

**SECTION R406
ADDITIONAL ENERGY EFFICIENCY REQUIREMENTS**

R406.1 Scope. This section establishes additional energy efficiency requirements for all new construction covered by this code, including additions subject to Section R502 and change of occupancy or use subject to Section R505 unless specifically exempted in Section R406. 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. 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 sum of credits from Tables R406.2 and R406.3 shall meet the requirements of Section R406.3.

R406.3 Additional energy efficiency requirements. Each dwelling unit in a residential building shall comply with sufficient options from Table R406.2 so as to achieve the following minimum number of credits:

1. Small Dwelling Unit: 3.0 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: 6.0 credits
All dwelling units that are not included in #1, #3 or #4.
3. Large Dwelling Unit: 7.0 credits
Dwelling units exceeding 5000 square feet of conditioned floor area.
4. Dwelling units serving R-2 occupancies: 4.5 credits
5. Additions less than or equal to 500 square feet:..... 1.5 credits

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.

**TABLE R406.2
FUEL NORMALIZATION CREDITS**

System Type	Description of Primary Heating Source	Credits	
		All Other	Group R-2
1	Combustion heating equipment meeting minimum federal efficiency standards for the equipment listed in Table C403.3.2(4) or C403.3.2(5)	0	0
2	For an initial heating system using a heat pump that meets federal standards for the equipment listed in Table C403.3.2(1)C or C403.3.2(2) or Air to water heat pump units that are configured to provide both heating and cooling and are rated in accordance with AHRI 550/590	1.0	1.0
3	For heating system based on electric resistance only (either forced air or Zonal)	-1.0	-1.0
4	For heating system based on electric resistance with a ductless mini-split heat pump system in accordance with Section R403.7.1 including the exception	0.5	N/A
5	All other heating systems	-1	-0.5

**TABLE 406.3
ENERGY CREDITS**

OPTION	DESCRIPTION	CREDIT(S)	
		All Other	Group R-2
1. EFFICIENT BUILDING ENVELOPE OPTIONS			
Only one option from Items 1.1 through 1.7 may be selected in this category. Compliance with the conductive UA targets is demonstrated using Section R402.1.4, Total UA alternative, where [1-(Proposed UA/Target UA)] > the required %UA reduction			
1.1	Prescriptive compliance is based on Table R402.1.1 with the following modifications: Vertical fenestration U = 0.24.	0.5	0.5
1.2	Prescriptive compliance is based on Table R402.1.1 with the following modifications: Vertical fenestration U = 0.20.	1.0	1.0
1.3	Prescriptive compliance is based on Table R402.1.1 with the following modifications: Vertical fenestration U = 0.28 Floor R-38 Slab on grade R-10 perimeter and under entire slab Below grade slab R-10 perimeter and under entire slab or Compliance based on Section R402.1.4: Reduce the Total conductive UA by 5%.	0.5	N/A
1.4	Prescriptive compliance is based on Table R402.1.1 with the following modifications: Vertical fenestration U = 0.25 Wall R-21 plus R-4 ci Floor R-38 Basement wall R-21 int plus R-5 ci Slab on grade R-10 perimeter and under entire slab Below grade slab R-10 perimeter and under entire slab or Compliance based on Section R402.1.4: Reduce the Total conductive UA by 15%.	1.0	1.0
1.5	Prescriptive compliance is based on Table R402.1.1 with the following modifications: Vertical fenestration U = 0.22 Ceiling and single-rafter or joist-vaulted R-49 advanced Wood frame wall R-21 int plus R-12 ci Floor R-38 Basement wall R-21 int plus R-12 ci Slab on grade R-10 perimeter and under entire slab Below grade slab R-10 perimeter and under entire slab or Compliance based on Section R402.1.4: Reduce the Total conductive UA by 30%.	2.0	1.5

