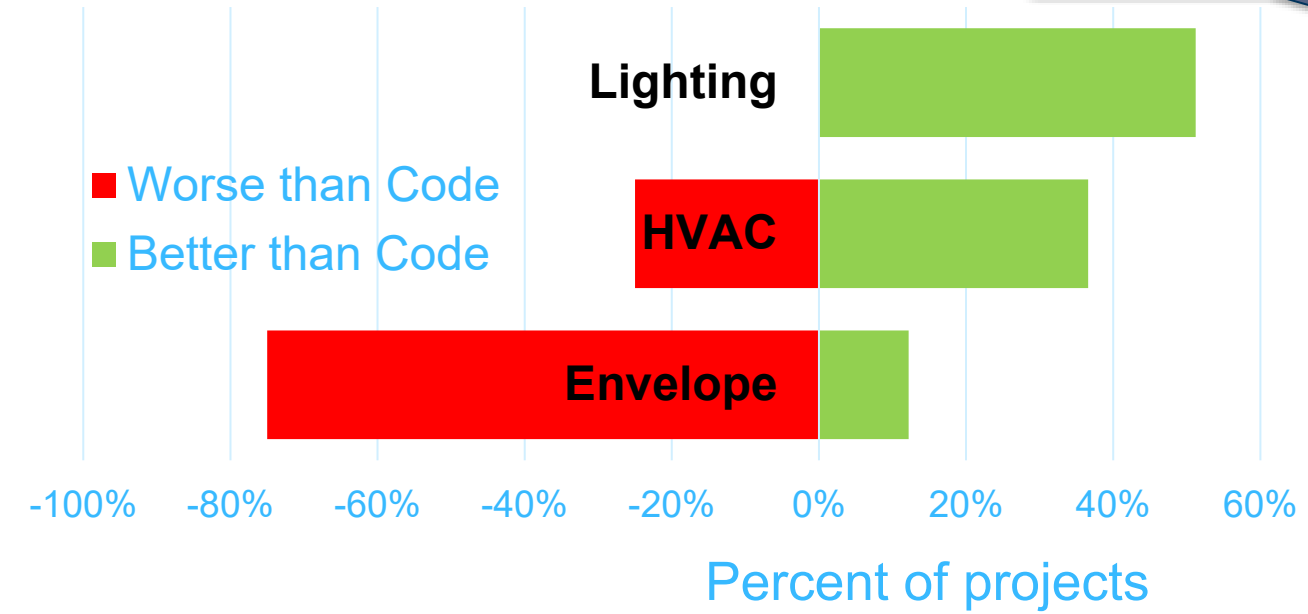
Why use a Performance Path?

- To demonstrate compliance for projects that cannot use the prescriptive path
- To make-up for systems not meeting prescriptive requirements of 90.1 by exceeding requirements for other systems
- To evaluate building performance in terms of energy cost
  - Impact of design decisions on future utility bills
  - Economic analysis of various options
- To document above-code performance

Slide credit: Karpman Consulting

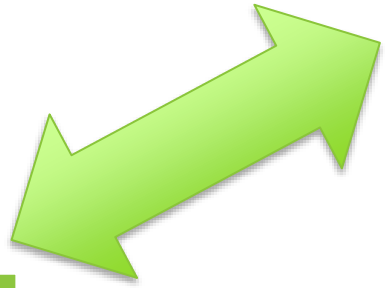
Common Trade-offs

Based on a national survey, most projects that use modeling to comply with code trade off worse-than-code envelope for better-than-code lighting and HVAC



Slide credit: Karpman Consulting

Mainly Focus on Prescriptive Path



Prescriptive Requirements

Mandatory Requirements

Plus One

Chapter 11 Performance (ECB)

Appendix G Performance (PRM)

COMcheck Basics

COMcheck Background

Oregon Energy Code Compliance

Yes, this still needs to be filled out when using Appendix G or Section 11

COMcheck™

+

Only COMcheck-web has 90.1-2019 available currently. Desktop version will soon be retired by DOE.

Code Compliance Form

State of Oregon
Building Codes Division
Better Buildings for Oregon

Part I	**COM*check* information**
Compliance path: ☐ Performance path ☐ Prescriptive path	COM*check* (Standard 90.1-2019) results: ☐ Pass ☐ Fail *For performance path, submit the energy model report with this form.
Prepared by or under the supervision of:	Date:
Part II	**Projected energy use**
Enter the ZERO Code 2.0 Calculator results for projected energy use. Estimated building energy consumption: _____ MBtu/yr	
Part III	**Estimated available renewables for the building**
Enter the ZERO Code 2.0 Calculator results for offsets. Total renewable energy to achieve Net Zero: _____ MBtu/yr On-site PV generational potential: _____ MBtu/yr Remaining off-site renewable energy: _____ MBtu/yr	
CHECKLIST AND APPLICANT SIGNATURE	
COM*check* report and ZERO Code 2.0 Calculator report must be submitted with this form. ☐ COM*check* report is attached ☐ ZERO Code Calculator report is attached	☐ Energy model report is attached (if COM*check* failed) ☐ 2021 OEESC COM*check* supplement report is attached

https://www.oregon.gov/bcd/codes-stand/Documents/oeesc-compliance-form.pdf

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COMcheck Resources

COMcheck

Getting Started

COMcheck-Web™ is accessible directly from the website without having to download and install.

COMcheck™ Desktop for Windows® may be downloaded and installed directly to your desktop.

- Download via the link at the bottom of the right sidebar.
- See if your state or county can use COMcheck to show compliance.
- View a list of supported software versions for code compliance tools.

Future update notice: *We are in the process of adding the **2021 IECC** to COMcheck-Web and anticipate that it will be available before the end of May. Note that it will not be added to COMcheck Desktop - all Codes moving forward will be added to COMcheck-Web as the Desktop version will eventually become unsupported. We generally recommend that users use Standard 90.1-2019 (which is available in COMcheck-Web now) until the 2021 IECC becomes available - if that would be acceptable in your jurisdiction.*

Commercial Compliance Using COMcheck™

The COMcheck software product group makes it easy for architects, builders, designers, and contractors to determine whether new commercial or high-rise residential buildings, additions, and alterations meet the requirements of the IECC and ASHRAE Standard 90.1, as well as several state-specific codes. COMcheck also simplifies compliance for building officials, plan checkers, and inspectors by allowing them to quickly determine if a building project meets the code.

COMcheck Support

Have a compliance question or need assistance with the software?

BECP's team of building energy codes experts is available to answer specific questions submitted through our web-based help desk.

Technical Support Document for Version 3.9.1 of the COMcheck Software

LATEST RELEASE

LAUNCH COMCHECK-WEB

DESKTOP VERSION

DESKTOP VERSION/BUILD: 4.1.5.5
PLATFORM: WINDOWS
RELEASE DATE: MARCH 2, 2022

RELEASE NOTES

VERSION 4.1.5.5 ADDRESSES THE FOLLOWING:

- CORRECTS REPORTING OF MECHANICAL EQUIPMENT EFFICIENCY REQUIREMENTS WHEN 2020 NEW YORK CITY ENERGY CONSERVATION CODE, APPENDIX CA (MODIFIED 90.1-2016) AND 2020 NYSTRETCH ENERGY CODE – 90.1-2016 ARE SELECTED

COMCHECK DESKTOP 4.1.5 SUPPORTED CODES:

2009, 2012, 2015 AND 2018 IECC; ASHRAE STANDARD 90.1-2007, 2010, 2013, 2016; VARIOUS STATE-DEVELOPED ENERGY CODES INCLUDING: COLORADO (BOULDER AND DENVER), NEW YORK CITY (NYCECC), NYSTRETCH, VERMONT; AS WELL AS ONTARIO AND PUERTO RICO.

COMCHECK-WEB SUPPORTED CODES:

2009, 2012, 2015 AND 2018 IECC; ASHRAE STANDARD 90.1-2007, 2010, 2013, 2016, 2019; VARIOUS STATE-DEVELOPED ENERGY CODES INCLUDING: COLORADO (BOULDER AND DENVER), DISTRICT OF COLUMBIA, FLORIDA, MASSACHUSETTS, NEW YORK CITY (NYCECC), NEW YORK STATE (NYSECCC), NYSTRETCH, VERMONT; AS WELL AS ONTARIO AND PUERTO RICO.

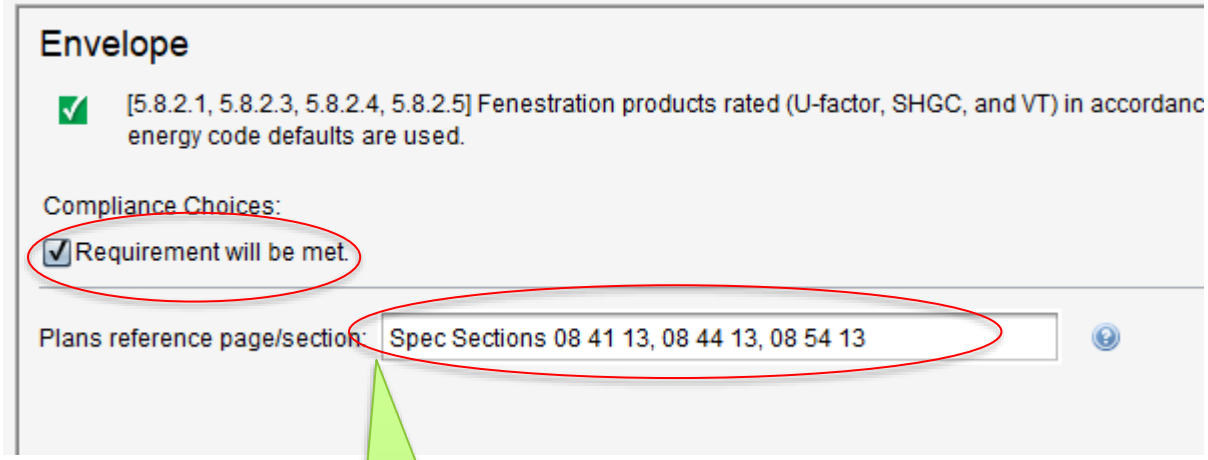
2021 IECC - EXPECTED FIRST QUARTER 2022.

DOWNLOAD

COMCHECK_4_1_5_5_SETUP.EXE 104.87 MB

https://www.energycodes.gov/comcheck

COMcheck Reports



Designer inputs can simplify plan review with detailed references

Columns for plans and field checks

Section # & Req.ID	Footing / Foundation Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
5.8.2.1, 5.8.2.3, 5.8.2.4, 5.8.2.5 [FR12]²	Fenestration products rated (U-factor, SHGC, and VT) in accordance with NFRC or energy code defaults are used.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** Spec Sections 08 41 13, 08 44 13, 08 54 13
5.8.2.2 [FR13]¹	Fenestration and door products are labeled, or a signed and dated certificate listing the U-factor, SHGC, VT, and air leakage rate has been provided by the manufacturer.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.

1 High Impact (Tier 1) 2 Medium Impact (Tier 2) 3 Low Impact (Tier 3)

COMcheck has built-in color-coded priority guides for where to focus first

Envelope Compliance

- At a high level, ASHRAE 90.1 requires envelopes comply with either:
  - Path 1: Prescriptive envelope requirements
  - Path 2: Building Envelope Trade-off

Envelope Trade-Off Path

- May provide more design flexibility when compared to prescriptive table requirements
  - Ex. a roof can be less insulated if there are better windows
- Can use COMcheck (or other simulation program) to demonstrate compliance
  - 90.1 includes Normative Appendix C to assist with what is required to be modeled
- The *building envelope* complies with the standard if:
  a. the *proposed design* satisfies the provisions of Sections 5.1, 5.4, 5.7, 5.8, and 5.9 and
  b. the *proposed envelope performance factor* of the *proposed design* is less than or equal to the *envelope performance factor* of the *base design*

- Limitations of the Envelope Trade-off Approach
  - If the building permit application applies to less than the whole building, then all parameters relating to unmodified existing conditions or future building components shall be identical when calculating the proposed EPF and base EPF
  - Any future components must meet prescriptive requirements of Section 5.5

Envelope Compliance – 90.1 2019

File Edit View Options Code Help

Project | Envelope | Interior Lighting | Exterior Lighting | Mechanical | Requirements

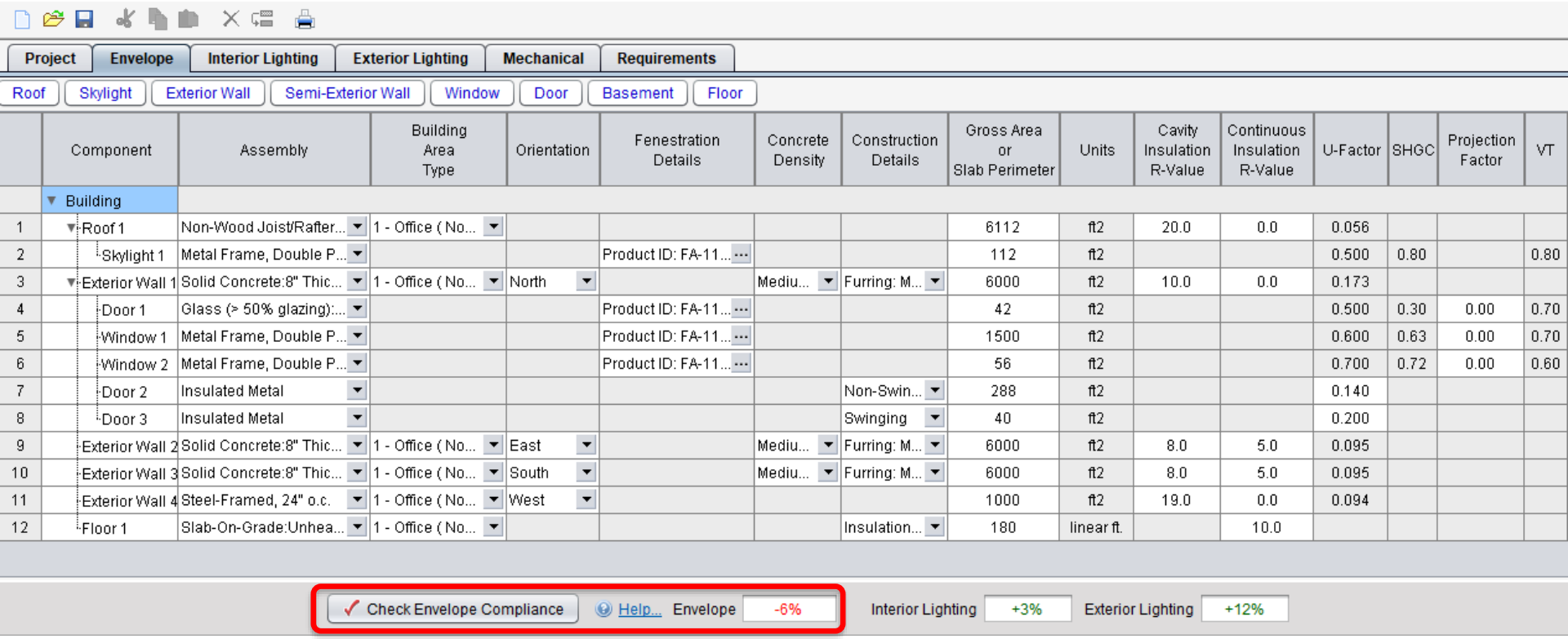
Roof | Skylight | Exterior Wall | Semi-Exterior Wall | Window | Door | Basement | Floor

	Component	Assembly	Building Area Type	Orientation	Fenestration Details	Concrete Density	Construction Details	Gross Area or Slab Perimeter	Units	Cavity Insulation R-Value	Continuous Insulation R-Value	U-Factor	SHGC	Projection Factor	VT
	▼ Building														
1	▼ Roof 1	Non-Wood Joist/Rafter...	1 - Office (No...					6112	ft2	20.0	0.0	0.056			
2	Skylight 1	Metal Frame, Double P...			Product ID: FA-11...			112	ft2			0.500	0.80		0.80
3	▼ Exterior Wall 1	Solid Concrete:8" Thic...	1 - Office (No...	North		Mediu...	Furring: M...	6000	ft2	10.0	0.0	0.173			
4	Door 1	Glass (> 50% glazing):...			Product ID: FA-11...			42	ft2			0.500	0.30	0.00	0.70
5	Window 1	Metal Frame, Double P...			Product ID: FA-11...			1500	ft2			0.600	0.63	0.00	0.70
6	Window 2	Metal Frame, Double P...			Product ID: FA-11...			56	ft2			0.700	0.72	0.00	0.60
7	Door 2	Insulated Metal					Non-Swin...	288	ft2			0.140			
8	Door 3	Insulated Metal					Swinging	40	ft2			0.200			
9	Exterior Wall 2	Solid Concrete:8" Thic...	1 - Office (No...	East		Mediu...	Furring: M...	6000	ft2	8.0	5.0	0.095			
10	Exterior Wall 3	Solid Concrete:8" Thic...	1 - Office (No...	South		Mediu...	Furring: M...	6000	ft2	8.0	5.0	0.095			
11	Exterior Wall 4	Steel-Framed, 24" o.c.	1 - Office (No...	West				1000	ft2	19.0	0.0	0.094			
12	Floor 1	Slab-On-Grade:Unhea...	1 - Office (No...				Insulation...	180	linear ft.		10.0				

Check Envelope Compliance | Help... | Envelope TBD (last result: -2%) | Interior Lighting +3% | Exterior Lighting +12%

neea

Envelope Compliance – 90.1 2019



Project | Envelope | Interior Lighting | Exterior Lighting | Mechanical | Requirements

Roof | Skylight | Exterior Wall | Semi-Exterior Wall | Window | Door | Basement | Floor

	Component	Assembly	Building Area Type	Orientation	Fenestration Details	Concrete Density	Construction Details	Gross Area or Slab Perimeter	Units	Cavity Insulation R-Value	Continuous Insulation R-Value	U-Factor	SHGC	Projection Factor	VT
	Building														
1	Roof 1	Non-Wood Joist/Rafter...	1 - Office (No...					6112	ft2	20.0	0.0	0.056			
2	Skylight 1	Metal Frame, Double P...			Product ID: FA-11...			112	ft2			0.500	0.80		0.80
3	Exterior Wall 1	Solid Concrete:8" Thic...	1 - Office (No...	North		Mediu...	Furring: M...	6000	ft2	10.0	0.0	0.173			
4	Door 1	Glass (> 50% glazing):...			Product ID: FA-11...			42	ft2			0.500	0.30	0.00	0.70
5	Window 1	Metal Frame, Double P...			Product ID: FA-11...			1500	ft2			0.600	0.63	0.00	0.70
6	Window 2	Metal Frame, Double P...			Product ID: FA-11...			56	ft2			0.700	0.72	0.00	0.60
7	Door 2	Insulated Metal					Non-Swin...	288	ft2			0.140			
8	Door 3	Insulated Metal					Swinging	40	ft2			0.200			
9	Exterior Wall 2	Solid Concrete:8" Thic...	1 - Office (No...	East		Mediu...	Furring: M...	6000	ft2	8.0	5.0	0.095			
10	Exterior Wall 3	Solid Concrete:8" Thic...	1 - Office (No...	South		Mediu...	Furring: M...	6000	ft2	8.0	5.0	0.095			
11	Exterior Wall 4	Steel-Framed, 24" o.c.	1 - Office (No...	West				1000	ft2	19.0	0.0	0.094			
12	Floor 1	Slab-On-Grade:Unhea...	1 - Office (No...				Insulation...	180	linear ft.		10.0				

Check Envelope Compliance | Help... | Envelope -6% | Interior Lighting +3% | Exterior Lighting +12%

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COMcheck report

COM*check* Software Version 4.1.5.2

Envelope Compliance Certificate

Should match Construction Documents & Specs

Envelope Assemblies

Assembly	Gross Area or Perimeter	Cavity R-Value	Cont. R-Value	Proposed U-Factor	Budget U-Factor(a)
Roof 1: Non-Wood Joist/Rafter/Truss, [Bldg. Use 1 - Office]	6112	20.0	0.0	0.056	0.021
Skylight 1: Metal Frame, Double Pane, Perf. Specs.: Product ID FA-11102, SHGC 0.80, VT 0.80, [Bldg. Use 1 - Office] (b)	112	---	---	0.500	0.500
Floor 1: Slab-On-Grade:Unheated, Vertical 2 ft., [Bldg. Use 1 - Office] (c)	180	---	10.0	0.540	0.520
NORTH					
Exterior Wall 1: Solid Concrete:8" Thickness, Medium Density, Furring: Metal, [Bldg. Use 1 - Office]	6000	5.0	10.0	0.067	0.104
Door 1: Glass (> 50% glazing):Metal Frame, Perf. Specs.: Product ID FA-1152, SHGC 0.30, VT 0.70, [Bldg. Use 1 - Office] (b)	42	---	---	0.500	0.680
Window 1: Metal Frame, Double Pane with Low-E, Perf. Specs.: Product ID FA-1152, SHGC 0.63, VT 0.70, [Bldg. Use 1 - Office] (b)	1500	---	---	0.600	0.380
Window 2: Metal Frame, Double Pane, Perf. Specs.: Product ID FA-1152, SHGC 0.72, VT 0.60, [Bldg. Use 1 - Office] (b)	56	---	---	0.700	0.380
Door 2: Insulated Metal, Non-Swinging, [Bldg. Use 1 - Office]	288	---	---	0.140	0.310
Door 3: Insulated Metal, Swinging, [Bldg. Use 1 - Office]	40	---	---	0.200	0.370
EAST					
Exterior Wall 2: Solid Concrete:8" Thickness, Medium Density, Furring: Metal, [Bldg. Use 1 - Office]	6000	8.0	5.0	0.095	0.104
SOUTH					
Exterior Wall 3: Solid Concrete:8" Thickness, Medium Density, Furring: Metal, [Bldg. Use 1 - Office]	6000	8.0	5.0	0.095	0.104
WEST					
Exterior Wall 4: Steel-Framed, 24" o.c., [Bldg. Use 1 - Office]	1000	19.0	0.0	0.094	0.064

(a) Budget U-factors are used for software baseline calculations ONLY, and are not code requirements.

(b) Fenestration product performance must be certified in accordance with NFRC and requires supporting documentation.

(c) Slab-On-Grade proposed and budget U-factors shown in table are F-factors.

