

MONTANA HOUSE 2

TECHNICAL SPECIFICATIONS

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# CHAPTER 1. DESIGN QUALIFICATION

## 1.1. Design Qualification

Single family homes built to meet Montana House 2 Specifications must meet the thermal envelope, heating system, and lighting and appliance efficiency requirements of either Path A or Path B listed in Table 1. The Montana House 2 Specification is designed to be the prescriptive standard for the minimum performance criteria for the components of Montana House 2. These specifications are intended to meet or exceed applicable existing building codes and Federal regulations. In any case where a Federal, State or local code or regulation exceeds these requirements, that code or regulation applies.

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| Table 1: Montana House 2 New Construction - Prescriptive Component Requirements |



# CHAPTER 2. THERMAL EFFICIENCY

## 2.1. General

All insulation materials shall be installed according to the manufacturer's instructions to achieve proper densities, avoid compression and voids, and maintain uniform R-values. To the maximum extent possible, insulation shall extend over the full component area to the intended R-value. All R-values specified are nominal.

Recessed fixtures (e.g., medicine cabinets, electrical panels, recessed lights, heating equipment, etc.) shall be covered by the full depth of insulation required by the component assembly. EXCEPTION: One percent of the component area (e.g., vaulted ceiling, wall) may have a minimum of R-10 insulation between the fixture and the building exterior if required ventilation clearances are maintained.

Hatches connecting conditioned spaces to attics and crawlspaces shall be insulated to at least the requirement for the appropriate component, except R-38 is allowed for ceiling hatches.

## 2.2. Ceiling

An advanced-frame attic is any combination of heel height, insulation material and baffles that provides the required ventilation space and a minimum of R-49 at the exterior edge of exterior walls. The insulation shall increase to the full R-value at the highest rate allowed by the roof pitch and taper down to reach the outside edge of the exterior wall or to blocking between rafters.

Ventilation baffles in attics shall be permanent, weather‑resistant retainers and allow insulation to be installed to the outer edge of the exterior wall to the fullest depth possible. All vents for attic/roofs and crawlspaces shall be clear of insulation. Attic and roof vents shall not be used as exhaust vents for mechanical ventilation systems.

## 2.3. Above Grade Walls

Insulation shall uniformly fill the entire cavity and to be installed as per manufacturer's directions. When present, insulated sheathing (either interior or exterior) is assumed to cover the entire opaque wall surface. All rim joists in heated basements or crawlspaces, or between floors, shall be insulated to the above-grade wall R-value.

### 2.3.1. Framing Description:

Framing systems shall use 2x6 wood framing. Intermediate framing is defined as follows:

*Intermediate*: Studs framed on 16 or 24-inch centers with single or double top plate(s) and single bottom plate. Corners use 2 studs or other means of fully insulating corners, and 1 stud with trim piece is used to support each header. Headers consist of double 2X material with R-10 insulation filling the remainder of the space. Interior partition wall/exterior wall intersections are fully insulated in the exterior wall, typically framed with 2 studs (corners) or drywall backers or ladder blocking (partitions).

## 2.4. Slab Floors

Slab floor insulation shall be installed under the entire slab in heated spaces. Slabs in heated spaces shall have an R-5 thermal break between footings, walls, and slabs in adjacent unconditioned spaces. Slab floors used as part of a radiant heating system shall have R-15 4’ perimeter and R-10 under the rest of the slab.

## 2.5. Sealed Crawlspace Wall Insulation

Perimeter insulation shall extend from the bottom of the subfloor to crawlspace floor covering any exposed foundation. Minimum of R-21 insulation shall be provided at the entire perimeter of the crawlspace. Insulation shall be permanently attached to framing materials in a manner capable of structurally supporting the insulation. Insulation may be either foam in-place or rigid insulation board or any combination of above.

## 2.6. Doors and Glazing

All windows, skylights and sliding glass doors shall be NFRC certified and labeled. Exterior doors that have not been tested shall use the default U-factors found in the following table:

 

## 2.7. Air Leakage Control

Building envelope leakage shall not exceed 4.0 ACH at 50 Pa for Path A or 3.0 ACH at 50 Pa for Path B.

## 2.8. Combustion Appliances

Neither unvented nor atmospheric combustion appliances should be installed in the house.

Whenever a combustion appliance used for secondary space heating is present within a building, a Combustion Appliance Zone (CAZ) pressure test should be performed and corrections made, as necessary, to avoid backdrafting. A UL listed carbon monoxide detector should also be installed within the heated space.

