Proposed changes to these Standards are with respect to RESNET Standards adopted by the Board of Directors at the annual meeting in February 2004. Proposed deletions are ~~stricken~~ and proposed additions are underlined.

CHAPTER THREE
Proposed 2005 RESNET Standards

300 NATIONAL ENERGY RATING TECHNICAL STANDARDS

301 GENERAL PROVISIONS

301.1 Purpose. The provisions of this document are intended to establish national residential energy rating Standards, consistent with the provisions of the Energy Policy Act of 1992, which any provider of home energy ratings may follow to produce uniform energy ratings for residential buildings.

301.1.1 Relationship to Other Standards. This Chapter is a companion Chapter to the "National Accreditation Procedures for Home Energy Rating Systems"(Chapter 1 of this Standard) and "National Rater Training and Certifying Standard (Chapter 2 of this Standard), as promulgated and maintained by the Residential Energy Services Network (RESNET) and recognized by the mortgage industry.

301.1.2 Relationship to State Law. These Standards specifically recognize the authority of each state that has a state law or regulation requiring certification, or licensing of home energy rating systems. To the extent that such state laws or regulations differ from these Standards, state law or regulation shall govern.

301.2 Scope. These Standards apply to existing or proposed, site-constructed or manufactured, single- and multi-family residential buildings three stories or less in height excepting hotels and motels.

302 DEFINITIONS AND ACRONYMS

Accreditation Procedures – The set of standards and procedures entitled "Mortgage Industry National Accreditation Procedures for Home Energy Rating Systems" as published and maintained by RESNET.

Annual Fuel Utilization Efficiency or *AFUE* – A standardized measure of heating system efficiency, based on the ratio of annual output energy to annual input energy that includes any non-heating season pilot input loss.

Auxiliary Electric Consumption – The annual auxiliary electrical energy consumption for a fossil fuel fired furnace or boiler in kilowatt-hours per year, derived from the Eae as follows:

Auxiliary Electric Consumption (kWh/yr) = Eae * (HLH) / 2080)
where:
HLH = annual heating load hours seen by the furnace/boiler
Note: If fan power is needed (kW), it is determined by Eae / 2080.

Bedroom – A room or space 70 square feet or greater, with egress window and closet, used or intended to be used for sleeping. A "den", "library", "home office" with a closet, egress window, and 70 square feet or greater or other similar rooms shall count as a bedroom, but living rooms and foyers shall not.

Biomass Fuel – Non-liquid and non-gaseous combustible substance burned to create energy, such as chunk wood, wood chips, corn husks, etc.

Biomass System – A biomass fuel combustion device and all associated mechanisms, controls, venting, and heat delivery components designed to provide space heating.

~~*Classic HERS Score* – The rating point score using the normalized modified end use loads for space heating, cooling, and hot water.~~

Climate zone – A geographical area defined as having similar long-term climate conditions.

COP – Coefficient of Performance, which is the ratio of the rate of heat delivered to the rate of energy input, in consistent units, for a complete heat pump system under designated operating conditions.

Conditioned Floor Area (CFA) – The finished floor area in square feet of a home that is conditioned by heating or cooling systems, measured in accordance with ANSI Standard Z765-~~1996~~2003 with exceptions as specified in Appendix A of this Standard.

Conditioned space boundary – The continuous planes of the building envelope that comprise the primary thermal and air flow barrier between the directly or indirectly conditioned space and either the outdoors or an adjacent unconditioned space.

Confirmed Rating – An energy rating accomplished using data gathered from an on-site audit inspection and, if required, performance testing of the physical building and its installed systems and equipment.

Detached one- and two-family dwelling – A building with one or two independent dwelling units with an individual or central HVAC system.

Directly Conditioned space – An enclosed space having heating equipment with a capacity exceeding 10 Btu/hr-ft^2, or cooling equipment with a capacity exceeding to 10 Btu/hr-ft^2. An exception is if the heating and cooling equipment is designed and thermostatically controlled to maintain a process environment temperature less than 65 degrees Fahrenheit or greater than 85 degrees Fahrenheit for the whole space the equipment serves.

Distribution System Efficiency – A system efficiency factor, not included in manufacturer's performance ratings for heating and cooling equipment, that adjusts for the energy losses associated with the delivery of energy from the equipment to the source of the load, such energy losses associated with heat transfer across duct or piping walls and air leakage to or from forced air distribution systems.

Eae – The average annual auxiliary electrical energy consumption for a gas furnace or boiler in kilowatt-hours per year as published in the GAMA Consumer's Directory of Certified Efficiency Ratings.

Energy analysis tool – A computerized calculation procedure for determining a home's energy efficiency rating and estimating annual purchased energy consumption and cost.

Energy Efficiency Ratio or EER – the ratio of net equipment cooling capacity in Btu/h to total rate of electric input in watts under designated operating conditions.

Energy efficiency rating or Energy rating – An unbiased indication of a home's relative energy performance based on consistent inspection procedures, operating assumptions, climate data and calculation methods.

Energy factor or EF –A standardized measure of water heater energy efficiency as determined under Department of Energy Regulations, 10 CFR 430.23(e)(2)(ii).

Energy saving measure or feature – Any material, component, device, system, construction method, process or combination thereof that will result in a reduction of energy use.

EPAct – The U.S. Energy Policy Act of 1992.

Equivalent Electric Power – The amount of electricity that would be produced from site fossil fuel uses when converted to electrical power using the Reference Electricity Production Efficiency.

Estimated annual energy cost savings – Positive dollar difference between estimated annual energy costs for an improved existing home as compared with the same home in its original condition or for a new home, as compared with the HERS Reference Home, local code or, for the purposes of Fannie Mae mortgages, the RESNET representation of the 1993 Model Energy Code, whichever is applicable.

~~*Expanded HERS Score* – The rating point score including space heating, cooling, domestic hot water, and all other rated expanded score equipment.~~

~~*Expanded Score Equipment* – Qualifying lighting fixtures, qualifying appliances and on-site power generation equipment that are included in the rating.~~

Exposed wall – Walls subjected to heat loss or gain.

Fenestration – A glazed opening and its associated sash and framing that is installed into a building.

Standards (HERS Standards) – Minimum criteria that a HERS Provider must meet in order to receive accreditation.

HERS – Home energy rating system.

HERS-BESTEST – The Home Energy Ratings System Building Energy Simulation Test published as NREL Report No. NREL/TP-472-7332.

HERS Index – A numerical integer value that represents the relative energy use of a Rated Home as compared with the energy use of the HERS Reference Home and where an Index value of 100 represents the energy use of the HERS Reference Home and an Index value of 0 (zero) represents a home that uses zero net purchased energy.

HERS provider – A person or organization that develops, manages, and operates a home energy rating system.

Home – A building with one or more dwelling units that has three or fewer stories above grade, or a single dwelling unit within a building of three or fewer stories above grade.

Home energy rater or rater – The person trained and certified by a Rating Provider to perform the functions of inspecting and analyzing a home to evaluate the minimum rated features and prepare an energy efficiency rating.

Home Energy Rating System or HERS – The materials and procedures needed to operate a home energy rating program including but not limited to: marketing materials, training materials, publications, rating tool, quality control, data collection and maintenance, agreements, data collection sheets, home owner reports, and other related materials and services.

Heating Seasonal Performance Factor or HSPF-- A standardized measure of heat pump efficiency, based on the total heating output of a heat pump, in Btu, divided by the total electric energy input, in watt-hours, under test conditions specified by the Air Conditioning and Refrigeration Institute Standard 210/240.

HVAC – Heating, Ventilating and Air Conditioning.

Indirectly Conditioned space – Enclosed space that is not directly conditioned:

(a) With area weighted heat transfer coefficient (U-value) to directly conditioned space exceeding that to the outdoors or to unconditioned spaces; or

(b) Through which air to or from directly conditioned spaces is transferred at a rate exceeding three air changes per hour.

Internal gains – The heat gains within a home attributable to lights, people, and miscellaneous equipment.

International Energy Conservation Code (IECC) – The model code for building energy conservation as promulgated by the International Code Council.

Labeled Ceiling Fan – A ceiling fan that has been labeled for efficiency in accordance with EPA guidelines such that the label shows the cfm, cfm/watt and watts of the fan at low, medium and high speeds.

Labeled Ceiling Fan Standardized Watts (LCFSW) – The power consumption in watts of a Labeled Ceiling Fan "standardized" to a medium speed air delivery of 3000 cfm.

Light Fixture – A complete lighting unit consisting of a lamp or lamps, and ballasting (when applicable) together with the parts designed to distribute the light, position and protect the lamps, and connect the lamps to the power supply. For built-in valence lighting, strings of low-voltage halogens, and track lights, each individual bulb shall count as a fixture.

Model Energy Code: 1993 (MEC '93) – The building energy code as promulgated by the Council of American Building Officials (CABO) in 1992 as amended in 1993. The RESNET representation of MEC '93 is the HERS Reference home as defined in the "Mortgage Industry National Home Energy Rating Standards" dated 1999.

Mechanical ventilation system – A fan designed to exchange the air in the house with outside air, sized to provide whole-house service per ASHRAE 62.2, and controlled automatically (i.e. not requiring human intervention to turn on and off). The presence of a remote-mounted on-off switch or dedicated circuit breaker labeled "whole house ventilation" (or equivalent) shall not disqualify a system from meeting the requirement of automatic control.

NREL – National Renewable Energy Laboratory.