Design fails compliance

Envelope FAILS: Design 6% worse than code

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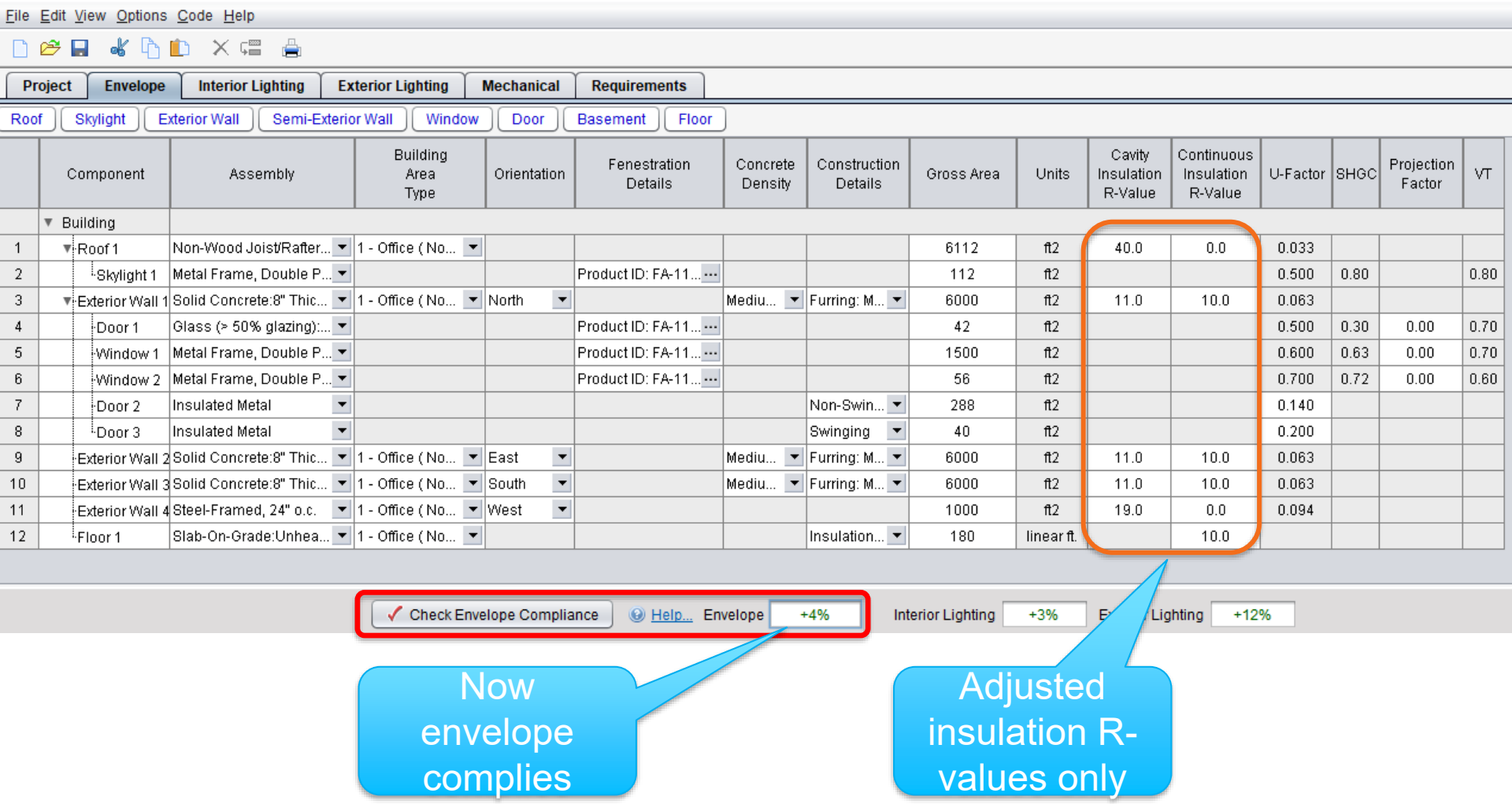
Re-Enter info to Check



	Component	Assembly	Building Area Type	Orientation	Fenestration Details	Concrete Density	Construction Details	Gross Area	Units	Cavity Insulation R-Value	Continuous Insulation R-Value	U-Factor	SHGC	Projection Factor	VT
	Building														
1	Roof 1	Non-Wood Joist/Rafter...	1 - Office (No...					6112	ft2	40.0	0.0	0.033			
2	Skylight 1	Metal Frame, Double P...			Product ID: FA-11...			112	ft2			0.500	0.80		0.80
3	Exterior Wall 1	Solid Concrete:8" Thic...	1 - Office (No...	North		Mediu...	Furring: M...	6000	ft2	11.0	10.0	0.063			
4	Door 1	Glass (> 50% glazing):...			Product ID: FA-11...			42	ft2			0.500	0.30	0.00	0.70
5	Window 1	Metal Frame, Double P...			Product ID: FA-11...			1500	ft2			0.600	0.63	0.00	0.70
6	Window 2	Metal Frame, Double P...			Product ID: FA-11...			56	ft2			0.700	0.72	0.00	0.60
7	Door 2	Insulated Metal					Non-Swin...	288	ft2			0.140			
8	Door 3	Insulated Metal					Swinging	40	ft2			0.200			
9	Exterior Wall 2	Solid Concrete:8" Thic...	1 - Office (No...	East		Mediu...	Furring: M...	6000	ft2	11.0	10.0	0.063			
10	Exterior Wall 3	Solid Concrete:8" Thic...	1 - Office (No...	South		Mediu...	Furring: M...	6000	ft2	11.0	10.0	0.063			
11	Exterior Wall 4	Steel-Framed, 24" o.c.	1 - Office (No...	West				1000	ft2	19.0	0.0	0.094			
12	Floor 1	Slab-On-Grade:Unhea...	1 - Office (No...				Insulation...	180	linear ft.		10.0				

COMcheck report

Assembly	Gross Area or Perimeter	Cavity R-Value	Cont. R-Value	Proposed U-Factor	Budget U-Factor(a)
Roof 1: Non-Wood Joist/Rafter/Truss, [Bldg. Use 1 - Office]	6112	40.0	0.0	0.033	0.021
Skylight 1: Metal Frame, Double Pane, Perf. Specs.: Product ID FA-11102, SHGC 0.80, VT 0.80, [Bldg. Use 1 - Office] (b)	112	---	---	0.500	0.500
Floor 1: Slab-On-Grade:Unheated, Vertical 2 ft., [Bldg. Use 1 - Office] (c)	180	---	10.0	0.540	0.520
NORTH					
Exterior Wall 1: Solid Concrete:8" Thickness, Medium Density, Furring: Metal, [Bldg. Use 1 - Office]	6000	11.0	10.0	0.063	0.104
Door 1: Glass (> 50% glazing):Metal Frame, Perf. Specs.: Product ID FA-1152, SHGC 0.30, VT 0.70, [Bldg. Use 1 - Office] (b)	42	---	---	0.500	0.680
Window 1: Metal Frame, Double Pane with Low-E, Perf. Specs.: Product ID FA-1152, SHGC 0.63, VT 0.70, [Bldg. Use 1 - Office] (b)	1500	---	---	0.600	0.380
Window 2: Metal Frame, Double Pane, Perf. Specs.: Product ID FA-1152, SHGC 0.72, VT 0.60, [Bldg. Use 1 - Office] (b)	56	---	---	0.700	0.380
Door 2: Insulated Metal, Non-Swinging, [Bldg. Use 1 - Office]	288	---	---	0.140	0.310
Door 3: Insulated Metal, Swinging, [Bldg. Use 1 - Office]	40	---	---	0.200	0.370
EAST					
Exterior Wall 2: Solid Concrete:8" Thickness, Medium Density, Furring: Metal, [Bldg. Use 1 - Office]	6000	11.0	10.0	0.063	0.104
SOUTH					
Exterior Wall 3: Solid Concrete:8" Thickness, Medium Density, Furring: Metal, [Bldg. Use 1 - Office]	6000	11.0	10.0	0.063	0.104
WEST					
Exterior Wall 4: Steel-Framed, 24" o.c., [Bldg. Use 1 - Office]	1000	19.0	0.0	0.094	0.064

(a) Budget U-factors are used for software baseline calculations ONLY, and are not code requirements.

(b) Fenestration product performance must be certified in accordance with NFRC and requires supporting documentation.

(c) Slab-On-Grade proposed and budget U-factors shown in table are F-factors.

Envelope design complies

Envelope PASSES: Design 4% better than code

What Can COMcheck Do For You?

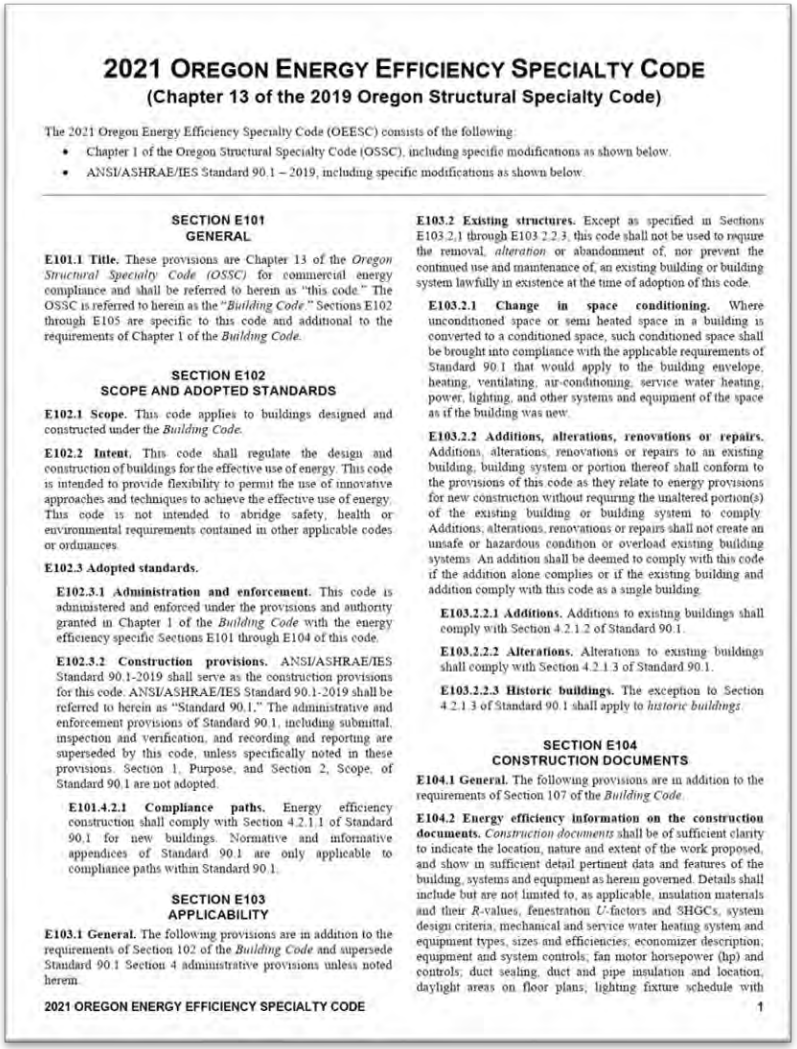
What it is

- Tool for designers to document project parameters to demonstrate compliance
- Tool for Plans examiners & inspectors to verify energy code compliance
- Helpful resource to focus energy code review to certain areas

What it is not

- Not proof that design complies
- Not foolproof
- Not a substitute for documentation on plans and specs

Administration and Scope



2021 OREGON ENERGY EFFICIENCY SPECIALTY CODE
(Chapter 13 of the 2019 Oregon Structural Specialty Code)

The 2021 Oregon Energy Efficiency Specialty Code (OEESC) 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 E105 are specific to this code and additional to the requirements of Chapter 1 of the *Building Code*.

SECTION E102
SCOPE AND ADOPTED STANDARDS

E102.1 Scope. This code applies to buildings designed and constructed under the *Building Code*.

E102.2 Intent. This code shall regulate the design and construction of buildings for the effective use of energy. This code is intended to provide flexibility to permit the use of innovative approaches and techniques to achieve the effective use of energy. This code is not intended to abridge safety, health or environmental requirements contained in other applicable codes or ordinances.

E102.3 Adopted standards.

E102.3.1 Administration and enforcement. This code is administered and enforced under the provisions and authority granted in Chapter 1 of the *Building Code* with the energy efficiency specific Sections E101 through E104 of this code.

E102.3.2 Construction provisions. ANSI/ASHRAE/IES Standard 90.1-2019 shall serve as the construction provisions for this code. ANSI/ASHRAE/IES Standard 90.1-2019 shall be referred to herein as "Standard 90.1." The administrative and enforcement provisions of Standard 90.1, including submittal, inspection and verification, and recording and reporting are superseded by this code, unless specifically noted in these provisions. Section 1, Purpose, and Section 2, Scope, of Standard 90.1 are not adopted.

E101.4.2.1 Compliance paths. Energy efficiency construction shall comply with Section 4.2.1.1 of Standard 90.1 for new buildings. Normative and informative appendices of Standard 90.1 are only applicable to compliance paths within Standard 90.1.

SECTION E103
APPLICABILITY

E103.1 General. The following provisions are in addition to the requirements of Section 102 of the *Building Code* and supersede Standard 90.1 Section 4 administrative provisions unless noted herein.

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 semi heated 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 that would apply to the building envelope, heating, ventilating, air-conditioning, service water heating, power, lighting, and other systems and equipment of the space as if the building was new.

E103.2.2 Additions, alterations, renovations or repairs. Additions, alterations, renovations or repairs to an existing building, building system or portion thereof shall conform to the provisions of this code as they relate to energy provisions for new construction without requiring the unaltered portion(s) of the existing building or building system to comply. Additions, alterations, renovations or repairs shall not create an unsafe or hazardous condition or overload existing building systems. An addition shall be deemed to comply with this code if the addition alone complies or if the existing building and addition comply with this code as a single building.

E103.2.2.1 Additions. Additions to existing buildings shall comply with Section 4.2.1.2 of Standard 90.1.

E103.2.2.2 Alterations. Alterations to existing buildings shall comply with Section 4.2.1.3 of Standard 90.1.

E103.2.2.3 Historic buildings. The exception to Section 4.2.1.3 of Standard 90.1 shall apply to *historic buildings*.

SECTION E104
CONSTRUCTION DOCUMENTS

E104.1 General. The following provisions are in addition to the requirements of Section 107 of the *Building Code*.

E104.2 Energy efficiency information on the construction documents. *Construction documents* shall be of sufficient clarity to indicate the location, nature and extent of the work proposed, and show in sufficient detail pertinent data and features of the building, systems and equipment as herein governed. Details shall include but are not limited to, as applicable, insulation materials and their *R*-values, fenestration *U*-factors and SHGCs, system design criteria, mechanical and service water heating system and equipment types, sizes and efficiencies; economizer description; equipment and system controls; fan motor horsepower (hp) and controls; duct sealing, duct and pipe insulation and location; daylight areas on floor plans; lighting fixture schedule with

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 E105 are specific to this code and additional to the requirements of Chapter 1 of the *Building Code*.

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E102.3.1 Administration and enforcement. This code is administered and enforced under the provisions and authority granted in Chapter 1 of the *Building Code* with the energy efficiency specific Sections E101 through E104 of this code.

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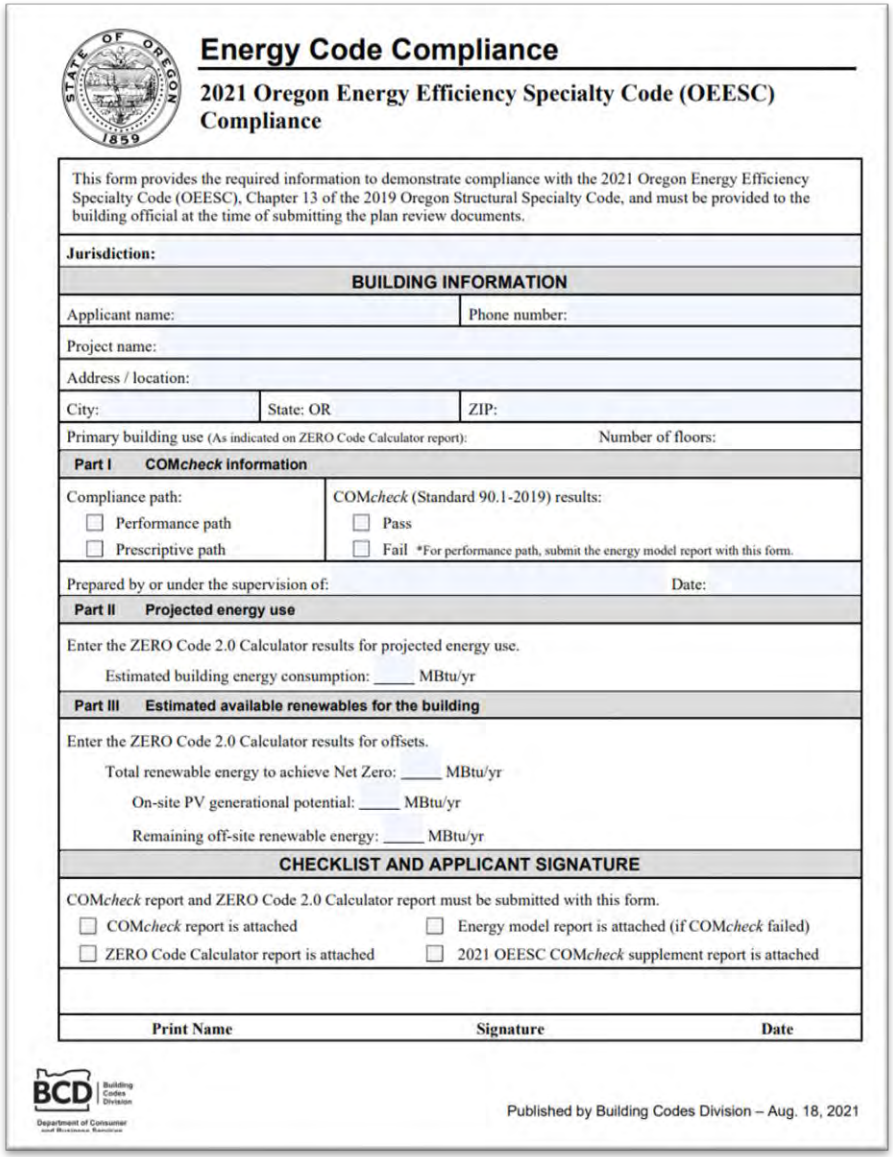
Energy Code Compliance Form



Energy Code Compliance

2021 Oregon Energy Efficiency Specialty Code (OEESC) Compliance

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.

Jurisdiction:

BUILDING INFORMATION

Applicant name:	Phone number:
Project name:	
Address / location:	
City:	State: OR ZIP:
Primary building use (As indicated on ZERO Code Calculator report):	Number of floors:

Part I COMcheck information

Compliance path: ☐ Performance path ☐ Prescriptive path	COMcheck (Standard 90.1-2019) results: ☐ Pass ☐ Fail *For performance path, submit the energy model report with this form.

Prepared by or under the supervision of: Date:

Part II Projected energy use

Enter the ZERO Code 2.0 Calculator results for projected energy use.

Estimated building energy consumption: _____ MBtu/yr

Part III Estimated available renewables for the building

Enter the ZERO Code 2.0 Calculator results for offsets.

Total renewable energy to achieve Net Zero: _____ MBtu/yr

On-site PV generational potential: _____ MBtu/yr

Remaining off-site renewable energy: _____ MBtu/yr

CHECKLIST AND APPLICANT SIGNATURE

COMcheck report and ZERO Code 2.0 Calculator report must be submitted with this form.

☐ COMcheck report is attached ☐ Energy model report is attached (if COMcheck failed)

☐ ZERO Code Calculator report is attached ☐ 2021 OEESC COMcheck supplement report is attached

Print Name	Signature	Date

BCD Building Codes Division
Department of Consumer and Business Services

Published by Building Codes Division – Aug. 18, 2021

Energy Code Compliance Form

Primary building use (As indicated on ZERO Code Calculator report): Number of floors:

Part I COM*check* information

Compliance path:	COM*check* (Standard 90.1-2019) results:
☐ Performance path	☐ Pass
☐ Prescriptive path	☐ Fail *For performance path, submit the energy model report with this form.

Prepared by or under the supervision of: Date:

Part II Projected energy use

Enter the ZERO Code 2.0 Calculator results for projected energy use.

Estimated building energy consumption: _____ MBtu/yr

Part III Estimated available renewables for the building

Enter the ZERO Code 2.0 Calculator results for offsets.

Total renewable energy to achieve Net Zero: _____ MBtu/yr

On-site PV generational potential: _____ MBtu/yr

Remaining off-site renewable energy: _____ MBtu/yr

CHECKLIST AND APPLICANT SIGNATURE

COM*check* report and ZERO Code 2.0 Calculator report must be submitted with this form.

☐ COM*check* report is attached	☐ Energy model report is attached (if COM*check* failed)
☐ ZERO Code Calculator report is attached	☐ 2021 OEESC COM*check* supplement report is attached

Print Name	Signature	Date

1.5% Green Energy Technology in Public Buildings

E104.2.1 Oregon Energy Compliance Form. *Construction documents* for new buildings shall include the 2021 Oregon Energy Compliance Form, including a ZERO Code 2.0 Calculator report (See *ZERO-Code.org/energy-calculator/*).

Note: For reference only. Not adopted by the State of Oregon, Building Codes Division, as part of the *state building code.*

The Oregon Department of Energy administers the 1.5% for Green Energy Technology program for public buildings. New construction and major renovation projects for public buildings are required to evaluate and install Green Energy Technology and report to the Oregon Department of Energy in accordance with Oregon Revised Statute (ORS) Chapter 279C, Section 279C.527-528 and Oregon Administrative Rule (OAR) Chapter 330, Division 135. See *Oregon.gov/energy.*

Slide Layout Overview

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
Section xxxx	yyyy

Section in 2021 OEESC

Where requirements often appear on submitted documents

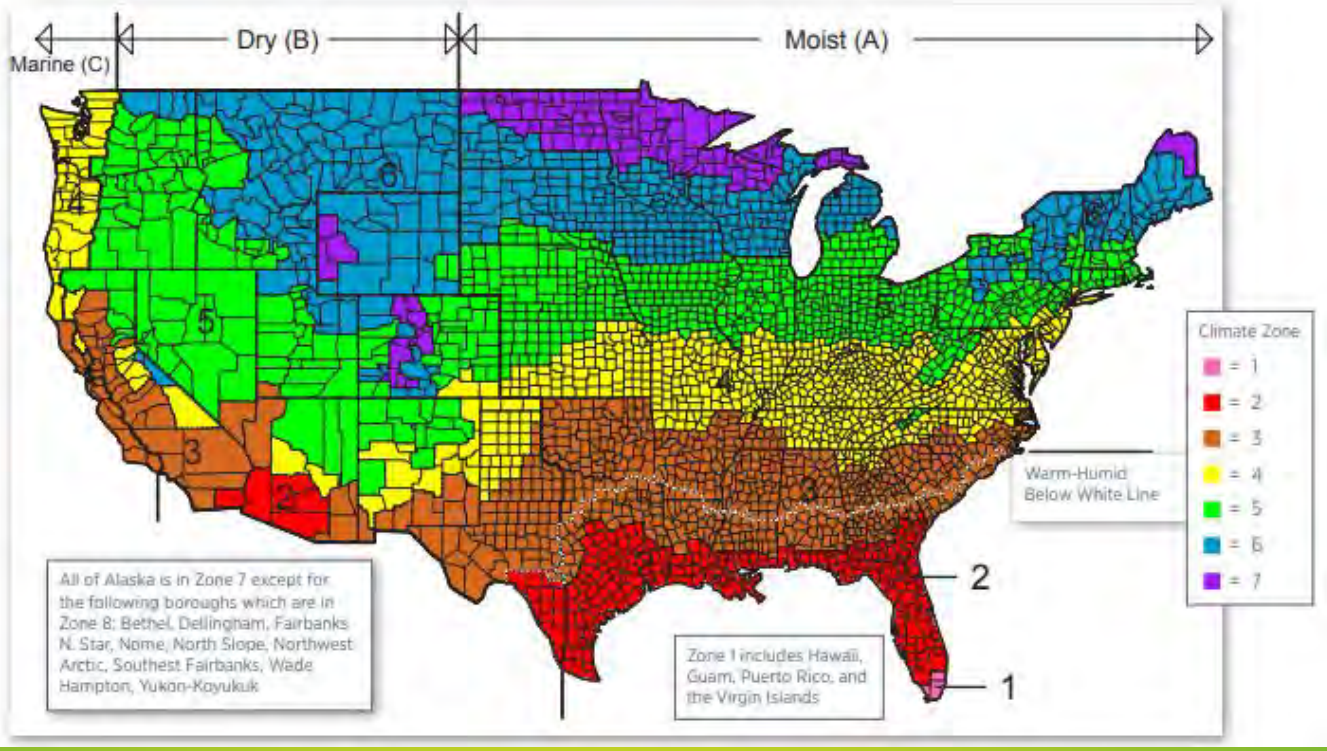
Area used to describe code requirements, notable elements, and unique OR exemptions

Indicates significant energy provision to check for

Climate Zone Map

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
Table Annex-1, Figure Annex-1	Performance path modeling

- Aligns with ASHRAE Standard 169-2013
  - Oregon limited to CZ 4c & 5b
- Comes into play for envelope features & modeling



Verification, Testing, Commissioning

- Previous language of controls being “Capable of” changed to add “configured to” throughout the standard
  - Control functions and setpoints required at time of inspection
- Expanded verification and commissioning required in 90.1-2019

- 2021 OEESC - Plans and specs should include verification and commissioning requirements **but** code official cannot require physical copies of drawings, energy test reports, forms, etc.
  - Building leakage test reports under Section 5.4.3 do need to be submitted (when leakage test path is used)

Verification, Testing, Commissioning

ENERGY EFFICIENCY

wattage and control narrative; air sealing details; and COM*check* compliance report. Supplemental information necessary to verify compliance with this standard, such as calculations, worksheets, compliance forms, vendor literature, or other data shall be made available when required by the *building official*.

