



Code Amendment Proposal Application

Department of Consumer & Business Services

Building Codes Division

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Oregon.gov/bcd

Read the entire code amendment proposal application before completing this form. Please complete all parts before submitting your proposal and refer to the provided checklist.

APPLICANT INFORMATION

Name:	Date:	
Representing (if applicable):	Work phone:	
Mailing address:	Cell phone:	
City:	State:	Zip:
Email address:		

PROPOSAL INFORMATION

Specialty code:
Code section(s):
Briefly explain the subject of your proposal:

INSTRUCTIONS AND CHECKLIST

Fill in all the information above and submit this page, signed and dated, with the required supplementary information for Parts I, II, III, and IV described on page 2 of this application. This application may be submitted by mail to the mailing address above, or by email to BCD.PTSPtech@oregon.gov.

Summary checklist for the applicant:

- Part I** Code amendment language is attached in the proper format.
- Part II** Amendment proposal requirements for amending the code have been reviewed.
- Part III** Amendment proposal criteria questions have been answered and are attached.
- Part IV** If applicable, additional ORSC energy efficiency amendment proposal information is attached.

Note: One application is required for each code section you are proposing to amend. If this proposal requires changes in other sections of the code for alignment, include those changes as part of this application.

APPLICANT SIGNATURE

Signature:  Date:

Copyright notice: By signing this Code Amendment Proposal Application, I understand and acknowledge that the work contained in this application is original, or if not original, I have the right to copy the work. By signing this work, I understand that any rights I may have in this work, including any form of derivative works and compilations, are assigned to the Department of Consumer and Business Services Building Codes Division. I also understand that I do not retain or acquire any rights once this work is used in a Department of Consumer and Business Services Building Codes Division publication.

Modified proposal submitted by the proponent Sept. 29, 2022

Revise Section N1101.1 General as follows:

SECTION N1101 SCOPE

N1101.1 General. The provisions of this chapter regulate the exterior envelope, as well as the design, construction and selection of heating, ventilating and air-conditioning systems, lighting and piping insulation required for the purpose of effective conservation of energy within a building or structure governed by this code.

All conditioned spaces within residential buildings shall comply with Table N1101.1(1) and ~~one additional measure from Table N1101.1(2).~~ **the requirements of Section N1109 Additional Efficiency Credits.**

Exceptions:

1. Application to existing buildings shall comply with Section N1101.2.
2. Application to additions shall comply with Section N1101.3.
3. Heated or cooled detached accessory structures that are not habitable shall meet the following envelope requirements without any additional measures: Walls: R- 21/U-0.064; Roofs: R-38/U-0.027 (attic) or R-20 continuous insulation/U-0.048 (above deck); Windows: U-0.35; Opaque doors: U-0.70; Roll-up doors: U-0.50.
- ~~4. New buildings using Section N1105.3.1, Exception 3, shall select two additional measures from Table N1101.1(2).~~

Revise Section N1101.3 Additions as follows:

N1101.3 Additions. Additions to existing buildings or structures may be made without making the entire building or structure comply if the new additions comply with the requirements of this chapter.

N1101.3.1 Large additions. Additions that are equal to or more than 600 square feet (55 m²) in area shall be required to ~~comply with~~ **select additional energy efficiency measures from Table N1101.1(2) N1109.2 that meet or exceed a total of 6 credits.**

N1101.3.2 Small additions. Additions that are less than 600 square feet (55 m²) in area shall be required to select one measure from Table ~~N1101.1(2)~~ **N1109.2** or comply with Table N1101.3.

Exception: Additions that are less than 225 square feet (20.9 m²). ~~in area shall not be required to comply with Table N1101.1(2) or Table N1101.3.~~

Revise Section N1101.4 Information on plans and specifications as follows:

N1101.4 Information on plans and specifications. Plans and specifications shall show in sufficient detail all pertinent data and features of the building and the equipment and systems as herein governed, including, but not limited to: exterior envelope component materials; R-values of insulating materials; fenestration U-factors; HVAC equipment efficiency performance and system controls; lighting; ~~an additional measure~~ **from Table N1101.1(2) N1109.2;** and the other pertinent data to indicate compliance with the requirements of the chapter.

