MINHERS Adoption and Implementation of Standard ANSI/RESNET/ICC 380-2016

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Chapter 1- RESNET National Standard for Quality Assurance Providers

101 General Provisions

101.1 Purpose

The purpose of these Standards is to ensure that accurate and consistent home energy ratings are assured by RESNET Accredited Rating Quality Assurance Providers through their certified Home Energy Raters nationwide; to increase the credibility of the Rating Quality Assurance Providers with consumers, the housing and mortgage finance industry, federal government, state governments, local governments, utility companies, and the private sector; and to promote voluntary participation in an objective, cost-effective, sustainable home energy rating process.

101.2 Scope

This document sets out the procedures for the accreditation of Rating Quality Assurance Providers and technical standards by which home energy ratings shall be conducted so their results will be acceptable to all public and private sector industries that may require an objective, cost-effective, sustainable home energy rating process.

Leaders in both the public and private sectors have identified the need for an accreditation process for Rating Quality Assurance Providers. This accreditation process may be used by these stakeholders to accept home energy ratings and to assure accurate, independent information upon which the mortgage industry may accept home energy ratings for the purposes of issuing energy efficient mortgage, or similar, products; a state may recognize the home energy ratings as a compliance method for state building energy codes; as qualification for public and private sector energy programs designed to reach specific energy saving goals; and as a way to provide housing markets the ability to differentiate residences based on their estimated energy efficiency. These Standards have been developed to satisfy the above purposes.

101.2.1 Relationship to State Law

These Standards specifically recognize the authority of states that have laws requiring certification or licensing of Rating Quality Assurance Providers. To the extent that state laws differ from these Standards, state laws shall govern.

101.3 Definitions and Acronyms

See Appendix B- Glossary of Terms.

102 Accreditation Criteria

102.1 Minimum Standards for Rating Quality Assurance (QA) Provider Accreditation

A RESNET accredited Rating Quality Assurance Provider (QA Provider) is responsible for ensuring that all of the ratings issued by the Provider comply with all of the criteria by which the Provider was accredited. QA Providers shall be accredited in accordance with the Accreditation Process specified in Chapter 9 of these Standards. A QA Provider must specifically meet the following minimum standards for Accreditation.

102.1.1 A written Quality Assurance (QA) Process that conforms to Chapter 9 of these Standards and any specific QA requirements for other Provider categories that may apply to a particular organization.

102.1.1.1 Employ or contract with a Quality Assurance Designee (QA Designee) that oversees the Provider's compliance with Chapter 9 of these Standards and any specific QA requirements for other Provider categories that may apply to a particular organization.

102.1.2 Rater and Rating Field Inspector Certification Standards. Certification and recertification of Home Energy Raters and Rating Field Inspectors shall be made by QA Providers, which shall include the following provisions:

102.1.2.1 A QA Provider shall maintain documentation that their Raters and Rating Field Inspectors meet the certification provisions contained in Chapter 2 of these standards.

102.1.2.2 Performance evaluation of ability to perform accurate ratings and field inspections.

102.1.2.2.1 In order for a Rater Candidate to be certified as a Home Energy Rater, they must satisfactorily complete two (2) supervised ratings as part of Rater training and a minimum of three (3) probationary ratings and successfully pass the RESNET National Core Competency Test, Combustion Appliance Zone Testing (CAZ) and Work Scope exams and any other RESNET required Rater exams. All requirements from Section 102.1.2.2.1 must be met within 12 months.

102.1.2.2.1.1 A Rater Candidate that does not complete a minimum of three (3) probationary ratings to the satisfaction of a QA Provider within twelve (12) months of passing the National Core Rater Test or otherwise does not achieve certification within the allowed twelve month time-frame must at a minimum, meet the following in order to maintain eligibility for certification:

102.1.2.2.1.1.1 Pass the National Core Rater Test again;

102.1.2.2.1.1.2 Complete three (3) additional probationary ratings in accordance with Section 102.1.2.2.1 ;

102.1.2.2.1.1.3 Complete at least (1) one of the three (3) additional probationary ratings as one of the required two (2) Confirmed Ratings in the presence of a QA Designee or a Rater Trainer in lieu of repeating the Rater Training requirement.

102.1.2.2.2 In order for a Rater Field Inspector "Candidate" to be certified as a Rating Field Inspector, they must meet the requirements set forth in Section 205.2.2 "Certification for Rating Field Inspector (RFI).

102.1.2.2.2.1 A Rater Field Inspector Candidate that does not complete the five (5) probationary inspections to the satisfaction of a Certified Rater within twelve (12) months of passing the National Core Rating Field Inspection Test must successfully retake the Test and complete five (5) new probationary inspections prior to certification.

102.1.2.3 For previously certified Home Energy Raters and Rating Field Inspectors who are new to a QA Provider, as part of the QA Provider's due diligence process, it is a recommended best practice that QA Providers require a minimum of three (3) probationary ratings with the new Rater and three (3) probationary inspections with new Rating Field Inspectors to confirm their skills.

102.1.2.4 Professional Development and recertification for Raters and Rating Field Inspectors. Raters and Rating Field Inspectors shall complete one of the below three options for recertification:

102.1.2.4.1 Complete 18 hours of RESNET approved professional development every three years. The 18 hours shall include completion of 18 hours of refresher course(s) offered by a RESNET Accredited Training Provider.

102.1.2.4.1.1 Course(s) shall be approved by the RESNET Training and Education Committee annually;

102.1.2.4.1.2 The Training and Education Committee shall identify areas of importance;

102.1.2.4.1.3 Raters shall be required to pass an exam upon completion of the professional development training.

OR

102.1.2.4.2 Documentation of 18 hours of attendance at a RESNET Conference in three (3) years would fulfill this requirement.

OR

102.1.2.4.3 Every three (3) years, Raters must pass the RESNET National Rater Test and Rating Field Inspectors must pass the RESNET National Rating Field Inspector Test.

102.1.2.5 Raters and Rating Field Inspectors must be certified at least once every three (3) years.

102.1.2.6 Rater Agreements. As a condition of Rater certification, each QA Provider shall ensure that a certified Rater who has met the requirements of Chapter 2, Achieving Certification, has entered into a written agreement with the QA Provider to provide home energy rating, field verification, and diagnostic services in compliance with these standards. A copy of the Rater written agreement shall be provided to RESNET with the QA Provider's accreditation application and within 60 days of making changes to the agreement. The written agreement shall at a minimum require Raters to:

102.1.2.6.1 Provide accurate and fair ratings, field verification and testing in compliance with these standards and RESNET Board of Directors-approved interpretations;

102.1.2.6.2 Comply with the RESNET Code of Ethics. The "RESNET Code of Ethics" is posted on the RESNET website. The Code of Ethics shall be attached to the written agreement. An un-executed copy of the written agreement shall be provided to RESNET with a QA Provider accreditation application and within 60 days of making changes to the agreement.

102.1.2.6.3 Provide specific statistical information about number and type of ratings conducted as requested by the QA Provider, including but not limited to Rating Field Inspectors (RFI's) utilized to complete submitted ratings.

102.1.3 A QA Provider shall provide documentation with its accreditation application that the energy rating software used to produce energy ratings is properly licensed.

102.1.4 Minimum Standards for Rating Quality Assurance Provider Operation Policies and Procedures must be written and provide for the following:

102.1.4.1 Projected Ratings. If the home energy rating Provider's program provides for Projected Ratings, the rating must be clearly labeled as a Projected Rating. Projected Rating reports shall stipulate at the top of the page as follows in 14 point type minimum: "Projected Rating Based on Plans – Field Confirmation Required."

102.1.4.2 Field verification of rated features of all homes in compliance with Chapter 3 and Appendix A-On-Site Inspection Procedures for Minimum Rated Features of these Standards.

102.1.4.3 Blower Door Test completed on all homes claiming credit for reduced air infiltration.

102.1.4.4 Duct testing completed on all homes claiming credit for reduced air distribution system leakage.

102.1.4.5 When applicable, improvement analysis given to home owner.

102.1.4.5.1 Recommended improvements with the cost basis supplied for each recommendation by the home energy rating software program, QA Provider or the Rater receiving quotes.

102.1.4.5.2 Estimated energy and cost savings of improvements based upon assumptions contained in the QA Provider program.

102.1.4.6 Written conflict of interest provisions that prohibits undisclosed conflicts of interest but allows waiver with advanced disclosure. The *Home Energy Rating Standard Disclosure* form adopted by the RESNET Board of Directors shall be completed for each home that receives a home energy rating and shall be provided to the rating client and made available to the home owner/buyer. Each form shall include, at a minimum, the name of the community/subdivision, city, and state where the home is located. Each form shall accurately reflect the proper disclosure for the home that it is rated (i.e. it should, reflect the Rater's involvement with the home at the time the final rating is issued. For the purpose of completing this disclosure, "Rater's employer" includes any affiliate entities. Recognizing that a number of different relationships may occur between the Rater or the Rater's employer and the rating client and/or homeowner and/or the marketplace in general, the QA Provider shall ensure that all disclosures are adequately addressed by the Provider's quality assurance plan, in accordance with the relevant quality assurance provisions of the standards.

102.1.4.7 Written Rater discipline procedures that include provisions for Probation, Suspension, and Revocation of Rater certification. These provisions at a minimum shall include defined thresholds for each category and be in compliance with 903.4.2.7 and 903.4.3. The Provider shall update the Rater's status in the RESNET Building Registry within ten (10) business days of any change.

The following represent minimum provisions for each Rater disciplinary category. A Provider's policies and procedures may be more stringent than the following requirements.

102.1.4.7.1 Probation – Violations of RESNET standards discovered by a Provider's QA Designee and or through a QA Provider's complaint resolution process, RESNET quality assurance monitoring or through the RESNET complaint resolution process. The Provider shall notify the Rater in writing of the specified deficiencies and shall require that specific corrective action, set forth in the notification, be agreed upon and, if possible implemented, not later than twenty (20) business days after the date set forth in such notification:. Violations include, but are not limited to, the following:

102.1.4.7.1.1 Non compliance with annual requirements for quality assurance;

102.1.4.7.1.2 Non compliance with Rater equipment calibration and or re-certification requirements;

102.1.4.7.1.3 Discovered violations of one or more provisions of the RESNET Standards that result in four or more non-compliant rating as defined in section 903.4.2.7;

102.1.4.7.1.4 Discovered violations of one or more provisions of the RESNET Standards involving Rater requirements for disclosure, professional conduct, record keeping and or reporting;

102.1.4.7.1.5 Misrepresentation of a certification status in marketing materials or services offered or actually provided, for which the rater does not possess the appropriate RESNET certification from the Provider.

102.1.4.7.2 Suspension – Any Rater certified by a Provider may have their certification suspended for circumstances including, but not limited to, any of the following:

102.1.4.7.2.1 For non-compliance with the terms of probation;

102.1.4.7.2.2 Continued discovery of violations through increased quality assurance reviews in accordance with section 903.4.3;

102.1.4.7.2.3 Two Probations within a twelve month period;

102.1.4.7.2.4 Willful misconduct;

102.1.4.7.2.5 Misrepresentation of a certification status in marketing materials, or services offered or actually provided, for which the Rater does not possess the appropriate RESNET certification from the Provider.

102.1.4.7.2.6 Provisions for Rater suspension shall include:

102.1.4.7.2.6.1 Written notification to the Rater including the cause, terms and restrictions including notification of the suspension of the Rater ability to complete, submit or acquire any new rating projects or new rating business recognized by the Provider as of the date of suspension;

102.1.4.7.2.6.2 Notification of suspension to RESNET through the Buildings Registry, known Rater clients (i.e. builders or other organizations with repeat business with a Rater or Rating Company), RESNET, EPA or other known EEPs;

102.1.4.7.2.6.3 Removal of the Rater's name and in cases of a single Rater company, the company name from any promotional website or lists maintained by Provider.

102.1.4.7.2.7 At the Provider's discretion, a Rater may be allowed to complete ratings identified as in progress at the time of the suspension provided the following conditions are met:

102.1.4.7.2.7.1 The Rater shall submit to the Provider copies of any previously completed site visit documentation for the home(s) in question;

102.1.4.7.2.7.2 The Rater agrees to complete the ratings within a defined minimum time-frame (maximum of 90 days) in compliance with RESNET standards;

102.1.4.7.2.7.3 The Provider shall complete, and Rater agrees to be subject to, file QA for each identified rating completed under this Section. Rater agrees to pay any associated Provider fees for the additional required QA file reviews;

102.1.4.7.2.7.4 The Provider shall complete, and Rater agrees to be subject to, field QA for 50% of the identified ratings completed under this Section;

102.1.4.7.2.7.5 The Rating client is informed and agrees to the terms of completion there by acknowledging the terms and conditions of Rater suspension.

102.1.4.7.2.8 Successful compliance with the terms of suspension will result in the Rater being placed on probation. At a minimum the duration of a suspension is 90 days from notification, with the ability for a Rater's certification to be re-instated after 90 days under agreed upon terms of probation.

102.1.4.7.3 Revocation – Any Rater certified by a Provider shall have their certification revoked for circumstances including, but not limited to, any of the following:

102.1.4.7.3.1 A Rater chooses to not renew their certification;

102.1.4.7.3.2 For non-compliance with the progressive terms of probation or suspension;

102.1.4.7.3.3 Failure to reach an agreement on terms of probation or suspension;

102.1.4.7.3.4 The continued discovery of violations through the mandatory RESNET QA requirements.

102.1.4.7.4 Fraud

102.1.4.7.5 Provisions for revocation of Rater certification shall include:

102.1.4.7.5.1 Written notice of revocation of the Rater's certification and access to the Rating software being provided to the Rater, including a statement that the Rater is no longer recognized to complete ratings in affiliation with the Provider;

102.1.4.7.5.2 Notification of termination to known Rater clients (i.e. builders or other organizations with repeat business with a Rater or Rating Company), RESNET, EPA or other known EEP;

102.1.4.7.5.3 Removal of the Rater's name and in cases of a single Rating Company name from any promotional website or lists maintained by the Provider;

102.1.4.7.5.4 Indicate the rater's revocation in the RESNET Building Registry.

102.1.4.7.6 Rater's who have their certification revoked may at their initiative re-apply for certification to any QA Provider as a Rater candidate after a period of no less than 180 days from the date of revocation provided the following conditions are met:

102.1.4.7.6.1 The Rater completes a minimum of three (3) probationary ratings, deemed acceptable in demonstrating the Rater's technical and administrative skills in completing accurate ratings, under the supervision of a Provider's QA Designee;

102.1.4.7.6.2 The Rater agrees to file QA by the Provider's QA Designee of a minimum of 20% for twelve (12) months from the date of reinstatement;

102.1.4.7.6.3 The Rater meets all other certification requirements.

102.1.4.8 RESNET may at its discretion review disputes between Providers and Raters regarding a Rater's probation, suspension or revocation status. Providers and/or Raters seeking RESNET's assistance shall provide pertinent and substantive information and arguments in support of the request.

