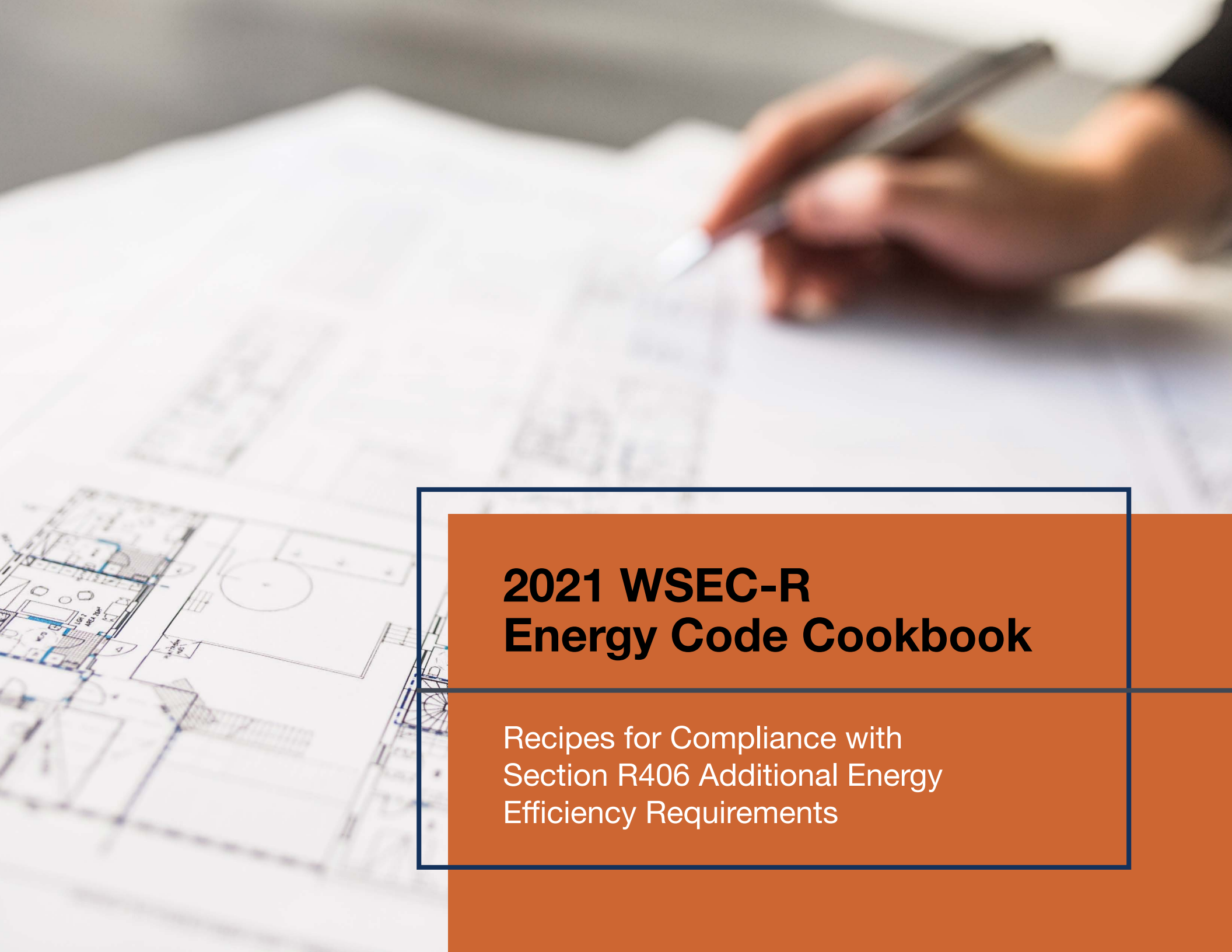


2021 WSEC-R Energy Code Cookbook

Recipes for Compliance with Section R406 Additional Energy Efficiency Requirements

Who is this for?

Builders and designers constructing new single-family homes in Washington.

What is the WSEC Cookbook?

Advancing energy codes in Washington are leading builders, designers and tradespeople to evaluate new designs and strategies. This "Cookbook" provides a collection of "Recipes" for single-family new construction to comply with the **2021 Washington State Residential Energy Code (WSEC-R)** Section R406: Additional Energy Efficiency Requirements.

How do you use the Cookbook?

The recipes are organized by home size from small to medium to large. Locate the section corresponding to your project's size, and then identify which recipes match the heating and hot water system types that are specified or under consideration for the project. The decision tree on page 4 provides helpful guidance for determining the recipe cards appropriate for your project.

