

NORTHWEST MODELING REQUIREMENTS

This guide provides rater/verifiers with technical guidance on modeling homes to generate northwest utility approved savings estimates. Utilities may use these savings estimates to meet conservation goals and issue incentives for qualified projects. These requirements also provide information on how data is uploaded to the regional new homes database (AXIS), and where supporting files are located.

Where these requirements conflict with guidance in modeling software help files, existing RESNET standards or modeling protocols for other certification programs, the requirements contained in this document shall take precedence for purposes of estimating approved savings. This helps ensure consistent and accurate estimates which adhere to regionally-accepted values.

These modeling requirements are updated annually through collaboration of the Northwest Modeling Alignment Stakeholder Group including representatives of the Northwest Energy Efficiency Alliance (NEEA) and its contractors, the Bonneville Power Administration (BPA), the Energy Trust of Oregon (ETO), the Northwest Power and Conservation Council's Regional Technical Forum (RTF).

The current version of this document and all supporting files can be found on the BetterBuiltNW website at www.BetterBuiltNW.com

Contents

1.	General Requirements	3
	Required Software	3
	Required Skills and Training.....	3
	Required Libraries and Reference Homes	3
	Table 1 – UDRH Files and Baseline Determinants.....	4
	AXIS Database & Post Processing	4
2.	General Building Information	4
	Site Information	4
	General Building Information	5
3.	Building Surfaces.....	6
	Foundation Wall Properties.....	6
	Slab Floor Properties.....	6
	Frame Floor Properties	7
	Rim and Band Joist Properties	7
	Above-Grade Wall Properties	7
	Window and Glass Door Properties.....	7
	Door Properties.....	7
	Ceiling Properties.....	7
	Skylight Properties	7
4.	Mechanical Equipment	8
	Load Allocation	8
	Gas Furnaces	8
	Heat Pumps.....	8
	Supplemental Heat Sources.....	9
	Radiant Hydronic Heating	10
	Integrated Space and Water Heating	11
	Water Heating.....	11
	Domestic Hot Water Efficiencies	11
5.	Duct systems, Infiltration and Ventilation	11
	Ducts	11
	Infiltration	12
	Ventilation.....	12
6.	Lights, Appliances, Other	13
	Appliances	13
	Lighting.....	14
	Miscellaneous and Auxiliary Equipment.....	14
	Interior Mass.....	14
	Photovoltaic Energy Systems.....	14
	Active Solar, Solar Water Heating and Sunspaces	14
	Table 2 – Modeling Guidance for Common Heating Equipment Combinations.....	15

1. GENERAL REQUIREMENTS

Required Software

REM/Rate™ - Version 15.7.1 must be used to determine estimated annual consumption and savings.

Required Skills and Training

- Minimum training requirements, as outlined in BetterBuiltNW New Homes Performance Path Training Requirements document, available at (<https://betterbuiltnw.com/resources/performance-path-rater-verifier-training-requirements>)
- Signed participation agreement with utility

Required Libraries and Reference Homes

Libraries

Where applicable, rater/verifiers shall use utility rate libraries available from relevant utility or home certification program.

Reference Homes

Approved User Defined Reference Home files are located on the BetterBuiltNW website (<https://betterbuiltnw.com/resources/libraries-udrh-v15.7.1>).

- User-Defined Reference Home (UDRH) characteristics are based on the Northwest Modeling Alignment Stakeholder Group's interpretation of current energy code for each state. In some states, heating system configuration or home size are also key determinants of UDRH characteristics. Rater/verifiers must use the appropriate UDRH file for the building characteristics and state where the modeled home is to be constructed.

Note:

The "Central" HVAC configuration applies to homes with central heat sources with ducted or hydronic distribution. Common examples of central systems include gas furnaces, hydronic radiant boilers, or conventional ducted air-source heat pumps. Homes with central systems that also contain a gas fireplace or other point-source heating device shall be classified as Central HVAC unless the largest portion of the home's heat load is served by the point-source heating device.

The "Zonal" HVAC configuration applies to homes in which one or more heat sources serve individual zones within the home. Common examples of zonal systems include combinations of one or more of the following equipment types: ductless heat pumps and supplemental heat sources such as electric resistance baseboard or wall heaters, or other point-source heating device (gas fireplace, unit heater, or similar). Rater/verifiers may use the Zonal HVAC configuration where ducted or hydronic radiant heat sources are in place only if the largest portion of the home's heat load is served by a mini-split heat pump or other point-source heating device.