**TABLE 406.3 (continued)
ENERGY CREDITS**

OPTION	DESCRIPTION	CREDIT(S)	
		All Other	Group R-2
1.6	<p>Prescriptive compliance is based on Table R402.1.1 with the following modifications:</p> <p>Vertical fenestration U = 0.18 Ceiling and single-rafter or joist-vaulted R-60 advanced Wood frame wall R-21 int plus R-16 ci Floor R-48 Basement wall R-21 int plus R-16 ci Slab on grade R-20 perimeter and under entire slab Below grade slab R-20 perimeter and under entire slab</p> <p>or</p> <p>Compliance based on Section R402.1.4: Reduce the Total conductive UA by 40%.</p>	3.0	2.0
1.7	<p>Advanced framing and raised heel trusses or rafters Vertical Glazing U-0.28 R-49 Advanced (U-0.020) as listed in Section A102.2.1, <i>Ceilings below a vented attic</i></p> <p>and</p> <p>R-49 vaulted ceilings with full height of uncompressed insulation extending over the wall top plate at the eaves.</p>	0.5	0.5
<p>2. AIR LEAKAGE CONTROL AND EFFICIENT VENTILATION OPTIONS Only one option from Items 2.1 through 2.4 may be selected in this category.</p>			
2.1	<p>Compliance based on R402.4.1.2:</p> <p>Reduce the tested air leakage to 3.0 air changes per hour maximum at 50 Pascals</p> <p>or</p> <p>For R-2 Occupancies, optional compliance based on Section R402.4.1.2: Reduce the tested air leakage to 0.3 cfm/ft² maximum at 50 Pascals</p> <p>and</p> <p>All whole house ventilation requirements as determined by Section M1507.3 of the <i>International Residential Code</i> or Section 403.8 of the <i>International Mechanical Code</i> shall be met with a high efficiency fan(s) (maximum 0.35 watts/cfm), not interlocked with the furnace fan (if present). Ventilation systems using a furnace including an ECM motor are allowed, provided that they are controlled to operate at low speed in ventilation only mode.</p> <p>To qualify to claim this credit, the building permit drawings shall specify the option being selected, the maximum tested building air leakage, and shall show the qualifying ventilation system and its control sequence of operation.</p>	0.5	1.0

**TABLE 406.3 (continued)
ENERGY CREDITS**

OPTION	DESCRIPTION	CREDIT(S)	
		All Other	Group R-2
2.2	<p>Compliance based on Section R402.4.1.2: Reduce the tested air leakage to 2.0 air changes per hour maximum at 50 Pascals</p> <p>or</p> <p>For R-2 Occupancies, optional compliance based on Section R402.4.1.2: Reduce the tested air leakage to 0.25 cfm/ft² maximum at 50 Pascals</p> <p>and</p> <p>All whole house ventilation requirements as determined by Section M1507.3 of the <i>International Residential Code</i> or Section 403.8 of the <i>International Mechanical Code</i> shall be met with a heat recovery ventilation system with minimum sensible heat recovery efficiency of 0.65.</p> <p>To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the maximum tested building air leakage and shall show the heat recovery ventilation system.</p>	1.0	1.5
2.3	<p>Compliance based on Section R402.4.1.2: Reduce the tested air leakage to 1.5 air changes per hour maximum at 50 Pascals</p> <p>or</p> <p>For R-2 Occupancies, optional compliance based on Section R402.4.1.2: Reduce the tested air leakage to 0.25 cfm/ft² maximum at 50 Pascals</p> <p>and</p> <p>All whole house ventilation requirements as determined by Section M1507.3 of the <i>International Residential Code</i> or Section 403.8 of the <i>International Mechanical Code</i> shall be met with a heat recovery ventilation system with minimum sensible heat recovery efficiency of 0.75.</p> <p>To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the maximum tested building air leakage and shall show the heat recovery ventilation system.</p>	1.5	2.0
2.4	<p>Compliance based on Section R402.4.1.2: Reduce the tested air leakage to 0.6 air changes per hour maximum at 50 Pascals</p> <p>or</p> <p>For R-2 Occupancies, optional compliance based on Section R402.4.1.2: Reduce the tested air leakage to 0.15 cfm/ft² maximum at 50 Pascals</p> <p>and</p> <p>All whole house ventilation requirements as determined by Section M1507.3 of the <i>International Residential Code</i> or Section 403.8 of the <i>International Mechanical Code</i> shall be met with a heat recovery ventilation system with minimum sensible heat recovery efficiency of 0.80. Duct installation shall comply with Section R403.3.7.</p> <p>To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the maximum tested building air leakage and shall show the heat recovery ventilation system.</p>	2.0	2.5