Acronyms

ACH50	Air changes per hour at 50 pascals pressure differential
AFUE	Annual Fuel Utilization Efficiency
ASHP	Air Source Heat Pump
HRV	Heat Recovery Ventilator
DHP	Ductless Heat Pump, aka Mini Splits
UEF	Uniform Energy Factor
HPWH	Heat Pump Water Heater
HSPF	Heating Seasonable Performance Factor
DHW	Domestic Hot Water
UA	U factor x Area
ER	Electric Resistance

Code Compliance Calculator

The **Code Compliance Calculator (C3)** is a free tool provided by Washington State University's (WSU) Energy Program that will help you document building designs for WSEC-R.

The C3 can help simplify your compliance documentation. By providing a completed C3 along with final testing forms/ certificates, you can typically avoid the need for additional documentation such as a prescriptive form, heating system sizing worksheet, and glazing schedule.

The C3 can be especially useful for designs using the UA percent trade-off for Option 1 envelope measures (Section R402.3) and the Total UA Alternative (Section R402.1.4). The C3 replaces the UA Alternative Worksheet and integrates the glazing schedule, the heating system sizing worksheet, and a ventilation calculator. Cost analysis and optimization for construction materials can also be performed on the C3, such as helping to inform decisions on where to locate windows with lower vs higher U-values to save on material costs.

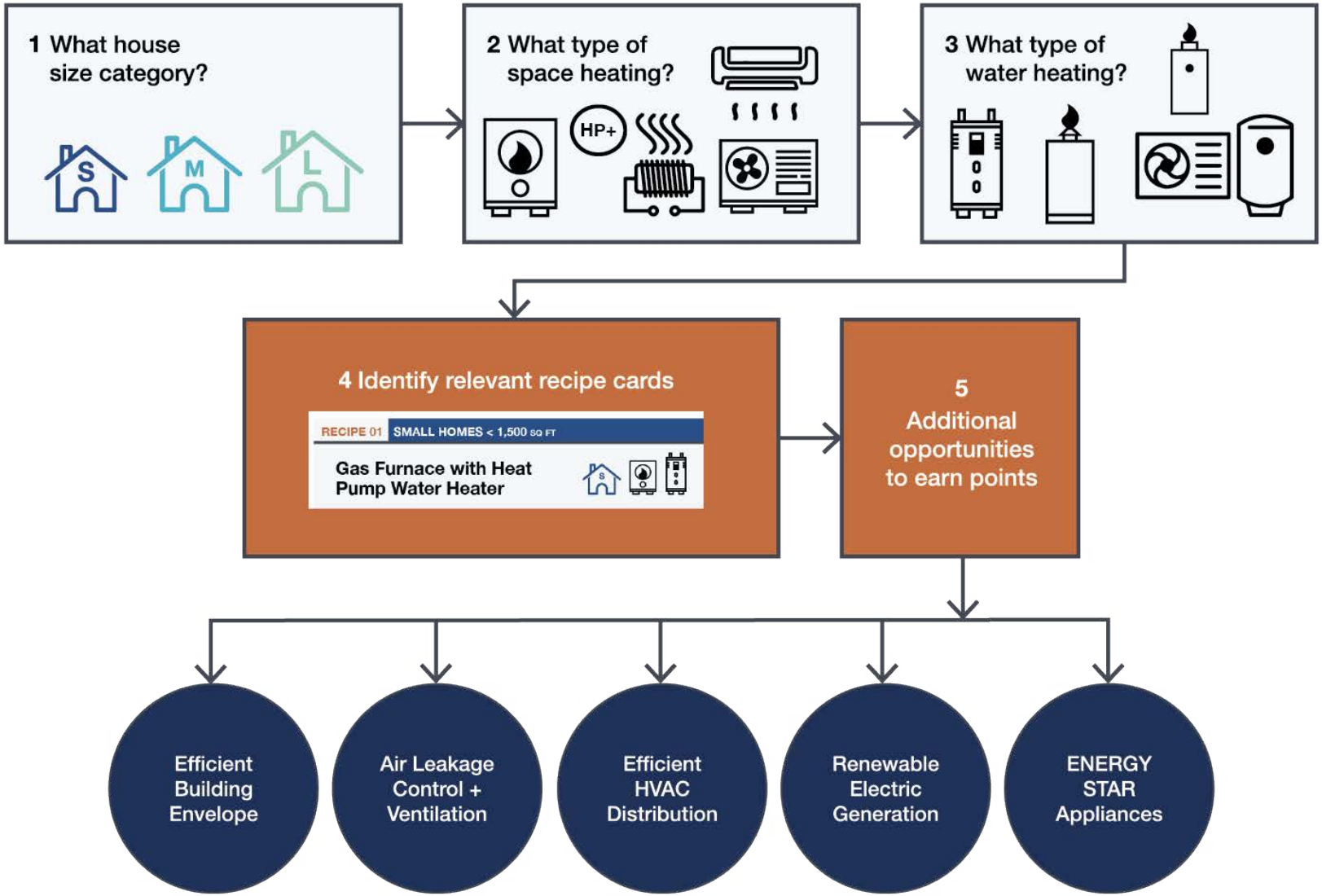
DISCLAIMER: *Many jurisdictions are familiar with or require prescriptive forms available from WSU, however it is recommended to work with your local jurisdiction to determine final satisfactory documentation. Results from the C3 assume that all data is entered correctly and completely, and do not constitute an official decision. Analysis should be reviewed by a building official/authority having jurisdiction.*