102.1.4.9 Rating and Tax Credit Verification record-keeping. QA Providers and/or their certified Raters shall maintain the Quality Assurance Date File for each rating and tax credit verification for the time frame specified in Section 904.8.8.3.

102.1.4.10 National RESNET Registry. The National RESNET Registry shall be maintained by RESNET and made available for use by accredited Home Energy Rating Quality Assurance Providers, their certified Raters and other parties in accordance with RESNET Board policy. Each accredited Home Energy Rating Quality Assurance Provider shall be included in the National RESNET Registry. Each accredited Home Energy Rating Quality Assurance Provider shall be responsible for maintaining a current and accurate listing of their Certified Raters using the National RESNET Registry. Each accredited Home Energy Rating Quality Assurance Provider shall be responsible for registering each Home Energy Rating conducted under the auspices of said Home Energy Rating Quality Assurance Provider in the National RESNET Registry in accordance with Sections 102.1.4.10.1 and102.1.4.10.2.

102.1.4.10.1 **Minimum Requirements**. At a minimum, the National RESNET Registry shall include:

102.1.4.10.1.1 The Rated Home characteristics, including but not limited to the following:

102.1.4.10.1.1.1 Physical location of the home, including street address, city, state and zip code

102.1.4.10.1.1.2 IECC climate zone of the home

102.1.4.10.1.1.3 Certified Rater ID

102.1.4.10.1.1.4 Accredited Rating Quality Assurance Provider ID

102.1.4.10.1.1.5 Date of the Rating

102.1.4.10.1.1.6 Status of the Rated Home (new or existing)

102.1.4.10.1.1.7 Rating Type for the home (confirmed or sampled)

102.1.4.10.1.1.8 Home Type (single-family, duplex, low-rise Multi-family)

102.1.4.10.1.1.9 Conditioned Floor Area of the home

102.1.4.10.1.1.10 Number of bedrooms in the home

102.1.4.10.1.1.11 The name and version number of the accredited software rating tool that created the Rating

102.1.4.10.1.2 The Rating results, including but not limited to the following:

102.1.4.10.1.2.1 Registration ID (provided by the Registry)

102.1.4.10.1.2.2 HERS Index Score

102.1.4.10.1.2.3 Annual Rated Home energy end uses for heating, cooling, hot water and lighting and appliance energy end uses by fuel type

102.1.4.10.1.2.4 Annual Rated Home on-site power production

102.1.4.10.1.2.5 Energy prices used to calculate costs by fuel type

102.1.4.10.1.2.6 Annual total cost to operate the Rated home

102.1.4.10.1.2.7 Annual Rated Home normalized Modified End Use Loads

102.1.4.10.1.2.8 Annual HERS Reference Home End Use Loads

102.1.4.10.1.2.9 Annual HERS Reference Home energy end uses for heating, cooling, hot water and lighting and appliance energy end uses by fuel type

102.1.4.10.1.3 An executable copy of the building input file used by the accredited software rating tool to generate the Home Energy Rating.

102.1.4.10.2 **Provider Responsibilities**. All accredited Home Energy Rating Quality Assurance Providers shall assure that the following minimum responsibilities are duly discharged.

102.1.4.10.2.1 All Home Energy Ratings conducted by their certified Raters are submitted to the National RESNET Registry.

102.1.4.10.2.2 All Quality Assurance controls that are required by National RESNET Standards are met or exceeded for Home Energy Ratings listed in the National RESNET Registry.

102.1.4.10.2.3 Rated Home Registration ID provided by the National RESNET Registry is prominently displayed on all Rating Certifications.

102.1.4.11 Complaint Response System. Each QA Provider shall have a system for receiving complaints. The QA Provider shall respond to and resolve complaints related to ratings, field verification, diagnostic testing services, and reports. QA Providers shall ensure that Raters inform purchasers and recipients of ratings and field verifications about the complaint system. Each QA Provider shall retain records of complaints received and responses to complaints for a minimum of three years after the date of the complaint.

102.1.4.12 All QA Providers shall collect and register the Energy Simulation File for each home rated (confirmed or sampled) by each Certified Rater with RESNET using the RESNET Buildings Registry. The QA Provider will register ratings and maintain this Registry in accordance with the policies and procedures established by RESNET related to the RESNET Buildings Registry.

102.1.4.13 Site data collection manual. All QA Providers shall provide Raters with a manual containing procedures for the on-site collection of data that at a minimum shall include the on-site inspection procedures for minimum rated features for new and existing homes provided in Appendix A- On-Site Inspection Procedures for Minimum Rated Features.

102.1.4.14 Written Quality Assurance Process that conforms to Chapter 9 of these Standards and any specific QA requirements for other Provider categories that may apply to a particular organization.

102.1.4.15 Rater training and certification requirements that conform to Chapter 1 and Chapter 2 of these Standards.

102.1.4.16 Rater Professional Development and recertification requirements that conform to Chapter 1 of these Standards.

103 Rating Software

103.1 Version Requirement

For the purposes of conducting Home Energy Ratings, as defined in these Standards, QA Providers shall be required to use the most current version of one of the RESNET approved rating software programs contained in the "National Registry of Accredited Rating Software Programs" posted on the RESNET website.

103.2 Rating Software Changes

Should changes that affect the calculated results of the home energy rating occur in the engineering algorithms of a RESNET approved home energy rating software program, QA Providers shall be required to do the following:

103.2.1 Transition period. On announcement of a new software version release, QA Providers have a maximum of 60 days to begin all new ratings with the new version.

103.2.2 This requirement only applies to changes mandated by the technical standard or otherwise affecting the calculations of the rating score or projected energy savings.

103.2.3 Persistence. Once a Projected Rating has been made on a property, the version of the rating software that was used initially may be used for the Confirmed Rating on that property. Providers, at their option, may update to the latest software version for in-process ratings.

104 Ratings Provided for Third-Party Energy Efficiency Programs

104.1 Definition

See Appendix B- Glossary of Terms for definition of Third Party Energy Efficiency Program (EEP)

104.2 Work Unrelated to Home Energy Ratings

When working with EEP's, Home Energy Raters may be required to perform tests, inspections, verifications and reporting that require skills related to energy efficiency not specific to Home Energy Ratings as defined in these Standards and/or are required to become a Certified Home Energy Rater. However, it is the responsibility of Certified Home Energy Raters to perform all of the stipulated tests, inspections, verifications and reporting related to energy efficiency required by the EEP when agreeing to work with their program, including proper completion of any and all checklists, certificates, or other documentation. Where a Rater does not possess the proper skill or knowledge of a particular test, inspection, verification or reporting requirement, they shall be responsible for obtaining sufficient training from the EEP, or trainer approved by the EEP, to properly fulfill the requirement. An exception may be made in cases where portions of an EEP's testing, inspection, verification or reporting process are completed by another company or individual who holds the required training or certifications.

104.3 QA Requirements

See Section 905 for QA Requirements for EEP's

Chapter 2- RESNET National Standard for Training and Certification

201 General Provisions

201.1 Purpose

The purpose of these standards is to ensure that Home Energy Rater Training is consistent and robust; to increase the credibility of the Training and Quality Assurance Providers with consumers, the housing and mortgage finance industry, federal government, state governments, local governments, utility companies, and the private sector; and to promote voluntary participation in an objective, cost-effective, sustainable home energy rating process.

201.2 Scope

This document defines the requirements of Accredited Training Providers, Certified Rater Instructors, and Certification Candidates. RESNET shall confirm that the requirements defined in this standard have been met when accrediting Training Providers and certifying Rater Instructors. Accredited Training Providers shall confirm that the requirements defined in this standard have been met when certifying individuals. This enhances the goal of producing a nationally recognized and uniform program.

201.3 Definitions and Acronyms

See Appendix B- Glossary of Terms.

202 General Provisions

202.1 Training and Education Committee

202.1.1 Committee Responsibilities

The Training and Education Committee considers, reviews, and approves the following items:

202.1.1.1 Core-competency examination questions, categories, time limits, and passing scores;

202.1.1.2 Subject categories that may be approved for Professional Development (PD) requirements for RESNET certified individuals.

202.1.2 Committee Chair

A member of the Board of Directors chairs the Training and Education Committee. RESNET Staff and the Board Chairperson nominate individuals to be the committee chair. Appointment of the committee chair requires majority approval of the Board.

202.1.3 Committee Members

The Committee Chair appoints individuals for committee membership. The RESNET Board of Directors retains the right to revoke individual committee membership.

202.1.4 Sub-Committees

Sub-committees may be formed to complete specific tasks. The chair of the Training and Education Committee appoints the sub-committee chairs. Sub-committee chairs and members need not be members of the Committee.

203 Accredited Training Providers

203.1 Achieving Accreditation

Training Providers are accredited in accordance with the Accreditation Process specified in Section 910.2 Provider Accreditation Process. Training Providers shall demonstrate through the following documentation that their training meets the criteria established through this Standard.

Training curriculum, materials, and manuals:

203.1.1 Examination materials.

203.1.2 Facilities description.

203.1.3 Organization description.

203.1.4 Principals and staff qualifications (detailed resumes).

203.1.5 The names of certified Rater Trainers it intends to teach classes.

203.2 Maintaining Accreditation

In order to maintain their accreditation in good standing, all Training Providers shall fully discharge the following duties and responsibilities. Failure to properly discharge any of these duties and responsibilities constitutes grounds for disciplinary action in accordance with Section 911 - *Probation, Suspension, and Revocation of Accreditation*.

203.2.1 Renew their accreditation in accordance with the renewal process found in Section 910.3 - Accreditation Renewal Process.

203.2.2 Maintain certified rater trainers. Only RESNET certified Rater Trainers can offer rater training through a RESNET accredited Rater Training Provider.

203.2.3 Hold the exam questions administered by RESNET in strictest confidence.

203.2.4 Maintain records for three years of all training materials and trainee data, training schedules, curricula, attendance records, examinations and individual examination results.

203.2.5 Provide candidates with a certificate or letter of completion, which accurately includes the candidate's legal name and completion dates of any items required for the candidate's certification.

203.2.6 Maintain curricula that align with the most up-to-date RESNET standards.

203.2.7 Provide for training facilities and equipment appropriate to the training being delivered.

203.2.8 Only RESNET accredited Training Providers can offer Rater Training using certified RESNET Rater Trainers.

203.3 Privileges and rights

Accredited Training Providers in good standing have the following privileges and rights:

203.3.1 The privilege to make and use any materials trademarked, copyrighted, or otherwise restricted by RESNET (other than the tests developed by RESNET) for marketing Training Courses or Training Providers or for recruiting Rater trainees, instructors or trainers.

203.3.2 The right to present evidence, arguments and a vigorous defense in any action brought under these standards by any party against a Training Provider.

203.4 Revocation of Accreditation

See Chapter 9- RESNET National Standard for Quality Assurance.

204 Certified Trainers

204.1 Achieving Certification

Individuals shall meet the following requirements to be certified as trainer. Only RESNET certified trainers can conduct rater training under the auspices of RESNET accredited Training Providers.

204.1.1 Demonstrate ability to effectively communicate with adults in a training environment. This ability is demonstrated through completion of a minimum sixteen (16) hour RESNET approved adult education program.

204.1.2 Demonstrate mastery of the Home Energy Rating System knowledge and ability sets provided in Section 207 - Capabilities. Mastery is demonstrated by passing the RESNET National Rater Training Competency Test with a minimum score of 90%.

204.1.3 Demonstrate mastery of the Home Energy Rating System knowledge and ability sets provided in Section 207- Capabilities. Mastery is demonstrated by passing the following three exams with a minimum score of 90%: The RESNET National Rater Training Competency Test, the RESNET Combustion Appliance Test, and The Work Scope Development Tests including the simulation exam.

204.1.4 Have an understanding of the purposes and benefits of home energy surveys, home energy ratings, and the ability to communicate these benefits to students.

204.1.5 Have a basic understanding of energy efficient mortgages, energy improvement mortgages and related products, and the ability to communicate these to students.

204.1.6 Beginning on January 1, 2015, as a certified Home Energy Rater, complete a minimum of twenty-five (25) Home Energy Ratings. These 25 Ratings shall have met the minimum quality assurance processes defined in Section 903.4. Trainers who were certified prior to the adoption of this amendment will have until January 1, 2017 to complete the required number of certified ratings.

204.2 Professional Development (PD)

Certified Trainers shall complete a two-hour annual RESNET roundtable on current information and also complete at least one of the following items:

204.2.1 Document twelve (12) hours per year of attendance at RESNET conferences, or RESNET approved Professional Development courses delivered by accredited

204.2.2 RESNET Training Providers, or RESNET sessions at Affordable Comfort Institute conferences, EEBA conferences, or other events and venues as approved by RESNET.

204.2.3 Instruct a minimum of thirty-six (36) hours of RESNET Certification or Professional Development per year, documented by an Accredited Training Provider in accordance with Section 203.2 – Maintaining Accreditation.

An individual that is both a Certified Trainer and Quality Assurance Designee shall complete both the two-hour RESNET roundtable for Rater Trainers and the two-hour roundtable for Quality Assurance Designees. Individuals selecting the additional PD option need only comply with the requirement one time. i.e. 24 hours is not required.

204.3 Revocation

The following items are ground for revocation of certified trainer designation.

204.3.1 Compromising the security or integrity of any RESNET certification exam.

204.3.2 Intentionally misrepresenting their training provider by training to curricula that differ from that submitted on the provider's training provider application.

