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
Proudly Operated by Battelle Since 1965

U.S. DEPARTMENT OF ENERGY

ASHRAE Oregon Chapter

https://www.energycodes.gov

https://www.orashrae.org/

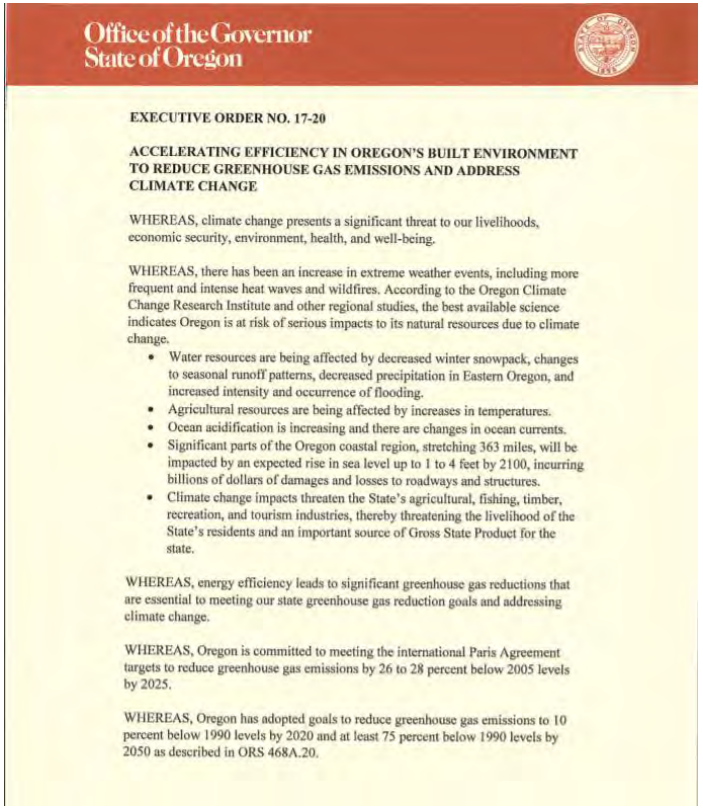
BCD Building Codes Division
Better Buildings for Oregon

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

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.

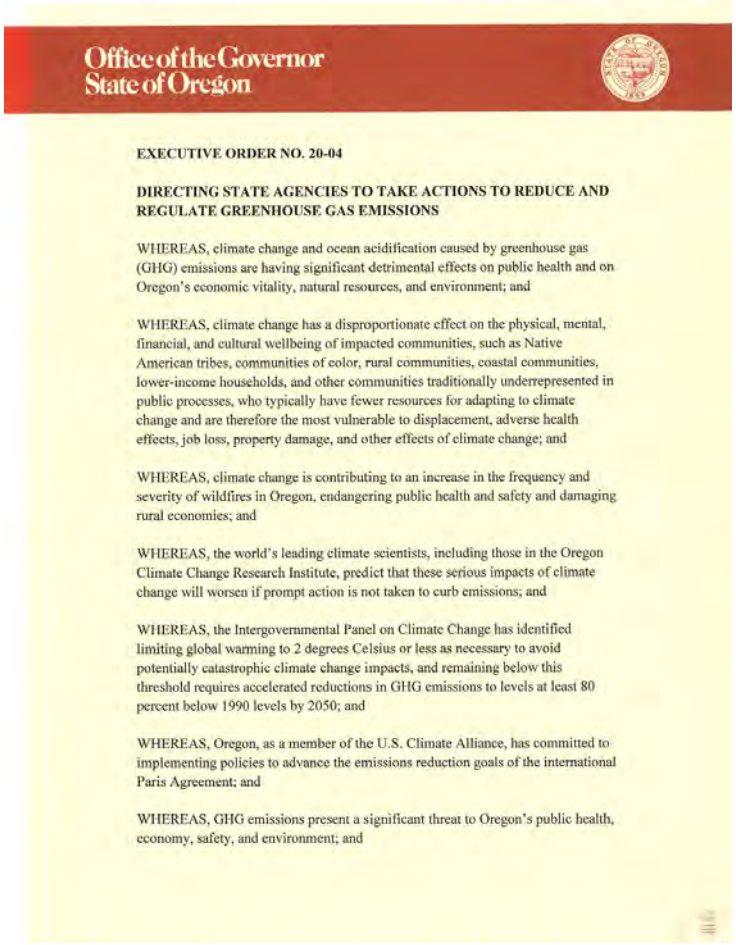
WHEREAS, Oregon has adopted goals to reduce greenhouse gas emissions to 10 percent below 1990 levels by 2020 and at least 75 percent below 1990 levels by 2050 as described in ORS 468A.20.

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

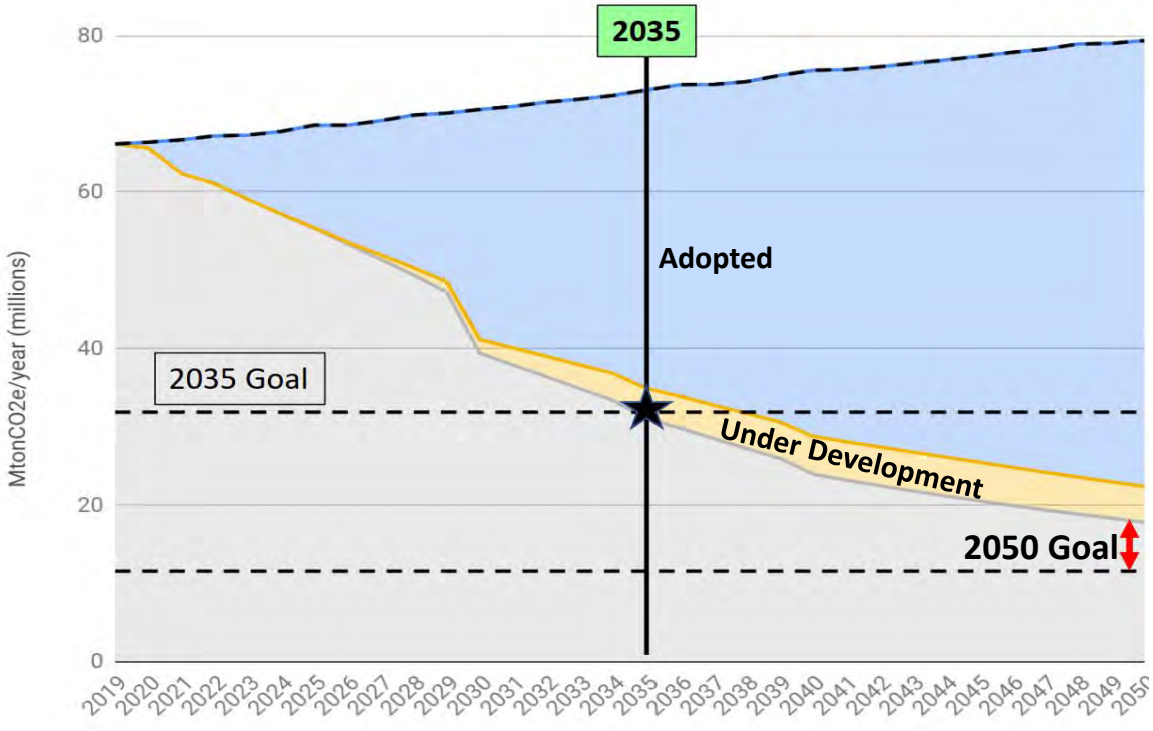
WHEREAS, Oregon, as a member of the U.S. Climate Alliance, has committed to implementing policies to advance the emissions reduction goals of the international Paris Agreement; and

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

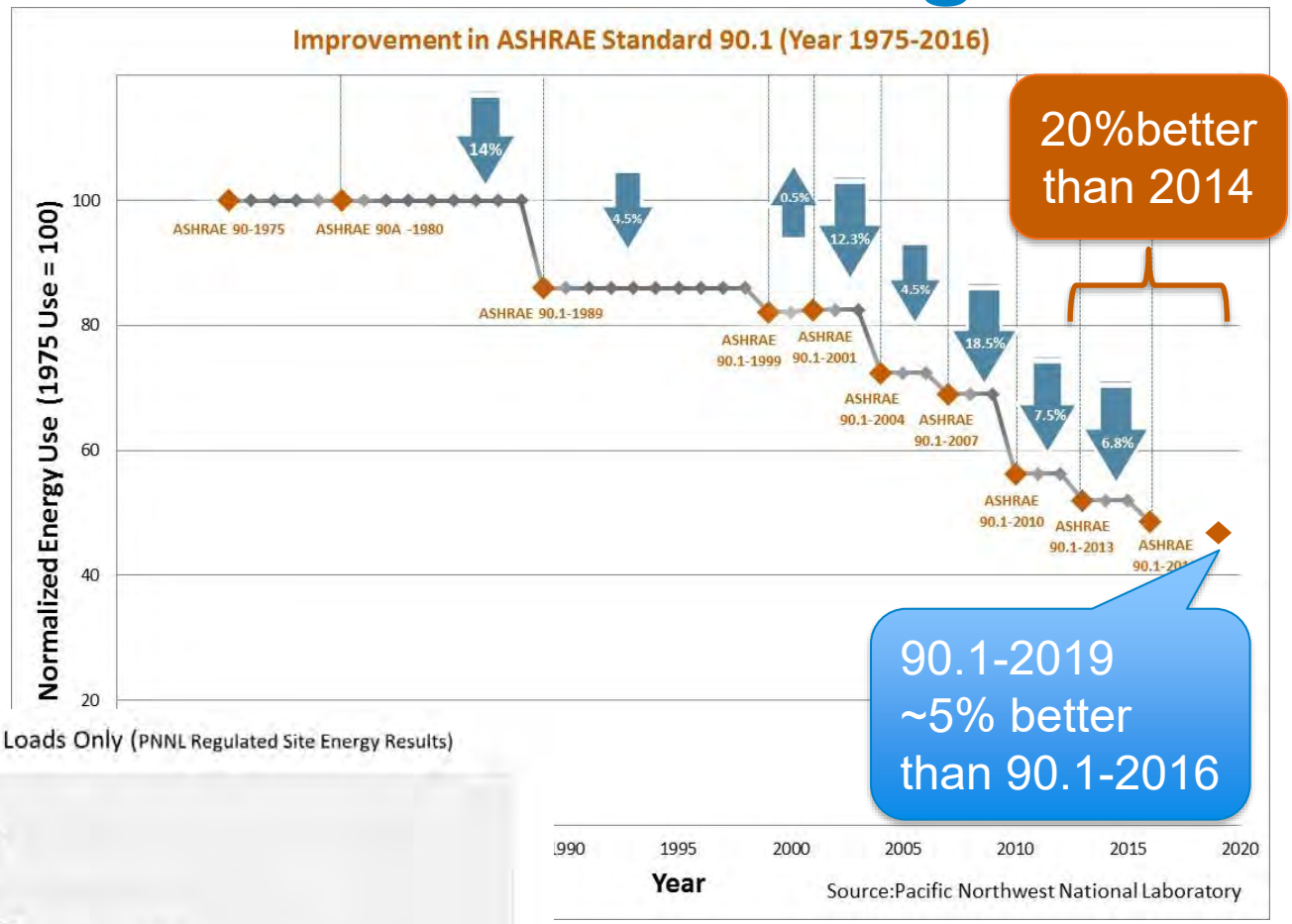
Recent years have seen enactment of significant energy and GHG reduction policies, including:

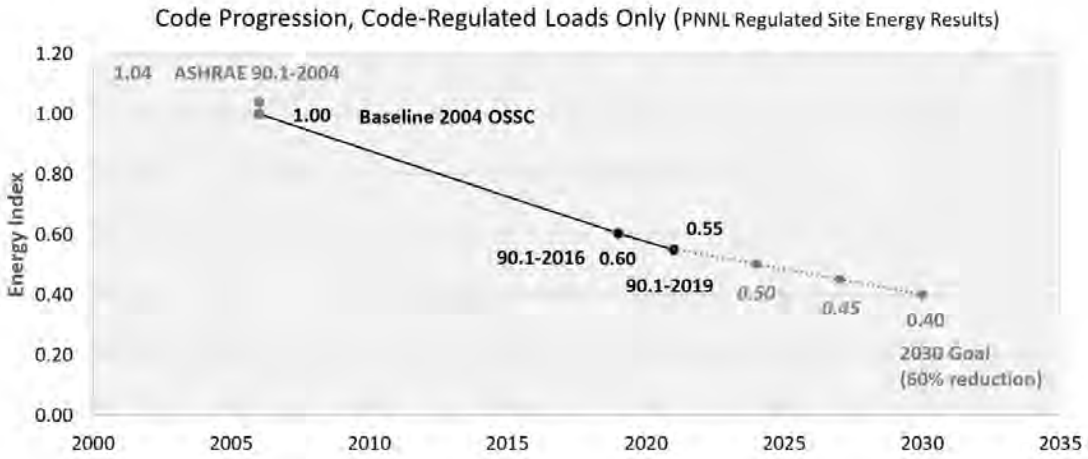
- **Climate Protection Program**
- **Oregon HB 2021 – 100% clean electricity**
- **Building energy code advancements**
- Product efficiency standards
- Solar + Storage rebate program
- Heat pump rebate program
- Community Renewable Energy Program
- Clean Fuels Standard

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





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

Compliance Pathways

OR Code Compliance Pathways

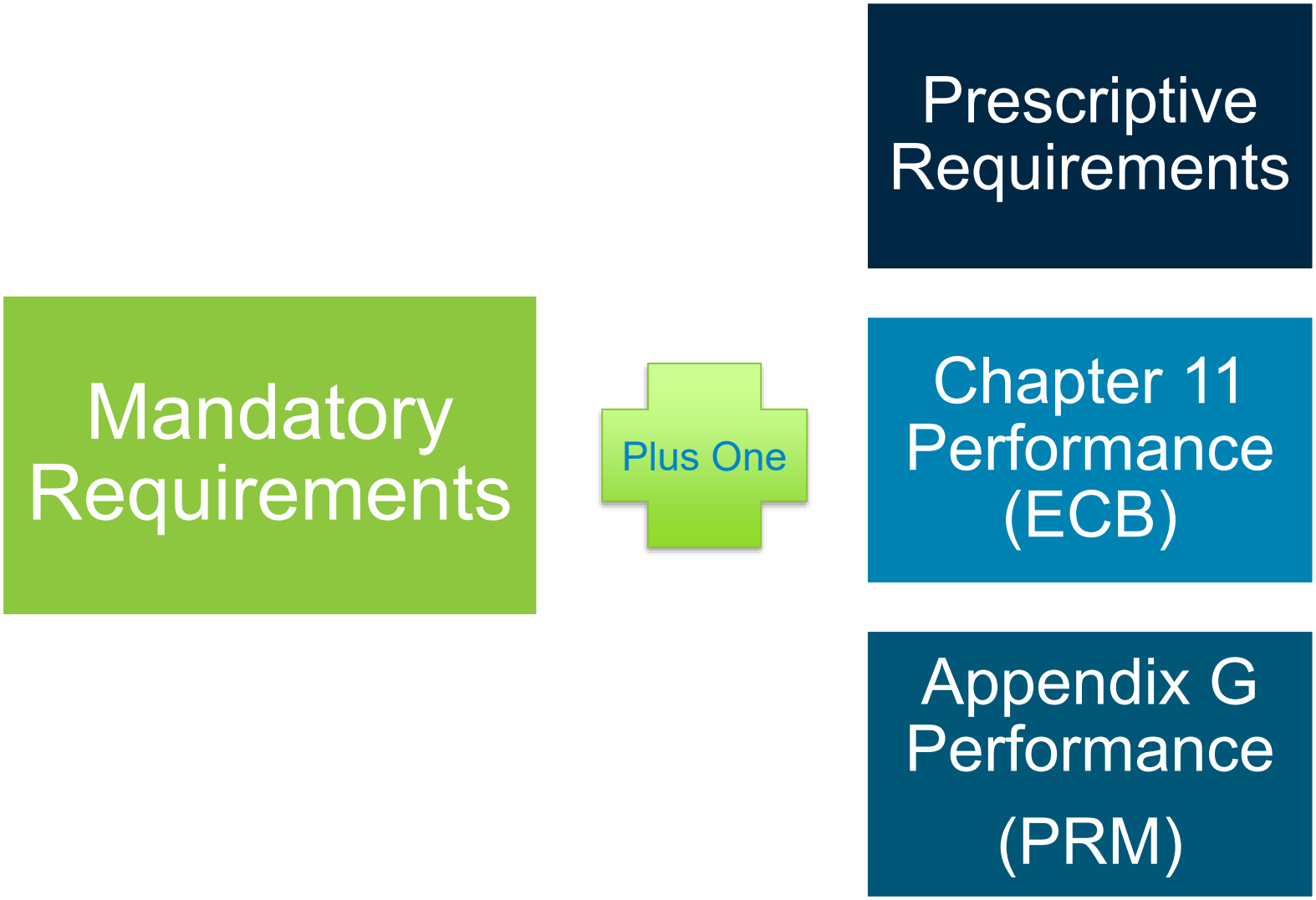
2021 OEESC

(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

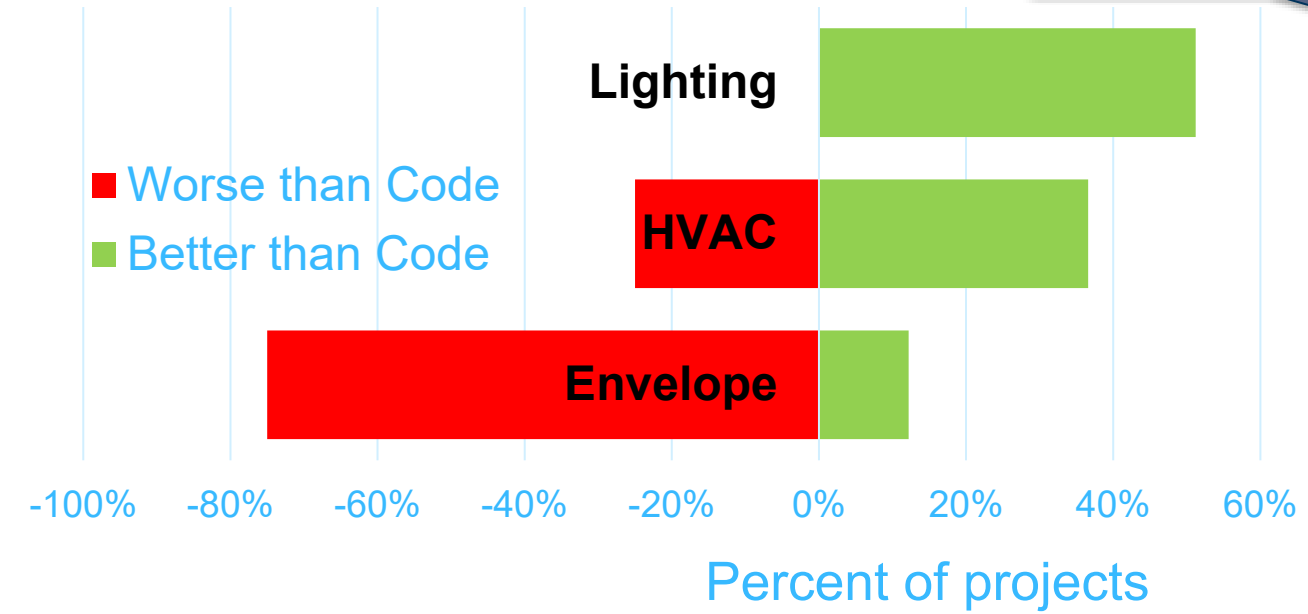
Why use a Performance Path?