For additional guidance on modeling HVAC systems, please refer to the Equipment Modeling Flow Chart (<https://betterbuiltnw.com/resources/equipment-modeling-flow-chart>) in addition to Table 2 and the Mechanical Equipment section of this document.

TABLE 1 – UDRH FILES AND BASELINE DETERMINANTS

State	HVAC Configuration	Floor Area	UDRH File
Washington	Zonal	<1,500 ft ²	WA Perf Path Zonal – Small_2020-Final.udr
	Zonal	1,500-5,000 ft ²	WA Perf Path Zonal – Medium_2020-Final.udr
	Zonal	>5,000 ft ²	WA Perf Path Zonal – Large_2020-Final.udr
	Central	<1,500 ft ²	WA Perf Path Central – Small_2020-Final.udr
	Central	1,500-5,000 ft ²	WA Perf Path Central – Medium_2020-Final.udr
	Central	>5,000 ft ²	WA Perf Path Central – Large_2020-Final.udr
	EPS Specific	Any	2020-SWWA EPS-REMv15.7-Final.udr
Oregon	Zonal	Any	OR Perf Path Zonal_2020-Final.udr
	Central	Any	OR Perf Path Central_2020-Final.udr
Idaho	Zonal	Any	ID Perf Path Zonal_2020-Final.udr
	Central	Any	ID Perf Path Central_2020-Final.udr
Montana	Zonal	Any	MT Perf Path Zonal_2020-Final.udr
	Central	Any	MT Perf Path Central_2020-Final.udr

AXIS Database & Post Processing

The AXIS database applies adjustments to REM/Rate™ outputs and calculates home-level savings based on REM/Rate™ calculations and adjustments developed by the Northwest Power Planning Council's Regional Technical Forum and the Northwest Modeling Alignment Stakeholder Group. The AXIS database collects additional information not included in REM/Rate™ software in order to perform additional energy savings calculations for the home. Rater/verifiers must enter all homes into AXIS and answer several in-system questions to complete the home data entry that supports these calculations.

Utility-approved savings values are available only after rater/verifier creates an AXIS entry and uploads the model file for the home. Rater/verifiers may use additional REM/Rate™ reports and outputs for other purposes, should they wish to do so.

Participating utilities have access to program and savings data in AXIS for their respective territories.

2. GENERAL BUILDING INFORMATION

Site Information

Climate Location

The home shall be modeled in the geographically closest climate location that is in the same IECC climate zone, or other climate location approved and specified by utility.

Utility Rates

The Rater/verifier shall use utility rates accurate to the utility territory in which the home will be constructed. Alternatively, Rater/verifier may use rates or rate library sets as required by utility or home certification program.

General Building Information

Conditioned Floor Area (CFA)

Rater/verifier shall include all finished and unfinished spaces that are within the thermal envelope of the home and receive intentional space conditioning. Rater/verifier shall *not* include spaces that receive minimal space conditioning, such as conditioned crawlspaces; or no intentional space conditioning, such as unheated basements or unvented crawlspaces in Conditioned Floor Area calculations. For homes with wall cavity depth of $> 7.5''$, floor and footprint areas shall be measured from the interior surface of all wall assemblies. All other aspects of dimensioning shall be performed in accordance with ANSI standard Z765-2003 for measuring houses. Alternatively, rater/verifier may use subsequent RESNET or ANSI standards for measuring homes, where required to do so by certification program or other oversight body.

Infiltration Volume

Rater/verifier shall calculate the total volume of all spaces within the thermal envelope of the home. Volume includes but is not limited to:

- All above- and below-grade finished living areas
- Volume from vaults and other ceiling height changes
- All other spaces, whether finished or unfinished, that are within the thermal envelope of the home and receive *intentional* conditioning, such as conditioned crawlspaces and unfinished basements.

Alternatively, rater/verifier may use subsequent RESNET or ANSI standards for measuring homes, where required to do so by certification program or other oversight body.

Number of Bedrooms

A bedroom shall be defined as any room 70 ft² or greater in size with a closet and egress, including dens, offices, and similar rooms. Living rooms, dining rooms, and foyers shall not be counted as bedrooms.