~~*Non-Rated Light Fixture* – All light fixtures except for those in qualifying light fixture locations.~~

On-site Power Production (OPP) – Electric power produced at the site of a Rated Home. OPP shall be the net electrical power production, such that it equals the gross electrical power production minus any purchased fossil fuel energy, converted to its Equivalent Electric Power, used to produce the on-site power.

Projected Rating – A rating performed prior to the construction of a new building or prior to implementation of energy-efficiency improvements to an existing building.

Purchased energy – The portion of the total energy requirement of a home purchased from a utility or other energy supplier.

Purchased Energy Fraction (PEfrac) – The fraction of the total energy consumption of the Rated Home that is purchased energy, wherein all site fossil energy uses are converted

to their Equivalent Electric Power using the Reference Electricity Production Efficiency of 40%.

~~*Qualifying Appliances* – For the purposes of rating, includes refrigerator/freezers, dishwashers, and ventilation fans and ceiling fans.~~

Qualifying Light Fixture – A light fixture comprised of any of the following components: a) fluorescent hard-wired (i.e. pin-based) lamps with ballast; b) screw-in compact fluorescent bulb(s); or c) light fixture controlled by a photocell and motion sensor.

Qualifying Light Fixture Locations – For the purposes of rating, those qualifying light fixtures located in kitchens, dining rooms, living rooms, family rooms/dens, bathrooms, hallways, stairways, entrances, bedrooms, garage, utility rooms, home offices, and all outdoor fixtures mounted on a building or pole. This excludes plug-in lamps, closets, unfinished basements, and landscape lighting.

Rated Home – The specific home being evaluated using the rating procedures and Standards contained in this document.

Rating Index – See HERS Index.

Rating tool – A computerized procedure for calculating a home's energy efficiency rating, annual energy consumption, and annual energy costs.

Reference Electricity Production Efficiency – Electric power production efficiency, including all production and distribution losses, of 40%, approximating the efficiency of a modern, high-efficiency, central power plant. The Reference Electricity Production Efficiency is to be used only to convert site fossil fuel energy uses to an Equivalent Electric Power for the sole purposes of providing home energy rating system credit for On-site Power Production.

Reference Home – A hypothetical home configured in accordance with the specifications set forth in Section 303.4 of these Standards.

RESNET – Residential Energy Services Network.

R-value – thermal resistance value measured in h-ft^2-F/Btu.

Seasonal Energy Efficiency Ratio or *SEER*-- A standardized measure of air conditioner efficiency based on the total cooling output of an air conditioner in Btu/h, divided by the total electric energy input, in watt-hours, under test conditions specified by the Air Conditioning and Refrigeration Institute Standard 210/240..

Standard Ceiling Fan – The ceiling fan against which Labeled Ceiling Fans are measured for efficiency. At medium fan speed, the Standard Ceiling Fan produces 3000 cfm of air flow and consumes uses 42.6 watts of power.

Thermal boundary wall – Any wall that separates directly or indirectly conditioned space from unconditioned space or ambient conditions.

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

Thermal storage mass – Materials or equipment incorporated into a home that will store heat, produced by renewable or non-renewable energy, for release at a later time.

Typical Meteorological Year or TMY Data – Hourly climate data published by the National Climatic Center, Asheville, NC, based on historical climate data in 216 locations.

U-value – Thermal transmittance value measured in Btu/h-ft^2-F.

303 TECHNICAL REQUIREMENTS

303.1 Rating Procedures

303.1.1 To determine the energy rating of a home, all HERS providers shall–

303.1.1.1 If rating an existing home, visit the home to collect the data needed to calculate the rating;

303.1.1.2 If rating a new, to-be-built home, follow the procedures set forth in Section 303.6 and 303.7 of these Standards to collect the data needed to calculate the rating;

303.1.1.3 Use the collected data to estimate the annual purchased energy consumption for heating, cooling and water heating, lighting and appliances for both the Rated Home and the Reference Home as defined in Section 303.4 of these Standards.

303.1.1.4 If the energy efficiency rating is conducted to evaluate proposed energy conserving improvements to the home, calculate additional estimates of annual purchased energy consumption with the home reconfigured to include those improvements sufficient to consider interactions among improvement options.

303.1.1.5 If the Rated Home includes On-site Power Production (OPP), then OPP shall be calculated as the gross electric power produced minus the Equivalent Electric Power of any purchased fuels used to produce the electric power. The HERS Reference Home shall not include On-site Power Production.

For example, assume 1000 kWh (3413 kBtu or 3.413 MBtu) of gross electrical power is produced using 60 therms (6 MBtu) of natural gas to operate a high-efficiency fuel cell system. Using these assumptions, OPP = 3.413 MBtu - (6 MBtu * 0.4) = 1.0 MBtu.

303.1.2 Estimates completed by all HERS providers under Sections 303.1.1.3, 303.1.1.4 and 303.1.1.5 of this Standard must be–

303.1.2.1 Based on the minimum rated features set forth in Section 303.7 of these Standards.

303.1.2.2 Conducted using the standard operating assumptions established in Section 303.5 of these Standards.

303.1.2.3 Conducted using rating tool that has been certified for accuracy under Chapter 1, Section 102.2 of these Standards ("National Accreditation Procedures for Home Energy Rating Systems").

303.1.3 All HERS providers shall compare the estimates provided under Section 303.1.1 of this Standard to determine the energy rating of the home and, if applicable, the energy rating of the home with proposed conservation measures and On-site Power Production installed.

303.2 Rating Determination

~~**303.2.1**Where programs or providers choose to not report the Expanded Score, only the Classic HERS Score shall be displayed.~~

303.2.1 HERS Index. The rating Index shall be a numerical integer value that is based on a linear scale constructed such that the HERS Reference Home has an Index value of 100 and a home that uses no net purchased energy has an Index value of 0 (zero). Each integer value on the scale shall represent a 1% change in the total energy use of the Rated home relative to the total energy use of the Reference home. ~~Point score. The Reference Home shall have a point score of 80 points on a 0 to 100 point scale. Each 5% increase or decrease in the relative energy efficiency of the Rated Home with respect to the Reference Home shall constitute a 1-point increase or decrease, respectively (from 80), in the Rated Home's score. The method used to calculate the score shall be approved by the accrediting body and be consistent for each HERS provider operating within a state.~~ Except in states or territories whose laws or regulations require a specific alternative method, which shall control, equations 1 and 2 shall be used in a 2-step process to calculate the ~~point score~~HERS Index for the Rated Home, as follows:

Step (1) Calculate the individual normalized Modified End Use Loads (nMEUL) for heating, cooling, and hot water using equation 1:

nMEUL = REUL * (nEC_x / EC_r) **(Eq. 1)**

where:

nMEUL = normalized Modified End Use Loads (for heating, including auxiliary electric consumption, cooling, or hot water) as computed using accredited simulation tools.

REUL = Reference Home End Use Loads (for heating, including auxiliary electric consumption, cooling or hot water) as computed using accredited simulation tools.

nEC_x = normalized Energy Consumption for Rated Home's end uses (for heating, cooling or hot water) as computed using accredited simulation tools.

EC_r = estimated Energy Consumption for Reference Home's end uses (for heating, cooling or hot water) as computed using accredited simulation tools.

and where:

nEC_x = (a* EEC_x – b)*(EC_x * EC_r * DSE_r) / (EEC_x * REUL)

where:

EC_x = estimated Energy Consumption for the Rated Home's end uses (for heating, cooling or hot water) as computed using accredited simulation tools.

EEC_x = Equipment Efficiency Coefficient for the Rated Home's equipment, such that

EEC_x equals the energy consumption per unit load in like units as the load, and as derived from the Manufacturer's Equipment Performance Rating (MEPR) such that

EEC_x equals 1.0 / MEPR for AFUE, COP or EF ratings, or such that

EEC_x equals 3.413 / MEPR for HSPF, EER or SEER ratings.

DSE_r = REUL/EC_r * EEC_r

For simplified system performance methods, DSE_r equals 0.80 for heating and cooling systems and 1.00 for hot water systems. [see Table 303.4.1(1)]. However, for detailed modeling of heating and cooling systems, DSE_r may be less than 0.80 as a result of part load performance degradation, coil air flow degradation, improper system charge and auxiliary resistance heating for heat pumps. Except as otherwise provided by these Standards, where detailed systems modeling is employed, it must be applied equally to both the Reference and the Rated Homes.