#  CHAPTER 3. HEATING AND COOLING SYSTEMS

## 3.1. General

The primary heating system shall be electric. All equipment shall be located and installed according to manufacturer specifications and guidelines, all applicable codes and standards, and accepted industry practices.

## 3.2. Air Source Heat Pumps

### 3.2.1 Heating Load Calculation and Equipment Selection and Sizing

The heat pump system shall be sized with a heating balance point of 30°F or lower[[1]](#footnote-1).

* 1. Heating loss calculations shall be made using a 70°F indoor design temperature.
	2. The recommended method and form for calculations and selection are available in the Air Conditioning Contractors of America (ACCA) Manuals J and S. Alternate computer or manual methods of calculating heating and cooling loads may be used if approved in advance by the utility.
	3. Component U-values and F-values used in the heat loss and heat gain coefficients shall reflect the actual construction of the building and be generally consistent with those found in ACCA Manual J 8th Edition, or later.
	4. Natural infiltration rate shall be set based on the house’s tested leakage rate, if test results are available. If the house’s tested leakage rate is not available, then the natural infiltration rate shall be set based on the average tested leakage rate of the builder’s MT House qualifying houses. If the builder’s MT House qualifying houses have not been tested, the natural infiltration rate shall be set to either 0.24 air changes per hour for houses qualifying under Path A or 0.18 air changes per hour for houses qualifying under Path B.
	5. 0% shall be used as the duct system loss in sizing calculations.

### 3.2.2 Compressor Control

If a low ambient temperature compressor cutout option is installed, it shall not cutout the compressor at temperatures above 5°F.

### 3.2.3 Auxiliary Heat Control

Auxiliary heatshall be controlled in the following manner depending on system type:

* For systems with a single stage of compression and for systems with multiple stages of compression but without supply air temperature sensor control: Auxiliary heat shall be controlled in such a manner that it does not engage when the outdoor air temperature is above 35°F, except when supplemental heating is required during a defrost cycle or when emergency heating is required during a refrigeration cycle failure.
* For systems with multiple stages of compression and supply air temperature sensor control: Auxiliary heat shall be controlled in such a manner that it does not engage when the supply air temperature is above 85°F.

### 3.2.4 Air Flow

Air flow across the indoor coil shall be as specified in the heat pump manufacturer’s literature, or greater than or equal to 325 cubic feet per minute (CFM) per 12,000 Btu/hr output at AHRI rating conditions (at 47°F) if the manufacturer’s recommended airflow rate is not specific. Approved measurement methods include using a TrueFlow plate or using the duct pressurization fan matching method per plate or fan manufacturer’s instructions.

### 3.2.5 External Static Pressure

The total external static pressure acting on the system air handler shall not exceed 0.8 inches of water (200 Pa) after the new heat pump is installed. Installer shall ensure the duct system can accommodate the heat pump system that is selected after sizing calculations are completed.

### 3.2.6 Refrigerant Charge

Temperature change across indoor coil after 10 minutes of heating operation shall be at or above the temperature split shown in the table below:



### 3.2.7 Indoor Thermostats

Thermostats used for both heating and cooling shall have a manual changeover feature or heating/cooling lockout to prevent cross-cycling between heating and cooling.

## 3.4. Zonal Electric Controls

Zonal systems shall have one electronic thermostat per zone.

## 3.5. Forced Air Electric Controls

For central furnace or similar type systems, a programmable thermostat shall be installed.

## 3.6 Ductwork

All air-handlers and all ducts must be within the continuous thermal and air barriers of the house. Ducts shall not be installed within exterior wall cavities. Building cavities shall not be used to transport air.

In multi-storied houses, particular attention shall be paid to sealing rim joists between floors. Where ducts are within a soffit, particular attention shall be paid to sealing the ceiling of the soffit, to ensure the ducts are within the pressure boundary of the house.

# CHAPTER 4. LIGHTING AND APPLIANCES

## 4.1. Lighting

All qualified homes shall have a minimum of 90% of all internal and external lighting sockets employing ENERGY STAR compact fluorescent lamps, or ENERGY STAR fixtures, or some combination of ENERGY STAR lamps and ENERGY STAR fixtures.

## 4.2. Appliances

All “built-in” appliances in qualified homes must be listed as ENERGY STAR qualified and labeled. Dishwashers are the only typical built-in appliance within an ENERGY STAR product category. It is recommended that ENERGY STAR labeled products also be considered for any non-built-in appliances provided as part of the new construction process.

1. Sizing for cooling loads is outside the scope of this specification. If cooling loads justify a larger unit than the minimum size required based on the heating sizing process, the larger unit should be installed. [↑](#footnote-ref-1)