New Construction Utility Programs

To support Residential New Construction in the Northwest, utilities throughout the region offer the opportunity to receive incentives for incorporating high-efficiency products and features in new construction homes. These incentives help to reduce the cost of integrating energy-efficient equipment from the start. Browse **BetterBuiltNW** or contact your local utility to find a program in your area.

45L Tax Credit

New builds that meet the requirements for the ENERGY STAR® Single-Family New Homes or the Department of Energy's Zero Energy Ready Homes programs are eligible for the 45L tax credit of $2,500 or $5,000 per home. BetterBuiltNW has developed a **45L Resource Hub** to help builders learn how to maximize their tax credit and build energy-efficient homes. For builders in Washington and across the Northwest, these tax credits provide significant financial benefits to incorporate energy-efficient features in new homes when layered with existing local funding opportunities.


1 What house size category?
S
M
L
2 What type of space heating?
HP+
3 What type of water heating?
4 Identify relevant recipe cards
RECIPE 01
SMALL HOMES < 1,500 SQ FT
Gas Furnace with Heat Pump Water Heater
5 Additional opportunities to earn points
Efficient Building Envelope
Air Leakage Control + Ventilation
Efficient HVAC Distribution
Renewable Electric Generation
ENERGY STAR Appliances

R406.3 ADDITIONAL ENERGY EFFICIENCY REQUIREMENTS

Homes need to meet specific energy efficiency requirements. You can choose from different options listed in Tables R406.2 and R406.3 to meet these requirements. The number of options you choose needs to add up to a certain minimum number of credits, depending on the size of the home. Here's how it works:

1. SMALL DWELLING UNIT: 5.0 CREDITS

If the living space is less than 1500 square feet and has less than 300 square feet of windows, or if it's an addition to an existing building that's between 500 and 1500 square feet in size, it needs to earn at least 5.0 credits from the available energy efficiency options.

2. MEDIUM DWELLING UNIT: 8.0 CREDITS

If the living space is over 1,500 and less than 5,000 square feet, it must earn at least 8.0 credits.

3. LARGE DWELLING UNIT: 9.0 CREDITS

If the living space is over 5000 square feet, it must earn at least 9.0 credits.

4. DWELLING UNITS SERVING R-2 OCCUPANCIES: 6.5 CREDITS

This category is related to Group R-2 occupancy. It needs to earn at least 6.5 credits.

5. ADDITIONS 150 SQUARE FEET TO 500 SQUARE FEET: 2.0 CREDITS

R406.2 CARBON EMISSION EQUALIZATION:

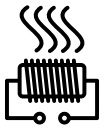
This section ensures an equalization of carbon emissions from different fuel sources. It establishes a baseline comparison for various fuels to determine their equivalent carbon emissions in energy efficiency options. This table adjusts the requirement credits based on this selected fuel. In other words, it helps ensure that the environmental impact of different fuel sources is considered when determining energy efficiency requirements for the building.

1. COMBUSTION HEATING EQUIPMENT

Heating systems using fuel combustion, such as gas furnaces or boilers.

2. HEAT PUMP + SUPPLEMENTAL HEATING

Primary heating system using a heat pump and supplemental heating by electric resistance or a combustion furnace.



3. ELECTRIC RESISTANCE ONLY

Heating systems using electric resistance to generate heat.

4. AIR SOURCE HEAT PUMP

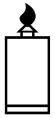
Heating system using an air-to-air or air-to-water heat pump units that are configured to provide both heating and cooling.

5. DUCTLESS HEAT PUMP

Heating system based on electric resistance with:

- Inverter-driven ductless mini-split heat pump system installed in the largest zone in the dwelling, or
- With 2 kW or less total installed heating capacity per dwelling.

5. EFFICIENT WATER HEATING

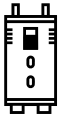


5.3 GAS TANK WATER HEATER

Gas water heater: min UEF 0.80

5.4 GAS TANKLESS WATER HEATER

Gas water heater: min UEF 0.91



5.5 HEAT PUMP WATER HEATER

Heat pump water heater: Tier III

5.6 SPLIT HEAT PUMP WATER HEATER

Split-system heat pump water heater: ≥ UEF 2.9

Gas Furnace with Heat Pump Water Heater

This recipe for a medium home includes an efficient gas furnace for primary heating with a connected smart thermostat for optimal temperature control. The HVAC distribution system is completely installed within the thermal envelope. An efficient heat pump water heater is also included, and it features a compact hot water distribution system. Additionally, it uses drain water heat recovery to meet the required energy credits.