EEC_r = Equipment Efficiency Coefficient for the Reference Home's equipment, such that EEC_r equals the energy consumption per unit load in like units as the load, and as derived from the Manufacturer's Equipment Performance Rating (MEPR) such that EEC_x equals 1.0 / MEPR for AFUE, COP or EF ratings, or such that EEC_x equals 3.413 / MEPR for HSPF, EER or SEER ratings.

and where the coefficients 'a' and 'b' are as defined by Table 303.2.2 below:

Table 303.2.2. Coefficients 'a' and 'b'

Fuel type and End Use	a	b
Electric space heating	~~1.9924~~2.2561	0
Fossil fuel* space heating	~~1.2544~~1.0943	~~0.6082~~0.4030
Biomass space heating	~~1.0144~~0.8850	~~0.6102~~0.4047
Electric air conditioning	~~2.9301~~3.8090	0
Electric water heating	~~0.8800~~0.9200	0
Fossil fuel* water heating	~~0.9404~~1.1877	~~0.7415~~1.0130

*Such as natural gas, LP, fuel oil

~~Step (2) Determine the "Classic HERS Score" using equation 2:~~

~~**Point score = 100 - ((TnML / TRL) * 20)** **(Eq. 2)**~~

~~where:~~

~~TnML = $nMEUL_{HEAT}$ + $nMEUL_{COOL}$ + $nMEUL_{HW}$ (Total of all normalized Modified End Use Loads as calculated using equation 1).~~

~~TRL = $REUL_{HEAT}$ + $REUL_{COOL}$ + $REUL_{HW}$ (Total of all Reference Home End Use Loads).~~

Step (~~3~~2) Determine the ~~"Expanded~~ HERS ~~Score~~Index~~"~~ using equation ~~3~~2:

~~Point Score~~HERS Index = ~~100 – ((~~PEfrac * (TnML$_{EXP}$ / TRL$_{EXP}$) * ~~20))~~100 (Eq. 2~~3~~)

where:

TnML$_{EXP}$ = $nMEUL_{HEAT}$ + $nMEUL_{COOL}$ + $nMEUL_{HW}$ + EUL_{LA} (Total of all normalized modified end use loads for heating, cooling and hot water as calculated using equation 1 plus EUL_{LA} = [(18,842 + 25.1*CFA) * 365] / ($1*10^6$) MBtu/year, modified by allowable reductions for qualifying lighting and appliances as specified by Section 303.4.1.7 of this Standard~~qualifying light fixture locations and qualifying appliance loads~~).

TRL_{EXP} = $REUL_{HEAT}$ + $REUL_{COOL}$ + $REUL_{H\,W}$ + $REUL_{LA}$ (Total of all Reference Home end use loads for heating, cooling and hot water plus $REUL_{LA}$ = [(18,842 + 25.1*CFA) * 365] / ($1*10^6$) MBtu/year including qualifying light fixture locations and qualifying appliance loads).

and where:

PEfrac = (TEU - OPP) / TEU

TEU = Total energy use of the Rated Home including all rated and non-rated energy features where all fossil fuel site energy uses are converted to Equivalent Electric Power by multiplying them by the Reference Electricity Production Efficiency of 40%

OPP = On-site Power Production as defined by Section 303.1.1.5

303.3 Rating Report

303.3.1 The Rated Home will be given a star rating between one and five-plus stars, determined by the numerical score HERS Index and the corresponding number of stars depicted in Table 303.3.1 for each of the Classic and Expanded HERS Scores:

TABLE 303.3.1. ScoreHERS Index, Star and Efficiency Scales for Rated Homes

Score HERS Index Range	Stars	Relative Efficiency Energy Use Change (with respect to Reference Home)
=>0=<500 and <20>400	✯	=>-4=<500% and <-3>400%
=>20 =<400and <40>300	✯+	=>-3=<400% and <-2>300%
=>40 =<300and <50>250	✯✯	=>-2=<300% and <-1>250%
=>50=<250 and <60>200	✯✯+	=>-1=<250% and <-1>200%
=>60=<200 and <70>150	✯✯✯	=>-1=<200% and <->150%
=>70=<150 and <80>100	✯✯✯+	=>=<150% and <>0%
=>80=<100 and <83>85	✯✯✯✯	=>=<0% and <>-15%
=>83=<85 and <86>70	✯✯✯✯+	=>=<-15% and <>-30%
=>86=<70 and <90>50	✯✯✯✯✯	=>=<-30% and <=>-50%
=>90 =<50 and <=100>=0	✯✯✯✯✯+	=>=<-50% and >=-100%

303.3.2 For each rating conducted under this part, a report shall be prepared containing, at a minimum, the following information:

303.3.2.1 The numerical rating scoreIndexs for the Classic HERS Score and, when applicable, the Expanded HERS Score determined in accordance with Section 303.2.1 of these Standards;

303.3.2.2 The star rating determined in accordance with Section 303.3.1 of these Standards, except that all plus (+) ratings other than 5+ are optional;

303.3.2.3 The estimated annual purchased energy consumption for space heating, space cooling, domestic hot water, and all other energy use, and the total of these four estimates;

303.3.2.4 The estimated annual energy cost for space heating, space cooling, domestic hot water, and all other energy use, and the total of these four estimates;

303.3.2.5 The unique physical location (full street address or recorded real property identifier) of the Rated home;

303.3.2.6 The name of the individual conducting the rating;

303.3.2.7 The date the rating was conducted;

303.3.2.8 The rating tool (including version number) used to calculate the rating; and

303.3.2.9 The following statement in no less than 8 point font, "The Home Energy Rating Standard Disclosure for this home is available from the rating provider." At a minimum, this will include the Rating Provider's mailing address and phone number.

303.3.3 If ratings are conducted to evaluate energy saving improvements to the home, in addition to the information set forth under Section 303.3.2 of this Standard, each rating report shall include–

303.3.3.1 The estimated annual energy cost savings for the home reconfigured to include those improvements;

303.3.3.2 The Energy Value of improved homes (present value of the energy cost savings) shall be calculated as follows:

303.3.3.2.1 For Fannie Mae energy efficient mortgages the present value factor shall be calculated as:

pvf = [1- (1 + r)^-n] / r

where:

pvf = present value factor

r = prevailing mortgage rate (Assumed Rate)

n = weighted life of the measures (23 years)

To determine the Energy Value of the improved home, the present value factor (pvf) shall be multiplied by the annual energy savings.

303.3.3.2.2 For Fannie Mae energy efficient mortgage products, the financing interest rate (Assumed Rate) shall be provided by RESNET annually from the information provided by Fannie Mae.

303.3.3.2.3 A weighted lifetime of 23 years shall be used in determining the present value factor for the energy cost savings.

303.3.3.3 The annual energy savings for a home shall be calculated by comparing the projected annual energy use cost of the Rated Home with the projected annual energy use cost of either the RESNET representation of the 1993 Model Energy Code's Standard Design Home for new homes or with the original home for existing homes. The monthly energy savings for the improved home shall be equal to the annual energy savings for the home divided by 12.

303.3.3.4 For FHA and Freddie Mac energy mortgages, the present worth of energy savings shall be calculated by taking the net annual energy savings (the annual energy savings minus the annual maintenance costs) times the present value factor developed by the U.S. Department of Housing and Urban Development. The present value factor is contained in the "HUD Mortgage Letter 93-13", as posted on RESNET's web site at http://www.natresnet.org/resources/lender/lhandbook/hud_93-13.htm.

~~**303.3.4**The rating report must also provide either:~~

~~**303.3.4.1**The estimated lights and appliance energy consumption of the Rated Home: or~~

~~**303.3.4.2**Information that additional energy savings related to lights and appliance use may be attainable and that the information available on Energy Guide labels and from other recognized sources may be used to consider the energy efficiency of appliances.~~

303.3.4 If a Projected Rating conducted under Section 303.6.1 of these Standards, the Rating shall be prominently identified as a "Projected Rating."

303.3.5 For each rating conducted under these Standards, the following items are to be prominently displayed on all reports and labels:

303.3.5.1 Date of the rating;

303.3.5.2 Annual estimated energy costs for heating, cooling, water heating and all other uses;

303.3.5.3 Rating ~~point score~~Index~~s~~ ~~(i.e. Classic HERS Score at all times' and Expanded HERS Score, if applicable,~~ and;

303.3.5.4 Star rating;

303.3.5.5 At the request of the person for whom the rating is being conducted, as an alternative to reporting the rating ~~point score~~Index and star rating, any home achieving a rating ~~score~~ Index as defined by EPA Energy Star Homes guidelines, be labeled an ENERGY STAR® Home.

303.4 HERS Reference Home and Rated Home Configuration

303.4.1 Calculation Procedure

303.4.1.1 General. Except as specified by this Section, the HERS Reference Home and Rated Home shall be configured and analyzed using identical methods and techniques.

303.4.1.2 Residence Specifications. The HERS Reference Home and Rated Home shall be configured and analyzed as specified by Table 303.4.1(1).

Table 303.4.1(1) Specifications for the HERS Reference and Rated Homes

Building Component	HERS Reference Home	Rated Home
Above-grade walls:	Type: wood frame Gross area: same as Rated Home U-Factor: from Table 303.4.1(2) Solar absorptance = 0.75 Emittance = 0.90	Same as Rated Home Same as Rated Home Same as Rated Home Same as Rated Home Same as Rated Home
Conditioned Basement ~~and crawlspace~~ walls:	Type: same as Rated Home Gross area: same as Rated Home U-Factor: from Table 303.4.1(2) with the insulation layer on the interior side of walls	Same as Rated Home Same as Rated Home Same as Rated Home
Floors over unconditioned spaces:	Type: wood frame Gross area: same as Rated Home U-Factor: from Table 303.4.1(2)	Same as Rated Home Same as Rated Home Same as Rated Home
Ceilings:	Type: wood frame Gross area: same as Rated Home U-Factor: from Table 303.4.1(2)	Same as Rated Home Same as Rated Home Same as Rated Home
Roofs:	Type: composition shingle on wood sheathing Gross area: same as Rated Home Solar absorptance = 0.75 Emittance = 0.90	Same as Rated Home Same as Rated Home Same as Rated Home Same as Rated Home
Attics:	Type: vented with aperture = 1ft^2 per 300 ft^2 ceiling area	Same as Rated Home
Foundations:	Type: same as Rated Home Gross Area: same as Rated Home U-Factor / R-value: from Table 303.4.1(2)	Same as Rated Home Same as Rated Home Same as Rated Home
Crawlspaces:	Type: vented with net free vent aperture = 1ft^2 per 150 ft^2 of crawlspace floor area.	Same as the Rated Home, but no less net free ventilation area than the Reference Home unless one of the following applies: 1) If an approved ground cover in accordance with IRC 408.2 (exception 2) is used, in