**TABLE 406.3 (continued)
ENERGY CREDITS**

OPTION	DESCRIPTION	CREDIT(S)	
		All Other	Group R-2
3. HIGH EFFICIENCY HVAC EQUIPMENT OPTIONS			
Only one option from Items 3.1 through 3.6 may be selected in this category.			
3.1 ^a	<p>Energy Star rated (U.S. North) Gas or propane furnace with minimum AFUE of 95%</p> <p>or</p> <p>Energy Star rated (U.S. North) Gas or propane boiler with minimum AFUE of 90%.</p> <p>To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the heating equipment type and the minimum equipment efficiency.</p>	1.0	1.0
3.2 ^a	<p>Air-source centrally ducted heat pump with minimum HSPF of 9.5.</p> <p>To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the heating equipment type and the minimum equipment efficiency.</p>	1.0	N/A
3.3 ^a	<p>Closed-loop ground source heat pump; with a minimum COP of 3.3</p> <p>or</p> <p>Open loop water source heat pump with a maximum pumping hydraulic head of 150 feet and minimum COP of 3.6.</p> <p>To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the heating equipment type and the minimum equipment efficiency.</p>	1.5	1.0
3.4	<p>Ductless mini-split heat pump system, zonal control: In homes where the primary space heating system is zonal electric heating, a ductless mini-split heat pump system with a minimum HSPF of 10.0 shall be installed and provide heating to the largest zone of the housing unit.</p> <p>To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the heating equipment type and the minimum equipment efficiency.</p>	1.5	2.0
3.5 ^a	<p>Air-source, centrally ducted heat pump with minimum HSPF of 11.0.</p> <p>To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the heating equipment type and the minimum equipment efficiency.</p>	1.5	N/A
3.6 ^a	<p>Ductless split system heat pumps with no electric resistance heating in the primary living areas. A ductless heat pump system with a minimum HSPF of 10 shall be sized and installed to provide heat to entire dwelling unit at the design outdoor air temperature.</p> <p>To qualify to claim this credit, the building permit drawings shall specify the option being selected, the heated floor area calculation, the heating equipment type(s), the minimum equipment efficiency, and total installed heat capacity (by equipment type).</p>	2.0	3.0

**TABLE 406.3 (continued)
ENERGY CREDITS**

OPTION	DESCRIPTION	CREDIT(S)	
		All Other	Group R-2
4. HIGH EFFICIENCY HVAC DISTRIBUTION SYSTEM OPTIONS			
4.1	<p>All supply and return ducts located in an unconditioned attic shall be deeply buried in ceiling insulation in accordance with Section R403.3.7.</p> <p>For mechanical equipment located outside the conditioned space, a maximum of 10 linear feet of return duct and 5 linear feet of supply duct connections to the equipment may be outside the deeply buried insulation. All metallic ducts located outside the conditioned space must have both transverse and longitudinal joints sealed with mastic. If flex ducts are used, they cannot contain splices.</p> <p>Duct leakage shall be limited to 3 cfm per 100 square feet of conditioned floor area.</p> <p>Air handler(s) shall be located within the conditioned space.</p>	0.5	0.5
4.2	<p>HVAC equipment and associated duct system(s) installation shall comply with the requirements of Section R403.3.7.</p> <p>Locating system components in conditioned crawl spaces is not permitted under this option.</p> <p>Electric resistance heat and ductless heat pumps are not permitted under this option.</p> <p>Direct combustion heating equipment with AFUE less than 80% is not permitted under this option.</p> <p>To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the heating equipment type and shall show the location of the heating and cooling equipment and all the ductwork.</p>	1.0	N/A
5. EFFICIENT WATER HEATING OPTIONS			
Only one option from Items 5.2 through 5.6 may be selected in this category. Item 5.1 may be combined with any option.			
5.1	<p>A drain water heat recovery unit(s) shall be installed, which captures waste water heat from all and only the showers, and has a minimum efficiency of 40% if installed for equal flow or a minimum efficiency of 54% if installed for unequal flow. Such units shall be rated in accordance with CSA B55.1 or IAPMO IGC 346-2017 and be so labeled.</p> <p>To qualify to claim this credit, the building permit drawings shall include a plumbing diagram that specifies the drain water heat recovery units and the plumbing layout needed to install it. Labels or other documentation shall be provided that demonstrates that the unit complies with the standard.</p>	0.5	0.5
5.2	<p>Water heating system shall include one of the following:</p> <p>Energy Star rated gas or propane water heater with a minimum UEF of 0.80.</p> <p>To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the water heater equipment type and the minimum equipment efficiency.</p>	0.5	0.5

