



Minutes
RESNET Board of Directors Fall 2011 Board Meeting
October 10 & 11, 2011
New Orleans, LA

Members Present:

Ben Adams
Dave Bell
Steve Byers
Brett Dillon
Charles Eley
Philip Fairey
David Goldstein
Mark Jansen
Lee O'Neal
Eurihea Speciale
Orlo Stitt
Greg Thomas
Daran Wastchak

Members Absent:

Dennis Creech
Andy Gordon
Bill Prindle
L. Javier Ruiz- Excused Absence
Barb Yankie- Excused Absence

Staff Present:

Steve Baden
Laurel Elam
Kathy Spigarelli

Monday October 10, 2011

Call to Order

David Goldstein called the meeting to order at 9:02 AM

Roll Call

Barb Yankie and L. Javier Ruiz received excused absences due to illness. A quorum was achieved.

Approval of Agenda

The draft agenda was approved.

Approval of February 27, 2011 Board Meeting Minutes

Eurihea Speciale made a motion to approve the February 27, 2011 draft Board of Directors meeting minutes. Orlo Stitt seconded the motion. The motion was approved unanimously.

RESNET Executive Director Report

Steve Baden delivered the RESNET Executive Director report. Mr. Baden reviewed the list of national and regional builders that have signed an MOU with RESNET to label their homes with the HERS Index. Mr. Baden showed the Board the new ENERGY STAR Label that includes the HERS Index at the bottom. He also and reported that the U.S, Department of Energy (DOE) will discontinue the E-scale and go with a prescriptive certification process.

Mr. Baden reported on the existing homes efforts including the Energy Smart Contractor Guideline updates and industry alliances supporting RESNET Energy Smart Standards. He also described how RESNET is engaging the private sector through industry councils that include roofing, insulation, and HVAC.

Mr. Baden reported on how RESNET is working on engaging consumers through updated versions of the website. Finally, he provided an update on the national buildings registry.

The RESNET Message

Steve Baden and Kathy Spigarelli discussed the RESNET Message Guide. The guide was developed by Qorvis Communications and is based on their research and focus group feedback. The guide will be emailed to the Board and should be considered an internal document to the RESNET Board and staff. The guide includes general messaging and interview tips.

Treasurer's Report

Lee O'Neal delivered the treasurer's report on RESNET's current financial health. Mr. O'Neal reported that the total income to date is \$1.2 million compared to \$1.1 million in 2010 and expenses to date are \$1.1 million compared to \$1 million in 2010. He stated that most of RESNET's income comes in the first quarter of each year through the annual RESNET Building Performance Conference and in the last quarter of the year from conference sponsorships and Provider accreditation fees.

Financial Sustainability Task Force Report

Ben Adams delivered the Financial Sustainability Task Force report. The first recommendation was to restructure the Provider fee schedule. This change was adopted by the RESNET Executive Committee in August 2011 and went into effect in September 2011. The second part of the report discussed improving revenues and included specific recommendations for conferences, membership and the website.

The Task Force suggested considering regional conferences, looking for new sponsors, and developing features or benefits for new partners/sponsors. They also suggested focusing on membership recruitment and including a membership requirement in builder MOU's.

Mr. Adams then reviewed the RESNET membership structure chart and noted that there is still not a clear difference between a Rater and Provider company. The task force recommends that Rater membership status should be based on being a rating company which will include one individual Rater membership and have an additional membership fee for employees of a rating company, which will encourage Raters to become members of RESNET.

An online survey will be conducted on member benefits, including Home Energy Magazine and the conference fee reduction. The Task Force still needs to define what a rating company is and what is the minimum criteria for membership.

It is the sense of the Board to move ahead with the new membership structure.

COMNET Strategic Partnership Update

Charles Eley gave the COMNET strategic partnership update. In July 2011, the RESNET Board approved recommendations to organize COMNET as partnership of non-profits. COMNET then developed a draft organizational structure, including an executive director and executive and steering committees, which will be sent to the Board for review. Mr. Eley reviewed COMNET's vision and mission statements, quality assurance plan, as well as the purpose and status of the energy modeling guidelines and procedures. He also showed the need for the COMNET portal and the benefits to energy modelers, software developers, and rating authorities.

RESNET Training and Education Committee Report

Mark Jansen asked Kathy Spigarelli to give the Training and Education Committee report. Ms. Spigarelli reported that the Combustion Appliance Zone and Work Scope simulation exam is currently being beta tested and that the multiple choice portion of the exam is already complete. She also reported that the required Rater Trainer roundtable webinar is scheduled for November 22nd

and will show trainers the Combustion Appliance Zone and Work Scope simulation exam. The trainers will pilot the simulation and multiple choice exams in December and January and the big launch will be at the 2012 RESNET Conference.

RESNET Technical Committee Report

Brett Dillon gave the Technical Committee report. Mr Dillon reported that some items are still in process, including the reference home Infiltration rate change and changing the reference code from 2004 to 2006. The domestic water heating subcommittee is currently working on an instant hot water adjustment amendment. The renewable energy subcommittee is working on guidance for renewables used for non-rated features. The auxiliary end use subcommittee is worked on the cost effectiveness amendment and retrofit savings amendment that is ready to release for public comment. The enclosures subcommittee is still working on the Conditioned Floor Area amendment and the outline for operational ratings. The HVAC subcommittee worked on a ground source heat pump amendment, which has passed, and the Manual J, D and S guide for Raters is in process and being coordinated with ACCA and NATE. The performance testing subcommittee completed chapter eight and is working on Combustion Appliance Zone Test amendments and revising the IR Guidelines. The insulation industry council has developed a draft revision to the insulation grading standards and is still being revised by the council.

RESNET Quality Assurance Committee Report

Daran Wastchak gave the Quality Assurance Committee report. He reported that the committee added new members and is now up to 12 members total following the resignation of Doug Beaman. The committee is currently working on additional cleaning up the RESNET Standards, including general editorial corrections, removing chapter four, fine tuning EEP requirements, and adding information on quality assurance for multifamily, sampled homes, and Energy Smart contractors. Changes in the future will include modifying the conflict of interest and internal quality assurance policies.

RESNET Accreditation Committee Report (Steve Baden)

Steve Baden gave the Accreditation Committee report because of Andy Gordon's absence. The committee has recently been formed and split from the Quality Assurance Committee in August 2011. Since the committee was formed, one Software, three Sampling, three Rating, and four Training Provider applications have been reviewed for accreditation.

Meeting recessed until 9 AM Tuesday October 11, 2011.

Tuesday October 11, 2011

Call to Order

David Goldstein called the meeting to order at 9:00 AM.

Washington Report

Carl Chidlow gave the Washington report and provided an overview of the current bills related to energy efficiency that are pending in Congress. He stated that in January an ad hoc energy efficiency coalition gathered in Washington to meet with Senators Snow and Bingaman. Mr. Chidlow reported that from this meeting a performance based tax credits were created and large stakeholders agree that it should require 3rd party verification. He also said that new and existing homes tax credits could possibly lapse, but several senators as well as Pulte are working together on an extension.

Mr. Chidlow reported that the Save Act is being championed by the leading builders of America and has republican and democratic support as well. RESNET is mentioned specifically in the Save Act language. Rural Star is another energy efficiency bill that involves rural electric coops and is a program that will allow people living in the area to borrow money to retrofit their homes which would then be paid back through their utility bill, thus attaching the loan to the home instead of the homeowner. Finally Mr. Chidlow announced that the coalition would be meeting again in Washington, DC on October 26.

Ben Adams suggested creating a Task Force to look at core differences between BPI and RESNET regarding quality assurance. Board members were asked to email Steve Baden if they are interested in being on taskforce.

Strategic Positioning Task Force Report

Daran Wastchak gave the Strategic Positioning Task Force report. The Task Force started working over a year ago and looked at the structure of RESNET. The working group had a meeting in July and discussed structure and determined that the by-laws need to first be changed in order to move forward. As a result, the development of new mission and vision statements is now on hold. Once new by-laws are in place, the Task Force will look at mission and vision statements again.

Proposed Modification of RESNET By-Laws

Steve Baden reviewed the proposed RESNET By-Laws modifications. He stated that the by-laws have not been changed since 2001 and, additionally, because RESNET is based in California, the organization is not in compliance with state laws for non-profits.

Legal counsel suggested changes after looking at national trends and California laws for non-profits. Mr. Baden asked the Board to approve the new by-laws which would then be sent to the RESNET membership for approval. Approval will require a two-thirds majority vote and must achieve quorum. Due to the logistical issues, the meeting will be held electronically.

Philip Fairey made a motion to accept the draft amended by-laws which shall be to the general membership for approval. Daran Wastchak seconded motion. Daran Wastchak proposed editorial changes to the draft By-Laws (Attachment A). Philip Fairey accepted the friendly amendment for the editorial changes and Daran Wastchak seconded the motion. The motion was unanimously adopted.

ANSI Standard Development Organization Status Report

Philip Fairey gave the ANSI Standards Development Organization (SDO) status report. He reported that RESNET's application to become an SDO has been sent to ANSI and only one letter of interest was received from ASHRAE. It was generally agreed that the response from ASHRAE represents an opportunity for collaboration between RESNET and ASHRAE. RESNET sent a response letter to ASHRAE, a copy also sent to ANSI as well. Mr. Fairey stated that RESNET is close to being certified as an ANSI Standards Development Organization.

Retrofit Savings Amendment Vote

Brett Dillon reported that the technical committee has approved a Retrofit Savings Amendment and called for a vote to send the amendment out for the public review and comment process. (*Attachment B*)

Brett Dillon made a motion to approve the retrofit savings amendment for the public review and comment process. Mark Jansen seconded the motion. The motion was unanimously approved.

