

Table 4.2.2(1) Specifications for the Energy Rating Reference and Rated Homes

Building Component	Energy Rating Reference Home	Rated Home
	Temperature setpoints: cooling temperature setpoint = 78 °F; heating temperature setpoint = 78 °F	Temperature setpoints: same as the Energy Rating Reference Home, except as required by Section 4.3.1

Table 4.2.2(1) Notes:

(a) Glazing shall be defined as sunlight-transmitting fenestration, including the area of sash, curbing or other framing elements, that enclose conditioned space. Glazing includes the area of sunlight-transmitting fenestration assemblies in walls bounding conditioned basements. For doors where the sunlight-transmitting opening is less than 50% of the door area, the glazing area of the sunlight transmitting opening area shall be used. For all other doors, the glazing area is the rough frame opening area for the door, including the door and the frame.

(b) For one- and two-family dwellings with conditioned basements and dwelling units in residential buildings not over three stories in height above grade containing multiple dwelling units the following formula shall be used to determine total window area:

$$AG = 0.18 \times CFA \times FA \times F$$

where:

AG = Total glazing area

CFA = Total Conditioned Floor Area

FA = (gross above-grade thermal boundary wall area) / (gross above-grade thermal boundary wall area + 0.5*gross below-grade thermal boundary wall area)

F = 1 - 0.44* (gross common wall Area) / (gross above-grade thermal boundary wall area + gross common wall area)

and where:

Thermal boundary wall is any wall that separates Conditioned Space from Unconditioned Space, outdoor environment or the surrounding soil.

Above-grade thermal boundary wall is any portion of a thermal boundary wall not in contact with soil.

Below-grade thermal boundary wall is any portion of a thermal boundary wall in soil contact.

Common wall is the total wall area of walls adjacent to another conditioned living unit, not including foundation walls.

(c) For fenestrations facing within 15 degrees of true south that are directly coupled to thermal storage mass, the winter interior shade coefficient shall be permitted to increase to 0.95 in the Rated Home.

(d) Where Effective Leakage Area (ELA) is defined in accordance with Equation 4.4 of ASHRAE Standard 62.2-2013, and where $SLA = ELA / CFA$ (where ELA and CFA are in the same units).

(e) Tested envelope leakage shall be determined and documented using the on-site inspection protocol as specified by requirements equivalent to Section 802 of the *Mortgage Industry National Home Energy Rating Systems Standards* by an Approved Tester.

(f) The combined air exchange rate for Infiltration and Whole-House Mechanical Ventilation Systems shall be determined in accordance with Equation 4.6 of ASHRAE Standard 62.2-2013.

(g) Either hourly calculations using the procedures given in the 2013 ASHRAE Handbook of Fundamentals (IP version), Chapter 16, page 16.25, Equation 51 using Shelter Class 4 or calculations yielding equivalent results shall be used to determine the energy loads resulting from infiltration in combination with Whole-House Mechanical Ventilation systems.

(h) Thermal storage element shall mean a component not normally part of the floors, walls, or ceilings that is part of a passive solar system, and that provides thermal storage.¹² A thermal storage element must be in the same room as fenestration that faces within 15 degrees of true south, or must be connected to such a room with pipes or ducts that allow the element to be actively charged.

(i) For a Rated Home with multiple heating, cooling, or water heating systems using different fuel types, the applicable system capacities and fuel types shall be weighted in accordance with the loads distribution (as calculated by accepted engineering practice for that equipment and fuel type) of the subject multiple systems. For the Energy Rating Reference Home, the minimum efficiencies given in Table 4.2.2(1a) below will be assumed for:

- 1) A type of device not covered by NAECA in the Rated Home;
- 2) A Rated Home heated by electricity using a device other than an air-source heat pump; or
- 3) A Rated Home that does not contain one or more of the required HVAC equipment systems.

Table 4.2.2(1a). Energy Rating Reference Home Heating and Cooling Equipment Efficiencies

Rated Home Fuel	Function	Reference Home Device
Electric	Heating	7.7 HSPF air source heat pump

¹² (Informative Note) Such as enclosed water columns, rock beds, or phase change containers.