#	POINTS	COMPLIANCE PATHWAY
Opt. 1	0	406.2 Energy Credit: Combustion
3.1	1	HVAC: 95% AFUE ENERGY STAR Furnace
3.11	0.5	HVAC: Smart Thermostat
4.1	0.5	HVAC: 100% Ducts inside
5.1	0.5	DHW: Drain Water Heat Recovery
5.2	0.5	DHW: Compact Distribution System
5.6	2	DHW: HPWH Tier 3
	5	TOTAL CREDITS REQUIRED

BENEFITS

- Consistent heating performance at extreme low temperatures
- Automates and optimizes heating/cooling thermostat schedules
- Prevents temperature fluctuations and energy loss from air leaks in ducting
- Cost-effective way to recover and reuse heat from wastewater, compatible with all water heaters
- Occupies less space and minimizes heat loss to ensure quick delivery of hot water, reducing wait times for homeowner
- HPWHs are popular and well-recognized for efficiency, making them a sales feature

RELATED TRAINING & RESOURCES

- Building with Ducts Inside Conditioned Spaces
- DuctsInside.org
- Drain-Water Heat Recovery
- Compact Water Design Savings
- HPWH Technical Guide for Single Family
- Hot Water Solutions

See the 'Trainings & Resources' page for more

Ductless Heat Pump with Electric Resistance Backup and Heat Pump Water Heater

This recipe for a small home uses a high-efficiency ductless mini-split heat pump for heating and cooling with electric resistance backup, along with a heat pump water heater, to meet the required energy credits.

#	POINTS	COMPLIANCE PATHWAY
Opt. 2	1.5	406.2 Energy Credit: Heat Pump + Supplemental Heating
3.5	1.5	HVAC: DHP with HSPF of 10 (HSPF2 of 9)
5.6	2	DHW: HPWH Tier 3
	5	TOTAL CREDITS REQUIRED

BENEFITS

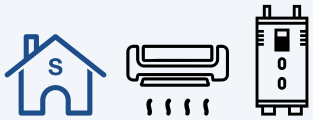
- Zonal heating/cooling targets specific areas in the home, offering flexibility and ease of install by requiring no ductwork
- Requires no ductwork, making it easier to install and improving air quality
- HPWHs are popular and well-recognized for efficiency, making them a sales feature
- High performance features that can provide market differentiation and potential incentives

RELATED TRAINING & RESOURCES

- 2021 WSEC-R Code Changes and HVAC Strategies
- Heat Pumps: Mastering Design Principles
- Heat Pumps: The Art of Commissioning
- Heat Pump Water Heater Technical Guide for Single Family
- Hot Water Solutions

See the 'Trainings & Resources' page for more

Ductless Heat Pump and Heat Pump Water Heater



This recipe for a small home features a high-efficiency ductless heat pump for both heating and cooling without backup, ensuring year-round comfort and energy savings. The water heating system includes an efficient heat pump water heater to provide significant energy savings.

#	POINTS	COMPLIANCE PATHWAY
Opt. 4	3	406.2 Energy Credit: 100% DHP
5.6	2	DHW: HPWH Tier 3
	5	TOTAL CREDITS REQUIRED

BENEFITS

- Zonal heating/cooling targets specific areas in the home, offering flexibility and ease of install by requiring no ductwork
- Requires no ductwork, making it easier to install and improving air quality
- HPWHs are popular and well-recognized for efficiency, making them a sales feature
- High performance features that can provide market differentiation and potential incentives

RELATED TRAINING & RESOURCES

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- Heat Pumps: Mastering Design Principles
- Heat Pumps: The Art of Commissioning
- Heat Pump Water Heater Technical Guide for Single Family
- Hot Water Solutions

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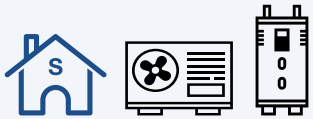
Heat Pump and Heat Pump Water Heater



This recipe for a small home uses a high-efficiency heat pump for both heating and cooling without backup, along with an efficient heat pump water heater, to meet the required energy credits.