Proposed Revised RESNET Publication 2006-001

Greg Thomas reported on the proposed revised RESNET Publication 2006-001 stating the revised publication adds a software standard and pathway for the calculation of savings in software which can be referenced. It also creates a credentialing path. A test was also added for interactivity of measures. (*Attachment C*)

Brett Dillon made a motion to approve the revised RESNET Publication 2006-001. Philip Fairey seconded the motion. The motion was unanimously approved.

Adopt RESNET 2012 Priorities

Steve Baden presented the proposed RESNET 2012 Priorities. (*Attachment D*)

1. Tap the Retrofit Market
2. Mainstream the RESNET HERS Index in the Housing Market
3. Maintain Quality Assurance of Rating a Building's Energy Performance and the Improvement of the Energy Performance of a Home
4. Advocate for Federal Action on Tax Credits and Financing the Improvements of Building Energy Performance
5. Foster Strategic Alliances with the Private Sector
6. Support COMNET Partnership
7. Position RESNET Members to Take Advantage of the New Emerging Business Opportunities
8. Begin Process of Adopting RESNET ANSI Standards
9. Maintain RESNET's Financial Sustainability

Striking the secretariat sentence from the COMNET priority was proposed and accepted as a friendly amendment. It was also noted that the list of priorities, as presented in Attachment D, is not ordered by priority. Mark Jansen made a motion to approve draft RESNET 2012 Priorities. Eurihea Speciale seconded the motion. The motion was unanimously approved.

Adopt RESNET 2012 Budget

Lee O'Neal presented the 2012 budget request. Mr. O'Neal reviewed the budget and a comparison to 2011. He presented the following proposed budget for 2012:

Proposed RESNET 2012 Budget

Payroll \$688,000

- Executive Director – Steve Baden
- Deputy Director – Kathy Spigarelli
- Customer Service Representative – Stephanie DeZee
- Program Manager and Conference Coordinator – Laurel Elam
- Quality Assurance and Accreditation Manager – Clinton Heyn
- Accountant – Faye Berriman
- ANSI Compliance Manager – TBD
- Business Development Manager – TBD
- Fund Raiser – TBD

Professional Services \$352,000

- Database Support – R.L. Martin & Associates
- DC Representative – Cardenas Partnership
- RESNET Site Maintenance
- Marketing Campaign
- ANSI Standard Development Organization Application
- Misc. Contractual Support – TBD if needed

Travel	\$100,000
RESNET Conference	\$212,000
Other	\$145,000
- Credit Card Service Fees (\$51,000)	
- Copying & Printing (\$2,000)	
- Insurance (\$5,000)	
- Internet Services (\$3,000)	
- Legal Services (\$9,000)	
- Meetings (\$4,000)	
- Misc. (\$7,000)	
- Postage (\$2,000)	
- Rater Member Subscriptions (\$30,000)	
- Software (\$4,000)	
- Supplies (\$7,000)	
- Telephone (\$14,000)	
- Rent (\$7,000)	

Total Proposed Budget \$1,497,000

Daran Wastchak made a motion to approve the 2012 budget request. Ben Adams seconded the motion. The motion was unanimously approved.

2012 RESNET Building Performance Conference Logistics

Kathy Spigarelli encouraged Board members to spread the word about the 2012 Conference in Austin, Texas as well as asked them to book their rooms at the conference hotel and consider exhibiting at the event. Board scholarships will also be available in 2012.

Brett Dillon made a motion to adjourn. Lee O'Neal seconded the motion.

Meeting adjourned at 1:19 PM.

Attachment A

Draft BYLAWS

of the

RESIDENTIAL ENERGY SERVICES NETWORK, INC. (RESNET)

ARTICLE I NAME AND PURPOSES

Section 1.01. Name. The name of the organization is the Residential Energy Services Network, Inc. (“RESNET” or the “Corporation”).

Section 1.02. Purpose. The Corporation is organized to develop and maintain consensus standards for evaluating building energy and resource efficiency performance; educate and support the building energy performance community, policymakers and the public on these standards; and accredit building energy performance organizations, professionals and/or software.

ARTICLE II MEMBERSHIP

Section 2.01. Members. The Board of Directors may provide membership in the Corporation under such terms and conditions as may be determined from time to time by the Board of Directors, in addition to those established by these Bylaws, without having to amend these Bylaws. The Board of Directors may establish classes of membership, each of which may have different eligibility requirements, be charged different membership fees and have different membership agreements. The authority to amend these bylaws and the Corporation’s Articles of Incorporation is reserved for the Board of Directors.

Section 2.02 Classes of Memberships. There shall be at least two classes of membership in good standing:

- (1) Full Members (RESNET Accredited Providers, certified Home Energy Raters/Energy Auditors and other membership classifications adopted by the Board of Directors)
- (2) Associate Members

Section 2.03 Termination of membership. The Board of Directors, by affirmative vote of the majority of all the members of the Board present at a Board meeting at which a quorum is present may suspend or expel a member provided the member is given notice

of fifteen (15) days and the opportunity to respond to the reason(s) for their membership suspension or termination. The membership of any member who fails to timely pay dues or fulfill other requirements of membership, or who becomes ineligible for membership, may be automatically terminated.

ARTICLE III AUTHORITY AND DUTIES OF DIRECTORS

Section 3.01. Authority of Directors. The Board of Directors is the policy-making body and may exercise all the powers and authority granted to the Corporation by law.

Section 3.02. Number and Tenure. The Board shall consist of a minimum of Thirteen (13) and a maximum of twenty one (21) directors, as determined by the Board of Directors.

The Board of Directors shall consist of the following:

- (1) A minimum of six (6) representatives of RESNET accredited Providers identified in the RESNET standards;
- (2) A minimum of three (3) representatives of Home Energy Raters/Energy Auditors certified by RESNET accredited Providers identified in the RESNET standards;
- (3) A minimum of one (1) representative of Associate Members;
- (4) A minimum of three (3) representatives of other member classifications established by the RESNET Board of Directors.

Directors shall serve staggered two-year terms and may be re-elected for any number of additional terms in office, consecutive or otherwise.

Section 3.03. Election of Directors. Members of the Board of Directors shall be elected by electronic ballot by the category of membership of the Corporation that they represent. A Nominations Committee shall be appointed by the Executive Committee to nominate candidates for the Board. The Nominations Committee shall make its recommendations to the full membership at least forty-five (45) days prior to the beginning of the new term of office. Members have the right to nominate other candidates by e-mail notice to the RESNET Executive Director at least thirty (30) days prior to the balloting. All candidates of the board shall be members of RESNET in good standing. The Executive Director shall prepare the election ballot.

Section 3.04. Resignation. Resignations are effective upon receipt by the Secretary of written notification.

Section 3.05. Removal. A Board member may be removed by a two-thirds vote of the Board of Directors if such removal is deemed by the Board to be in the best interest of the Corporation. Any such removal shall be without prejudice to the contract rights, if any, of the person so removed.

Section 3.06. Replacement of Vacant Board Seats – The Board of Directors may fill a vacant Board position by a majority vote. The newly appointed Board member must belong to the same membership category of the position that is vacant. The newly appointed Board member shall serve for the remainder of the Board member’s term which they are filling.

Section 3.07. Regular Meetings. The Board of Directors shall hold at least one (1) regular meeting per calendar year and if only one meeting is scheduled, that meeting shall be the annual meeting.

Section 3.08. Special Meetings. Meetings shall be at such dates, times and places as the President shall determine.

Section 3.09. Notice. Meetings may be called by the President or at the request of any two directors by notice mailed, telephoned, or e-mailed to each member of the Board not less than forty-eight (48) hours before such meeting.

Section 3.10. Quorum. A quorum shall consist of a majority of the Board. Attendance may be a meeting in person, by teleconference, or electronically. All decisions will be by majority vote of those present at a meeting, teleconference or electronic vote at which a quorum is present. If less than a majority of the directors is present, a majority of the directors present may adjourn the meeting without further notice.

Section 3.11. Participation in Meetings by Telephone Conference or Electronically. Members of the Board may participate in a meeting through use of conference telephone or electronic communications.

Section 3.12. Action Without a Meeting. Any action required or permitted to be taken at a meeting of the Board of Directors (including amendment of these Bylaws) may be taken without a meeting if all the members of the Board consent in writing to taking the action without a meeting and to approving the specific action. Such consents shall have the same force and effect as a unanimous vote of the Board.

Section 3.13. Reimbursement. Directors shall serve without compensation with the exception that expenses incurred in the furtherance of the Corporation’s business are allowed to be reimbursed with documentation and prior approval. In addition, Directors serving the organization in any other capacity are allowed to receive compensation.

ARTICLE IV EXECUTIVE COMMITTEE

Section 4.01. Membership. The Executive Committee of the Corporation shall consist of the President; Vice President; Secretary; Treasurer and Immediate Past President.

Section 4.02. Authority of Executive Committee. The Executive Committee shall possess and may exercise all the powers granted to the Board of Directors, except the

power to amend the Articles of Incorporation or Bylaws, approve amendments to the RESNET Standards, approve the annual operating budget, and to in-debt the Corporation in an amount above \$5,000.00. Any decision made by the Executive Committee can be overturned by a majority vote of the full Board of Directors at a regularly scheduled or special Board meeting.

Section 4.03. Quorum of the Executive Committee. A quorum shall be three members of the Executive Committee.

Section 4.04. Special Meetings. Meetings shall be at such dates, times and places as the President shall determine.

Section 4.05. Notice. Meetings may be called by the President or at the request of any two members of the Executive Committee by notice mailed, telephoned, or e-mailed to each member of the Executive Committee not less than forty-eight (48) hours before such meeting.

Section 4.06. Participation in Meetings by Telephone Conference or Electronically. Members of the Executive Committee may participate in a meeting through use of conference telephone or electronic communications.