Foundation Type

- Slab on Grade: Use for all homes with slab on grade foundation.
- Enclosed Crawlspac: Use for all crawlspaces, whether vented or unvented, which will *not* receive direct, intentional space conditioning. Set “Thermal Boundary Location” accurate to the home. Do not leave “Thermal Boundary Location” set to “REM Default” as doing so may result in inaccurate model outputs. This is a result of an internal REM/Rate bug, see REM/Rate help for additional details.
- Conditioned Crawlspac: Do not use the Conditioned Crawlspac Foundation Type designation. Instead, use Conditioned Basement designation and adhere to guidance provided under Conditioned Basement below.
- Conditioned Basement: Use for basements, whether finished or unfinished, that will receive direct, *intentional* space conditioning. Also select this type for conditioned crawlspaces, adding the relevant characteristics to the foundation wall, slab and conditioned volume model inputs.

Note: For REM/Rate™ to provide an accurate model of ground-contact heat loss, a slab entry must be provided for conditioned crawlspaces, even if a slab is not present in the home. Add this as a slab with characteristics accurate to the floor of the crawlspace. Subsequent values shall be entered in accordance with these descriptions. For example, foundation wall location shall be specified as “between conditioned space and ambient/ground”, not “between conditioned crawlspace and ambient/ground”. If a separate mechanical exhaust ventilation strategy is used for the conditioned crawlspace, this must be added to the whole-house ventilation rate, duration and fan wattage. Rater/verifier shall not add a framed floor assembly over the conditioned basement or crawlspace. Addition of a framed floor assembly over the conditioned basement or crawlspace in this modeling scenario will result in errors/warnings and will prevent REM/Rate™ from providing analysis results.

- Unconditioned Basement: Use for basements, whether finished or unfinished, which will not receive direct, *intentional* conditioning.
- “More than One Type”: Use for all homes constructed with a combination of the types above. For each foundation type included in the home, follow the respective guidance provided above. Set “Thermal Boundary Location” accurate to home. Do not leave “Thermal Boundary Location” set to “REM Default”.

3. BUILDING SURFACES

Rater/verifier may create custom library entries as follows:

- Create an accurate name and description for the library entry.
- Specify the surface characteristics in REM/Rate™’s “Quick Fill” or “Path Layer” entry screens, using appropriate values for insulation R-values, framing factors, etc.
- Overall U-value for the assembly will be reviewed by utility program or QA representative during file QA. Include any necessary notes on methodology and assumptions in REM/Rate™’s Notes screen or under the notes question in AXIS.

Foundation Wall Properties

Refer to guidance under Foundation Type and Building Surfaces above. For all other aspects, please refer to REM/Rate™’s internal guidance.

Note: Because conditioned crawlspaces are to be modeled as conditioned basements, foundation wall location for a conditioned crawlspace shall be specified as “between conditioned space and ambient/ground”, not “between conditioned crawlspace and ambient/ground”.

Slab Floor Properties

Slab insulation characteristics shall be entered accurate to the home. “Total Exposed Perimeter” value shall include all slab perimeter that does not abut conditioned space or a separate, below grade buffer space. Rater/verifier shall enter all slab characteristics according to the guidance provided in REM/Rate™’s help file. Where the slab will be used as radiant distribution for a hydronic heat source, the rater/verifier shall designate the home’s slab as “Radiant” in the slab library entry.

For all other aspects, follow REM/Rate™’s internal guidance.

Note: For REM/Rate™ to assign the thermal boundary and provide an accurate model, a slab entry must be provided for conditioned crawlspaces, even if a slab is not present. Add this as an uninsulated slab with characteristics accurate to the floor of the crawlspace.

Frame Floor Properties

Refer to guidance under Building Surfaces above. For all other aspects, please refer to REM/Rate™'s internal guidance.

Rim and Band Joist Properties

Refer to guidance under Building Surfaces above. For all other aspects, please refer to REM/Rate™'s internal guidance.

Above-Grade Wall Properties

Refer to guidance under Building Surfaces above. For all other aspects, please refer to REM/Rate™'s internal guidance.