#	POINTS	COMPLIANCE PATHWAY
Opt. 4	3	406.2 Energy Credit: 100% ASHP
5.6	2	DHW: HPWH Tier 3
	5	TOTAL CREDITS REQUIRED

BENEFITS

- Designed for whole-home heating / cooling, offering consistent indoor temperatures
- HPWHs are popular and well-recognized for efficiency, making them a sales feature

RELATED TRAINING & RESOURCES

- 2021 WSEC-R Code Changes and HVAC Strategies
- Heat Pumps: Mastering Design Principles
- Heat Pumps: The Art of Commissioning
- Heat Pump Water Heater Technical Guide for Single Family
- Hot Water Solutions

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Gas Furnace with Split Heat Pump Water Heater

This recipe for a medium home includes an efficient gas furnace and a smart thermostat for enhanced efficiency and comfort. The HVAC distribution system is entirely within the thermal envelope. The home also features advanced airtightness, high-efficiency ventilation with heat recovery, and enhanced envelope. An efficient split heat pump water heater with a compact hot water distribution system is included. Additionally, it incorporates drain water heat recovery and ENERGY STAR rated appliances to meet the required energy credits.

#	POINTS	COMPLIANCE PATHWAY
Opt. 1	0	406.2 Energy Credit: Combustion
1.2	1	Envelope: Walls R20 + R5 Continuous Insulation, Windows U0.25, Floors R38, Ceiling R60
2.1	1	Air Leakage: 2ACH50, Whole House Ventilation, 65% Efficient HRV
3.1	1	HVAC: 95% AFUE ENERGY STAR Furnace
3.11	0.5	HVAC: Smart Thermostat
4.1	0.5	HVAC: 100% Ducts inside
5.1	0.5	DHW: Drain Water Heat Recovery
5.2	0.5	DHW: Compact Distribution System
5.7	2.5	DHW: Split HPWH
7.1	0.5	Appliances
	8	TOTAL CREDITS REQUIRED

BENEFITS

- Increased envelope performance minimizes drafts and heat loss, resulting in better thermal comfort, quieter indoor environment, and improved indoor air quality
- Better envelope protection from temperature extremes and moisture, reducing risk and lowering maintenance costs
- Continuous fresh air circulation without significant energy loss
- Consistent heating performance at extreme low temperatures
- Automates and optimizes heating/cooling thermostat schedules
- Prevents temperature fluctuations and energy loss from air leaks in ducting
- Cost-effective way to recover and reuse heat from wastewater, compatible with all water heaters
- Occupies less space and minimizes heat loss to ensure quick delivery of hot water, reducing wait times for homeowner
- Split HPWH system separates the HP unit from the water tank, offering installation flexibility and potentially reducing space constraints

RELATED TRAINING & RESOURCES

- Advanced Walls: Continuous Exterior Insulation Factsheet
- Super-Insulated Walls Factsheet
- Using Building Science to Inform Envelope Design
- Selecting & Installing Exterior Insulation
- Exterior Air Barrier Details for the NW
- Balanced Ventilation Approaches for Healthy Indoor Air

See the 'Trainings & Resources' page for more

Ductless Heat Pump with Electric Resistance Backup and Heat Pump Water Heater

This recipe for a medium home includes a high-efficiency ductless mini-split heat pump for primary heating and cooling, with an electric resistance backup for extremely cold weather. The home also features advanced air-tightness, high-efficiency ventilation with heat recovery, and enhanced envelope. An efficient heat pump water heater is also included, and it features a compact hot water distribution system. Additionally, it consists of a drain water heat recovery unit to meet the required energy credits.

#	POINTS	COMPLIANCE PATHWAY
Opt. 2	1.5	406.2 Energy Credit: Heat Pump + Supplemental Heating
1.2	1	Envelope: Walls R20 + R5 Continuous Insulation, Windows U0.25, Floors R38, Ceiling R60
2.1	1	Air Leakage: 2ACH50, Whole House Ventilation, 65% Efficient HRV
3.5	1.5	HVAC: DHP with HSPF of 10 (HSPF2 of 9)
5.1	0.5	DHW: Drain Water Heat Recovery
5.2	0.5	DHW: Compact Distribution System
5.6	2	DHW: HPWH Tier 3
	8	TOTAL CREDITS REQUIRED

BENEFITS

- Increased envelope performance minimizes drafts and heat loss, resulting in better thermal comfort, quieter indoor environment, and improved indoor air quality
- Better envelope protection from temperature extremes and moisture, reducing risk and lowering maintenance costs
- Continuous fresh air circulation without significant energy loss
- Zonal heating/cooling targets specific areas in the home, offering flexibility and ease of install by requiring no ductwork
- Cost-effective way to recover and reuse heat from wastewater, compatible with all water heaters
- Occupies less space and minimizes heat loss to ensure quick delivery of hot water, reducing wait times for homeowner
- HPWHs are popular and well-recognized for efficiency, making them a sales feature

RELATED TRAINING & RESOURCES

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Heat Pump with Gas Backup and Heat Pump Water Heater

This recipe for a medium home includes a high-efficiency heat pump for primary heating and cooling, with a gas backup for extremely cold weather. The HVAC distribution system is completely installed within the thermal envelope. An efficient heat pump water heater is also included, and it features a compact hot water distribution system. Additionally, it includes a very efficient envelope and air tightness level with a high-efficiency ventilation system and a drain water heat recovery unit to meet the required energy credits.