ARTICLE V AUTHORITY AND DUTIES OF OFFICERS

Section 5.01. Officers. The officers of the Corporation shall be a President, Vice President, Secretary, and Treasurer and such other officer(s) as the Board may determine from time to time.

Section 5.02. Appointment of Officers; Terms of Office. The officers of the Corporation shall be elected by the Directors immediately following the election of the Directors at the annual Board meeting. Officers shall serve any number of one-year terms, consecutive or otherwise.

Section 5.03. Resignation. Resignations are effective upon receipt by the Secretary of a written notification.

Section 5.04. Removal. An officer may be removed by a two-thirds vote of the Board of Directors if such removal is deemed by the Board to be in the best interests of the Corporation. Any such removal shall be without prejudice to the contract rights, if any, of the person so removed.

Section 5.05. President. The President shall be a director of the Corporation and will preside at all meetings of the Board of Directors. The President shall perform all duties attendant to that office, subject, however, to the control of the Board of Directors, and shall perform such other duties as on occasion shall be assigned by the Board of Directors. The President shall serve a maximum of two consecutive terms.

Section 5.06. Vice President. The Vice President shall be a director of the Corporation and shall serve as President if the President is absent or disabled. When so acting, the Vice President shall have all powers of the President and be subject to all restrictions on the President.

Section 5.07. Secretary. The Secretary shall be a director of the Corporation and shall be responsible for keeping the minutes of all meetings of the Board of Directors.

Section 5.08. Treasurer. The Treasurer shall be a director of the Corporation and shall be responsible for keeping the financial books for the Corporation. The Treasurer shall report to the Board of Directors at each regular meeting on the status of the Corporation's finances.

Section 5.09. Reimbursement. Officers shall serve without compensation with the exception that expenses incurred in the furtherance of the Corporation's business are allowed to be reimbursed with documentation and prior approval.

ARTICLE VI EXECUTIVE DIRECTOR

Section 6.01. Appointment. The Board of Directors may appoint a person or entity to serve the Corporation as the Executive Director.

Section 6.02. Authority. The Executive Director shall conduct the day-to-day business of the Corporation under the direction of the Board of Directors. Such direction shall be provided through the Executive Director's job description, the Corporation's budget, and direction provided by the Executive Committee. The Executive Director shall serve as an ex-officio, non-voting, member of the Board of Directors and Executive Committee. Consistent with the direction provided by the Board of Directors, the Executive Director may enter into contracts, hire and supervise staff, sign checks and generally communicate on behalf of the Corporation. The Executive Committee shall establish the compensation of the Executive Director.

ARTICLE VII INDEMNIFICATION

Section 7.01. Indemnification. Every member of the Board of Directors, officer or employee of the Corporation may be indemnified by the Corporation against all expenses and liabilities, including counsel fees, reasonably incurred or imposed upon such members of the Board, officer or employee in connection with any threatened, pending, or completed action, suit or proceeding to which she/he may become involved by reason of her/his being or having been a member of the Board, officer, or employee of the Corporation, or any settlement thereof, unless adjudged therein to be liable for negligence or misconduct in the performance of her/his duties. Provided, however, that in the event of a settlement the indemnification herein shall apply only when the Board

approves such settlement and reimbursement as being in the best interest of the Corporation. The foregoing right of indemnification shall be in addition and not exclusive of all other rights which such member of the Board, officer or employee is entitled.

Section 7.02. Insurance. The Corporation may purchase and maintain liability insurance on its own behalf and on behalf of its directors, officers, staff, and agents. Its purpose is to insure the Corporation against any liability claim asserted against it and to insure any director, officer, staff person, or agent against any liabilities asserted against such person arising out of his or her station in the Corporation or actions taken by that person on behalf of the Corporation.

ARTICLE VIII FINANCIAL ADMINISTRATION

Section 8.01. Fiscal Year. The fiscal year of the Corporation shall be January 1 – December 31 but may be changed by resolution of the Board of Directors.

Section 8.02. Accountability. The financial records of the organization shall be maintained by the Treasurer and shall be subject to review and audit as specified in Section 8.06 and otherwise determined by the Board of Directors from time to time. The organization shall adopt, and financial records shall be maintained, in accordance with an approved record retention policy.

Section 8.03. Execution of Checks. All checks for the payment of money in the amount over \$10,000.00 shall have the approval of a minimum of two officers of the Corporation (indicated on the invoice and/or by signing a check for the transaction).

Section 8.04. Deposits and Accounts. All funds of the Corporation, not otherwise employed, shall be deposited from time to time in general or special accounts in such banks, trust companies, or other depositories as the Executive Committee or any committee to which such authority has been delegated by the Executive Committee may select. For the purpose of deposit and for the purpose of collection for that account of the Corporation, checks, drafts, and other orders of the Corporation may be endorsed, assigned, and delivered on behalf of the Corporation by the Executive Director.

Section 8.05. Investments. The funds of the Corporation may be retained in whole or in part in cash or be invested and reinvested on occasion in such property, real, personal, or otherwise, or stocks, bonds, or other securities, as the Executive Committee may deem desirable, without regard to the limitations, if any, now imposed or which may hereafter be imposed by law regarding such investments, and which are permitted to organizations exempt from Federal income taxation under Section 501(c)(3) of the Internal Revenue Code.

Section 8.06 Financial Controls. The Corporation is committed to maintaining best

practices in its financial controls, reporting and recordkeeping. To that end, proper separation of financial controls shall be maintained (including requiring transactions to be authorized by a person(s) other than the person(s) signing or executing the transaction with a third person(s) reviewing financial transactions, including bank statements). In addition, an independent audit committee shall be established and shall be responsible for receiving and handling concerns and complaints regarding the corporation's financial matters and ensuring that an annual financial review (internal or by external auditors as appropriate in accordance with the organization's budget size and the direction of the Board of Directors) is conducted.

ARTICLE IX BOOKS AND RECORDS

Correct books of account of the activities and transactions of the Corporation shall be kept at the office of the Corporation. These shall include a minute book, which shall contain a copy of the Certificate of Incorporation, a copy of these Bylaws, and all minutes of meetings of the Board of Directors.

ARTICLE X CONFLICTS OF INTEREST

Section 10.01. Existence of Conflict, Disclosure. Directors, officers, employees and contractors of the Corporation should refrain from any actions or activities that impair, or appear to impair, their objectivity in the performance of their duties on behalf of the Corporation. A conflict of interest may exist when the direct, personal, financial or other interest(s) of any director, officer, staff member or contractor competes or appears to compete with the interests of the Corporation. If any such conflict of interest arises, the interested person shall call it to the attention of the President or Committee Chair for resolution following the policy adopted by the Board of Directors. If the conflict relates to a matter requiring Board or Committee action, such person shall not vote on the matter. When there is a doubt as to whether any conflict of interest exists, the matter shall be resolved by a vote of the Board of Directors or Committee, excluding the person who is the subject of the possible conflict.

Section 10.02. Nonparticipation in Vote. The person having a conflict shall not participate in the final deliberation or decision regarding the matter under consideration. However, the person may be permitted to provide the Board or Committee with any and all relevant information related to the conflict.

Section 10.03. Minutes of Meeting. The minutes of the meeting of the Board or Committee shall reflect that the conflict was disclosed and that the interested person did not vote on the matter.

Section 10.04. Conflict of Interest Policy and Annual Review. The Board of Directors shall adopt a conflict of interest policy. Directors, staff members and contractors shall be advised of the Policy upon undertaking the duties of their position

with the Corporation. For informational purposes and guidance, the Policy shall be reviewed annually by directors, staff members and contractors.

ARTICLE XI AMENDMENT OF BYLAWS

Subject to applicable law and California Corporation Code Section 5150(a), these Bylaws may be amended by a two-thirds vote of the Board of Directors, provided prior notice is given of the proposed amendment in the notice of the meeting at which such action is taken.

ARTICLE XII NON-DISCRIMINATION/HARASSMENT

Section 12.01. Equal opportunity. Employees, contractors, consultants and volunteers will be recruited without unlawful discrimination due to race, color, sex, age, religion, national origin, sexual orientation, disability, veteran status, marital status or any other classification protected by applicable discrimination laws.

Section 12.02. Discrimination against any employee, contractor, consultant or volunteer based on race, color, sex, age, religion, national origin, sexual orientation, disability, veteran status, marital status or any other illegal basis shall not be tolerated.

Section 12.03. Harassment includes verbal or physical conduct that creates a hostile or offensive work environment or demeans or shows hostility toward an individual because of his/her race, color, sex, age, religion, national origin, sexual orientation, disability, veteran status, marital status or any other classification protected by applicable discrimination law.

ARTICLE XIII WHISTLEBLOWER PROTECTION

The Board of Directors shall adopt a formal policy on whistleblower protection. At a minimum, the policy shall include protection from retaliation, reporting procedures and a formal investigation procedure.

ARTICLE XIV PARLIAMENTARY AUTHORITY

Conduct of Meetings. At all meetings of the RESNET Board, Executive Committee and Committees, the President or Chair of the meeting shall conduct the meeting pursuant to general rules of parliamentary procedure, provided such rules of conduct are not inconsistent with these Bylaws.

Attachment B
CHAPTER THREE
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

301.2.1 Application of Standards

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

See Appendix B.

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 303.7 and 303.8 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, $OPP = 3.413 \text{ MBtu} - (6 \text{ MBtu} * 0.4) = 1.0 \text{ MBtu}$.