Revise Section N1105.3.3 as follows:

N1105.3.3 Deeply buried duct in vented crawlspace. Ducts deeply buried in crawlspace insulation shall be in accordance all of the following when selecting ~~two measures from Table N1101.1(2)~~ **25 credits from Table N1109.2:**

1. Insulation shall be installed to fill gaps and voids between the duct and the floor above, and a minimum of R-19 insulation shall be installed between the duct between the duct and unconditioned crawlspace.
2. All ductwork in the crawlspace shall be insulated to R-8.

Add new Section N1109 Additional Efficiency Requirements as follows:

SECTION N1109
ADDITIONAL EFFICIENCY REQUIREMENTS

N1109.1 General. This section establishes additional efficiency credits to achieve additional energy efficiency in accordance with Section N1101.1.

N1109.2 Additional energy efficiency credit requirements. Not less than two of the additional efficiency measures shall be selected from Table N1109.2 that meet or exceed a total of 20 credits. Each measure selected shall meet the relevant subsections of Section N1109.2 and receive credit as specified in Table N1109.2 for the specific climate zone. Interpolation of credits between measures shall not be permitted.

TABLE N1109.2
CREDITS FOR ADDITIONAL ENERGY EFFICIENCY

<u>Measure Number</u>	<u>Measure Description</u>	<u>Credit Value</u>	
		<u>CZ 4C</u>	<u>CZ 5</u>
<u>N1109.2.1.1 (1)</u>	<u>≥ 2.5% reduction in total UA</u>	<u>1</u>	<u>1</u>
<u>N1109.2.1.1 (2)</u>	<u>≥ 5% reduction in total UA</u>	<u>2</u>	<u>3</u>
<u>N1109.2.1.1 (3)</u>	<u>> 7.5% reduction in total UA</u>	<u>2</u>	<u>3</u>
<u>N1109.2.1.2</u>	<u>0.22 U-factor windows</u>	<u>3</u>	<u>4</u>
<u>N1109.2.2 (1)</u>	<u>High performance cooling system option 1</u>	<u>3</u>	<u>3</u>
<u>N1109.2.2 (2)</u>	<u>High performance cooling system option 2</u>	<u>3</u>	<u>2</u>
<u>N1109.2.2 (3)</u>	<u>High performance gas furnace option 1</u>	<u>5</u>	<u>7</u>
<u>N1109.2.2 (4)</u>	<u>High performance gas furnace option 2</u>	<u>4</u>	<u>5</u>
<u>N1109.2.2 (5)</u>	<u>High performance heat pump system option 1</u>	<u>6</u>	<u>6</u>
<u>N1109.2.2 (6)</u>	<u>High performance heat pump system option 2</u>	<u>5</u>	<u>5</u>
<u>N1109.2.2 (7)</u>	<u>Ground source heat pump</u>	<u>6</u>	<u>8</u>
<u>N1109.2.3 (1)</u>	<u>Fossil fuel service water heating system</u>	<u>3</u>	<u>2</u>

Measure Number	Measure Description	Credit Value	
		CZ 4C	CZ 5
N1109.2.3 (2)	High performance heat pump water heating system option 1	8	6
N1109.2.3 (3)	High performance heat pump water heating system option 2	8	6
N1109.2.3 (4)	Solar hot water heating system	6	6
N1109.2.3 (5)	Drain water heat recovery unit	2	2
N1109.2.5 (1)	3 ACH50 air leakage rate with ERV or HRV installed	10	13
N1109.2.5 (2)	3 ACH50 air leakage rate with balanced ventilation	4	5
N1109.2.5 (3)	2.5 ACH50 air leakage rate with ERV or HRV installed	12	15
N1109.2.5 (4)	2.0 ACH50 air leakage rate with ERV or HRV installed	14	17
N1109.2.6	Energy Efficient Appliances	7	5
N1109.2.7	Renewable Energy Measure	11	9

N1109.2.1 Enhanced envelope options. The *building thermal envelope* shall meet the requirements of Section N1109.2.1.1 or N1109.2.1.2.