- 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

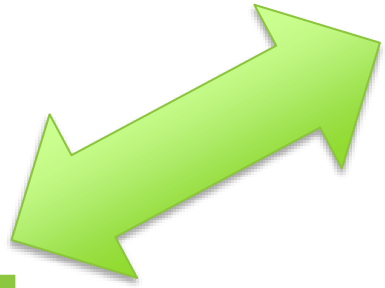
What to Look for?

- Trade off Limits
  - Mandatory Provisions (Sections 5.4, 6.4, 7.4, 8.4, 9.4, 10.4)
  - Operating Schedules

- Except where specifically instructed, all building systems and equipment shall be modeled identically for both the proposed design and baseline building design

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

25

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.

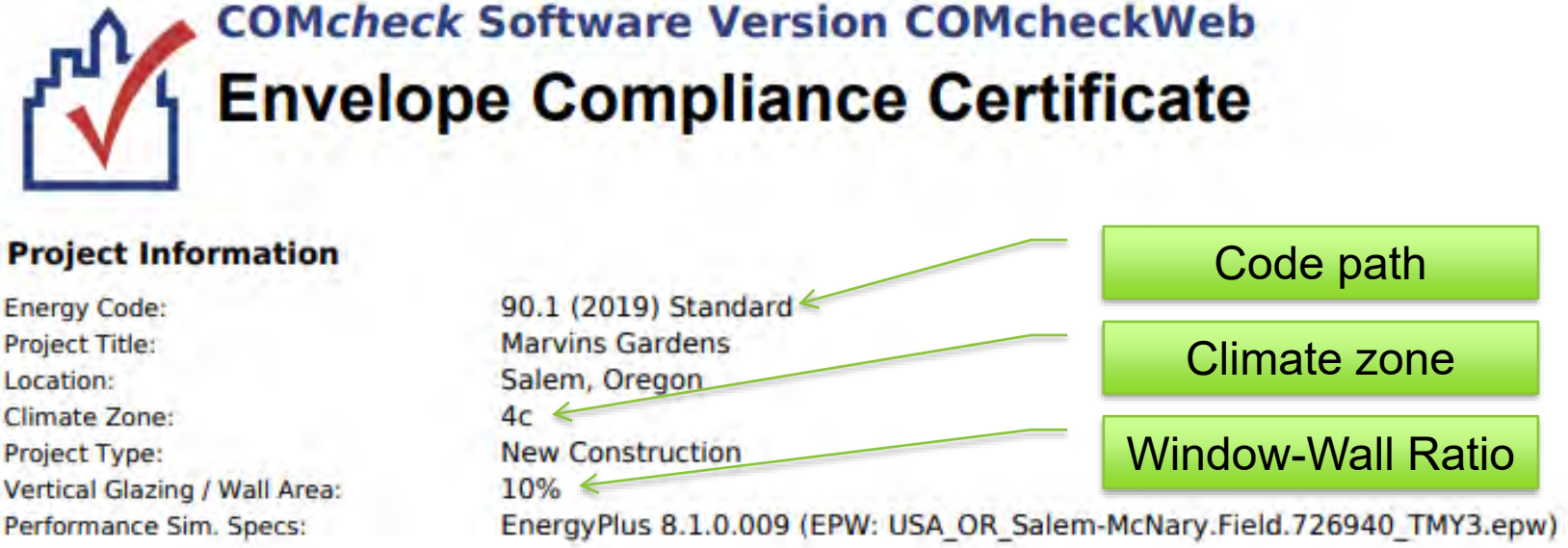
DOWNLOAD

COMCHECK_4_1_5_5_SETUP.EXE 104.87 MB

https://www.energycodes.gov/comcheck

COMcheck Reports

Use the COMcheck reports to help with plan review and inspection



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)

COMcheck Reports

COM*check* Software Version COMcheckWeb

Inspection Checklist

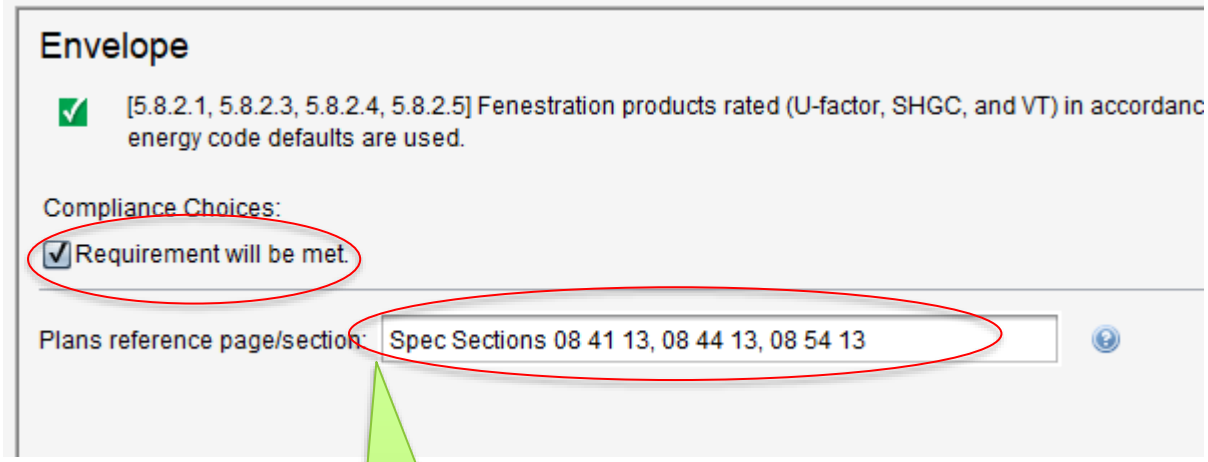
Energy Code: 90.1 (2019) Standard

Requirements: 100.0% were addressed directly in the COM*check* 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, 5.4.3.1.1, 5.7 [PR1][1]	Plans and/or specifications provide all information with which compliance can be determined for the building envelope and document where exceptions to the standard are claimed.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** Designer note: continuous air barrier requirements met through 5.4.3.1.3(b) Materials. Refer to sheet A_X.Y

COMcheck Reports



Designer inputs can simplify your review with good plan 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

What Can COMcheck Do For You?

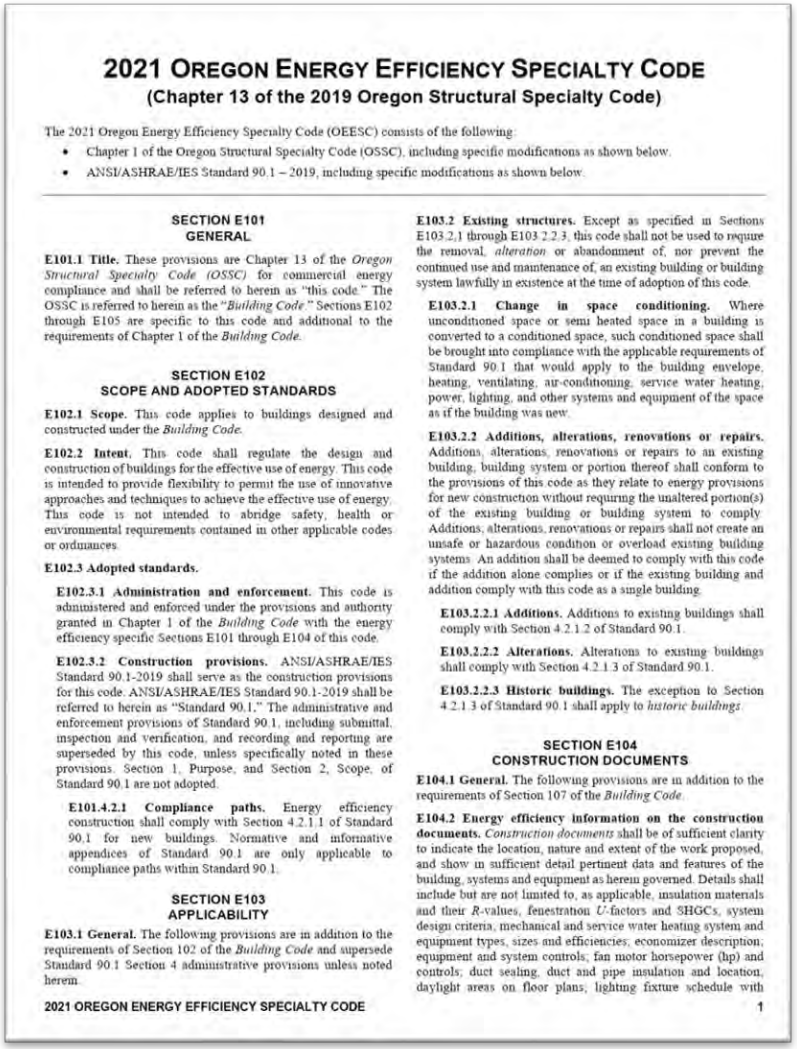
What it is

- 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

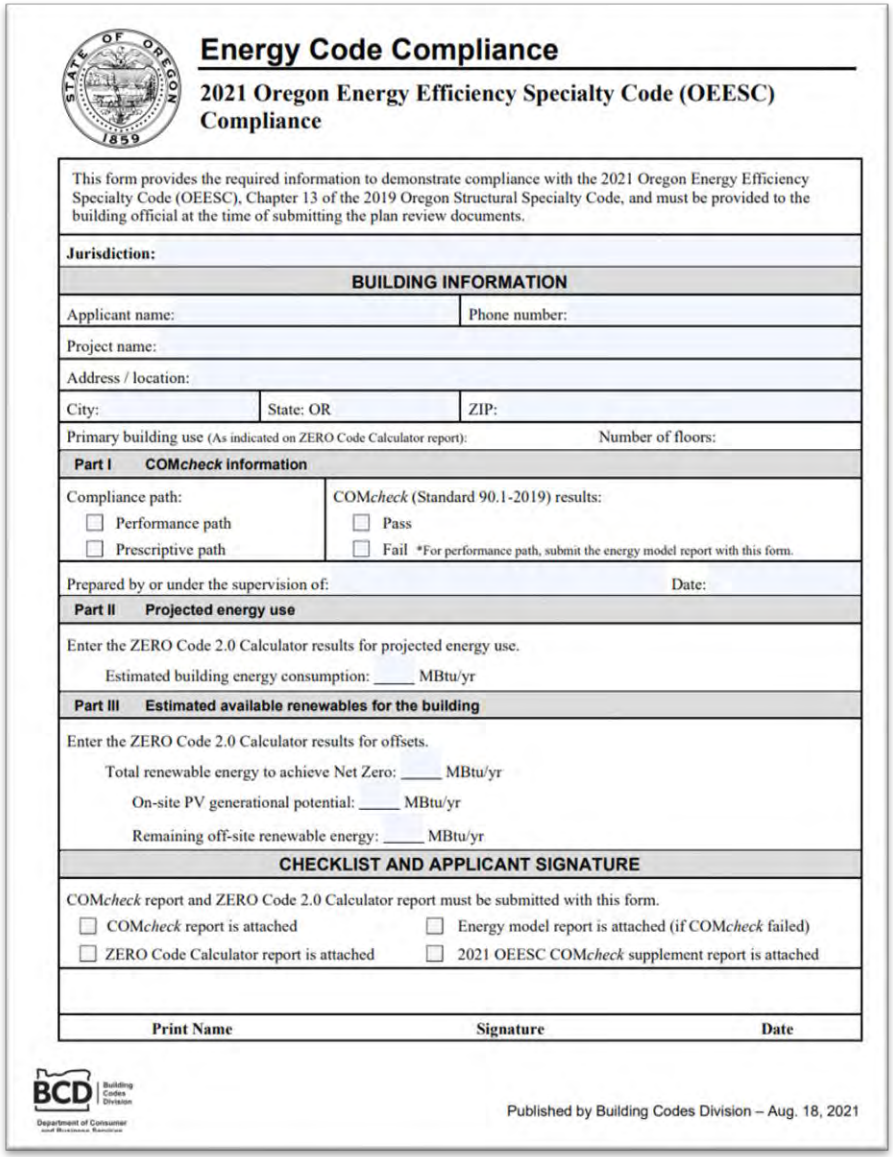
E101.1 Title. These provisions are Chapter 13 of the *Oregon Structural Specialty Code (OSSC)* for commercial energy compliance and shall be referred to herein as "this code." The OSSC is referred to herein as the "*Building Code*." Sections E102 through E105 are specific to this code and additional to the requirements of Chapter 1 of the *Building Code*.

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.

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

neea

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

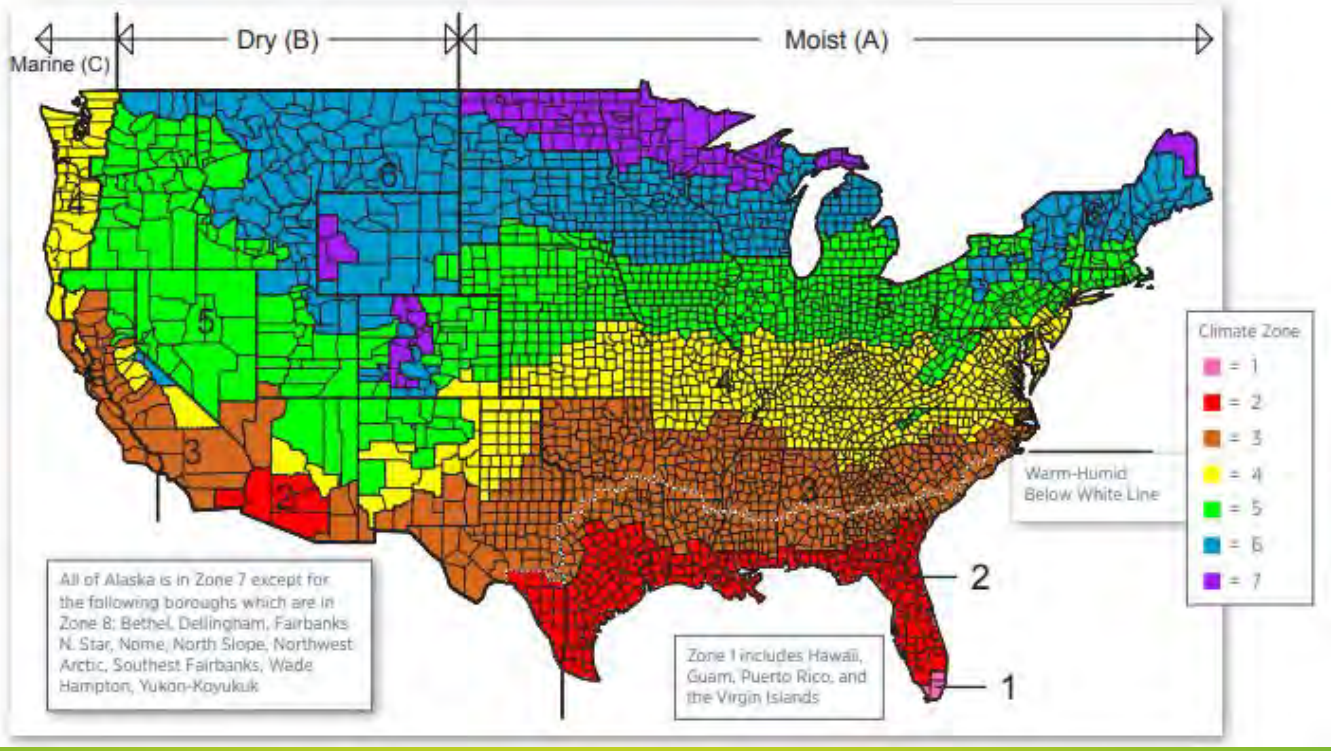
Area used to describe code requirements, notable elements, and unique OR exemptions

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)

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

Building Envelope

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

Semiheated Spaces

- 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

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*.

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.

How about Replacements?

Section 6.1.1.3.1

- Direct replacement equipment now needs to meet many of the requirements formerly for new equipment only. For example:
  - Various controls requirements
  - Economizer requirements
  - Fan efficiency
  - Boiler turndown

Full list of requirements

- 6.3, “Simplified Approach Option for HVAC Systems”
- 6.4.1, “Equipment Efficiencies, Verification, and Labeling Requirements”
- 6.4.3.1, “Zone Thermostatic Controls”
- 6.4.3.2, “Set-Point Overlap Restrictions”
- 6.4.3.3, “Off-Hour Controls” except for Section 6.4.3.3.4, “Zone Isolation”
- 6.4.3.4, “Ventilation System Controls”
- 6.4.3.7, “Freeze Protection and Snow/Ice Melting Systems”
- 6.4.3.8, “Ventilation Controls for High-Occupancy Areas” only for single-zone equipment
- 6.4.3.9, “Heated or Cooled Vestibules”
- 6.4.5, “Walk-In Coolers and Walk-In Freezers”
- 6.5.1.1, “Air Economizers” for units located outdoors
- 6.5.1.3, “Integrated Economizer Control”
- 6.5.1.4, “Economizer Heating System Impact”
- 6.5.3.1.3, “Fan Efficiency”
- 6.5.3.2.1, “Supply Fan Airflow Control”
- 6.5.3.6, “Fractional Horsepower Fan Motors”
- 6.5.4.1, “Boiler Turndown”
- 6.5.4.3, “Chiller and Boiler Isolation”
- 6.5.5.2, “Fan Speed Control

HVAC Replacement Exceptions

- When equipment is repaired but not replaced. The equipment being repaired does not have to meet the standard's minimum efficiencies; however, the modifications may not increase the equipment's energy use. For instance, if a condenser coil is replaced, the new coil must have an equal or better heat transfer performance than the coil being replaced.
- When the replacement of existing equipment with complying equipment requires extensive revisions to other systems, equipment, or elements of the building, and where the replacement equipment is a like-for-like replacement.
- When the refrigerant in existing equipment is changed but cannot be replaced with the same refrigerant due to the phase-out of the existing refrigerant. This may reduce the efficiency of the existing equipment but is allowed.
- When existing equipment is relocated. For instance, the standard does not apply when an existing hydronic heat pump is moved to another location within the building.
- When ducts and pipes are located in existing spaces with insufficient space for the code-required insulation. For example, if the piping in an existing chase needs to be replaced and there is not sufficient space for the new code-required insulation, the piping may be installed with thinner insulation.