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 303.8 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 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. 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 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:

$$\text{nMEUL} = \text{REUL} * (\text{nEC}_x / \text{EC}_r) \quad (\text{Eq. 1})$$

where:

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

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

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

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

and where:

$$\text{nEC}_x = (\text{a} * \text{EEC}_x - \text{b}) * (\text{EC}_x * \text{EC}_r * \text{DSE}_r) / (\text{EEC}_x * \text{REUL})$$

where:

EC_x = estimated Energy Consumption for the Rated Home's end uses (for heating, including auxiliary electric consumption, 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.

$$\text{DSE}_r = \text{REUL} / \text{EC}_r * \text{EEC}_r$$

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_r equals 1.0 / MEPR for AFUE, COP or EF ratings, or such that EEC_r 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	2.2561	0
Fossil fuel* space heating	1.0943	0.4030
Biomass space heating	0.8850	0.4047
Electric air conditioning	3.8090	0
Electric water heating	0.9200	0
Fossil fuel* water heating	1.1877	1.0130

*Such as natural gas, LP, fuel oil

Step (2) Determine the HERS Index using equation 2:

$$\text{HERS Index} = \text{PEfrac} * (\text{TnML} / \text{TRL}) * 100 \quad (\text{Eq. 2})$$

where:

$$\text{TnML} = n\text{MEUL}_{\text{HEAT}} + n\text{MEUL}_{\text{COOL}} + n\text{MEUL}_{\text{HW}} + \text{EUL}_{\text{LA}} \text{ (MBtu/yr).}$$

$$\text{TRL} = \text{REUL}_{\text{HEAT}} + \text{REUL}_{\text{COOL}} + \text{REUL}_{\text{HW}} + \text{REUL}_{\text{LA}} \text{ (MBtu/yr).}$$

and where:

EUL_{LA} = Rated Home end use loads for lighting, appliances and MELs as defined by Section 303.4.1.7.2, converted to MBtu/yr, where MBtu/yr = (kWh/yr)/293 or (therms/yr)/10, as appropriate.

REUL_{LA} = Reference Home end use loads for lighting, appliances and MELs as defined by Section 303.4.1.7.1, converted to MBtu/yr, where MBtu/yr = (kWh/yr)/293 or (therms/yr)/10, as appropriate.

and where:

$$\text{PEfrac} = (\text{TEU} - \text{OPP}) / \text{TEU}$$

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 HERS Index and the corresponding number of stars depicted in Table 303.3.1:

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

HERS Index Range	Stars	Relative Energy Use (with respect to Reference Home)
=<500 and >401	★	=<500% and >401%
=<400 and >301	★+	=<400% and >301%
=<300 and >251	★★	=<300% and >251%
=<250 and >201	★★+	=<250% and >201%
=<200 and >151	★★★	=<200% and >151%
=<150 and >101	★★★+	=<150% and >1%
=<100 and >91	★★★★	=<0% and >-9%
=<90 and >86	★★★★+	=<-10% and >-14%
=<85 and >71	★★★★★	=<-15% and >-29%
=<70 and >=0	★★★★★+	=<-30% 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 Index 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, the following requirements will apply in addition to the information set forth under Section 303.3.2 of this Standard.

303.3.3.1 The annual energy cost savings for the Rated home shall be estimated by comparing the projected annual energy cost of the Rated home to the projected annual energy use cost of a reference home. For new homes in which the results will be used to apply for an Energy Efficient Mortgage (EEM), the most recent HERS reference home shall be the baseline, except when an alternative reference home is specified by the lender or program underwriter. For existing homes in which the results will be used to apply for an Energy Improvement Mortgage (EIM) the unimproved home shall be used as the baseline. For savings calculations unrelated to EEM's or EIM's, the user may select any reference home as the baseline.

303.3.3.2 The estimated monthly energy cost savings for the Rated home shall be equal to the annual energy cost savings divided by 12.

303.3.3.3 The Energy Value for the Rated home (e.g., present value of the energy cost savings) shall be calculated as follows:

303.3.3.3.1 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 (i.e., Assumed Rate)

n = weighted life of the measures (23 years)

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

303.3.3.3.2 For Fannie Mae energy efficient mortgage products, the prevailing mortgage rate (i.e., Assumed Rate) shall be provided by RESNET annually from the information provided by Fannie Mae.

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

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.

303.3.3.5 Each rating report shall include:

- 303.3.3.5.1** The estimated monthly energy cost savings for the Rated home;
- 303.3.3.5.2** The Energy Value for the Rated Home;
- 303.3.3.5.3** For FHA and Freddie Mac energy mortgages, the present worth of energy savings;
- 303.3.3.5.4** The weighted lifetime of the measures that was used to determine the present value factor;
- 303.3.3.5.5** The prevailing mortgage rate (i.e. Assumed Rate) that was used to determine the present value factor;
- 303.3.3.5.6** The utility rates that were used to determine the estimated annual energy cost savings. The following units shall apply, as applicable to the fuel type(s) used by the Rated home: \$ per kWh for electricity, \$ per therm for natural gas, and \$ per gallon for fuel oil;
- 303.3.3.5.7** The reference home from which annual energy cost savings were calculated (e.g., 1993 MEC, 2006 IECC, 2006 HERS);
- 303.3.3.5.8** A reference to the methodology used to calculate the values on the report. Specifically, the report shall reference “Section 303.3.3 of RESNET’s 2006 Mortgage Industry National Homes Energy Rating Systems Standards”.

3.3.4 If a Projected Rating conducted under Section 303.7.1 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 Index 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 Index and star rating, any home achieving a rating

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 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 Values from Table 303.4.1.(4) shall be used to determine solar absorptance except where test data are provided for roof surface in accordance with ASTM methods E-903, C-1549, E-1918, or CRRC Method # 1. Emittance values provided by the roofing manufacturer in accordance with ASTM C-

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

Building Component	HERS Reference Home	Rated Home
		1371 shall be used when available. In cases where the appropriate data are not known, same as the Reference 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. U-factor: from Table 303.4.1(2) for floors over unconditioned spaces.	Same as the Rated Home, but not less net free ventilation area than the Reference Home unless an approved ground cover in accordance with IRC 408.1 is used, in 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. 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	For residences that are not tested, the same as the

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

Building Component	HERS Reference Home	Rated Home
	recovery)	<p>HERS Reference Home</p> <p>For residences without 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</p> <p>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 $0.01 \times \text{CFA} + 7.5 \times (\text{Nbr}+1)$ cfm</p>
Mechanical ventilation:	<p>None, except where a mechanical ventilation system is specified by the Rated Home, in which case:</p> <p>Annual vent fan energy use: $\text{kWh/yr} = 0.03942 \times \text{CFA} + 29.565 \times (\text{Nbr}+1)$ (per dwelling unit)</p> <p>where: CFA = conditioned floor area N_{br} = number of bedrooms</p>	<p>Same as Rated Home</p> <p>Same as Rated Home</p>
Internal gains:	As specified by Table 303.4.1(3)	Same as HERS Reference Home, except as provided by Section 303.4.1.7.2
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	Same as Rated Home

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

Building Component	HERS Reference Home	Rated Home
	<p>directly exposed to room air</p> <p>For masonry basement walls, same as Rated Home, but with insulation required by Table 303.4.1(2) located on the interior side of the walls</p> <p>For other walls, for ceilings, floors, and interior walls, wood frame construction</p>	<p>Same as Rated Home</p> <p>Same as Rated Home</p>
Heating systems ^{(h),(i)}	<p>Fuel type: same as Rated Home</p> <p>Efficiencies:</p> <p>Electric: air source heat pump with prevailing federal minimum efficiency</p> <p>Non-electric furnaces: natural gas furnace with prevailing federal minimum efficiency</p> <p>Non-electric boilers: natural gas boiler with prevailing federal minimum efficiency</p> <p>Capacity: sized in accordance with Section 303.5.1.4 of this Standard.</p>	<p>Same as Rated Home ⁽ⁱ⁾</p> <p>Same as Rated Home</p> <p>Same as Rated Home</p> <p>Same as Rated Home</p> <p>Same as Rated Home</p>
Cooling systems ^{(h),(k)}	<p>Fuel type: Electric</p> <p>Efficiency: in accordance with prevailing federal minimum standards</p> <p>Capacity: sized in accordance with Section 303.5.1.4 of this Standard.</p>	<p>Same as Rated Home ^(k)</p> <p>Same as Rated Home</p> <p>Same as Rated Home</p>
Service water heating systems ^{(h),(m)}	<p>Fuel type: same as Rated Home</p> <p>Efficiency: in accordance with prevailing federal minimum standards</p> <p>Use (gal/day): $30 \cdot N_{du} + 10 \cdot N_{br}$ where N_{du} = number of dwelling units</p> <p>Tank temperature: 120 F</p>	<p>Same as Rated Home ^(m)</p> <p>Same as Rated Home</p> <p>Same as HERS Reference Home</p> <p>Same as HERS Reference Home</p>
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(4), except when tested in accordance with ASHRAE Standard 152-2004 ⁽ⁿ⁾ , and then either

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

Building Component	HERS Reference Home	Rated Home
		calculated through hourly simulation or calculated in accordance with ASHRAE Standard 152-2004
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 303.5.1.2

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:

$$AF = 0.18 \times AFL \times FA \times F$$

where:

AF = Total fenestration area

AFL = Total floor area of directly conditioned space

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

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

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	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	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 they 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)	Slab-on-Grade ^(d,e) R-Value & Depth
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	0.55	0.030	0.082	0.047	0.059	10, 2 ft.
5 and Marine 4	0.35	0.55	0.030	0.060	0.033	0.059	10, 2 ft.
6	0.35	0.55	0.026	0.060	0.033	0.059	10, 4 ft.
7 and 8	0.35	0.55	0.026	0.057	0.033	0.059	10, 4 ft.