Window and Glass Door Properties

Rater/verifier shall enter window and glass door areas, orientations, and physical characteristics accurate to the rated home. Window U-value and SHGC may be calculated as area-weighted averages. Fenestration with similar characteristics (orientation, overhangs, wall association, and thermal characteristics) may be combined to streamline data entry. Rater/verifier should use default values for shading as follows:

- Interior Shading
 - Winter: 0.85
 - Summer: 0.70
- Adjacent Shading
 - Winter: "None"
 - Summer: "None"

Door Properties

Rater/verifier shall enter door areas, R-values, and other physical characteristics accurate to the rated home.

Ceiling Properties

Refer to guidance under Building Surfaces above. For all other aspects, please refer to REM/Rate™'s internal guidance.

Skylight Properties

Rater/verifier shall enter skylight areas, orientations, and other physical characteristics accurate to the rated home. For skylights with similar characteristics (pitch, orientation, ceiling association, and thermal characteristics), U-value and SHGC may be calculated as area-weighted averages and skylight areas may be combined to streamline data entry. For all skylights, Winter and Summer Shading Factors shall be set to "None".

4. MECHANICAL EQUIPMENT

Rater/verifier shall model all mechanical equipment with capacity, efficiency, air handler location, and back up heat values accurate to the unit selected.

For additional guidance on modeling HVAC systems, please refer to the Equipment Modeling Flow Chart (<https://betterbuiltNW.com/resources/equipment-modeling-flow-chart>) in addition to Table 2 and Reference Homes section of this document.

Load Allocation

Where multiple equipment or system types are in place, rater/verifier must use discretion when determining the heat load allocation. Suggested sources to consider when making this determination include:

- Portion of home served by each piece of equipment
- HVAC load sizing/selection calcs (Manual J/S)
- Known or expected usage patterns throughout the heating/cooling season

For additional guidance, please refer to the Equipment Modeling Flow Chart (<https://betterbuiltNW.com/resources/equipment-modeling-flow-chart>) and Table 2.

Gas Furnaces

Rater/verifier shall use capacity, efficiency, and auxiliary electric use AHRI rated values accurate to the unit selected.

Note: Systems utilizing a gas boiler or tankless gas water heater combined with an air handler or fan coil for distribution shall be modeled as a gas furnace (above) with additional auxiliary energy use to account for both pump and air handler energy.

Heat Pumps

Air Source Heat Pumps

Rater/verifier shall model all conventional central air source heat pumps via the “Air Source Heat Pump” Library Type. Rater/verifier shall use capacity, efficiency, backup heat capacity, and auxiliary electric use values accurate to the unit selected and the entry shall be made in the “Air-Source Heat Pump” Library Type.

Mini-split Heat Pumps

Rater/verifier shall model all Ductless and Ducted mini-split heat pumps via the “Air Source Heat Pump” Library Type. Model all Ductless and Ducted mini-split heat pumps as follows:

- Enter capacity and HSPF values accurate to the unit selected. Use the specific AHRI certificate that reflects the indoor unit’s ducting arrangement (e.g. certificate for "Non-Ducted Indoor Units" vs. "Ducted Indoor Units"). Most mini-split heat pumps do not include internal electric resistance back up heat. Unless the manufacturer’s product information indicates internal back up heat, set “Electric Resistance Backup Capacity” value to zero.
- For Ductless heat pumps, no ductwork shall be assigned to the system unless auxiliary distribution systems are in use. Where auxiliary distribution systems are in use, contact a utility or home certification program representative for further guidance.

- For Ducted mini-split heat pumps, “Sq. Feet Served” shall be entered for the whole home or zone the unit will serve and “Duct Surface Area” shall be estimated using REM/Rate™’s “Estimate Surface Area” option. Duct system location shall be entered accurate to the duct system to be installed in the home. Alternatively, if a duct design has been provided, the rater/verifier may calculate duct surface area based on the design. (See “Duct systems” below). If no supplemental heat sources – wall heaters, zone heaters, fireplaces, electric baseboards, or electric resistance floor heat exist in the home, no further action is required.
- For mixed ducted and non-ducted mini-split heat pumps, refer to the modeling guidance in Table 2. A system is considered mixed ducted and non-ducted when there is a single outdoor unit serving multiple indoor units that are both ducted and non-ducted.
- If supplemental wall heaters, zone heaters, fireplaces, electric baseboards, or electric resistance floor heat will be present in the home, the rater/verifier shall enter the supplemental heat as a separate space heating system according to the Equipment Modeling Flow Chart (<https://betterbuilt.nw.com/resources/equipment-modeling-flow-chart>), Table 2, and the sections that follow.