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

OR

6.4 Mandatory Requirements

Plus One

6.5 Prescriptive Requirements

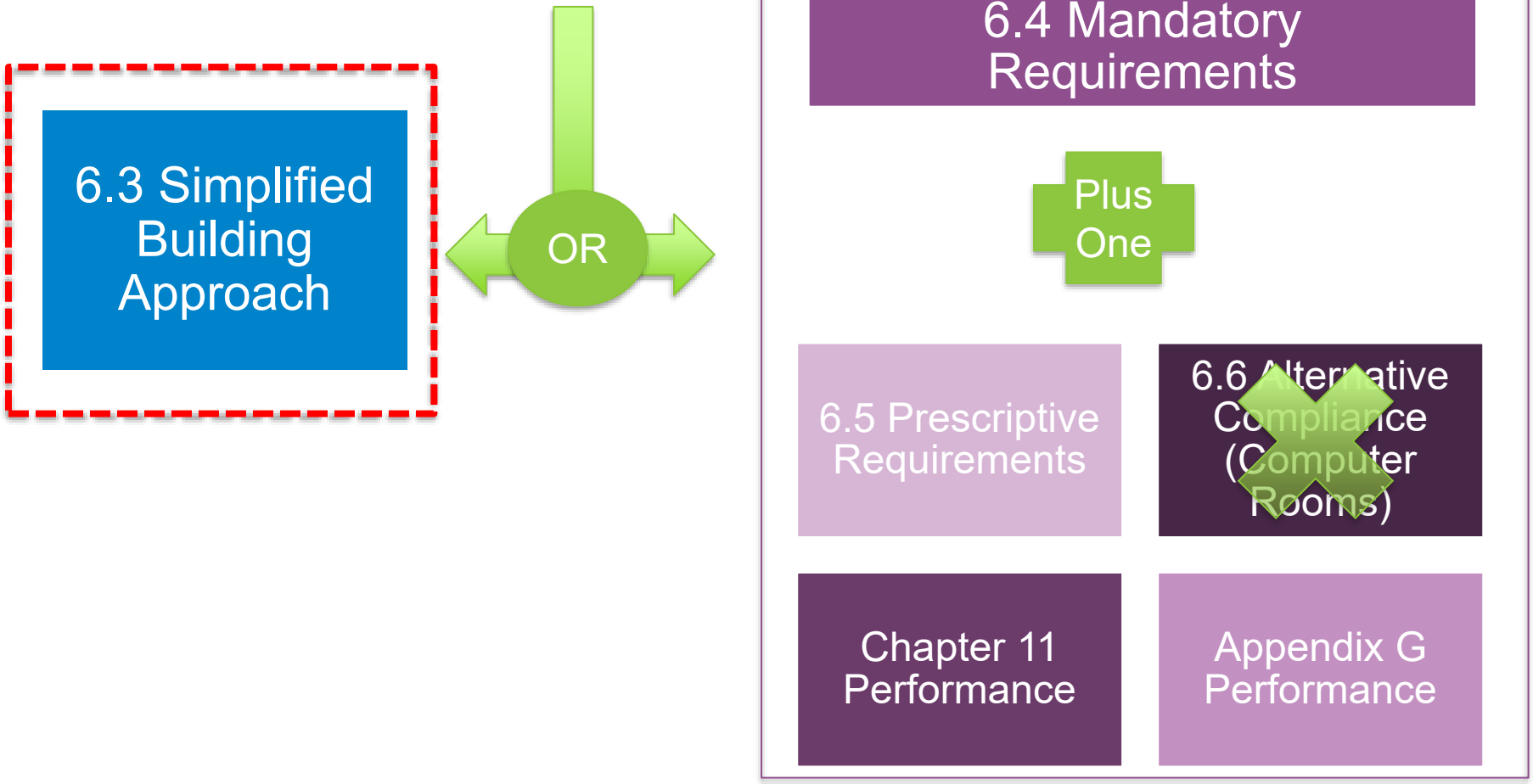
6.6 Alternative Compliance (Computer Rooms)

Chapter 11 Performance

Appendix G Performance

HVAC Compliance Pathways

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



6.3 Simplified Path

- Available if systems and **building meet certain criteria**
  - 2 stories or fewer
  - Floor area < 25,000 ft^2
  - Each HVAC system complies with a list of requirements in 6.3.2 (ALL must be met)

- The **HVAC system must meet the following requirements:**
  - Single zone HVAC
  - Cooling and heating with unitary packaged or split system that meets efficiency tables
  - Supply fan variable flow if >65,000 Btu/h
  - Economizer if >54,000 Btu/h
  - Electric resistance heat limitations for heat pumps
  - Piping and ductwork insulation in accordance with other sections
  - Exhaust air energy recovery in accordance with other sections
  - Manual changeover or dual set-point thermostat
  - No reheat/simultaneous heating and cooling
  - >10,000 CFM requires optimum start controls
  - Plus additional requirements….

Simplified Building Method - Mechanical

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: ABC Building

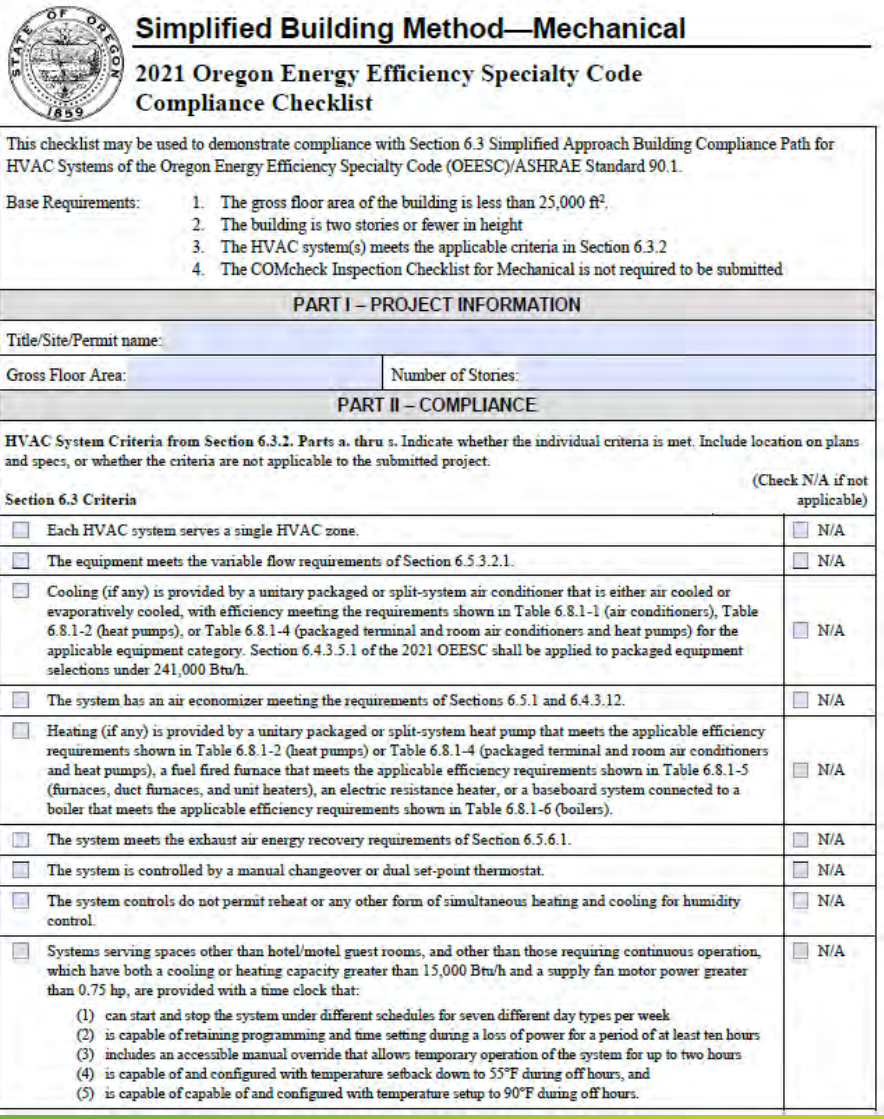
Gross Floor Area: 10,000 | Number of Stories: 2

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	☐ N/A

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

HVAC Compliance Pathways

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

6.3 Simplified Building Approach

OR

6.4 Mandatory Requirements

Plus One

6.5 Prescriptive Requirements

6.6 Alternative Compliance (Computer Rooms)

Chapter 11 Performance

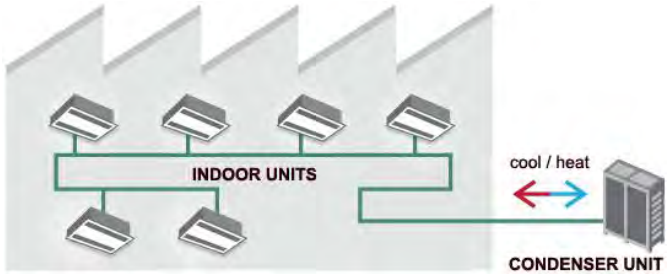
Appendix G Performance

6.4 Mandatory Requirements – Equipment Efficiencies

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
6.4.1, Tables 6.8.1-x	Mech. schedules, specs

Updated equipment efficiencies (Tables 6.8.1-1 through -16)

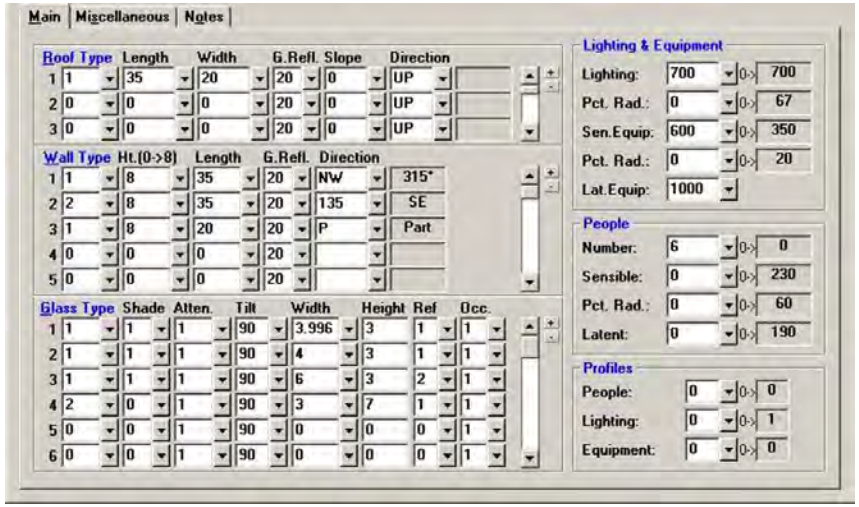
- Generally equivalent to federal minimums
- Increased efficiency for some packaged RTUs, ground loop ACs, SPVAC/HPs, heat rejection equipment, VRF, boilers
- New requirements for: computer room air conditioners, DOAS units



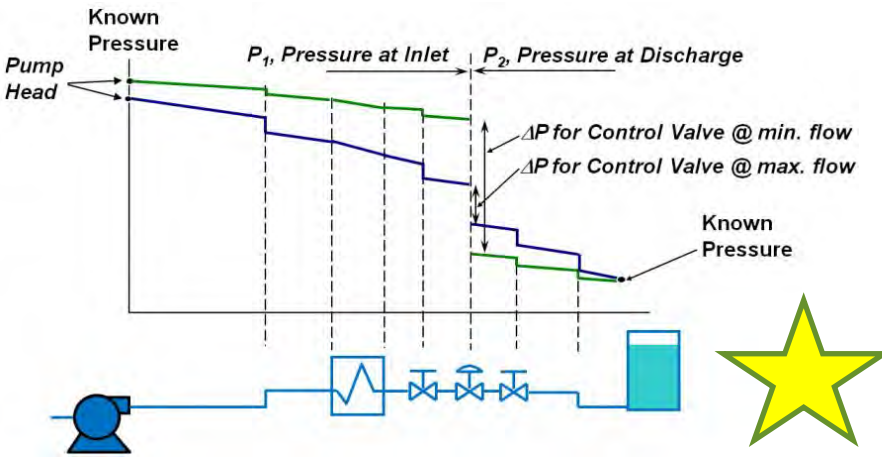
6.4 Mandatory Requirements – Load Calculations

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
6.4.2	Supplemental calcs

- Requirement for calculation of heating and cooling loads for the purpose of sizing systems and equipment to be done in accordance with ANSI/ASHRAE/ACCA Standard 183



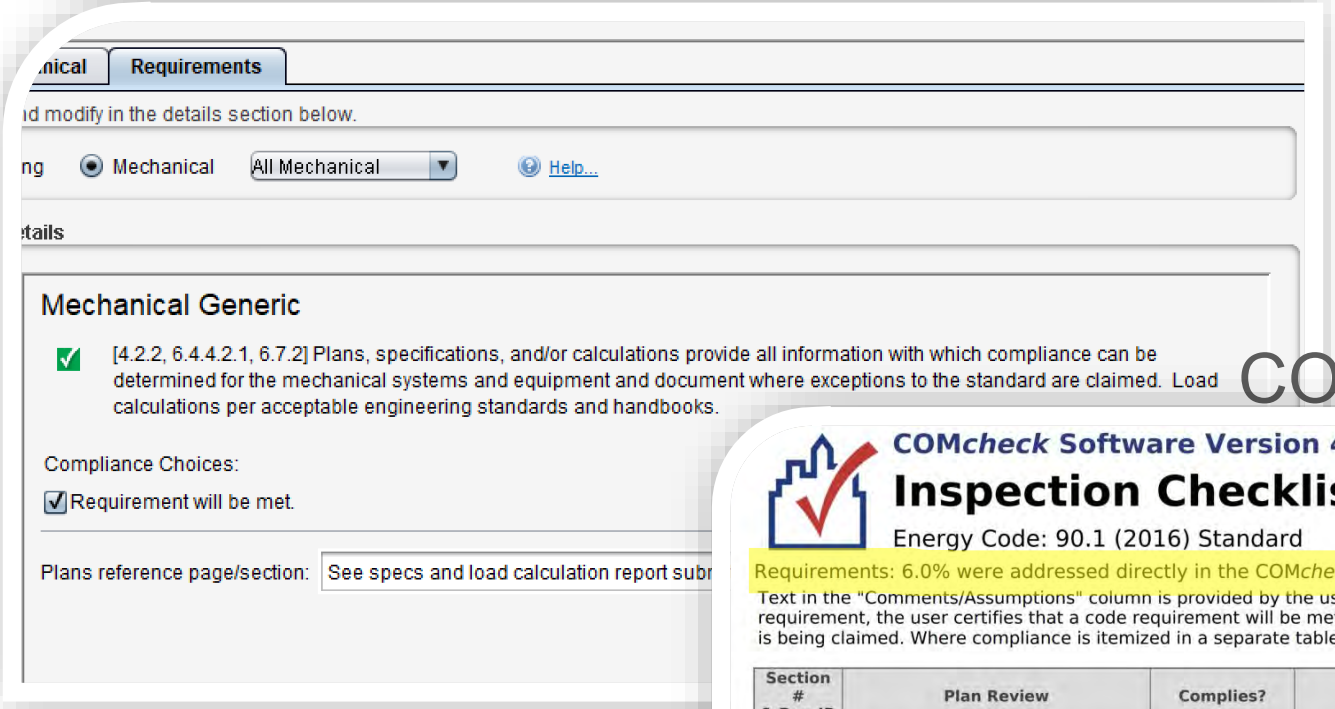
- General requirement for pump differential pressure (head) to be determined in accordance with generally accepted engineering standards. Calculate drop at each device in critical circuit.



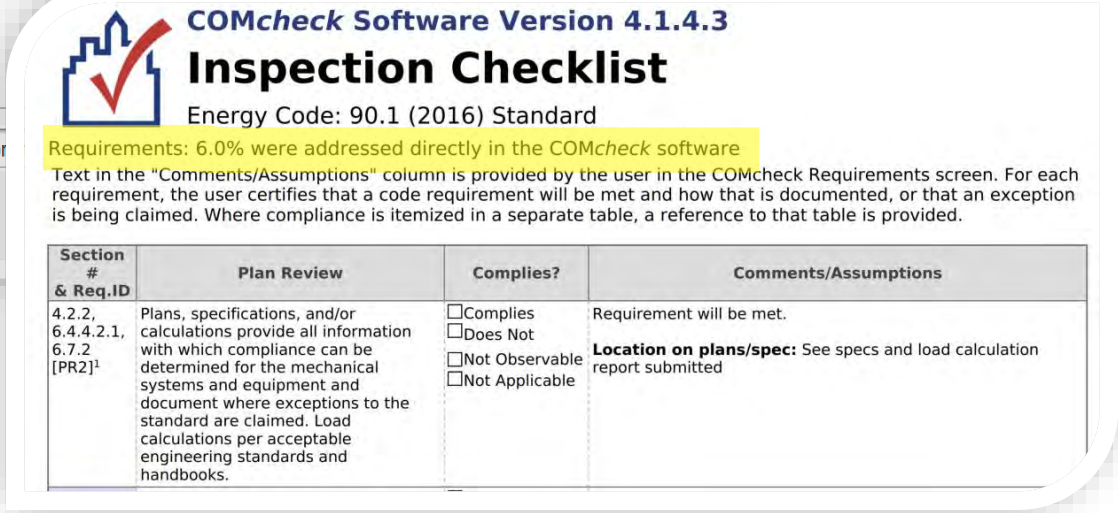
6.4 Mandatory Requirements – Load Calculations

COMcheck reference example

Engineer / Designer Entry



COMcheck Report



6.4 Mandatory Requirements – Zone Thermostatic Controls

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

- Requirement for individual zone thermostatic control
- Dwelling units permitted to be considered a single zone
- Same exception for independent perimeter systems that are designed to offset building envelope loads only, are permitted to serve one or more zones

6.4 Mandatory Requirements – Dead Band/Setpoint Overlap Restriction

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
6.4.3.2, 6.4.3.1.2	Mech plans, Seq. of Ops, specs., Cx plan

- Where used to control both heating and cooling, zone thermostatic controls shall be ***capable and configured to*** a 5°F deadband
- Where heating and cooling are controlled by separate zone thermostatic controls, provide means to prevent heating setpoint from exceeding the cooling setpoint

"Capable and configured to" change throughout the code

COMcheck report reference:

Section # & Req.ID	Final Inspection	Complies?	Comments/Assumptions
6.4.3.1.2 [FI3][3]	Thermostatic controls have a 5 °F deadband.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** see specs section XX.YYY and Sheet M.Z

6.4 Mandatory Requirements – Off Hour Controls

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

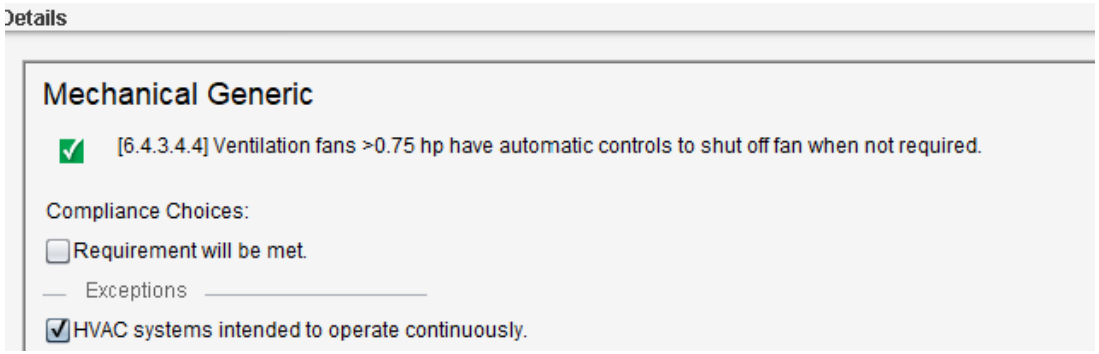
- Automatic Shutdown
  - Time schedule controls (7 day) **OR** occupant sensor **OR** timer (up to 2 hours) **OR** security system interlock
- Setback controls
  - **2014 OEESC**: specified setback capabilities down to 55°F (heating) or up to 85°F (cooling)
  - **90.1-2019**: capable and configured to 10°F below heating setpoint and 5°F above cooling setpoint (or to prevent high humidity levels)
- Optimum start controls
  - **2014 OEESC**: general requirement for optimum start
  - **90.1-2019**: systems with setback controls and DDC shall have optimum start.
    - » **Requires algorithm to be a function of difference between space T, occupied setpoint, OAT, and time until occupancy**
- Zone Isolation – similar requirements, some new exception language

