2021 Energy Code
Type: Residential
Subtype: New Construction, Additions, Remodels

City of Tukwila - Permit Center
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Residential Energy Code Construction

For 2021 International Codes

This bulletin details the minimum compliance paths to the 2021 Washington State Residential Energy Coode, which applies to residential buildings and the buildings sites and associated systems and equipment.

Chapter 4 outlines three paths to compliance for residential buildings:

1. General Compliance- Section R401 – R406 (except 405)
2. Total Building Performance- Section 405, no additional energy credits
3. Certified Passive House- Section 407

General Compliance Path

Minimum requirements for compliance
Projects shall comply with Sections R401 through R404. In addition, dwelling units and sleeping units in a residential building shall comply with Section R406.

R401 General

A permanent certificate shall be completed by the builder or other approved party and posted on the electrical panel.

R402 Building Thermal Envelope

Building thermal envelope shall meet the requirements of this chapter.

Assemblies shall have a U-factor equal to or less than that specified in Table R402.1.2.

- Above-Grade Wall Assembly U-Factor shall be equal to or less than 0.056.
- Footnote (a.) for Table R402.1.2 states that U-factors or F-factors shall be obtained from measurement, calculations, or an approved source, or as specified in Section R402.1.5.
- R402.1.5 states if the proposed building thermal envelope UA is less than or equal to the target UA, the building shall be considered in compliance with Table R402.1.2.
- R402.1.5 directs you to R402.1.6. R406.1.6 directs you to Appendix A of the Commercial energy code.

Acceptable Wall Assemblies - Table R402.1.2 equivalent

- Above grade wall assembly from sheet walls (above grade) in the listed Code Compliance Calculator (C3) document on the WSU Energy Program website
- Appendix A of the Commercial energy code Table A103.3.1(5) identifies a 2x6 single wood stud wall with an R-21 batt, constructed with either an “intermediate or advanced” framing both having a UA rating less than .056 which is compliant with table R402.1.2.
    - **A103.2.2 Intermediate**. Studs framed on 16” centers with double top plate and single bottom plate. Corners use two studs or other means of fully insulating corners, and each opening is framed by two studs. Headers shall be insulated with R-10 insulation. Interior partition wall/exterior wall intersections are fully insulated in the exterior wall.

- **A103.2.3 Advanced.** Studs framed on 24" centers with double top plate and single bottom plate. Corners use two studs or other means of fully insulating corners, and one stud is used to support each header. Headers consist of double 2x material with R-10 insulation. Interior partition wall/exterior wall intersections are fully insulated in the exterior wall.

Approved sources for wall UA calculations.

Please contact us if you would like to propose an alternative:

FAQ U-Values for Non-Prescriptive Constructions~2023-10-24.pdf (wsu.edu)

- These typical constructions were defined for convenience in meeting code requirements, but you are not required to follow these prescriptive building assemblies. **Note:** If you follow the prescriptive assembly, you may not need to determine the U-factor of your assembly.
- If you choose to construct a building assembly that is different than the prescriptive building assemblies, however, WSEC-R defines maximum U-factors that are equivalent to these prescriptive constructions in Table R402.1.3 in 2018 and Table R402.1.2 in 2021. For above-grade walls, for example, the equivalent maximum U-factor to meet baseline code requirements is 0.056 (WAC 51-11R-40211:) under the 2021 WSEC-R.

Building Designer Resources | Applied Building Technology Group, LLC

- ABTG Wall Calculator | Applied Building Technology Group, LLC
- ABTG Steel Wall Calculator | Applied Building Technology Group, LLC

WSU Energy Program > Building Efficiency > Home Energy Raters

R403 Systems

Minimum requirements for mechanical and plumbing systems

R404 Electrical Power and Lighting Systems

Minimum requirements for electrical power and lighting systems

R406- Additional Energy Efficiency Requirements

This section establishes additional energy efficiency requirements for all new construction covered by this code. Credit from both Sections R406.2 and R406.3 are required.

R406.2 Carbon emission equalization.

This section establishes a base equalization between fuels used to define the equivalent carbon emissions of the options specified.

R406.3 Additional energy efficiency requirements.

Each dwelling unit in a residential building shall comply with sufficient options from Tables R406.2 and R406.3 to achieve the following minimum number of credits:

1. Small Dwelling Unit:.....5.0 credits

   Dwelling units less than 1500 square feet in conditioned floor area with less than 300 square feet of fenestration area. Additions to existing building greater than 500 square feet of heated floor area but less than 1500 square feet.

2. Medium Dwelling Unit:.....8.0 credits

   All dwelling units that are not included in #1, #3 or #4.

3. Large Dwelling Unit:.....9.0 credits
   Dwelling units exceeding 5000 square feet of conditioned floor area.
4. Dwelling units serving Group R-2 occupancies: .....6.5 credits
   See Section R401.1 and residential building in Section R202 for Group R-2 scope.
5. Additions 150 square feet to 500 square feet:.....2.0 credits

Required Details for General compliance.

- If you are using a non-perspective wall assembly for Table R402.1.2 it needs to be backed by demonstration through the above listed paths and detailed on the plan set.
- The permit shall define the base fuel selection to be used and the points specified in Table R406.2 shall be used to modify the requirements in Section R406.3.
- The drawings included with the building permit application shall identify which options have been selected and the point value of each option, regardless of whether separate mechanical, plumbing, electrical, or other permits are utilized for the project.

Total Building Performance Path

As an alternative to the General Compliance Path, projects can comply with Section R405, with no additional energy credits from Section R406 required.