Ground Source Heat Pumps

Follow REM/Rate™’s internal guidance for modeling ground source heat pumps (GSHP). Check with local utility to determine whether GSHP are eligible under their program.

Dual Fuel Heat Pumps

Dual fuel heat pump (DFHP) designation applies to equipment configurations incorporating both a central air source heat pump and a central gas furnace connected to a shared duct system. Rater/verifier shall model all dual fuel heat pumps as “Dual Fuel Heat Pump” Library Type. Rater/verifier shall use capacity, efficiency, backup heat capacity, and Switch Over Temperature values accurate to the equipment installed in the home. If unavailable, rater/verifier may select equipment with similar capacity and efficiency values from the Dual Fuel Heat Pump library, but rater/verifier must field-verify Switch Over Temperature and enter an accurate value when modeling.

Supplemental Heat Sources

Electric Resistance Zonal Heat

If supplemental electric resistance wall heaters, zone heaters, baseboard heaters, or electric resistance floor heat will be present in the home, the rater/verifier shall enter the supplemental heat as a separate space heating system as follows:

- System type: “Electric baseboard or Radiant”
- Fuel type: “Electric”
- Rated output capacity (kBtuh) = Total capacity of supplemental heat, in kBtuh.
- Seasonal equipment efficiency = 1.0 COP
- In homes with multiple heat sources, the rater/verifier shall allocate the load to those sources based on guidance provided in the Equipment Modeling Flow Chart (<https://betterbuilt.nw.com/resources/equipment-modeling-flow-chart>) and Table 2.

Fireplaces

Unless instructed otherwise by the program, gas and wood fireplaces shall be modeled as fuel-fired unit heaters. In homes with multiple heat sources, the rater/verifier shall allocate the load to those sources based on guidance provided in the Equipment Modeling Flow Chart

(<https://betterbuiltnw.com/resources/equipment-modeling-flow-chart>) and Table 2. Rater/verifiers shall enter values for output capacity, seasonal efficiency, and auxiliary electric use accurate to the equipment installed in the home as follows:

- System type: “Fuel-Fired Unit Heater”
- Fuel type: “Natural Gas”, “Propane”, or “Wood”
- Rated output capacity (kBtuh): As Rated
- Efficiency: As Rated

Radiant Hydronic Heating

Where hydronic systems will use a radiant slab for distribution, the rater/verifier shall designate the home’s slab as “Radiant” in the slab floor library entry. In homes with multiple heat sources, the rater/verifier shall allocate the load to those sources based on guidance provided in the Equipment Modeling Flow Chart (<https://betterbuiltnw.com/resources/equipment-modeling-flow-chart>) and Table 2. Rater/verifier shall enter values for fuel type, output capacity, seasonal efficiency, and auxiliary electric use accurate to the equipment installed in the home, as follows:

- System type: “Fuel-fired Hydronic Distribution” or “Electric Hydronic Distribution”
- Fuel type: Accurate to the equipment installed
- Rated output capacity (kBtuh) = Accurate to the equipment installed. For electric resistance units, convert output kW to kBtuh according to the following conversion: 1 kW = 3.412 kBtuh
- Seasonal equipment efficiency
 - For Fuel-fired Hydronic Distribution Type: Enter the rated AFUE for the equipment installed. For combined Heat/DHW equipment that is not rated in AFUE, enter the CAE for the equipment installed, with “AFUE” as the unit type
 - For Electric Hydronic Distribution Type:
 - For electric resistance sources: Specify a COP of 1.0
 - For heat pump or compressor-driven sources, please contact a program representative for guidance specific to the installed equipment configuration with the following details:
 - System specification sheet
 - Details on electric resistance back-up and its capacity
 - Heating and cooling distribution method
 - Control strategy of the equipment
- Where supplemental hot water heaters, or “buffer tanks” are included in the hydronic system, the rater/verifier shall include this equipment as a supplemental heat source, entering the equipment’s EF or UEF as the equipment efficiency with “COP” as the unit type and manually allocate the home’s heating load based on guidance provided in the Equipment Modeling Flow Chart (<https://betterbuiltnw.com/resources/equipment-modeling-flow-chart>) and Table 2.