6.4 Mandatory Requirements – Ventilation Fan Controls

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

- Fans with motors > 0.75 hp shall have automatic controls complying with 6.4.3.3.1 to turn off fans when not required, unless they are intended to operate continuously
- Controls can be time schedules, occupant sensors, manual timer, or security system interlock

COMcheck designer entry (will show on Mechanical Inspection Checklist this is submitted to building official):



6.4 Mandatory Requirements – Hotel Controls

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

If > 50 guest rooms, controls capable of and configured for 3 modes of temperature control:

- **Occupied:** HVAC setpoints return to occupied settings
- **Rented & Unoccupied**: within 20 minutes of guest leaving, automatically raise/lower setpoint by 4°F
- **Unrented & Unoccupied**: setpoints automatically reset to 80°F or higher cooling and 60°F or lower heating
- Unrented and unoccupied determined by either:
  - Continuously unoccupied for up to 16 hours
  - Networked guest room control system indicates room is unrented and is unoccupied for 30 minutes

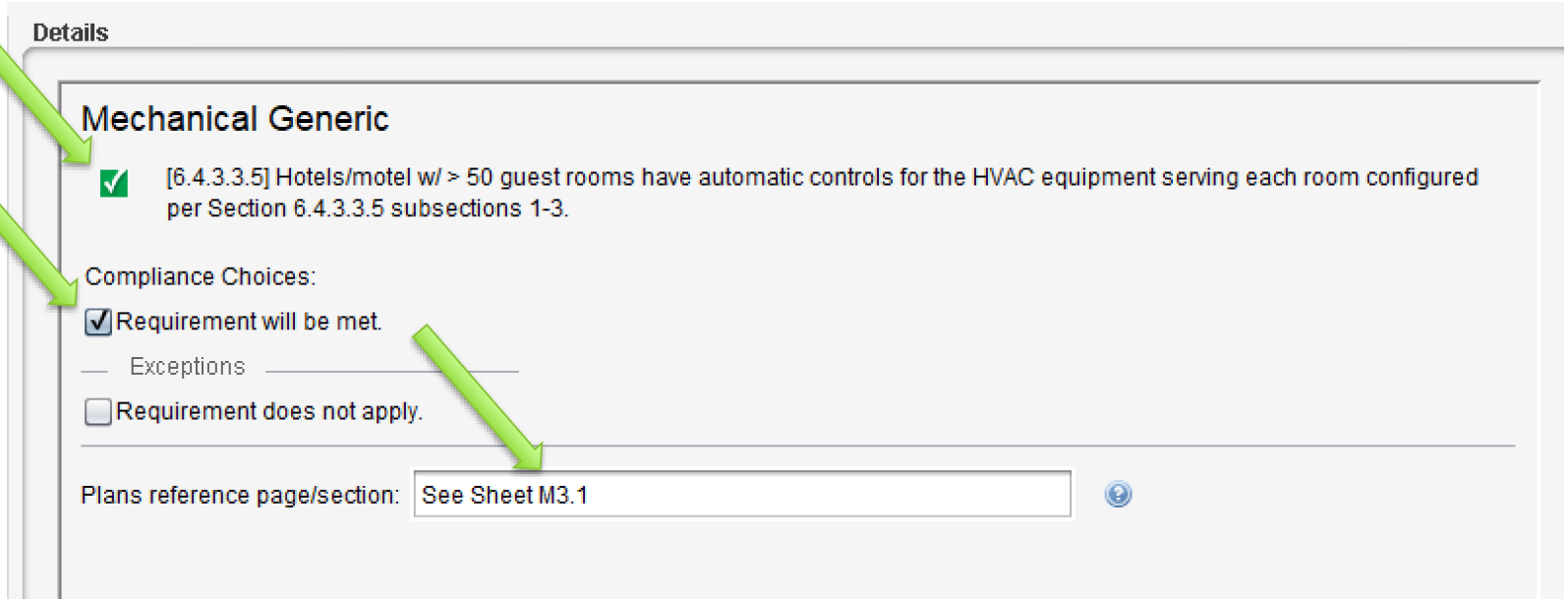
6.4 Mandatory Requirements – Hotel Controls

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

- Ventilation also shuts off when unoccupied.
  - Within 20 minutes of all occupants leaving the guest room, turn off ventilation and exhaust fans or use isolation devices to shut off outdoor air to the guest room and exhaust air from the guest room.
- **Exception:** Daily preoccupancy outside air purge is allowed for 60 minutes or 1 air change
- Captive key card systems can be used to comply with setpoint and ventilation requirements

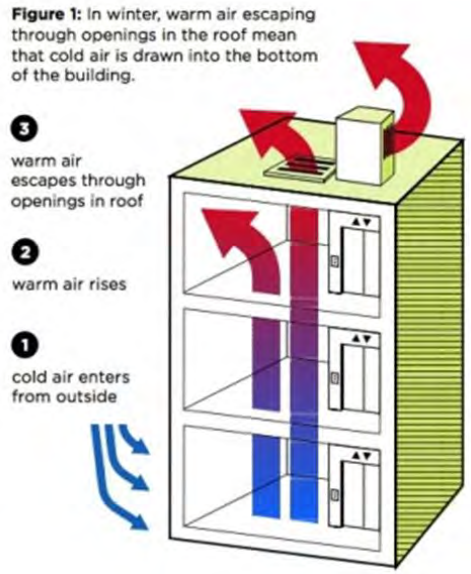
6.4 Mandatory Requirements – Hotel Controls

COMcheck reference



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



90.1-2019: 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 – Shutoff Damper Controls, Leakage

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
6.4.3.4.2-3	Mech plans, Seq. of Ops, specs.

90.1-2019

- OA intake and exhaust equipped with motorized dampers that will automatically shut when system or spaces are not in use
- Capable of and configured to automatically shut off during warm-up, cool down, and setback (unless ventilation reduces energy or code-required)
- Leakage performance requirements of 10 cfm/ft^2 motorized, 20 cfm/ ft^2 non-motorized <3 stories
- Exceptions
  - Gravity dampers okay for exhaust and relief in buildings <3 stories
  - Gravity dampers okay in systems with design OA <=300 cfm
  - Unconditioned space ventilation and exhaust
  - Systems serving Type 1 kitchen exhaust

6.4 Mandatory Requirements – Enclosed Parking Garage Ventilation

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

2021 Oregon / ASHRAE 90.1-2019

- Automatically detect contaminant levels and reduce flow ~~to 50% or less of design capacity~~ per Section 404 of the Mechanical Code by.
  - Staging fans, or
  - Modulating fan airflow
- Exceptions:
  1. Garages <30,000 ft^2 with no mechanical cooling or heating
  2. ~~Garages that have a garage area to *ventilation system motor nameplate horsepower* ratio that exceeds 1500 ft^2/hp and do not utilize *mechanical cooling*~~
  3. Where not permitted by AHJ

6.4 Mandatory Requirements – Heat Pump Auxiliary Control

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
6.4.3.5	Mech schedules, Seq. of Ops, specs., Cx plan

- Requires heat pumps with internal resistance heat to have controls that prevent supplemental heater operation when the heat pump alone can meet the load:
  - During both steady-state operation and setback recovery
  - Supplemental heat is okay during defrost cycles
- And as previously mentioned, Oregon-specific requirement for packaged HVAC equipment:

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.

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

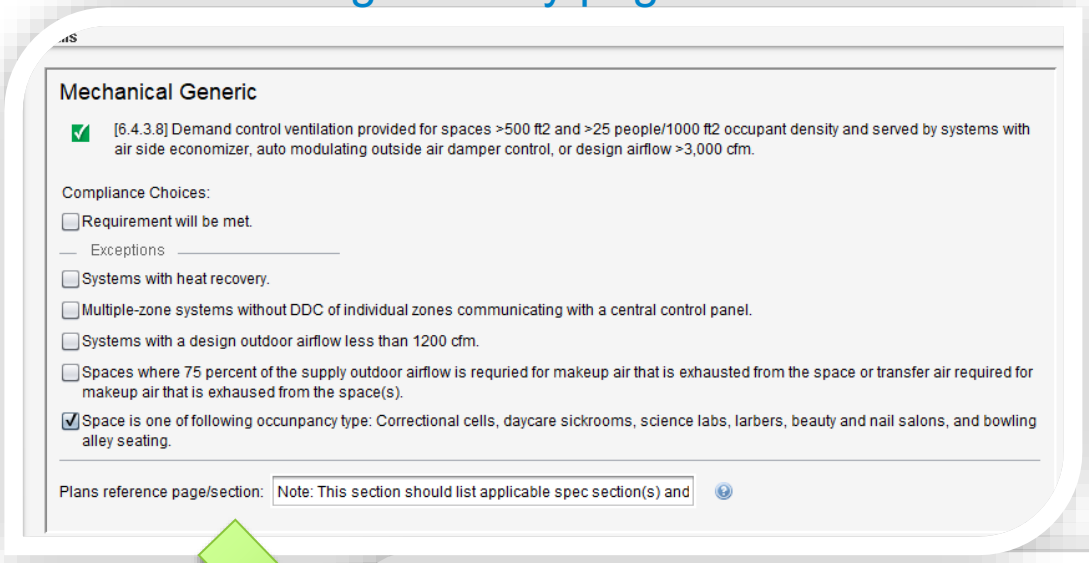
OCCUPANCY CLASSIFICATION	OCCUPANT DENSITY #/1000 FT² [a]	PEOPLE OUTDOOR AIRFLOW RATE IN BREATHING ZONE, R_p CFM/PERSON
Correctional facilities		
Booking/waiting	50	7.5
Cells		
without plumbing fixtures	25	5
with plumbing fixtures[g]	25	5
Day room	30	5
Dining halls (see "Food and beverage service")	—	—
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

6.4 Mandatory Requirements – DDC

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

DDC required in many situations (6.4.3.10)

Table 6.4.3.10.1 *DDC* Applications and Qualifications

Building Status	Application	Qualifications
New *building*	Air-handling *system* and all zones served by the *system*	Individual *systems* supplying more than three zones and with fan *system* bhp of 10 hp and larger
	Chilled-water plant and all coils and *terminal* units served by the *system*	Individual plants supplying more than three zones and with design cooling capacity of 300,000 Btu/h and larger
	Hot-water plant and all coils and *terminal* units served by the *system*	Individual plants supplying more than three zones and with design heating capacity of 300,000 Btu/h and larger
Alteration or addition	Zone *terminal* unit such as *VAV* box	Where existing zones served by the same air-handling, chilled-water, or hot-water *system* have *DDC*
	Air-handling *system* or fan coil	Where existing air-handling *systems* and fan coils served by the same chilled- or hot-water plant have *DDC*
	New air-handling *system* and all new zones served by the *system*	Individual *systems* with fan *system* bhp of 10 hp and larger and supplying more than three zones and more than 75% of zones are new
	New or upgraded chilled-water plant	Where all chillers are new and plant design cooling capacity is 300,000 Btu/h and larger
	New or upgraded hot-water plant	Where all *boilers* are new and plant design heating capacity is 300,000 Btu/h and larger

6.4 Mandatory Requirements – DDC Requirements

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

- Where DDC IS required, certain capabilities are required:

6.4.3.10.2 DDC Controls

Where *DDC* is required by Section 6.4.3.10.1, the *DDC system* shall be capable of and configured with all of the following, as required, to provide the *control* logic required in Section 6.5:

a. Monitoring zone and *system demand* for fan pressure, pump pressure, heating, and cooling.

b. Transferring zone and *system demand* information from zones to air *distribution system* controllers and from air *distribution systems* to heating and cooling plant controllers.

c. Automatically detecting those zones and *systems* that may be excessively driving the *reset* logic and generate an alarm or other indication to the *system* operator.

d. Readily allowing operator removal of zones from the *reset* algorithm.

6.4 Mandatory Requirements – CHW Plant Monitoring

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

- For electric motor-driven CHW plants
  - In new buildings
  - New plants in existing buildings

- Monitoring and measurement for energy use and efficiency (kW/ton) is required for all chiller plants over a certain capacity, which for Oregon climate zones is:
  - Water-cooled CHW plants: > 1500 tons peak cooling capacity
  - Air-cooled CHW plants: > 860 tons peak cooling capacity

6.4 Mandatory Requirements – Economizer Fault Detection and Diagnosis

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

- Air cooled DX units with an economizer installed in accordance with 6.5.1 shall include fault detection and diagnostics (FDD) with a host of required sensors and capabilities

6.4.3.12 Economizer Fault Detection and Diagnostics (FDD)

Air-cooled direct-expansion cooling units listed in Tables 6.8.1-1 and 6.8.1-2, where an *air economizer* is installed in accordance with Section 6.5.1, shall include a fault detection and diagnostics (FDD) *system* complying with the following:

a. The following temperature sensors shall be *permanently installed* to monitor *system* operation:
   1. *Outdoor air*
   2. Supply air
   3. Return air, where required for economizer *control*

b. The *system* shall have the capability of displaying the value of each sensor.

c. The FDD *system* or unit *controls* shall be capable of and configured to provide *system* status by indicating the following:
   1. Free cooling available
   2. Economizer enabled
   3. Compressor enabled
   4. Heating enabled
   5. Mixed-air low-limit cycle active

d. The FDD *system* or unit *controls* shall have provisions to manually initiate each operating mode so that the operation of compressors, economizers, fans, and the heating *system* can be independently tested and verified.

e. The FDD *system* shall be capable of and configured to detect the following faults:
   1. Air temperature sensor failure/fault
   2. Not economizing when the unit should be economizing
   3. Economizing when the unit should not be economizing
   4. Damper not modulating
   5. Excess *outdoor air*

f. The FDD *system* shall be capable of and configured to report faults to a fault management application or *DDC system* accessible by operating or *service* personnel, or annunciated locally on zone *thermostats*.

6.4 Mandatory Requirements – Economizer Fault Detection and Diagnosis

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

COMcheck report reference:

6.4.3.12 [FI200][3]	Air economizer has a fault detection and diagnostics (FDD) system (see details for configuration and operational requirements).	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** This section should list where to find specs / mechanical drawing #s / control sequences to document compliance

6.4 Mandatory Requirements – HVAC Duct Insulation

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
6.4.4.1.2	Mech. Plans, Specs.

90.1-2019

- Based on location, heating and/or cooling
- Generally R-6 for unconditioned space
- Exterior requirement will depend on system type and CZ

Table 6.8.2 Minimum Duct Insulation R-Value[a]

Climate Zone	Duct Location		
	Exterior [b]	*Unconditioned Space* and Buried Ducts	*Indirectly Conditioned Space* [c,d]
Supply and Return Ducts for Heating and Cooling			
0 to 4	R-8	R-6	R-1.9
5 to 8	R-12	R-6	R-1.9
Supply and Return Ducts for Heating Only			
0 to 1	None	None	None
2 to 4	R-6	R-6	R-1.9
5 to 8	R-12	R-6	R-1.9
Supply and Return Ducts for Cooling Only			
0 to 6	R-8	R-6	R-1.9
7 to 8	R-1.9	R-1.9	R-1.9

6.4 Mandatory Requirements – HVAC Duct Insulation

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
6.4.4.1.2	Mech. Plans, Specs.

- Area classification for “indirectly conditioned spaces” (such as a return plenum)
- Some exceptions

Exceptions to 6.4.4.1.2

1. Factory-installed plenums, casings, or *ductwork* furnished as a part of HVAC *equipment* tested and rated in accordance with Section 6.4.1.
2. Ducts or plenums located in *heated spaces*, *semiheated spaces*, or *cooled spaces*.
3. For runouts less than 10 ft in length to air *terminals* or air outlets, the *rated R-value of insulation* need not exceed R-3.5.
4. Backs of air outlets and outlet plenums exposed to *unconditioned space* or *indirectly conditioned space* with face areas exceeding 5 ft^2 need not exceed R-2; those 5 ft^2 or smaller need not be insulated.

6.4 Mandatory Requirements – HVAC Piping Insulation

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
6.4.4.1.3	Mech. Plans, Specs.

- Requirements (for heating) are:

Table 6.8.3-1 Minimum *Piping* Insulation Thickness Heating and Hot Water Systems[a,b,c,d,e] (Steam, Steam Condensate, Hot-Water Heating and Domestic Water *Systems*)

Fluid Operating Temperature Range (°F) and Usage	Insulation Conductivity		≥Nominal Pipe or Tube Size, in.				
	Conductivity, Btu·in/h·ft²·°F	Mean Rating Temperature, °F	<1	1 to <1-1/2	1-1/2 to <4	4 to <8	≥8
			Insulation Thickness, in.				
>350	0.32 to 0.34	250	4.5	5.0	5.0	5.0	5.0
251 to 350	0.29 to 0.32	200	3.0	4.0	4.5	4.5	4.5
201 to 250	0.27 to 0.30	150	2.5	2.5	2.5	3.0	3.0
141 to 200	0.25 to 0.29	125	1.5	1.5	2.0	2.0	2.0
105 to 140	0.22 to 0.28	100	1.0	1.0	1.5	1.5	1.5

a. For insulation outside the stated conductivity range, the minimum thickness (T) shall be determined as follows: $T = r\{(1 + t/r)^{K/k} - 1\}$, where T = minimum insulation thickness (in.), r = actual outside radius of pipe (in.), t = insulation thickness listed in this table for applicable fluid temperature and pipe size, K = conductivity of alternate material at mean rating temperature indicated for the applicable fluid temperature [Btu·in/h·ft²·°F]; and k = the upper value of the conductivity range listed in this table for the applicable fluid temperature.

b. These thicknesses are based on *energy efficiency* considerations only. Additional insulation is sometimes required relative to safety issues/surface temperature.

c. For *piping* smaller than 1.5 in. and located in partitions within *conditioned spaces*, reduction of these thicknesses by 1 in. shall be permitted (before thickness adjustment required in footnote [a]) but not to thicknesses below 1 in.

d. For direct-buried heating and hot-water *system piping*, reduction of these thicknesses by 1.5 in. shall be permitted (before thickness adjustment required in footnote [a]) but not to thicknesses below 1 in.

e. The table is based on steel pipe. Nonmetallic pipes schedule 80 thickness or less shall use the table values. For other nonmetallic pipes having *thermal resistance* greater than that of steel pipe, reduced insulation thicknesses are permitted if documentation is provided showing that the pipe with the proposed insulation has no more heat transfer per metre than a steel pipe of the same size with the insulation thickness shown in the table.

6.4 Mandatory Requirements – HVAC Piping Insulation

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
6.4.4.1.3	Mech. Plans, Specs.