Plans and specifications shall include applicable requirements for submittal information and record documents required by Sections 5.7, 6.7, 7.7, 8.7, 9.7, and 10.7 of Standard 90.1. Plans and specifications shall include building commissioning requirements per Section 4.2.5.2 of Standard 90.1. Plans and specifications shall include verification and testing requirements per Section 4.2.5.1 of Standard 90.1. The *building official* shall not require or expect physical copies of record drawings, manuals, functional performance test reports, or energy reporting unless specifically noted in this section. Section 5.4.3.1.1 of Standard 90.1 building leakage test report shall be submitted to the *building official* where applicable. Materials shall be listed and labeled per Section 4.2.3 of Standard 90.1.

Exception: The *building official* is authorized to waive the requirements for *construction documents*, COM*check* reports, or other supporting data if the code official determines these are not necessary to confirm compliance with this code.

Overall Scope

- 90.1 provides minimum energy-efficient requirements for the design and construction, and a plan for operation and maintenance of
  - new buildings and their systems,
  - new portions of buildings and their systems,
  - new systems and equipment in existing buildings, and
  - new equipment or building systems specifically identified in the standard that are part of industrial or manufacturing processes

- In general it applies to new buildings and their systems, building additions and their systems, and **new systems and equipment in existing buildings**.

i.e. Alterations

Alteration Exceptions

There are several exceptions where alterations to envelope are not required to meet code for insulation, air leakage, and fenestrations, provided the alteration will not increase the energy use of the building

- Storm windows over existing glazing (low emissivity coating)
- Replacement of glazing in existing sash and frame, provided U-factor and SHGC are same or better
- Alterations to the roof, wall, or floor cavities that are insulated to full depth with R-3 per inch
- Alterations to walls and floors without framing cavities and no new cavities are created
- Roof recovering
- Removal and replacement of roof membrane where there is existing roof insulation either integral to or below the roof deck
- Replacement of doors does not require the installation of a vestibule
- Replacement of existing fenestration up to 25% of existing building fenestration and provided that U-factor and SHGC are the same or better

Building Envelope

Simplified Building Method - Envelope

Simplified Building Method—Envelope

2021 Oregon Energy Efficiency Specialty Code Compliance Checklist

This checklist may be used to demonstrate compliance with the Oregon Energy Efficiency Specialty Code (OEESC), which is based on ASHRAE Standard 90.1, for new buildings, alterations, and additions. To use this checklist, the building envelope shall comply with ASHRAE 90.1 Section 5.4, mandatory provisions and Section 5.5, Prescriptive Building Envelope Compliance Path.

*Note: This checklist **may not** be used for the Building Envelope Trade-Off Compliance Path, Section 5.6.

PART I – PROPERTY OWNER INFORMATION

Property owner name: Phone number:

Installation address: Climate Zone: ☐ 4C ☐ 5B

City: State

Installer: ☐ Contractor ☐ Owner (*If owner,*

PART II – (

Contractor name:

Email address:

BCD business license #:

PA

Mandatory provisions

The building envelope of new buildings, alterations item below is required to demonstrate compliance v

- ☐ **Whole-building air leakage:** Compliance wi and documentation has been provided to the l
- ☐ **Continuous air barrier:** The entire building accordance with Section 5.4.3.1.2.
- ☐ **Loading dock weatherseals:** Cargo doors an
- ☐ **Vestibules and revolving doors:** Building entrances comply with Section 5.4.3.3 for vestibules and revolving doors.
- ☐ **Insulation:** Insulation complies with the product information and installation requirements in Section 5.8.1.
- ☐ **Fenestration and doors:**
  - ☐ Fenestration and doors comply with the product rating and labeling requirements and U-factor, SHGC, and VT determination requirements in Section 5.8.2.
  - ☐ Fenestration and doors comply with the air leakage requirements in Section 5.8.3.

Prescriptive Building Envelope Option (Section 5.5)

- Project complies with the requirements in Table 5.5-____: ☐ Yes ☐ N/A
  (*check one*) ☐ Nonresidential ☐ Residential ☐ Semiheated
- **Opaque Areas.** (5.5.3) All *opaque* surfaces, except *doors*, comply with one of the following methods:
  (*check one*) ☐ Minimum rated *R-value* ☐ Maximum *U-factor*, *C-factor*, or *F-factor*

Roof Insulation. (5.5.3.1)	☐ Insulation entirely above deck ☐ Metal building ☐ Attic and other	
	PROPOSED *R-value or U-factor* ____ REQUIRED *R-value or U-factor* ____	☐ N/A
Above-Grade Wall Insulation. (5.5.3.2)	☐ Mass ☐ Metal building ☐ Steel-framed ☐ Wood-framed and other	
	PROPOSED *R-value* or *U-factor* ____ REQUIRED *R-value or U-factor* ____	☐ N/A

Envelope Compliance paths

- Aside from simplified path, there are two ways to comply with envelope requirements
- Focus of this section is on prescriptive

	Prescriptive Option	Trade-Off Option
Fenestration area	Vertical fenestration area is limited to 40% of the gross exterior wall area, and skylights are limited to 3% of the roof area (6% as permitted by Section 5.5.4.4.2).	Fenestration area greater than 40% is permitted if the performance of envelope components is improved over that required by the prescriptive requirements.
Area take-offs	It is only necessary to verify that the vertical fenestration area is less than 40% of the gross exterior wall area and that the total skylight area meets the prescriptive requirements.	Surface areas must be calculated for each type and class of construction. Vertical fenestration and wall areas must be separately calculated for surfaces facing the major compass points (N, S, E, W) plus NE, SE, SW, and NW.
U-factor compliance	Not necessary if the R-value option is used.	Required.

Space-conditioning Categories

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
5.1.2	COMcheck report

Separate envelope component requirements apply to three types of spaces

- *Nonresidential conditioned*
- *Residential conditioned*
- *Semiheated*

- *Nonresidential:* all occupancies other than residential.
  - Defining characteristic is that no one is there at night and whether it is a dwelling unit

- *Residential*: *spaces* in buildings used primarily for living and sleeping
  - ex. dwelling units, hotel/motel guest rooms, hostels, prisons, fire stations

- *Semiheated: spaces* have a heating system with system greater than 3.4 Btu/h·ft^2 but not heated to comfort levels, and not cooled.

Space-conditioning Categories

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
5.1.2	COMcheck report

COMcheck Software Version COMcheckWeb

Envelope Compliance Certificate

Project Information

Energy Code:	90.1 (2019) Standard
Project Title:	Marvins Gardens
Location:	Salem, Oregon
Climate Zone:	4c
Project Type:	New Construction
Vertical Glazing / Wall Area:	10%
Performance Sim. Specs:	EnergyPlus 8.1.0.009 (EPW: USA_OR_Salem-McNary.Field.726940_TMY3.epw)

Construction Site:
123 Main
Salem, OR 97103

Owner/Agent:

Designer/Contractor:

Building Area	Floor Area
1-Office : Nonresidential	12160
2-Workshop : Semiheated	1000

Conditioned Space Definition

Most common

- ***conditioned space:*** a *cooled space*, *heated space*, or *indirectly conditioned space* defined as follows:
  - a. ***cooled space:*** an *enclosed space* within a *building* that is cooled by a cooling *system* whose sensible output capacity is 3.4 Btu/h·ft^2 of *floor* area.
  - b. ***heated space:*** an *enclosed space* within a *building* that is heated by a heating *system* whose output capacity relative to the *floor* area is greater than or equal to the criteria in Table 3.2.
  - c. ***indirectly conditioned space:*** an *enclosed space* within a *building* that is not a *heated space* or a *cooled space*, which is heated or cooled indirectly by being connected to adjacent *spaces*, provided:
    - » 1. the product of the *U-factors* and surface areas of the *space* adjacent to connected *spaces* exceeds the combined sum of the product of the *U-factors* and surface areas of the *space* adjoining the outdoors, *unconditioned spaces*, and to or from *semiheated spaces* (e.g., corridors) or
    - » 2. that air from heated or *cooled spaces* is intentionally transferred (naturally or mechanically) into the *space* at a rate exceeding 3 ach (e.g., atrium).

Big takeaway: Spaces should be considered conditioned unless Code Official determines otherwise

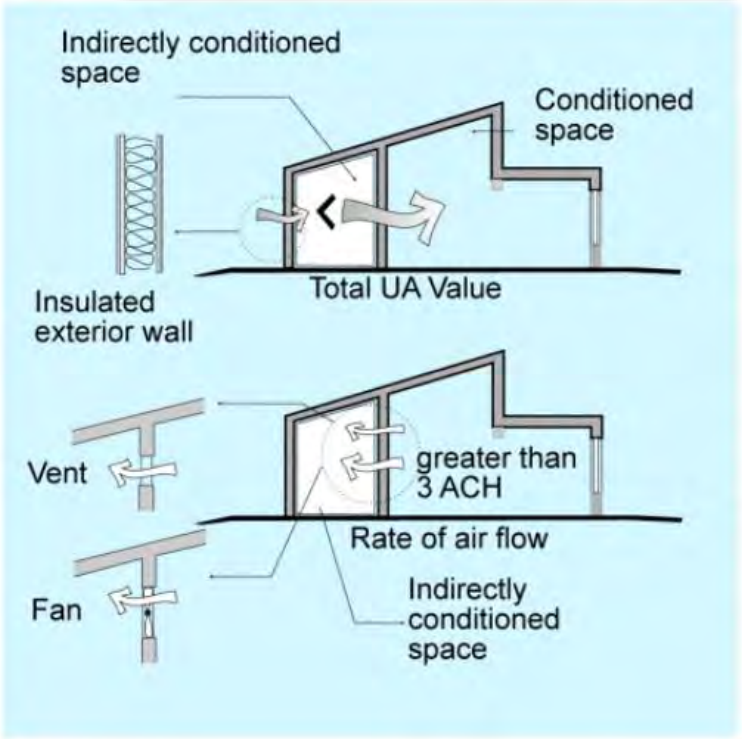


Figure 5-A. Examples of Indirectly Conditioned Spaces

Semiheated Spaces

2nd most common

- A semiheated space:
  - Has a heating system with a capacity ≥ 3.4 Btu/h.ft^2 of floor area but is not conditioned space
  - Space is not cooled at all
- Spaces are no longer considered semiheated (become "conditioned" space) if heating thresholds exceed the following:

"Conditioned Space" Heating Thresholds, btu/h-ft^2		
Climate Zone	2021 Oregon / 90.1-2019	2014 OEESC
4c	>8	>10
5	>12	>15

Reduced thresholds for "conditioned" space means fewer buildings can qualify as "semiheated"

- Spaces are assumed to be *conditioned space* and comply with requirements of *conditioned space* at time of construction regardless of whether the mechanical or electrical equipment is included in the building permit application or installed at that time
- Exceptions:
  - » Space is designated as semiheated or unconditioned and
  - » Approved as such by the building official
  - » A space with limited radiant heating system meeting the requirements of Section 6.5.8.2 shall be considered an *unconditioned space*.

Unique Oregon exception

Unconditioned Spaces

Least common

- *Unconditioned space:* an *enclosed space* within a *building* that is not a *conditioned space* or a *semiheated space*.
  - Crawlspaces, attics, and parking garages with natural or mechanical *ventilation* are not considered *enclosed spaces*.

- Unconditioned spaces are not automatically exempt from all building envelope requirements

- *How to identify:*
  - *An unconditioned space* does not have a space cooling system and either does not have a space heating system or the space heating system has a capacity that is less than 3.4 Btu/h·ft^2. The default assumption is that all spaces are conditioned or semiheated.

- Unique Oregon Definition:
  - ***unconditioned space:*** an enclosed space within a building that is not a conditioned space or a semiheated space, including automatic sprinkler riser rooms and fire pump rooms per Section 902 of the *Building Code*. Crawlspaces, attics, and unheated parking garages with natural or mechanical ventilation are not considered enclosed spaces.

Semiexterior spaces

- If a *building* contains any *semiheated space* or *unconditioned space* then the *semiexterior building envelope* shall comply with the requirements for *semiheated space*.

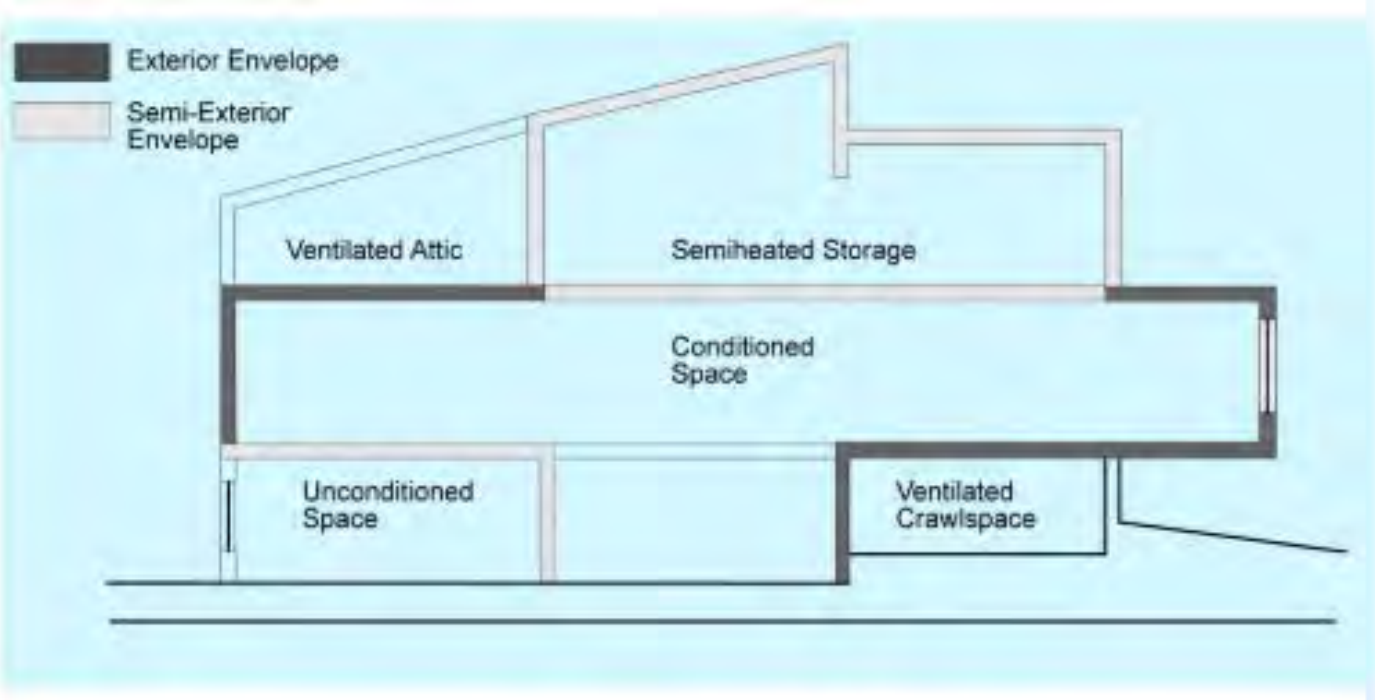


Figure 5-B. Building Envelope Components and Space Types

Putting it all together

Impacts Envelope Requirements

Space Conditioning Categories

- Non-residential Conditioned
- Residential Conditioned
- Semiheated

Impacts Heating Requirements

Space Heating Categories

- Conditioned
- Semiheated
- Unconditioned

Air-Leakage

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
5.4.3	Supplemental OEESC form, Arch plans

Mandatory air-leakage requirements exist for:

Continuous Air Barriers

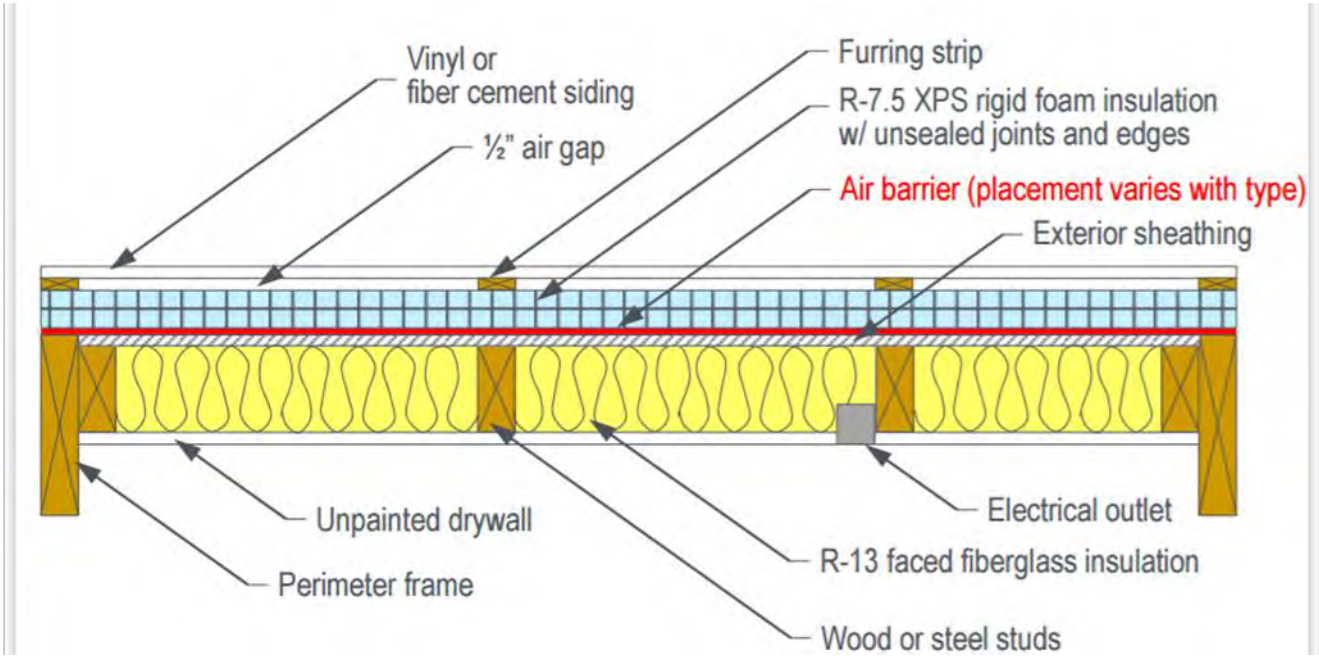
Loading dock weather seals

Vestibules and revolving doors

Air Leakage

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
5.4.3	Supplemental OEESC form, Arch plans, specs

- Air Leakage compliance in 90.1-2019 consists of:
  - Construction of a continuous Air Barrier
  - 3rd party whole-building air leakage testing and verification
  - Lab-verified component air-leakage rates

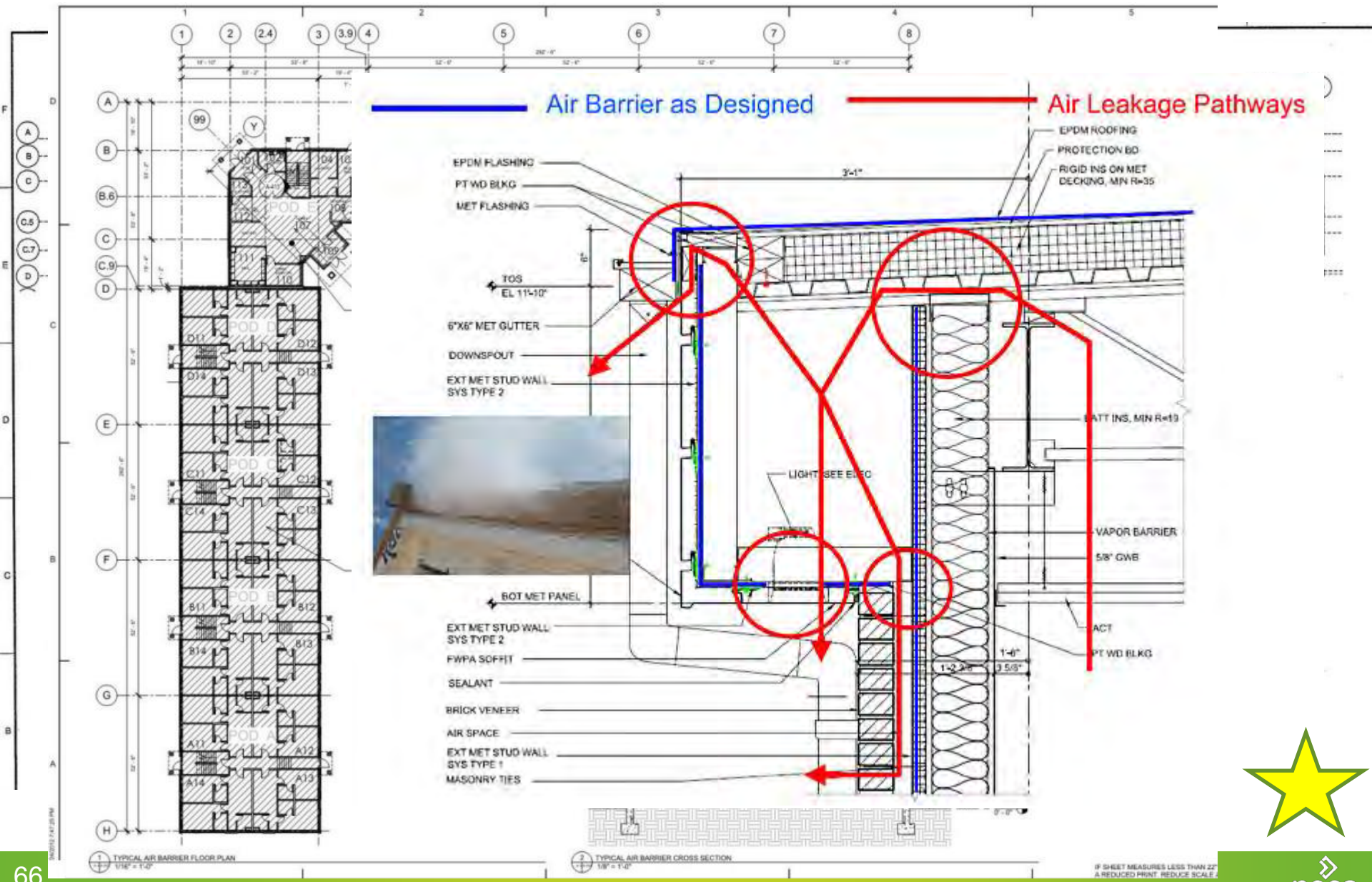


Whole Building Air-Leakage

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
5.4.3.1.1	Supplemental OEESC form, Arch plans

- Continuous air barrier required in all buildings covered by the Standard except *semiheated* spaces
  - Measured whole building air-leakage rate not to exceed 0.40 cfm/ft^2 (at a pressure differential of 0.3 in. of water)
- Exceptions
  1. Partial whole-building testing on buildings >50,000 ft^2
  2. Air leakage is > 0.40 cfm/ft^2 and < 0.60 cfm/ft^2 and a tracer gas test/thermal imaging is used to seal remaining leaks
  3. **Not required if meeting continuous air barrier design and installation verification program meeting requirements of 5.9.1.2**
- All components of the air barrier must be specifically identified on the construction plans and specifications, including details of sealing joints, interconnections, and sealing of penetrations.

