
Code Section #   __R401, R408 (new section)______________

Brief Description:
Add passive house certification (PHIUS and PHI) as high-level alternate compliance paths on the same level as the R405 Simulated Performance Alternative, as being sufficient to demonstrate energy code compliance without calculation of a standard reference design. These paths would be bolstered by some additional prescriptive requirements. Verification of the energy design based on plans and specifications would be required for permit, and final certification would be required for certificate of occupancy.

Proposed code change text: (Copy the existing text from the Integrated Draft, linked above, and then use underline for new text and strikeout for text to be deleted.)

R401.2 Compliance. Projects shall comply with one of the following:

1. Sections R401 through R404. In addition, dwelling units and sleeping units in a residential building shall comply with Section R406.

2. Section R405. In addition, dwelling units and sleeping units in a residential building shall comply with Section R406.

3. Section R408 (certified passive house).

SECTION R408
CERTIFIED PASSIVE HOUSE

R408.1 General. Projects shall comply with R408.2 or R408.3

R408.2 Passive House Institute US (PHIUS): PHIUS+ 2018 Passive Building Standard, including its USDOE Energy Star and Zero Energy Ready Home co-requisites, and performance calculations by PHIUS-approved software. Projects shall also comply with the provisions of sections R401 through R404 formerly labeled “Mandatory” Table R405 2, i.e., R401.3 Certificate, R402.2.9.1 Heated slab-on-grade floors, R402.4 Air leakage, R402.5 Maximum fenestration U-factor, R403.1 Controls, R403.2 Heat pump supplementary heat, R403.2.2 Sealing, R403.3.3 Duct testing, R403.3.4 Duct leakage, R403.3.5 Building cavities, R403.4 Mechanical system piping insulation, R403.5.1 Heated water circulation and maintenance system, R403.6 Mechanical ventilation, R403.7 Equipment sizing and efficiency rating, R403.8 Systems serving multiple dwelling units, R403.9 Snow melt system controls, R403.10 Pool and permanent spa energy consumption, R403.11 Portable spas, R404.1 Lighting equipment.

R408.2.1 PHIUS Documentation

1. Prior to the issuance of a building permit, the following items must be provided to the Building Official: A list of compliance features, and a PHIUS Pre-certification letter.
2. Prior to the issuance of a certificate of occupancy, the following item must be provided to the building official: A PHIUS+ 2018 (or later) project certificate.

R408.3 Passive House Institute (PHI): Low Energy Building Standard, version 9f or later, including performance calculations by PHI-approved software. Projects shall also comply with the provisions of Section R401 through R404.

R408.3.1 PHI Documentation

1. Prior to the issuance of a building permit, the following items must be provided to the building official: A list of compliance features, and a statement from a Passive House Certifier that the modeled energy performance is congruent with the plans and specifications, and that the modeled performance meets said standard.

2. Prior to the issuance of a certificate of occupancy, the following item must be provided to the building official: A PHI Low Energy Building project certificate.

**Purpose of code change:**

Supports progress towards the 70% building energy savings and zero-emission goals mandated by RCW 19.27A.160 and RCW 19.27A.020, by recognizing performance-focused passive-building approaches.

Your amendment must meet one of the following criteria. Select at least one:

- [ ] Addresses a critical life/safety need.
- [ ] Consistency with state or federal regulations.
- [ ] The amendment clarifies the intent or application of the code.
- [ ] Addresses a unique character of the state.
- [X] Addresses a specific state policy or statute. (Note that energy conservation is a state policy)
- [ ] Corrects errors and omissions.

Check the building types that would be impacted by your code change:

- [X] Single family/duplex/townhome
- [ ] Multi-family 4 + stories
- [ ] Institutional
- [X] Multi-family 1 – 3 stories
- [ ] Commercial / Retail
- [ ] Industrial

Your name: Graham S. Wright
Your organization: Shift Zero
Other contact name: Poppy Storm
Email address: poppy.storm@2050-institute.org, graham@passivehouse.us
Phone number: 503 887 7028

**Economic Impact Data Sheet**

Briefly summarize your proposal’s primary economic impacts and benefits to building owners, tenants and businesses.

Passive house certifications represent a performance-based approach to energy savings, meaning that a number of different combinations of energy-saving measures are possible design choices – there is some design flexibility, as long as the modeled energy use of the proposed design is below the required levels. In contrast, the usual prescriptive approach may become awkward when reaching for deep energy savings, requiring overinvestment in some measures and underinvestment in others.

The main distinguishing feature of passive building standards is that there are separate performance criteria specifically on heating and cooling energy, as well as overall energy use. This makes for a particular focus on using passive measures to reduce heating and cooling loads, which are still the largest energy end-use for most residential buildings in most climates. In normal operation this tends
to reduce the seasonal and daily fluctuation in the load on the utility and in outage situations it increases the resilience or passive-survivability of the building from a thermal comfort point of view.