- Requirements (for cooling) are:

Table 6.8.3-2 Minimum *Piping* Insulation Thickness Cooling *Systems* (Chilled Water, Brine, and Refrigerant)[a,b,c,d]

Fluid Operating Temperature Range (°F) and Usage	Insulation Conductivity		Nominal Pipe or Tube Size, in.				
	Conductivity, Btu·in/h·ft^2·°F	Mean Rating Temperature, °F	<1	1 to <1-1/2	1-1/2 to <4	4 to <8	≥8
			Insulation Thickness, in.				
40 to 60	0.21 to 0.27	75	0.5	0.5	1.0	1.0	1.0
<40	0.20 to 0.26	50	0.5	1.0	1.0	1.0	1.5

a. For insulation outside the stated conductivity range, the minimum thickness (T) shall be determined as follows: $T = r\{(1 + t/r)^{K/k} - 1\}$, where T = minimum insulation thickness (in.), r = actual outside radius of pipe (in.), t = insulation thickness listed in this table for applicable fluid temperature and pipe size, K = conductivity of alternate material at mean rating temperature indicated for the applicable fluid temperature [Btu·in/h·ft2·°F]; and k = the upper value of the conductivity range listed in this table for the applicable fluid temperature.

b. These thicknesses are based on *energy efficiency* considerations only. Issues such as water vapor permeability or surface condensation sometimes require vapor retarders or additional insulation.

c. For direct-buried cooling *system piping*, insulation is not required.

d. The table is based on steel pipe. Nonmetallic pipes schedule 80 thickness or less shall use the table values. For other nonmetallic pipes having *thermal resistance* greater than that of steel pipe, reduced insulation thicknesses are permitted if documentation is provided showing that the pipe with the proposed insulation has no more heat transfer per foot than a steel pipe of the same size with the insulation thickness shown in the table.

6.4 Mandatory Requirements – HVAC Piping Insulation

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
6.4.4.1.3	Mech. Plans, Specs.

- Piping insulation exceptions:

Exceptions to 6.4.4.1.3

1. Factory-installed *piping* within HVAC *equipment* tested and rated in accordance with Section 6.4.1.
2. *Piping* that conveys fluids having a design operating temperature range between 60°F and 105°F, inclusive.
3. *Piping* that conveys fluids that have not been heated or cooled through the use of *fossil fuels* or electricity (such as *roof* and condensate drains, domestic cold-water supply, and natural-gas *piping*).
4. Where heat gain or heat loss will not increase *energy* use (such as liquid refrigerant *piping*).
5. In *piping* 1 in. or less, insulation is not required for strainers, *control* valves, and balancing valves.

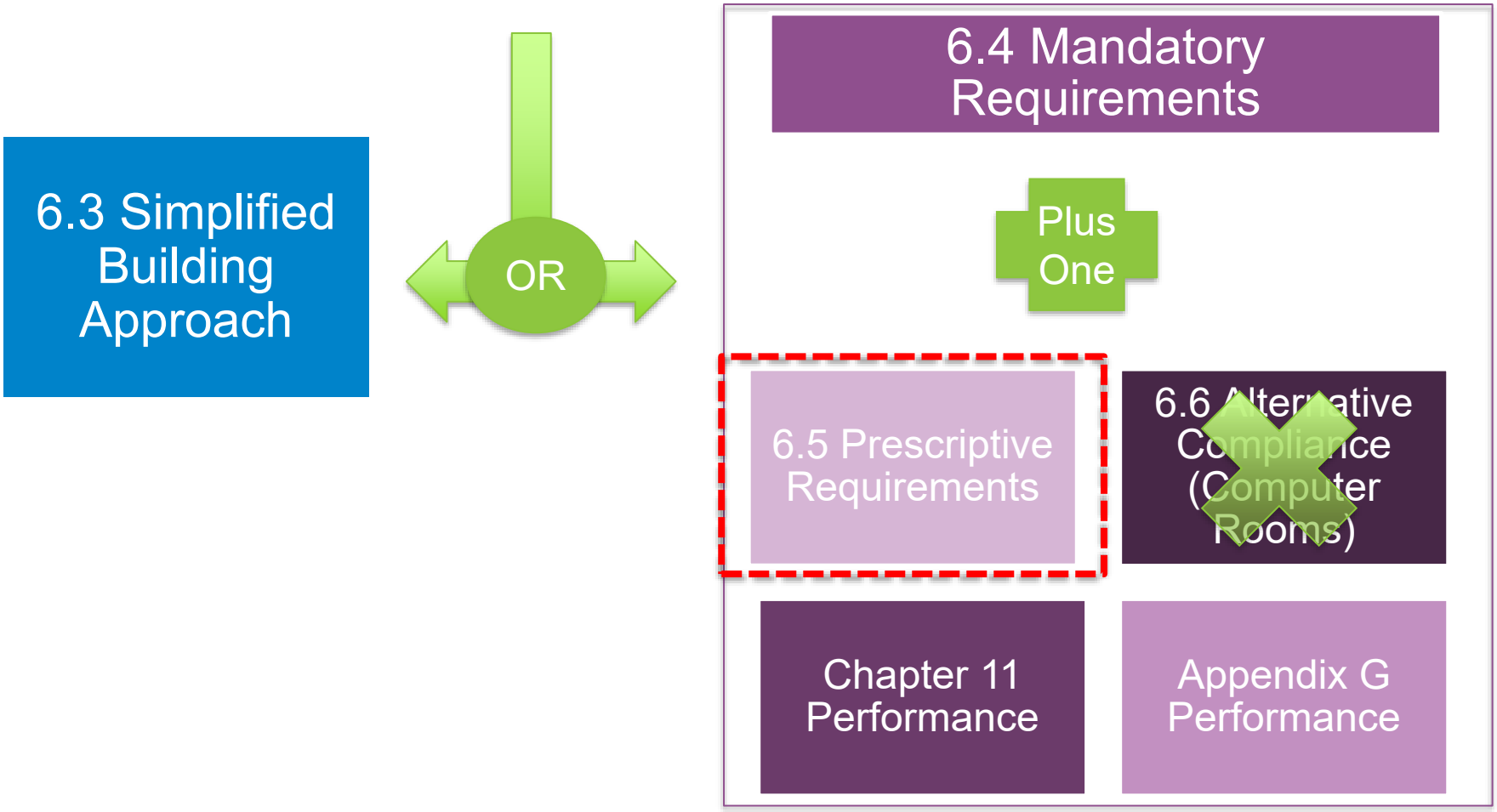
6.4 Mandatory Requirements – Walk-In Coolers and Freezers

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
6.4.5	Arch/Mech/Specialty Plans, Specs.

- Oregon has had standards for walk-in coolers and walk-in freezers since 2009
- Requirements in ASHRAE 90.1 are essentially a duplication of what are already federal standards that are preempted from state modification
- Also 6.5.11 has new requirements for refrigeration systems with remote compressors and condensers

HVAC Compliance Pathways

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



Economizer Requirements

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
6.5.1	Mech schedules, Seq. of Ops, Specs., Cx plan

- Same general threshold for economizer requirement **(capacity ≥ 54,000 btu/hr) for individual fan cooling units**
- Mandatory FDD
- New high efficiency cooling equipment exemptions
- Other exceptions related to specific scenarios
- New required economizer controls (6.5.1.1.2)
  - Can't be controlled by MAT alone (except single-zone systems)
  - Economizer enabled when OAT<75F
  - Sensor calibration and accuracy requirements
- Integrated economizer controls (6.5.1.3)
  - Economizer interlocked with mechanical cooling to provide partial cooling even when some mechanical cooling is required.

Economizer Requirements

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
6.5.1	Mech schedules, Seq. of Ops, Specs.

- 90.1 computer room exceptions are a little more involved than in the past:

11. *Systems* primarily serving *computer rooms* where
    a. the total design cooling load of all *computer rooms* in the *building* is less than 3,000,000 Btu/h and the *building* in which they are located is not served by a centralized chilled water plant;
    b. the room total design cooling load is less than 600,000 Btu/h and the *building* in which they are located is served by a centralized chilled water plant;
    c. the local water authority does not allow cooling towers; or
    d. less than 600,000 Btu/h of *computer-room* cooling *equipment* capacity is being added to

12. Dedicated *systems* for *computer rooms*, where a minimum of 75% of the design load serves
    a. those *spaces* classified as an *essential facility*,
    b. those *spaces* having a design of Tier IV as defined by ANSI/TIA-942,
    c. those *spaces* classified under NFPA 70 Article 708—*Critical Operations Power Systems* (COPS), or
    d. those *spaces* where core clearing and settlement *services* are performed such that their failure to settle pending financial transactions could present systemic risk as described in "The Interagency Paper on Sound Practices to Strengthen the Resilience of the U.S. Financial System" (April 7, 2003).

Economizer Requirements

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
6.5.1	Mech schedules, Seq. of Ops, Specs.

- New efficiency improvement alternative to economizers
- Other exceptions related to specific scenarios:
  - Chilled-water cooling systems without a fan or that use induced airflow, where the total capacity of these systems is less than 1,000,000 Btu/h in Climate Zone 4; less than 1,400,000 Btu/h in Climate Zones 5
  - Non-particulate air treatment
  - Hospitals and processes with humidity requirements
  - Condenser heat recovery is present
  - Smaller residential systems (<270,000 Btu/hr)
  - Envelope-load-dominated or low operating hours
  - Supermarkets with affected open refrigeration

Table 6.5.1-2 Eliminate Required Economizer for Comfort Cooling by Increasing Cooling *Efficiency*

Climate Zone	*Efficiency* Improvement[a]
2A	17%
2B	21%
3A	27%
3B	32%
3C	65%
4A	42%
4B	49%
4C	64%
5A	49%
5B	59%
5C	74%
6A	56%
6B	65%
7	72%
8	77%

a. If a unit is rated with an *IPLV*, *IEER*, or *SEER*, then to eliminate the required economizer, the minimum cooling *efficiency* of the HVAC unit must be increased by the percentage shown. If the HVAC unit is only rated with a full-load metric like *EER* cooling then these must be increased by the percentage shown.

Airside Economizers – Capacity and Control

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
6.5.1.1.2	Mech schedules, Seq. of Ops, Specs.

- Control through mixed-air-temperature-only is not allowed (except for single-zone systems)
- Capable and configured to require high-limit shut-off
- Sensor calibration and accuracy requirements

Table 6.5.1.1.3 High-Limit Shutoff *Control* Settings for *Air Economizers*[b]

Control Type	Allowed Only in Climate Zone at Listed *Set Point*	Required High-Limit *Set Points* (Economizer Off when):	
		Equation	Description
Fixed dry-bulb temperature	0B, 1B, 2B, 3B, 3C, 4B, 4C, 5B, 5C, 6B, 7, 8	$T_{OA} > 75°F$	*Outdoor air* temperature exceeds 75°F
	5A, 6A	$T_{OA} > 70°F$	*Outdoor air* temperature exceeds 70°F
	0A, 1A, 2A, 3A, 4A,	$T_{OA} > 65°F$	*Outdoor air* temperature exceeds 65°F
Differential dry-bulb temperature	0B, 1B, 2B, 3B, 3C, 4B, 4C, 5A, 5B, 5C, 6A, 6B, 7, 8	$T_{OA} > T_{RA}$	*Outdoor air* temperature exceeds return air temperature
Fixed enthalpy with *fixed* dry-bulb temperature	All	$h_{OA} > 28$ Btu/lb[a] or $T_{OA} > 75°F$	*Outdoor air* enthalpy exceeds 28 Btu/lb[a] of dry air[a] or *outdoor air* temperature exceeds 75°F
Differential enthalpy with *fixed* dry-bulb temperature	All	$h_{OA} > h_{RA}$ or $T_{OA} > 75°F$	*Outdoor air* enthalpy exceeds return air enthalpy or *outdoor air* temperature exceeds 75°F

a. At altitudes substantially different than sea level, the *fixed* enthalpy limit shall be set to the enthalpy value at 75°F and 50% rh. As an example, at approximately 6000 ft elevation, the *fixed* enthalpy limit is approximately 30.7 Btu/lb.
b. Devices with selectable rather than adjustable *set points* shall be capable of being set to within 2°F and 2 Btu/lb of the *set point* listed.

Fluid Economizers – Capacity and Control

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
6.5.1.2	Mech schedules, Seq. of Ops, Specs.

- Fluid economizer systems capable of providing up to 100% of the expected system cooling load at:
  - General requirement: 50°F dry bulb / 45°F wet bulb OAT
  - Computer rooms with water-cooled economizers: 30°F dry bulb / 25°F wet bulb OAT
  - Computer rooms with air-cooled economizers: 25°F dry bulb (4C) or 20°F dry bulb (5B)
  - Systems with dehumidification limitations: 45°F dry bulb / 40°F wet bulb OAT

- New maximum hydronic pressure drop requirements for fluid economizers
  - Maximum 15’ pressure drop through coils/HX or secondary loop so that economizer coil pressure drop is not seen by the loop in normal (non-economizing) mode

Integrated Economizer Control

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
6.5.1.3	Mech schedules, Seq. of Ops, Specs., Cx plan

- Economizer interlocked with mechanical cooling to provide partial cooling even when some mechanical cooling is required.
- Units with economizers must also have:
  - Interlocking to limit OA damper closing for frost protection until leaving air temperature is less than 45°F
  - > 65,000 btu/hr units that control the capacity of mechanical cooling based on occupied space temperature shall have minimum 2 stages of cooling
  - All other DX units that control space temperature by modulating airflow to the space shall comply with:

Table 6.5.1.3 DX Cooling Stage Requirements for Modulating Airflow Units

Rating Capacity, Btu/h	Minimum Number of Mechanical Cooling Stages	Minimum Compressor Displacement[a]
≥65,000 and <240,000	3	≤35% of full load
≥240,000	4	≤25% full load

a. For mechanical cooling stage *control* that does not use variable compressor displacement the percent displacement shall be equivalent to the mechanical cooling capacity reduction evaluated at the full load rating conditions for the compressor.

Economizer Heating, Humidification System Impact

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
6.5.1.4, 6.5.1.5	Seq. of Ops, Specs.

- Economizer controls and system design shall not increase the building heating energy use during normal operation
  - Exception for zone-level heating for VAV systems

- Systems with hydronic cooling and humidification systems that are designed to maintain a dew point > 35°F shall use a fluid economizer, if an economizer is required

Reheat/Simultaneous Heating & Cooling

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

- Supply air temperature reheat limits (6.5.2.1)
  - Dual maximum VAV control
  - Max SAT of 20°F above room Setpoint
- New provisions to prevent reheat when humidity control is provided (6.5.2.3)
- New requirements for preheat coil control; can't run when AC is on or unit is economizing (6.5.2.5-6)

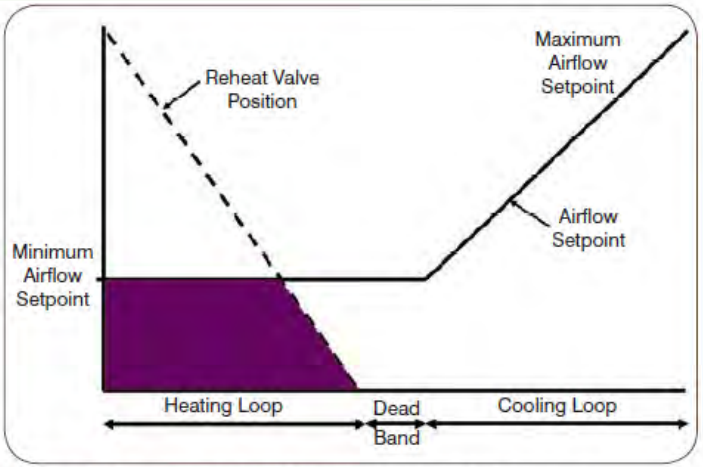


Figure 1: Conventional VAV reheat control diagram.

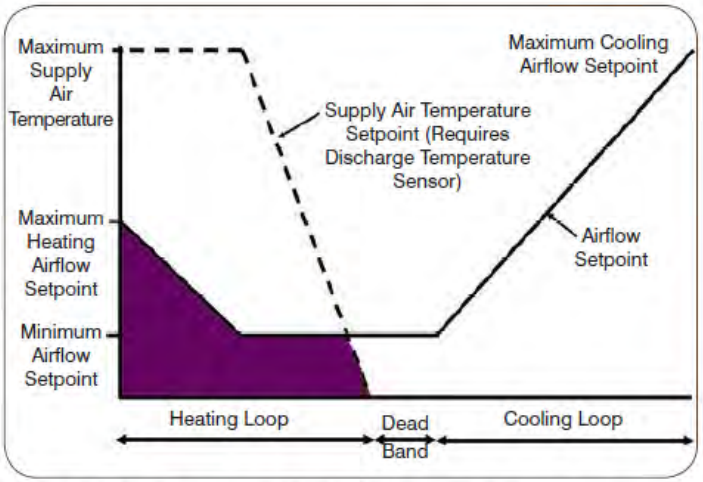


Figure 2: Dual maximum VAV reheat control diagram.

Simultaneous Heating and Cooling

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

- Zone thermostatic controls to prevent reheating, recooling, mixing, simultaneous heating and cooling to the same zone (but there are a number of exceptions to this to look at and be aware of)
  - *Previous limit of reheat, recooled, or mixed in peak heating demand was to 50% of zone peak supply rate*

Exceptions to 6.5.2.1

1. Zones for which the volume of air that is reheated, recooled, or mixed is less than the larger of the following:
   a. Twenty percent of the zone design peak supply for *systems* with *DDC* and 30% for other *systems*.
   b. The outdoor airflow rate required to meet the *ventilation* requirements of ASHRAE Standard 62.1 for the zone.
   c. Any higher rate that can be demonstrated, to the satisfaction of the *authority having jurisdiction*, to reduce overall *system* annual *energy* use by offsetting *reheat/recool energy* losses through a reduction in *outdoor air* intake for the *system*.
   d. The airflow rate required to comply with applicable codes or accreditation standards, such as pressure relationships or minimum air change rates.
2. Zones with *DDC* that comply with all of the following:
   a. The airflow rate in *dead band* between heating and cooling does not exceed the larger of the following:
      (1) Twenty percent of the zone design peak supply rate.
      (2) The outdoor airflow rate required to meet the *ventilation* requirements of ASHRAE Standard 62.1 for the zone.
      (3) Any higher rate that can be demonstrated, to the satisfaction of the *authority having jurisdiction*, to reduce overall *system* annual *energy* use by offsetting *reheat/recool energy* losses through a reduction in *outdoor air* intake.
      (4) The airflow rate required to comply with applicable codes or accreditation standards, such as pressure relationships or minimum air change rates.
   . The airflow rate that is reheated, recooled, or mixed shall be less than 50% of the zone design peak supply rate.
   . The first stage of heating consists of modulating the zone supply air temperature *set point* up to a maximum *set point* while the airflow is maintained at the *dead band* flow rate.
   . The second stage of heating consists of modulating the airflow rate from the *dead band* flow rate up to the heating maximum flow rate.

aboratory exhaust *systems* that comply with Section 6.5.7.3.

ones where at least 75% of the *energy* for *reheating* or for providing warm air in mixing *ystems* is provided from *site-recovered energy* (including condenser heat) or *site-solar nergy*.

Simultaneous Heating and Cooling

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

Section # & Req.ID	Mechanical Rough-In Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
6.5.2.1 [ME17][1]	Zone controls that limit reheating, recooling, and simultaneous heating and cooling as well as control sequencing.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Zones with DDC include: larger of =20% zone peak flow, flow required per Standard 62.1, higher rate approved by AHJ for outlying conditions, OR airflow rate that complies with applicable codes/accreditation standards; air flow reheated/recooled/mixed = 50% of zone peak supply rate; first stage of heating consists of modulating the zone supply air temperatiure setpoint to a maximum setpoint with airflow held at dead band flow rate; AND second stage of heating modulates airflow rate fromt the dead band flow rate up to the heating maximum flow rate.