N1109.2.1.1 Enhanced envelope performance UA. The proposed total *building thermal envelope* UA, shall be calculated in accordance with Table N1104.1(1) and shall meet one of the following:

- 1. Not less than 2.5% below the total code UA of the *building thermal envelope*.**
- 2. Not less than 5% below the total code UA of the *building thermal envelope*.**
- 3. Not less than 7.5% below the total code UA of the *building thermal envelope*.**

N1109.2.1.2 Improved fenestration. *Vertical fenestration* shall have a U-factor equal to or less than 0.22.

N1109.2.2 More efficient HVAC equipment performance options. Heating and cooling equipment shall meet one of the following efficiencies:

- 1. Greater than or equal to 16.9 SEER2 air conditioner.**
- 2. Greater than or equal to 16.0 SEER2 air conditioner.**
- 3. Greater than or equal to 96 AFUE natural gas furnace**
- 4. Greater than or equal to 92 AFUE natural gas furnace**
- 5. Greater than or equal to 8.5 HSPF2/16.9 SEER2 air source heat pump.**
- 6. Greater than or equal to 8.5 HSPF2/16.0 SEER2 air source heat pump**
- 7. Greater than or equal to 3.5 COP ground source heat pump.**

For multiple cooling systems, all systems shall meet or exceed the minimum efficiency requirements in this section and shall be sized to serve 100 percent of the cooling design load. For multiple heating systems, all systems shall meet or exceed the minimum efficiency requirements in this section and shall be sized to serve 100 percent of the heating design load.

N1109.2.3 Reduced energy use in service water-heating options. The hot water system shall meet one of the equipment options in Table N1109.2.3 or the requirements of item 5 below:

TABLE N1109.2.3 EFFICIENT SERVICE WATER HEATING EQUIPMENT OPTIONS

<u>Option</u>	<u>Water Heater</u>	<u>Size</u>	<u>Type</u>	<u>Efficiency</u>
<u>1.</u>	<u>Gas-fired storage water heaters</u>	<u>≤ 55 gallons</u>	<u>Medium Draw Pattern</u>	<u>UEF≥0.81</u>
			<u>High Draw Pattern</u>	<u>UEF≥0.86</u>
		<u>>55 gallons</u>	<u>Medium Draw Pattern</u>	<u>UEF≥0.86</u>
			<u>High Draw Pattern</u>	<u>UEF≥0.86</u>
<u>2.</u>	<u>Gas-fired instantaneous water-heater</u>			<u>UEF≥0.95</u>
<u>3.</u>	<u>Electric water heaters</u>		<u>Integrated HPWH</u>	<u>UEF≥3.30</u>
	<u>Uniform Energy Factor (UEF)</u>		<u>Integrated HPWH, 120 Volt/15 Amp Circuit</u>	<u>UEF≥2.20</u>
	<u>First-hour rating FHR≥0.45 gallons per hour</u>		<u>Split-system HPWH</u>	<u>UEF≥2.20</u>
<u>4.</u>	<u>Solar water heaters</u>		<u>Electric backup</u>	<u>SUEF≥3.00</u>
	<u>Solar uniform energy factor (SUEF)</u>		<u>Gas backup</u>	<u>SUEF≥1.80</u>

5. Drain water heat recovery unit installed on minimum of one shower/tub-shower

N1109.2.5 Improved air sealing and efficient ventilation system option. The measured air leakage rate shall be one of the following:

- 1. Less than or equal to 3.0 ACH50, with either an Energy Recovery Ventilator (ERV) or Heat Recovery Ventilator (HRV) installed.**
- 2. Less than or equal to 3.0 ACH50, with balanced ventilation as defined in Section 202 of the 2021 International Mechanical Code.**
- 3. Less than or equal to 2.5 ACH50, with either an ERV or HRV installed.**
- 4. Less than equal to 2.0 ACH50, with either an ERV or HRV installed.**

Minimum HRV and ERV requirements, measured at the lowest tested net supply airflow, shall be greater than or equal to 75 percent Sensible Recovery Efficiency (SRE), less than or equal to 1.1 cubic feet per minute per watt (0.03 m3/min/watt) and shall not use recirculation as a defrost strategy. In addition, the ERV shall be greater than or equal to 50 percent Latent Recovery/ Moisture Transfer (LRMT).