Notes:

- Non-fenestration U-Factors shall be obtained from measurement, calculation, or an approved source.
- Climates zones shall be as specified by the 2004 Supplement to the International Energy Conservation Code.
- For basements where the conditioned space boundary comprises the basement walls.
- R-5 shall be added to the required R-value for slabs with embedded heating.
- Insulation shall extend downward from the top of the slab vertically to the depth indicated.

Table 303.4.1(3). Internal Gains for HERS Reference Homes ^(a)

End Use / Component	Sensible Gains (Btu/day)			Latent Gains (Btu/day)		
	a	b	c	a	b	c
Residual MELs		7.27			0.38	
Interior lighting	4,253	7.48				
Refrigerator	5,955		168			
TVs	3,861		645			
Range/Oven (elec) ^(b)	2,228		262	248		29
Range/Oven (gas) ^(b)	3,934		470	1,020		122
Clothes Dryer (elec) ^(b)	661		188	73		21
Clothes Dryer (gas) ^(b)	685		194	85		24
Dish Washer	219		87	219		87
Clothes Washer	95		26	11		3
Gen water use	-1227		-409	1,245		415
Occupants ^(c)			3716			2,884

Notes for Table 303.4.1(3)

(a) Table values are coefficients for the following general equation:

$$\text{Gains} = a + b \cdot \text{CFA} + c \cdot \text{Nbr}$$

where CFA = Conditioned Floor Area and Nbr = Number of bedrooms.

- (b) For Rated Homes with electric appliance use (elec) values and for Rated homes with natural gas-fired appliance use (gas) values
- (c) Software tools shall use either the occupant gains provided above or similar temperature dependent values generated by the software where number of occupants equals the number of bedrooms and occupants are present in home 16.5 hours per day.

Table 303.4.1(4). 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 ^(d)	0.88	
“Ductless” systems ^(e)	1.00	

Table 303.4.1(4) 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.

Table 303.4.1(5).

Default Solar Absorptance for Various Roofing Surfaces	
Roof Materials	Absorptance
White Composition Shingles	0.80
White Tile (including concrete)	0.60
White Metal	0.50
All others	0.92

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 303.4.1.4 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

System Type	EAE
Oil boiler	330
Gas boiler	170
Oil furnace	$439 + 5.5 * \text{Capacity (kBtu/h)}$
Gas furnace	$149 + 10.3 * \text{Capacity (kBtu/h)}$

303.4.1.7 Lighting, Appliances and Miscellaneous Electric Loads (MELs)

303.4.1.7.1 HERS Reference Home. Lighting, appliance and miscellaneous electric loads in the HERS Reference Home shall be determined in accordance with the values provided in Table 303.4.1.7.1(1) and Table 303.4.1.7.1(2), as appropriate, and equation 3:

$$\text{kWh (or therms) per year} = a + b \cdot \text{CFA} + c \cdot \text{Nbr} \quad (\text{Eq. 3})$$

where:

'a', 'b', and 'c' are values provided in Table 303.4.1.7.1(1) and Table 303.4.1.7.1(2)

CFA = conditioned floor area

Nbr = number of bedrooms

303.4.1.7.1.1 Electric Reference Homes. Where the Rated Home has electric appliances, the HERS Reference Home lighting, appliance and miscellaneous loads shall be determined in accordance with the values given in Tables 303.4.1.7.1(1).

Table 303.4.1.7.1(1). Lighting, Appliance and Miscellaneous Electric Loads (kWh/yr) in electric HERS Reference Homes

End Use Component ^(a)	Equation Coefficients		
	a	b	c
Residual MELs		0.91	
Interior lighting	455	0.80	
Exterior lighting	100	0.05	
Refrigerator	637		18
Televisions	413		69
Range/Oven	331		39
Clothes Dryer	524		149
Dish Washer	78		31
Clothes Washer	38		10

Table 303.4.1.7.1(1) Notes:

(a) For homes with garages, an additional 100 kWh per year shall be added to the HERS Reference home for garage lighting.

303.4.1.7.1.2 Reference Homes with Natural Gas Appliances. Where the Rated Home is equipped with natural gas cooking or clothes drying appliances, the Reference Home cooking and clothes drying loads defined above in Table 303.4.1.7(1) shall be replaced by the natural gas and electric appliance loads provided below in Table 303.4.1.7(2), as applicable.

Table 303.4.1.7(2). Natural Gas Appliance Loads (therms/yr) for HERS Reference Homes with gas appliances

End Use Component ^(a)	Equation Coefficients		
	a	b	c
Range/Oven (therms)	22.6		2.7
Range/Oven (kWh)	22.6		2.7
Clothes Dryer (therms)	18.8		5.3
Clothes Dryer (kWh)	41		11.7

Table 303.4.1.7(2) Notes:

(a) Both the natural gas and the electric components shall be included in determining the HERS Reference Home annual energy use for the above appliances.

303.4.1.7.1.3 Garage Lighting. Where the Rated Home includes an enclosed garage, 100 kWh/yr shall be added to the energy use of the Reference Home to account for garage lighting.

303.4.1.7.1.4 Mechanical Ventilation. Where mechanical ventilation is provided in the Rated home, $REUL_{LA}$ shall be modified for the Reference Home by adding $[0.03942 * CFA + 29.565 * (N_{br} + 1)]$ kWh/yr for ventilation fan operation, converted to MBtu/yr, where $MBtu/yr = (kWh/yr)/293$.

303.4.1.7.1.5 Ceiling Fans. Where ceiling fans are included in the Rated Home they shall also be included in the Reference Home in accordance with the provisions of Section 303.4.1.7.2.11 of this Standard.

303.4.1.7.2 Rated Homes. For Rated homes, the following procedures shall be used to determine lighting, appliance and residual miscellaneous electric load energy consumption.

303.4.1.7.2.1 Residual MELs. Residual miscellaneous electric loads in the Rated Home shall be the same as in the HERS Reference Home and shall be calculated as $0.91 * CFA$, where CFA is the conditioned floor area.

303.4.1.7.2.2 Interior Lighting. Interior lighting in the Rated home is calculated using equation 5:

$$kWh/yr = 0.8 * [(4 - 3 * qFF_{IL}) / 3.7] * (445 + 0.8 * CFA) + 0.2 * (455 + 0.8 * CFA) \quad (\text{Eq. 5})$$

where:

CFA = Conditioned floor area

qFF_{IL} = the ratio of the Qualifying interior Light Fixtures to all interior light fixtures in Qualifying interior Light Fixture Locations.

For rating purposes, the Rated Home shall not have qFF_{IL} less than 0.10 (10%).

(Informative Note: When $qFF_{IL} = 0.10$ (10%), the above equation reduces to the standard interior lighting equation of: $kWh/yr = 455 + 0.8 * CFA$.)

For the purpose of adjusting the annual interior lighting energy consumption for calculating the rating, EUL_{LA} shall be adjusted by ΔEUL_{IL} , which shall be calculated as the annual interior lighting energy use derived by the procedures in this section minus the annual interior lighting energy use derived for the HERS Reference Home in Section 303.4.1.7.1, converted to MBtu/yr, where $MBtu/yr = (kWh/yr)/293$.

For Interior lighting, internal gains in the Rated home shall be modified by 100% of the interior lighting ΔEUL_{IL} converted to Btu/day as follows: $\Delta EUL_{IL} * 10^6 / 365$.

303.4.1.7.2.3 Exterior Lighting. Exterior lighting in the Rated home shall be determined using equation 6:

$$kWh/yr = (100 + 0.05 * CFA) * (1 - FF_{EL}) + 0.25 * (100 + 0.05 * CFA) * FF_{EL} \quad (\text{Eq. 6})$$

where

CFA = Conditioned floor area

FF_{EL} = Fraction of exterior fixtures that are Qualifying Light Fixtures

For the purpose of adjusting the annual exterior lighting energy consumption for calculating the rating, EUL_{LA} shall be adjusted by ΔEUL_{EL}, which shall be calculated as the annual exterior lighting energy use derived by the procedures in this section minus the annual exterior lighting energy use derived for the HERS Reference Home in Section 303.4.1.7.1, converted to MBtu/yr, where MBtu/yr = (kWh/yr)/293.

Internal gains in the Rated Home shall not be modified as a result of reductions in exterior lighting energy use.

303.4.1.7.2.4 Garage Lighting. For Rated homes with garages, garage lighting in the Rated home shall be determined using equation 7:

$$\text{kWh} = 100*(1-\text{FF}_{\text{GL}}) + 25*\text{FF}_{\text{GL}} \quad (\text{Eq. 7})$$

where:

FF_{GL} = Fraction of garage fixtures that are Qualifying Light Fixtures

For the purpose of adjusting the annual garage lighting energy consumption for calculating the rating, EUL_{LA} shall be adjusted by ΔEUL_{GL}, which shall be calculated as the annual garage lighting energy use derived by the procedures in this section minus the annual garage lighting energy use derived for the HERS Reference Home in Section 303.4.1.7.1 (i.e. 100 kWh/yr), converted to MBtu/yr, where MBtu/yr = (kWh/yr)/293.

Internal gains in the Rated Home shall not be modified as a result of reductions in garage lighting energy use.

303.4.1.7.2.5 Refrigerators. Refrigerator energy use for the Rated Home shall be determined from either Refrigerator Energy Guide Labels or from age-based defaults provided in Table 303.4.1.7.2.5(1).