Pre-heat Coils, Ventilation Air Heating Control

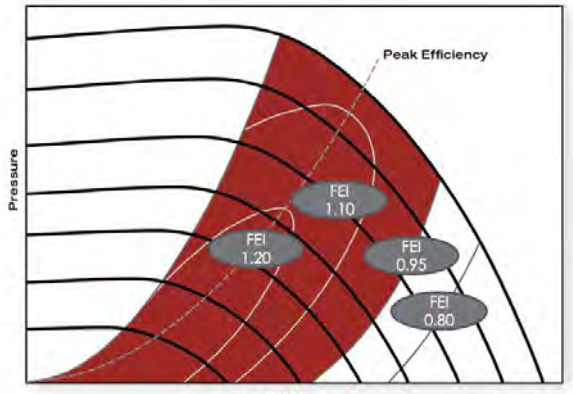
2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
6.5.2.5, 6.5.2.6	Seq. of Ops, Specs., Cx plan

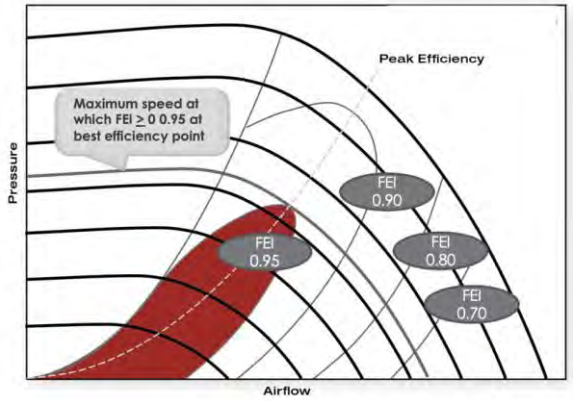
- Preheat coils required to have controls to stop heat output when mechanical cooling (including economizing) is occurring
- Units that provide ventilation air to multiple zones (like DOAS) and operate in conjunction with zone heating/cooling shall not use heating or heat recovery to warm supply air greater than 60°F when majority of building zones require cooling

Fan Energy Index

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

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





Images courtesy of AMCA

Fan Energy Index

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

- FEI is a true wire-to-air method
- Requirement:
  - Constant speed: FEI ≥ 1.0
  - VAV – FEI ≥ 0.95

$$FEI = \frac{\text{Reference Fan Electrical Input Power}}{\text{Fan Electrical Input Power}}$$

Images courtesy of AMCA

Fan System Power Limitation

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
6.5.3.1.1, 6.5.3.1.2	Mech schedules, specs, supp. calcs

- Applies to systems with total fan system motor nameplate hp > 5
- Same Fan Power Limitation equation

Table 6.5.3.1-1 Fan Power Limitation[a]

	Limit	Constant Volume	Variable Volume
Option 1: Fan *system* motor nameplate hp	Allowable *motor nameplate hp*	$hp \le cfm_S \times 0.0011$	$hp \le cfm_S \times 0.0015$
Option 2: Fan *system* bhp	Allowable fan *system* bhp	$bhp \le cfm_S \times 0.00094 + A$	$bhp \le cfm_S \times 0.0013 + A$

  - Pressure drop adjustments:
    - » Credits mostly the same (change for ERV credit)
    - » New deductions required for systems without central cooling, heating, or with central electric resistance heat
- Still requirement to select fan motor no larger than the first available motor size greater than the bhp, with indication of bhp on design documents
  - Same exceptions as before, plus **new exception for fans with nameplate < 1 hp**

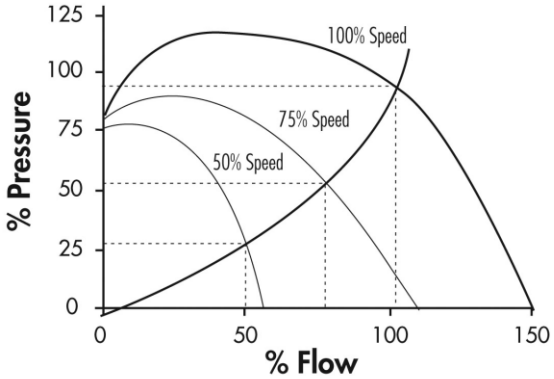
More Fan Requirements

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

- **Fan speed control** (6.5.3.2.1)
  - Fan speed controls required for:

Cooling *System* Type	Fan Motor Size, hp	*Mechanical Cooling* Capacity, Btu/h
DX cooling	Any	≥ 65,000
Chilled-water and evaporative cooling	≥ 1/4	Any

- **Fractional horsepower fan motors (between 1/12hp and 1hp)** (6.5.3.6)
  - ECM or have a min efficiency of 70%



VAV Systems

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

VAV static pressure setpoint

- Multi-zone VAV systems with fans >5 HP required to have static pressure setpoint re-set (6.5.3.2.3)
- Other systems required to locate static pressure sensors such that the setpoint is ≤ 1.2” (wg 6.5.3.2.2)

Multizone VAV ventilation optimization control (6.5.3.3)

- Systems with DDC to zone level must include a means to reduce OA rates below design rates in response to changes in system ventilation efficiency (from 62.1 Appendix A)
- Exceptions:
  - » VAV systems with zonal transfer fans, dual-duct dual-fan VAV systems, and systems with fan-powered terminal units
  - » Systems where design exhaust is > 70% of total design OA rate

Ventilation Design

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
6.5.3.7	Mech plans, specs, Supp. calcs

- Requires one of the following for OA ventilation systems:
  - Design ventilation limited to 135% of the required minimum OA rate (larger of 62.1, exhaust, or other applicable codes/standards)
  - Dampers, ductwork, and controls required to allow the system to supply no more than the required minimum OA rate with a single set-point adjustment
  - System includes exhaust air energy recovery in compliance with other parts of 90.1

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

Occupied-Standby Controls

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

COMcheck Report Reference:

Section # & Req.ID	Mechanical Rough-In Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
6.5.3.8 [ME112][1]	Occupied standy controls for zones serving rooms that are required to have automatic partial OFF or automatic full OFF lighting controls per Section 9.4.1.1 shall meet the following within five minutes of all rooms in that zone entering occupied-standby mode: a)Active heating set point shall be setback at least 1°F, b)Active cooling set point shall be setup at least 1°F and c)All airflow supplied to the zone shall be shut off whenever the space temperature is between the active heating and cooling set points.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Multizone systems without automatic zone flow control dampers. **Location on plans/spec:** See Sheet M Y.Z

Boiler Turndown

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
6.5.4.1	Mech. Schedules, Specs

- Boiler systems with a design input larger than 1,000,000 btu/hr required to meet turndown ratio
  - Table 6.5.4.1 Boiler Turndown

Boiler System Design Input, Btu/h	Minimum Turndown Ratio
≥1,000,000 and ≤5,000,000	3 to 1
>5,000,000 and ≤10,000,000	4 to 1
>10,000,000	5 to 1

  - Previous requirements were for a multi-stage or modulating burner for boilers > 500,000 btu/hr

Hydronic Variable Flow Systems

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
6.5.4.2	Mech plans, Seq. of Ops, specs.

- HVAC pumping systems with three or more control valves designed to modulate or step open and close as a function of load shall be
  - Designed for variable fluid flow
  - Capable of reducing flow rates to ≤ 25% of design flow rate or equipment minimum
- Individual or parallel pumps serving variable flow systems with a motor hp (or combined parallel hp) at least the power in Table 6.5.4.2 shall have controls and/or devices resulting in pump motor demand ≤ 30% of design wattage at 50% of design water flow
  - For OR climate zones 4C and 5B
    - » CHW pumps: ≥ 7.5 hp
    - » HW pumps: ≥ 10 hp
  - Control as function of desired flow or differential pressure (with specifications for delta P control, dP setpoint reset, etc.)

Hydronic Variable Flow Systems

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
6.5.4.2	Mech plans, Seq. of Ops, specs.

- Exceptions to hydronic variable flow systems control requirements
  - Differential pressure setpoint reset not required when valve position is used to comply with CHW and HW temperature reset controls
  - Variable flow control not required on heating water pumps where more than 50% of annual heat is generated by an electric boiler
  - Variable flow not required for primary pumps in a primary/secondary system
  - Variable flow not required for a coil pump provided for freeze protection
  - Variable flow not required for heat recovery coil runaround loops

CHW and HW Temperature Reset Controls

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

- Threshold: 300,000 btu/hr design capacity
- Requirement to include controls to automatically reset supply water temperatures by representative building loads (return temperature) or OA temperature
- Where DDC is used to control valves, the set point shall be reset based on valve positions until one valve is nearly wide open or setpoint limits of the system equipment or application have been reached
- Exceptions: where CHW supply is already cold (district heating), process temperature requirements, or where valve position is used to comply with 6.5.4.2

Hydronic Heat Pumps and Water-Cooled Unitary AC

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

90.1-2019

- All hydronic heat pumps and water-cooled unitary AC require a 2-position automatic valve interlocked to shut off flow when the compressor is off (exception: if units use a fluid economizer)
- If hydronic system has total pump power > 5 hp, controls required that result in pump motor demand of no more than 30% design wattage at 50% of flow

Pipe Sizing

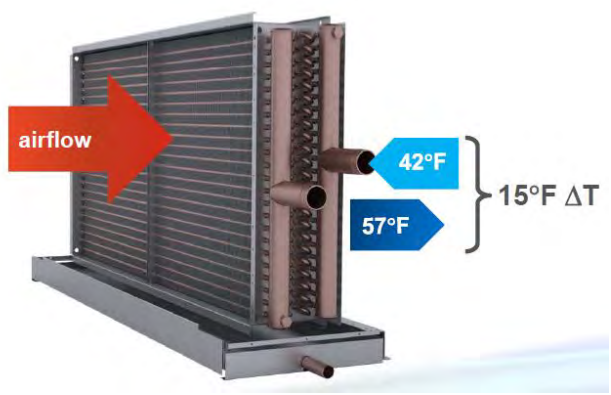
2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
6.5.4.6	Supp. Calcs, specs

- Applies to CHW and condenser water piping
- Maximum flow rates shall not exceed the value provided for the given pipe size and operating hours
- Increased maximum values (allowances) for variable flow/variable speed systems
- Exceptions
  - Piping sections not in the critical circuit at design conditions (and not expected to be in critical circuit for more than 30% of operating hours)
  - Other piping systems with same or less total pressure drop than values in table as applied to standard weight steel pipe

Chilled Water Coil Selection

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
6.5.4.7	Mech. Schedules, Supp. Calcs, specs

- Minimum 15°F water temperature delta T
- Minimum 57°F LWT at design conditions
- Exceptions
  1. Coils with an air-side pressure drop exceeding 0.70 in. of water when rated at 500 fpm face velocity and dry conditions (no condensation).
  2. Individual fan-cooling units with a design supply airflow rate 5,000 cfm and less.
  3. Constant-air-volume systems.
  4. Coils selected at the maximum temperature difference allowed by the chiller.
  5. Passive coils (no mechanically supplied airflow).
  6. Coils with design entering chilled-water temperatures of 50°F and higher.
  7. Coils with design entering air dry-bulb temperatures of 65°F and lower.



Heat Rejection Equipment – Fan Speed Control

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
6.5.5.2	Mech. Schedules, Seq. of Ops, specs

- Fan speed control required for motors (or array of motors) ≥ 5 hp (compared to 7.5 previously)
- Must result in fan motor demand reduction to ≤ 30% of design wattage at 50% design airflow
- Fan speed modulated based on leaving fluid temperature or condensing temperature/pressure of heat rejection device

Exceptions

- Condenser fans serving multiple refrigerant circuits or fluid cooling circuits
- Condenser fans serving flooded condensers

Energy Recovery

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
6.5.6.1	Mech. Schedules, specs

- Previous 2014 OEESC:
  - Required for systems ≥ 5,000 cfm and ≥ 70% OA
- New 90.1-2019:
  - For systems operating < 8,000 hours/yr, **no requirement**
  - For systems operating ≥ 8,000 hours/yr, based on cfm and OA %. If cfm exceeds value, **energy recovery is required**

Table 6.5.6.1-2 Exhaust Air *Energy* Recovery Requirements for *Ventilation Systems* Operating Greater than or Equal to 8000 Hours per Year

Climate Zone	% *Outdoor Air* at Full Design Airflow Rate							
	≥10% and <20%	≥20% and <30%	≥30% and <40%	≥40% and <50%	≥50% and <60%	≥60% and <70%	≥70% and < 80%	≥80%
	Design Supply Fan Airflow Rate, cfm							
3C	NR	NR	NR	NR	NR	NR	NR	NR
0B, 1B, 2B, 3B, 4C, 5C	NR	≥19,500	≥9000	≥5000	≥4000	≥3000	≥1500	≥120
0A, 1A, 2A, 3A, 4B, 5B	≥2500	≥2000	≥1000	≥500	≥140	≥120	≥100	≥80
4A, 5A, 6A, 6B, 7, 8	≥200	≥130	≥100	≥80	≥70	≥60	≥50	≥40

NR—Not required

Energy Recovery

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
6.5.6.1	Mech. Schedules, specs

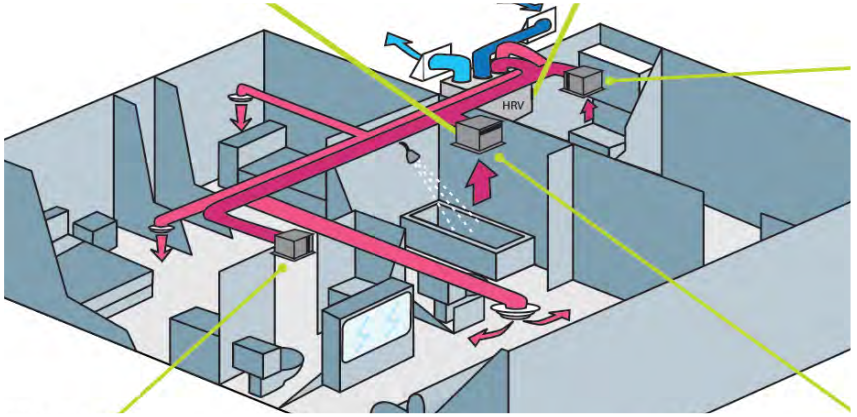
- Result is some cases that would have required ERV before may not now, and vice versa
- Recovery system effectiveness ≥ 50%
- Number of exceptions
  - Lab systems meeting 6.5.7.3
  - Systems serving uncooled spaces that are heated to < 60°F
  - Where > 60% of outdoor heating energy is provided from site-recovered or site solar energy
  - Cooling energy recovery in climate zones 3c, **4c, 5b,** 5c, 6b, 7, and 8
  - Where sum of airflow rates exhausted and relieved within 20 ft of each other is < 75% of the design outdoor airflow
  - Systems requiring dehumidification that employ energy recovery in series with the cooling coil
  - Systems operating < 20 hrs/week at outdoor air % in Table 6.5.6.1-1

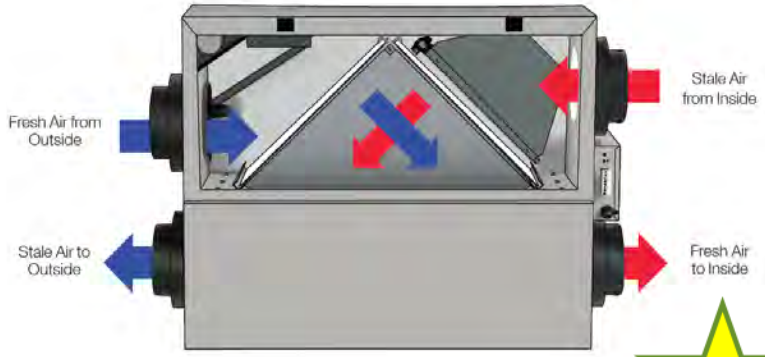
Exhaust Air Energy Recovery Non-Transient Dwelling Units

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*)

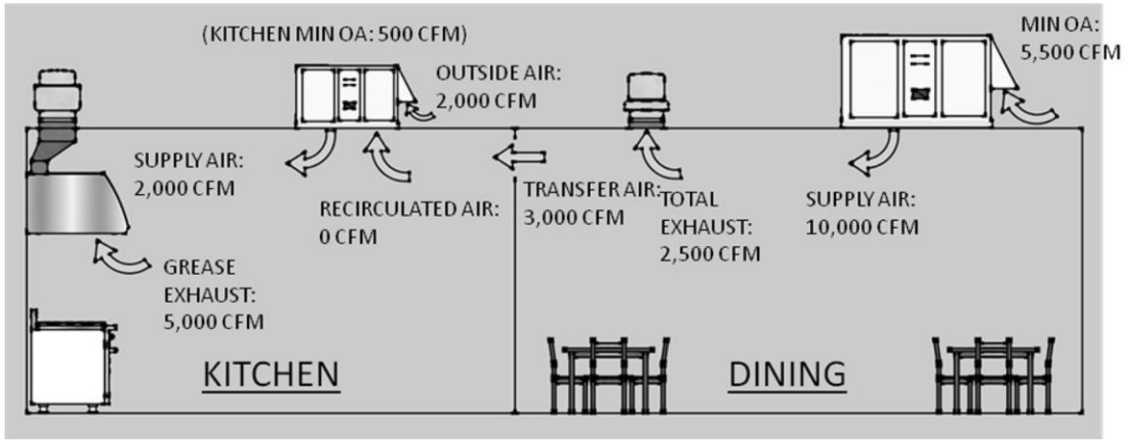
Kitchen Exhaust

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
6.5.7.2	Mech plans & schedules, Seq. of Ops

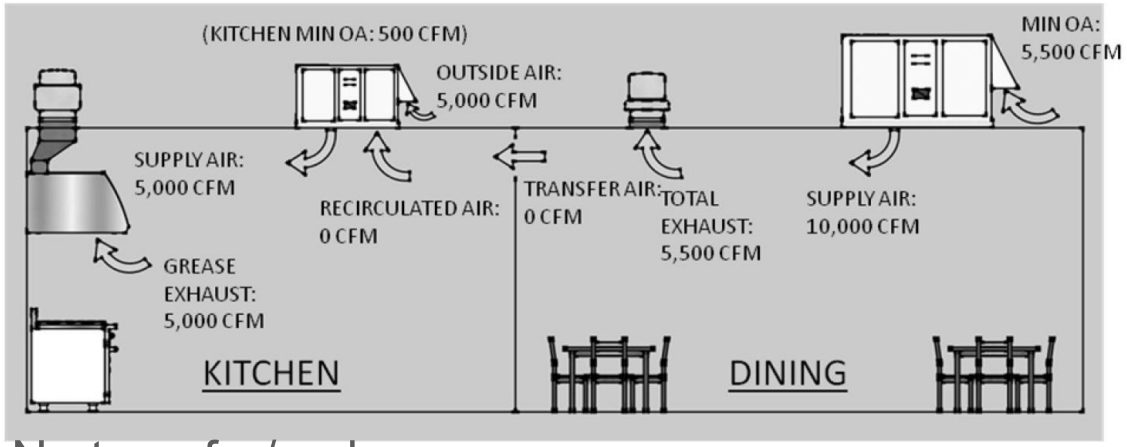
- Mostly the same requirements
- Replacement air introduced directly into the hood cavity of kitchen exhaust hoods shall not exceed 10% of the hood exhaust flow rate
- If total kitchen exhaust > 5000 cfm, then each hood shall comply with the maximum exhaust rate (cfm/linear foot) for that type of hood and equipment
- If total kitchen exhaust > 5000 cfm, then either
  - 50% of replacement air is transfer air that would otherwise be exhausted
  - Demand ventilation on at least 75% of exhaust air
  - Energy recovery (sensible) of 40% on half of total exhaust

Kitchen Exhaust

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
6.5.7.2	Mech plans & schedules, Seq. of Ops



Partial transfer/make-up



No transfer/make-up

- The 5,000 cfm threshold was developed based on small restaurants with separate kitchens from national changes and larger areas
- Exception provided where at least 75% of the replacement air is transfer air that would otherwise be exhausted

Radiant Heating

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
6.5.8	Arch & Mech plans

- Unenclosed Spaces
  - Radiant heating required when heating unenclosed spaces (except loading docks with air curtains)
- Enclosed spaces
  - Must conform to other portions of 90.1 (hydronic, VAV system requirements when used in conjunction, etc.)
- Radiant Heating for Enclosed Unconditioned Spaces
  - Overhead radiant heating allowed for spot heating occupied areas
    - » Limited to 500 ft^2 or 10% of space floor area and needs automatic shutdown controls

Hot Gas Bypass

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
6.5.9	Mech schedules, Specs

- Maximum allowable hot gas bypass % reduced

90.1-2019

Rated Capacity	Maximum Hot-Gas Bypass, % of total capacity
≤ 240,000 Btu/hr	15%
> 240,000 Btu/hr	10%

OEESC-2014

Rated Capacity	Maximum Hot-Gas Bypass, % of total capacity
≤ 240,000 Btu/hr	50%
> 240,000 Btu/hr	25%

- Applied in systems with stepped or continuous unloading
- Limitation also pertains to chillers
- Hot gas bypass not to be used on constant-volume units

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

Data Centers

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
6.5.12 ~~6.6.1~~	Mech schedules, Supp. Calcs.