204.3.3 Violation of RESNET defined test-proctoring procedures.

204.3.4 Non-payment of RESNET provider accreditation fees.

205 Certification Candidates

205.1 General Provisions

205.1.1 Training

Training is not required. Rater candidates who did not attend HERS rater training shall pass all required exams and complete probationary ratings.

205.1.2 Examinations

Examinations allow a candidate to demonstrate the knowledge required appropriate to their desired certification. RESNET online examinations are time-limited and open-book allowing any reference materials but excluding any form of communication with other individuals during the examination session. Written examinations are administered by RESNET and overseen by a RESNET certified trainer or their designated proctor. Approved proctors include BPI exam proctors, faculty and staff of libraries, trade schools, colleges, independent testing institutions, or others as approved by RESNET. Approved proctors shall adhere to RESNET's defined test proctoring procedures.

205.1.3 Simulated Practical Examinations

Simulated practical examinations allow a candidate to demonstrate their ability to perform certain tasks appropriate to their desired certification. Rater practical examinations shall be administered through the RESNET Rater Simulation Practical Examination.

205.1.3.1 The effective date for RESNET Rater Simulation Practical Test is July 1, 2016. Raters who were certified prior to July 1, 2016 shall pass the RESNET Rater Simulation Practical Test by July 1, 2017.

205.2 Certification

Prior to issuing a candidate's certification, a RESNET Accredited Rating Provider shall confirm that the candidate has completed at a minimum, all of the following tasks appropriate to their desired certification within a 12-month period. Only RESNET Accredited Rating Providers may certify candidates. Rating Providers may require additional training beyond these requirements as needed to address their specific program, climate, software, or administrative requirements.

205.2.1 Home Energy Survey Professional (HESP)

205.2.1.1 Pass the national HESP Exam with a score of at least 75%.

205.2.2 Rating Field Inspector (RFI)

205.2.2.1 Pass the RESNET graded field evaluation using the RESNET JobWerks RFI Tool.

205.2.2.1.1 The graded field evaluation shall performed under the observation of a certified trainer, Quality Assurance Designee, or QAD Delegate.

205.2.2.2 Complete at least five probationary Rating Field Inspections observed by a certified HERS rater or a quality assurance designee. The certified HERS Rater or QAD shall use the RESNET JobWerks RFI Tool to document the results of probationary inspections. The probationary Rating Field Inspections shall comprise at a minimum the following tasks.

205.2.2.2.1 Use pressure differential diagnostics to identify intermediate buffer zones including (but not limited to) attics, garages, or crawlspaces.

205.2.2.2.2 Identify insulation defects and account for them in energy analysis tool inputs.

205.2.2.2.3 Identify insulation types, thickness, and alignment with air barriers.

205.2.2.2.4 Measure pressure differences across the building envelope imposed by the operation of the home's equipment.

205.2.2.2.5 Perform envelope leakage testing in accordance with the airtightness testing protocols contained in ANSI/RESNET/ICC 380-2016~~RESNET/ICC/ANSI Standard 380-2016Chapter 8~~.

205.2.2.2.6 Perform duct leakage testing in accordance with the duct testing protocols contained in ANSI/RESNET/ICC 380-2016~~RESNET/ICC/ANSI Standard 380-2016~~ ~~Chapter 8~~ and interpret results.

205.2.2.2.7 Identify room and zone pressure imbalances caused by lack of ducted return air or pressure relief mechanisms such as transfer grilles or jumper ducts.

205.2.2.2.8 Perform CAZ, spillage, and CO testing in accordance with Carbon Monoxide (CO) Test and Depressurization Test for the Combustion Appliance Zone (CAZ) protocols contained in ANSI/ACCA 12 QH, Appendix A, Sections A4 and A5.

205.2.2.2.9 The effective date for item 205.2.2.2.8 is Jan 1, 2014. Rating Field Inspectors who were certified prior to Jan 1, 2014 shall pass the RESNET Combustion Appliance Test, and The Work Scope Development Tests before January 1, 2015.

205.2.2.3 RFI's shall not complete independent field testing and inspections until they have satisfactorily completed the requisite five probationary Rating Field Inspections per205.2.2.2 and pass the RESNET graded field evaluation.

205.2.2.4 After successfully completing the probationary Rating Field Inspections and passing the RESNET Graded Field Evaluation, RFI's may be permitted to conduct all rating tasks contained under Appendix A- On-Site Inspection Procedures for Minimum Rated Features: On-Site Inspections Procedures for Minimum Rated Features without having a certified Rater on site."

205.2.3 Home Energy Rater (HERS Rater)

205.2.3.1 Pass the national HERS Rater test, the RESNET Combustion Appliance Simulation Test with a score of at least 85, the Work Scope Development Test with a score of at least 80 and the RESNET Rater Simulation Practical Test with a score of at least 80% on each exam.

205.2.3.2 Demonstrate competency at certain tasks mentored by a Certified Trainer by completing two training ratings. These ratings shall not contain any errors identified by RESNET approved rating software. Both ratings shall have a reasonably acceptable level of accuracy when compared to the trainer's independent ratings of the same houses or building plans. The Trainer may choose these tasks to be performed in a hands-on environment, from house plans, or through RESNET approved computer simulations. However at least one of the two training ratings shall be a confirmed rating conducted in-person with a certified trainer on a real house. The candidate shall perform the following procedures during the confirmed training rating.

205.2.3.2.1 Use pressure differential diagnostics to identify intermediate buffer zones including (but not limited to) attics, garages, or crawlspaces.

205.2.3.2.2 Identify insulation defects and account for them in energy analysis tool inputs.

205.2.3.2.3 Identify insulation types, thickness, and alignment with air barriers.

205.2.3.2.4 Measure pressure differences across the building envelope imposed by the operation of the home's equipment.

205.2.3.2.5 Perform building envelope leakage testing in accordance with the airtightness testing protocols contained in ANSI/RESNET/ICC ~~RESNET/ICC/ANSI~~ Standard 380-2016 2016~~Chapter 8 –~~.

205.2.3.2.6 Perform duct leakage testing in accordance with the duct testing protocols contained in ANSI/RESNET/ICC 380-2016~~RESNET/ICC/ANSI Standard 380-2016 Chapter 8 –~~ and interpret results.

205.2.3.2.7 Identify room and zone pressure imbalances caused by lack of ducted return air or pressure relief mechanisms such as transfer grilles or jumper ducts.

205.2.3.2.8 Identify gas leaks using combustible gas sensing equipment. If a leak is found, recommend that a certified technician repair the leak.

205.2.3.2.9 Perform CAZ, spillage, and CO testing in accordance with Carbon Monoxide (CO) Test and Depressurization Test for the Combustion Appliance Zone (CAZ) protocols contained in ANSI/ACCA 12 QH, Appendix A, Sections A4 and A5.

205.2.3.2.10 Raters who were certified prior to January 1, 2014 shall pass the RESNET Combustion Appliance Test and The Work Scope Development Tests before January 1, 2015.

205.2.3.3 After passing the exam and completing the two training ratings, but prior to being certified, the candidate shall complete three probationary ratings with a Rating Provider. At least two of the three probationary ratings shall be confirmed ratings.

206 Recertification

206.1 To renew certification Home Energy Survey Professionals, Rating Field Inspectors, and HERS Raters, shall complete at least one of the following requirements every three years:

206.1.0.1 Pass the national RESNET test appropriate to their certification.

206.1.0.2 Document 18 hours of attendance at RESNET conferences, or RESNET approved Professional Development courses delivered by accredited RESNET Training Providers, or RESNET sessions at Affordable Comfort Institute conferences, EEBA conferences, or other events and venues as approved by RESNET. PD completed by RESNET certified individuals prior to achieving a higher certification will be applied toward the PD requirements of their new certification

207 Capabilities

Certified individuals shall have certain capabilities to perform the work required under their certification. The categories listed in this section are contained in Chapter 3 - , Chapter 8 -, ANSI/RESNET/ICC 380-2016~~RESNET/ICC/ANSI Standard 380-2016~~ and Appendix 1 - On-Site Inspection Procedures for Minimum Rated Features. Certification candidates shall demonstrate proficiency at these capabilities through successful completion of certification requirements specified in See Section 205 Certification Candidates. Training providers should ensure that their curricula effectively cover these items.

207.1 Home Energy Survey Professional (HESP)

Home Energy Surveys are primarily conducted on existing homes. HESPs do not perform any performance, diagnostic, or destructive testing. All capabilities listed here are limited to visually accessible items in the home unless otherwise noted.

207.1.1 General

207.1.1.1 Have a basic understanding of building performance evaluation.

207.1.1.2 Complete a RESNET approved Home Energy Survey form.

207.1.1.3 Demonstrate customer communication skills, ethics, and privacy.

207.1.2 Basics of specifications

207.1.2.1 Have a basic understanding of energy improvement measure interactions, expected life, and bundling for optimal performance considering the house-as-a-system and the emerging need for deep energy savings.

207.1.3 Health and Safety

207.1.3.1 Identify moisture issues such as condensation, leaks through building components, signs of mold or mildew, insect damage, efflorescence and stains.

207.1.3.2 Identify potential combustion appliance safety hazards related to previous retrofit work.

207.1.3.3 Identify evidence in combustion equipment of flame rollout, blocked chimneys, rust and corrosion, and missing or damaged vent connectors.

207.1.4 Building Science Concepts

207.1.4.1 Use appropriate energy terminology and definitions in home energy survey reports.

207.1.4.2 Identify areas of potential envelope leakage, thermal bypasses, and thermal bridging.

207.1.5 Determining Conditioned Space Volume

207.1.5.1 ~~Identify~~ Determine the Conditioned Space V~~v~~olume ~~within~~of a dwelling unit ~~building that is conditioned space~~ as defined in Appendix B.~~spaces as directly conditioned, indirectly conditioned, or unconditioned.~~

~~207.1.5.2 Define the home's thermal boundary and make appropriate recommendations for changing the thermal boundary.~~

207.1.6 Building Components

207.1.6.1 Identify exterior building components.

207.1.6.2 Determine building orientation and shading characteristics.

207.1.6.3 Measure building dimensions and use them to calculate gross and net areas.

207.1.6.4 Estimate approximate age of building.

207.1.7 Insulation

207.1.7.1 Identify the presence or absence of insulation and the quality of its installation when visually accessible.

207.1.7.2 Determine thickness, R-value, and location of insulation.

207.1.7.3 Recommend levels of insulation by climate zone.

207.1.8 Building Foundations

207.1.8.1 Identify foundation type as crawl space, basement, or slab-on-grade.

207.1.8.2 Identify foundation ventilation system types if present.

207.1.8.3 Identify location, type, and approximate R-value of foundation insulation systems.

207.1.9 Framed Floors

207.1.9.1 Identify location and type of floor system, its insulation type, thickness, and approximate R-value.

207.1.10 Above Grade Walls

207.1.10.1 Determine wall types, insulation thickness, and approximate R-value.

207.1.10.2 Identify signs of building additions.

207.1.11 Windows, doors, and skylights

207.1.11.1 Identify window and skylight types, frame materials, and permanently installed shading devices.

207.1.11.2 Determine window, door, and skylight efficiencies and performance factors.

207.1.12 Rim or Band Joist

207.1.12.1 Determine insulation type, thickness, and approximate R-value.

207.1.13 Ceilings

207.1.13.1 Determine ceiling type, insulation thickness, and approximate R-value.

207.1.14 Attic

207.1.14.1 Identify type of attic and location of attic venting.

207.1.15 Roof

207.1.15.1 Identify approximate age, type, and color of roofing materials.

207.1.15.2 Determine approximate R-value if insulated.

207.1.16 Systems

207.1.16.1 Identify types, model numbers, and location of systems.

207.1.16.2 Determine equipment efficiencies from equipment labels, model numbers or default tables.

207.1.16.3 Identify HVAC pros/cons, drivers and sensitivities for major system types.

207.1.16.4 Identify basic combustion appliance concerns.

207.1.17 Domestic Hot Water Systems

207.1.17.1 Identify system types and efficiency factors from equipment labels, model numbers, or default tables.

207.1.18 Air Leakage

207.1.18.1 Identify common air-leakage sites and indicate likely opportunities for leakage reduction.

207.1.18.2 Identify mechanical systems likely to cause air-leakage or pressure imbalances.

207.1.19 Duct Leakage

207.1.19.1 Determine duct type, location, and R-value.

207.1.19.2 Identify obvious leakage locations and indications of previous sealing.

207.1.20 Ventilation Systems

207.1.20.1 Identify presence and type of exhaust fans and determine whether they vent to outdoors.

207.1.20.2 Appliances and Lighting

207.1.20.3 Estimate efficiency from model numbers or vintage.

207.1.20.4 Identify potential lighting upgrades.

207.2 Rating Field Inspector (RFI)

A Rating Field Inspector is permitted to conduct all tasks contained within Appendix A- On-Site Inspection Procedures for Minimum Rated Features. A Certified Rating Field Inspector shall have proficiency at the capabilities of a HESP in addition to the following items.

207.2.1 General

207.2.1.1 Use field inspection forms to identify and document the minimum rated features of the Reference Home and Rated Home in accordance with the requirements of ANSI/RESNET/ICC 301-2014 – HERS Reference Home and Rated Home Configuration and Appendix A- On-Site Inspection Procedures for Minimum Rated Features – On-Site Inspection Procedures.

207.2.1.2 Identify potential problems with the building such as health and safety concerns, building durability issues, potential comfort problems, and possible elevated energy use.

207.2.1.3 Identify basic home construction types and the ramifications of these for energy usage.

207.2.2 Determining Conditioned Space Volume

~~207.2.2.1 Use pressure differential diagnostics to identify intermediate buffer zones including (but not limited to) attics, garages, or crawlspaces.~~

207.2.2.2 Determine the ~~c~~Conditioned ~~space~~ Space Volume of a dwelling unit as defined in Appendix B~~Appendix A- On-Site Inspection Procedures for Minimum Rated Features~~.

207.2.3 Health and Safety

207.2.3.1 Identify problems related to poor indoor air quality (IAQ), building durability, and human comfort.

207.2.3.2 Identify potential presence of mold and potential causes.

207.2.4 Moisture Principles and Properties

207.2.4.1 Identify potential or existing moisture issues (bulk water intrusion, capillary action, air transport, vapor diffusion).