**Table 4.2.2(1a). Energy Rating Reference Home
Heating and Cooling Equipment Efficiencies**

Rated Home Fuel	Function	Reference Home Device
Non-electric warm air furnace or space heater	Heating	78% AFUE gas furnace
Non-electric boiler	Heating	80% AFUE gas boiler
Any type	Cooling	13 SEER electric air conditioner
Biomass System ^(a)	Heating	63% Efficiency

Notes:

(a) Biomass fuel systems shall be included in ratings only when a permanent heating system sized to meet the load of the dwelling unit does not exist. Where installed to supplement a permanent heating system that cannot meet the load of the dwelling unit, the biomass system shall be assigned only that part of the load that cannot be met by the permanent heating system.

(j) For a Rated Home without a heating system, a gas heating system with the efficiency provided in Table 4.2.2(1a) shall be assumed for both the Energy Rating Reference Home and Rated Home. For a Rated Home that has no access to natural gas or fossil fuel delivery, an air-source heat pump with the efficiency provided in Table 4.2.2(1a) shall be assumed for both the Energy Rating Reference Home and Rated Home.

(k) For a Rated Home without a cooling system, an electric air conditioner with the efficiency provided in Table 4.2.2(1a) shall be assumed for both the Energy Rating Reference Home and the Rated Home.

(l) For a Rated Home with a non-storage-type water heater, a 40-gallon storage-type water heater of the same fuel as the proposed water heater shall be assumed for the Energy Rating Reference Home. For tankless water heaters, the Energy Factor (EF) shall be multiplied by 0.92 for Rated Home calculations. For a Rated Home without a proposed water heater, a 40-gallon storage-type water heater of the same fuel as the predominant fuel type used for the heating system(s) shall be assumed for both the Rated and Energy Rating Reference Homes. In both cases the Energy Factor of the water heater shall be as prescribed for water heaters by CFR 430.32(d), published in the Federal Register/Volume 66, No. 11, Wednesday, January 17, 2001 for water heaters manufactured after January 20, 2004.

(m) Tested duct leakage shall be determined and documented by an Approved Tester using the protocols equivalent to those specified in Section 803 of the *Mortgage Industry National Home Energy Rating Systems Standards*.

(n) Raters shall obtain Energy Factors (EF) for domestic hot water equipment from manufacturer's literature or from AHRI directory for equipment being used, where available. Where a manufacturer provided or AHRI published EF is not available¹³ the rater shall use the guidance provided in i and ii to determine the effective EF of the water heater.

¹³ (Informative Note) For example, commercial water heaters.

- i. For residential oil, gas and electric water heaters or heat pumps, default EF values provided in Table 4.4.2(3) for age-based efficiency or Table 4.4.2(4) for non-age-based efficiency shall be used.
- ii. For commercial water heaters used in residential applications, one of the following approaches shall be followed to determine the EF for a particular piece of equipment.
 - a. Use an approved commercial hot water system calculator.
 - b. Use Table C404.2 Minimum Performance of Water-Heating Equipment in the 2012 IECC to find the minimum requirement for the type of water heater.

Table 4.2.2(2). Component Heat Transfer Characteristics for Energy Rating Reference Home ^(a)

Climate Zone ^(b)	Fenestration and Opaque Door U-Factor	Glazed Fenestration Assembly SHGC	Ceiling U-Factor	Frame Wall U-Factor	Floor Over Unconditioned Space U-Factor	Basement Wall U-Factor ^(c)	Slab-on-Grade R-Value & Depth ^(d,e)
1	1.20	0.40	0.035	0.082	0.064	0.360	0
2	0.75	0.40	0.035	0.082	0.064	0.360	0
3	0.65	0.40	0.035	0.082	0.047	0.360	0
4 except Marine	0.40	0.40	0.030	0.082	0.047	0.059	10, 2 ft.
5 and Marine 4	0.35	0.40	0.030	0.060	0.033	0.059	10, 2 ft.
6	0.35	0.40	0.026	0.060	0.033	0.059	10, 4 ft.
7 and 8	0.35	0.40	0.026	0.057	0.033	0.059	10, 4 ft.

Notes:

- (a) Non-fenestration U-Factors shall be obtained from measurement, calculation, or an Approved source.
- (b) Climates zones shall be as specified by the 2006 IECC.
- (c) For basements where the Conditioned Space Boundary comprises the basement walls.
- (d) R-5 shall be added to the required R-value for slabs with embedded heating.
- (e) Insulation shall extend downward from the top of the slab vertically to the depth indicated.