N1109.2.6 Energy efficient appliances. Appliances installed in a dwelling unit shall meet the product energy efficiency specifications listed in Table N1109.2.6, or equivalent energy efficiency specifications. Not less than three appliance types from Table N1109.2.6 shall be installed for compliance with this section.

TABLE RN1109.2.6 EFFICIENT APPLIANCE REQUIREMENTS

<u>Refrigerator</u>	<u>Energy Star Program Requirements, Product Specification for Consumer Refrigeration Products, Version 5.1 (08/05/2021)</u>
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<u>Dishwasher</u>	<u>Energy Star Program Requirements for Residential Dishwashers, Version 6.0 (01/29/2016)</u>
<u>Clothes Dryer</u>	<u>Energy Star Program Requirements, Product Specification for Clothes Dryers, Version 1.1 (05/05/2017)</u>
<u>Clothes Washer</u>	<u>Energy Star Program Requirements, Product Specification for Clothes Washers, Version 8.1 (02/05/2018)</u>

N1109.2.7 Renewable Energy. Renewable energy resources shall be permanently installed that have the rated capacity to produce a minimum of 1.0 watt of on-site renewable energy per square foot of conditioned floor area. To qualify for this option, renewable energy certificate (REC) documentation shall be provided to the code official by the property owner or owner's authorized agent which demonstrates that where RECs or energy attribute certificates (EACs) are associated with that portion of renewable energy used to comply with this option, the RECs or EACs shall be retained, or retired, on behalf of the property owner.

OR-2023 Credit Proposal – Part III and IV

Part III:

1. Describe the concept and purpose of this proposal.

In 2017, Governor Kate Brown issued [Oregon Executive Order 17-20](#) stating the next version of ORSC must “require newly constructed residential buildings to achieve at least equivalent performance levels with the 2017 U.S. Department of Energy Zero Energy Ready Standard by October 1, 2023”. This proposal aims to provide a meaningful step in closing the gap between the BDC proposal for the 2023 ORSC and ZERH target stated in EO 17-20.

This proposal builds on the additional efficiency options in the 2021 IECC by converting those package options into a credit-based system similar to the “Additional Efficiency Credits” system in C406 of the commercial section of the energy code. The proposal to the 2024 IECC requires projects to select additional efficiency “credits” equal to achieve a target of 10, representing the 10% energy savings needed from this section of the code. There are 25 measure options provided, covering all aspects of building performance. This approach has a history in the Northwest having previously been used by Oregon and is currently in place in Washington, where it has proven to be an effective method of increasing efficiency for residential construction using the prescriptive approach. This option does not require performance energy modeling or HERS verification which will increase its usefulness. This type of flex credits option can also be easily implemented in the U.S. DOE REScheck software.

2. What problem in the existing Oregon code or national model code is this proposal solving? How does this amendment address the issue? If you have evidence demonstrating the problem, submit that information.

Currently the packages in the 2021 IECC and the 2021 ORSC are not equal and result in varying degrees of savings. This proposal aims to build on the packages in the 2021 IECC and the 2021 ORSC while providing a framework for achieving approximately equivalent savings from the additional efficiency options. Moreover, this proposal will provide maximum flexibility for designer professionals and builders to achieve improved efficiency by selecting the most cost-effective and sensible efficiency improvement combinations for a given project. There are high barriers to entry for new technologies, even when they could transform the marketplace and provide energy- or cost-saving benefits for homeowners. Innovative building practices or emerging technologies that jurisdictions may be reluctant to require in the base energy code can be listed as an optional package item before the technology is market-tested.

This proposal will improve efficiency by roughly 15% while unlocking the competitive market for new technologies or building components that are difficult to regulate.

3. Has this been proposed at the national model code level. If so, explain when it was proposed, what happened, and why it was not adopted. Provide all associated national model code hearing information and background.

This proposal is based on a proposal that was modified by the IECC 2024 residential consensus committee and subcommittee and is currently moving forward in the model standard adoption process as REPI-18. Over the first two balloting phases of the 2024 IECC, REPI-18 achieved 96% support from consensus committee members.