Table 303.4.1(1) Specifications for the HERS Reference and Rated Homes

Building Component	HERS Reference Home	Rated Home
		which case, the same net free ventilation area as the Rated Home down to a minimum net free vent area of 1ft^2 per 1,500 ft^2 of crawlspace floor area; 2) Where conditioned or mechanical ventilation air is supplied according to IRC 408.2 (exception 4), in which case, the same as the Rated Home; or 3) Where a conditioned crawlspace according to IRC 408.2 (exception 5), in which case, the same as the Rated Home.
	U-factor: from Table 303.4.1(2) for floors over unconditioned spaces	Same as Rated Home
Doors:	Area: 40 ft^2 Orientation: North U-factor: same as fenestration from Table 303.4.1(2)	Same as Rated Home Same as Rated Home Same as Rated Home
Glazing: [a]	Total area [b] =18% of conditioned floor area Orientation: equally distributed to four (4) cardinal compass orientations (N,E,S,&W) U-factor: from Table 303.4.1(2) SHGC: from Table 303.4.1(2) Interior shade coefficient: Summer = 0.70 Winter = 0.85 External shading: none	Same as Rated Home Same as Rated Home Same as Rated Home Same as Rated Home Same as HERS Reference Home [c] Same as Rated Home
Skylights	None	Same as Rated Home
Thermally isolated sunrooms	None	Same as Rated Home
Air exchange rate	Specific Leakage Area (SLA) [d] = 0.00048 (assuming no energy recovery)	For residences that are not tested, the same as the HERS Reference Home For residences without

Table 303.4.1(1) Specifications for the HERS Reference and Rated Homes

Building Component	HERS Reference Home	Rated Home
		mechanical ventilation systems that are tested in accordance with ASHRAE Standard 119, Section 5.1, the measured air exchange rate [(e)] but not less than 0.35 ach For residences with mechanical ventilation systems that are tested in accordance with ASHRAE Standard 119, Section 5.1, the measured air exchange rate [(e)] combined with the mechanical ventilation rate,[(f)] which shall not be less than 0.01 x CFA + 7.5 x (Nbr+1)
Mechanical ventilation:	None, except where a mechanical ventilation system is specified by the Rated Home, in which case: Annual vent fan energy use: kWh/yr = 0.03942*CFA + 29.565*(N_{br}+1) (per dwelling unit) where: CFA = conditioned floor area N_{br} = number of bedrooms	Same as Rated Home Same as Rated Home
Internal gains:	IGain = 17,900 + 23.8*CFA + 4104*N_{br} (Btu/day per dwelling unit)	Same as HERS Reference Home, except as provided by Section 303.4.1.7.
Internal mass:	An internal mass for furniture and contents of 8 pounds per square foot of floor area	Same as HERS Reference Home, plus any additional mass specifically designed as a Thermal Storage Element [(g)] but not integral to the building envelope or structure
Structural mass:	For masonry floor slabs, 80% of floor area covered by R-2 carpet and pad, and 20% of floor directly exposed to room air For masonry basement walls, same as Rated Home, but with	Same as Rated Home Same as Rated Home

Table 303.4.1(1) Specifications for the HERS Reference and Rated Homes

Building Component	HERS Reference Home	Rated Home
	insulation required by Table 303.4.1(2) located on the interior side of the walls	
	For other walls, for ceilings, floors, and interior walls, wood frame construction	Same as Rated Home
Heating systems [h),(i)]	Fuel type: same as Rated Home	Same as Rated Home [(i)]
	Efficiencies:	
	Electric: air source heat pump with prevailing federal minimum efficiency	Same as Rated Home
	Non-electric furnaces: natural gas furnace with prevailing federal minimum efficiency	Same as Rated Home
	Non-electric boilers: natural gas boiler with prevailing federal minimum efficiency	Same as Rated Home
	Capacity: sized in accordance with Section 303.5.1.4 of this Standard.	Same as Rated Home
Cooling systems [h),(k)]	Fuel type: Electric	Same as Rated Home [(k)]
	Efficiency: in accordance with prevailing federal minimum standards	Same as Rated Home
	Capacity: sized in accordance with Section 303.5.1.4 of this Standard.	Same as Rated Home
Service water heating systems [(h) (m)]	Fuel type: same as Rated Home	Same as Rated Home [(m)]
	Efficiency: in accordance with prevailing federal minimum standards	Same as Rated Home
	Use (gal/day): $30*N_{du} + 10*N_{br}$ where N_{du} = number of dwelling units	Same as HERS Reference Home
	Tank temperature: 120 F	Same as HERS Reference Home
Thermal distribution systems:	A thermal distribution system efficiency (DSE) of 0.80 shall be applied to both the heating and cooling system efficiencies.	As specified by Table 303.4.1(3), except when tested in accordance with ASHRAE Standard 152-2004[(n)], and then either calculated through hourly simulation or calculated in accordance with ASHRAE Standard 152-2004

Table 303.4.1(1) Specifications for the HERS Reference and Rated Homes

Building Component	HERS Reference Home	Rated Home
Thermostat	Type: manual Temperature setpoints: cooling temperature set point = 78 F; heating temperature set point = 68 F	Type: Same as Rated Home Temperature setpoints: same as the HERS Reference Home, except as required by Section 305.5.1.2

Table 303.4.1(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 is 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 homes with conditioned basements and for multi-family attached homes the following formula shall be used to determine total window area:

$A_F = 0.18 \times A_{FL} \times F_A \times F$

where:

A_F = Total fenestration area

A_{FL} = Total floor area of directly conditioned space

F_A = (Above-grade thermal boundary gross wall area) / (above-grade boundary wall area + 0.5 x below-grade boundary wall area)

F = (Above-grade thermal boundary wall area) / (above-grade thermal boundary wall area + common wall area) or 0.56, whichever is greater

and where:

Thermal boundary wall is any wall that separates conditioned space from unconditioned space or ambient conditions

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

Below-grade 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 due 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 Leakage Area (L) is defined in accordance with Section 5.1 of ASHRAE Standard 119 and where SLA = L / CFA (where L and CFA are in the same units). Either hourly calculations using the procedures given in the 2001 *ASHRAE Handbook of Fundamentals*, Chapter 26, page 26.21, equation 40 (Sherman-Grimsrud model) or calculations yielding equivalent results shall be used to determine the energy loads resulting from air exchange.

(e) Tested envelope leakage shall be determined and documented by a Certified Rater using the on-site inspection protocol as specified in Appendix A under "Blower Door Test." Either hourly calculations using the procedures given in the 2001 *ASHRAE Handbook of Fundamentals*, Chapter 26, page 26.21, equation 40 (Sherman-Grimsrud

model) or calculations yielding equivalent results shall be used to determine the energy loads resulting from air exchange.

(f) The combined air exchange rate for infiltration and mechanical ventilation shall be determined in accordance with equation 43 of 2001 *ASHRAE Handbook of Fundamentals* page 26.24 in combination with the" Whole-house Ventilation" provisions of 2001 *ASHRAE Handbook of Fundamentals*, page 26.19 for intermittent mechanical ventilation.

(g) 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 such as enclosed water columns, rock beds, or phase change containers. A thermal storage element must be in the same room as fenestration that faces within 15 degrees of due south, or must be connected to such a room with pipes or ducts that allow the element to be actively charged.

(h) 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 HERS Reference Home, the prevailing federal minimum efficiency shall be assumed except that the efficiencies given in Table 303.4.1(1)(a) below will be assumed when:

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

Table 303.4.1(1)(a). Default HERS Reference Home Heating and Cooling Equipment Efficiencies (i) (k) (m) (n)

Rated Home Fuel	Function	Reference Home Device
Electric	Heating	~~6.8~~7.7 HSPF air source heat pump
Non-electric warm air furnace or space heater	Heating	78% AFUE gas furnace
Non-electric boiler	Heating	80% AFUE gas boiler
Any type	Cooling	~~10~~ 13 SEER electric air conditioner
Biomass System (1)	Heating	63% Efficiency

Table 303.4.1(1)(a) Notes:

(1) Biomass fuel systems should not be included in ratings when then are considered "*supplemental* systems", i.e. where an automatic system, sized to meet the load of the house exists. Biomass systems should only be included in the rating in those situations where the automatic heating system is not large enough to meet the load of the house, and a biomass fuel system is in place to meet the balance of the load, or where there is only a biomass fuel system in place. In the situation where there are two systems that together meet the

load, the biomass system shall be assigned only that part of the load that cannot be met by the automatic system.

(i) For a Rated Home without a proposed heating system, a heating system with the prevailing federal minimum efficiency shall be assumed for both the HERS Reference Home and Rated Home. For electric heating systems, the prevailing federal minimum efficiency air-source heat pump shall be selected.

(k) For a Rated Home without a proposed cooling system, an electric air conditioner with the prevailing federal minimum efficiency shall be assumed for both the HERS Reference Home and the Rated Home.

(m) For a Rated Home with a non-storage type water heater, a 40-gallon storage-type water heater with the prevailing federal minimum efficiency and with the same fuel as the proposed water heater shall be assumed for the HERS Reference Home. For a Rated Home without a proposed water heater, a 40-gallon storage-type water heater with the prevailing federal minimum efficiency with the same fuel as the predominant heating fuel type shall be assumed for both the Rated and HERS Reference Homes.

(n) Tested duct leakage shall be determined and documented by a Certified Rater using the on-site inspection protocol as specified in Appendix A under “Air leakage (ducts)”.