Air Barrier Documentation



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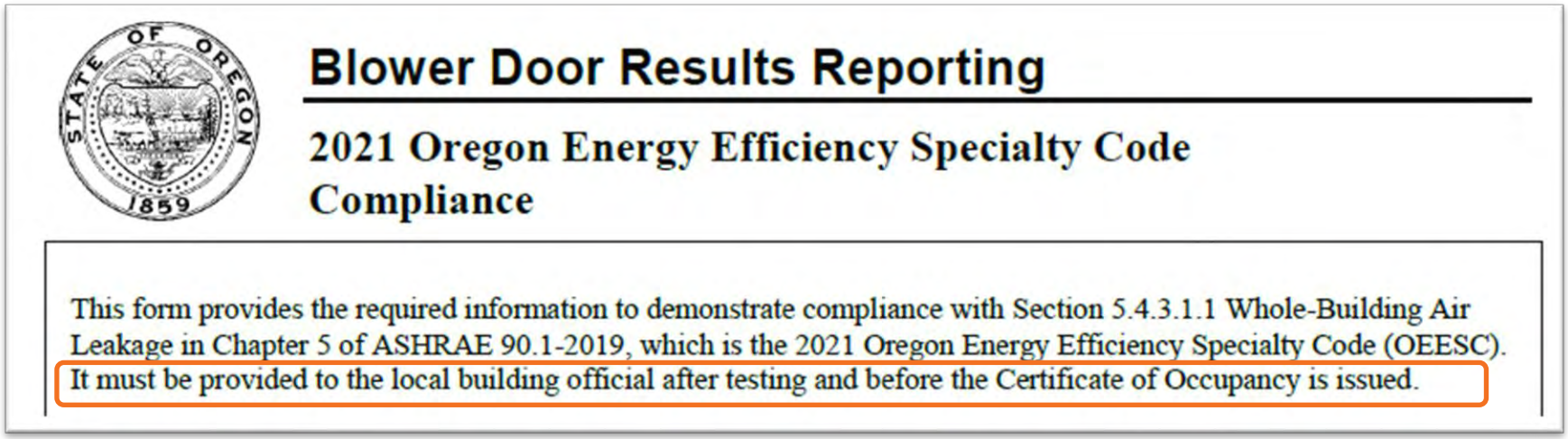
Verification of Air Barrier Design & Installation

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
5.9.1.2	Supplemental OEESC form, Arch plans

- Verification of the design and installation of the *continuous air barrier* shall be determined in accordance with the following by an independent third party when using Exception 3 of Section 5.4.3.1.1:
  a. A design review shall be conducted to verify and document compliance with the requirements in Sections 5.4.3 and 5.8.3.2.
  b. Periodic field inspection of the continuous air barrier materials and assemblies shall be conducted during construction while the continuous air barrier is still accessible for inspection and repair to verify and document compliance with the requirements of Sections 5.4.3.1.2 and 5.8.3.
  c. Reporting shall comply with Section 4.2.5.1.2.

OEESC Blower Door Form

- Remember this form provides info on compliance or which exception is being taken
- C of O hinges on this form being submitted



Blower Door Results Reporting

2021 Oregon Energy Efficiency Specialty Code Compliance

This form provides the required information to demonstrate compliance with Section 5.4.3.1.1 Whole-Building Air Leakage in Chapter 5 of ASHRAE 90.1-2019, which is the 2021 Oregon Energy Efficiency Specialty Code (OEESC). It must be provided to the local building official after testing and before the Certificate of Occupancy is issued.

- Verifiers cannot be designers or installers who were directly involved in the project

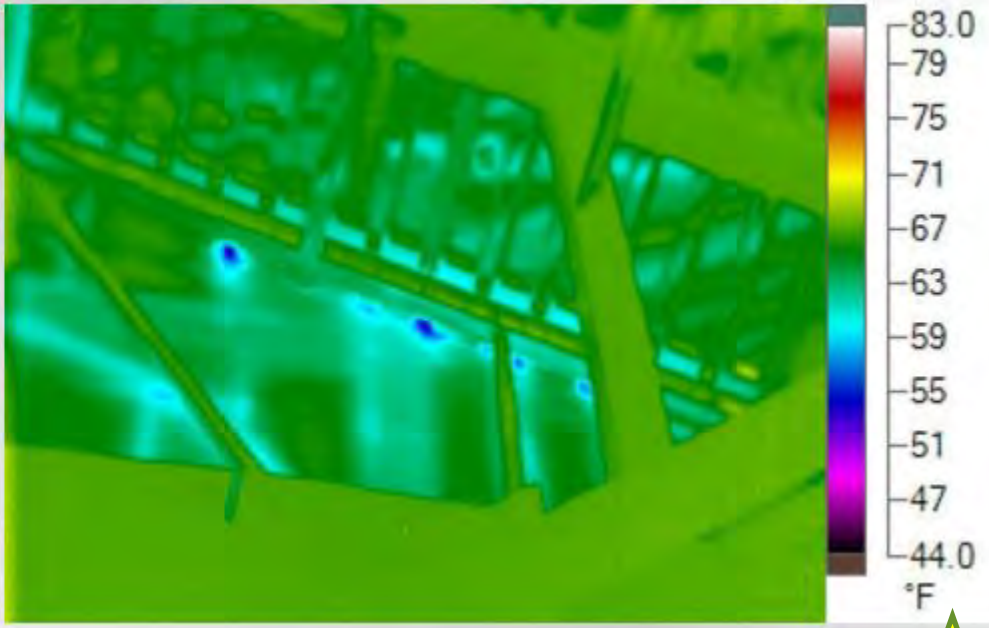
V&T providers shall be the owner's qualified employees, *commissioning providers*, *design professionals*, qualified designers, or qualified technicians experienced with verification or *FPT* of the designated systems. *V&T providers* shall not be individuals who performed design or installation of the *systems* or assemblies being verified or tested.

Air Barrier inspections

- Pay special attention to joints and penetrations during installation
- To address this, 90.1 requires approved sealing, caulking, gasketing, or taping in the following locations:
  a) Joints around window and door frames
  b) Junctions between walls and foundations, between walls at building corners, between walls and structural floors or roofs, and between walls and roof or wall panels
  c) Openings at penetrations of utility services through roofs, walls, and floors
  d) Building assemblies used as ducts or plenums
  e) Joints, seams, connections between planes, and other changes in air barrier materials
- A quality air barrier system is largely achieved through careful construction practices and attention to detail.
- 90.1 also has requirements for limiting air leakage through mechanical air intakes and exhausts. These requirements are addressed in the mechanical section, not in the building envelope section

Air Barrier Examples

Preliminary Whole Building Testing with Thermal Imaging



Air Leakage of Components

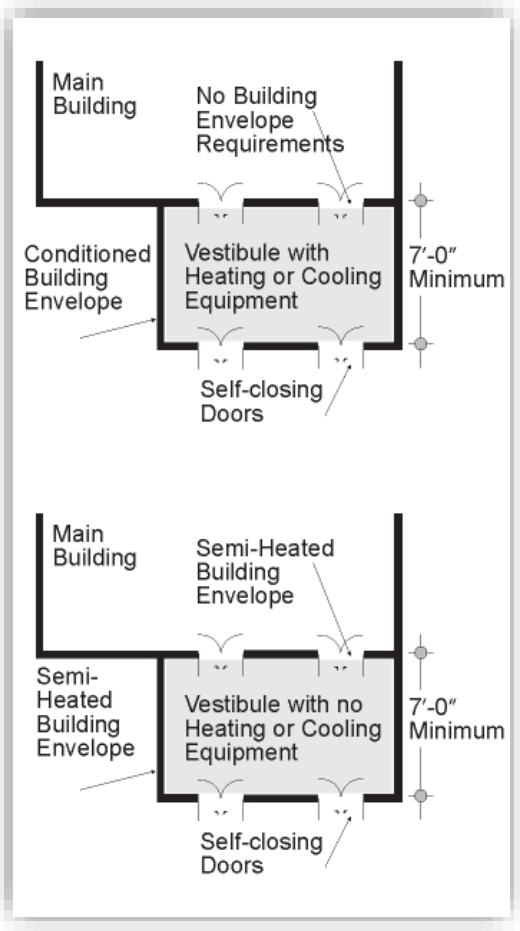
2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
5.8.3	Arch plans & specs

- Air leakage for materials & assemblies shall be determined by a laboratory accredited by a nationally recognized accreditation organization.
  - For doors/windows also labeled and certified by the manufacturer
  - Tables 5.8.3.1 and 5.8.3.2 list air leakage thresholds and test pressures
- **Exceptions:**
  1. *Field-fabricated fenestration* and *doors*.
  2. Metal coiling *doors* in *semiheated spaces* in Climate Zone 0 through 6 shall have an air leakage not exceeding 1.0 cfm/ft^2 when tested at a pressure of at least 1.57 psf in accordance with ANSI/DASMA 105, NFRC 400, or ASTM E283.
  3. Products in *buildings* that are tested and shown to comply with a whole-*building* air leakage in accordance with Section 5.4.3.1.1 without using Exception 3.

Vestibules

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
5.4.3.3	COMcheck, Architectural dwgs

- **Vestibules must have**
  - Self-closing doors
  - Interior and exterior doors not necessary to open at the same time
  - Distance between interior and exterior doors not < 7 ft when in closed position
  - Floor area of each vestibule to not exceed the greater of 50 ft^2 or 2% of the gross conditioned floor area for that level of the building
  - Exterior envelope of conditioned vestibule comply with conditioned space requirements
  - Interior/exterior envelope of unconditioned vestibule comply with semiheated space requirements



Vestibules

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
5.4.3.3	COMcheck, Architectural dwgs

- **Vestibules (or revolving doors) required for *building entrances***
  - Defined as means ordinarily used to gain access to building
- Vestibules are generally required in commercial spaces, but there are a number of exceptions:

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^2 in *gross conditioned floor area*.
7. *Building entrances* in *buildings* that are located in Climate *Zone* 0, 4, 5, 6, 7, or 8, where the *building* is less than 1,000 ft^2 in *gross conditioned floor area*.
8. *Doors* that open directly from a *space* that is less than 3,000 ft^2 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 through 8 that have an air curtain complying with Section 10.4.5.
11. Buildings under 25,000 ft^2 (2,322 m^2) meeting the requirements of Section 5.4.3.1.1 with a leakage rate less than 0.30 cfm/ft^2.

Vestibules for large spaces

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
5.4.3.4	COMcheck, Architectural dwgs

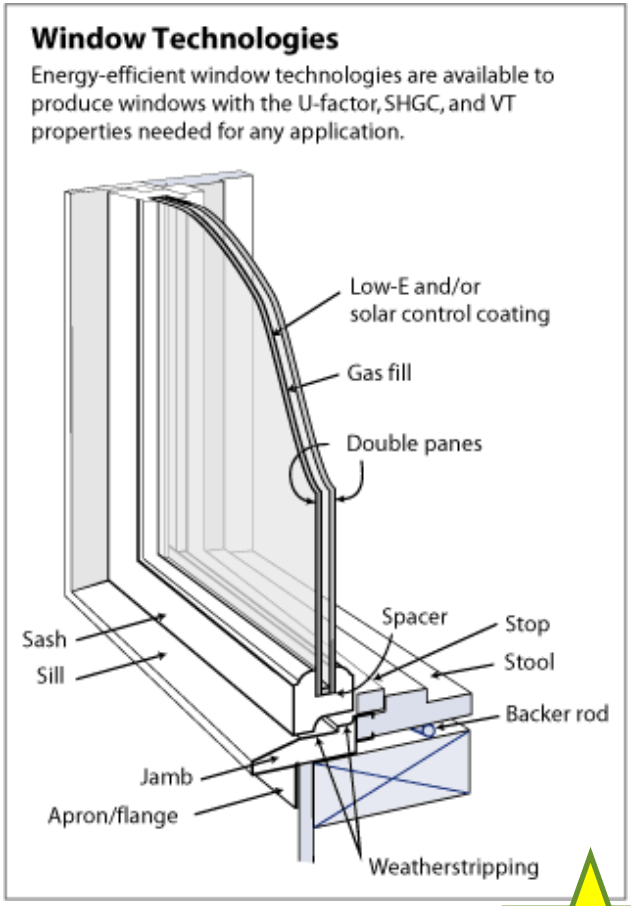
- Where Vestibules are required for:
  - *spaces* having a *gross conditioned floor area* for that level of the *building* of 40,000 ft^2 and greater (such as large retail),
  - and when the *doors* opening into and out of the vestibule are equipped with automatic, electrically driven, self-closing devices,
- Then the interior and exterior *doors* shall have a minimum distance between them of not less than 16 ft.

Opaque Assemblies & Fenestration

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
Tables 5.5-4, 5.5-5	COMcheck, Architectural dwgs, specs

- 90.1-2019 includes a comprehensive update to the fenestration prescriptive requirements

Example	ASHRAE 90.1-2019	OEESC 2014	Reduction
Frame Wall	U-0.064	U-0.064	0.0%
Roof Deck	U-0.032	U-0.048	33.3%
Fixed Metal Windows	U-0.36	U-0.45	20.0%
SHGC	0.36	0.40	10.0%



Opaque Assemblies & Fenestration

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
Tables 5.5-4, 5.5-5	COMcheck, Architectural dwgs, specs

- Fenestration is now based on type, not material

Fenestration	Assembly Max. U	Assembly Max. *SHGC*
Vertical Fene 0% to 40%		(for all frame
Nonmetal framing		0.36
Metal framing		
Metal framing		
Metal framing, entrance door	0.68	

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

Envelope U-factors & R-Values

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
Table 5.5-4	COMcheck, Architectural dwgs, specs

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

	Nonresidential		*Residential*		Semiheated	
Opaque Elements	Assembly Maximum	Insulation Min. *R-Value*	Assembly Maximum	Insulation Min. *R-Value*	Assembly Maximum	Insulation Min. *R-Value*
Roofs						
Insulation entirely above deck	U-0.032	R-30 c.i.	U-0.032	R-30 c.i.	U-0.093	R-10 c.i.
Metal building[a]	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
Attic and other	U-0.021	R-49	U-0.021	R-49	U-0.034	R-30
Walls, above Grade						
Mass	U-0.104	R-9.5 c.i.	U-0.090	R-11.4 c.i.	U-0.580	NR
Metal building	U-0.060	R-0 + R-15.8 c.i.	U-0.050	R-0 + R-19 c.i.	U-0.162	R-13
Steel-framed	U-0.064	R-13 + R-7.5 c.i.	U-0.064	R-13 + R-7.5 c.i	U-0.124	R-13
Wood-framed and other	U-0.064	R-13 + R-3.8 c.i. or R-20	U-0.064	R-13 + R-3.8 c.i. or R-20	U-0.089	R-13
Wall, below Grade						
Below-grade wall	C-0.119	R-7.5 c.i.	C-0.092	R-10 c.i.	C-1.140	NR
Floors						
Mass	U-0.057	R-14.6 c.i.	U-0.051	R-16.7 c.i.	U-0.107	R-6.3 c.i.
Steel joist	U-0.038	R-30	U-0.038	R-30	U-0.052	R-19
Wood-framed and other	U-0.033	R-30	U-0.033	R-30	U-0.051	R-19

Envelope U-factors & R-Values

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
Table 5.5-4	COMcheck, Architectural dwgs, specs

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

Slab-on-Grade Floors									
Unheated	F-0.520	R-15 for 24 in.		F-0.520	R-15 for 24 in.		F-0.730	NR	
Heated	F-0.843	R-20 for 24 in.		F-0.688	R-20 for 48 in.		F-0.900	R-10 for 24 in.	
Opaque Doors									
Swinging	U-0.370			U-0.370			U-0.370		
Nonswinging	U-0.310			U-0.310			U-0.360		
Fenestration	**Assembly Max. U**	**Assembly Max. *SHGC***	**Assembly Min. *VT/SHGC***	**Assembly Max. U**	**Assembly Max. SHGC**	**Assembly Min. *VT/SHGC***	**Assembly Max. U**	**Assembly Max. *SHGC***	**Assembly Min. *VT/SHGC***
Vertical Fenestration, 0% to 40% of *Wall*									
Fixed	0.36	0.36	1.10 (for all types)	0.36	0.36	1.10 (for all types)	0.50	NR (for all types)	NR (for all types)
Operable	0.45	0.33		0.45	0.33		0.65		
Entrance door	0.63	0.33		0.63	0.33		0.77		
Skylight, 0% to 3% of *Roof*									
All types	0.50	0.40	NR	0.50	0.40	NR	0.75	NR	NR

* The following definitions apply: c.i. = *continuous insulation* (see Section 3.2), FC = filled cavity (see Section A2.3.2.5), *Ls* = *liner system* (see Section A2.3.2.4), NR = no (insulation) requirement.

a. When using the *R-value* compliance method for *metal building roofs*, a thermal spacer block is required (see Section A2.3.2).

Envelope U-factors & R-Values

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
Table 5.5-5	COMcheck, Architectural dwgs, specs

Table 5.5-5 *Building Envelope* Requirements for Climate Zone 5 (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*
Roofs						
Insulation entirely above deck	U-0.032	R-30 c.i.	U-0.032	R-30 c.i.	U-0.063	R-15 c.i.
Metal building[a]	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
Attic and other	U-0.021	R-49	U-0.021	R-49	U-0.034	R-30
Walls, above grade						
Mass	U-0.090	R-11.4 c.i.	U-0.080	R-13.3 c.i.	U-0.151[b]	R-5.7 c.i.[b]
Metal building	U-0.050	R-0 + R-19 c.i.	U-0.050	R-0 + R-19 c.i.	U-0.094	R-0 + R-9.8 c.i.
Steel-framed	U-0.055	R-13 + R-10 c.i.	U-0.055	R-13 + R-10 c.i.	U-0.084	R-13+R-3.8 c.i.
Wood-framed and other	U-0.051	R-13 + R-7.5 c.i. or R-19 + R-5 c.i.	U-0.051	R-13 + R-7.5 c.i. or R-19 + R-5 c.i.	U-0.089	R-13
Wall, below Grade						
Below-grade wall	C-0.119	R-7.5 c.i.	C-0.092	R-10 c.i.	C-1.140	NR
Floors						
Mass	U-0.057	R-14.6 c.i.	U-0.051	R-16.7 c.i.	U-0.107	R-6.3 c.i.
Steel joist	U-0.038	R-30	U-0.038	R-30	U-0.052	R-19
Wood-framed and other	U-0.033	R-30	U-0.033	R-30	U-0.051	R-19

Envelope U-factors & R-Values

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
Table 5.5-5	COMcheck, Architectural dwgs, specs

Table 5.5-5 *Building Envelope* Requirements for Climate Zone 5 (A,B,C)*

Slab-on-Grade Floors									
Unheated	F-0.520	R-15 for 24 in		F-0.510	R-20 for 24 in.		F-0.730	NR	
Heated	F-0.688	R-20 for 48 in.		F-0.688	R-20 for 48 in.		F-0.900	R-10 for 24 in.	
Opaque Doors									
Swinging	U-0.370			U-0.370			U-0.370		
Nonswinging	U-0.310			U-0.310			U-0.360		
Fenestration	**Assembly Max. U**	**Assembly Max. *SHGC***	**Assembly Min. *VT/SHGC***	**Assembly Max. U**	**Assembly Max. SHGC**	**Assembly Min. *VT/SHGC***	**Assembly Max. U**	**Assembly Max. *SHGC***	**Assembly Min. *VT/SHGC***
Vertical Fenestration, 0% to 40% of *Wall*									
Fixed	0.36	0.38	1.10 (for all types)	0.36	0.38	1.10 (for all types)	0.50	NR (for all types)	NR (for all types)
Operable	0.45	0.33		0.45	0.33		0.65		
Entrance door	0.63	0.33		0.63	0.33		0.77		
Skylight, 0% to 3% of *Roof*									
All types	0.50	0.40	NR	0.50	0.40	NR	0.75	NR	NR

* The following definitions apply: c.i. = *continuous insulation* (see Section 3.2), FC = filled cavity (see Section A2.3.2.5), *Ls* = *liner system* (see Section A2.3.2.4, NR = no (insulation) requirement.

a. When using the *R-value* compliance method for *metal building roofs*, a thermal spacer block is required (see Section A2.3.2).

b. Exception to Section 5.5.3.2 applies for *mass walls* above *grade*.

Envelope & Fenestration Details

- COMcheck report lists proposed U-factors for envelope and fenestration components

Envelope Assemblies

Assembly	Gross Area or Perimeter	Cavity R-Value	Cont. R-Value	Proposed U-Factor	Budget U-Factor(a)
Floor - Level 1 Radiant: Heated Slab-On-Grade Fully Insulated (user specified perimeter R-value + R-5 under slab), [Bldg. Use 1 - School/University] (d)	68	---	20.0	0.602	0.843
Floor - Level 0: Unheated Slab-On-Grade, Vertical 2 ft., [Bldg. Use 1 - School/University] (d)	368	---	15.0	0.520	0.520
Floor - Level 1: Unheated Slab-On-Grade, Vertical 2 ft., [Bldg. Use 1 - School/University] (d)	308	---	15.0	0.520	0.520
Floor - Gym: Unheated Slab-On-Grade, Vertical 2 ft., [Bldg. Use 1 - School/University] (d)	288	---	15.0	0.520	0.520
Roof: Insulation Entirely Above Deck, [Bldg. Use 1 - School/University]	38868	---	30.0	0.032	0.032
NORTH					
Ext. Wall - Main Bldg North: Wood-Framed, 16in. o.c., [Bldg. Use 1 - School/University]	4436	21.0	8.6	0.038	0.064
Window - Storefront: Metal Frame: Fixed, Perf. Specs.: Product ID 451T Kawneer Storefront w/ SolarBan 70 Glass, SHGC 0.25, VT 0.55, [Bldg. Use 1 - School/University] (c)	442	---	---	0.360	0.380
Window - Fiberglass: Other Window: Fixed, Perf. Specs.: Product ID Cascadia Fiberglass with Cardinal 366CWL - K - 025, SHGC 0.27, VT 0.65, [Bldg. Use 1 - School/University] (c)	425	---	---	0.240	0.310
Ext. Wall - Gym North: Wood-Framed, 16in. o.c., [Bldg. Use 1 - School/University]	2187	21.0	8.6	0.038	0.064

Used for calcs, not code levels

Changes in Window-to-Wall Ratio (WWR)

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
Tables 5.5-4, 5.5-5	COMcheck forms

- ASHRAE 90.1 allows up to 40% WWR for each space conditioning type in Climate Zones 4c & 5b
  - Previous 2014 OEESC limited WWR to 30%, so this is a potential rollback

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

Fenestration	Assembly Max. U	Assembly Max. *SHGC*	Assembly Min. *VT/SHGC*	Assembly Max. U	Assembly Max. SHGC	Assembly Min. *VT/SHGC*	Assembly Max. U	Assembly Max. *SHGC*	Assembly Min. *VT/SHGC*
Vertical Fenestration, 0% to 40% of *Wall*									
Fixed	0.36	0.36	1.10 (for all types)	0.36	0.36	1.10 (for all types)	0.50	NR (for all types)	NR (for all types)
Operable	0.45	0.33		0.45	0.33		0.65		
Entrance door	0.63	0.33		0.63	0.33		0.77		
Skylight, 0% to 3% of *Roof*									
All types	0.50	0.40	NR	0.50	0.40	NR	0.75	NR	NR

Window-Wall Ratio check

COMcheck Software Version COMcheckWeb

Envelope Compliance Certificate

Project Information

Energy Code:	90.1 (2019) Standard
Project Title:	Marvins Gardens
Location:	Salem, Oregon
Climate Zone:	4c
Project Type:	New Construc
Vertical Glazing / Wall Area:	10%
Performance Sim. Specs:	EnergyPlus 8.1.0.009 (EPW: USA_OR_Salem-McNary.Field.726940_TMY3.epw)

COMcheck shows WWR at top of report

Construction Site:
123 Main
Salem, OR 97103

Owner/Agent:

Designer/Contractor:

Building Area	Floor Area
1-Office : Nonresidential	12160
2-Workshop : Semiheated	1000

Envelope Assemblies

Assembly	Gross Area or Perimeter	Cavity R-Value	Cont. R-Value	Proposed U-Factor	Budget U-Factor(a)
NORTH					
Ext. Wall - Main Bldg North: Wood-Framed, 16in. o.c., [Bldg. Use 1 - School/University]	4436	21.0	8.6	0.038	0.064
Window - Storefront: Metal Frame: Fixed, Perf. Specs.: Product ID 451T Kawneer Storefront w/ SolarBan 70 Glass, SHGC 0.25, VT 0.55, [Bldg. Use 1 - School/University] (c)	442	---	---	0.360	0.380
Window - Fiberglass: Other Window: Fixed, Perf. Specs.: Product ID Cascadia Fiberglass with Cardinal 366CWL - K - 025, SHGC 0.27, VT 0.65, [Bldg. Use 1 - School/University] (c)	425	---	---	0.240	0.310
Ext. Wall - Gym North: Wood-Framed, 16in. o.c., [Bldg. Use 1 - School/University]	2187	21.0	8.6	0.038	0.064
Window - Storefront: Metal Frame: Fixed, Perf. Specs.: Product ID 451T Kawneer Storefront w/ SolarBan 70 Glass, SHGC 0.25, VT 0.55, [Bldg. Use 1 - School/University] (c)	102	---	---	0.360	0.380
EAST					
Ext. Wall - Main Bldg East: Wood-Framed, 16in. o.c., [Bldg. Use 1 - School/University]	6422	21.0	8.6	0.038	0.064
Window - Storefront: Metal Frame: Fixed, Perf. Specs.: Product ID 451T Kawneer Storefront w/ SolarBan 70 Glass, SHGC 0.25, VT 0.55, [Bldg. Use 1 - School/University] (c)	178	---	---	0.360	0.380

Envelope PASSES: Design 1% better than code

neea

Skylights

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
5.5.4.2, Tables 5.5-4, 5.5-5	COMcheck, Architectural dwgs, specs

- U-factor not greater than 0.50 (SHGC 0.40)
- Exception: U-factor for skylights allowed to be increased no greater than 0.75 Btu/h-ft^2 °F provided:
  - » They have a glazing material or diffuser with a measured haze value greater than 90% when tested in accordance with ASTM D1003
  - » They have a skylight VT greater than 0.40 and
  - » All general lighting in the daylight area under skylights controlled by multi-level photocontrols in accordance with Section 9.4.1.1 (f)

Maximum Skylight Fenestration Area

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
5.5.4.2, Tables 5.5-4, 5.5-5	COMcheck forms

- 0 - 3% of roof for Climate Zones 4c & 5b
- Exception: Can increase to 6% of gross roof area if the total *daylight area under skylights* is a minimum of half the *floor area* of the *space* and if:
  - They have a glazing material or diffuser with a measured haze value greater than 90% when tested according to ASTM D1003.
  - They have a skylight VT greater than 0.40.
  - They have all general lighting in the daylight area under skylights controlled by multilevel photocontrols in accordance with Section 9.4.1.1(f).