Note: Systems utilizing a gas boiler or tankless water heater combined with an air handler or fan coil for distribution shall be modeled as a gas furnace (above) with additional auxiliary energy use to account for both pump and air handler energy.

Integrated Space and Water Heating

Rater/verifier shall model integrated space and water heating equipment as separate space and water heat systems. Per the software developers' guidance, use of the "Integrated Space/Water Heating" Library Type is not recommended.

Water Heating

Rater/verifier shall enter water heaters with size, location, type, and efficiencies accurate to the equipment installed in the home. RESNET approved software currently only allow EF values for water heaters. For equipment that is rated in UEF, rater/verifier may utilize the current EF as listed in AHRI or a historic EF value for the same model or similar product. In the absence of a current or historical EF, rater/verifier may use the RESNET EF Calculator.

- Heat Pump Water Heaters (HPWH) – Rater/verifier shall enter the Northern Climate Uniform Energy Factor (UEF_{NC}) or Northern Climate Energy Factor (EF_{NC}) from NEEA's Qualified Products List. Where a HPWH is ducted for both intake and exhaust air, rater/verifier may enter the unit's location as "Ambient".
- Supplemental hot water heat (buffer tanks) for radiant hydronic systems shall be modeled as specified under "Radiant Hydronic Heating" above.

Domestic Hot Water Efficiencies

Rater/verifier shall enter values in REM/Rate™'s Domestic Hot Water Efficiencies screen accurate to the equipment and features installed in the home. Where recirculation systems are installed, consult with a program representative for additional guidance.

Note: Select inputs/characteristics from the DHW Efficiencies screen may be required by current energy, mechanical, or plumbing codes in your state or local jurisdiction. Refer to current codes for additional detail on requirements for showerhead and faucet flow rates, and pipe insulation on hot water pipes. Where these items are required by code, rater/verifier is permitted to enter values consistent with state energy, mechanical, or plumbing code as the default.

5. DUCT SYSTEMS, INFILTRATION AND VENTILATION

Ducts

Rater/verifier shall enter "Sq. Feet Served" for the whole home or zone the duct system is intended to serve and "Duct Surface Area" shall be estimated using REM/Rate™'s "Estimate Surface Area" option. Alternatively, if a duct design has been provided, the rater/verifier may calculate duct surface area based on the design.

While certain duct system locations may be considered as 'ducts inside' by local or national standards/specs due to their claim of equivalent performance, for the purposes of this document and the programs it serves, duct system location must be entered accurate to the duct system to be installed in the home. Ex. If ducts are buried under insulation, they may be considered as 'ducts inside' by certain standards, however, they shall be modeled accurate to the home, as 'Attic, under insulation' in REM/Rate™. For additional details on which duct location is accurate the home, refer to REM/Rate™'s internal guidance.

NOTE: PTCS definition of ‘ducts located within conditioned space’ shall not be used as an equivalent to model all ducts within the conditioned spaces. Duct location must be accurate to the home.

If the home has more than one ducted heat source, rater/verifier shall create a duct system entry for each heating/cooling source.

Rater/verifier shall enter duct “Leakage to Outside – Total” accurate to the Leakage to Outside/Leakage to Exterior test results for the home. In homes where Leakage to Outside/Leakage to Exterior test is not performed, rater/verifier may use the Total Duct Leakage test result as the “Leakage to Outside – Total” value as a conservative estimate. Rater/verifier shall not use REM/Rate™’s “Use Default Leakage” option. The “Exemption- No Test Required” box shall not be checked.

If all ducts and equipment are located within conditioned space or meet PTCS definition of ducts located within conditioned space (maximum of five percent (5%) of the linear feet of the supply duct system and up to five percent (5%) of the linear feet of the return duct system may be located outside the thermal and/or air barriers of the house), rater/verifier may enter “Leakage to Outside – Total” value of 80 CFM50 in lieu of testing.