Table 303.4.1(2). Component Heat Transfer Characteristics for HERS 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]	~~Crawl Space U-Factor~~	Slab-on-Grade [d,e] R-Value & Depth
1	1.20	0.40	0.035	0.082	0.064	0.360	~~0.477~~	0
2	0.75	0.40	0.035	0.082	0.064	0.360	~~0.477~~	0
3	0.65	0.40	0.035	0.082	0.047	0.360	~~0.136~~	0
4 except Marine	0.40	0.55	0.030	0.082	0.047	0.059	~~0.065~~	10, 2 ft.
5 and Marine 4	0.35	0.55	0.030	0.060	0.033	0.059	~~0.065~~	10, 2 ft.
6	0.35	0.55	0.026	0.060	0.033	0.059	~~0.065~~	10, 4 ft.
7 and 8	0.35	0.55	0.026	0.057	0.033	0.059	~~0.065~~	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 2004 Supplement to the International Energy Conservation Code.
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.

Table 303.4.1(3). Default Distribution System Efficiencies for Inspected Systems [a]

Distribution System Configuration and Condition:	**Forced Air Systems**	**Hydronic Systems** [b]
Distribution system components located in unconditioned space	0.80	0.95
Distribution systems entirely located in conditioned space [c]	0.88	1.00
Proposed "reduced leakage" with entire air distribution system located in the conditioned space [d]	0.96	
Proposed "reduced leakage" air distribution system with components located in the unconditioned space	0.88	
"Ductless" systems [e]	1.00	

Table 303.4.1(3) Notes:
(a) Default values given by this table are for distribution systems as rated, which meet minimum IECC 2000 requirements for duct system insulation.
(b) Hydronic Systems shall mean those systems that distribute heating and cooling energy directly to individual spaces using liquids pumped through closed loop piping and that do not depend on ducted, forced air flows to maintain space temperatures.

(c) Entire system in conditioned space shall mean that no component of the distribution system, including the air handler unit or boiler, is located outside of the conditioned space boundary.
(d) Proposed "reduced leakage" shall mean substantially leak free to be leakage of not greater than 3 cfm to outdoors per 100 square feet of conditioned floor area and not greater than 9 cfm total air leakage per 100 square feet of conditioned floor area at a pressure differential of 25 Pascal across the entire system, including the manufacturer's air handler enclosure. Total air leakage of not greater than 3 cfm per 100 square feet of conditioned floor area at a pressure difference of 25 Pascal across the entire system, including the manufacturer's air handler enclosure, shall be deemed to meet this requirement without measurement of air leakage to outdoors. This rated condition shall be specified as the required performance in the construction documents and requires confirmation through field-testing of installed systems as documented by a Certified Rater.
(e) Ductless systems may have forced airflow across a coil but shall not have any ducted airflows external to the manufacturer's air handler enclosure.

303.4.1.3 All enclosure elements shall use framing fractions that are consistent with and representative of reality. Default enclosure framing fractions are provided by Table 303.4.1.3.

Table 303.4.1.3. Default Framing Fractions for Enclosure Elements

Enclosure Element	Frame Spacing (in o.c.)	Default Frame Fraction (% area)
Walls (standard):		
@16" o.c.	16	23%
@24" o.c.	24	20%
Walls (advanced):		
@16" o.c.	16	19%
@24" o.c.	24	16%
Structural.Insulated.Panels	48	10%
Floors (standard):		
@16" o.c.	16	13%
@24" o.c.	24	10%
Floors (advanced):		
@16" o.c.	16	11%
@24" o.c.	24	8%
Ceilings (standard trusses):		
@16" o.c.	16	14%
@24" o.c.	24	11%
Ceilings (advanced trusses – "raised heel"):		
@16" o.c.	16	10%
@24" o.c.	24	7%
Ceilings (conventional framing):		
@16" o.c.	16	13%
@24" o.c.	24	9%

303.4.1.4 Insulation Inspections: All enclosure elements for the Rated Home shall have their insulation assessed in accordance with this Standard. Installed cavity insulation shall be rated as Grade I, II, or III in accordance with the on-site inspection procedures of Appendix A.

303.4.1.4.1 The HERS Reference Home enclosure elements shall be modeled assuming Grade I insulation. Default values for Rated Home insulation that is not inspected according to the procedures of Appendix A shall be in accordance with the requirements of Grade III as given in Section 303.4.1.4.2 and shall be recorded as "not inspected" in the rating information.

Exceptions:

(a) Modular and manufactured housing using IPIA (In-Plant Inspection Agent) inspections may be substituted for the HERS inspection. However, housing manufacturer shall include RESNET insulation inspection details and requirements in their "DAPIA" (Design Approval Primary Inspection Agency) packages submitted to HUD which are used by IPIA's for their factory inspections.

(b) Structural Insulated Panels (SIP's), Insulated Concrete Forms (ICF's), and other similar insulated manufactured assemblies. Note that manufacturer's claims of "equivalent" R-values based on reduced air leakage or other secondary effects may not be used; only the thermal resistance values for the actual materials as found in ASHRAE Fundamentals may be used.

(c) A RESNET-approved, third-party audited installer certification program may be substituted under the conditions specified in the RESNET approval process.

303.4.1.4.2 Insulation Assessment: Insulated surfaces categorized as "Grade I" shall be modeled such that the insulation R-value within the cavity is considered at its measured (for loose fill) or labeled value, including other adjustments such as compression, and cavity fill versus continuous, for the insulated surface area (not including framing or other structural materials which shall be accounted for separately). Insulated surfaces categorized as "Grade II" shall be modeled such that there is no insulation R-value for 2% of the insulated surface area and its measured or labeled value, including other adjustments such as compression and cavity fill versus continuous, for the remainder of the insulated surface area (not including framing or other structural materials). Insulated surfaces categorized as "Grade III" shall be modeled such that there is no insulation R-value for 5% of the insulated surface area and its measured or labeled value, including other adjustments such as compression and cavity fill versus continuous, for the remainder of the insulated surface area (not including framing or other structural materials). Other building materials, including framing, sheathing, and air films shall be assigned aged or settled -values according to ASHRAE Fundamentals. In addition, the following accepted conventions shall be used in modeling Rated Home insulation enclosures:

303.4.1.4.2.1 Insulation that does not cover framing members shall not be modeled as if it covers the framing. Insulated surfaces that have continuous insulation (i.e. rigid foam, fibrous batts, loose fill, or sprayed insulation) covering the framing

members shall be assessed and modeled according to Section 303.1.4 and combined with the cavity insulation, framing and other materials to determine the overall assembly R-value.

303.4.1.4.2.2 Compression: for modeling purposes, the base R-value of fibrous insulation that is compressed to less than its full rated thickness in a completely enclosed cavity shall be assessed according to the manufacturer's documentation; in the absence of such documentation, use R-value correction factor (CF) for Compressed Batt or Blanket from Manual J, 8th edition Table A5-1, Section 7-d.

303.4.1.4.2.3 Where large areas of insulation that is missing, or has a different R-value from the rest of an assembly exist, these areas shall be modeled with the appropriate R-value and assembly description separately from the rest of the assembly. Insulation R-values may not be averaged according to coverage area. For example, if 50 square feet of a wall area has no cavity fill insulation at all, that 50 square feet shall be recorded as a separate building component with no cavity insulation, but with the existing structural components.

303.4.1.4.2.4 Steel framing in insulated assemblies: calculations for the overall thermal properties of steel-framed walls, ceilings and floors shall be based on the "Thermal Design Guide for Exterior Walls, Publication RG-9405, American Iron and Steel Institute; the "Zone Method" from 2001 ASHRAE Handbook of Fundamentals (P 25.10-11); or equivalent.

303.4.1.5 Renewable energy systems, using solar, wind or other renewable energy sources, which offset the energy consumption requirements of the Rated Home, shall not be included in the Reference Home.

303.4.1.6 For non-electric warm furnaces and non-electric boilers, the values in Table 303.4.1.5 shall be used for auxiliary electric (Eae) in the Reference Home.

Table 303.4.1.5. Reference Home Eae Values

System Type	Eae
Oil boiler	330
Gas boiler	170
Oil furnace	439 + 5.5*Capacity (kBtu/h)
Gas furnace	149 + 10.3*Capacity (kBtu/h)

303.4.1.7 Lighting and Appliances

303.4.1.7.1 Lighting. Reference home annual lighting use in kWh/yr/(dwelling unit) shall be calculated as (455 + 0.80 * CFA) with an internal gain factor equal to 90% of lighting energy use (10% of lighting energy use is assumed to occur outside of the conditioned floor area of the home).~~Reference home annual lighting use (in kWh) is the product of the house conditioned floor area and the annual lighting intensity for the qualifying fixtures; that is, lighting energy use in kWh/yr = (CFA*0.64) + 364) per dwelling unit.~~

For the purpose of adjusting the annual light fixture energy consumption for calculating the rating, EUL_{LA} shall be adjusted by adding lighting ΔEUL_{LA}, where ΔEUL_{LA} (MBtu/yr/(dwelling unit)) = [29.5 – 0.5189*CFA*$FL_{\%}$ – 295.12*$FL_{\%}$ + 0.0519*CFA] * 0.003413, and where $FL_{\%}$ is the ratio of Qualifying Light Fixtures to all light fixtures in Qualifying Light Fixture Locations, and CFA is the Conditioned Floor Area. For calculation purposes, the rated home shall never have $FL_{\%}$ less than 10%.