- 90.1-2019 introduced alternate compliance path for Data Centers (≥ 20 W/ft^2 **and** ≥ 10kW instant load) to follow 90.4
- 2021 OEESC moved this from alternate compliance path to mandatory (created new section 6.5.12)
  - Also referenced 90.4-2019 instead of 90.4-2016
    - » Large change in mechanical efficiency values in 2019 version
- Created clearer definitions for data center vs. computer room

Data Center vs. Computer Room

Computer Room

A room whose primary function is to house *ITE* for the processing and storage of electronic data.

Data Center

A computer room (or series of computer rooms that share *data center systems*) serving a total *ITE* load greater than 10 kW and 20 W/ft^2 of conditioned floor area.

Data Centers

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
6.5.12 ~~6.6.1~~	Mech schedules, Supp. Calcs.

MLC is the sum of all power required for cooling, fans, pumps, heat rejection, etc. divided by the power for the data center IT equipment

$$(Annualized\ Mechanical\ Load\ Component) = \frac{\left(\begin{array}{l}\text{Mech\_}Energy25\% + \text{Mech\_}Energy50\% + \\ \text{Mech\_}Energy75\% + \text{Mech\_}Energy100\%\end{array}\right)}{\left(\begin{array}{l}\text{Data Center } ITE\ Energy25\% + \\ \text{Data Center } ITE\ Energy50\% + \\ \text{Data Center } ITE\ Energy75\% + \\ \text{Data Center } ITE\ Energy100\%\end{array}\right)} \quad (6.5)$$

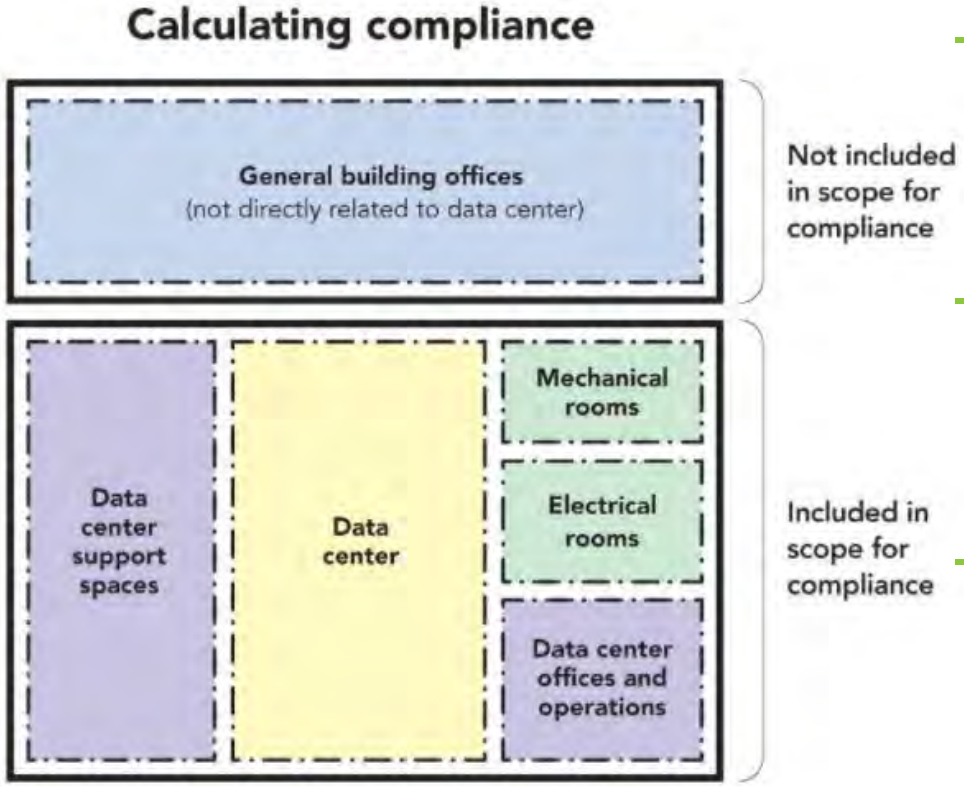
where

$$\text{Mech\_}EnergyX\% = \text{Total Annual } Cooling\ Energy + \text{Pump } Energy + \text{Heat Rejection Fan } Energy + \text{Air-Handler Fan } Energy$$

where each term is a constant value calculated at each of the following *ITE* loads: 25%, 50%, 75%, 100%.

Climate Zones as Listed in ASHRAE Standard 169	HVAC Maximum *Annualized MLC* for *Data Center ITE Design Power* > 300 *kW*	HVAC Maximum *Annualized MLC* for *Data Center ITE Design Power* ≤ 300 *kW*
4B	0.14	0.24
5C	0.14	0.23

What is Included?



- Check plans for system types serving data centers and ensure they are captured in MLC calcs
- ITE load (denominator) should include all loads related to data center, not just servers
- Request backup calculations for determining MLC
  - Can be easy to leave critical components out of calculation
  - Tradeoffs are acceptable between mech. and elec.

Mech Sections w/ Minor Changes

- **Heat Recovery for Service Water Heating**
  - Same threshold requirements of 6MMBtu and service water heating load > 1 MMBtu
  - Requirement for 24 hours/day facility operation before requirement applies
- **Laboratory Exhaust**
  - Just moved to new section rather than an exception to ERVs
- **Radiant Heating**
  - Same requirements as before
- **Hydronic System and Hydronic Heat Pump System Controls**
  - Same requirements as before
- **Supply Air Temp Reset Controls**
  - Same requirements, just changes from minimum reset of **35% to 25%** of difference between design SAT and design room air temperature
- **Chiller & Boiler Isolation Controls**
  - Same requirements for buildings with more than 1 chiller or boiler to shut off all flow to the chiller/boiler when that equipment is shut down
- **Tower Flow Turndown**
  - Same requirements as before

Submittals / Completion

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

90.1-2019

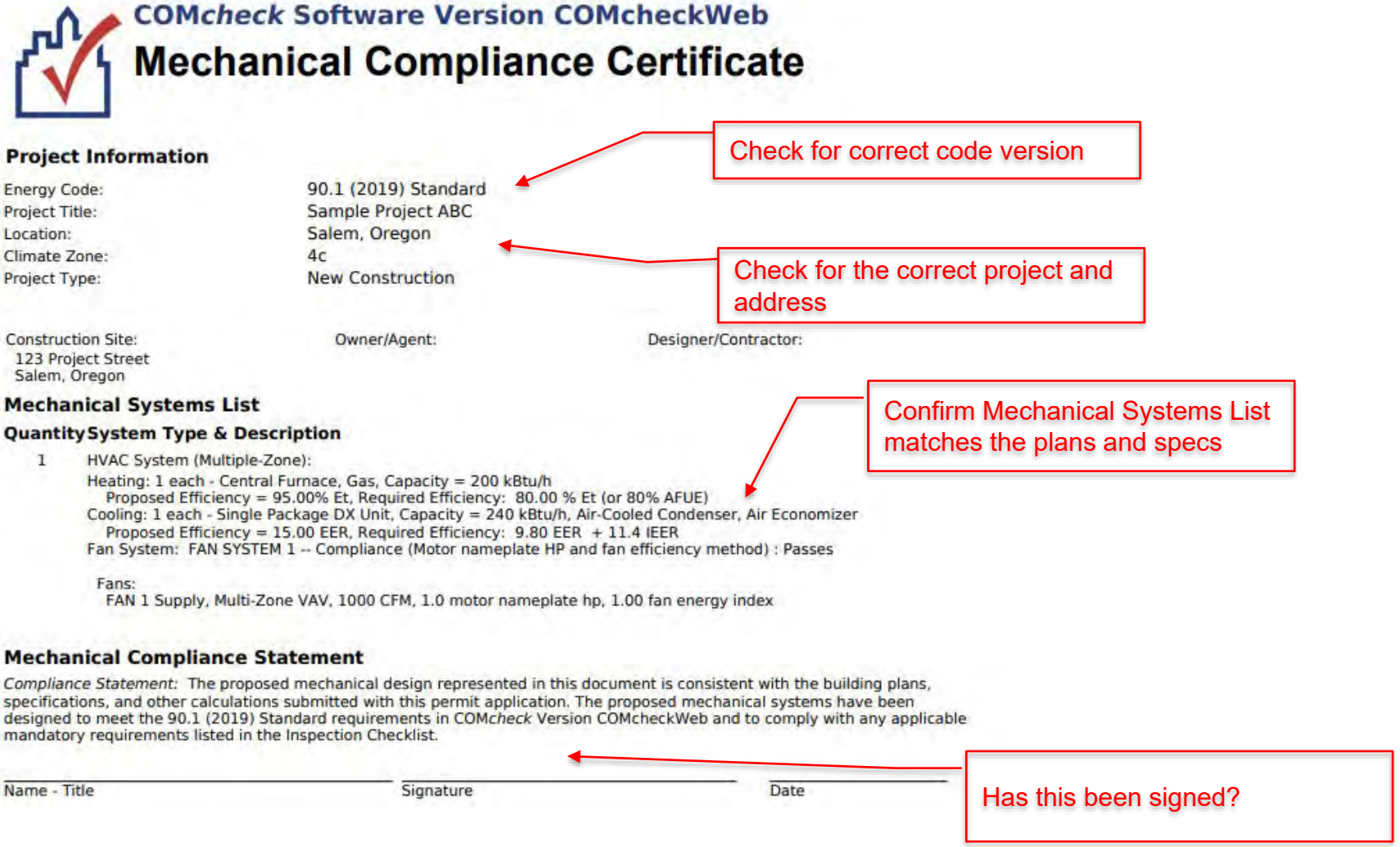
- Construction documents shall require that :
  - within 90 days after system acceptance, record drawings and O&M manual **delivered to owner**
  - All HVAC systems be balanced with generally accepted engineering standards, and air and hydronic systems first balanced to minimize losses and then to meet 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?

Service Water Heating

Service Water Heating Scope

- **New Buildings** required to comply
- **Additions** to existing buildings required to comply
  - Exception: When the *service water heating* to an addition is provided by existing *service water-heating systems* and *equipment* shall not be required to comply with this standard.
- Alterations where equipment is a direct replacement for existing equipment must comply
  - Compliance shall not be required where there is insufficient *space* or access to meet these requirements.
- No simplified building path for Service Water Heating

Service Water Heating Equipment Efficiency (Mandatory)

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
7.4.1 - 7.4.2	Plumbing dwgs, specs, supp. calcs.

- Requires load calcs to limit water heater oversizing
- Efficiency according to Table 7.8

Table 7.8 Performance Requirements for Water-Heating *Equipment*—Minimum *Efficiency* Requirements

Equipment Type	Size Category (Input)	Subcategory or Rating Condition	Performance Required [a]	Test Procedure[b,c]
Gas storage *water heaters*	≤75,000 Btu/h	<4000 (Btu/h)/gal ≥20 gal and ≤55 gal	For applications outside U.S., see footnote (h). For U.S. applications, see footnote (g).	10 CFR 430 Appendix E
		<4000 (Btu/h)/gal >55 gal and ≤100 gal	For applications outside U.S., see footnote (h). For U.S. applications, see footnote (g).	10 CFR 430 Appendix E
	>75,000 Btu/h and ≤105,000 Btu/h [d]	<4000 (Btu/h)/gal ≤120 gal ≤180°F	Very Small DP: UEF = 0.2674 – (0.0009 × V_r) Low DP: UEF = 0.5362 – (0.0012 × V_r) Medium DP: UEF = 0.6002 – (0.0011 × V_r) High DP: UEF = 0.6597 – (0.0009 × V_r)	10 CFR 430 Appendix E
	>105,000 Btu/h [d,f]	<4000 (Btu/h)/gal	80% E_t SL ≤ (Q/800 + 110$\sqrt{V}$), Btu/h	10 CFR 431.106
Pool heaters, gas	All		82% E_t for commercial pool heaters and for applications outside U.S. For U.S. applications, see footnote (g).	10 CFR 430 Appendix P
Heat pump *pool* heaters	All	50°F db 44.2°F wb *outdoor air* 80.0°F entering water	4.0 *COP*	10 CFR 430 Appendix P

Service Hot Water Efficiency (Mandatory)

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
7.4.2	Plumbing dwgs, specs, supp. calcs.

- Storage tanks and boilers with >140 gallons storage capacity not required to meet standby loss requirements so long as:
  - Tank surface insulated to R-12.5
  - No standing pilot light
  - Flue-damper installed on gas or oil-fired water heaters

Service Hot Water Piping Insulation (Mandatory)

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
7.4.3	Plumbing dwgs, specs, supp. calcs.

- Pipe insulation required on:
  - Supply/return of recirc system
  - Externally heated piping
  - First 8 feet of supply for non-recirculating system
  - Branch piping, and inlet piping to heat traps

Table 6.8.3-1 Minimum *Piping* Insulation Thickness Heating and Hot Water Systems[a,b,c,d,e] (Steam, Steam Condensate, Hot-Water Heating and Domestic Water *Systems*)

Fluid Operating Temperature Range (°F) and Usage	Insulation Conductivity		≥Nominal Pipe or Tube Size, in.				
	Conductivity, Btu·in/h·ft²·°F	Mean Rating Temperature, °F	<1	1 to <1-1/2	1-1/2 to <4	4 to <8	≥8
			Insulation Thickness, in.				
>350	0.32 to 0.34	250	4.5	5.0	5.0	5.0	5.0
251 to 350	0.29 to 0.32	200	3.0	4.0	4.5	4.5	4.5
201 to 250	0.27 to 0.30	150	2.5	2.5	2.5	3.0	3.0
141 to 200	0.25 to 0.29	125	1.5	1.5	2.0	2.0	2.0
105 to 140	0.22 to 0.28	100	1.0	1.0	1.5	1.5	1.5

Service Water Heating System Controls (Mandatory)

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
7.4.4	Plumbing dwgs, specs, Seq. of Ops.

- Requires temperature controls to allow adjustment from 120°F or lower
- Requires automatic time switches or other controls to turn off temperature maintenance system when no use
- Max temperature to public facility restroom lav = 110°F
- Recirculation time controls mandatory on all recirculation systems
  - Limit operation to 5 minutes after heating cycle ends

Pools (Mandatory)

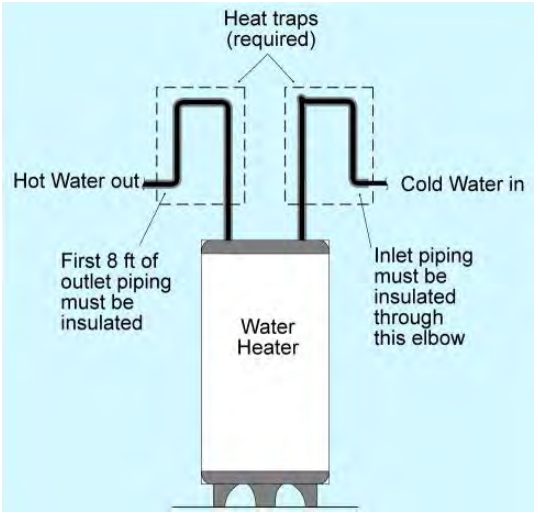
2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
7.4.5	Plumbing dwgs, specs, Seq. of Ops.

- Pool heater on/off control, pool covers (R-12 if heated >90°F), and time switch for pool pumps & heaters required
  - Exception for pool cover if 60% of heating energy is recovered from site
  - 90.1-2019 does not contain previous Oregon requirement for heat recovery on indoor pools >200 ft^2

Heat Traps (Mandatory)

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
7.4.6	Plumbing dwgs, specs, field inspection

- Requires heat traps on inlet & outlet for vertical risers serving storage tanks
- Heat trap keeps buoyant hot water from circulating through a piping distribution system through natural convection
  - By restricting the flow from the storage tank, standby heat loss is minimized



Combined Space/Water Heating

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
7.5.1	Plumbing dwgs, supp. calcs

- A combination gas-fired (or oil-fired) *boiler system* providing space and water heat for a building must meet one of the following:
  - Standby loss doesn't exceed threshold determined by equation: $$SL_{max} = \frac{13.3 \times pmd + 400}{n}$$

Type of Building	Maximum Hourly	Maximum Daily	Average Daily
Nursing homes	4.5 gal (17 L)/bed	30.0 gal (114 L)/bed	18.4 gal (69.7 L)/bed
Office buildings	0.4 gal (1.5 L)/person	2.0 gal (7.6 L)/person	1.0 gal (3.8 L)/person

  - AHJ determines combination water/space heat system will use less than individual units
  - Total energy input is <150,000 btu/h

High-Capacity Service Water Heating

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
7.5.3	Plumbing dwgs, supp. calcs

- Large service water heating systems with total installed input capacity ≥ 1,000,000 Btu/hr are required to have:
  - Weighted average thermal efficiency ≥ 90% calculated as:

$$\text{Capacity Weighted Average Efficiency} = \frac{\sum(\text{Input Capacity} \times \text{Efficiency})}{\sum \text{Input Capacity}} = \frac{\text{Total Output Capacity}}{\text{Total Input Capacity}}$$

- Exceptions
  - Where 25% of annual service water heating requirement is provided by solar or site-recovered energy
  - Equipment is installed in individual dwelling units
  - Individual gas water heaters with input capacity < 100,000 btu/hr

Going away in future 90.1

Verification & Commissioning

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

- Need to verify or commission SHW controls
- Verify that they work in accordance with their respective sections for:
  - SHW temp controls
  - Recirc pumps or heat trace controls
  - Pool time switch controls

Misc. Equipment

Pressure Boost Systems

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
10.4.2	Plumbing dwgs, specs

- *Service* water pressure-booster *systems* shall be designed such that the following apply:
  - One or more pressure sensors shall be used to vary pump speed and/or start and stop pumps. The sensors shall either be located near the critical *fixtures* that determine the pressure required, or logic shall be employed that adjusts the *set point* to simulate operation of remote sensors.
  - No devices shall be installed for the purpose of reducing the pressure of all of the water supplied by any booster *system* pump or booster *system*, except for safety devices.
  - No booster *system* pumps shall operate when there is no *service* water flow.