Implementation and fiscal impact

- 1. Explain how the proposed provisions would be enforced? Are additional inspections or permits required? Describe any necessary equipment, training, tests or special certifications.**
- 2. What is the fiscal impact of this proposal? Provide a cost benefit analysis and include the resources or methods you used to determine the fiscal impact.**

The code change proposal will increase the cost of construction. Requiring additional efficiency measures, such as more insulation, more efficient windows, reduced air leakage and duct leakage, and/or more efficient equipment, to save 15% energy will increase the cost of construction, but the resulting energy and cost savings will recoup the initial costs and will continue to benefit consumers over the useful life of the home. Additionally, the flexibility of this approach allows for the most cost-effective means of meeting the stated energy reduction goals of the State.

This proposal would not require additional inspections or permits. Designers would need to include which measures are selected to satisfy the minimum number of credits needed in their submitted building plans.

Impacted stakeholders and other specialty codes

- 1. It is important that proposals be shared with stakeholders that will be impacted by them. Was this proposal developed with people or organizations likely to be affected by it? Has it been reviewed or shared with people or organizations likely to be affected by it? If so, who, and if not, why not?**
- 2. Does this proposal impact other specialty codes or statewide programs?**

As mentioned in Part III, this proposal mirrors REPI-18 that is currently working its way through the 2024 IECC consensus process. The IECC consensus committee consists of relevant building industry stakeholders and this proposal has received broad feedback and support, which is reflected in this current proposal. Additionally, support for this proposal is widespread, including the National Association of Home Builders (NAHB), the Air Conditioning, Heating, and Refrigeration Institute (AHRI), and as well as energy efficiency advocates. This version has also integrated REPI-136 from the 2024 IECC, which originally was a proposal from Daikin Corporation for more efficient HVAC equipment.

For reference a number of measures from this proposal are aligned with the DOE Zero Energy Ready Homes (ZERH) requirements. The DOE ZERH program requires 94% AFUE heating systems and 13 SEER for air conditioner for climate zones 4C and 5. Additionally, the ZERH program requires infiltration of 2.5 ACH50 at in climate zone 4C and 2 ACH50 in climate zone 5.

Part IV:

- 1. Modeled estimated energy savings Modeled estimated energy savings based on the US Department of Energy's Methodology for Evaluating Cost-effectiveness of Residential Energy Code Changes (US DOE Methodology) established for its Building Energy Codes Program (BCAP) and for a 1,200 square foot single-family home on a 6,000 square foot lot, including;**
 - a) The building components, their associated input values, and their assumptions used for developing the average baseline code results, the proposed code amendment(s), and the data sources for those building components, input values and assumptions;**

- b) The data sources for the input values, beginning with the US DOE Methodology or other national standard(s), followed by the baseline code, then regional data, as appropriate, where national methodologies or standards do not apply; and
 - c) Weighting factors, provided by the division, based on foundation type, fuel type, and climate zone.
2. Increased construction costs above those of the base code that would result from the proposed amendments relative to the US DOE Methodology home and for a 1,200 square foot single family home on 6,000 a square foot lot, detailed and specific enough to allow for the reproduction of the analysis, based on the following factors:
- a) A standard cost for different fuel types based on data provided by the division, or from the US Energy Information Agency (EIA) if not available from the division. These costs will be used in any analysis of code change proposals and the costs by fuel type will be used for the duration of the code adoption cycle;
 - b) Cost of labor;
 - c) Quantity of labor;
 - d) Cost of materials;
 - e) Quantity of materials;
 - f) Overhead costs;
 - g) Profit; and
 - h) Factors or conditions that would make an alteration, repair, change of use, or change of occupancy, or other code upgrade triggering event in an existing building more expensive to comply with, or would otherwise make the included cost analysis unreliable. Where the code upgrade triggering event would have a fiscal impact, an estimate

This cost analysis compares one possible pathway through the additional efficiency requirements that would result in the necessary 15 credits and includes: a high performance gas furnace (option 2), heat pump water heater and Energy Star Appliances (refrigerator, dishwasher, clothes washer and clothes dryer). The points for these options are outlined for each climate zone below.