#	POINTS	COMPLIANCE PATHWAY
Opt. 2	1.5	406.2 Energy Credit: Heat Pump + Supplemental Heating
1.2	1	Envelope: Walls R20 + R5 Continuous Insulation, Windows U0.25, Floors R38, Ceiling R60
2.1	1	Air Leakage: 2ACH50, Whole House Ventilation, 65% Efficient HRV
3.11	0.5	HVAC: Smart Thermostat
3.2	0.5	HVAC: 95% AFUE Supplemental Furnace
4.1	0.5	HVAC: 100% Ducts inside
5.1	0.5	DHW: Drain Water Heat Recovery
5.2	0.5	DHW: Compact Distribution System
5.6	2	DHW: HPWH Tier 3
	8	TOTAL CREDITS REQUIRED

BENEFITS

- Increased envelope performance minimizes drafts and heat loss, resulting in better thermal comfort, quieter indoor environment, and improved indoor air quality
- Better envelope protection from temperature extremes and moisture, reducing risk and lowering maintenance costs
- Continuous fresh air circulation without significant energy loss
- Consistent heating performance at extreme low temperatures
- Zonal heating/cooling offers flexibility and targets specific areas in the home, requiring no ductwork and making it easier to install
- Cost-effective way to recover and reuse heat from wastewater, compatible with all water heaters
- HPWHs are popular and well-recognized for efficiency, making them a sales feature

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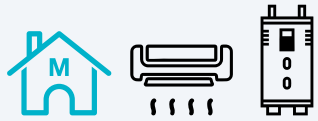
Ductless Heat Pump with Heat Pump Water Heater



This recipe for a medium home includes a high-efficiency heat pump for both heating and cooling. An efficient heat pump water heater is also included, and it features a compact hot water distribution system. Additionally, it features drain water heat recovery to meet the required energy credits.

#	POINTS	COMPLIANCE PATHWAY
Opt. 4	3	406.2 Energy Credit: 100% DHP
3.7	2	HVAC: DHP with min. HSPF of 10 (HSPF2 of 9) with no electric resistance in primary living areas
5.1	0.5	DHW: Drain Water Heat Recovery
5.2	0.5	DHW: Compact Distribution System
5.6	2	DHW: HPWH Tier 3
	8	TOTAL CREDITS REQUIRED

BENEFITS

- Zonal heating/cooling offers flexibility and targets specific areas in the home, requiring no ductwork and making it easier to install
- Cost-effective way to recover and reuse heat from wastewater, compatible with all water heaters
- Occupies less space and minimizes heat loss to ensure quick delivery of hot water, reducing wait times for homeowner
- HPWHs are popular and well-recognized for efficiency, making them a sales feature

RELATED TRAINING & RESOURCES

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- Heat Pumps: Mastering Design Principles
- Heat Pumps: The Art of Commissioning
- Drain-Water Heat Recovery
- Compact Water Design Savings
- HPWH Technical Guide for Single Family

See the 'Trainings & Resources' page for more

Ultra-Efficient Heat Pump with Heat Pump Water Heater

This recipe for a medium home includes a very efficient heat pump for both heating and cooling. The HVAC distribution system is completely installed within the thermal envelope. An efficient heat pump water heater is also included, and it features a compact hot water distribution system. Additionally, it includes drain water heat recovery and ENERGY STAR rated appliances to meet the required energy credits.

#	POINTS	COMPLIANCE PATHWAY
Opt. 4	3	406.2 Energy Credit: 100% ASHP
3.6	1	HVAC: ASHP with HSPF of 11 (HSPF2 of 9.4)
4.1	0.5	HVAC: 100% Ducts inside
5.1	0.5	DHW: Drain Water Heat Recovery
5.2	0.5	DHW: Compact Distribution System
5.6	2	DHW: HPWH Tier 3
7.1	0.5	Appliances
	8	TOTAL CREDITS REQUIRED

BENEFITS

- Designed for whole-home heating/cooling, offering consistent indoor temperatures
- Higher HSPF provides superior energy efficiency
- Prevents temperature fluctuations and energy loss from air leaks in ducting
- Cost-effective way to recover and reuse heat from wastewater, compatible with all water heaters
- Occupies less space and minimizes heat loss to ensure quick delivery of hot water, reducing wait times for homeowner
- HPWHs are popular and well-recognized for efficiency, making them a sales feature

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- Heat Pumps: Mastering Design Principles
- Heat Pumps: The Art of Commissioning
- Building with Ducts Inside Conditioned Spaces
- DuctsInside.org
- Drain-Water Heat Recovery

See the 'Trainings & Resources' page for more

Gas Furnace with Split Heat Pump Water Heater

This recipe for a large home combines an efficient gas furnace with advanced insulation and fenestration to reduce thermal transfer. The tightly sealed structure features a smart thermostat and a high-efficiency gas furnace with heat recovery ventilation and ducts inside. Drain water recovery, a compact distribution system, and a split-system heat pump water heater maximize water heating efficiency. ENERGY STAR rated appliances enhance the home's overall energy efficiency.