Minimum Skylight Fenestration Area

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
5.5.4.2, Tables 5.5-4, 5.5-5	COMcheck forms, Ltg. plans

- In any enclosed space in a building that is
  - 2500 ft^2 and greater;
  - directly under a roof with ceiling heights greater than 15 ft; and
  - one of the following space types: **office, lobby, atrium, concourse, corridor, storage (including nonrefrigerated warehouse), gymnasium, fitness/exercise area, playing area, gymnasium seating area, convention exhibit/event space, courtroom, automotive service, fire station engine room, manufacturing corridor/transition and bay areas, retail, library reading and stack areas, distribution/sorting area, transportation baggage and seating areas, or workshop,**
- the total daylight area under skylights shall be a minimum of half the floor area and either
  - provide a minimum skylight area to daylight area under skylights of 3% with a skylight VT of at least 0.40 or
  - provide a minimum skylight effective aperture of at least 1%.
- These skylights shall have a glazing material or diffuser with a measured haze value greater than 90% when tested according to ASTM D1003. General lighting in the daylight area shall be controlled as described in Section 9.4.1.1(f).

Minimum Skylight Fenestration Area

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
5.5.4.2, Tables 5.5-4, 5.5-5	COMcheck forms

- Exceptions:
  - *Enclosed spaces* in Climate Zones 6 through 8
  - *Enclosed spaces* where it is documented that existing structures or natural objects block direct-beam sunlight on at least half of the roof over the enclosed space for more than 1500 daytime hours per year between 8 a.m. and 4 p.m.
  - Enclosed spaces where the daylight area under roof monitors is greater than 50% of the enclosed space floor area.
  - Enclosed spaces where it is documented that 90% of the skylight area is shaded on June 21 in the Northern Hemisphere (December 21 in the Southern Hemisphere) at noon by permanent architectural features of the building.
  - Enclosed spaces where the total area minus the primary sidelighted area and secondary sidelighted area is less than 2500 ft^2 and where the lighting is controlled according to sidelighting requirements described in Section 9.4.1.1(e).

Skylight Compliance Details

Section # & Req.ID	Plan Review	Complies?	Comments/Assumptions
5.5.4.2.3 [PR7][2]	In buildings > 2,500 ft2, any enclosed spaces directly under a roof with ceiling heights > 15 ft. and used as an office, lobby, atrium, concourse, corridor, storage (including nonrefrigerated warehouse), gymnasium, fitness/exercise area, playing area, gymnasium seating area, convention exhibit/event space, courtroom, automotive service, fire station engine room, manufacturing corridor/transition and bay areas, retail, library reading and stack areas, distribution/sorting area, transportation baggage and seating areas, or workshop, the following requirements apply: The daylight zone under skylights is >= half the floor area and (a) the skylight area to daylight zone is >= 3 percent with a skylight VT >= 0.40 or (b) the minimum skylight effective aperture >= 1 percent. The skylights have a measured haze value > 90 percent.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.

This could be a great area to describe/point to compliance details

Envelope Assemblies

Assembly	Gross Area or Perimeter	Cavity R-Value	Cont. R-Value	Proposed U-Factor	Budget U-Factor[a]
Roof 1: Non-Wood Joist/Rafter/Truss, [Bldg. Use 1 - Office]	6112	40.0	0.0	0.033	0.021
Skylight 1: Metal Frame, Double Pane, Perf. Type: Energy code default, Triple Pane, Tinted , SHGC 0.42, VT 0.22, [Bldg. Use 1 - Office]	112	---	---	0.640	0.500
Floor 1: Slab-On-Grade:Unheated, Vertical 2 ft., [Bldg. Use 1 - Office] (b)	180	---	10.0	0.540	0.520

Overhang Adjustments

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
5.5.4.4	COMcheck forms

- 90.1 credits permanent overhangs by adjustment to SHGC
- Size of overhang is determined by projection factor

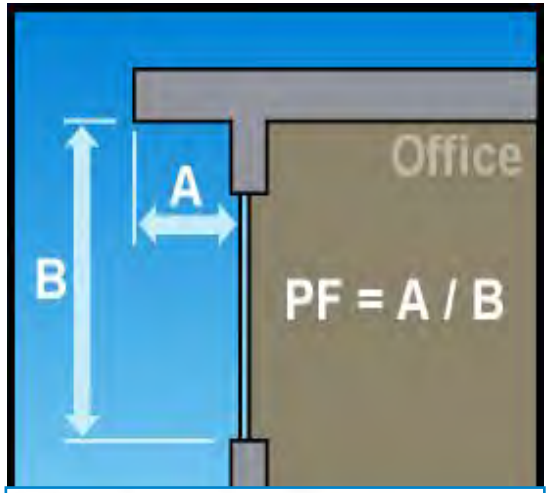


Table 5.5.4.4.1 ***SHGC*** **Multipliers for Permanent Projections**

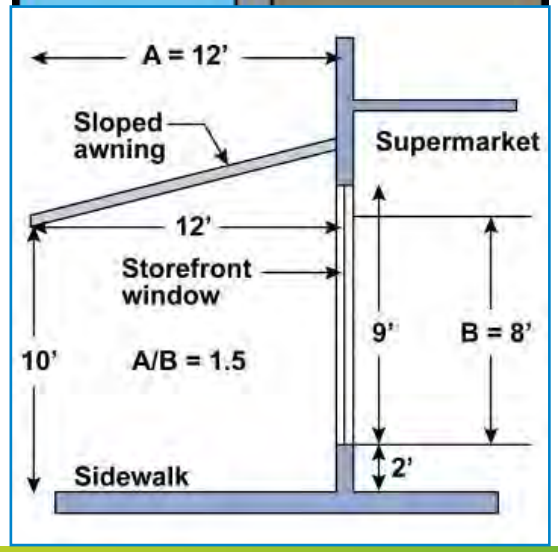
Projection Factor	*SHGC* Multiplier (South, East, and West Orientations)
0 to 0.10	1.00
>0.10 to 0.20	0.91
>0.20 to 0.30	0.82
>0.30 to 0.40	0.74
>0.40 to 0.50	0.67
>0.50 to 0.60	0.61
>0.60 to 0.70	0.56
>0.70 to 0.80	0.51
>0.80 to 0.90	0.47
>0.90 to 1.00	0.44

PF is a COMcheck entry

Window 2: Metal Frame, Double Pane, Perf. Type: Energy code default, Triple Pane, Clear , SHGC 0.60, VT 0.59, [Bldg. Use 1 - Office]

Window 3: Metal Frame:Fixed, Perf. Type: Energy code default, Single Pane, Clear , SHGC 0.82, PF 0.50, VT 0.76, [Bldg. Use 1 - Office]

Projection Factor	
0.50	
0.00	



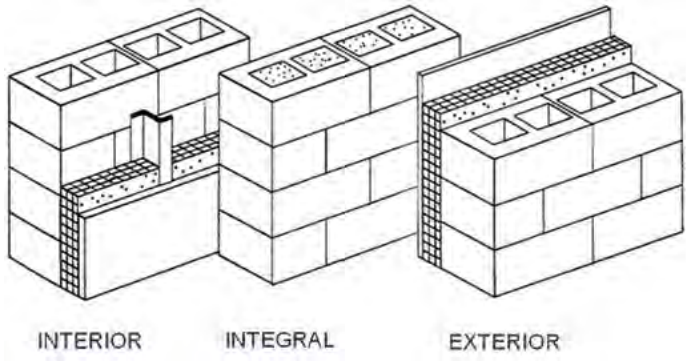
Mass Walls

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
5.5.3.2, Tables 5.5-4, 5.5-5	COMcheck, Architectural dwgs, specs

- Prior exception in OEESC for above-grade mass walls (commonly single-wythe CMU) if they are mostly open and/or semiheated spaces
  - Ex. gymnasium, auditorium, arena, kennel, warehouse

	Nonresidential		*Semiheated*	
	Climate Zone 4	*Climate Zone 5*	*Climate Zone 4*	*Climate Zone 5*
Opaque Elements	Assembly Maximum	Assembly Maximum	Assembly Maximum	Assembly Maximum
Walls, above Grade				
Mass	U-0.104	U-0.090	U-0.580	U-0.151
Metal building	U-0.060	U-0.050	U-0.162	U-0.094
Steel-framed	U-0.064	U-0.055	U-0.124	U-0.084
Wood-framed and other	U-0.064	U-0.051	U-0.089	U-0.089

Semiheated space: an enclosed space within a building that is heated by a heating system whose output capacity is greater than or equal to 3.4 Btu/h·ft^2 of floor area but is not a conditioned space
Semiheated spaces are heated, but not to comfort levels, and not cooled



Mass Walls

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
5.5.3.2, Tables 5.5-4, 5.5-5	COMcheck, Architectural dwgs, specs

Statewide Alternate Method
No. 21-02

Mass walls of insulated masonry units

BCD Building Codes Division
Department of Consumer and Business Services

Code/edition/section: 2021 Oregon Energy Efficiency Specialty Code (OEESC) / ASHRAE 90.1-2019

Date: Aug. 16, 2021

Subject: Alternate thermal compliance path for mass walls found in Statewide Alternate Method 19-01 and the 2018 Washington State Energy Code.

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

Opaque Elements	Assembly Maximum
Walls, above Grade	
Mass	U-0.104[b]

Table 5.5-5 *Building Envelope* Requirements for Climate Zone 5 (A, B,C)

Opaque Elements	Assembly Maximum
Walls, above Grade	
Mass	U-0.090[c]

b. Exception: Integral insulated concrete block walls complying with ASTM C90 with all cores filled shall be considered compliant, when meeting both of the following:

1) at least 50% of cores shall be filled with vermiculite or equivalent fill insulation, and

2) the wall encloses the following building types: gymnasium, auditorium, church chapel, arena, kennel, manufacturing plant, indoor swimming pool, pump station, water and wastewater treatment station, storage facility, restroom and concessions, mechanical and electrical structures, storage areas, warehouse (storage and retail), and motor vehicle facility.

Insulation Installation

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
5.5.3.1, 5.8.1	COMcheck, Architectural dwgs, specs

- Rated R-value clearly identified by an identification mark applied by manufacturer to each piece of building envelope insulation
  - Exception - provide documentation
- Installed per manufacturer's instructions & best practices
  - Ex. staggered rigid insulation joints, protected from exterior elements
- Achieve rated R-value
  - Metal buildings exception if roof and wall insulation is compressed between roof or wall skin and the structure
- No open-blown or poured loose-fill insulation when ceiling slope is > 3/12
  Insulation materials in ground contact shall have a water absorption rate no greater than 0.3% when tested in accordance with ASTM C272
- If eave vents installed:
  - Provide baffling of air vents to deflect incoming air above the surface of the insulation

Slab-On-Grade Floor Insulation

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
5.5.3.5	COMcheck, Architectural dwgs, specs

- Insulation to be installed around the perimeter of the slab-on-grade floor to the distance specified according to Tables 5.5-4 or 5.5-5
  - Heated slabs have HW pipes or heating coils embedded in them, unheated do not
  - Insulation is required for unheated slabs in OR climate zones (except in semiheated buildings)
- If a design can't comply with prescriptive option for this, can always use envelope trade-off option

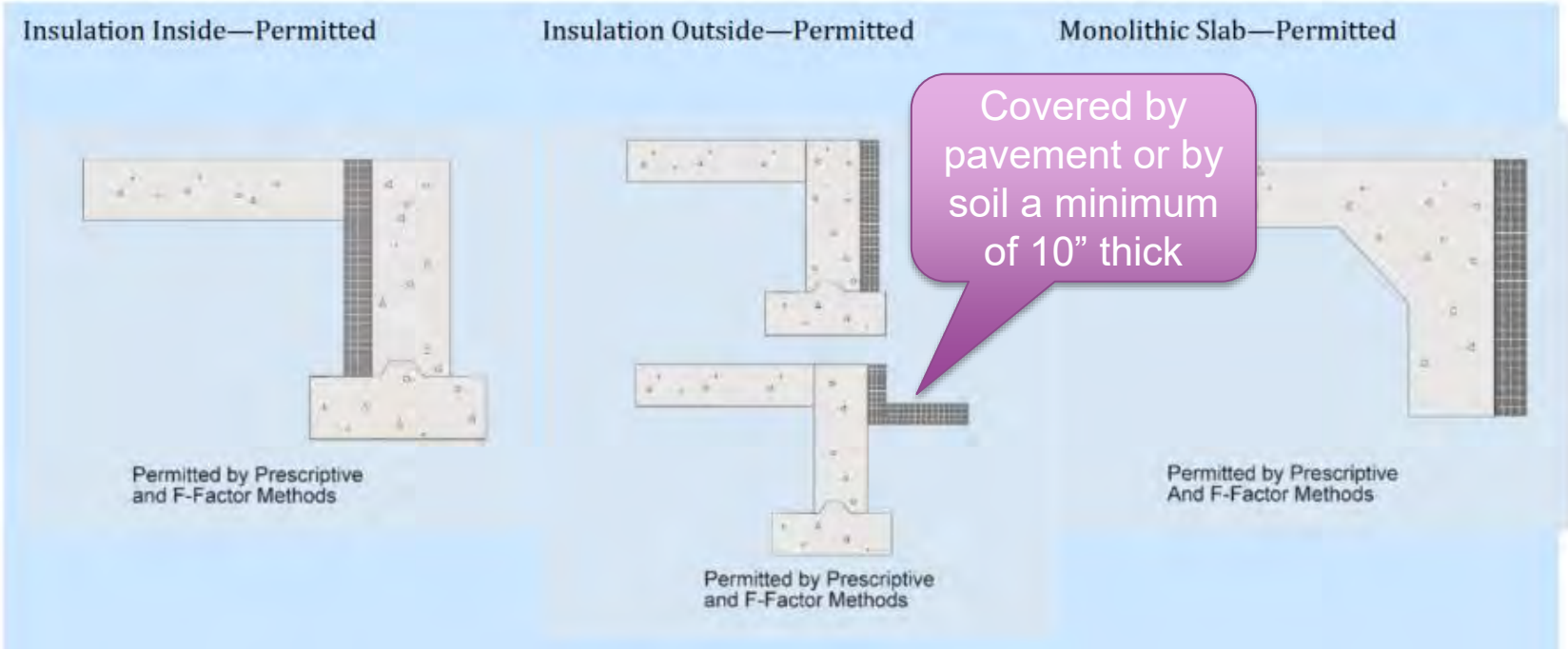
Slab-on-Grade Insulation

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
Tables 5.5-4, 5.5-5	COMcheck, Architectural dwgs, specs

	Non-Residential		Semiheated	
	CZ 4	CZ 5	CZ 4	CZ 5
Insulation				
Unheated Slabs	R-15 for 24" below	R-15 for 24" below	NR	NR
Heated Slabs	R-20 for 24" below	R-20 for 48" below	R-10 for 24" below	R-10 for 24" below
Assembly Maximum				
Unheated Slabs	F-0.520	F-0.520	F-0.730	F-0.730
Heated Slabs	F-0.843	F-0.688	F-0.900	F-0.900

- Requires insulation for both heated and un-heated slabs for non-residential buildings
- Tables give both R-value of insulation and depth.
  - Ex. R-20 for 48” means that insulation with a thermal resistance of 20 must be installed and that the insulation must extend a distance of 48” starting from the top surface of the slab

Slab-On Grade Floor Insulation

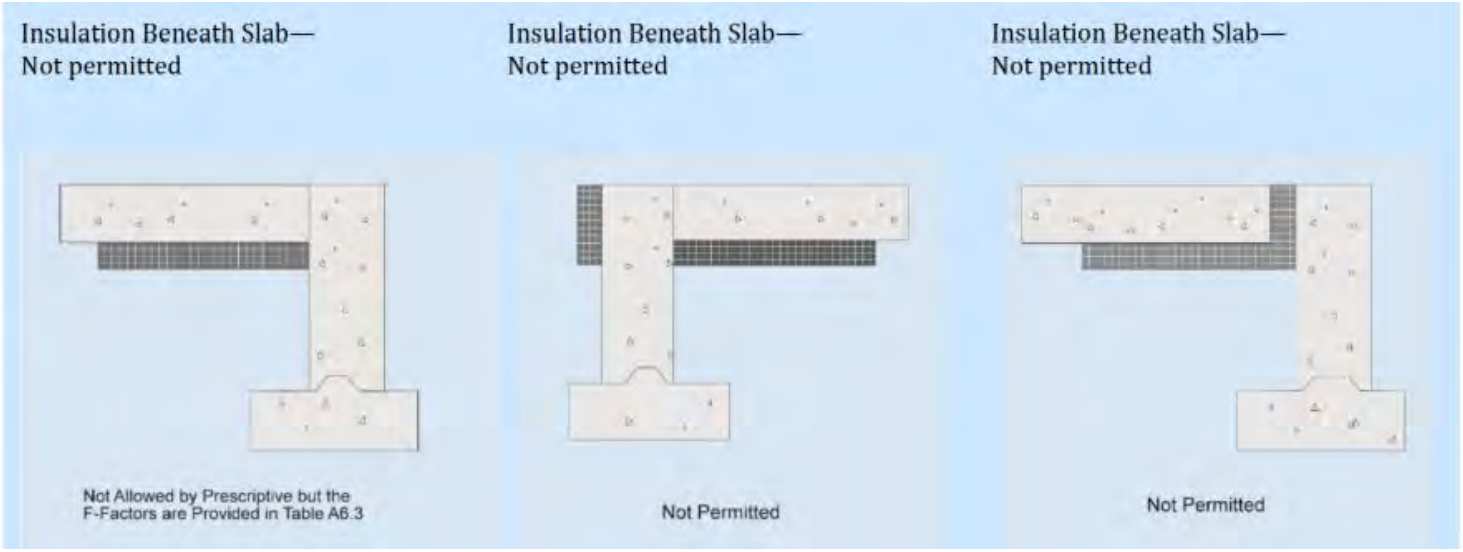


Inside foundation wall extend downward from top of slab a minimum distance specified or to the top of the footing, whichever is less

Outside foundation wall extend from top of the slab or downward to at least the bottom of the slab and then horizontally to a minimum distance specified

Exception: monolithic slab-on-grade floor, insulation to extend from the top of the slab-on-grade to the bottom of the footing

Not Allowed: Slab-On Grade Floor Insulation



Does not thermally isolate edge of the floor from outside temps. Heat flows directly through edge of slab and insulation provides very little benefit. Very unlikely to achieve code prescriptive F-factor	Adding a little vertical insulation helps decrease the edge heat transfer, but still major thermal bridge between interior and exterior insulation. Still unlikely to achieve code prescriptive F-factor	This solves it! But it routinely gets overlooked in the field so not allowed in prescriptive path

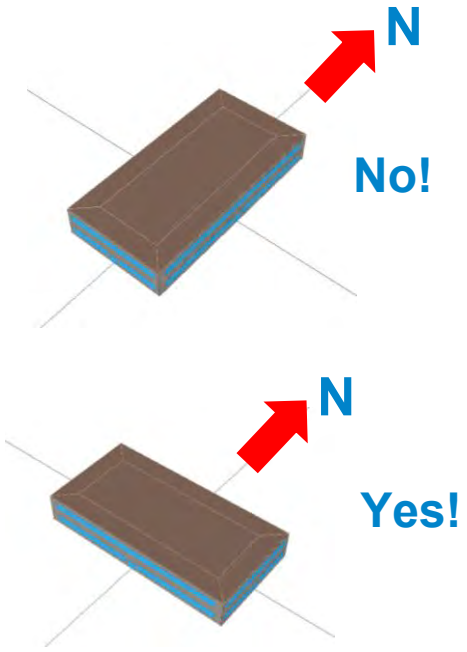
Note: in some situations, horizontal insulation *may* help achieve code prescriptive F-factors. Consult ASHRAE 90.1 Appendix A Table A6.3.1-1 for F-factor table of various assemblies

Fenestration Orientation

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
5.5.4.5	Arch/Civil dwgs

- Compliance requires following 1 of 2 paths:

Option 1 – Area Method	Option 2 – SHGC Weighted Method
East & West fenestration areas are each less than 25% of building total	East & West area weighted SHGC is each less than average area weighted SHGC.



- Several exemptions related to:
  - large amounts of east & west shade being present,
  - alterations with no increase in vertical fenestration,
  - buildings where vertical fenestration area < 20% of gross wall area on east or west facades along with lower SHGC values than required, or
  - street-side façade where street level story is less than 20 feet, has larger overhangs, and the total window area is <75% of the street-side wall area

HVAC

New Oregon-specific amendments

- ANSI/ASHRAE Standard 90.4-2019, Energy Standard for Data Centers
- Radiant spot heating

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^2 (46 m^2) 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).

- Packaged HVAC equipment with electric heat

b. Section 6.4.3.5.1 Packaged HVAC Equipment with Electric Heat

HVAC equipment for new buildings with a cooling capacity less than 241,000 Btu/h from Table 6.8.1-1 shall not have electric supplemental heat exceeding 21,500 Btu/h (6 kW). Equipment shall have heat pump operation for the first stage of heating and shall be selected from Table 6.8.1-2.