For lighting, internal gains in the Rated home shall be reduced by 90% of the lighting ΔEUL_{LA} calculated in Btu/day using the following equation: $\Delta Igain = 0.90 * \Delta EUL_{LA} * 10^6 / 365$.~~For calculating light fixture energy consumption when calculating the rating score, the annual light fixture usage (in kWh) is the product of the annual lighting intensity (ALI) and the Conditioned Floor Area (CFA), where the ALI (kWh/yr-ft^2) = (98.38/CFA + 0.1730)*($FL_{\%}$) + (393.5/CFA + 0.6919)*(1-$FL_{\%}$) and where $FL_{\%}$ is the ratio of Qualifying Light Fixtures to all light fixtures in Qualifying Light Fixture Locations. The rated home shall never have $FL_{\%}$ less than 10%. For calculating the light fixture energy consumption to report annual purchased energy, the annual lighting consumption is equal to 1.25* ALI *CFA (kWh/yr)~~.

303.4.1.7.2 Refrigerators. Reference home annual refrigerator energy use shall be 775 kWh/yr per dwelling unit.

For the purposes of adjusting the annual refrigerator energy consumption for calculating the rating, the EUL_{LA} shall be adjusted by adding ΔEUL_{LA}, where refrigerator ΔEUL_{LA}(kWh/yr/(dwelling unit)) = Total Annual Energy Consumption of Refrigerators in Rated Home – 775.

For refrigerators, internal gains in the Rated home shall be reduced by 100% of the refrigerator ΔEUL_{LA} calculated in Btu/day using the following equation: $\Delta Igain = \Delta EUL_{LA} * 10^6 / 365$.

303.4.1.7.3 Mechanical Ventilation System Fans. If ventilation fans are present, the EUL_{LA} shall be adjusted by adding ΔEUL_{LA}, where ΔEUL_{LA} (kWh/year/(dwelling unit)) = Total Annual Energy Consumption of the Ventilation System in the Rated Home – [0.03942*CFA + 29.565*(N_{br}+1)]

303.4.1.7.4 Dishwashers. A dishwasher, with annual energy use as specified by Table 303.4.1.8 with an internal gain factor equal to 60% of dishwasher energy use, shall be assumed in the Reference home. If no labeled dishwasher energy factor is specified for the Rated home, the Rated home shall have the same dishwasher annual energy use and internal gain factor as the Reference home.~~If a dishwasher is indicated in the design, one will be included in the reference home. When present, reference home annual dishwasher energy use for each dwelling unit in the rated home is based on the number of bedrooms from the following Table 303.4.1.8.~~

Table 303.4.1.8

Bedrooms per Dwelling Unit	Reference Dishwasher kWh

1	90
2	126
3	145
4	174
5+	203

For the purposes of calculating dishwasher energy savings and hot water energy savings for calculating the rating, the energy savings shall be calculated based on the following formula using Cycles/Year by number of Bedroom (N_{br}) as specified in Table 303.4.1.9~~For calculating dishwasher energy consumption and hot water energy consumption, when a dishwasher is present or space is provided, or if specified, the energy consumption shall be calculated based on the following formula with inputs from the following cycles per year by number of bedroom (N_{br}) as specified in Table 303.4.1.9.~~

Dishwasher annual energy use for each dwelling unit in the rated home (kWh/yr) = (0.27) * (cycles/yr/(dwelling unit)) / (dishwasher rated Energy Factor)

Table 303.4.1.9

N_{br} per Dwelling Unit	**Cycles/Yr per Dwelling Unit**
1	154
2	214
3	247
4	296
5+	345

EUL_{LA} shall be adjusted by adding dishwasher ΔEUL_{LA}, where ΔEUL_{LA} (MBtu/yr/(dwelling unit)) = (cycles/yr)*[0.27/(dishwasher rated Energy Factor) – 0.587]*0.003413.

Internal gains in the Rated Home shall be reduced by 60% of the dishwasher ΔEUL_{LA} calculated in Btu/day using the following equation: $\Delta Igain = 0.60 * \Delta EUL_{LA} * 10^6 / 365$.

The reduction in hot water use (gallons/day) shall be based on the following formula, to be used in adjusting the hot water Use Equation given by Table 303.4.1(1):

Reduction in hot water use (gallons/day/(dwelling unit)) = [(7.4 gal/cycle) – (0.73)/(dishwasher rated Energy Factor in cycles/kWh)/(90 ^{o}F)/(0.0024 kWh/gal/F)] * [(cycles/yr/(dwelling unit))/(365 days/year)]

303.4.1.7.5 Ceiling Fans. If ceiling fans are included in the Rated home, they shall also be included in the Reference home. Three (3) ceiling fans shall be assumed in both the Reference Home and the Rated Home. A daily ceiling fan operating schedule equal to 14 full-load hours shall be assumed in both the Reference Home and the Rated Home

during periods when ceiling fans are operational. Ceiling fans shall be assumed to operate only during the cooling season, which may be estimated to be all months with an average temperature greater than 63 ^{o}F. The cooling thermostat (but not the heating thermostat) shall be set up by 0.5 ^{o}F in both the Reference and Rated Home during periods when ceiling fans are assumed to operate.

The Reference Home shall use three (3) Standard Ceiling Fans of 42.6 watts each for total full-load fan wattage of 128 watts (42.6 * 3 = 128). The Rated Home shall use the Labeled Ceiling Fan Standardized Watts (LCFSW), also multiplied by three (3) fans to obtain total ceiling fan wattage for the Rated Home. The Rated Home LCFSW shall be calculated as follows:

LCFSW = (3000cfm) / (cfm/watt as labeled at medium speed)

During periods of fan operation, the fan wattage, at 100% internal gain fraction, shall be added to internal gains for both the Reference and Rated Homes. In addition, annual ceiling fan energy use, in MBtu/year (kWh/year * $3.413x10^{-3}$), for both the Rated and Reference homes shall be added to the lighting and appliance end use loads (EUL_{LA} and $REUL_{LA}$) given in Equation 2, Section 303.2.1 of this Chapter.

303.4.1.8 If the Rated Home includes On-site Power Production, the Purchased Energy Fraction for the Rated Home (see Section 303.2.2) shall be used to determine the impact of the On-site Power Production on the HERS ~~point score~~Index.

303.5 Operating Condition Assumptions

303.5.1 All HERS providers shall estimate the annual purchased energy consumption for heating, cooling and hot water for both the Rated Home and the Reference Home using the following assumptions–

303.5.1.1 Internal heat gains ("IGain" in Btu/day per dwelling unit) from lights, people and equipment of

IGain = 17,900 + 23.8 * CFA + 4,140 * Nbr

where

CFA = conditioned floor area per dwelling unit

Nbr = number of bedrooms per dwelling unit

As adjusted for ~~lower~~ internal gains from high-efficiency lighting and appliances in the Rated home as provided by Section 303.4.1.7.~~assuming 90% of the change in the lighting energy with respect to the Reference home light fixtures and assuming 100% of the change in appliance energy with respect to the Reference home for lights and appliances in the Rated home that are more efficient than those of the Reference home.~~

303.5.1.2 Where programmable offsets are available in the Rated Home, 2 ^{o}F temperature control point offsets with an 11 p.m. to 5:59 a.m. schedule for heating and a 9 a.m. to 2:59 p.m. schedule for cooling, and with no offsets assumed for the Reference Home;

303.5.1.3 When calculating annual purchased energy for cooling, internal latent gains assumed as 0.20 times sensible internal heat gains;

303.5.1.4 The climatologically most representative TMY or equivalent climate data, which may be interpolated between climate sites if interpolation is established or approved by the accrediting body and consistent for all HERS providers operating within a state.

303.5.1.5 Manufacturer's Equipment Performance Ratings (e.g., HSPF, SEER, AFUE) shall be corrected for local climate conditions and mis-sizing of equipment. To determine equipment mis-sizing, the capacity of heating and cooling vapor compression equipment shall be calculated in accordance with ACCA Manual J, Eighth Edition, ASHRAE 2001 Handbook of Fundamentals, or an equivalent computation procedure, using the following assumptions:

303.5.1.5.1 For the HERS Reference Home:

303.5.1.5.1.1 Indoor temperatures shall be 75 F for cooling and 70 F for heating.

303.5.1.5.1.2 Outdoor temperatures shall be the 99.0% and 1.0% design temperatures as published in the ASHRAE Handbook of Fundamentals for the city where the home is located or the most representative city for which design temperature data are available.

303.5.1.5.1.3 Infiltration rate in air changes per hour (ach) shall be:

(a) For summer: 1.2 * nL * W

(b) For winter: 1.6 * nL * W

(c) Where: nL = 0.48

(d) W = Weather factor from W Tables in ASHRAE Standard 136

303.5.1.5.1.4 Mechanical ventilation shall be zero.

303.5.1.5.1.5 All windows shall have blinds/draperies that are positioned in a manner that gives an Internal Shade Coefficient (ISC) of 0.70 in the summer and an ISC of 0.85 in the winter. These values are represented in ACCA Manual J Eighth Edition as "dark closed blinds" in the summer and "dark, fully drawn roller shades" in the winter.

303.5.1.5.1.6 Internal heat gains shall be 1,600 Btu/hr sensible for appliances plus 230 Btu/hr sensible and 200 Btu/hr latent per occupant, with the number of occupants equal to the number of bedrooms plus one.

303.5.1.5.1.7 Heat pump equipment shall be sized to equal the larger of the heating and cooling season calculations in accordance with these procedures.