207.2.5 Measuring Building Components

207.2.5.1 Use construction documents such as building drawings and specification sheets, or actual measured building dimensions to produce a scaled and dimensioned sketch of a home.

207.2.6 Collecting Field Data (including photo documentation)

207.2.6.1 Determine building orientation.

207.2.6.2 Measure window overhang lengths, heights, and distances from top and bottom of windows.

207.2.6.3 Determine roof slopes, gable heights, etc.

207.2.6.4 Calculate gross and net areas and volumes.

207.2.7 Insulation

207.2.7.1 Identify insulation types, thickness measurements, common usage locations, and alignment with air barriers.

207.2.7.2 Identify insulation defects, and grading (I, II, III).

207.2.8 Building Foundations

207.2.8.1 Identify type as crawl space, basement, or slab.

207.2.8.2 Identify ventilation system types.

207.2.8.3 Identify location, type, and R-value of insulation systems.

207.2.9 Framed Floors

207.2.9.1 Determine if framed floors are exposed to Cconditioned Sspace Vvolume, Uunconditioned Sspace Vvolume, ~~interstitial,~~ or ~~the~~ outdoors.

207.2.9.2 Determine floor system type and frequency of framing members.

207.2.9.3 Determine insulation thickness, type, and grade (I, II, or III).

207.2.10 Slab-on-Grade

207.2.10.1 Identify slab as covered or exposed.

207.2.11 Above Grade Walls

207.2.11.1 Determine if walls are exposed to ~~interstitial~~Conditioned Space Volume, U~~u~~nconditioned S~~s~~pace V~~v~~olume, or ~~the~~ outdoors.

207.2.11.2 Determine construction type, thickness, and exterior color.

207.2.12 Windows and Doors

207.2.12.1 Identify window labels, framing types and materials, U-factors, reflective and low-e films and coatings, shading and overhangs, and orientation.

207.2.12.2 Identify exterior door types, insulation, and orientation.

207.2.12.3 Identify glass-area of exterior doors and windows.

207.2.13 Heating and Cooling Systems

207.2.13.1 Determine equipment efficiencies using equipment data (make, model, nameplate data), AHRI or other current accepted guides, or age-based defaults.

207.2.13.2 Identify space-conditioning systems as active or passive.

207.2.13.3 Identify heating system properties: fuel type, burner type, venting type, distribution type, and efficiency.

207.2.13.4 Ground-source heat pumps, air-source heat pumps, and air conditioning systems.

207.2.13.5 Identify ductless systems (hydronic, steam, electric).

207.2.13.6 Identify combo systems.

207.2.13.7 Identify solar thermal systems.

207.2.13.8 Identify control types (standard thermostats, programmable thermostats, multi-zone controls.

207.2.13.9 Identify sizing and design issues, control types, and their impacts on energy use and humidity control.

207.2.13.10 Identify summer and winter design temperatures.

207.2.13.11 Identify cooling and heating system design trade-offs.

207.2.14 Gas Leakage Testing

207.2.14.1 Identify gas leaks using combustion gas sensing equipment.

207.2.15 CAZ Testing

207.2.15.1 Perform CAZ depressurization, spillage, and CO testing.

207.2.15.2 Identify CAZ depressurization issues caused by duct return leaks in the CAZ zone, supply leaks outside the house pressure boundary, zonal pressure imbalances, and/or exhaust appliances including other combustion equipment.

207.2.16 Air Leakage

207.2.16.1 Identify air leakage mechanisms and drivers, energy and comfort implications, and health and safety issues.

207.2.16.2 Perform single-point and multi-point building envelope leakage testing in accordance with the airtightness testing protocols contained in ANSI/RESNET/ICC ~~RESNETICC/ANSI~~ Standard 380-~~-~~ 2016 ~~Chapter 8 –~~.

207.2.16.3 Identify potential air sealing using zonal pressure differentials and measurement techniques

207.2.16.4 Measure pressure differences across the building envelope imposed by the operation of the home's equipment.

207.2.17 Conditioned Air Distribution Systems

207.2.17.1 Identify impacts of designed and imposed flaws (closed interior doors, blocked registers and grilles, air handler filters).

207.2.17.2 Identify duct supply and return types (flexible, rigid metal, building chase, insulated panels) and locations with respect to thermal and air barriers.

207.2.17.3 Identify room and zone pressure imbalances caused by lack of ducted return air or pressure relief mechanisms such as transfer grilles or jumper ducts.

207.2.17.4 Perform duct leakage testing in accordance with the duct testing protocols contained in ANSI/RESNET/ICC ~~RESNET/ICC/ANSI~~ Standard 380 2016~~Chapter 8 –~~ and recommend sealing as needed based on test results.

207.2.17.5 Determine need for duct insulation in ~~unconditioned~~ Unconditioned Space ~~v~~Volumes and specify thickness of retrofit insulation if needed.

207.2.18 Ventilation

207.2.18.1 Identify fresh air ventilation from supply, exhaust and balanced flow systems.

207.2.18.2 Identify heat-recovery ventilation (HRV) and energy-recovery ventilation (ERV) systems.

207.2.18.3 Determine HRV or ERV efficiency, fan power and duty cycle characteristics.

207.3 Home Energy Rating System Rater (HERS Rater)

A Certified Home Energy Rater shall have proficiency at the knowledge and abilities of a HESP and a Rating Field Inspector in addition to the following.

207.3.1 General

207.3.1.1 Understand and be familiar with local climate conditions, housing stock, and climate- specific practices.

207.3.1.2 Understand local utility pricing structures (flat vs. tiered rates, net-metering regulations) and sources for reliable utility information.

207.3.1.3 Prepare a detailed work scope.

207.3.1.4 Develop field inspection forms.

207.3.1.5 Identify major U.S. climate zones and energy consumption impacts of local climate zone.

207.3.2 RESNET Rating System

207.3.2.1 Communicate the business aspects of being a RESNET HERS Rater.

207.3.2.2 Maintain current knowledge of the HERS Rating method using the Reference Home as defined in ANSI/RESNET/ICC 301-2014.

207.3.2.3 Conduct both projected and confirmed building simulation and performance analysis to provide HERS Ratings in accordance with the requirements in Chapter 3 ~~–~~ and ~~Chapter 8 –~~ ANSI/RESNET/ICC 380-2016~~RESNET/ICC/ANSI Standard 380-2016~~ .

207.3.2.4 Use RESNET approved energy analysis software capable of producing a HERS Index, data entry procedures, reporting, and analysis of results.

207.3.2.5 Calculate HERS Score computation using the Normalized Modified Loads Rating Method.

207.3.2.6 Communicate the benefits of the Home Energy Rating System to homeowners, builders, finance and real estate agents and cultivate partnerships between those individuals.

207.3.2.7 Assist and educate customers and builders with:

207.3.2.7.1 Home Energy Surveys and Home Energy Ratings.

207.3.2.7.2 Cost effectiveness of energy efficient building design.

207.3.2.7.3 Quality assurance.

207.3.2.7.4 Marketing of HERS Rated Homes.

207.3.2.7.5 Qualifications for programs such as ENERGY STAR®.

207.3.2.7.6 Real estate financing, economic terminology, and energy code compliance.

207.3.2.7.7 Financing advantages of Energy Efficient Mortgages (EEM) and Energy Improvement Mortgages (EIM).

207.3.2.7.8 Adding appraisal value through energy improvements.

207.3.2.8 Provide excellent customer service in an ethical and fully disclosed manner.

207.3.2.9 Produce reports which meet minimum reporting requirements and improvement analysis.

207.3.2.10 Maintain standard operating procedures and office administration.

207.3.2.11 Maintain knowledge of current technical guidelines.

208 Reciprocity

Nationally accredited Home Energy Rating Providers shall accept certified training provided by an accredited Training Provider as meeting the core competencies for a Home Energy Rater. Accredited Home Energy Rating Providers may add additional training requirements needed to address their specific program, climate, software or administrative requirements.

Chapter 3- NATIONAL HOME ENERGY RATING TECHNICAL STANDARDS

301 General Provisions

301.1 Purpose

The provisions of this Standard are intended to establish residential energy rating standards, consistent with the provisions of the Energy Policy Act of 1992, that any provider of home energy ratings may follow to produce uniform energy ratings for residential buildings.

301.2 Scope

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

301.3 Relationship to Other Standards.

This Chapter is a companion to the (Chapter 1 of this Standard); (Chapter 2 of this Standard); and (Chapter 9 of this Standard).

302 Definitions

The following terms have specific meanings as used in this Standard. In the event that definitions given here differ from definitions given elsewhere, including those given in ANSI/RESNET/ICC 301- 2014, the definitions given here shall govern.

302.1 Approved Rating Provider

Shall mean a RESNET-accredited Quality Assurance Provider who is listed in good standing in the National RESNET Registry.

302.2 Approved Software Rating Tool

Shall mean a RESNET-accredited HERS® Rating Tool that has been tested and approved in accordance with RESNET Publication 002-15 and that is listed in the RESNET National Registry of Accredited Rating Software Programs http://www.resnet.us/professional/programs/energy_rating_software

302.3 Approved Tester

Shall mean a RESNET Rater or Rating Field Inspector (RFI) who has been certified by a RESNET-accredited Quality Assurance Provider and who is listed in good standing in the National RESNET Registry.

302.4 Certified Rater

Shall mean a RESNET Rater who has become qualified to conduct home energy ratings through certification by a RESNET-accredited Quality Assurance Provider and who is listed in good standing in the National RESNET Registry.

303 Technical Requirements

303.1 Applicable Standards

All RESNET Home Energy Ratings conducted in accordance with this Standard shall comply with the provisions of ANSI/RESNET/ICC 301-2014, "Standard for the Calculation and Labeling of the Energy Performance of Low-Rise Residential Buildings using the HERS Index."

303.2 Sampled Ratings

All Confirmed and Sampled RESNET Ratings shall be registered with the National RESNET Registry in accordance with Sections 102.1.4.10 and 102.1.4.12.

303.3 HERS Rating Tools

All RESNET-accredited HERS Rating Tools shall prohibit printing of Confirmed and Sampled HERS Ratings until such rating has been registered with the National RESNET Registry and a unique registration identification has been assigned. Said registration identification shall be prominently displayed on all printed HERS Rating reports.

Chapter 7- RESNET National Standards for Home Energy Audits

701 General Provisions

701.1 Purpose

The provisions of this standard are intended to define a framework for a home energy audit process. A certified auditor, an accredited Provider and/or a program will apply this standard to improve the energy performance of existing homes through uniform, comprehensive home energy surveys, audits and ratings for existing residential buildings. This standard is intended to encourage investments by building owners that produce the following outcomes:

Increase the energy efficiency of homes;

Increase the comfort of homes;

Increase the durability of homes;

Reduce the risk that energy improvement recommendations will contribute to health, safety, or building durability problems;

Reduce waste and pollution, protecting the environment; and

Ensure that the recommendations are within the community standards (e.g. historic districts, flood zones, subdivision covenants).

And to ensure that throughout the process, energy improvement recommendations are portrayed with reasonable and consistent projections of energy savings.

701.2 Scope

This Home Energy Audit Standard will address RESNET Providers for each area of home inspection, applicable procedures, types of home inspections, certifications of the inspectors, summary of requirements for each type of inspection, and the reports to accompany each type of inspection.

701.2.1 Application of Standards

This standard applies to existing site-constructed or manufactured, single- or multi-family, residential buildings three stories or less in height.

701.2.2 Relationship to State Law

This standard specifically recognizes that some state laws or regulations have additional requirements to those specified in this document. To the extent that such state laws or regulations differ from these Standards, state law or regulation shall govern.

701.3 Relationship to Other Standards

This Chapter is a companion Chapter to the RESNET Mortgage Industry National Home Energy Rating System Standard as promulgated and maintained by the Residential Energy Services Network (RESNET) and recognized by the mortgage industry and programs promoting the improved energy performance of buildings.

701.4 Definitions and Acronyms

See Appendix B- Glossary of Terms.

701.5 National Standard for Home Energy Audits.

There are 3 categories of home performance assessments defined in this standard, listed in order of increasing accuracy and completeness:

1. Home Energy Survey (HES)
    a. On-Line Home Energy Survey
    b. Professional Home Energy Survey

702 Home Energy Survey Professional Provider Accreditation Criteria

702.1 Minimum Standards for Home Energy Survey Professional (HESP) Provider Accreditation

Home Energy Survey Professional Providers shall be accredited in accordance with the Accreditation Process specified in Chapter 9 of these Standards. An HESP Provider shall specifically meet the following minimum standards for Accreditation.

702.1.1 Home Energy Survey Professional Standard. Home Energy Survey Professionals (HESPs) shall be certified (and re-certified) by RESNET-accredited HESP Providers, who shall abide by the following provisions:

702.1.1.1 HESP Providers shall provide documentation that the HESPs under their Providership meet the following certification requirements:

702.1.1.1.1 Performance Evaluation. HESPs shall pass a performance evaluation of their ability to perform accurate Home Energy Surveys and/or Building Performance Audits in accordance with sections 703 and 704. Each HESP shall complete a probationary period where close supervision is provided by the HESP Provider's QA Designee (as defined in Chapter 9 of these Standards).The probationary period covers a minimum of three Home Energy Surveys (as applicable) after which the QA Designee shall determine if additional training is needed.

702.1.1.1.2 Professional Development for HESPs. HESPs shall complete one of the below three options:

702.1.1.1.2.1 Complete 18 hours of professional development every three years. The 18 hours shall include completion of 18 hours of refresher course(s) offered by a RESNET Accredited HESP Training Provider; or

702.1.1.1.2.2 Documentation of 18 hours of attendance at a RESNET Conference every three (3) years; or

702.1.1.1.2.3 Pass the HESP online test every three years.

702.1.1.1.3 Testing. All certified HESPs shall pass the national Home Energy Survey Professional (HESP) online test administered by RESNET with a score of at least 75 percent.

702.1.1.1.4 Recertification of individuals by the HESP Provider shall occur every three (3) years.

702.1.1.1.5 Agreements. As a condition of certification, each HESP Provider shall ensure that each certified individual enters into a written agreement with the Provider to provide the applicable field verification services in compliance with these Standards. An un-executed copy of the written agreement shall be provided to RESNET with the Provider's accreditation application, and again within 60 days of making changes to the agreement. The written agreement shall, at a minimum require Auditors to:

702.1.1.1.5.1 Provide audit verification services in compliance with these Standards;

702.1.1.1.5.2 Provide accurate and fair Professional Surveys ; and

702.1.1.1.5.3 Comply with the RESNET Code of Ethics. The RESNET Code of Ethics shall be attached to the written agreement.