For cold climates the “kit” of passive measures that works well together has been known for some decades now – superinsulation including multi-pane glazing and thermally-broken construction details, air-sealing, balanced ventilation with heat recovery, and any combustion appliances sealed. There are still some pitfalls though, and with a performance-standard approach it becomes important that the energy modeling is done correctly/consistently; this requires some training, and there is energy design work to be done on each project. Certification programs bring 3rd party verification of the energy design and model, and key aspects of the construction quality – such as the air-tightness and the moisture/vapor control.

Provide your best estimate of the construction cost (or cost savings) of your code change proposal? (See OFM Life Cycle Cost Analysis tool and Instructions; use these Inputs. Webinars on the tool can be found Here and Here)

$7.10/square foot  (For residential projects, also provide $9800/ dwelling unit)

Show calculations here, and list sources for costs/savings, or attach backup data pages

The initial cost estimates above are taken from a subset of the life-cycle cost optimization study that was done to set the PHIUS+ 2018 heating and cooling criteria (presentation slide deck attached for background). The cost data is from NREL’s National Residential Efficiency Measures Database, as implemented in BEopt 2.8. A total of 300 cases were run in the PHIUS study, covering all North American climate zones, five building sizes from 1000-80000 square feet, and three occupant densities from 875 to 235 square feet per person. Fifteen of those cases happened to occur in Oregon, Washington, or British Columbia, and the numbers quoted above are simple averages of those cases.

Provide your best estimate of the annual energy savings (or additional energy use) for your code change proposal?

Click here to enter text. KWH/ square foot (or) 11 KBTU/ square foot

(For residential projects, also provide 19500 KBTU / dwelling unit)

Show calculations here, and list sources for energy savings estimates, or attach backup data pages

The numbers entered above assume that what is being asked for here is the difference in site energy use (all end-uses) between WA state 2015 code and the proposal, possibly net of on-site renewables but not of off-site renewables. It also assumes that all projects would use the R408 alternate path; this is an exaggeration.

The assumptions about the 2015 WA code performance are taken from Ecotope’s spreadsheet “WSEC2018_proposal_est savings_weighting” with some additional unit conversions shown in the yellow highlight (see excerpt below in Table 1.) This shows that on a per square foot basis, there is not much difference between single-family and multifamily: 29.6±0.7 kBtu/sf.yr. On a per-unit basis the difference is much larger.

The data for the proposal’s energy performance is again taken only from the NW subset of the PHIUS+ 2018 study. On a per square foot basis the site EUI averaged 18.6 kBtu/sf.yr from conservation measures alone (passive and equipment, no renewables). Thus the savings = 29.6 – 18.6 = about 11 kBtu/sf.yr.

The per-unit situation appears more uncertain, with the multifamily showing negative savings, 24872 – 27925 = -3053 kBtu/unit.yr and the single family positive savings 63022 – 20914 = 42108 kBtu/unit. Averaging those two gives the 19500 kBtu/unit entered above, but the uncertainty is something like ±100%.

All questions must be answered to be considered complete. Incomplete proposals will not be accepted.
Table 1. 2015 WA code EUI benchmarks, by Ecotope.

<table>
<thead>
<tr>
<th>Code</th>
<th>Btype</th>
<th>Filter Base</th>
<th>Total Energy Use (kWh equiv)</th>
<th>Savings Over 2015</th>
<th>Savings Over 2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>wa2006</td>
<td>mf</td>
<td>base</td>
<td>10363</td>
<td></td>
<td></td>
</tr>
<tr>
<td>wa2006</td>
<td>sf</td>
<td>base</td>
<td>27095</td>
<td></td>
<td></td>
</tr>
<tr>
<td>wa2015</td>
<td>mf</td>
<td>base</td>
<td>7289</td>
<td></td>
<td></td>
</tr>
<tr>
<td>wa2015</td>
<td>sf</td>
<td>base</td>
<td>18471</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2. EUI data from NW subset of PHIUS+ 2018 Optimization Study_FINAL – Run list.

Also attached are:
An additional draft comparison study of WA code to the earlier PHIUS+ 2015 standard, by TRC solutions.
Three case studies on WA code versus the original PHIUS+ (2012) and PHIUS+ 2015, by PHIUS.

Lastly, note that the PHIUS+ 2018 framework on total impact uses net source energy and credits both on-site and some off-site renewable energy options, including discounted RECs. The equivalent net site energy target (for an all-electric building) would be down around 12.4 depending on occupant density, so the “savings” including renewables would be closer to 17 kBtu/sf.yr, again if everyone used this path.

List any code enforcement time for additional plan review or inspections that your proposal will require, in hours per permit application:

Probably not long, 0.25 – 0.5 hours.

All questions must be answered to be considered complete. Incomplete proposals will not be accepted.