303.5.1.5.1.8 Systems shall be smaller than the size calculated using this procedure plus 100 Btu/hr.

303.5.1.5.2 For the Rated Home:

303.5.1.5.2.1 Indoor temperatures shall be 75 F for cooling and 70 F for heating.

303.5.1.5.2.2 Outdoor temperatures shall be the 99.0% and 1.0% design temperatures as published in the ASHRAE Handbook of Fundamentals for the city where the home is located or the most representative city for which design temperature data are available.

303.5.1.5.2.3 Infiltration rate shall be either the measured envelope leakage area converted to equivalent natural air changes per hour (ach,nat) or the default value derived above for the Reference Home modified as follows:

(a) For summer: either 1.2 * ach,nat or 1.2 * nL * W

(b) For winter: either 1.6 * ach,nat or 1.6 * nL * W

(c) Where: nL = 0.48

(d) W = Weather factor from W Tables in ASHRAE Standard 136

303.5.1.5.2.4 Mechanical ventilation shall only be included for systems that are controlled to run every hour or every time the HVAC system operates. Standard bathroom and kitchen ventilation may not be considered as ventilation for sizing purposes.

303.5.1.5.2.5 Combined infiltration and ventilation may not be less than the ventilation rates required by ASHRAE Standard 62.2-2004, nor greater than nL * W * 1.2 in summer and nL * W * 1.6 in winter.

303.5.1.5.2.6 Windows shall include observed blinds/draperies. For new homes, all windows shall assume blinds/draperies that are positioned in a manner that gives an Internal Shade Coefficient (ISC) of 0.70 in the summer and an ISC of 0.85 in the winter. (These values are represented in ACCA Manual J Eighth Edition as "dark closed blinds" in the summer and "dark fully drawn roller shades" in the winter.)

303.5.1.5.2.7 Internal heat gains shall be 1,600 Btu/hr sensible plus 230 Btu/hr sensible and 200 Btu/hr latent per occupant, with the number of occupants equal to the number of bedrooms plus one.

303.5.1.5.2.8 Heat pump equipment shall be sized to equal the larger of the heating and cooling season calculations in accordance with these procedures.

303.5.1.5.2.9 To the degree that the installed equipment for the Rated Home exceeds properly sized equipment in accordance with the above procedures, the manufacturer's equipment performance rating shall be reduced accordingly.

303.5.1.6 For heat pumps and air conditioners where a detailed, hourly HVAC simulation is used to separately model the compressor and evaporator energy (including part-load performance), the back-up heating energy, the distribution fan or blower energy and crank case heating energy, the Manufacturer's Equipment Performance Rating (HSPF and SEER) shall be modified as follows to represent the performance of the compressor and evaporator

components alone: HSPF, corr = HSPF, mfg / 0.582 and SEER, corr = SEER, mfg / 0.941. The energy uses of all components (i.e. compressor and distribution fan/blower; and crank case heater) shall then be added together to obtain the total energy uses for heating and cooling.

303.5.1.7 Natural ventilation shall be assumed in both the Reference and Rated Homes during hours when natural ventilation will reduce annual cooling energy use.

303.5.1.8 When a whole-house fan is present in the Rated Home, it shall operate during hours of favorable outdoor conditions, and no whole-house fan shall be assumed in the Reference Home. The fan energy associated with the whole-house fan shall be included in the normalized Energy Consumption for the Rated Home's cooling end-use (nEC_x).

~~**303.5.1.9Non-rated energy consuming devices**. Consistent with Sections 303.3.2.3 and 303.3.2.4 of these Standards all HERS providers shall calculate and report the annual purchased energy consumption and energy cost for the operation of all non-rated energy consuming devices in the Rated and Reference Homes. Actual efficiency of these devices is not considered and usage estimates are based on Table 303.5.1.9. The data in Table 10 may be modified if they are established or approved by the accrediting body consistent for all HERS providers operating within the state.~~

303.5.1.9 Local residential energy or utility rates that–

(a) Are revenue-based and include customer service and fuel charges;
(b) Are updated at least annually; and
(c) Are confirmed by the accrediting body.

~~**Table 303.5.1.9. Annual Energy Use for Non-Rated Features**~~

~~End use~~	~~Units/year~~	~~Energy estimate~~	~~Applicability~~
~~Ceiling Fan~~	~~kWh~~	~~220/ea~~	~~If present.~~
~~Dryer, electric~~	~~kWh~~	~~875/ea~~	~~If present, or if 220V wiring is present @ dryer location~~
~~Dryer, gas~~	~~Therms~~ ~~kWh~~	~~60/ea~~ ~~100/ea~~	~~If present, or if gas piping is present @ dryer location. a~~
~~Microwave Oven-built-in~~	~~kWh~~	~~191/per cooking area~~	~~If permanently installed.~~
~~Miscellaneous Plug Loads~~	~~kWh~~	~~500~~	~~All homes.~~
~~Pool Pump~~	~~kWh~~	~~1700/ea~~	~~If present~~
~~Range/Oven Combo-electric~~	~~kWh~~	~~450/per cooking area~~	~~If present, or if 220V wiring is present @ range location.~~
~~Range/Oven Combo-gas w/pilot~~	~~Therms~~	~~44/per cooking area~~	~~If present, or if gas piping is present @ range location~~
~~Range/Oven Combo-gas w/o pilot~~	~~Therms~~	~~22/per cooking area~~	~~If present.~~
~~Television~~	~~kWh~~	~~720~~	~~All homes.~~

~~Table 303.5.1.9. Annual Energy Use for Non-Rated Features~~

~~End use~~	~~Units/year~~	~~Energy estimate~~	~~Applicability~~
~~Washer, clothes~~	~~kWh~~	~~99/ea~~	~~If present, or facilities present for washer.~~
~~Well pump~~	~~kWh~~	~~288/ea~~	~~If present.~~

303.6 Projected and Confirmed Ratings

303.6.1 A HERS provider may calculate the Projected Rating of a to-be-built or to-be-improved home based on architectural drawings with material, mechanical and electrical specifications for a to-be-built home, or based on a site audit for a to-be-improved home; and by:

303.6.1.1 Using either the envelope leakage rate specified as the required performance by the construction documents, the site-measured envelope leakage rate, or a default value as specified for the Reference home in Table 303.4.1(1).

303.6.1.2 Using either the distribution system efficiency specified as the required performance by the construction documents, the site-measured distribution system efficiency, or a default distribution system efficiency value from Table 303.4.1(1); and

303.6.1.3 Using the planned location and orientation of the proposed home, or if the proposed orientation is unknown, calculating ratings for the home facing each of the four cardinal directions, north, south, east and west, and using the ~~lowest rating score~~largest HERS Index as the ”worst case” Projected Rating.

303.6.2 Upon completion of construction and verification of the proposed specifications, all rated features of the home shall be confirmed using site inspections and envelope air leakage rates and distribution system efficiencies derived from on-site diagnostic tests conducted in accordance with Section 303.7.1 of this Standard, and the actual orientation of the home.

303.6.3 Rating tools accredited under Section 303.8 of this Standard must be retested and re-certified if a new version of the tool is released that includes changes to the engineering algorithms.

303.7 Minimum Rated Features

303.7.1 All HERS providers shall calculate the estimated annual purchased energy consumption for heating, cooling, water heating ~~(~~and~~, if applicable~~ lighting and appliances~~)~~ set forth in Section 303.1 of this Standard using the energy loss and gain associated with the minimum rated features as set forth in Table 303.7.1(1),

303.7.1.1 For existing homes, the envelope thermal characteristics of building elements 1 through 7 set forth in Table 303.7.1(1) are determined by site observation.

303.7.1.2 If data for the minimum rated features set forth in Section 303.7.1.1 of this Standard cannot be obtained by observation or without destructive disassembly of the home, default values shall be used. The default values are determined from the following sources listed in the preferential order of use:

(a) For manufactured homes, available manufacturer's data:
(b) Current and historical local building practices; or
(c) Current and historical local building codes.

303.7.1.3 For existing homes, the determination of air leakage and duct leakage values set forth as building elements 10 and 11 in Table 303.7.1(1) are determined by data collected on site using the following procedures listed in preferential order of use:

303.7.1.3.1 Current on-site diagnostic tests conduced in accordance with the requirements set forth in Table 303.4.1(1); or

303.7.1.3.2 Observations of the condition of the building and duct system made by a Certified Rater. Based on these observations, values from Tables 303.4.1(3) shall be used.

303.7.1.3.3 The energy efficiency of the mechanical equipment set forth as building elements 12 through 14 in Table 303.7.1(1) is determined by data collected on site using the following sources listed in preferential order of use:

(a) Current on-site diagnostic test data as corrected using the following equation:

Eff,rated = Eff,listed * Es,measured / Es,listed

where:

Eff,rated = annual efficiency to use as input to the rating
Eff,listed = listed annual efficiency by manufacturer or directory
Es,measured = measured steady state efficiency of system
Es,listed = manufacturer's listed steady state efficiency, under the same operating conditions found during measurement

(b) Name plate data;
(c) Manufacturer's data sheet; or
(d) Equipment directories.

303.7.1.4 When information on the energy efficiency of mechanical equipment cannot be determined from the sources listed in paragraph 303.7.1.3.3 of this Standard, the values set forth in Tables 303.7.1(2); 303.7.1(3); 303.7.1(4) and 303.7.1(5) shall be used.

303.7.1.5 Any HERS provider may base annual purchased energy consumption estimates for the Rated Home on additional features if the HERS provider's energy analysis tool is capable of doing so.