Air Curtains

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
10.4.5	Arch/Mech dwgs, specs.

- Shall be tested in accordance with ANSI/AMCA 220 or ISO 27327-1 and installed and commissioned in accordance with the manufacturer's instructions to ensure proper operation
- Shall have a jet velocity of not less than 6.6 ft/s at 6.0 in. above the floor and direction not less than 20 degrees towards the opening.
- Automatic controls shall be provided that will operate the air curtain with the opening and closing of the door.

Clean Water Pumps

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
10.4.7	Plumbing dwgs, specs, supp. calcs.

- Table of maximum PEI values for given pumps
  - Use variable load for pumps sold with VFDs

Table 10.8-6 Maximum Pump Energy Index (PEI)

Maximum PEI for Pumps Manufactured on or after January 27, 2020					
Pump Type	**Nominal Speed of Rotation (RPM)**	**Operating Mode**	**Maximum PEI [a]**	**C-Value [b]**	**Test Procedure**
End suction, close coupled	1800	Constant load	1.00	128.47	10 CFR Part 431
End suction, close coupled	3600	Constant load	1.00	130.42	10 CFR Part 431
End suction, close coupled	1800	Variable load	1.00	128.47	10 CFR Part 431
End suction, close coupled	3600	Variable load	1.00	130.42	10 CFR Part 431
End suction, frame mounted	1800	Constant load	1.00	128.85	10 CFR Part 431
End suction, frame mounted	3600	Constant load	1.00	130.99	10 CFR Part 431
End Suction, frame mounted	1800	Variable load	1.00	128.85	10 CFR Part 431
End suction, frame mounted	3600	Variable load	1.00	130.99	10 CFR Part 431

Clean Water Pumps

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
10.4.7	Plumbing dwgs, specs, supp. calcs.

- Clean water pumps meeting the following criteria shall comply with the requirements shown in Table 10.8-6:

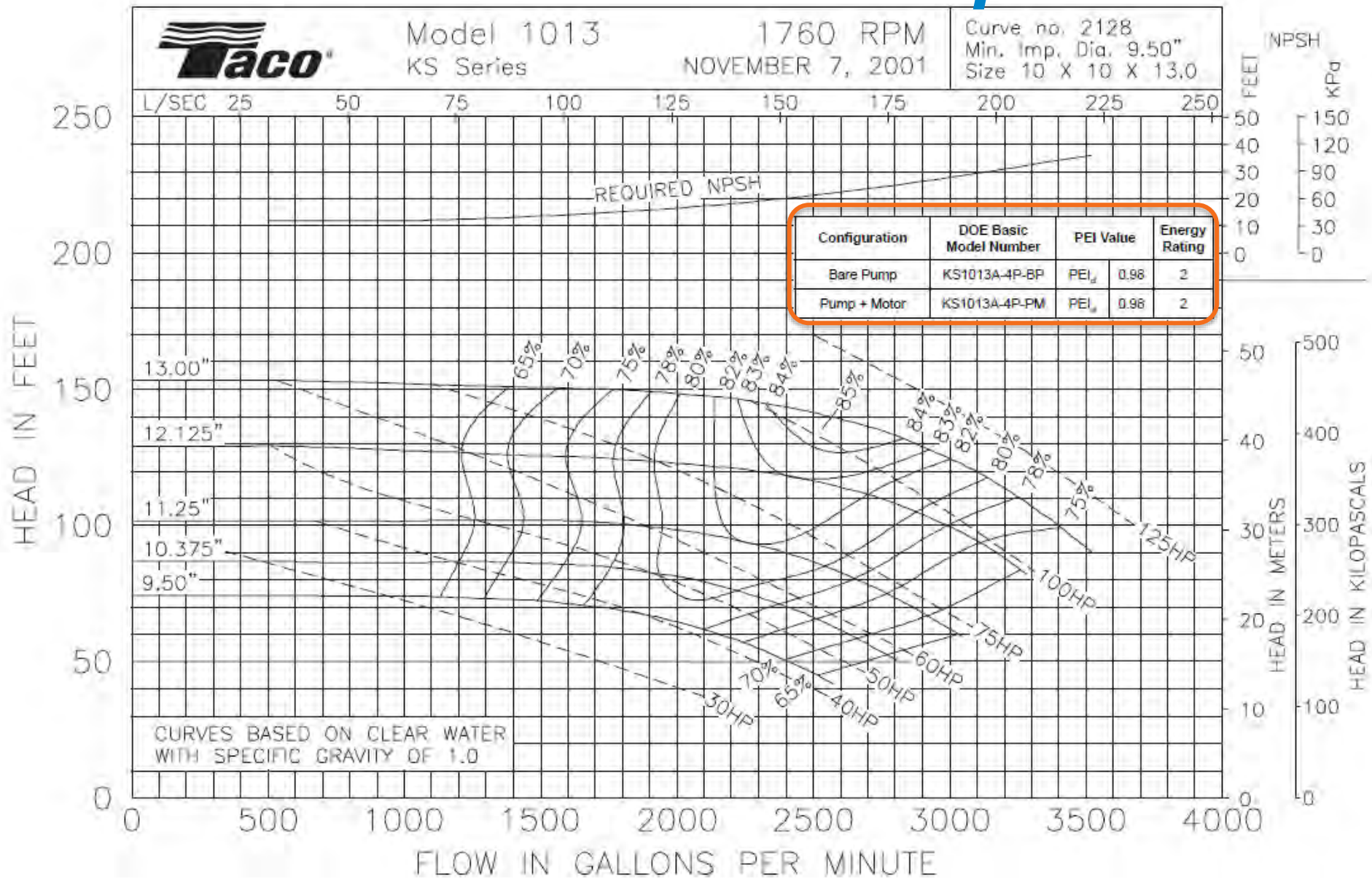
  a. A flow rate of 25 gal/min or greater at its best efficiency point (BEP) at full impeller diameter
  b. Maximum head of 459 ft at its BEP at full impeller diameter and the number of stages required for testing
  c. Design temperature range from 14°F to 248°F
  d. Designed to operate with either
     1. a 2- or 4-pole induction motor or
     2. a noninduction motor with a speed of rotation operating range that includes speeds of rotation between 2880 and 4320 rpm and/or 1440 and 2160 rpm, and
     3. in either (1) or (2), the driver and impeller must rotate at the same speed
  e. For submersible turbine pumps, a 6 in. or smaller bowl diameter
  f. For end-suction close-coupled pumps and end-suction frame-mounted/own bearings pumps, specific speed less than or equal to 5000 rpm when calculated using U.S. customary units

Clean Water Pumps

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
10.4.7	Plumbing dwgs, specs, supp. calcs.

- Requirements apply to pumps 1-200 HP only
- Several exceptions for niche applications. Namely:
  1. Fire pumps.
  2. Self-priming pump.
  3. Prime-assist pumps.
  4. Magnet-driven pumps.
  5. Pumps designed to be used in a nuclear facility
  6. Pumps meeting the design and construction requirements set forth in U.S. Military Specifications

Clean Water Pumps



Configuration	DOE Basic Model Number	PEI Value		Energy Rating
Bare Pump	KS1013A-4P-BP	PEI_4	0.98	2
Pump + Motor	KS1013A-4P-PM	PEI_4	0.98	2

neea

Verification & Commissioning

2021 Oregon / ASHRAE 90.1-2019	Compliance Documentation Location
10.9	Commissioning plan

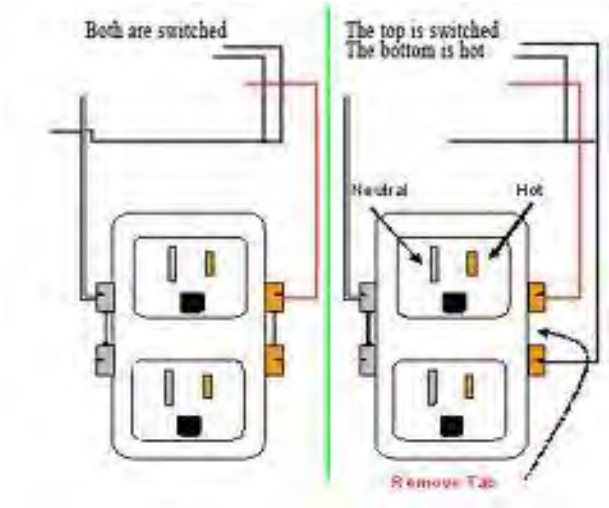
- Need to verify or commission pressure boost systems, elevator standby controls, whole building energy monitoring
- Verify that they work in accordance with their respective sections.

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

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 (Schools
- 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 - 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

Interior Lighting Controls

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

- ASHRAE table format that includes Space-By-Space LPDs and control requirements (small part shown below)

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.			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.								
Common *Space* Types[1]	*LPD* Allowances, W/ft^2	*RCR* Threshold	Local *Control* (See Section 9.4.1.1[a])	Restricted to *Manual* ON (See Section 9.4.1.1[b])	Restricted to Partial *Automatic* ON (See Section 9.4.1.1[c])	Bilevel Lighting *Control* (See Section 9.4.1.1[d])	*Automatic* Daylight Responsive *Controls* for Sidelighting (See Section 9.4.1.1[e][6])	*Automatic* Daylight Responsive *Controls* for *Toplighting* (See Section 9.4.1.1[f][6])	*Automatic* Partial OFF (See Section 9.4.1.1[g] [Full Off complies])	*Automatic* Full OFF (See Section 9.4.1.1[h])	Scheduled Shutoff (See Section 9.4.1.1[i])
			a	b	c	d	e	f	g	h	i
Atrium											
<20 ft in height	0.39	NA	REQ	ADD1	ADD1		REQ	REQ		ADD2	ADD2
≥20 ft and ≤40 ft in height	0.48	NA	REQ	ADD1	ADD1	REQ	REQ	REQ		ADD2	ADD2
>40 ft in height	0.60	11	REQ	ADD1	ADD1	REQ	REQ	REQ		ADD2	ADD2
Audience Seating Area											
Auditorium	0.61	6	REQ	ADD1	ADD1	REQ	REQ	REQ		ADD2	ADD2
Gymnasium	0.23	6	REQ	ADD1	ADD1	REQ	REQ	REQ		ADD2	ADD2
Motion picture theater	0.27	4	REQ	ADD1	ADD1	REQ	REQ	REQ		ADD2	ADD2
Penitentiary	0.67	4	REQ	ADD1	ADD1		REQ	REQ		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

HVAC & Lighting Controls Coordination

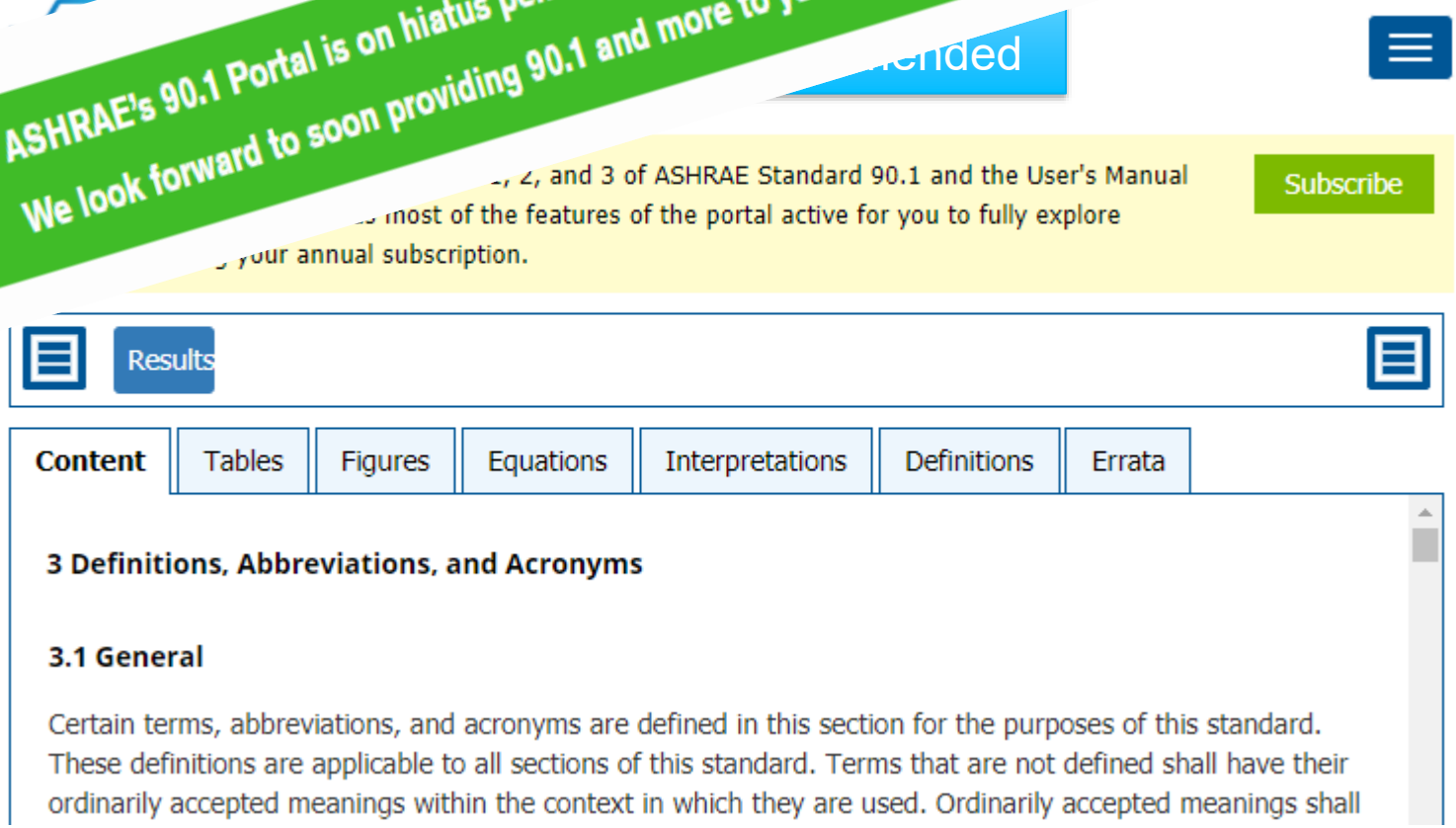
- Important to coordinate occupancy-based controls in Lighting with HVAC requirements
  - Demand-Control Ventilation in 6.4.3.8
  - Occupied Standby Controls in 6.5.3.8
- HVAC & Lighting controls becoming a bigger focus
- Several technologies that help accomplish both (ex. Luminaire Level Lighting Controls)
- Hard to coordinate reviews between trades during plan review
  - Can lead to inspection issues and change orders

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 require~~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.

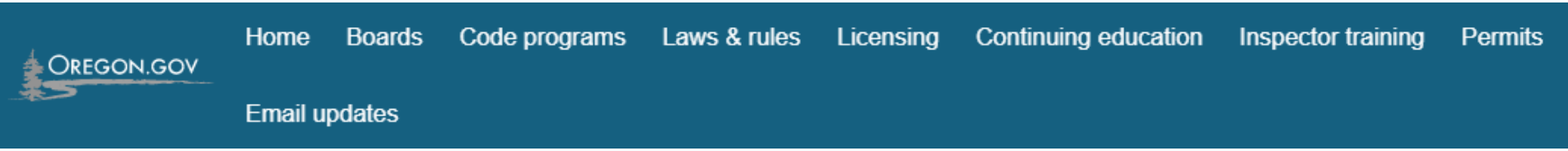
[. . .]

Forthcoming Changes

- ASHRAE 90.1-2022 will include changes such as:

  - **Lowering of economizer threshold to ≥ 33,000 Btu/hr for fan-cooling units located outside the building**
  - **Occupied-standby control of multiple-zone systems resets the minimum outdoor air set point to zero**
  - DCV changing from threshold based on floor area and occupancy → climate zone and occupant airflow rate
  - Requirement for high-capacity space heating boilers (1 MMBtu, similar to SWH systems) to be ≥ 90% Et
  - Adds compressed air as a covered system and imposes part-load efficiency and controls requirements
  - Lowers parking garage ventilation fan turndown from 50%→ 20%
  - Adds efficiency requirements for large diameter fans (≥ 84.5”)
  - Numerous clarifications and better alignment with the performance paths in Section 11 and Appendix G
  - Corrects heat pump and heat recovery chiller capacity and efficiency tables

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

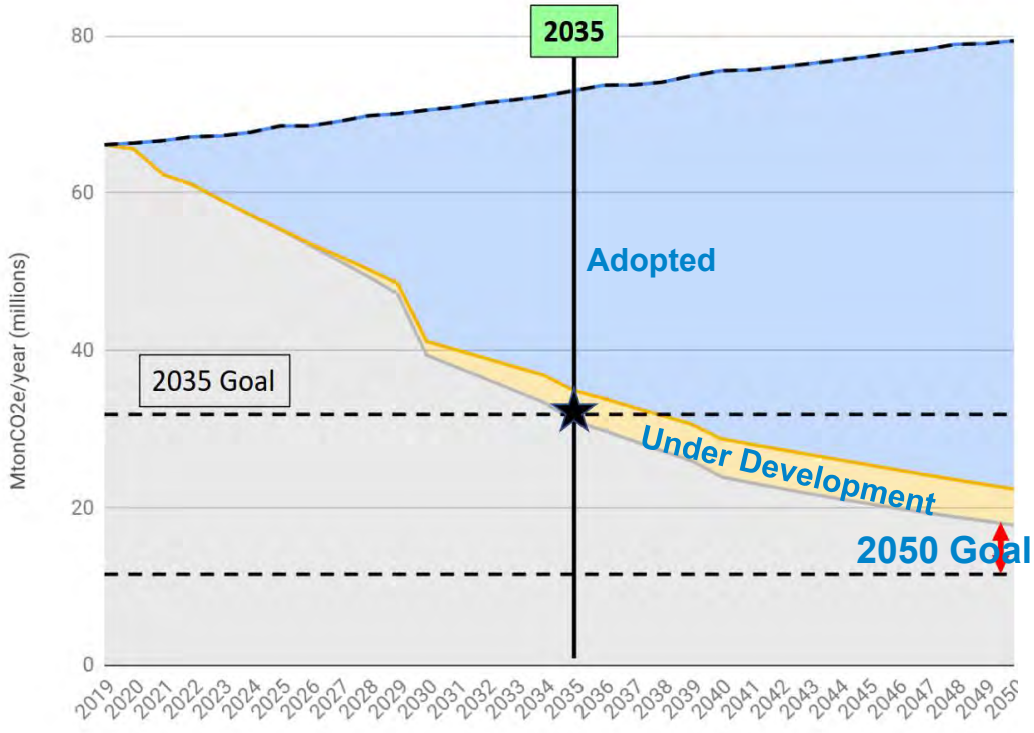
Mandatory Oct. 1, 2021

- 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

neea

Thank You!
Questions?

Blake Shelide, P.E.
Facilities Engineer
Energy Planning and Innovation
550 Capitol St. NE
Salem, OR 97301
503-373-7809
Blake.Shelide@oregon.gov

Nicholas O'Neil, P.E.
Director of Research & Evaluation
1033 SE Main St, Suite 1
Portland, OR 97214
971-544-7211
noneil@energy350.com