Infiltration

Rater/verifier shall enter infiltration values accurate to the home. Infiltration “Measurement Type” shall be entered as “Blower door test”. Heating and cooling season infiltration values shall be the blower door test results, entered with “CFM @ 50 pascals”, “CFM @ 25 pascals”, or “ACH @ 50 pascals” as the unit type. Rater/verifier shall not use “Natural ACH” as the unit type. The “Shelter Class” value shall be “4” and “Code Verification” value shall be set to “Tested”.

Note: For preliminary model submissions, the infiltration value may be set to 4 ACH₅₀ or another value based on rater/verifier’s observations and experience with the particular builder of the modeled home.

Ventilation

Balanced Ventilation Type

Select the Balanced ventilation system type for systems that are designed to simultaneously supply and exhaust air from the home, including Heat Recovery Ventilators (HRVs) and Energy Recovery Ventilators (ERVs). HRVs must be modeled with Adjusted Sensible Recovery Efficiency (ASRE) and fan wattage (Watts) as listed in the HVI directory (www.hvi.org) for the equipment operating speed that meets minimum ventilation standards (ASHRAE 62.2-2010 or similar) under continuous operation.

Rater/verifier shall provide HRV/ERV model numbers in REM/Rate™’s Notes area.

- Type: Balanced
- Adjusted Sensible Recovery Efficiency (%): HVI-listed ASRE value for equipment operating speed meeting ASHRAE 62.2-2010 under continuous operation.
- Adjusted Total Recovery Efficiency (%): HVI-listed ATRE value for equipment operating speed meeting ASHRAE 62.2-2010 under continuous operation. If ATRE rating is unavailable, enter “0”.
- Rate (cfm): Continuous ventilation rate, as calculated per ASHRAE 62.2-2010 or similar
- Hours/Day: 24
- Fan watts: HVI-listed Wattage value for equipment operating speed meeting continuous ventilation rate, as calculated per ASHRAE 62.2-2010 or similar

Exhaust Only Ventilation Type

Rater/verifier shall select this ventilation type if an exhaust fan is used as the primary means of whole-house ventilation.

- Type: Exhaust Only
- Rate (cfm): Continuous ventilation rate, as calculated per ASHRAE 62.2-2010 or similar
- Hours/Day: 24
- Fan watts: HVI-listed Wattage value for equipment operating speed meeting continuous ventilation rate, as calculated per ASHRAE 62.2-2010 or similar

Supply Only Ventilation Type

Rater/verifier shall select this ventilation type for systems designed to supply air into the home, including systems consisting of a fresh air intake duct attached to the return plenum of a central heating system.

- Type: Supply Only
- Rate (cfm): Continuous ventilation rate, as calculated per ASHRAE 62.2-2010 or similar
- Hours/Day: 24
- Fan watts: based on the following formula:

$$\text{Fan watts} = \text{Air handler fan wattage} * 0.146$$

Where,

$$\text{Air handler fan wattage} = \text{Air handler motor HP} * 745.7$$

Note: Air handler motor HP is commonly available on the manufacturer's specification sheet and is usually unavailable on AHRI.

For homes with multiple air handlers or systems where the air handler motor capacity is unavailable on the manufacturer specification sheet, please contact a program representative.

Air Cyclor Ventilation Type

Due to REM/Rate™'s underlying assumptions associated with the Air Cyclor ventilation type, rater/verifiers shall not select this system type. For systems utilizing a fresh air intake duct attached to the return plenum of a central heating system, rater/verifiers shall select "Supply Only" ventilation type and follow the associated modeling guidance above.

6. LIGHTS, APPLIANCES, OTHER

Appliances

If appliances are present in the home at the time of verification, rater/verifier shall use values accurate to the equipment present in the home. If appliances are not present but verifier can confirm purchase of the equipment for that home, the verifier shall use values accurate to the equipment and home.

NOTE: Verifiers are also required to input 'Elec Rate', 'Gas Rate', and 'Annual Gas Cost' per the Energy Guide of the clothes washer. Please refer to REM/Rate™'s internal guidance for additional support. Not providing these values will cause the simulation to produce garbage values.

If appliances are not present and verifier is unaware of any purchased equipment in the home at the time of verification, rater/verifier shall use default values, as specified below:

- Refrigerator
 - Total Consumption: 691 kWh/yr
- Dishwasher
 - kWh/yr: 270
 - Place Setting Capacity: 12
- Clothes Washer and Dryer
 - Dryer CEF: 2.62
 - Moisture Sensing toggled “on” (Checkmark in box)
 - Washer Presets: “Med Efficiency”

Lighting

Rater/verifier shall enter lighting values accurate to the home.