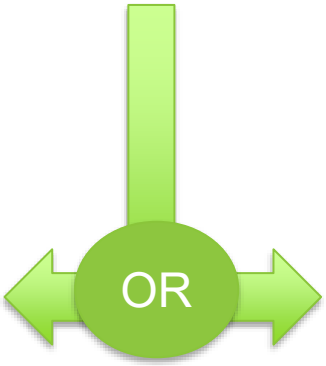
Compliance Paths

- ASHRAE 90.1 now includes 90.4 as an alternate compliance path for Data Centers
- Oregon expanded exceptions for Data Centers to require them to comply with ASHRAE 90.4 under these conditions:
  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.

HVAC Compliance Pathways

HVAC Section 6: 6.1 General, 6.7 Submittals, 6.8 Equipment Efficiency Tables

6.3 Simplified Building Approach



6.4 Mandatory Requirements

Plus One

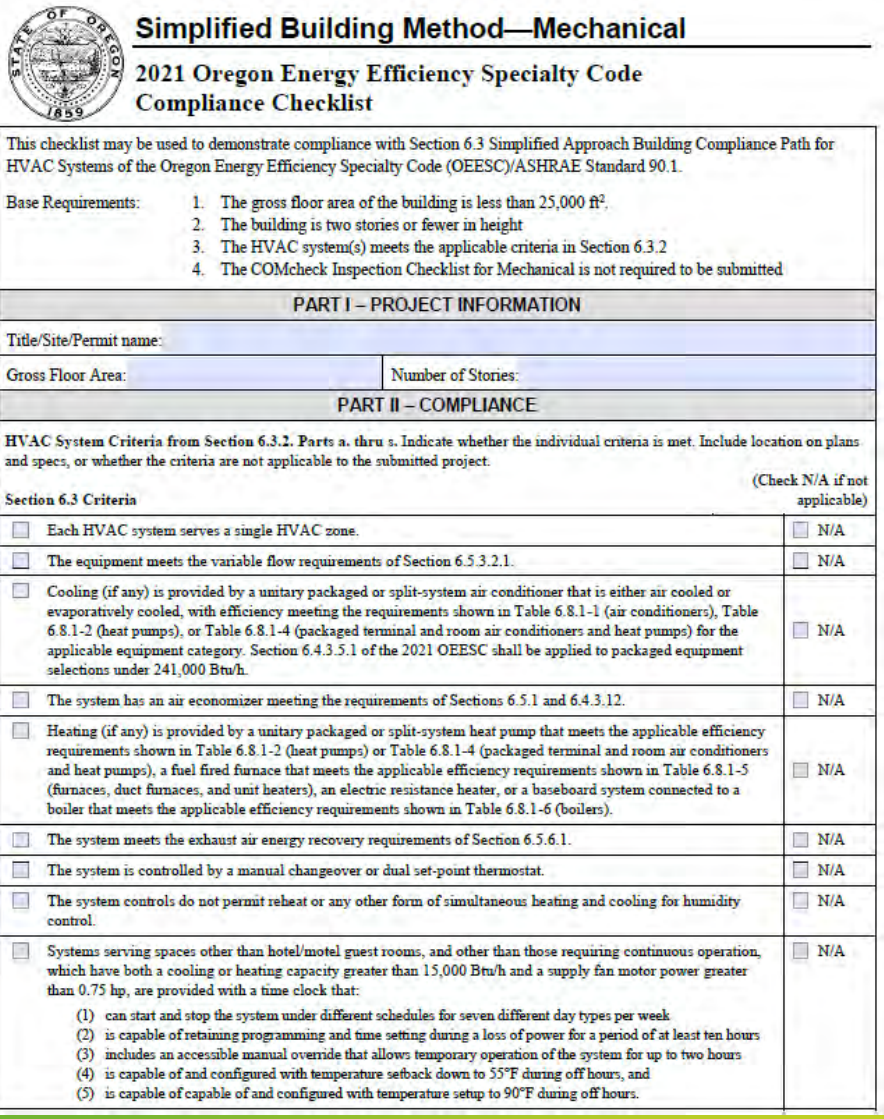
6.5 Prescriptive Requirements

6.6 Alternative Compliance (Computer Rooms)

Chapter 11 Performance

Appendix G Performance

Supplemental OEESC form



Simplified Building Method—Mechanical

2021 Oregon Energy Efficiency Specialty Code Compliance Checklist

This checklist may be used to demonstrate compliance with Section 6.3 Simplified Approach Building Compliance Path for HVAC Systems of the Oregon Energy Efficiency Specialty Code (OEESC)/ASHRAE Standard 90.1.

Base Requirements:

1. The gross floor area of the building is less than 25,000 ft².
2. The building is two stories or fewer in height
3. The HVAC system(s) meets the applicable criteria in Section 6.3.2
4. The COMcheck Inspection Checklist for Mechanical is not required to be submitted

PART I – PROJECT INFORMATION

Title/Site/Permit name:

Gross Floor Area: | Number of Stories:

PART II – COMPLIANCE

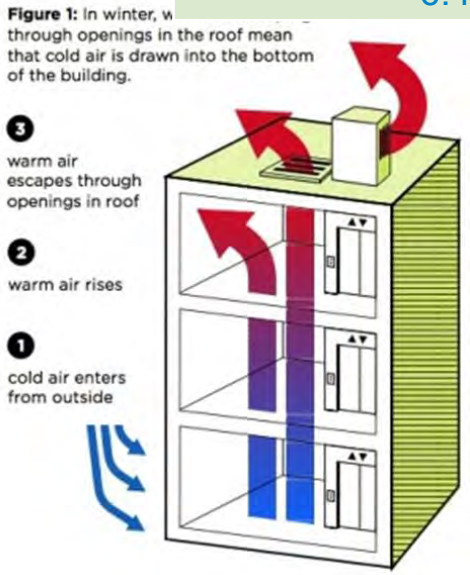
HVAC System Criteria from Section 6.3.2. Parts a. thru s. Indicate whether the individual criteria is met. Include location on plans and specs, or whether the criteria are not applicable to the submitted project.

Section 6.3 Criteria	(Check N/A if not applicable)
☐ Each HVAC system serves a single HVAC zone.	☐ N/A
☐ The equipment meets the variable flow requirements of Section 6.5.3.2.1.	☐ N/A
☐ Cooling (if any) is provided by a unitary packaged or split-system air conditioner that is either air cooled or evaporatively cooled, with efficiency meeting the requirements shown in Table 6.8.1-1 (air conditioners), Table 6.8.1-2 (heat pumps), or Table 6.8.1-4 (packaged terminal and room air conditioners and heat pumps) for the applicable equipment category. Section 6.4.3.5.1 of the 2021 OEESC shall be applied to packaged equipment selections under 241,000 Btu/h.	☐ N/A
☐ The system has an air economizer meeting the requirements of Sections 6.5.1 and 6.4.3.12.	☐ N/A
☐ Heating (if any) is provided by a unitary packaged or split-system heat pump that meets the applicable efficiency requirements shown in Table 6.8.1-2 (heat pumps) or Table 6.8.1-4 (packaged terminal and room air conditioners and heat pumps), a fuel fired furnace that meets the applicable efficiency requirements shown in Table 6.8.1-5 (furnaces, duct furnaces, and unit heaters), an electric resistance heater, or a baseboard system connected to a boiler that meets the applicable efficiency requirements shown in Table 6.8.1-6 (boilers).	☐ N/A
☐ The system meets the exhaust air energy recovery requirements of Section 6.5.6.1.	☐ N/A
☐ The system is controlled by a manual changeover or dual set-point thermostat.	☐ N/A
☐ The system controls do not permit reheat or any other form of simultaneous heating and cooling for humidity control.	☐ N/A
☐ Systems serving spaces other than hotel/motel guest rooms, and other than those requiring continuous operation, which have both a cooling or heating capacity greater than 15,000 Btu/h and a supply fan motor power greater than 0.75 hp, are provided with a time clock that: (1) can start and stop the system under different schedules for seven different day types per week (2) is capable of retaining programming and time setting during a loss of power for a period of at least ten hours (3) includes an accessible manual override that allows temporary operation of the system for up to two hours (4) is capable of and configured with temperature setback down to 55°F during off hours, and (5) is capable of capable of and configured with temperature setup to 90°F during off hours.	☐ N/A

- Supplemental form has all required checks on it
- No need for COMcheck form
- Similarly, form requires designer to submit but needs to be reconciled with plans & specs
  - Bldg <25,000 ft²
  - HVAC serves single zone
  - HVAC efficiencies meet requirements
  - Energy recovery
  - Insulation requirements
  - Controls requirements

6.4 Mandatory Requirements – Stair and Shaft Vents

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
6.4.3.4.1	Mech plans, Seq. of Ops, Cx plan



<u>90.1-2019</u>: stair and elevator shaft vents capable and configured to automatically close during normal building operation

COMcheck report reference:

6.4.3.4.1 [ME3][3]	Stair and elevator shaft vents have motorized dampers that automatically close.		☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** see specs section YYZZZ and sheet M 5.Y

6.4 Mandatory Requirements – Demand Controlled Ventilation

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
6.4.3.8	Mech plans, Seq. of Ops, Cx plan

- Similar requirements as OEESC 2014
- Continues to apply to spaces > 500 ft^2, with design occupancy for ventilation of >= 25 people per 1000 ft^2 and served by systems with either
  - Air-side economizer
  - Automatic modulating control of OA damper, or
  - Design OA flow > 3000 cfm
- Exceptions:

Exceptions to 6.4.3.8

1. *Systems* with exhaust air *energy* recovery complying with Section 6.5.6.1.
2. Multiple-zone *systems* without *DDC* of individual zones communicating with a central *control* panel.
3. *Systems* with a design outdoor airflow less than 750 cfm.
4. *Spaces* where >75% of the *space* design outdoor airflow is required for *makeup air* that is exhausted from the *space* or *transfer air* that is required for *makeup air* that is exhausted from other *spaces*.
5. *Spaces* with one of the following occupancy categories as defined in ASHRAE Standard 62.1: correctional cells, daycare sickrooms, science labs, barbers, beauty and nail salons, and bowling alley seating.

6.4 Mandatory Requirements – Demand Controlled Ventilation

- Sample from OMC: Occupant Density Defaults

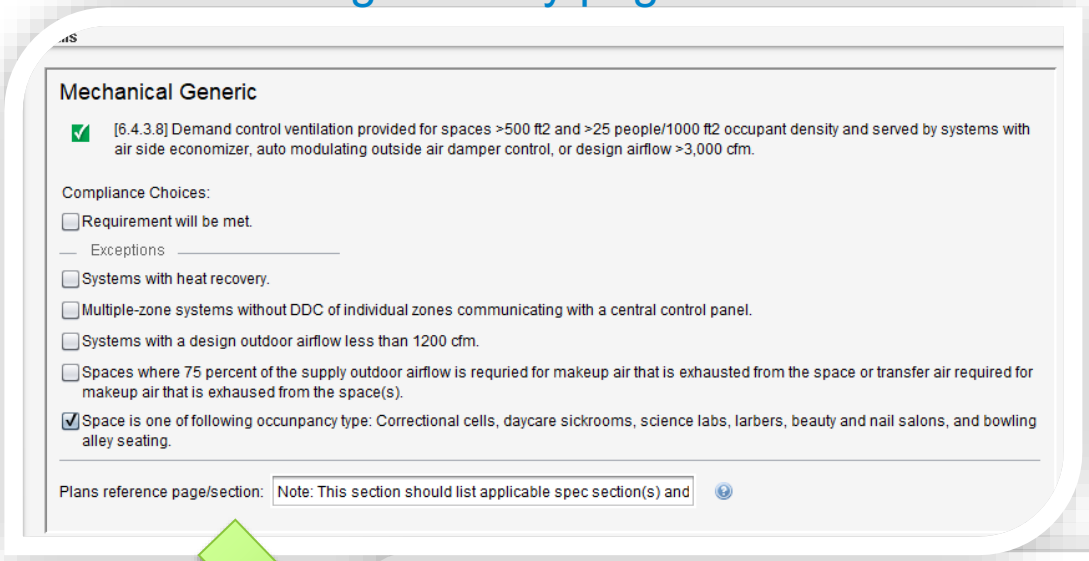
OCCUPANCY CLASSIFICATION	OCCUPANT DENSITY #/1000 FT² [a]	PEOPLE OUTDOOR AIRFLOW RATE IN BREATHING ZONE, R_p CFM/PERSON
Correctional facilities		
Booking/waiting	50	7.5
Cells		
without plumbing fixtures	25	5
with plumbing fixtures[g]	25	5
Day room	30	5
Dining halls (see "Food and beverage service")	—	—
Guard stations	15	5
Dry cleaners, laundries		
Coin-operated dry cleaner	20	15
Coin-operated laundries	20	7.5
Commercial dry cleaner	30	30
Commercial laundry	10	25
Storage, pick up	30	7.5
Education		
Art classroom[g]	20	10
Auditoriums	150	5
Classrooms (ages 5-8)	25	
Classrooms (age 9 plus)	35	
Computer lab	25	
Corridors (see "Public spaces")	—	
Day care (through age 4)	25	
Lecture classroom	65	
Lecture hall (fixed seats)	150	
Locker/dressing rooms[g]	—	
Media center	25	
Multiuse assembly	100	
Music/theater/dance	35	
Science laboratories[g]	25	
Smoking lounges[b]	70	
Sports locker rooms[g]	—	
Wood/metal shops[g]	20	
Food and beverage service		
Bars, cocktail lounges	100	
Cafeteria, fast food	100	
Dining rooms	70	
Kitchens (cooking)[b]	20	

… + more

6.4 Mandatory Requirements – Demand Controlled Ventilation

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
6.4.3.8	Mech plans, Seq. of Ops, Cx plan

COMcheck designer entry page:



COMcheck Mechanical Report

6.4 Mandatory Requirements – Heated or Cooled Vestibules

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
6.4.3.9	Mech plans, Seq. of Ops, Cx plan

- Automatic off required for vestibule heating when OAT > 45°F
- Maximum 60°F heating setpoint, minimum 85°F cooling setpoint
  - Exceptions: if energy used to condition the vestibule is from site-recovered energy or transfer air that would otherwise be exhausted

Occupied-Standby Controls

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
6.5.3.8	COMcheck forms, Arch/Mech/Ltg. Plans

- Required for zones serving rooms required to have partial or full off controls per lighting controls section 9.4.1.1.
- Refer to ASHRAE 62.1 occupancy categories that allow ventilation air to be reduced to 0 when space is in occupied-standby mode
  - *occupied-standby mode*: when a zone is scheduled to be occupied, and an occupant sensor indicates no occupants are within the zone.
- Requires that:
  a) Active heating set point shall be setback at least 1°F.
  b) Active cooling set point shall be setup at least 1°F.
  c) All airflow supplied to the zone shall be shut off whenever the space temperature is between the active heating and cooling set points.

- **Exception**: Multiple zone systems without automatic zone flow control dampers.

Occupied-Standby Controls

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
6.5.3.8	COMcheck forms, Arch/Mech/Ltg. Plans

- Categories ASHRAE 62.1 says acceptable to reduce to zero ventilation air during *occupied-standby* hrs
- Requires coordination between arch/mech/elec plans
- **Significant energy saver**

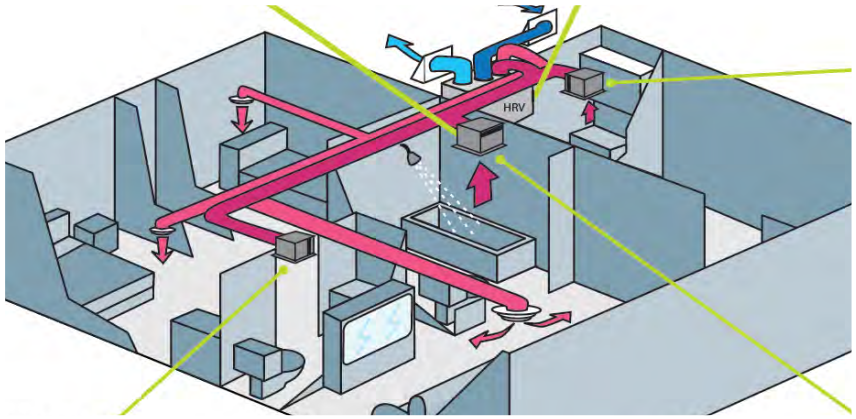
Occupancy Category	Occupancy Category
Educational Facilities	**Miscellaneous Spaces**
Lecture classroom	Bank vaults/safe deposit
Lecture hall (fixed seats)	Banks or bank lobbies
Music/theater/dance	Computer (not printing)
Multiuse assembly	Transportation waiting
General	**Public Assembly Spaces**
Break rooms	Auditorium seating area
Coffee stations	Places of religious worship
Conference/meeting	Courtrooms
Corridors	Legislative chambers
Hotels, Motels, Resorts, Dormitories	Lobbies
	Museums/galleries
Bedroom/living room	**Transient Residential**
Barracks sleeping areas	Dwelling unit
Lobbies/prefunction	Common corridors
Multipurpose assembly	**Retail**
Office Buildings	Mall common areas
Main entry lobbies	Barbershop
Office space	Supermarket
Reception areas	**Sports and Entertainment**
Telephone/data entry	Spectator areas
	Disco/dance floors
	Stages, studios

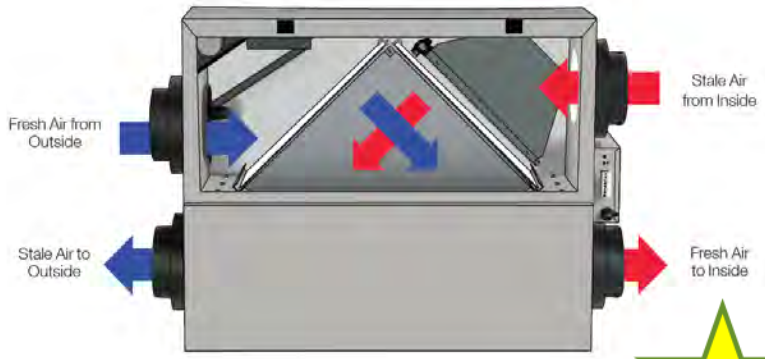
Exhaust Air Energy Recovery Non-Transient Dwelling Units

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
6.5.6.1.1	Mech schedules, specs, supp. calcs

- New energy recovery requirements for *nontransient* dwelling units (apartments & condos)
  - Enthalpy recovery ratio (ERR) at design conditions
    - ≥ 50% ERR at cooling
    - ≥ 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
    - Not required in OR climates for 500ft^2 or less apts

Images courtesy of American Aldes





Exhaust Air Energy Recovery Non-Transient Dwelling Units

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
6.5.6.1.1	Mech schedules, specs, supp. calcs

- Look to Mechanical Code for required ventilation (supply, exhaust) rates
- General requirement to recover energy from point exhaust (kitchen, restrooms) to pre-condition supply air
- Supply and exhaust rates for dwellings are relatively balanced in the mechanical code
- Opportunities for central or individual ERV, based on design preference

TABLE 403.3.1.1 MINIMUM VENTILATION RATES

OCCUPANCY CLASSIFICATION	OCCUPANT DENSITY #/1000 FT² [a]	PEOPLE OUTDOOR AIRFLOW RATE IN BREATHING ZONE, R_p CFM/PERSON	AREA OUTDOOR AIRFLOW RATE IN BREATHING ZONE, R_a CFM/FT² [a]	EXHAUST AIRFLOW RATE CFM/FT² [a]
Private dwellings, single and multiple				
Garages, common for multiple units[b]	—	—	—	0.75
Kitchens[b]	—	—	—	25/150[f]
Living areas[c]	Based on number of bedrooms. First bedroom, 2; each additional bedroom, 1	0.35 ACH but not less than 15 cfm/person	—	—
Toilet rooms and bathrooms[g, i, j]	—	—	—	20/80[f]

- Note: dryer exhaust is independent (OSMC 501.2 *"dryer exhaust shall be independent of all other systems*)

Door Switches

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
6.5.10	Specs, Seq. of Ops, Cx Plan

- New requirement for controls that will, when door is open:
  - Disable heating or adjust setpoint to 55°F within 5 minutes
  - Disable cooling or adjust setpoint to 90°F within 5 minutes
- Exceptions:
  - Entries with automatically closing devices
  - Spaces with no thermostat
  - Alterations to existing buildings
  - Loading docks

Submittals / Completion

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
6.7	Submittals

90.1-2019

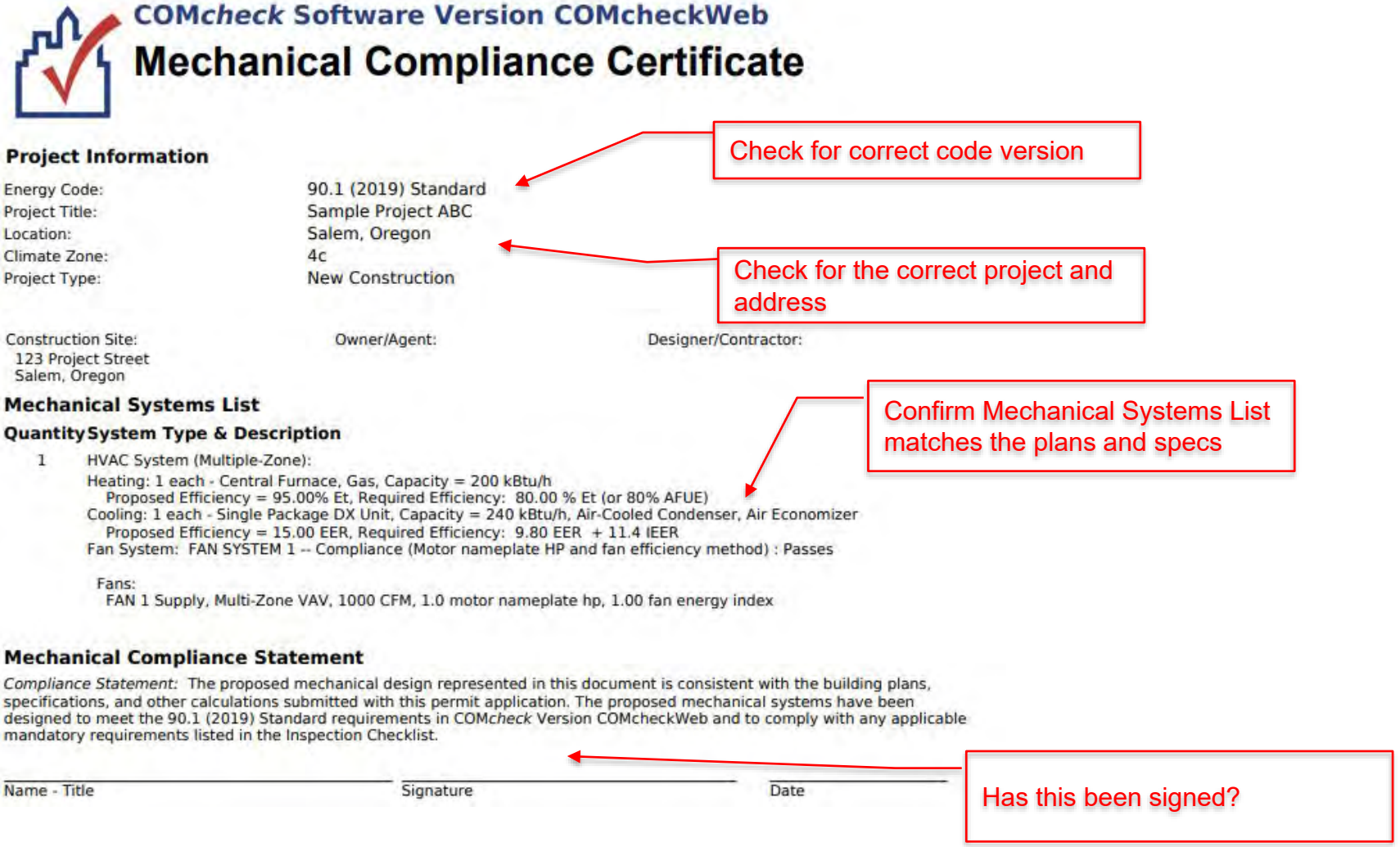
- Construction documents shall require that :
  - within 90 days after system acceptance, record drawings and O&M manual **delivered to owner**
  - All HVAC systems be balanced with generally accepted engineering standards, and air and hydronic systems first balanced to minimize losses and then to meet design flow conditions
  - Written TAB report be **provided to owner** for zones > 5,000 ft^2
  - Detailed **Cx instructions** for HVAC systems shall be provided in the construction documents
  - **General requirement for requirements to be on the plans, but building official shall not require copies of any reports or drawings**

OEESC-2014

- Requirement to provide a means for system balancing
- Requirement to construction documents specify delivery of O&M manual to building owner

HVAC COMcheck

A few items to check first



COMcheck Software Version COMcheckWeb

Mechanical Compliance Certificate

Project Information

Energy Code:	90.1 (2019) Standard
Project Title:	Sample Project ABC
Location:	Salem, Oregon
Climate Zone:	4c
Project Type:	New Construction

Construction Site:
123 Project Street
Salem, Oregon

Owner/Agent:

Designer/Contractor:

Mechanical Systems List

Quantity **System Type & Description**

1 HVAC System (Multiple-Zone):
Heating: 1 each - Central Furnace, Gas, Capacity = 200 kBtu/h
Proposed Efficiency = 95.00% Et, Required Efficiency: 80.00 % Et (or 80% AFUE)
Cooling: 1 each - Single Package DX Unit, Capacity = 240 kBtu/h, Air-Cooled Condenser, Air Economizer
Proposed Efficiency = 15.00 EER, Required Efficiency: 9.80 EER + 11.4 IEER
Fan System: FAN SYSTEM 1 -- Compliance (Motor nameplate HP and fan efficiency method) : Passes

Fans:
FAN 1 Supply, Multi-Zone VAV, 1000 CFM, 1.0 motor nameplate hp, 1.00 fan energy index

Mechanical Compliance Statement

Compliance Statement: The proposed mechanical design represented in this document is consistent with the building plans, specifications, and other calculations submitted with this permit application. The proposed mechanical systems have been designed to meet the 90.1 (2019) Standard requirements in COM*check* Version COMcheckWeb and to comply with any applicable mandatory requirements listed in the Inspection Checklist.