702.1.2 Minimum Standards for HEA Provider Operation Policies and Procedures shall be submitted in written form to RESNET for approval, and shall at a minimum provide for the following:

702.1.2.1 Written conflict of interest provisions that prohibit undisclosed conflicts of interest, but may allow waiver with advanced disclosure. The "Standard Disclosure" form adopted by the RESNET Board of Directors shall be completed for each home that receives a Home Energy Survey or Building Performance Audit and shall be provided to the client and made available to the homeowner. Each form shall accurately reflect the proper disclosure for the home that it represents. For the purpose of completing this disclosure, "Auditor's employer" includes any affiliate entities. Recognizing that a number of different relationships may exist among the auditor or the auditor's employer, other contractors that may complete work on the home, and the survey client and/or homeowner, the HESP Provider shall ensure that all disclosures are

adequately addressed by the Provider's quality assurance plan, in accordance with the relevant quality assurance provisions of these Standards.

702.1.2.2 Written Auditor discipline procedures that include progressive discipline for probation, suspension, and decertification.

702.1.2.3 In accordance with the minimum requirements set forth in Chapter 9 for quality assurance, a written audit Quality Assurance Plan and designation of a Quality Assurance Designee.

702.1.2.4 Auditor Registry. The HESP Provider shall maintain a registry of all of its certified Auditors. The specified Provider shall also keep on file the names and contact information for all certified Auditors, including company name, mailing address, voice phone number, fax number, and email address. Upon request, the HESP Provider shall provide to RESNET its registry of certified HESPs.

702.1.2.5 Complaint Response Process. Each HESP Provider shall have a publicly accessible system for receiving complaints. HEA Providers shall ensure that Auditors inform clients about the complaint process by publicizing the web address of the complaint resolution process. Each HESP Provider shall retain records of complaints received and responses to complaints for a minimum of three (3) years after the date of the complaint.

703 National Home Energy Audit Procedures

703.1 Home Energy Survey

The purpose of the Home Energy Survey is to assess the general condition of the home with respect to energy performance. The Home Energy Survey shall include a report that shows a general range of a home's energy efficiency based on minimum specific criteria (e.g. insulation, equipment age, general condition, energy usage and costs) and a lookup matrix based on regional norms and climate, as approved by RESNET. The Home Energy Survey is not required if the homeowner wishes to directly pursue a HERS Rating. The Home Energy Survey will take one of two forms: a DOE- or RESNET- approved computerized On-Line Home Energy Survey performed by the owner or occupant, or a Professional Home Energy Survey conducted by a certified Home Energy Survey Professional.

703.1.1 On-Line Home Energy Survey

The On-Line Home Energy Survey shall collect substantially the same data and information and shall be subject to the same limitations as the Professional Home Energy Survey. On-line Home Energy Survey software shall be hosted by a RESNET accredited HEA Provider or another organization approved by RESNET and the on-line program report shall be approved by RESNET.

703.1.2 Professional Home Energy Survey

The Professional Home Energy Survey shall include on-site visual inspection of the energy features of the dwelling unit, and documentation of its general condition, including envelope features and ages; equipment types, characteristics and ages; appliance and lighting characteristics; and likely anticipated remediation issues such as moisture or combustion appliance problems. Where available, the Professional Home Energy Survey shall include a review of utility use and billing history. The Home Energy Survey is a visual inspection only and does not include diagnostic testing. Home Energy Survey Professionals may also use home energy survey and labeling software programs approved by RESNET or the U.S. Department of Energy. A homeowner is not required to have a Professional Home Energy Survey prior to having a Building Performance Audit or Comprehensive HERS Rating.

703.1.2.1 The Home Energy Survey Professional (HESP) shall interview the homeowner regarding energy, comfort problems and related durability issues. The HESP shall review the goals listed in 701.1 of these Standard, and provide an explanation of the home energy audit process and potential availability of incentive programs that maybe accessed by the homeowner. The interview shall include, but is not limited to, the following subject areas:

703.1.2.1.1 Comfort complaints, including areas of the home that are too hot or too cold.

703.1.2.1.2 Energy billing concerns.

703.1.2.1.3 Durability issues, including water intrusion, ice damming, etc.

703.1.2.1.4 The potential for the homeowner to follow up with a Building Performance Audit or Comprehensive HERS Rating.

703.1.2.1.5 Interest in potential home energy performance improvements.

703.1.2.2 The HESP shall inform the homeowner of low cost/no cost improvements that can be implemented by the homeowner.

703.1.2.3 The HESP shall request copies of utility bills and/or written permission to obtain past energy use information from the utility supplier(s), for the purpose of estimating generalized end-use consumption (base, heating, and cooling). If the customer declines, the HESP shall explain the reason for the request and the potential effect on the home energy survey.

703.1.2.4 The HESP shall advise the homeowner on where to locate qualified individuals (including the RESNET website) to conduct a Building Performance Audit, a Comprehensive HERS Rating, and/or RESNET Qualified Contractors to complete the work on the home.

703.1.2.5 Minimum Procedures for a Professional Home Energy Survey:

703.1.2.5.1 The Home Energy Survey Professional (HESP) shall complete a RESNET-approved survey form. The survey form will require the HESP to visually review the home to determine, measure or estimate the following features:

703.1.2.5.1.1 R-values and location of wall/ceiling/floor insulation;

703.1.2.5.1.2 Square footage and approximate age of home;

703.1.2.5.1.3 Glazing type(s), frame material(s), and permanently installed shading devices such as screens or applied films;

703.1.2.5.1.4 Type, model number, efficiency (if available), and location of heating/cooling system(s);

703.1.2.5.1.5 Type of ductwork, location and R-value of duct insulation, visual assessment of obvious duct leakage, and any indications of previous duct sealing;

703.1.2.5.1.6 Type of foundation is crawl space, basement, or slab, along with venting and insulation locations;

703.1.2.5.1.7 Type of attic, approximate age, type and color of roofing material and presence and type of venting.

703.1.2.5.1.8 Checklist of common air-leakage sites; indicating likely opportunities for leakage reduction;

703.1.2.5.1.9 Estimated age and efficiency (if available), condition, number and location of major appliances such as dishwashers, refrigerators, freezers and washing machines;

703.1.2.5.1.10 Number, type, and controls of indoor and outdoor light fixtures and portable lamps that are suitable for energy efficient re-lamping;

703.1.2.5.1.11 Durability issues such as visual indications of common moisture problems, including condensation, roof leaks, foundation leaks, ground-water intrusion, ice damming, and plumbing leaks, as well as signs of mold, mildew, insect damage, efflorescence, and stains;

703.1.2.5.1.12 Presence, size, and location of exhaust fans, and determination of whether they are vented to the outdoors;

703.1.2.5.1.13 Number, type, and flow rate of water fixtures (e.g. faucets, showerheads), presence and control of hot water recirculation loop/pump;

703.1.2.5.1.14 Presence and type(s) of combustion equipment; visually identifiable evidence of flame roll-out, blocked chimney, rust and corrosion; missing or damaged vent connectors;

703.1.2.5.1.15 Mechanical systems that are likely to cause or contribute to excess infiltration or pressure imbalances, such as attic fans or bedrooms with no return air or transfer grilles.

703.1.2.5.1.16 Any identified potential combustion appliance safety hazards related to energy retrofit work.

703.1.2.5.2 The following elements are outside the scope of a Professional Home Energy Survey:

703.1.2.5.2.1 The use of blower doors, duct leakage test equipment or an infrared camera.

703.1.2.5.2.2 Any other diagnostic testing of the home

703.1.2.5.2.3 Quantification of any levels of air tightness, duct tightness, or ventilation amounts.

703.1.2.5.2.4 Combustion Appliance Zone (CAZ) testing

703.1.2.5.3 Energy savings estimates will only be generalized and presented along with the qualification that a Building Performance Audit or Comprehensive HERS Rating shall be obtained to calculate more detailed energy savings estimates.

703.1.2.6 Minimum Professional Home Energy Survey Report Documentation

703.1.2.6.1 At the completion of the Professional Home Energy Survey the Home Energy Survey Professional shall provide the homeowner a standardized report using a format approved by RESNET, signed and dated by the HESP. The report at a minimum shall provide information to the homeowner that addresses:

703.1.2.6.1.1 All data collected in accordance with Section 703.1.2.5, above;

703.1.2.6.1.2 Whole-house solutions overview of how the home works as a system and how to prioritize actions;

703.1.2.6.1.3 The quality of installation of HVAC equipment including general information on proper sizing of equipment, duct sealing, insulation and general condition of the ductwork, and the importance of proper refrigerant charge and air flow;

703.1.2.6.1.4 The quality of the building envelope air sealing and proper levels of insulation;

703.1.2.6.1.5 An overview of potentially appropriate ENERGY STAR or better products and appliances;

703.1.2.6.1.6 Information regarding access to a Building Performance Audit or HERS Rating;

703.1.2.6.1.7 Potential non-energy benefits of improving the energy efficiency of the home including reduction of carbon emissions, improved comfort and air quality;

703.1.2.6.1.8 General statement regarding opportunities to improve the thermal envelope, mechanical equipment, lighting and appliances in the home;

703.1.2.6.1.9 General discussion of observations and concerns regarding combustion appliance operation;

703.1.2.6.1.10 A safety notification form adopted by RESNET that is filled out and presented to the homeowner identifying potential hazards such as lead paint, asbestos, mold, and radon that are outside the scope of the Home Energy Survey;

703.1.2.6.1.11 Information on available rebate, financing, and/or tax incentive programs that will help the homeowner

703.1.2.7 Limitations

Unless certified by RESNET as a Building Performance Auditor or Comprehensive HERS Rater, (or another certification that is recognized by RESNET as equivalent), the Home Energy Survey Professional shall not produce a detailed written work scope for improvements as part of a Professional Home Energy Survey.

703.2 HERS Rating on an Existing Home

The purpose of the HERS Rating on an existing home is to identify building performance deficiencies and provide a work scope sufficient for improvements to be made to the audited home. The HERS Rating Performance Audit includes an evaluation, performance testing, computer software analysis using software that is accredited by RESNET for this purpose, and reporting of proposed treatments for improvement of an existing home. The evaluation shall include a review of the data collected from any previous energy audit or survey, any further required measurement and performance testing, and combustion appliance testing. The Rater shall determine the appropriate work scope for the home. A homeowner may elect to go through this process with or without a prior Professional Home Energy Survey. A HERS Rating on existing home includes all of the provisions of the Professional Home Energy Survey (Section 703.1.2.5), plus the performance of diagnostic testing and reporting requirements as follows:

703.2.1 Evaluate building shell air leakage in CFM_{50}

At a minimum, a single point (50 Pa) blower door depressurization test shall be performed in accordance with the envelope testing protocols contained in ANSI/RESNET/ICC 380-2016~~RESNET/ICC/ANSI Standard 380-2016 Chapter 8 of these Standards~~ and the results there of shall be included in the audit report.

703.2.2 Evaluate duct leakage.

703.2.2.1 The Auditor shall perform a duct leakage test in accordance with the protocols contained in ANSI/RESNET/ICC 380-2016~~RESNET/ICC/ANSI Standard 380-2016 Chapter 8~~ of these Standards, and/or specify a duct leakage test in accordance with RESNET standards prior to beginning any duct-sealing work.

703.2.3 Conduct CAZ Depressurization, Spillage and CO testing

703.2.3.1 The auditor must perform a worst-case depressurization, spillage, and CO test in accordance with the RESNET interim guidelines.

703.2.4 Prepare a Detailed Retrofit Work Scope

A BPA Report shall include a retrofit work scope in accordance with the RESNET interim guidelines.

703.2.4.1 The work scopes for recommended improvements shall be determined by the Auditor based upon the findings of the assessment and the client's budget and objectives. The recommendations shall be presented to the homeowner in order of priority based on cost effectiveness and priorities for remediation of combustion appliance deficiencies. At a minimum, five (5) of the most cost-effective measures must be recommended regardless of the client's budget.

703.3 HERS Rating

The HERS Rating is the most in-depth performance audit. It includes evaluation, performance testing, reporting of the proposed work scope for improvement of an existing home in accordance with Section 703.2, and a HERS Rating in accordance with Chapter 3 of these Standards. A homeowner is not required to have a Professional Home Energy Survey prior to having a Comprehensive HERS Rating.

704 Required Skills for Certification

704.1 Minimum skills and knowledge base required to conduct a Professional Home Energy Survey

704.1.1 Basics of heat transfer concepts

704.1.2 Basics of building performance testing

704.1.3 Basics of air distribution leakage

704.1.4 Calculating gross and net areas

704.1.5 Definitions/energy terminology

704.1.6 Basic combustion appliance concerns

704.1.7 Basics of envelope leakage, thermal bypass, thermal bridging

704.1.8 Determining envelope insulation

704.1.8.1 Presence/absence of insulation and when observable, the quality of its installation

704.1.8.2 Recommended levels of insulation by climate zone

704.1.9 HVAC – determining equipment efficiencies from model numbers or default tables

704.1.9.1 HVAC pros/cons, drivers and sensitivities of major system types

704.1.9.2 Household appliances – estimate efficiency from model numbers or vintage

704.1.9.3 Energy, power, moisture, heat-conductivity/resistance, and temperature units and key conversion factors

704.1.9.4 Measuring building dimensions

704.1.9.5 Identification and documentation of energy survey inspected features of the home

704.1.9.6 Basics of specifications

704.1.9.7 Determining window and door efficiency

704.1.9.8 Determining building orientation and shading characteristics

704.1.9.9 Defining the thermal boundary, and appropriate recommendations for changing the thermal boundary

704.1.9.10 Basics of measure interaction, expected life, and bundling for optimal performance considering the house as a system and the emerging need for deep savings.

705 General Limitations and Exclusions

705.1 Limitations

705.1.1 The energy use information contained in reports resulting from Professional Home Energy Survey HERS Ratings do not constitute any warranty of energy cost or savings.