Table 303.7.1(1) Minimum Rated Features

Building element	Minimum Rated Feature

Table 303.7.1(1) Minimum Rated Features

Building element	Minimum Rated Feature
1. Floor/Foundation Assembly.	Construction type (slab-on-grade, crawl space; basement), insulation (edge, under slab, cavity, sheathing), vented or unvented (crawl space), capacitance (if slab or basement receives appreciable solar gain).
2. Walls	Construction type, insulation value (cavity, sheathing); capacitance, color (light, medium, or dark).
3. Roof/Ceiling Assembly	Construction type, insulation value (cavity, sheathing), roof color (light, medium, or dark).
4. Rim Joist	Insulation value (cavity, sheathing).
5. Doors	Construction type, insulation value.
6. Windows	Construction type, orientation, U-value (of complete assembly), solar heat gain coefficient, shading.
7. Skylights	Construction type, orientation, tilt, U-value (of complete assembly), heat gain coefficient, shading.
8. Passive Solar System (Direct Gain system)	Solar type, collector type and area, orientation, tilt efficiency, storage tank size, pipe insulation value.
9. Solar Domestic Hot Water Equipment	System type, collector type and area, orientation, tilt, efficiency, storage tank size, pipe insulation value.
10. Air Leakage	Air leakage measurement type (default estimate, blower door test, tracer gas test), volume of conditioned space.
11. Distribution System	System type, location, insulation value (duct and pipe), air leakage measurement type (default estimate, duct pressurization).
12. Heating Equipment	Equipment type, location, efficiency (AFUE, HSPF), auxiliary electric (Eae).
13. Cooling Equipment	Equipment type, location, efficiency (SEER, COP).
14. Domestic Hot Water Equipment	Equipment type, location, energy factor or seasonal efficiency, extra tank insulation value, pipe insulation value.
15. Control Systems	Thermostat type.
16. Light fixtures	Number of qualifying and non-qualifying light fixtures in qualifying locations (i.e. kitchens, dining rooms, living rooms, family rooms/dens, bathrooms, hallways, stairways, entrances, bedrooms, garage, utility rooms, home offices, and all outdoor fixtures mounted on a building or pole (excluding landscape lighting)).

Table 303.7.1(1) Minimum Rated Features

Building element	Minimum Rated Feature
17. Refrigerator(s)	Total annual energy consumption (kWh) for all units from: California Energy Commission: Appliance Database at http://www.energy.ca.gov/appliances/appliance/index.html or Association of Home Appliance Manufacturers (AHAM) directories
18. Dishwasher(s)	Energy factor (cycles/kWh) for all units from: the Federal Trade Commission's " Dishwasher Energy Data" posted at http://www.ftc.gov/bcp/conline/edcams/eande/appliances/data/2004/dwasher/brand.htm
19. Ceiling Fans	Labeled cfm, Watts and cfm/Watt at medium fan speed from EPA ENERGY STAR ceiling fan label.
~~19~~20. Mechanical Ventilation System(s)	Equipment type, daily run hours, and wattage (may be listed in the Certified Home Ventilating Products Directory available from the Heating and Ventilation Institute (HVI).
~~20~~21. ~~Photovoltaics~~ On-site Power Generation	Total annual kWh generation ~~from installer/manufacturer~~and total site fuel used in the production of on-site power generation as derived from manufacturer's performance ratings.

Table 303.7.1(2) Default Solid Fuel Combustion Seasonal Efficiencies for Space Heating

Type	Location	Seasonal Efficiency	Notes
EPA-Listed Stove, Furnace, or Boiler	Conditioned space	Contained in the EPA publication "Certified Wood Heaters" and posted at http://www.epa.gov/compliance/resources/publications/monitoring/programs/woodstoves/certifiedwood.pdf	
EPA-Listed Stove, Furnace or Boiler	Unconditioned space	0.85 of EPA listing	
EPA Stove – Not Listed	Conditioned space	60%	For stoves with documented EPA compliance, but not found on EPA's Web site list of certified stoves

Table 303.7.1(2) Default Solid Fuel Combustion Seasonal Efficiencies for Space Heating

Type	Location	Seasonal Efficiency	Notes
EPA Stove – Not Listed	Unconditioned space	50%	For stoves with documented EPA compliance, but not found on EPA's Web site list of certified stoves
EPA-Listed Stove Insert	Enclosed, such as in fireplace	Subtract 10% from listed seasonal efficiency	
Non-EPA Stove	Conditioned space	50%	Not tested or listed by EPA
Non-EPA Stove	Unconditioned space	40%	Not tested or listed by EPA
Biomass Fuel Furnace or Boiler with Distribution System	Conditioned space	50%	Not tested or listed by EPA Distribution system efficiency shall also be considered
Biomass Fuel Furnace or Boiler with Distribution System	Unconditioned space	40%	Not tested or listed by EPA Distribution system efficiency shall also be considered
Biomass Fuel Furnace or Boiler with Distribution System	Outside	30%	Not tested or listed by EPA Distribution system efficiency shall also be considered
Solid Fuel Furnace or Boiler – Independently Tested	Central with ducted or hydronic distribution	0.85 of tested listing	Only permitted with documentation of independent testing lab documentation Distribution system efficiency shall also be considered

Table 303.7.1(3) Default Values for Mechanical System Efficiency (Age-based)

Mechanical Systems	Units	Pre-1960	1960-1969	1970-1974	1975-1983	1984-1987	1988-1991	1992 to present
Heating:								
Gas Furnace	AFUE	0.60	0.60	0.65	0.68	0.68	0.76	0.78
Gas Boiler	AFUE	0.60	0.60	0.65	0.65	0.70	0.77	0.80
Oil Furnace or Boiler	AFUE	0.60	0.65	0.72	0.75	0.80	0.80	0.80
Air-Source Heat Pump	HSPF	4.50	4.50	4.70	5.50	6.30	6.80	6.80
Ground-Water Geothermal Heat pump	COP	2.70	2.70	2.70	3.00	3.10	3.20	3.50
Ground-Coupled Geothermal Heat Pump	COP	2.30	2.30	2.30	2.50	2.60	2.70	3.00
Cooling:								
Air-Source Heat Pump	SEER	5.00	6.10	6.50	7.40	8.70	9.40	10.00
Ground-Water Geothermal Heat Pump	EER	10.00	10.00	10.00	13.00	13.00	14.00	16.00
Ground-Coupled Geothermal Heat Pump	EER	8.00	8.00	8.00	11.00	11.00	12.00	14.00
Central Air Conditioner	SEER	5.00	6.10	6.50	7.40	8.70	9.40	10.00
Room Air Conditioner	EER	5.00	6.10	6.10	6.70	7.70	8.10	8.50
Water Heating:								
Storage Gas	EF	0.47	0.47	0.47	0.49	0.55	0.56	0.56
Storage Oil	EF	0.47	0.47	0.47	0.48	0.49	0.54	0.56
Storage Electric	EF	0.79	0.80	0.80	0.81	0.83	0.87	0.88

TABLE 303.7.1(4) Default Values for Mechanical System Efficiency (not Age-based)

	Units	Rating
Heating:		
Gas Wall Heater (Gravity)	AFUE	0.65
Gas Floor Furnace	AFUE	0.60
Gas Water Heater (Space Heating).	AFUE	0.75
Electric Furnace	HSPF	3.413
Electric Radiant	HSPF	3.413
Heat Pump Water Heater (Space)	HSPF	5.11
Electric Water Heater (Space)	HSPF	2.73
Cooling:		
Electric Evaporative Cooling	EER	30
Gas Absorption Cooler	COP	0.40

TABLE 303.7.1(4) Default Values for Mechanical System Efficiency (not Age-based)

	Units	Rating
Water Heating:		
Heat Pump	COP	2.00
Instantaneous Electric	EF	0.87
Instantaneous Gas	EF	0.75
Solar (Use SRCC Adjustment Procedures)	EF	2.00

Table 303.7.1(5) Default Eae Values

System Type	Eae
Oil boiler	330
Gas boiler	170
Oil furnace	439 + 5.5 * Capacity (kBtu/h)
Gas furnace	149 + 10.3 * Capacity (kBtu/h)

303.8 Software Rating Tools

303.8.1 Minimum capabilities. Calculation procedures used to comply with this Standard shall be computer-based rating software tools capable of calculating the annual energy consumption and ~~rating score~~ HERS Index of all building elements that differ between the HERS Reference Home and the Rated Homes and shall include the following capabilities:

303.8.1.1 Compliance with the rating provisions of Section 303.1 of this Standard

303.8.1.2 Computer generation of ~~point scores~~HERS Index and star ratings in accordance with the provisions of Section 303.2 of this Standard

303.8.1.3 Automated computer generation of the HERS Reference Home using only the input for the Rated Home

303.8.1.4 The software tool shall not allow the user to directly modify the building component characteristics of the HERS Reference Home

303.8.1.5 Calculation of whole-building, single-zone sizing for the heating and cooling equipment in the HERS Reference Home residence in accordance with Section 303.5.1.4 of this Standard.

303.8.1.6 Calculations that account for the indoor and outdoor temperature dependencies and the part-load performance of heating, ventilating, and air conditioning equipment based on climate and equipment sizing

303.8.1.7 Printed rating report in accordance with Section 303.3 of this Standard

303.8.2 Approved tools. Rating software tools shall be accredited by RESNET through compliance with the "RESNET Rating Software Testing and Verification Procedures" posted on the RESNET web site at www.natresnet.org (see also Chapter 1, Section 102.2.1).