Table 303.4.1.7.2.5(1) Age-based Refrigerator Defaults

Refrigerator/Freezer Type	Annual kWh Equation
Single-door refrigerator only	(13.5*AV + 299)*VR
Single-door refrigerator/freezer	(13.5*AV + 299)*VR
Refrigerator with top freezer	(16.0*AV + 355)*VR
with TDI	(17.6*AV + 391)*VR
Refrigerator with side-by-side freezer	(11.8*AV + 501)*VR
with TDI	(16.3*AV + 527)*VR
Refrigerator with bottom freezer	(16.6*AV + 367)*VR
Upright freezer only manual defrost	(10.3*AV + 264)*VR
Upright freezer only auto defrost	(14.0*AV + 391)*VR
Chest freezer only	(11.0*AV + 160)*VR

where:

AV = Adjusted Volume = (refrigerator compartment volume)
+ 1.63*(freezer compartment volume)

TDI = Through the door ice

VR = Vintage Ratio from Table 303.4.1.7.2.5(2)

Table 303.4.1.7.2.5(2) Age-based Vintage Ratios

Refrigerator Vintage	Vintage Ratio
1972 or before	2.50
1980	1.82
1984	1.64
1988	1.39
1990	1.30
1993	1.00
2001 forward	0.77

For the purposes of determining adjusted volume (AV), the following defaults may be used:

Table 303.4.1.7.2.5(3) Default Adjusted Volume Equations

Model Type	Default Equation
Single door refrigerator only	AV = 1.00 * nominal volume
Single door refrigerator/freezer	AV = 1.01 * nominal volume
Bottom Freezer	AV = 1.19 * nominal volume
Top Freezer	AV = 1.16 * nominal volume
Side by Side	AV = 1.24 * nominal volume
Freezer only	AV = 1.73 * nominal volume

For the purpose of adjusting the annual refrigerator energy consumption for calculating the rating, EUL_{LA} shall be adjusted by ΔEUL_{FRIG} , which shall be calculated as the annual refrigerator energy use derived by the procedures in this section minus the annual refrigerator energy use derived for the HERS Reference Home in Section 303.4.1.7.1, converted to MBtu/yr, where MBtu/yr = (kWh/yr)/293.

For refrigerator energy use, internal gains in the Rated home shall be modified by 100% of the refrigerator ΔEUL_{FRIG} converted to Btu/day as follows: $\Delta EUL_{FRIG} * 10^6 / 365$. Internal gains shall not be modified for refrigerators located in unconditioned spaces (e.g. unconditioned garages, etc.)

303.4.1.7.2.6 Televisions. Television energy use in the Rated Home shall be the same as television energy use in the HERS Reference Home and shall be calculated as $TVkWh/yr = 413 + 69 * Nbr$, where Nbr is the number of bedrooms in the Rated Home.

303.4.1.7.2.7 Range/Oven. Range/Oven (cooking) energy use for the Rated Home shall be determined as follows:

1) For electric cooking:

$$\text{kWh/yr} = \text{BEF} * \text{OEF} * (331 + 39 * \text{Nbr}) \quad (\text{Eq. 12a})$$

2) For natural gas cooking:

$$\text{Therms/yr} = \text{OEF} * (22.6 + 2.7 * \text{Nbr}) \quad (\text{Eq. 12b})$$

plus:

$$\text{kWh/yr} = 22.6 + 2.7 * \text{Nbr} \quad (\text{Eq. 12c})$$

where:

BEF= Burner Energy Factor = 0.91 for induction ranges and 1.0 otherwise.

OEF = Oven Energy Factor = 0.95 for convection types and 1.0 otherwise

Nbr = Number of bedrooms

For the purpose of adjusting the annual Range/Oven energy consumption for calculating the rating, EUL_{LA} shall be adjusted by ΔEUL_{RO} , which shall be calculated as the annual Range/Oven energy use derived by the procedures in this section minus the annual Range/Oven energy use derived for the HERS Reference Home in Section 303.4.1.7.1, converted to MBtu/yr, where $MBtu/yr = (\text{kWh/yr}) / 293$ or $(\text{therms/yr}) / 10$, whichever is applicable.

For Range/Oven energy use, internal gains in the Rated Home shall be modified by 80% of the Range/Oven ΔEUL_{RO} converted to Btu/day as follows: $\Delta EUL_{RO} * 10^6 / 365$. Of this total amount, internal gains shall be apportioned as follows, depending on fuel type:

- a) For electric Range/Ovens, 90% sensible internal gains and 10% latent internal gains
- b) For gas Range/Ovens, 80% sensible internal gains and 20% latent internal gains.

303.4.1.7.2.8 Clothes Dryers. Clothes Dryer energy use for the Rated Home shall be determined by the following equation.

$$\text{kWh/yr} = 12.5 * (164 + 46.5 * \text{Nbr}) * \text{FU} / \text{EFdry} * (\text{CAPw} / \text{MEF} - \text{LER} / 392) / (0.2184 * (\text{CAPw} * 4.08 + 0.24)) \quad (\text{Eq. 13})$$

where:

Nbr = Number of bedrooms in home

FU = Field Utilization factor = 1.18 for timer controls **or** 1.04 for moisture sensing

EFdry = Efficiency Factor of clothes dryer (lbs dry clothes/kWh) from the CEC database ¹ or use following electric clothes dryer default: 3.01

CAPw = Capacity of clothes washer (ft³) from the manufacturer's data or the CEC database **or** the EPA Energy Star website ² **or** use default of 2.874 ft³

¹ http://www.energy.ca.gov/appliances/database/excel_based_files/

² http://www.energystar.gov/index.cfm?c=clotheswash.pr_clothes_washers

MEF³ = Modified Energy Factor of clothes washer from Energy Guide Label

or use default of 0.817

LER³⁷ = Labeled Energy Rating of clothes washer (kWh/yr) from Energy Guide Label

or use default of 704

For natural gas clothes dryers the following equations shall be used:

$$\text{Therms/yr} = (\text{result of Eq. 13}) * 3412 * (1 - 0.07) * (3.01 / \text{EFdry-g}) / 100000 \quad (\text{Eq. 13a})$$

$$\text{kWh/yr} = (\text{result of Eq. 13}) * 0.07 * (3.01 / \text{EFdry-g}) \quad (\text{Eq. 13b})$$

where:

EFdry-g = Efficiency Factor for gas clothes dryer from the CEC database¹
or use the following gas clothes dryer default: 2.67.

For the purpose of adjusting the annual Clothes Dryer energy consumption for calculating the rating, EUL_{LA} shall be adjusted by ΔEUL_{CD} , which shall be calculated as the annual Clothes Dryer energy use derived by the procedures in this section minus the annual Clothes Dryer energy use derived for the HERS Reference Home in Section 303.4.1.7.1, converted to MBtu/yr, where $\text{MBtu/yr} = (\text{kWh/yr}) / 293$ or $(\text{therms/yr}) / 10$, whichever is applicable.

For Clothes Dryer energy use, total internal gains in the Rated Home shall be modified by 15% of the Clothes Dryer ΔEUL_{CD} converted to Btu/day as follows: $\Delta EUL_{CD} * 10^6 / 365$. Of this total amount, 90% shall be apportioned to sensible internal gains and 10% to latent internal gains. Internal gains shall not be modified for Clothes Dryers located in unconditioned spaces (e.g. unconditioned garages, etc.)

303.4.1.7.2.9 Dishwashers. Dishwasher energy use for the Rated Home shall be determined using the following equation.

$$\text{kWh/yr} = [(86.3 + 47.73/\text{EF})/215] * \text{dWcpy} \quad (\text{Eq. 14a})$$

where:

EF = Labeled dishwasher energy factor

or

EF = 215/(labeled kWh/year)

dWcpy = $(88.4 + 34.9 * \text{Nbr}) * 12 / \text{dWcap}$

where:

dWcap = Dishwasher place setting capacity; Default = 12 settings for standard sized dishwashers and 8 place settings for compact dishwashers

³ This value must be determined from the energy rating for clothes washer as it determines the amount of moisture remaining in the clothes after the washer cycle is completed.

And the change (Δ) in daily hot water use (GPD – gallons per day) for dishwashers shall be calculated as follows:⁴

$$\Delta\text{GPD}_{\text{DW}} = [(\mathbf{88.4+34.9*Nbr})*\mathbf{8.16} - (\mathbf{88.4+34.9*Nbr}) * \mathbf{12/dWcap}*(\mathbf{4.6415*(1/EF)} - \mathbf{1.9295})]/\mathbf{365} \quad (\text{Eq. 14b})$$

For the purpose of adjusting the annual Dishwasher energy consumption for calculating the rating, EUL_{LA} shall be adjusted by $\Delta\text{EUL}_{\text{DW}}$, which shall be calculated as the annual Dishwasher energy use derived by the procedures in this section minus the annual Clothes Dishwasher energy use derived for the HERS Reference Home in Section 303.4.1.7.1, converted to MBtu/yr, where $\text{MBtu/yr} = (\text{kWh/yr}) / 293$ or $(\text{therms/yr}) / 10$, whichever is applicable.

For the purpose of adjusting the daily hot water use for calculating the rating, the daily hot water use change shall be ' $\Delta\text{GPD}_{\text{DW}}$ ' as calculated above.

For Dishwasher energy use, total internal gains in the Rated Home shall be modified by 60% of the Dishwasher $\Delta\text{EUL}_{\text{DW}}$ converted to Btu/day as follows: $\Delta\text{EUL}_{\text{DW}} * 10^6 / 365$. Of this total amount, 50% shall be apportioned to sensible internal gains and 50% to latent internal gains.

303.4.1.7.2.10 Clothes Washers. Clothes Washer annual energy use and daily hot water use for the Rated Home shall be determined as follows.