Required Details for Total Building Performance Path

- The components of Table R405.2 must be **listed on the approved plan set** including demonstration of compliance with the listed code section for each item.
- Compliance software tools shall generate a report that documents that the proposed design complies with Section R405.2.
- A compliance report on the proposed design shall be submitted with the application for the building permit.
- Upon completion of the building, a confirmed compliance report based on the confirmed condition of the building shall be submitted to the code official before a certificate of occupancy is issued.

R405.1 Scope.

Criteria for compliance using total building performance analysis. Such analysis shall include heating, cooling, mechanical ventilation, and service water-heating energy only.

R405.2 Performance-based compliance.

Compliance based on total building performance requires that a proposed design meet all of the following:

1. The requirements of the sections indicated within Table R405.2.
2. For structures less than 1,500 square feet of conditioned floor area, the annual site energy consumption shall be less than or equal to 64 percent of the annual site energy consumption of the standard reference design.
3. For structures 1,500 to 5,000 square feet of conditioned floor area, the annual site energy consumption shall be no more than 47 percent of the standard reference design.

4. For structures over 5,000 square feet of conditioned floor area, the annual site energy consumption shall be no more than 41 percent of the standard reference design.
5. For structures serving Group R-2 occupancies, the annual site energy consumption shall be less than or equal to 61 percent of the annual site energy consumption of the standard reference design. See Section R401.1 and residential building in Section R202 for Group R-2 scope.

Energy use derived from simulation analysis shall be expressed in Btu per square foot of conditioned floor area per year.

Table R405.2 Mandatory Compliance Measures for Total Building Performance

Reference to a code section includes all the relative subsections except as indicated in the table

Section	Subsection	Title
General	R401.3	Certificate
Envelope	R402.1.1	Vapor retarder
	R402.2.3	Eave baffle
	R402.2.4.1	Access hatches and doors
	R402.4	Air leakage
	R402.5	Maximum fenestration U-factor
Systems	R403.1	Controls
	R403.3	Ducts (Except for R403.3.2 and R403.3.3
	R403.4	Mechanical system piping insulation
	R403.5.1	Heated water circulation and temperature maintenance system
	R403.5.3	Drain water heat recovery units
	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	Energy consumption of pools and spas
	R403.11	Portable spas
	R403.12	Residential pools and permanent residential spas
Electrical Power & Lighting	R404.1	Lighting equipment
	R404.2	Interior lighting control

R405.3 Documentation.

Documentation of the software used for the performance design and the parameters for the building shall be in accordance with Sections R405.3.1 through R405.3.2.2.

R405.3.2.1 Compliance report for permit application.

A compliance report submitted with the application for building permit shall include all of the following:

1. Building street address, or other building site identification.
2. The name, organization and contact information of the individual performing the analysis and generating the compliance report.
3. The name and version of the compliance software tool.
4. Documentation of all inputs entered into the software used to produce the results for the reference design and/or the rated home.
5. A certificate indicating that the proposed design complied with Section R405.2. The certificate shall document the building components' energy specifications that are included in the calculation including: component-level insulation R-values or U-factors; duct system and building envelope air leakage testing assumptions; and the type and rated efficiencies of proposed heating, cooling, mechanical ventilation and service water-heating equipment to be installed. If on-site renewable energy systems will be installed, the certificate shall report the type and production size of the proposed system. Additional documentation reporting estimated annual energy production shall be provided.
6. When a site-specific report is not generated, the proposed design shall be based on the worst-case orientation and configuration of the rated home.

R405.3.2.2 Compliance report for certificate of occupancy.

A compliance report submitted for obtaining the certificate of occupancy shall include all of the following:

1. Building street address, or other building site identification
2. Declaration of the total building performance path on the title page of the energy report and the title page of the building plans.
3. A statement, bearing the name of the individual performing the analysis and generating the report, along with their organization and contact information, indicating that the as-built building complies with Section R405.2.
4. The name and version of the compliance software tool.
5. A site-specific energy analysis report that is in compliance with Section R405.2.
6. A final confirmed certificate indicating compliance based on inspection, and a statement indicating that the confirmed rated design of the built home complies with Section R405.2. The certificate shall report the energy features that were confirmed to be in the home, including component level insulation R-values or U-factors; results from any required duct system and building envelope air leakage testing; and the type and rated efficiencies of the heating, cooling, mechanical ventilation and service water-heating equipment installed.
7. Where on-site renewable energy systems have been installed, the certificate shall report the type and production size of the installed system. Additional documentation reporting estimated annual energy production shall be provided.

R405.4 Calculation procedure.

Calculations of the performance design shall be in accordance with Sections R405.4.1 and R405.4.2.

R405.5 Calculation software tools.

Calculation software, where used, shall be in accordance with Sections R405.5.1 through R405.5.3

Certified Passive House

R407.1 General.

Projects shall comply with Section R407.2 or R407.3.

R407.2 Passive House Institute U.S. (PHIUS).

Projects shall comply with 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 Table R405.2.

R407.2.1 PHIUS documentation.

Prior to the issuance of a building permit, the following items must be provided to the code official:

1. A list of compliance features.
2. A PHIUS precertification letter.

- Prior to the issuance of a certificate of occupancy, the following item must be provided to the code official: A PHIUS+ 2018 (or later) project certificate.

R407.3 Passive House Institute (PHI).

Projects shall comply with 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.

R407.3.1 PHI documentation.

Prior to the issuance of a building permit, the following items must be provided to the code official:

1. A list of compliance features.
2. 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.

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