#	POINTS	COMPLIANCE PATHWAY
Opt. 1	0	406.2 Energy Credit: Combustion
1.3	1.5	Envelope: Walls R21 + R12 Continuous Insulation, Windows U0.18, Floors R38, Ceiling R60
2.1	1.5	Air Leakage: 2ACH50, Whole House Ventilation, 65% Efficient HRV
3.1	1	HVAC: 95% AFUE ENERGY STAR Furnace
3.11	0.5	HVAC: Smart Thermostat
4.1	0.5	HVAC: 100% Ducts inside
5.1	0.5	DHW: Drain Water Heat Recovery
5.2	0.5	DHW: Compact Distribution System
5.7	2.5	DHW: Split HPWH
7.1	0.5	Appliances
	9	TOTAL CREDITS REQUIRED

BENEFITS

- Increased envelope performance minimizes drafts and heat loss, resulting in better thermal comfort, quieter indoor environment, and improved indoor air quality
- Better envelope protection from temperature extremes and moisture, reducing risk and lowering maintenance costs
- Continuous fresh air circulation without significant energy loss
- Consistent heating performance at extreme low temperatures
- Automates and optimizes heating/cooling thermostat schedules
- Prevents temperature fluctuations and energy loss from air leaks in ducting
- Cost-effective way to recover and reuse heat from wastewater, compatible with all water heaters
- Occupies less space and minimizes heat loss to ensure quick delivery of hot water, reducing wait times for homeowner
- Split HPWH system separates the HP unit from the water tank, offering installation flexibility and potentially reducing space constraints

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Ductless Heat Pump with Electric Resistance Backup and Split Heat Pump Water Heater

This recipe for a large home features a high-efficiency ductless mini-split heat pump for primary heating and cooling, with electric resistance backup to ensure optimal efficiency and comfort. The home is designed with enhanced airtightness, high-efficiency ventilation, and superior insulation. A split-system heat pump water heater and a compact hot water distribution system are also included. Additionally, it utilizes a drain water heat recovery unit and ENERGY STAR rated appliances to meet the required energy credits.

#	POINTS	COMPLIANCE PATHWAY
Opt. 2	1.5	406.2 Energy Credit: Heat Pump + Supplemental Heating
1.2	1	Envelope: Walls R20 + R5 Continuous Insulation, Windows U0.25, Floors R38, Celing R60
2.1	1	Air Leakage: 2ACH50, Whole House Ventilation, 65% Efficient HRV
3.5	1.5	HVAC: DHP with HSPF of 10 (HSPF2 of 9)
5.1	0.5	DHW: Drain Water Heat Recovery
5.2	0.5	DHW: Compact Distribution System
5.7	2.5	DHW: Split HPWH
7.1	0.5	Appliances
	9	TOTAL CREDITS REQUIRED

BENEFITS

- Increased envelope performance minimizes drafts and heat loss, resulting in better thermal comfort, quieter indoor environment, and improved indoor air quality
- Better envelope protection from temperature extremes and moisture, reducing risk and lowering maintenance costs
- Continuous fresh air circulation without significant energy loss
- Zonal heating/cooling offers flexibility and targets specific areas in the home, requiring no ductwork and making it easier to install
- Cost-effective way to recover and reuse heat from wastewater, compatible with all water heaters
- Occupies less space and minimizes heat loss to ensure quick delivery of hot water, reducing wait times for homeowner
- Split HPWH system separates the HP unit from the water tank, offering installation flexibility and potentially reducing space constraints

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Ultra-Efficient Heat Pump with Heat Pump Water Heater

This recipe for a large home includes a very efficient heat pump for both heating and cooling for improved comfort without backup. The HVAC distribution system is fully contained within the thermal envelope, which consists of superior insulation and fenestration. An efficient heat pump water heater is included, along with a compact hot water distribution system. Additionally, it incorporates drain water heat recovery and ENERGY STAR rated appliances to meet the required energy credits.