Name - Title _____ Signature _____ Date _____

Check for correct code version

Check for the correct project and address

Confirm Mechanical Systems List matches the plans and specs

Has this been signed?

HVAC COMcheck

A few items to check first

COMcheck Software Version COMcheckWeb

Inspection Checklist

Energy Code: 90.1 (2019) Standard

Requirements: 8.0% were addressed directly in the COMcheck software

Text in the "Comments/Assumptions" column is provided by the user in the COMcheck Requirements screen. For each requirement, the user certifies that a code requirement will be met and how that is documented, or that an exception is being claimed. Where compliance is itemized in a separate table, a reference to that table is provided.

Section # & Req.ID	Plan Review	Complies?	Comments/Assumptions
4.2.2, 6.4.4.2.1, 6.7.2 [PR2][1]	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the mechanical systems and equipment and document where exceptions to the standard are claimed. Load calculations per acceptable engineering standards and handbooks.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** *** Note from Engineer, Architect, Designer, etc. about where to find documentation on plans for specs of code compliance. ***
4.2.5.2 [PR5][1]	Commissioning shall be performed as stated in Sections 5.9.2, 6.9.2, 7.9.2, 8.9.2, 9.9.2, 10.9.2, 11.2(d), and G1.2.1(c). Commissioning must utilize ASHRAE/IES Standard 202 or other generally accepted engineering standards acceptable to the building official. FPT and verification requirements for commissioning are as stated in Section 4.2.5.1. Commissioning shall document compliance of the building systems, controls, and building envelope with required provisions of this standard. Commissioning requirements shall be incorporated into the construction documents.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

Are reference comments complete?

Is “Requirement will be met” listed?

Misc. Equipment

Elevators

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
10.4.3	Specialty dwgs, specs

- OEESC referenced Oregon Elevator Specialty Code, primarily focused on life safety
- 90.1 lists several efficiency requirements:
  - **Lighting:** *luminaires* in each elevator cab, not including signals and displays, the sum of the lumens divided by the sum of the watts shall be no less than 35 lm/W
  - **Mechanical:** *ventilation* fans for elevators without air conditioning shall not consume over 0.33 W/cfm at maximum speed
  - **Standby Mode:** When stopped and unoccupied with *doors* closed for over 15 minutes, cab interior lighting and *ventilation* shall be de-energized until required for operation
  - **Documentation**: Design docs need to list use category and energy efficiency class A-G (per ISO 25745-2, Table 7)

Whole Building Monitoring

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
10.4.6	Specialty, dwgs, Specs, Seq. of Ops.

- Measurement devices shall be installed to monitor the *building* use of the following types of *energy* supplied by a utility, *energy* provider, or plant that is not within the *building*:
  - Natural gas.
  - *Fuel* oil.
  - Propane.
  - Steam.
  - Chilled water.
  - Hot water.

Whole Building Monitoring – Recording & Reporting

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
10.4.5.2	Specialty, dwgs, Specs, Seq. of Ops.

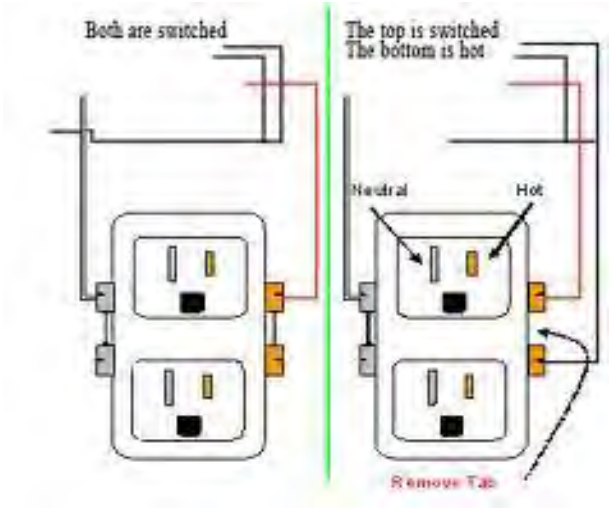
- The *energy* use of each *building* on the *building* site shall be recorded at a minimum of every 60 minutes and reported at least hourly, daily, monthly, and annually. The *system* shall be capable of maintaining all data collected for a minimum of 36 months and creating user reports showing at least hourly, daily, monthly, and annual *energy* consumption and *demand*.
- **Exceptions**:
  - *Buildings* or additions < 25,000 ft^2.
  - Individual tenant *spaces* < 10,000 ft^2.
  - *Dwelling units*.
  - *Residential buildings* with < 10,000 ft^2 of common area.
  - *Fuel* used for on-site emergency *equipment*.

Power

Automatic Receptacle Control

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
8.4.2	Elec. dwgs, specs.

- Min 50% receptacles in private offices, conference rooms, printing rooms, break rooms, open offices and classrooms required to be controlled by auto device (timeclocks or occ sensors)
- 25% of branch circuits for modular furniture
- Power strips with integrated occ sensor doesn't comply
- Controlled receptacles must be marked and uniformly distributed



Automatic Receptacle Control

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
8.4.2	Elec. dwgs, specs.

- Controlled by one of the following:
  - scheduled time-of-day that turns receptacles off at specific programmed times
    - » an independent program schedule shall be provided for controlled areas of no more than 5000 ft^2 and not more than one *floor* (the occupant shall be able to manually override the *control device* for up to two hours);
  - an *occupant sensor* to turn receptacles off within 20 minutes of all occupants leaving a *space*; or
  - *control* or alarm *system* that turns receptacles off within 20 minutes after determining that the area is unoccupied.
- Controlled receptacles must be clearly marked to differentiate from a standard receptacle

Automatic Receptacle Control

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
8.4.2	Elec. dwgs, specs., OEESC form, COMcheck

- A few exceptions
- Receptacles for the following shall not require an *automatic control device*:
  1. Receptacles specifically designated for *equipment* requiring continuous operation (24/day, 365 days/year).
  2. *Spaces* where an *automatic control* would endanger the safety or security of the room or *building* occupants.
  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%.

Unique Oregon Exception

Electrical Energy Monitoring

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
8.4.3.1	Elec. dwgs, specs

- Measurement devices shall be installed in new *buildings* to monitor the electrical *energy* use for each of the following separately:
  a. Total electrical energy
  b. HVAC systems
  c. Interior lighting
  d. Exterior lighting
  e. Receptacle circuits

- For buildings with multiple tenants, the above must be separately monitored for total building and for each tenant (excluding shared systems)

Exception:
- up to 10% of each separate load (other than total) can be from other electrical loads

Electrical Energy Reporting

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
8.4.3.2	Elec. dwgs, specs

- Energy use must be automatically recorded a minimum of every 15 minutes
- Use must be reported at least hourly, daily, monthly, and annually
- Data for tenants must be made available to that tenant
- Buildings with BMS need to graphically display energy use data and retain data for at least 36 months

Electrical Energy Monitoring & Reporting

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
8.4.3.2	Elec. dwgs, specs

- **Exceptions to Sections 8.4.3.1 and 8.4.3.2**
  1. *Building* less than 25,000 ft^2.
  2. Individual tenant *spaces* less than 10,000 ft^2.
  3. *Dwelling units*.
  4. *Residential buildings* with less than 10,000 ft^2 of common area.
  5. Critical and *Equipment* branches of NEC Article 517.

Lighting

New Compliance Method for Lighting in Simple Buildings

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
9.3	OEESC form, elec. dwgs

- Allowed if at least 80% of floor area is office, retail, or school
- Can be used for new buildings or tenant improvements < 25,000 ft^2
- Single interior and exterior LPD targets that cover the entire building, LPAs are sometimes lower than prescriptive requirements
- 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**

New Compliance Method for Lighting in Simple Buildings

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
Table 9.3.1	N/A

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

Interior *Space* Type	Interior Lighting Power Allowance	*Controls* [a]
All *spaces* in school *buildings* other than parking garages, stairwells, and corridors	0.70 W/ft^2	All lighting shall be *automatically* controlled to turn off when the *building* is either unoccupied or scheduled to be unoccupied. (**Exception:** Lighting load not exceeding 0.02 W/ft^2 multiplied by the gross lighted area of the *building* shall be permitted to operate at all times.) Each *space* shall have a *manual control* 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^2	These *spaces* shall also be controlled by *manual-ON occupant sensors*.
Gymnasiums and cafeterias	0.70 W/ft^2	These *spaces* shall also be controlled by *occupant sensors*.
Restrooms	0.70 W/ft^2	These *spaces* shall also be controlled by *occupant sensors*.
Stairwells and corridors in school *buildings* and parking garages	0.70 W/ft^2	These *spaces* shall also be controlled by *occupant sensors* 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 *building* is either unoccupied or scheduled to be unoccupied.
Parking garages	0.13 W/ft^2	All lighting shall be *automatically* controlled to turn off during garage nonoperating hours. Lighting shall also be controlled by *occupant sensors*. *Controls* 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^2.

a. All lights in the space shall be controlled.

New Compliance Method for Lighting in Simple Buildings

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
Table 9.3.2	N/A

Table 9.3.2 Simplified Building Method for *Building* Exteriors

Exterior Area Type	*Exterior Lighting Power Allowance*[a,b]	*Controls*[c]
Base allowance	200 W	*Luminaires* 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^2	*Luminaires* shall be turned off or the power reduced by a minimum of 75% during nonoperating hours.
Landscape	0.04 W/ft^2	*Luminaires* shall be turned off or the power reduced by a minimum of 75% during nonoperating hours.
Entry doors	14 W/linear foot	*Luminaires* shall be turned off or the power reduced by a minimum of 75% during nonoperating hours.
Stairs and ramps	0.7 W/ft^2	No additional *controls* required.
Parking lots and drives	0.05 W/ft^2	*Luminaires* 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^2	*Luminaires* 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^2 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^2. 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.

OEESC Simplified Lighting Form

Simplified Building Method—Lighting Compliance Checklist

2021 Oregon Energy Efficiency Specialty Code Compliance

This checklist can be used to demonstrate compliance with the Simplified Building Method, Section 9.3 of the Oregon Energy Efficiency Specialty Code (OEESC)/ASHRAE Standard 90.1 in either office buildings, retail buildings, or school buildings. This form is in addition to the COM*check* compliance report.

Notes:
1. For the Simplified Building Method, the building shall be less than 25,000 ft^2.
2. Lighting Compliance Checklist is not required to be submitted
3. Certificate may show lighting results as "FAILS"
4. Report must be for Building Area Method, not Area Category (Space-by-Space)

PART I – PROJECT INFORMATION

Title/Site/Permit name:

Floor area:

PART II – COMPLIANCE

Lighting power allowance: The total lighting power allowance (W/ft^2) for the building shall be less than the allowance from Tables 9.3.1-1 through 9.3.1-3.

Building type: Select the building type, which shall not be less than 80% of the total building conditioned floor area.

- ☐ **Office** Allowed lighting power: 0.70 W/ft^2
- ☐ **Retail** Allowed lighting power: 1.0 W/ft^2
- ☐ **School** Allowed lighting power: 0.70 W/ft^2
- ☐ **Garage** Allowed lighting power: 0.13 W/ft^2 (must be associated with occupancy listed above)

COM*check* Interior Lighting Compliance Certificate results:

Enter the specified results from the COM*check* Interior Lighting Compliance Certificate.

*No exemptions or allowances are permitted

1. Proposed Interior Lighting Power (Total) _____ Watts
2. Building floor area from COM*check* report: _____ ft^2
3. Lighting Power Density (Total W /Floor Area): _____ W/ ft^2 (Divide line 1 by line 2)

* The Lighting Power Density must be less than the allowed lighting power for the building type as noted above.

Where an interior garage is provided, repeat the calculation: 1. _____ Watts 2. _____ ft^2 3. _____ W/ft^2

☐ **Check if the proposed interior lighting power density does not exceed the Section 9.3.1 allowances.**

- Oregon still requires a designer run the design through COMcheck, but it's ok if it "fails"
- Indicate LPD for whole building, not space-by-space
- Use COMcheck total watts/bldg. floor area to show compliance

OEESC Simplified Lighting Form

IIIA. OFFICE BUILDINGS—SIMPLIFIED BUILDING METHOD (TABLE 9.3.1-1)

Automatic controls—All spaces in an office building, other than parking garages, stairwells, and corridors, require automatic controls to turn off lighting when the building is either unoccupied or scheduled to be unoccupied, **except** that lighting loads not exceeding 0.02 W/ft^2 multiplied by the gross lighted area of the building shall be permitted to operate at all times.

Use the following checklist to demonstrate compliance with the lighting control requirements in each interior space type.

	Interior Space Type	Controls (All lighting shall be controlled)	Location on the plans
☐	Office spaces ≤ 250 ft^2 Classrooms Conference rooms Meeting rooms Training rooms Storage rooms Break rooms	☐ Automatic controls turn all lighting off when building is unoccupied or scheduled to be unoccupied **OR** ☐ Exception: Lighting loads not exceeding 0.02 W/ft^2 × gross lighted area operate at all times ☐ Manual control device that allows the occupant to reduce lighting power by a minimum of 50% and to turn the lighting off ☐ Manual-ON occupancy sensors	
☐	Office spaces > 250 ft^2 Restrooms	☐ Automatic controls to turn lighting off when building is unoccupied or scheduled to be unoccupied **OR** ☐ Exception: Lighting loads do not exceed 0.02 W/ft^2 × gross lighted area ☐ Manual control device that allows the occupant to reduce lighting power by a minimum of 50% and to turn the lighting off. ☐ Occupancy sensors (May be automatic ON)	
☐	Stairwells and corridors in office buildings	☐ Automatic controls to turn lighting off when building is unoccupied or scheduled to be unoccupied **OR** ☐ Exception: Lighting loads do not exceed 0.02 W/ft^2 × gross lighted ☐ Occupancy sensor to reduce the power by a minimum of 50% after no activity is detected for not longer than 20 minutes	
☐	Parking garages	☐ Automatic controls to turn lighting off during nonoperating hours. ☐ Occupancy sensors to reduce the power by a minimum of 50% after no activity is detected for not longer than 20 minutes No device shall control more than 3600 ft^2	

- Simple check of which controls are being used for each area
- Each bldg. type has different list of spaces/reqmnts

LPD - Building Area Method

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
Table 9.5.1	COMcheck form, Elec. schedules, specs

Building Area Type[a]	LPD, W/ft²
Automotive facility	0.75
Convention center	0.64
Courthouse	0.79
Dining: Bar lounge/leisure	0.80
Dining: Cafeteria/fast food	0.76
Dining: Family	0.71
Dormitory	0.53
Exercise center	0.72
Fire station	0.56
Gymnasium	0.76
Health-care clinic	0.81
Hospital	0.96
Hotel/motel	0.56
Library	0.83
Manufacturing facility	0.82
Motion picture theater	0.44
Multifamily	0.45
Museum	0.55
Office	0.64
Parking garage	0.18
Penitentiary	0.69
Performing arts theater	0.84
Police station	0.66
Post office	0.65
Religious facility	0.67
Retail	0.84
School/university	0.72
Sports arena	0.76
Town hall	0.69
Transportation	0.50
Warehouse	0.45
Workshop	0.91

- **Building area LPDs** – Almost all reduced as much as **34%** with overall avg reduction across all building types of **12%**
- Some went down compared to 90.1-2016

Building Area Method – Lighting Power Densities (w/sq. ft.)

Building Type	90.1 2016		90.1 2019
Office	0.79	⇨	0.64
Hotel/Motel	0.75	⇨	0.56
Manufacturing Facility	0.90	⇨	0.82
Parking Garage	0.15	⇨	0.18
Retail	1.06	⇨	0.84
School/University	0.81	⇨	0.72
Warehouse	0.48	⇨	0.45

LPD - Space-By-Space Method

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
Table 9.6.1	COMcheck form, Elec. schedules, specs

Space-by-Space LPDs – Average LPD reduction from 2016: **5%**

The *control* functions below shall be implemented in accordance with the descriptions found in the referenced paragraphs within Section 9.4.1.1 For each *space* type:
(1) All REQs shall be implemented.
(2) At least one ADD1 (when present) shall be implemented.
(3) At least one ADD2 (when present) shall be implemented.

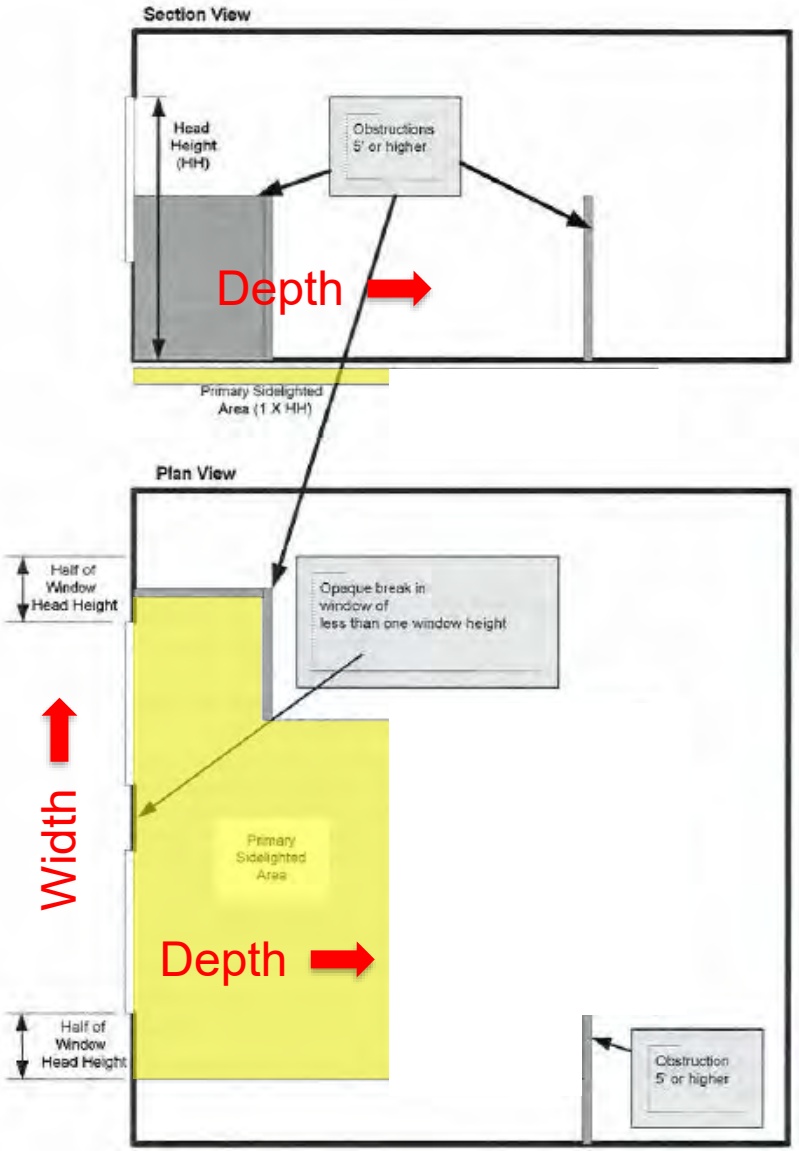
Informative Note: This table is divided into two sections; this first section covers *space* types that can be commonly found in multiple *building* types. The second part of this table covers *space* types that are typically found in a single *building* type.

Common *Space* Types[1]	*LPD* Allowances, W/ft²	*RCR* Threshold	a Local *Control* (See Section 9.4.1.1[a])	b Restricted *Manual* O… (See Sect… 9.4.1.1[b])					h *Automatic* Full OFF (See Section 9.4.1.1[h])	i Scheduled Shutoff (See Section 9.4.1.1[i])
Atrium										
<20 ft in height	0.39	NA	REQ	ADD1					ADD2	ADD2
≥20 ft and ≤40 ft in height	0.48	NA	REQ	ADD1					ADD2	ADD2
>40 ft in height	0.60	11	REQ	ADD1					ADD2	ADD2
Audience Seating Area										
Auditorium	0.61	6	REQ	ADD1					ADD2	ADD2
Gymnasium	0.23	6	REQ	ADD1					ADD2	ADD2
Motion picture theater	0.27	4	REQ	ADD1					ADD2	ADD2
Penitentiary	0.67	4	REQ	ADD1					ADD2	ADD2
Performing arts theater	1.16	8	REQ	ADD1	ADD1	REQ	REQ	REQ	ADD2	ADD2
Religious facility	0.72	4	REQ	ADD1	ADD1	REQ	REQ	REQ	ADD2	ADD2
Sports arena	0.33	4	REQ	ADD1	ADD1		REQ	REQ	ADD2	ADD2
All other audience seating areas	0.23	4	REQ	ADD1	ADD1		REQ	REQ	ADD2	ADD2

Space-by-Space Method – Lighting Power Densities (w/sq. ft.)