Measures Selected	CZ 4C	CZ5
1. High Performance Gas Furnace option 2	4	5
2. Heat Pump Water Heater	8	6
3. Energy Star Appliances	7	5
Total Credits	19	16

1. High Efficiency Furnace:

This option is in the 2021 ORSC and is present in the BCD draft of the 2023 and therefor does not need to be included in our cost effectiveness calculation.

2. Heat Pump Water Heater:

The Northwest Energy Efficiency provided this analysis as cost justification for the heat pump water heater measure used in their analysis for their proposal #1, which specifies an electrical heat pump water heater with a minimum UEF of 3.5, which exceeds the UEF of 3.30 that appears in our proposal

	Prop #1: HE DHW System HPWH	
Incremental Cost Elements	RS Means	RTF
c. Cost of labor;	\$ -	
d. Quantity of labor;	\$ 4.00	
e. Cost of materials;	\$ 1,476.00	
f. Quantity of materials;	\$ 1.00	
g. Overhead costs;	\$ 162.36	
h. Profit; and	\$ 73.80	
i. N/A		
Total Incremental Cost	\$ 1,712.16	\$ 887.08
Fiscal Impact		
Energy Savings (kWh)	364	364
Energy Savings (Therms)	26	26
Fuel Cost (kWh)	\$0.11	\$0.11
Fuel Cost (Therms)	\$1.15	\$1.15
Energy Benefit (kWh)	\$40.09	\$40.09
Energy Benefit (Therms)	\$29.53	\$29.53
Total Energy Benefit	\$69.61	\$69.61

3. Energy Star Appliances:

Based on our research and supported research from DOE, we performed the cost-effectiveness analysis outlined in the table below.

ENERGY STAR Appliances Summary Table

Appliance	Type	Baseline Cost	Energy Star	Cost Difference	Energy Savings	Simple Payback
Refrigerator*	Standard	\$657.04	\$675.42	\$18.38	44.4 kWh	3.02
	Icemaker	\$1295.30	\$1332.59	\$37.29	33.6 kWh	6.12
	Side by Side	\$1000.17	\$1030.86	\$39.69	71.9 kWh	8.61
Dishwasher**	Standard	\$441	\$469	\$28	31 kWh	6.58
	Washer ***	Top Loading	\$465	\$576	\$111	70.27 kWh
	Front Loading	\$788	\$805	\$17	32.3 kWh	3.84
Dryer ****	Vented gas	\$702	\$761	\$59	12.7 therms	3.94
	Vented electric	\$570	\$601	\$31	313 kWh	0.72

*DOE Refrigerator Analysis ([TSD](#), 2019); ** DOE Dishwasher Analysis ([TSD](#), 2022); *** DOE Analysis ([TSD](#), 2022); **** DOE Dryer Analysis ([TSD](#), 2021)

Pacific Northwest National Lab completed a cost-effectiveness analysis of REPI-18 as part the IECC adoption process. This analysis is included as an attachment to this proposal with the methodology described below.

The process to determine energy credit measure savings utilized the PNNL residential prototypes and followed the DOE established methodology. The PNNL residential prototypes consist of two building types (single family and multifamily), four foundation types (slab, crawlspace, unheated basement and heated basement) as well as four system types (gas, oil and electric furnace as well as heat pump). The prototypes were simulated using a national level analysis with 19 representative cities encompassing all climate zones, moisture regimes and humidity designations. Energy use index (EUI) results for the baseline 2021 IECC as well as the energy credit measures were aggregated over the 8 established climate zones. The energy credit measure EUI percent savings was simply the baseline 2021 IECC EUI minus the energy credit measure EUI then divided by the baseline EUI.

Unlike the energy credit measures such as envelope, appliances, and duct locations which apply equally to all of our residential prototype models, for the evaluation of HVAC measures, we looked only at improving the efficiency of the given technology for prototypes using that system. For example, the envelope UA reduction was applied to all foundation types and all system types and compared against the baseline which included all foundation types and system types. The increased gas furnace efficiency was applied only to the homes that were already using a gas furnace and compared only against the baseline homes which also used a gas furnace. In other words, homes with a more efficient gas furnace were NOT compared to baseline homes containing any other system types. The result is an analysis which shows the site EUI savings that occur when a specific technology is upgraded beyond the federal minimum efficiency.