705.1.2 Surveys Ratings that are performed in accordance with these standards:

705.1.2.1 Are not technically exhaustive.

705.1.2.2 Will not identify concealed conditions or latent defects.

705.1.3 The Building Performance Audit Comprehensive HERS Rating is intended to be an inspection of the structural soundness of the home or any other attributes of the home other than the home's energy features and safety issues related directly to proposed work scopes.

705.1.4 The Home Energy Survey is not applicable to building design and construction features except those listed in Section 703.1.2.5.

Chapter 8- RESNET Standards

801 General Provisions

801.1 Purpose

This Standard will present ~~a step-by-step approach for how to measure: enclosure air leakage for the inspection of low rise, three stories or less, residential and light commercial buildings, and duct leakage associated with HVAC systems air flows for ventilation systems, and~~ procedures for work scope development and combustion safety ~~procedures~~testing.

801.2 Scope

The purpose of this document sets out the procedures for ~~performance testing and~~ work scope development and combustion safety testing by which home energy ratings shall be conducted so their results will be acceptable to all public and private sector industries that may require an objective, cost-effective, sustainable home energy rating process.

801.3 Definitions and Acronyms

See Appendix B- Glossary of Terms.

~~802 Procedures for Building Enclosure Airtightness~~

~~The purpose of this test procedure is to determine the airtightness of a building enclosure measured in cubic feet per minute at a 50 Pa pressure difference (CFM_{50}).~~

~~802.1 On-Site Inspection Protocol~~

~~There are three acceptable airtightness test procedures:~~

~~802.1.1 Single-point test: Measuring air leakage one time at a single pressure difference as described in Section 802.5~~

~~802.1.2 Multi-point test: Measuring air leakage at multiple induced pressures differences as described in Section 802.6~~

~~802.1.3 Repeated single-point test: The test is similar to the single point test, but the test is done multiple times for improved accuracy and estimating uncertainty as described in Section 802.7~~

~~The building may be tested by applying a positive or negative pressure. Follow all manufacturers' instructions for set-up and operation of all equipment. If certain requirements of this standard cannot be met, then all deviations from the standard shall be recorded and reported.~~

~~**Note:** Use caution when deciding how and whether to test homes with potential airborne contaminants (e.g. fireplace ash, mold or asbestos) and refer to local, state and national protocols/standards for methods to deal with these and other contaminants.~~

~~802.2 Protocol for Preparing the Building Enclosure for Testing~~

~~802.2.1 Doors and windows that are part of the conditioned space boundary shall be closed and latched.~~

802.2.2 Attached garages: All exterior garage doors and windows shall be closed and latched unless the blower door is installed between the house and the garage, in which case the garage shall be opened to outside by opening at least one exterior garage door.

802.2.3 Crawlspaces: If a crawlspace is inside the conditioned space boundary, interior access doors and hatches between the house and the crawlspace shall be opened and exterior crawlspace access doors, vents and hatches shall be closed. If a crawlspace is outside the conditioned space boundary, interior access doors and hatches shall be closed. For compliance testing purposes, crawl space vents shall be open.

802.2.4 Attics: If an attic is inside the conditioned space boundary, interior access doors and hatches between the house and the conditioned attic shall be opened; and attic exterior access doors and windows shall be closed. If an attic is outside the conditioned space boundary, interior access doors and hatches shall be closed and exterior access doors, dampers or vents shall be left in their as found position and their position during testing shall be recorded on the test report.

802.2.5 Interior Doors: Shall be open within the Conditioned Space Boundary. See the definition of "Conditioned Space Boundary" for clarification.

802.2.6 Chimney dampers and combustion air inlets on solid fuel appliances: Dampers shall be closed. Take precautions to prevent ashes or soot from entering the house during testing. Although the general intent of this standard is to test the building in its normal operating condition, it may be necessary to temporarily seal openings to avoid drawing soot or ashes into the house. Any temporary sealing shall be noted in the test report.

802.2.7 Combustion appliance flue gas vents: Shall be left in their normal appliance-off condition.

802.2.8 Fans: Any fan or appliance capable of inducing airflow across the building enclosure shall be turned off including, but not limited to, clothes dryers, attic fans, kitchen and bathroom exhaust fans, outdoor air ventilation fans, air handlers, and crawl space and attic ventilation fans. Continuously operating ventilation systems shall be turned off and the air openings sealed, preferably at the exterior terminations.

802.2.9 Non-motorized dampers which connect the conditioned space to the exterior or to unconditioned spaces: Dampers shall be left as found. If the damper will be forced open or closed by the induced test pressure, that fact shall be reported in the test report. Clothes dryer exhaust openings should not be sealed off even if there is no dryer attached but this fact should be noted in the test report.

802.2.10 Motorized dampers which connect the conditioned space to the exterior (or to unconditioned spaces): The damper shall be placed in its closed position and shall not be further sealed.

802.2.11 Un-dampered or fixed-damper intentional openings between conditioned space and the exterior or unconditioned spaces: Shall be left open or fixed position, however, temporary blocking shall be removed. For example: fixed-damper ducts supplying outdoor air for intermittent ventilation systems (including central fan integrated distribution systems) shall be left in their fixed-damper position. *Exception:* Un-dampered supply air or exhaust air openings of *continuously operating* mechanical ventilation systems shall be sealed (preferably seal at the exterior of enclosure) and ventilation fans shall be turned off as specified above.

802.2.12 Whole building fan louvers/shutters: Shall be closed. If there is a seasonal cover, install it.

802.2.13 Evaporative coolers: The opening to the exterior shall be placed in its off condition. If there is a seasonal cover, install it.

802.2.14 Operable window trickle-vents and through-the-wall vents: Shall be closed.

802.2.15 Supply registers and return grilles: Shall be left open and uncovered.

802.2.16 Plumbing drains with p-traps: Shall be sealed or filled with water, if empty.

802.2.17 Combustion appliances: Shall remain off during the test.

Maintain the above conditions throughout the test. If during the test, induced pressures affect operable dampers, seasonal covers, etc. then reestablish the set-up and consider reversing direction of fan flow.

After testing is complete, return the building to its as found conditions prior to the test. For example, make sure that any combustion appliance pilots that were on prior to testing remain lit after testing.

802.3 Accuracy Levels for Enclosure Leakage Testing

This standard defines two levels of accuracy:

802.3.1 Standard level of accuracy: level of accuracy that produces test results that can be used in the modeling software or to assess compliance with a performance standard, energy code, or specific program requirement. This is the level of accuracy that is normally attained unless there are adverse testing conditions such as high winds, an extremely leaky building or very large baseline pressure adjustments.

802.3.2 Reduced level of accuracy: during adverse testing conditions or in certain applications where testing time and costs are a factor, a test with a reduced level of accuracy may be used. Such applications may include demonstrating compliance with a performance standard, energy code, or specific program requirement. However, measurements made with a reduced level of accuracy may require surpassing the threshold value by an amount which will account for the added uncertainty as defined in the sections below. RESNET accredited software that uses test results with a reduced level of accuracy shall internally adjust the calculations in accordance with this chapter.

802.4 Installation of the Blower Door Airtightness Testing System

802.4.1 Install the blower door system in an exterior doorway or window that has unrestricted access to the building and no obstructions to airflow within five feet of the fan inlet and two feet of the fan outlet. Avoid installing the system in a doorway or window exposed to the wind.

802.4.2 It is permissible to use a doorway or window between the conditioned space and unconditioned space as long as the unconditioned space has an unrestricted air pathway to the outdoors. For example, an attached garage or porch can be used as the unconditioned space; in that case, be sure to open all exterior windows and doors of the unconditioned space to the outdoors.

802.4.3 Install the pressure gauge(s), fans and tubing connections according to equipment manufacturer's instructions.

802.4.4 Record the indoor and outdoor temperatures in degrees F to an accuracy of 10 degrees F.

802.4.5 Record the elevation of the building site with an accuracy of 2000 feet; this may be omitted at elevations less than 5000 feet above sea level.

802.4.6 If ACH_{50}, i.e., air changes per hour @ 50 Pa, will be calculated, record the building volume (the volume enclosed by the conditioned space boundary).

802.5 Procedure for Conducting a One-Point Airtightness Test (if a multi-point test will be conducted, skip to Section 802.6)

802.5.1 Choose and record a time averaging period of at least 10 seconds to be used for measuring pressures. With the blower door fan sealed and off, measure and record 5, independent, average baseline building pressure readings with respect to outside to a resolution of 0.1 Pa.

802.5.2 Subtract the smallest baseline measurement from the largest recorded in Step 802.5.1 and record this as the baseline range.

802.5.3 Airtightness tests with a baseline range less than 5.0 Pa, will be considered a Standard Level of Accuracy Test. Airtightness tests with a baseline range between 5.0 Pa and 10.0 Pa will be considered a Reduced Level of Accuracy Test and the results will be adjusted using Section 802.8. A one point test cannot be performed under this standard if the baseline range is greater than 10.0 Pa. Record the level of accuracy for the test as standard or reduced, as appropriate. The baseline test may be repeated employing a longer time averaging period in order to meet the desired level of accuracy.

802.5.4 Re-measure the baseline building pressure using the same time averaging period recorded in Step 802.5.1 or use the average of the baseline pressures measured in step 802.5.1.This measurement is defined as the Pre-Test Baseline Building Pressure. If desired for greater accuracy, a longer time averaging period may be used. Record the Pre-Test Baseline Building Pressure.

802.5.5 Unseal the blower door fan. Turn on and adjust the fan to create an induced building pressure of approximately 50 Pa. Induced building pressure shall be defined as the (unadjusted) building pressure minus the pre-test baseline building pressure. If a 50 Pa induced building pressure cannot be achieved because the blower door fan does not have sufficient flow capacity, then achieve the highest induced building pressure possible with the equipment available.

802.5.6 A one-point test may only be performed if the maximum induced building pressure is at least 15 Pa and greater than four times the baseline pressure. If the maximum induced building pressure is less than 15 Pa, recheck that the house set up is correct and determine if any basic repairs are needed prior to further testing or modeling of the building. A multi-point test may be attempted, or multiple fans may be used. If using multiple fans, follow the manufacturer's instruction for measurement procedures.

802.5.7 Measure and record the unadjusted building pressure and nominal (not temperature and altitude corrected) fan flow using the same averaging period used in Step 802.5.4. Record the unadjusted building pressure (with 0.1 Pa resolution), nominal fan flow (with 1 CFM resolution), fan configuration (rings, pressurization or depressurization, etc), fan and manometer models and serial numbers.

802.5.8 Turn off the fan.

802.5.9 If your pressure gauge has the capability to display the induced building pressure (i.e. "baseline adjustment" feature) and adjust the fan flow value to an induced building pressure of 50 Pa (i.e. "@50 Pa" feature), then follow the manometer manufacturer's procedures for calculating the results of a one-point test and record the following values: induced building pressure, nominal CFM_{50}, fan configuration, fan and manometer models and serial numbers. If needed calculate the following values: induced building pressure = measured building pressure minus the Pre-Test Baseline Building Pressure

Note: If a "baseline adjustment" feature of the manometer was used, then the induced building pressure is displayed on the pressure gauge.

nominal CFM_{50}=(50 / induced building pressure) $^{0.65}$ x recorded fan flow

Note: If both a "baseline adjustment" feature and an "@50 Pa" feature were used, the nominal CFM_{50} is displayed directly on the pressure gauge.

If the altitude is above 5,000 feet or the difference between the inside and outside temperature is more than 30 degrees Fahrenheit then calculate the corrected CFM_{50} as defined below:

corrected CFM_{50}=

nominal CFM_{50} x altitude correction factor x temperature correction factor

where:

altitude correction factor= 1 + .000006 x altitude, altitude is in feet

temperature correction factors are listed in Table 802.1

802.6 Procedure for Conducting a Multi-Point Airtightness Test

802.6.1 Equipment that can automatically perform a multi-point test may be used to perform the steps below.

802.6.2 With the blower door fan sealed and off, measure and record the pre-test baseline building pressure reading with respect to outside. This measurement shall be taken over a time-averaging period of at least 10 seconds and shall have a resolution of 0.1 Pa. Record the pre-test baseline building pressure measurement.

802.6.3 Unseal the blower door fan. Turn on and adjust the fan to create an induced building pressure of approximately 60 Pa. If a 60 Pa induced building pressure cannot be achieved because the blower door fan does not have sufficient flow capacity, then adjust the fan to achieve the highest induced building pressure possible.

802.6.4 Measure the unadjusted building pressure (not baseline adjusted) and nominal fan flow (neither temperature nor altitude corrected) using the same time-averaging period used in Step 802.6.2. Record the unadjusted building pressure (with 0.1 Pa resolution), nominal fan flow (with 1 CFM resolution), fan configuration, fan model and fan serial number. Assure that the fan is being operated according to the manufacturer's instructions.

Note: since both pre- and post-test baseline measurements are required, do not use any baseline-adjustment feature of the manometer. In addition, do not use an "@50 Pa" feature because the nominal fan flow shall be recorded.

802.6.5 Take and record a minimum of 7 additional unadjusted building pressure and nominal fan flow measurements at target induced pressures which are approximately equally-spaced between 60 Pa (or the highest achievable induced building pressure) and 15 Pa. In very leaky buildings, the low end of this range may be reduced to as little as 4 Pa plus the absolute value of the baseline pressure.

802.6.6 Turn off and seal the blower door fan.

802.6.7 Measure and record the post-test baseline building pressure reading with respect to outside. This measurement shall be taken over the same time-averaging period used in Step 802.6.2 and shall have a resolution of 0.1 Pa. Record the post-test baseline building pressure measurement.

802.6.8 Enter the recorded test values, temperatures and altitude into software that can perform the necessary calculations in accordance with ASTM E779-10, Section 9. The software program shall calculate and report: corrected CFM_{50} and the percent uncertainty in the corrected CFM_{50}, at the 95% confidence

level, as defined in ASTM E779-10, Section 9. Although ACH_{50} may be reported, this calculation may be omitted if the ACH_{50} metric is not needed.

Note: To avoid a higher percent uncertainty than desired, the testing technician may choose a larger, time-averaging period and start over at Step 802.6.2.

802.6.9 If the reported uncertainty in the corrected CFM_{50} is less than or equal to 10.0%, then the airtightness test shall be classified as a Standard Level of Accuracy test. If the reported uncertainly in the corrected CFM_{50} is greater than 10.0%, the airtightness test shall be classified as a Reduced Level of Accuracy test and the results will be adjusted using Section 802.8.