Annual energy use shall be calculated using the following equation:

$$\text{kWh/yr} = ((\text{LER}/\mathbf{392}) - ((\text{LER}*(\$/\text{kWh}) - \text{AGC})/(\mathbf{21.9825}*(\$/\text{kWh}) - (\$/\text{therm}))/\mathbf{392}) * \mathbf{21.9825}) * \text{ACY} \quad (\text{Eq. 15a})$$

where:

LER = Label Energy Rating (kWh/yr) from Energy Guide Label

\$/kWh = Electric Rate from Energy Guide Label

AGC = Annual Gas Cost from Energy Guide Label

\$/therm = Gas Rate from Energy Guide Label

ACY = Adjusted Cycles per Year

and where:

$\text{ACY} = \text{NCY} * ((\mathbf{3.0*2.08+1.59})/(\text{CAPw}*\mathbf{2.08+1.59}))$

where:

$\text{NCY} = (\mathbf{3.0/2.847}) * (\mathbf{164} + \text{Nbr}*\mathbf{45.6})$

CAPw = washer capacity in cubic feet from the manufacturer's data or the CEC database⁵ or the EPA Energy Star website⁶ or use default of 2.874 ft³

And daily hot water use shall be calculated as follows:

⁴ http://www1.eere.energy.gov/buildings/appliance_standards/residential/docs/lcc_dishwasher.xls

⁵ http://www.energy.ca.gov/appliances/database/excel_based_files/

⁶ http://www.energystar.gov/index.cfm?c=clotheswash.pr_clothes_washers

$$\text{DHW}_{\text{gpd}} = 120.5 * \text{therms/cyc} * \text{ACY} / 365 \quad (\text{Eq. 15b})$$

where:

$$\text{therms/cyc} = (\text{LER} * \$/\text{kWh} - \text{AGC}) / (21.9825 * \$/\text{kWh} - \$/\text{therm}) / 392$$

For the purpose of adjusting the annual Clothes Washer energy consumption for calculating the rating, EUL_{LA} shall be adjusted by ΔEUL_{CW} , which shall be calculated as the annual Clothes Washer energy use derived by the procedures in this section minus the annual Clothes Washer energy use derived for the HERS Reference Home in Section 303.4.1.7.1, converted to MBtu/yr, where $\text{MBtu/yr} = (\text{kWh/yr}) / 293$ or $(\text{therms/yr}) / 10$, whichever is applicable.

For the purpose of adjusting the daily hot water use for calculating the rating, the daily hot water use change shall be calculated as the daily hot water use derived by the procedures in this section minus 7.94 gallons per day for the reference standard clothes washer.

For Clothes Washer energy use, total internal gains in the Rated Home shall be modified by 30% of the Clothes Washer ΔEUL_{CW} converted to Btu/day as follows: $\Delta EUL_{CW} * 10^6 / 365$. Of this total amount, 90% shall be apportioned to sensible internal gains and 10% to latent internal gains. Internal gains shall not be modified for Clothes Washers located in unconditioned spaces (e.g. unconditioned garages, etc.)

Rating and label data on clothes washer may be found at the following web sites:

EPA: www.energystar.gov/index.cfm?c=clotheswash.pr_clothes_washers

CEC:

www.energy.ca.gov/appliances/database/excel_based_files/Clothes_Washers/

303.4.1.7.2.11 Ceiling Fans. If ceiling fans are included in the Rated home, they shall also be included in the Reference home. The number of bedrooms plus one (Nbr+1) ceiling fans shall be assumed in both the Reference Home and the Rated Home. A daily ceiling fan operating schedule equal to 10.5 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 °F. The cooling thermostat (but not the heating thermostat) shall be set up by 0.5 °F in both the Reference and Rated Home during periods when ceiling fans are assumed to operate.

The Reference Home shall use number of bedrooms plus one (Nbr+1) Standard Ceiling Fans of 42.6 watts each. The Rated Home shall use the Labeled Ceiling Fan Standardized Watts (LCFSW), also multiplied by number of bedrooms plus one

(Nbr+1) fans to obtain total ceiling fan wattage for the Rated Home. The Rated Home LCFSW shall be calculated as follows:

$$\text{LCFSW} = (3000\text{cfm}) / (\text{cfm/watt as labeled at medium speed})$$

Where installed ceiling fans in the Rated Home have different values of LCFSW, the average LCFSW shall be used for calculating ceiling fan energy use in the Rated Home.

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/yr [(kWh/yr)/293], for both the Rated and Reference homes shall be added to the lighting and appliance end use loads (EUL_{LA} and $REUL_{LA}$, as appropriate) as specified by Equation 2, Section 303.2.1 of this Chapter.

303.4.1.7.2.12 Mechanical Ventilation System Fans. If ventilation fans are present in the Rated Home, EUL_{LA} shall be adjusted by adding total annual kWh energy consumption of the ventilation system in the Rated Home, converted to MBtu/yr, where $\text{MBtu/yr} = (\text{kWh/yr}) / 293$.

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 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 Where programmable offsets are available in the Rated Home, 2 °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;

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

303.5.1.3 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.

303.5.1.4 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:

303.5.1.4.1 HERS Reference Home:

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

303.5.1.4.1.2 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.

303.5.1.4.1.3 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

303.5.1.4.1.4 Mechanical ventilation shall be zero.

303.5.1.4.1.5 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.

303.5.1.4.1.6 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.

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

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

303.5.1.4.2 The Rated Home:

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

303.5.1.4.2.2 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.

303.5.1.4.2.3 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 $1.2 * \text{ach,nat}$ or $1.2 * \text{nL} * \text{W}$
- (b) For winter: either $1.6 * \text{ach,nat}$ or $1.6 * \text{nL} * \text{W}$
- (c) Where: $\text{nL} = 0.48$
- (d) $\text{W} =$ Weather factor from W Tables in ASHRAE Standard 136

303.5.1.4.2.4 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.

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

303.5.1.4.2.6 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.)

303.5.1.4.2.7 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.

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

303.5.1.4.2.9 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.

303.5.1.5 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: $\text{HSPF, corr} = \text{HSPF, mfg} / 0.582$ and $\text{SEER, corr} = \text{SEER, mfg} / 0.941$. 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.

303.5.1.6 For ground-loop and ground-water heat pumps, the Auxiliary Electric Consumption shall be determined as follows:

$$\text{GSHP Auxiliary Electric Consumption (kWh/yr)} = \text{GSHP}_{\text{pump}} + \text{GSHP}_{\text{fan}}$$

Where:

$\text{GSHP}_{\text{pump}}$ in watts is the observed pump nameplate data (Volts *Amps) for all hours of heat pump operation. Amps may be taken from nameplate as Run Load Amps (RLA) or Full Load Amps (FLA). Alternatively, pumping energy that is measured on-site with a watt-hour meter, or using measured V*A may be substituted. Such measured pumping energy may be further adjusted for on-site measured duty cycle during heat pump operation, when pumping is intermittent during continuous heat pump operation.

GSHP_{fan} : If ducts are attached to the system to deliver heating or cooling, the external fan energy in watts, $\text{GSHP}_{\text{fan}} = (\text{air flow in CFM} * 0.5 \text{ CFM per watt})$, shall be added for all hours of heat pump operation. The air flow in CFM shall be $(360 * \text{rated cooling btu/h} / 12,000)$, where 360 is the air flow in CFM per ton (12 kbtu/h) of capacity

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).

303.5.1.9 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.

303.6 Standardized Existing Home Retrofit Savings

Standardized energy savings for existing home retrofits shall be determined by comparing a Baseline Home with an Improved Home in accordance with the provisions of this section.

303.6.1 Baseline Home. The Baseline Home for the purposes of determining the energy savings of an existing home retrofit shall be the original configuration of the existing home, including the full complement of lighting, appliances and residual miscellaneous energy use as specified by Tables 303.4.1.7.1(1) and 303.4.1.7.1(2). The energy use of these end uses in the Baseline Home shall be based on the original home configuration following the provision of Section 303.4.1.7.2.

303.6.1.1 Where multiple appliances of the same type exist in the original configuration of the existing home, the same number of those appliance types shall be included in the Baseline Home.

303.6.1.2 Where a standard appliance as defined by Tables 303.4.1.7.1(1) and 303.4.1.7.1(2) does not exist in the original configuration of the existing home, the standard default energy use and internal gains as specified by Table 303.4.1(3) for that appliance shall be included in the Baseline home.

303.6.2 Improved Home. The improved home for the purpose of determining the energy savings of an existing home retrofit shall be the existing home’s configuration including all energy improvements to the original home and including the full complement of lighting, appliances and residual miscellaneous energy use contained in the home after all energy improvements have been implemented.

303.6.2.1 Where an appliance has been upgraded but the existing appliance is not removed from the existing home property, both the new and existing appliance shall be included in the Improved Home.⁷

303.6.2.2 Where a standard appliance as defined by Tables 303.4.1.7.1(1) and 303.4.1.7.1(2) does not exist in the improved configuration of the existing home, the standard default energy use and internal gains as specified by Table 303.4.1(3) for that appliance shall be included in the Improved Home.

303.6.2.3 Improvements in lighting and appliance energy use in the Improved Home shall be calculated in accordance with Section 303.4.1.7.2.

303.6.3 Standard Operating Conditions.

303.6.3.1 Both the Baseline Home and Improved Home shall be configured in accordance with the Rated Home specifications of Table 303.4.1(1) except that the Baseline Home shall not violate the input constraints specified in Table 303.6.3(1) below.

Table 303.6.3(1) Baseline Home Input Constraints

Equipment Constraints*	Minimum Value
Forced-air furnace, AFUE	72%
Hot water / steam boiler, AFUE	60%
Heat Pump, HSPF	6.5
Heat Pump, SEER	9.0
Central air conditioner, SEER	9.0
Room air conditioner, EER	8.0
Gas-fired storage water heater, EF	0.50

⁷ For example, if a refrigerator is upgraded to a more efficient model and the original refrigerator is kept on property for potential use as a second refrigerator; both refrigerators shall be included in the Improved Home energy model.