**TABLE 406.3 (continued)
ENERGY CREDITS**

OPTION	DESCRIPTION	CREDIT(S)	
		All Other	Group R-2
5.3	<p>Water heating system shall include one of the following: Energy Star rated gas or propane water heater with a minimum UEF of 0.91</p> <p>or</p> <p>Solar water heating supplementing a minimum standard water heater. Solar water heating will provide a rated minimum savings of 85 therms or 2000 kWh based on the Solar Rating and Certification Corporation (SRCC) Annual Performance of OG-300 Certified Solar Water Heating Systems</p> <p>or</p> <p>Water heater heated by ground source heat pump meeting the requirements of Option 3.3.</p> <p>To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the water heater equipment type and the minimum equipment efficiency and, for solar water heating systems, the calculation of the minimum energy savings.</p>	1.0	1.0
5.4	<p>Water heating system shall include one of the following: Electric heat pump water heater meeting the standards for Tier I of NEEA's advanced water heating specification</p> <p>or</p> <p>For R-2 Occupancy, electric heat pump water heater(s), meeting the standards for Tier I of NEEA's advanced water heating specification, shall supply domestic hot water to all units. If one water heater is serving more than one dwelling unit, all hot water supply and recirculation piping shall be insulated with R-8 minimum pipe insulation.</p> <p>To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the water heater equipment type and the minimum equipment efficiency.</p>	1.5	2.0
5.5	<p>Water heating system shall include one of the following: Electric heat pump water heater meeting the standards for Tier III of NEEA's advanced water heating specification</p> <p>or</p> <p>For R-2 Occupancy, electric heat pump water heater(s), meeting the standards for Tier III of NEEA's advanced water heating specification, shall supply domestic hot water to all units. If one water heater is serving more than one dwelling unit, all hot water supply and recirculation piping shall be insulated with R-8 minimum pipe insulation.</p> <p>To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the water heater equipment type and the minimum equipment efficiency.</p>	2.0	2.5

**TABLE 406.3 (continued)
ENERGY CREDITS**

OPTION	DESCRIPTION	CREDIT(S)	
		All Other	Group R-2
5.6	<p>Water heating system shall include one of the following:</p> <p>Electric heat pump water heater with a minimum UEF of 2.9 and utilizing a split system configuration with the air-to-refrigerant heat exchanger located outdoors. Equipment shall meet Section 4, requirements for all units, of the NEEA standard <i>Advanced Water Heating Specification</i> with the UEF noted above</p> <p>or</p> <p>For R-2 Occupancy, electric heat pump water heater(s), meeting the standards for Tier III of NEEA's advanced water heating specification and utilizing a split system configuration with the air-to-refrigerant heat exchanger located outdoors, shall supply domestic hot water to all units. If one water heater is serving more than one dwelling unit, all hot water supply and recirculation piping shall be insulated with R-8 minimum pipe insulation.</p> <p>To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the water heater equipment type and the minimum equipment efficiency.</p>	2.5	3.0
6. RENEWABLE ELECTRIC ENERGY OPTION			
6.1	<p>For each 1200 kWh of electrical generation per housing unit provided annually by on-site wind or solar equipment a 1.0 credit shall be allowed, up to 3 credits. Generation shall be calculated as follows:</p> <p>For solar electric systems, the design shall be demonstrated to meet this requirement using the National Renewable Energy Laboratory calculator PVWATTS or approved alternate by the code official.</p> <p>Documentation noting solar access shall be included on the plans.</p> <p>For wind generation projects designs shall document annual power generation based on the following factors:</p> <p>The wind turbine power curve; average annual wind speed at the site; frequency distribution of the wind speed at the site and height of the tower.</p> <p>To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall show the photovoltaic or wind turbine equipment type, provide documentation of solar and wind access, and include a calculation of the minimum annual energy power production.</p>	1.0	1.0
7. APPLIANCE PACKAGE OPTION			
7.1	<p>All of the following appliances shall be new and installed in the dwelling unit and shall meet the following standards:</p> <p>Dishwasher – Energy Star rated</p> <p>Refrigerator (if provided) – Energy Star rated</p> <p>Washing machine – Energy Star rated</p> <p>Dryer – Energy Star rated, ventless dryer with a minimum CEF rating of 5.2.</p> <p>To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall show the appliance type and provide documentation of Energy Star compliance. At the time of inspection, all appliances shall be installed and connected to utilities. Dryer ducts and exterior dryer vent caps are not permitted to be installed in the dwelling unit.</p>	0.5	1.5

- a. An alternative heating source sized at a maximum of 0.5 Watts/ft² (equivalent) of heated floor area or 500 Watts, whichever is bigger, may be installed in the dwelling unit.

SECTION R407 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*:

1. 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.