802.7 Procedure for Conducting a Repeated Single Point Test

802.7.1 With the blower door fan sealed and off, measure and record the pre-test baseline building pressure reading with respect to outside. This measurement shall be taken over a time-averaging period of at least 10 seconds and shall have a resolution of 0.1 Pa. Record this value as the pre-test baseline building pressure measurement.

802.7.2 Unseal the blower door fan. Turn on and adjust the fan to create an induced building pressure of approximately 50 Pa. If a 50 Pa induced building pressure can not be achieved because the blower door fan does not have sufficient flow capacity, then achieve the highest induced building pressure possible with the equipment available.

802.7.3 If during any single repeat of this test, the induced building pressure is less than 15 Pa, recheck that the house set up is correct and determine if any basic repairs are needed prior to further testing or modeling of the building. Following any repairs or changes to the set up, the test shall be restarted from the beginning. If you can not reach at least 15 Pa every time, then use the procedures in sections 802.5 or 802.6.

802.7.4 Measure and record the unadjusted building pressure and nominal (not temperature and altitude corrected) fan flow using the same time-averaging period used in Step 802.6.2. Record the unadjusted building pressure (with 0.1 Pa resolution), nominal fan flow (with 1 CFM resolution), fan configuration (rings, pressurization or depressurization, etc), fan model and fan serial number.

Note: If your pressure gauge has the capability to display the induced building pressure (i.e. baseline adjustment feature) and the capability to adjust the fan flow value to an induced building pressure of 50 Pa (i.e. "@50 Pa" feature), then follow the manufacturer's procedures for calculating the results of a one-point test and record the following values: induced building pressure, nominal CFM_{50}, fan configuration, fan model and fan serial number.

802.7.5 Turn off the fan.

802.7.6 Calculate the following values: induced building pressure =unadjusted building pressure (Pa) minus pre-test baseline building pressure (Pa).

Note: If a baseline adjustment feature was used, then the induced building pressure is displayed on the pressure gauge.

nominal CFM_{50}=(50 Pa / Induced building pressure) $^{0.65}$ x nominal fan flow.

Note: If both a baseline adjustment feature and an "@50 Pa" feature were used, the nominal CFM_{50} is displayed directly on the pressure gauge.

802.7.7 Repeat Steps 802.7.1 through 802.7.6 until a minimum of 5 nominal CFM_{50} estimates have been recorded. The same fan configuration shall be used for each repeat.

802.7.8 Calculate the Average Nominal CFM_{50} by summing the individual nominal CFM_{50} readings and dividing by the number of readings.

802.7.9 If the altitude is above 5,000 feet or the difference between the inside and outside temperature is more than 30 degrees Fahrenheit then calculate the corrected CFM_{50} as defined below:

Calculate the Average Corrected CFM_{50}= Average Nominal CFM_{50} x altitude correction factor x temperature correction factor

where:

altitude correction factor= 1 + .000006 x altitude, altitude is in feet

temperature correction factors are listed in Table 802.1

Table 802.1 Temperature Correction Factors for Pressurization and Depressurization Testing - Calculated according to ASTM E779-10.

Correction Factors for Pressurization Testing

		INSIDE TEMPERATURE (F)								
		50	55	60	65	70	75	80	85	90
OUTSIDE TEMP (F)	-20	1.062	1.072	1.081	1.090	1.099	1.108	1.117	1.127	1.136
	-15	1.056	1.066	1.075	1.084	1.093	1.102	1.111	1.120	1.129
	-10	1.051	1.060	1.069	1.078	1.087	1.096	1.105	1.114	1.123
	-5	1.045	1.054	1.063	1.072	1.081	1.090	1.099	1.108	1.117
	0	1.039	1.048	1.057	1.066	1.075	1.084	1.093	1.102	1.111
	5	1.033	1.042	1.051	1.060	1.069	1.078	1.087	1.096	1.105
	10	1.028	1.037	1.046	1.055	1.064	1.072	1.081	1.090	1.099
	15	1.023	1.031	1.040	1.049	1.058	1.067	1.076	1.084	1.093
	20	1.017	1.026	1.035	1.044	1.052	1.061	1.070	1.079	1.087
	25	1.012	1.021	1.029	1.038	1.047	1.056	1.064	1.073	1.082
	30	1.007	1.015	1.024	1.033	1.041	1.050	1.059	1.067	1.076
	35	1.002	1.010	1.019	1.028	1.036	1.045	1.054	1.062	1.071
	40	0.997	1.005	1.014	1.023	1.031	1.040	1.048	1.057	1.065
	45	0.992	1.000	1.009	1.017	1.026	1.035	1.043	1.051	1.060
	50	0.987	0.995	1.004	1.012	1.021	1.029	1.038	1.046	1.055
	55	0.982	0.990	0.999	1.008	1.016	1.024	1.033	1.041	1.050
	60	0.977	0.986	0.994	1.003	1.011	1.019	1.028	1.036	1.045
	65	0.973	0.981	0.989	0.998	1.006	1.015	1.023	1.031	1.040
	70	0.968	0.976	0.985	0.993	1.001	1.010	1.018	1.026	1.035
	75	0.963	0.972	0.980	0.988	0.997	1.005	1.013	1.022	1.030

	80	0.959	0.967	0.976	0.984	0.992	1.000	1.009	1.017	1.025
	85	0.955	0.963	0.971	0.979	0.988	0.996	1.004	1.012	1.020
	90	0.950	0.958	0.967	0.975	0.983	0.991	0.999	1.008	1.016
	95	0.946	0.954	0.962	0.970	0.979	0.987	0.995	1.003	1.011
	100	0.942	0.950	0.958	0.966	0.970	0.982	0.990	0.998	1.007
	105	0.938	0.946	0.954	0.962	0.970	0.978	0.986	0.994	1.002
	110	0.933	0.942	0.950	0.952	0.966	0.974	0.982	0.990	0.998

Correction Factors for Depressurization Testing

		INSIDE TEMPERATURE (F)								
		50	55	60	65	70	75	80	85	90
	-20	0.865	0.861	0.857	0.853	0.849	0.845	0.845	0.837	0.833
	-15	0.874	0.870	0.866	0.862	0.858	0.854	0.854	0.846	0.842
	-10	0.883	0.879	0.874	0.870	0.866	0.862	0.862	0.854	0.850
	-5	0.892	0.887	0.883	0.879	0.875	0.871	0.871	0.863	0.859
	0	0.900	0.896	0.892	0.887	0.883	0.879	0.879	0.871	0.867
	5	0.909	0.905	0.900	0.896	0.892	0.888	0.888	0.879	0.875
	10	0.918	0.913	0.909	0.905	0.900	0.896	0.896	0.888	0.884
	15	0.927	0.922	0.918	0.913	0.909	0.905	0.905	0.896	0.892
	20	0.935	0.931	0.926	0.922	0.917	0.913	0.913	0.905	0.900
OUTSIDE TEMP (F)	25	0.944	0.939	0.935	0.930	0.926	0.922	0.922	0.913	0.909
	30	0.952	0.948	0.943	0.939	0.934	0.930	0.930	0.921	0.917
	35	0.961	0.956	0.952	0.947	0.943	0.938	0.938	0.930	0.925
	40	0.970	0.965	0.960	0.956	0.951	0.947	0.947	0.938	0.934
	45	0.978	0.974	0.969	0.964	0.960	0.955	0.955	0.946	0.942
	50	0.987	0.982	0.977	0.973	0.968	0.963	0.963	0.955	0.950
	55	0.995	0.990	0.986	0.981	0.976	0.972	0.972	0.963	0.958
	60	1.004	0.999	0.994	0.989	0.985	0.980	0.980	0.971	0.967
	65	1.012	1.008	1.003	0.998	0.993	0.988	0.988	0.979	0.975
	70	1.021	1.016	1.011	1.006	1.001	0.997	0.997	0.988	0.983
	75	1.029	1.024	1.019	1.015	1.010	1.005	1.005	0.996	0.991
	80	1.038	1.033	1.028	1.023	1.018	1.013	1.013	1.004	0.999
	85	1.046	1.041	1.036	1.031	1.026	1.022	1.022	1.012	1.008
	90	1.055	1.050	1.045	1.040	1.035	1.030	1.030	1.020	1.016

95	1.063	1.058	1.053	1.048	1.043	1.038	1.038	1.028	1.024
100	1.072	1.066	1.061	1.056	1.051	1.046	1.046	1.037	1.032
105	1.080	1.075	1.070	1.064	1.059	1.054	1.054	1.045	1.040
110	1.088	1.083	1.078	1.073	1.068	1.063	1.063	1.053	1.048

802.7.10 Estimate the precision uncertainty using one of the two following methods

802.7.10.1 Standard Statistical Process – Use a calculator or computer to compute the Standard Deviation of the repeated Nominal CFM_{50} readings. Divide this Standard Deviation by the square root of the number of readings. Multiply the result by the t-statistic in Table 802.2 corresponding to the number of readings taken. Convert this result to a percentage of the Average Nominal CFM_{50}.

Table 802.2 Precision Uncertainty: Values of t-statistic

Number of readings	t-statistic
5	2.78
6	2.57
7	2.45
8	2.37
9	2.31

802.7.11 If a software program is used, it shall at a minimum calculate and report:

802.7.11.1 Average CFM_{50}, corrected for altitude and temperature

802.7.11.2 The percent uncertainty in the CFM_{50}, at the 95% confidence level, as calculated in 802.7.10.

802.7.11.3 ACH_{50} (air changes per hour @ 50 Pa) = (CFM_{50} x 60) /building volume (in cubic feet). This calculation may be omitted if the ACH_{50} metric is not needed.

802.7.12 If the reported uncertainty in the CFM_{50} is less than or equal to 10.0%, then the airtightness test shall be classified as a Standard Level of Accuracy test as defined in section 802.3.If the reported uncertainly in the CFM_{50} is greater than 10.0%, the airtightness test shall be classified as a Reduced Level of Accuracy test as defined in section 802.3.

802.8 Application of Results

802.8.1 Adjusting CFM_{50} for Tests with a Reduced Level of Accuracy. When using results classified as having a Reduced Level of Accuracy, an adjustment shall be used in certain situations. The adjustment is done to improve the probability that the tested building meets the required performance threshold. The adjusted CFM_{50} in these situations is defined as:

adjusted CFM_{50} = extending factor x corrected CFM_{50},

where:

For a One-point Test, classified as Reduced Level of Accuracy:

extending factor = 1 + 0.1 x (50 / the induced pressure)

For a Multi-point Test, classified as Reduced Level of Accuracy:

extending factor = 1 + (% uncertainty / 100)

adjusted CFM_{50} value shall be used when:

determining whether or not a building meets an airtightness threshold, and

conducting a Home Energy Rating for the purpose of compliance with any standard, energy code or program.

adjusted CFM_{50} value shall NOT be used when:

calculating the expected energy savings from retrofit,

conducting an energy audit, or

assessing the relative airtightness of a group of buildings.

802.8.2 Other Leakage Metrics:

ELA may be calculated by: $ELA = 0.055 \times CFM_{50}$

Where ELA is in square inches

ACH_{50} = corrected CFM_{50} x 60 / building volume (in cubic feet)

Specific Leakage Area may be calculated by:

SLA = 0.00694 x ELA/ building floor area (square feet)

Where ELA (Effective Leakage Area) referenced to 4 pa is in square inches

Normalized Leakage Area may be calculated by:

$NLA = SLA \times (S)^{0.3}$, where S is the number of stories above grade

802.9 Equipment Accuracy and Requirements

Blower door fans used for building air leakage testing shall measure airflow (after making any necessary air density corrections) with an accuracy of +/- 5%.Pressure gauges shall measure pressure differences with a resolution of 0.1 Pa and have an accuracy of +/- 1% of reading or 0.5Pa, whichever is greater.

Blower door and associated pressure testing instruments shall be tested annually for calibration by the HERS Rating Provider or Certified Rater. The provider shall use a standard for field testing of calibration provided by the equipment manufacturer. Magnehelic Gauges cannot be field tested and shall be re-calibrated by the Blower Door manufacturer annually. Field check the fan and flow measuring systems for defects and maintain them according to manufacturers recommendations. The HERS Rating Provider or Certified Rater shall maintain a written log of the annual calibration check to verify all equipment accuracy for a period of three (3) years. These records shall be made available within 3 business days to the RESNET Quality Assurance Administrator upon request.

803 On-Site Inspection Procedure for Duct Leakage Testing

The purpose of these test procedures is to make a determination of the amount of leakage of a duct system, either total system leakage or leakage to outside of the conditioned space. Because total duct leakage (to both

inside and outside the conditioned space) at 25 Pascals should always be greater than the leakage to outside, the total leakage may be used instead of leakage to outside for determining that a system meets a required threshold. The total leakage value may be entered into software as if it were leakage to the outside for this purpose. However, total leakage should not be substituted for leakage to outside when conducting an energy audit or predicting savings from retrofits, except as indicated. Table 803.1 summarizes the test methods approved for use in the RESNET Standards.

803.1 Air Handler Flow

For the purposes of determining if a total duct leakage test method may be used (see Table 803.1), the Air handler flow can be measured in accordance with ASHRAE Standard152-2004, ASTM E1554-2007, or by using the following default values: 400 CFM per ton of air conditioner or heat pump capacity or 200 CFM per 12,000 Btu/h of furnace (output) capacity whichever is greater.

Table 803.1 Duct Leakage Test Methods

Test Method	Test pressure	Conversion to operating pressure	Supply/Return	Notes
Leakage to the Outside Tests				-
RESNET Standard Section 803.7	25 Pa	No conversion	Assume ½ supply and ½ return	-
ASHRAE 152 Annex B	25 Pa	½ plenum pressure for supply and return individually	Separate	-
ASTM E1554-07 Method A: "Delta Q"	Normal Operation	n/a	Separate	Can be used for energy auditing but not compliance testing. To limit precision errors this test is only allowed in this RESNET Standard if the Building Enclosure Leakage is less than 2500 cfm @ 50 Pa
ASTM E1554 Method B	25 Pa	½ plenum pressure for supply and return individually	Separate	-
-	-	-	-	-

Total Duct Leakage Tests				The total leakage may be used instead of leakage to outside for compliance testing. It may be used for energy audits or savings estimates if the total leakage is less than 10% of air handler flow.
RESNET Standard Section 803.5	25 Pa	No conversion	Assume ½ supply and ½ return	-
ASHRAE 152 Annex C	25 Pa	½ plenum pressure or assume 62.5 Pa	Assumes ½ supply and ½ return	2.5% of air handler flow added if testing done without air handler.2.5% added if testing done without registers/grilles.