Oil-fired storage water heater, EF	0.45
Electric storage water heater, EF	0.86
Enclosure Constraints (including air film conductances)	Maximum U-factor
Wood-frame wall	0.222
Masonry wall	0.250
Wood-frame ceiling with attic (interior to attic space)	0.286
Unfinished roof	0.400
Wood-frame floor	0.222
Single-pane window, wood frame	0.714
Single-pane window, metal frame	0.833

* **Exception:** Where the labeled equipment efficiency exists for the specific piece of existing equipment, the labeled efficiency shall be used in lieu of these minimum input constraints.

303.6.3.2 Air Distribution Systems

303.6.3.2.1 In cases where the air distribution system leakage is not measured in the original Baseline Home, the ducts shall be modeled in the spaces in which they are located and the air distribution system leakage to outdoors at 25 Pascal pressure difference shall be modeled in both the Baseline Home and the Improved Home as 0.10 times the conditioned floor area of the home split equally between the supply and return side of the air distribution system with the leakage distributed evenly across the duct system.

Exception: If the air handler unit and a minimum of 75% of its duct system are entirely inside the conditioned space boundary, the air distribution system leakage to outdoors at 25 Pascal pressure difference shall be modeled in both the Baseline Home and the Improved Home as 0.05 times the conditioned floor area of the home split equally between the supply and return side of the air distribution system with the leakage distributed evenly across the duct system.

303.6.3.2.2 In cases where the air distribution system leakage is measured:

303.6.3.2.2.1 For the Baseline Home, the ducts shall be modeled in the spaces in which they are located and the air distribution system leakage to outdoors at 25 Pascal pressure difference shall be modeled as the lesser of the measured air distribution system leakage to outdoors at 25 Pascal pressure difference in the original Baseline Home or 0.24 times the conditioned floor area of the home, either split evenly between the supply and return side of the air distribution system or as measured separately with the leakage distributed evenly across the duct system.

303.6.3.2.2.2 For the Improved Home, the ducts shall be modeled in the spaces in which they are located and the air distribution system leakage to outdoors at 25 Pascal pressure difference shall be set equal to the measured air distribution system leakage to outdoors at 25 Pascal pressure difference in the Improved

Home, either split evenly between the supply or return side of the air distribution system or as measured separately with the leakage distributed evenly across the duct system.

303.6.3.3 Both the Baseline Home and the Improved Home shall be subjected to the operating conditions specified by Section 303.5.1.4.2.

303.6.4 Total Energy Savings Calculation.

303.6.4.1 Energy units used in the calculation of energy savings shall be units of Equivalent Electric Power using the Reference Electricity Production Efficiency for fossil fuels. Equivalent electric energy use shall be calculated using Equation 303.6.4-1.

$$kWh_{eq} = kWh_{elec} + \frac{Btu_{fossil} * 0.40}{3412}$$

(Eqn. 303.6.4-1)

303.6.4.2 Energy savings shall be calculated as the difference between the whole-house projected equivalent energy use of the Baseline Home and the whole-house projected equivalent energy use of the Improved Home.

303.6.4.3 The energy savings percentage of the retrofit shall be calculated as the whole-house equivalent energy savings as determined by Section 303.6.4.2 above divided by the whole-house equivalent energy use of the Baseline Home.

303.7 Projected and Confirmed Ratings

303.7.1 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:

303.7.1.1 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).

303.7.1.2 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

303.7.1.3 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 largest HERS Index as the "worst case" Projected Rating.

303.7.2 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 303.8.1 of this Standard, and the actual orientation of the home.

303.7.3 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.

303.8 Minimum Rated Features

303.8.1 All HERS providers shall calculate the estimated annual purchased energy consumption for heating, cooling, water heating and 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 303.8.1(1),

303.8.1.1 For existing homes, the envelope thermal characteristics of building elements 1 through 7 set forth in Table 303.8.1(1) are determined by site observation.

303.8.1.2 If data for the minimum rated features set forth in Section 303.8.1.1 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.

303.8.1.3 For existing homes, the determination of air leakage and duct leakage values set forth as building elements 10 and 11 in Table 303.8.1(1) are determined by data collected on site using the following procedures listed in preferential order of use:

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

303.8.1.3.2 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.

303.8.1.3.3 The energy efficiency of the mechanical equipment set forth as building elements 12 through 14 in Table 303.8.1(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:

$$\text{Eff}_{\text{rated}} = \text{Eff}_{\text{listed}} * \text{Es}_{\text{measured}} / \text{Es}_{\text{listed}}$$

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.

303.8.1.4 When information on the energy efficiency of mechanical equipment cannot be determined from the sources listed in paragraph 303.8.1.3.3 of this Standard, the values set forth in Tables 303.8.1(2); 303.8.1(3); 303.8.1(4) and 303.8.1(5) shall be used.

303.8.1.5 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 303.8.1(1) Minimum Rated Features

Building element	Minimum Rated Feature
1. Floor/Foundation Assembly.	Construction type (slab-on-grade, crawl space; basement), insulation value (edge, under slab, cavity, sheathing), framing material and on-center spacing, insulation installation (Grade I, II, or III), vented or unvented (crawl space), capacitance (if slab or basement receives appreciable solar gain).
2. Walls	Construction type, insulation value (cavity, sheathing), framing material and on-center spacing insulation installation (Grade I, II, or III) capacitance, color (light, medium, or dark).
3. Roof/Ceiling Assembly	Construction type, insulation value (cavity, sheathing), framing material and on-center spacing insulation installation (Grade I, II, or III), framing covered by insulation or exposed, 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.

Table 303.8.1(1) Minimum Rated Features

Building element	Minimum Rated Feature
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); power consumption of ground fluid circulating pump(s) for ground-loop and ground-water heat pumps.
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)).
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.
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).
21. On-site Power Generation	Total annual kWh generation and total site fuel used in the production of on-site power generation as derived from manufacturer's performance ratings.

Table 303.8.1(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
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

Table 303.8.1(2) Default Solid Fuel Combustion Seasonal Efficiencies for Space Heating

Type	Location	Seasonal Efficiency	Notes
			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 303.8.1(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	0.72	0.72	0.72	0.72	0.72	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	6.5	6.5	6.5	6.5	6.5	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	9.0	9.0	9.0	9.0	9.0	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	9.0	9.0	9.0	9.0	9.0	9.40	10.00
Room Air Conditioner	EER	8.0	8.0	8.0	8.0	8.0	8.10	8.50

Table 303.8.1(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
Water Heating:								
Storage Gas	EF	0.50	0.50	0.50	0.50	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	0.86	0.86	0.86	0.86	0.86	0.87	0.88

* **Exception:** Where the labeled equipment efficiency exists for the specific piece of existing equipment, the labeled efficiency shall be used in lieu of these minimum input constraints.

TABLE 303.8.1(4) Default Values for Mechanical System Efficiency (not Age-based)*

	Units	Rating
Heating:		
Gas Wall Heater (Gravity)	AFUE	0.72
Gas Floor Furnace	AFUE	0.72
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
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

* **Exception:** Where the labeled equipment efficiency exists for the specific piece of existing equipment, the labeled efficiency shall be used in lieu of these minimum input constraints.

Table 303.8.1(5) Default EAE Values

System Type	EAE
Oil boiler	330
Gas boiler	170
Oil furnace	$439 + 5.5 * \text{Capacity (kBtu/h)}$
Gas furnace	$149 + 10.3 * \text{Capacity (kBtu/h)}$

303.9 Software Rating Tools

303.9.1 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 HERS Index of all building elements that differ between the HERS Reference Home and the Rated Homes and shall include the following capabilities:

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

303.9.1.2 Computer generation of HERS Index and star ratings in accordance with the provisions of Section 303.2 of this Standard

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

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

303.9.1.5 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.

303.9.1.6 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

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

303.9.2 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).

303.10 Innovative Design Request

303.10.1 HERS providers can petition RESNET for adjustment to the HERS Index for a Rated Home with features or technologies not addressed by approved software tools and/or this Standard. Innovative Design Requests (IDRs) to RESNET shall include, at a minimum, the following:

303.10.1.1 A Rating generated from approved rating software tool for Rated Home without feature(s) that cannot be modeled in the software tool.

303.10.1.2 Written description of feature(s) not included in Rating generated from software.

303.10.1.3 Manufacturer's technical and/or performance specifications for feature(s) not included in the Rating generated from the approved software tool.

303.10.1.4 Estimated energy impact. Calculations or simulation results estimating the energy impact of feature(s) not included in the Rating generated from an approved software tool and documentation to support the calculation methodology and/or describe the modeling approach used.

303.10.1.5 Estimated adjustment to HERS Index. Calculations shall follow procedures of Sections 303.1 and 303.2.

303.10.2 Upon review of an IDR, RESNET Standing Technical Committee shall request additional supporting documentation for further consideration or provide a recommendation with justification to the Board as follows: a) is approved, b) is denied, or c) is approved with modifications. The RESNET Board of Directors shall accept or reject the recommendation of Technical Committee or request further information from the Technical Committee.

303.10.3 IDRs shall be approved on a case by case basis. RESNET shall assign a unique identifier to each IDR and maintain a database of IDRs. If RESNET approves the IDR, the HERS provider may issue a supplemental report that adjusts the HERS Index as approved.

Justification for Proposed Amendment:

For quite some time, it has been the contention of many that the RESNET standards apply only to new homes and that they do not address existing home. While this has never been the actual case, it has also been true that the RESNET standards did not contain a specific methodology for the calculation of standardized energy savings (asset savings) resulting from existing home retrofits. This proposed new section of the RESNET Standards is drafted to provide a specific methodology that will fill this gap. Such a standard methodology is sorely needed by the Rating industry and by others, including Congress, in the development of policies and programs aimed at reducing energy use in existing housing stock.

Proposed Effective Date for Amendment: November 15, 2011.

Attachment C