Miscellaneous and Auxiliary Equipment

In homes with significant load-affecting miscellaneous or auxiliary equipment present, rater/verifier shall gather equipment data and note the equipment in the REM/Rate™ “Notes” window.

Interior Mass

DO NOT USE

Photovoltaic Energy Systems

Rater/verifier shall enter values for photovoltaic systems accurate to the modeled home. Where possible, Array and Inverter information should be obtained from builder or installing solar contractor.

Active Solar, Solar Water Heating and Sunspaces

DO NOT USE

TABLE 2 – MODELING GUIDANCE FOR COMMON HEATING EQUIPMENT COMBINATIONS

Equipment Combination	Equipment Efficiencies	Load Allocation	Reference Home (UDRH)	Other Notes
Mixed Ducted/Ductless Mini-split Heat Pumps	From AHRI. Rater/verifier to use AHRI certificate specific to indoor unit ducting arrangement (e.g. - "Non-Ducted Indoor Units" vs. "Ducted Indoor Units")	Rater/verifier to use discretion. May be based on: -Portion of home served by each piece of equipment -HVAC load sizing/selection calcs (Manual J/S) -Known/expected usage patterns	Zonal UDRH	<i>Model ducts accurately to duct design or systems installed in home (where applicable).</i>
Hydronic Radiant with Mini-split Heat Pump/s	From AHRI. For Mini-splits, Rater/verifier to use AHRI certificate specific to indoor unit ducting arrangement (e.g. - "Non-Ducted Indoor Units" vs. "Ducted Indoor Units")	Load allocation shall be entered manually, rater/verifier to use discretion. May be based on: -Portion of home served by each piece of equipment -HVAC load sizing/selection calcs (Manual J/S) -Known/ expected usage patterns	Zonal UDRH	<i>Do not use REM/Rate's "Capacity Weight % of Load Served" function.</i>
Mini-split Heat Pump/s with Supplemental Zonal	For Mini-Splits, Rater/verifier to use AHRI certificate specific to indoor unit ducting arrangement (e.g. - "Non-Ducted Indoor Units" vs. "Ducted Indoor Units") For ER zonal, Fireplace, or Other types, model according to equipment-specific guidance provided herein	Prescriptive allocation: 90% of heat load allocated to Mini-split heat pumps Remaining 10% allocated to supplemental source/s If multiple supplemental sources are in use, rater/verifier to use discretion based on: -Portion of home served by each piece of equipment -HVAC load sizing/selection calcs (Manual J/S) -Known/ expected usage patterns	Zonal UDRH	<i>Model ducts accurately to duct design or systems installed in home (where applicable).</i>
Central Furnace or ASHP with Mini-split Heat Pump/s	From AHRI. For Mini-splits, Rater/verifier to use AHRI certificate specific to indoor unit ducting arrangement (e.g. - "Non-Ducted Indoor Units" vs. "Ducted Indoor Units")	Rater/verifier to use discretion. May be based on: -Portion of home served by each piece of equipment -HVAC load sizing/selection calcs (Manual J/S) -Known/expected usage patterns	UDRH selection to be based on equipment serving the greatest portion of the home's heating load: -If zonal/point-source in nature, use Zonal UDRH -If central, use Central UDRH	<i>Model ducts accurately to duct design or systems installed in home (where applicable).</i>
Ductless Mini-split with Auxiliary Distribution	From AHRI. Rater/verifier to use AHRI certificate specific to indoor unit ducting arrangement (e.g. - "Non-Ducted Indoor Units" vs. "Ducted Indoor Units") Fan wattage and duct losses for auxiliary distribution system to be included in model. Contact program for guidance.	Rater/verifier to use discretion. May be based on: -Portion of home served by each piece of equipment -HVAC load sizing/selection calcs (Manual J/S) -Known/expected usage patterns	UDRH selection to be based on equipment serving the greatest portion of the home's heating load: -If zonal/point-source in nature, use Zonal UDRH -If central, use Central UDRH	<i>Contact program representative for modeling guidance specific to this equipment combination.</i>