#	POINTS	COMPLIANCE PATHWAY
Opt. 4	3	406.2 Energy Credit: 100% ASHP
1.2	1	Envelope: Walls R20 + R5 Continuous Insulation, Windows U0.25, Floors R38, Ceiling R60
3.6	1	HVAC: ASHP with HSPF of 11 (HSPF2 of 9.4)
4.1	0.5	HVAC: 100% Ducts inside
5.1	0.5	DHW: Drain Water Heat Recovery
5.2	0.5	DHW: Compact Distribution System
5.6	2	DHW: HPWH Tier 3
7.1	0.5	Appliances
	9	TOTAL CREDITS REQUIRED

BENEFITS

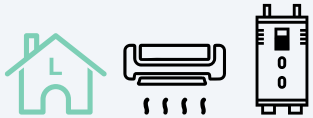
- Increased envelope performance minimizes heat loss, resulting in better thermal comfort and a quieter indoor environment
- Better envelope protection from temperature extremes and moisture, reducing risk and lowering maintenance costs
- Designed for whole-home heating/cooling, offering consistent indoor temperatures
- Higher HSPF provides superior energy efficiency
- Prevents temperature fluctuations and energy loss from air leaks in ducting
- Cost-effective way to recover and reuse heat from wastewater, compatible with all water heaters
- Occupies less space and minimizes heat loss to ensure quick delivery of hot water, reducing wait times for homeowner
- HPWHs are popular and well-recognized for efficiency, making them a sales feature

RELATED TRAINING & RESOURCES

- Advanced Walls: Continuous Exterior Insulation Factsheet
- Super-Insulated Walls Factsheet
- Using Building Science to Inform Envelope Design
- Selecting & Installing Exterior Insulation
- 2021 WSEC-R Code Changes and HVAC Strategies
- Heat Pumps: Mastering Design Principles

See the 'Trainings & Resources' page for more

Ductless Heat Pump with Heat Pump Water Heater



This recipe for a large home integrates a high-efficiency ductless mini-split heat pump with an advanced envelope, including superior fenestration and comprehensive insulation to enhance thermal efficiency. Water heating is optimized through drain water heat recovery, a compact distribution setup, and a highly efficient heat pump water heater, providing significant energy savings.

#	POINTS	COMPLIANCE PATHWAY
Opt. 4	3	406.2 Energy Credit: 100% DHP
1.2	1	Envelope: Walls R20 + R5 Continuous Insulation, Windows U0.25, Floors R38, Ceiling R60
3.7	2	HVAC: DHP with min. HSPF of 10 (HSPF2 of 9) with no electric resistance in primary living areas
5.1	0.5	DHW: Drain Water Heat Recovery
5.2	0.5	DHW: Compact Distribution System
5.6	2	DHW: HPWH Tier 3
	9	TOTAL CREDITS REQUIRED

BENEFITS

- Increased envelope performance minimizes heat loss, resulting in better thermal comfort and a quieter indoor environment
- Better envelope protection from temperature extremes and moisture, reducing risk and lowering maintenance costs
- Zonal heating/cooling offers flexibility and targets specific areas in the home, requiring no ductwork and making it easier to install
- Cost-effective way to recover and reuse heat from wastewater, compatible with all water heaters
- Occupies less space and minimizes heat loss to ensure quick delivery of hot water, reducing wait times for homeowner
- HPWHs are popular and well-recognized for efficiency, making them a sales feature

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See the 'Trainings & Resources' page for more

The trainings and resources listed below are categorized according to specific topics and measures within the 2021 WSEC-R. We recommend you also visit these websites for more info:

- BetterBuiltNW Resource Hub
- WSU Training Opportunities
- WSU FAQs and Additional Resources

45L Tax Credit

- 45L Tax Credit Resource Hub
- 45L Tax Credit: What You Need to Know

Envelopes

- Advanced Walls: Continuous Exterior Insulation Factsheet
- Super-Insulated Walls Factsheet
- Using Building Science to Inform Envelope Design
- Selecting & Installing Exterior Insulation

Air Leakage

- Exterior Air Barrier Details for the NW
- Top 10 Best Practices for Today's Homebuilder

Whole House Ventilation & HRVs

- Balanced Ventilation Approaches for Healthy Indoor Air
- Installation Elements for ERVs / HRVs
- Design & Quality Control Best Practices for ERVs / HRVs

Furnace

- Combustion Furnaces (DOE)

Smart Thermostat

- Programmable Thermostats (DOE)

Heat Pumps

- 2021 WSEC-R Code Changes and HVAC Strategies (Built Green)
- Mastering Design Principles
- The Ultimate Installation Guide
- The Art of Commissioning

Ducts Inside

- Building with Ducts Inside Conditioned Spaces
- DuctsInside.org
- Simple Steps to Improve Ductwork Installations

Drain Water Heat Recovery

- Drain-Water Heat Recovery (DOE)

Compact Distribution System

- WaterSense Discusses Compact Water Design Savings (WSU)
- Guide for Efficient Hot Water Delivery Systems (EPA)

Heat Pump Water Heater

- Heat Pump Water Heater Technical Guide for Single Family
- Hot Water Solutions

Appliances

- ENERGY STAR Most Efficient 2024