Space Type	90.1 2016		90.1 2019
Office, open plan	0.81	⇨	0.61
Guest room	0.77	⇨	0.41
Lobby, hotel	1.06	⇨	0.51
Parking area, interior	0.14	⇨	0.15
Retail sales Area	1.22	⇨	1.05
Classroom/lecture/training	0.92	⇨	0.71
Warehouse, med. To bulky items	0.35	⇨	0.33

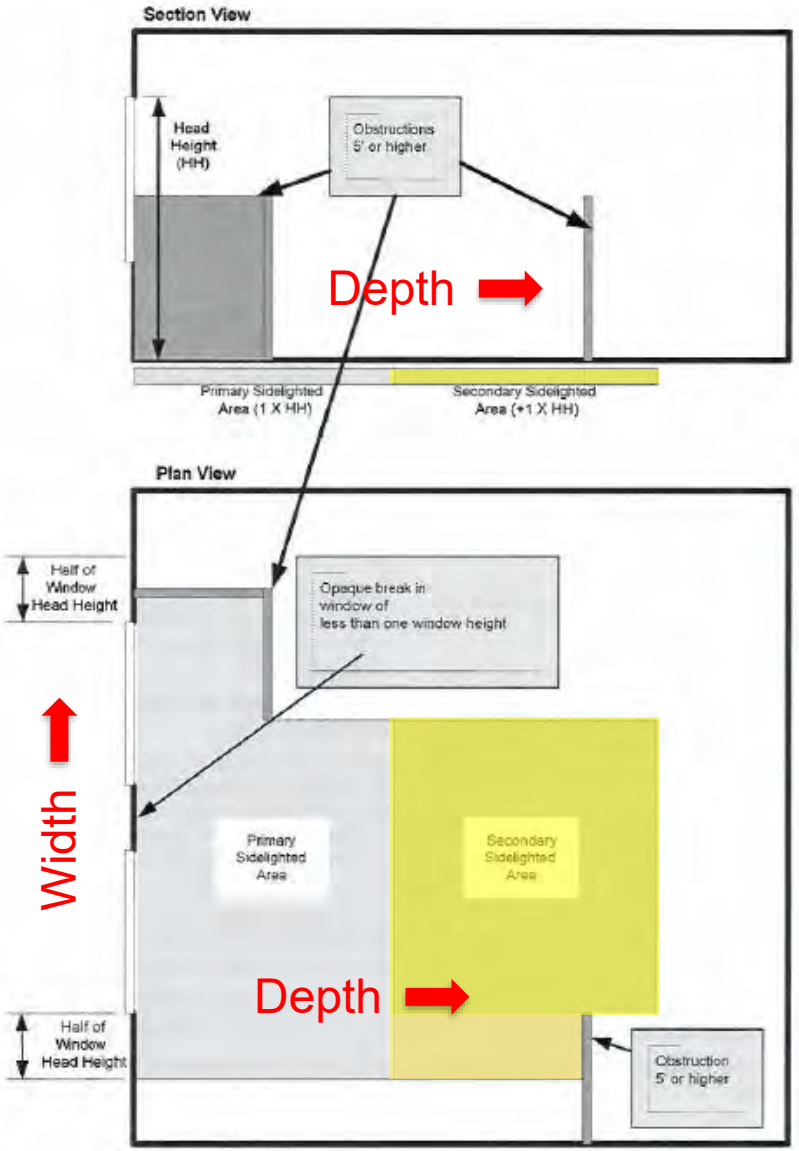
Primary Sidelighted Area



2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
Section 9.4.1.1 [e] & [f]	Supp. calcs.

- **Width** = width of vertical fenestration plus, on each side, the smaller of:
  - half of vertical fenestration floor-to-head height or
  - the distance to any 5 ft or higher vertical obstruction
- **Depth** = horizontal distance perpendicular to vertical fenestration; begins at glazed wall, ends at the smaller of:
  - one vertical fenestration floor-to-head height or
  - the distance to any 5 ft or higher opaque vertical obstruction.

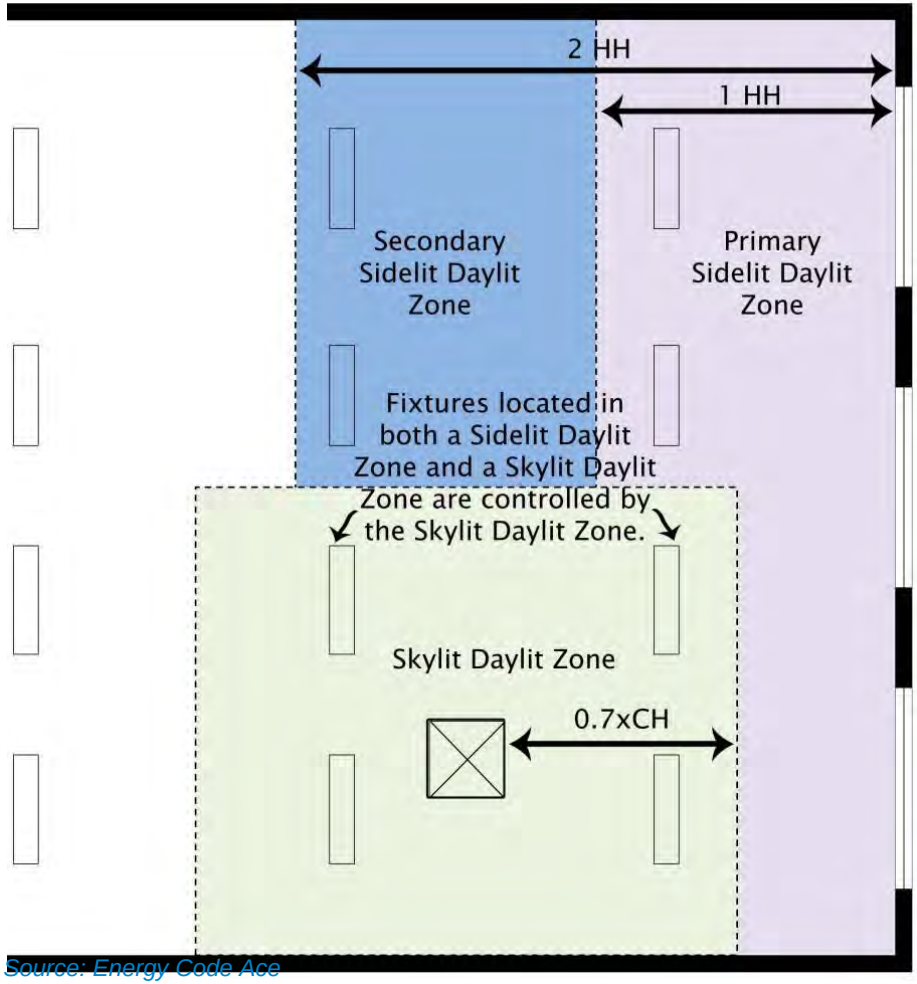
Secondary Sidelighted Area



2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
Section 9.4.1.1 [e] & [f]	Supp. calcs.

- **Width** = width of vertical fenestration plus, on each side, the smaller of:
  - half of vertical fenestration floor-to-head height or
  - the distance to any 5 ft or higher vertical obstruction
- **Depth** = horizontal distance perpendicular to vertical fenestration; begins at edge of primary sidelighted area depth, ends at the smaller of:
  - one vertical fenestration floor-to-head height or
  - the distance to any 5 ft or higher opaque vertical obstruction.

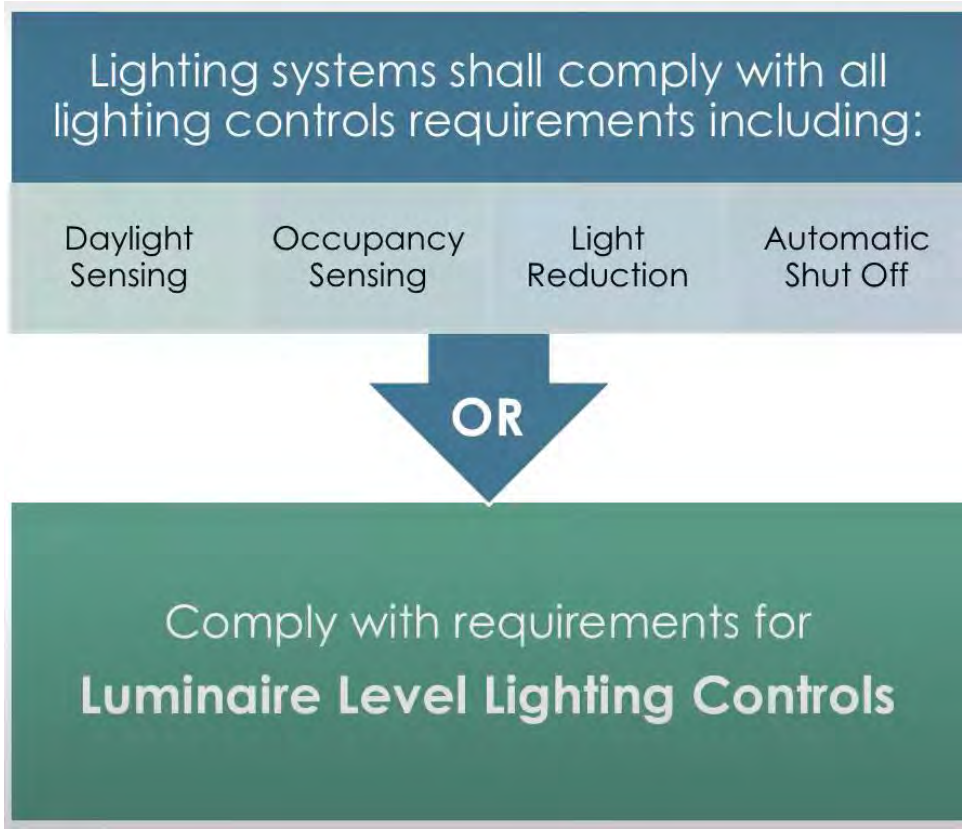
Sidelighting Zones on Plans



Source: Energy Code Ace

- Clearly delineating zones speeds up review time
- Lighting controls an increasing area of scrutiny with code officials
- Other controls may be required in addition to daylighting

Luminaire Level Lighting Controls



- LLLC can be incorporated as a compliance strategy to meet control requirements, including:
  - Partial automatic on
  - Bilevel lighting control
  - Automatic daylight control
  - Automatic partial/full off
  - Scheduled shutoff

Dwelling Units

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
Section 9.4.3	COMcheck forms, lighting plans, specs

- 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. Dwelling unit floor area shall be excluded from total building floor area under the Building Area Compliance Method (9.5.1).

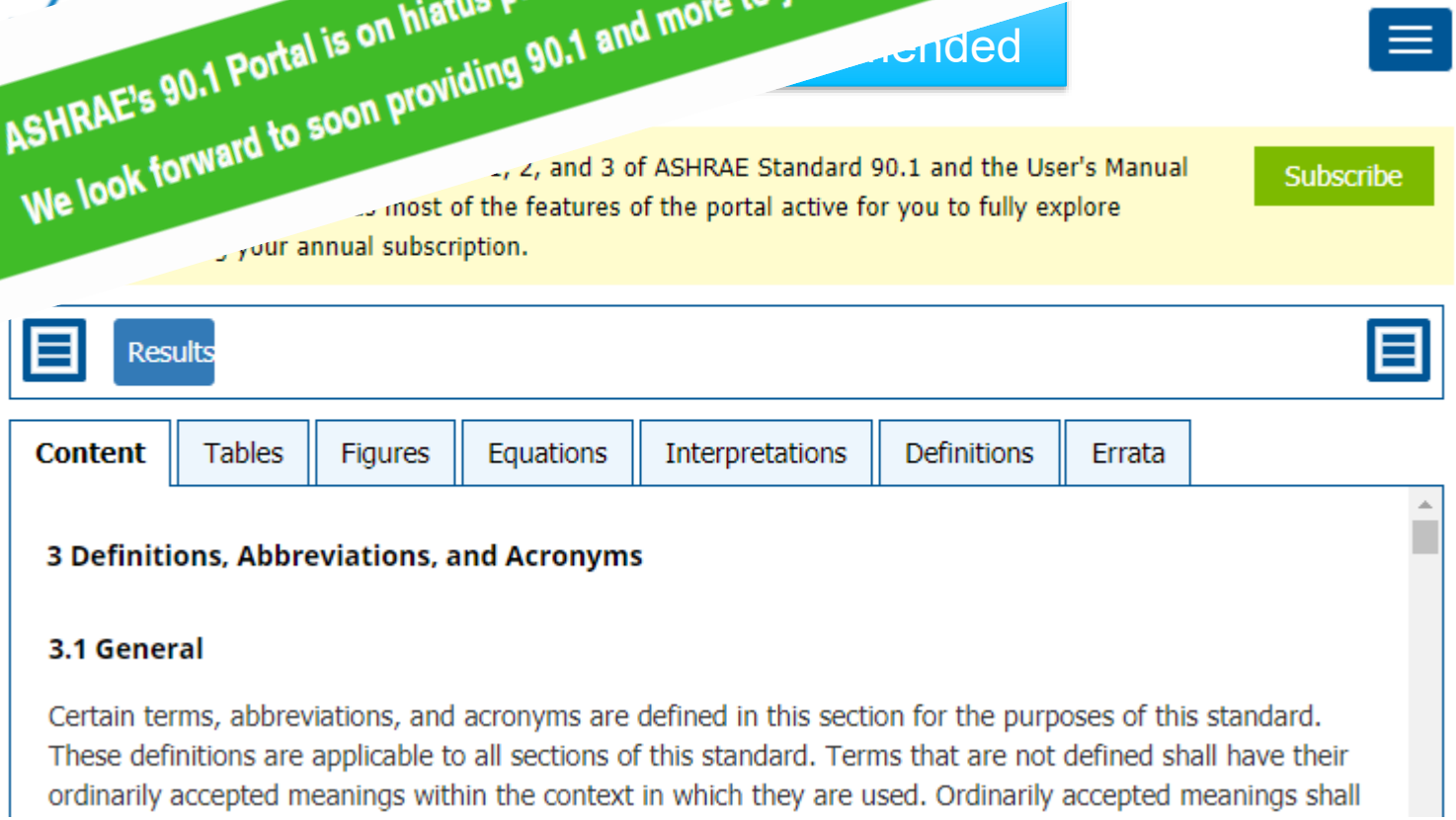
- Exceptions:
  1. Lighting that is controlled with dimmers or controlled in accordance with Section 9.4.1.1(h). (Auto-off)
  2. Hotel/motel guest rooms. The requirements for hotel/motel guest rooms are covered in Table 9.6.1 and Section 9.4.1.3(b).

Resources & Open Discussion

ASHRAE 90.1 Portal

ASHRAE 90.1 online portal (annual s
https://www.ashrae.org/technical-resour
Includes user's manu

ASHRAE's 90.1 Portal is on hiatus pending a redesign, expansion, and relaunch at an undetermined future date.
We look forward to soon providing 90.1 and more to you bigger and better than ever.



ASHRAE 90.1-2019 Addenda

- ASHRAE publishes adopted addenda to its standards
  - Clarifications as well as new requirements
- Typically rolled into next update of the standard
- OR does not adopt published addenda outright
  - Will be part of discussion for OR adoption of 90.1-2022 when released
- Gives you a sense of forthcoming changes

https://www.ashrae.org/technical-resources/standards-and-guidelines/standards-addenda/addenda-to-standard-90-1-2019

ASHRAE 90.1-2019 Addenda

- Example: Simplified building path requirements will now apply to smaller HVAC systems

Addendum c to Standard 90.1-2019

Revise Sections 6.3.2 and 6.4.3.3 of the Standard as shown (I-P and SI).

6.3.2 Criteria. The *HVAC system* must meet all of the following criteria:

[. . .]

j. *Systems* serving *spaces* other than ~~hotel/motel guest rooms~~*residential spaces*, ~~and other than those~~ that do not requir~~ing~~ continuous operation~~, which have both~~ with a cooling or heating capacity greater than ~~15,000~~ 7000 Btu/h (2.1 kW) ~~and a supply fan motor power greater than 0.75 hp, shall be provided with a time clock that (1) can start and stop the *system* under different schedules for seven different day types per week, (2) is capable of retaining programming and time setting during a loss of power for a period of at least ten hours, (3) includes an accessible *manual* override that allows temporary operation of the *system* for up to two hours, (4) is capable of and configured with temperature *setback* down to 55°F during off hours, and (5) is capable of capable of and configured with temperature setup to 90°F during off hours.~~ shall comply with Sections 6.4.3.3.1 and 6.4.3.3.2.

k. *Systems* serving *residential spaces* other than hotel/motel guest rooms shall comply with Section 6.4.3.3.1 and 6.4.3.3.2 except for electric resistance heaters rated at 1.5 kW or less with a *readily accessible manual control* that lowers the *set point* or turns the unit off.

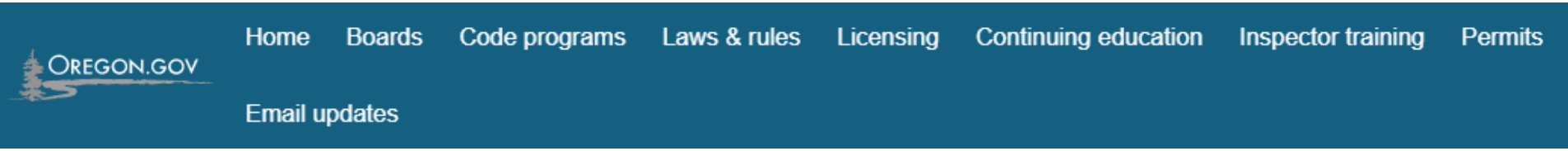
l. *Systems* serving hotel/motel guest rooms shall comply with Section 6.4.3.3.5.

[. . .]

Forthcoming Changes

- ASHRAE 90.1-2022 will include changes such as:
  - Daylighting controls apply to lower wattage thresholds
    - » Primary zone: 75W down from 150W
    - » Secondary zone: 150W down from 300W
  - Closing loophole on lighting alterations. (Addendum p)
    - » Retrofitting a luminaire for which the original lamps and ballast/driver are replaced with a new lamp/light source and driver/ballast that was not a component of the original luminaire shall be considered an alteration.
  - Reduces the track lighting requirement from 30 W/lin ft to 10 W/lin ft
  - Improvements to elevator fan, lighting, and movement efficiencies
  - Adds prescriptive requirements for on-site renewables (Addendum by)
    - » Site shall have equipment for on-site renewable energy with a rated capacity of not less than 0.25 W/ft² or 0.85 Btu/ ft².
  - Adds definition of insulated metal panels and new section to clarify how to determine U-factor of IMPs
  - Numerous clarifications and better alignment with the performance paths in Section 11 and Appendix G

BCD Code Resources



Adopted commercial energy code

2021 Oregon Energy Efficiency Specialty Code (OEESC)
Chapter 13 of the Oregon Structural Specialty Code (OSSC)

- Effective April 1, 2021
- Phase-in period ends Oct. 1, 2021
- Based on ASHRAE Standard 90.1-2019
- Significant changes summary

Compliance forms and resources

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

- Oregon energy efficiency compliance form
- COM*check* supplement form
- Blower door results reporting
- Simplified building method - Lighting compliance
- Simplified building method - Envelope
- Simplified building method - Mechanical compliance

Use the following resources to complete the compliance form:

- Commercial compliance using COM*check*
- COM*check* web
- Zero Code calculator

Code update training

- 2021 OEESC update training video
- Significant changes summary
- Code adoption process and information

ASHRAE 90.1-2019 resources

- ANSI/ASHRAE/IES Standard 90.1-2019 Envelope
- ANSI/ASHRAE/IES Standard 90.1-2019 HVAC
- ANSI/ASHRAE/IES Standard 90.1-2019 Lighting
- US Department of Energy Building Energy Codes Training

https://www.oregon.gov/bcd/codes-stand/Pages/energy-commercial-compliance.aspx

ODOE Code Resources

OREGON.GOV

Home | Boards | Code programs | Laws & rules | Licensing | Continuing education | Inspector training | Permits

Email updates

To build smart and conserve energy, Oregon has developed energy codes and standards for buildings.

Oregon's building codes are administered by the state Building Codes Division, including the:

- 2021 Oregon Efficiency Specialty Code (OEESC): The 2021 OEESC, based on ASHRAE Standard 90.1-2019, became effective on April 1, 2021. This code becomes mandatory after the six-month phase-in period ends on Oct. 1, 2021. More information can be found on the Oregon Building Codes Division Energy Code Program page.
- 2021 Oregon Residential Specialty Code (ORSC), which in Chapter 11 contains the residential building energy provisions. The 2021 ORSC became effective on April 1, 2021, and will become mandatory after a similar 6 month phase in as the commercial energy code. During the phase-in period, use of the 2017 ORSC with the 2021 ORSC Chapter 1 or the 2021 ORSC in its entirety is permitted.

These codes outline energy efficiency requirements for Oregon buildings. The codes cover insulation, equipment, windows, lighting, and much more.

TRAINING RESOURCES

- Commercial Building Codes
- Residential Building Codes
- Residential- Earth Advantage ORSC HVAC Training Slides

GENERAL RESOURCES

- Oregon Building Codes Division-Energy Code Program
- Oregon Energy Building Code Stakeholder Panel
- Built Environment Efficiency Working Group
- Northwest Energy Efficiency Alliance
- USDOE Energy Code Map
- International Energy Conservation Code
- ASHRAE Standard 90.1

Ask an Energy Code Question Through Our Customer Service Portal

https://www.oregon.gov/energy/energy-oregon/Pages/Energy-Code.aspx

neea

Oregon Code Update Cycle

2019 OZERCC / ASHRAE 90.1-2016

Commercial energy provisions - Effective Oct. 1, 2019

2021 OEESC / ASHRAE 90.1-2019

Commercial energy provisions - Effective April 1, 2021, with phase-in period

View the code update training video

> **Phase-in period - April 1 to Sept. 30, 2021**
> Use of one of the following is permitted:
> - The 2019 OZERCC
> - The 2021 OEESC

2021 OEESC / ASHRAE 90.1-2019

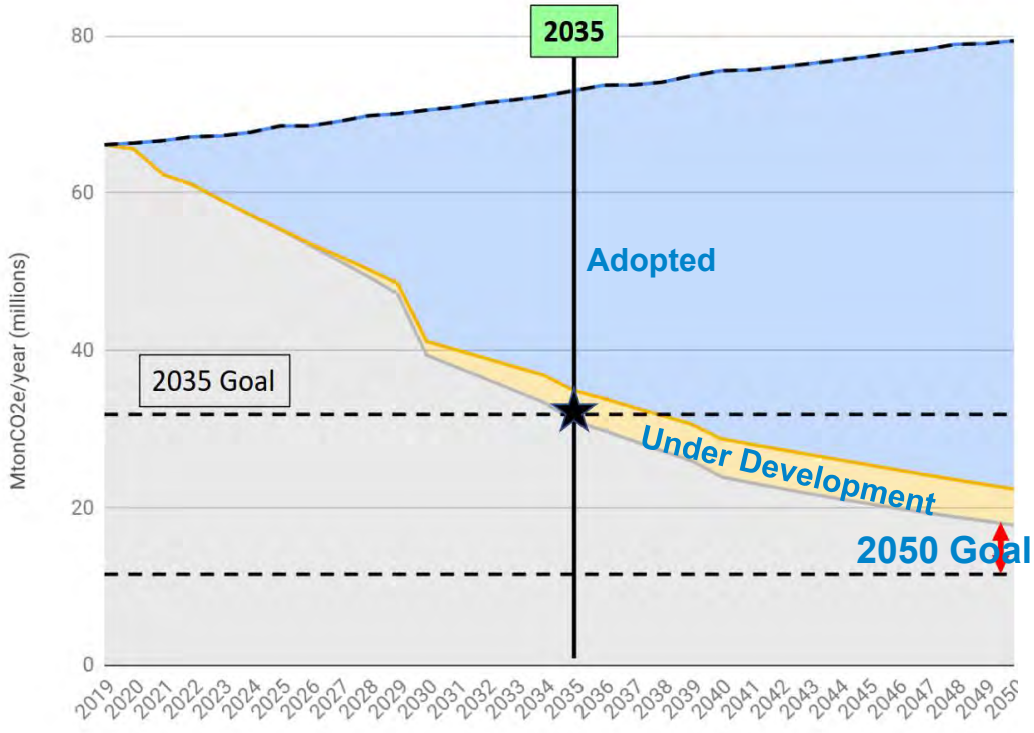
Mandatory Oct. 1, 2021

- Codes updated every 3 years
- OR begins new cycle after DOE finalizes rule
  - Typically within 18 months after new version of ASHRAE released
  - Aligns with federal standards, provides COMcheck support
- 90.1-2022 expected Q4 of 2022
  - Likely to start the OR code update cycle 2023 for adoption in 2024

Why Building Code Updates Matter

- Improve the energy efficiency and reduce the associated GHG emissions of new building stock
- Critical piece of broader greenhouse gas reduction goals
- Combined with many other generation and demand side efficiency and renewable initiatives, contribute to progress toward goals

"Roadmap to 2035"



July 13, 2022 Oregon Global Warming Commission Meeting, https://www.keeporegoncool.org/meetings

Thank You!
Questions?

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