803.2 RESNET Simplified Test Procedures

For purposes of this chapter, duct leakage may be measured by either pressurizing or depressurizing the duct system. Tests measure either total leakage or leakage to the outside. Total leakage includes all leaks in the air distribution system and leakage to the outside only refers to leaks to outside the conditioned space. The following text mentions only pressurization, but depressurization may also be used.

Testing of the duct system(s) of a building is accomplished by use of a duct leakage testing device and, when testing leakage to outside, a blower door. For total duct leakage, the duct leakage tester is attached and used to pressurize the duct system to 25 Pa. This test measures all duct leakage including leakage between the ducts and the conditioned space and leakage between the ducts and any unconditioned space or outside.

When performing a duct leakage to outside test, a blower door is also used to pressurize the building to 25 Pa while the duct leakage tester is used to equalize the pressure inside the duct system with the building pressure induced by the blower door (e.g 25 Pa). Multiple blower doors may be used if the conditioned space can't be uniformly pressurized with a single blower door (for example- a conditioned crawlspace). Because the ducts and the conditioned space of the building are theoretically at the same pressure, little or no air flows through leaks between the ducts and the conditioned space and the duct leakage tester only measures the leakage between the ducts and spaces outside the conditioned space. When ducts are entirely within the conditioned space boundary, 100% of the system is visible at the time of testing and the system is fully ducted (i.e., no building cavities are used to transport air) the ducts do not have to be tested and the ducts may be assumed to have no leakage to outside the conditioned space.

803.2.1 Multifamily Buildings

For multifamily buildings where each unit has its own duct system, each unit may be tested individually using the procedures in this RESNET standard. Each unit should be treated as if it is a single family dwelling. The leakage to outside test is performed using a blower door in the main entry to the unit to pressurize the individual unit with reference to outside. If the main entry door is in an interior hallway then the hallway needs to be well connected to outside through open windows or doors or an exterior window or door (such as to deck or patio) may be used. Similarly, only the ducts in the unit under test are pressurized. For compliance testing, use measured leakage to outside. For energy audits or savings estimates, it may be assumed that the leakage to outside is one-half of this measured leakage. For compliance testing, the total leakage test method may be used instead of leakage to outside.

803.3 Protocol for Preparing the Building and the Duct System for a Duct Leakage Test

~~(Items 803.3.1-803.3.8 are used for both Total and Outside Leakage tests)~~

~~803.3.1 Adjust the HVAC system controls so that the air handler fan does not turn on during the test.~~

~~803.3.2 Turn off any fans that could change the pressure in either the conditioned space or any spaces containing ducts or air handlers (bathroom fans, clothes dryers, kitchen vent hood, attic fan, etc.).~~

~~803.3.3 Turn off all vented combustion appliances if there is a possibility that the space containing the appliance will be depressurized during the test procedure.~~

~~803.3.4 Remove all filters from the duct system and air handler cabinet. If the duct leakage testing system is installed at a central return grille, also remove the filter from that grille.~~

~~803.3.5 Any intentional openings into the duct system such as combustion air or ventilation ducts shall be left in their normal non-ventilation operating position. Motorized dampers should be closed.~~

~~803.3.6 If ducts run through unconditioned spaces such as attics, garages or crawlspaces, open vents, access panels, doors, or windows between those spaces and the outside to eliminate pressure changes due to duct leakage during the test procedure.~~

~~803.3.7 Supply registers and return grilles shall be temporarily sealed in some manner so as to allow for the pressurization of the duct system.~~

~~803.3.8 Zone and bypass (not balancing) dampers shall be set to the open position to allow uniform pressures throughout the duct system.~~

~~Total leakage test only: Fully open at least one door, window or comparable opening between the building and outside to prevent changes in building pressure when the duct leakage testing system is running.~~

~~Leakage to the outside test only: All exterior doors and windows between the building and outside shall be closed, and other openings to the outside that may hinder the ability of a blower door fan to pressurize the building to 25 Pa with reference to outside should be closed or covered in some manner. Interior doors shall be open.~~

~~803.4 Installation of the Duct Leakage Testing System (used for both total leakage and leakage to outside tests)~~

~~803.4.1 Attach the duct leakage tester system to the largest return grille closest to the air handler. Use the manufacturer's recommended installation procedure that is consistent with the mode (i.e. pressurization vs. depressurization) of the test being performed. Be sure the remaining opening in the return grille is temporarily sealed. When testing a duct system with 3 or more returns, installation of the duct leakage tester at the air handler cabinet may be a better attachment location. Document the attachment location of the duct leakage testing system.~~

~~803.4.2 Select a location to measure duct pressure. Choose one of the following three locations to measure duct pressure:~~

~~The largest supply register closest to the air handler, or~~

~~The main supply trunk line, or~~

~~The supply plenum can be used if the duct leakage tester is installed at a central return.~~

~~Document the duct pressure measurement location.~~

803.4.3 Insert a pressure probe into the duct system at the chosen measurement location. If measuring at the supply trunk line or supply plenum, you must use a static pressure probe (be sure the probe is pointing into the air stream). If measuring at a supply register, you may use a static pressure probe, or you may simply insert a straight pressure probe or the end of a piece of flexible tubing.

803.4.4 Install the pressure gauge and tubing connections in accordance with the manufacturer's instructions and the test mode (pressurization vs. depressurization) being used. The duct system pressure should be measured with reference to the inside of the building. Turn on and configure the pressure gauge for the test procedure being performed.

803.5 Procedure for Conducting a Total Duct Leakage Test

803.5.1 Select the appropriate range (e.g. flow ring) of the duct leakage testing fan and configure the flow gauge to match the selected range.

803.5.2 Turn on the duct leakage testing fan and increase fan speed until the duct system has been pressurized to 25 Pa (+/- 0.5 Pa). Measure and record the duct pressure reading (0.1 Pa resolution) and the fan flow reading (1 CFM resolution) using a 5 second averaging period. Also record the fan configuration (range), fan and manometer models and serial numbers. Be sure the fan is being operated according to the manufacturer's instructions.

If 25 Pa of duct pressure cannot be achieved because the duct testing fan does not have sufficient flow capacity, then achieve the highest duct pressure possible with the equipment available and record the values above.

Note: If your pressure gauge has the capability to adjust the fan flow value to a duct pressure of 25 Pa (i.e. @25 Pa feature), then follow the manufacturer's procedures for conducting a one-point total leakage test, and record the following values: duct pressure, CFM25 (or fan flow in CFM and pressure in Pa if 25 Pa not achieved), fan configuration, fan and manometer models and serial numbers. If your gauge does not have an @25 feature and the measured duct pressure was not exactly 25 Pa, calculate and record CFM_{25} as: $CFM_{25} = (25\ Pa / \text{duct pressure})^{0.6} \times \text{fan flow}$.

803.5.3 Turn off the duct testing fan.

803.6 Installation of the Blower Door System (used for leakage to outside test only)

803.6.1 Install the blower door system in an exterior doorway that has unrestricted access to the building and no obstructions to air flow within five feet of the fan inlet. The blower door fan should be installed in a configuration that is consistent with the mode of the duct leakage test (i.e. pressurization vs. depressurization).

803.6.2 Install the pressure gauge(s), fan and tubing connections as per manufacturer's instructions.

803.7 Procedure for Conducting a Duct Leakage to Outside Test

803.7.1 With both the blower door and duct leakage fans sealed, measure the baseline building pressure with reference to outside using a 5 second averaging period.

803.7.2 Unseal the blower door fan. Turn on the blower door fan and pressurize the building by 25 Pa (+/- 0.5 Pa) from the measured baseline building pressure (i.e. change the building pressure by 25 Pa). **Note:** If your pressure gauge has the capability to display the induced building pressure (i.e. baseline adjustment feature), then follow the manufacturer's procedures for pressurizing the building by 25 Pa.

803.7.3 With the blower door fan continuing to run, unseal the duct leakage testing fan and select the appropriate range on the duct leakage testing fan. Configure the duct leakage testing system gauge to match the selected range.

803.7.4 Turn on the duct leakage testing fan and increase fan speed until the duct system pressure reads 0.0 (+/- 0.1 Pa). **Note:** The duct system pressure should be measured with reference to the inside of the building.

803.7.5 Re-check the blower door pressure gauge and if necessary, re-adjust the blower door fan to maintain a 25 Pa pressurization. **Note:** If the blower door fan is being operated with a "cruise control" feature, it is not necessary to recheck the blower door pressure gauge.

803.7.6 Return to the duct leakage pressure gauge and if necessary, re-adjust the duct leakage testing fan until the duct system pressure reads 0.0.

803.7.7 Record the following values: building pressure, duct pressure, CFM of flow through the duct testing fan, duct testing fan configuration, duct testing fan and manometer models and serial numbers. Calculate and record CFM25:CFM25 = (25 Pa/ building pressure)$^{.6}$ x duct leakage fan flow.

803.7.8 Turn off both the blower door and duct leakage testing fans.

Note: If the blower door system is unable to pressurize the building to 25 Pa because the blower door fan does not have sufficient flow capacity, then you will need to conduct the test at the highest achievable building pressure and adjust the measured duct leakage as described in step 803.7.7.

Note: If the duct testing fan was unable to create a pressure difference of zero between the duct system and the building (while the blower door is pressurizing the building to 25 Pa) because the duct testing fan does not have sufficient flow capacity, then the test will need to be performed at a lower building pressure and adjust the measured duct leakage as described in step 803.7.7.

803.8 Application of Results

803.8.1 The results of the total duct leakage test represent the total amount of duct leakage both to the inside and to the outside of the conditioned space and represent the overall leakage of the entire system. The total leakage may be of use in some programs where the total system duct leakage is required.

803.8.2 The duct leakage to the outside test is designed to measure only the duct leakage occurring to the outside of the conditioned space. Many programs use this measurement as the determining factor as to whether a duct system fails or passes.

803.8.3 If rating software requires separate input of supply and return leakage that have not individually been measured you shall assume that ½ of the total measured leakage is in the supply and ½ is in the return.

803.9 Equipment Accuracy and Requirements

Duct testing fans used for determining either total leakage or leakage to outside shall measure airflow with an accuracy of +/- 5%.Pressure gauges shall measure pressure differences with a resolution of 0.1 Pa and have an accuracy of +/- 1% of the reading or 0.5 Pa, whichever is greater.

Blower doors, duct testers, and associated pressure testing instruments shall be field-tested annually for calibration. The calibration procedure shall follow the equipment manufacturer's recommendations.

The HERS Rating Provider or Certified Rater shall maintain a written log of the annual calibration check to verify all equipment accuracy for a period of three (3) years. These records shall be made available within 3 business days to the RESNET Quality Assurance Administrator upon request.

804 On-Site Inspection Procedure for Ventilation Airflow Testing

The purpose of these test procedures are to measure the air flows through whole house ventilation systems and local exhausts. The test procedures treat the air flows into and out of the grille being measured separately. The Air Flow Resistance method may only be used on systems that do not have multiple branches in the ventilation air duct system. Use of a manometer with manufacturer-installed calibrated ports (common on ERV/HRV equipment) is an acceptable method if the manufacturer's instructions are followed

804.1 Air Flows into Grilles

804.1.1 Powered Flow Hood

A powered flow hood consists of:

A flow capture device that is to be placed over the grille to be measured. The flow capture element needs to be large enough to cover the whole grille and be airtight.

A pressure measuring system inside the flow capture element that is designed and installed to measure the static pressure inside the flow capture element.

A manometer to measure the pressure difference between the inside of the flow capture element and the room.

An air flow meter to measure the air flow through the air flow capture element. The air flow meter shall measure airflow with an accuracy of +/- 5%.

A variable-speed fan to move air through the flow capture element and the flow meter.

804.1.1.1 Place the flow capture element over the grille to be measured.

804.1.1.2 Turn on the air flow assisting fan and adjust the airflow until zero pressure difference is measured between the flow capture element and the room.

804.1.1.3 Record the air flow through the air flow meter.

804.1.2 Air Flow Resistance

The Air Flow Resistance method measures the pressure difference across a flow capture element with a known air flow resistance. A rectangular user fabricated box can be used if the size of the hole is not greater than half the size of the box in each direction and the distance from the hole to the grille is at least as large as the larger dimension of the hole. User fabricated devices shall be approved by a provider prior to use.

804.1.2.1 Place the flow capture element over the grille to be measured. Ensure there is air tight seal around the grille and the flow device so that all of the air entering the grille goes through the device.

804.1.2.2 Measure the pressure difference (DP) between the flow capture element and the room at a corner of the inlet side of the box. The hole in the flow capture device should be sized so that the pressure difference is between 1 and 5 Pa.

804.1.2.3 Calculate the air flow using the manufacturer's calibration of the air flow resistance device.

~~For user fabricated devices that do not have a manufacturer's calibration, the following equations may be used to calculate the air flow.~~

~~Air Flow (cfm) = Open Area´1.07´(DP)$^{0.5}$; for Area in in^2, DP in Pa~~

~~Air Flow (L/s) = Open Area´0.078´(DP)$^{0.5}$; for Area in cm^2, DP in Pa~~

~~804.2 Air Flows Out of Grilles~~

~~804.2.1 Powered Flow Hood~~

~~The measurement procedure is the same as for air flow into grilles (Section 804.1.1) but with the fan and flow meter arranged to have flow out of the grille.~~

~~804.2.2 Bag Inflation~~

~~The Bag Inflation method requires the use of a bag of a known volume, a method to hold the bag open (typically a lightweight frame of wood, plastic or metal wire), a shutter to start the air flow and a stopwatch.~~

~~804.2.2.1 Completely empty the bag of air and place a shutter over its opening.~~

~~804.2.2.2 Rapidly withdraw the shutter and start the stopwatch.~~

~~804.2.2.3 When the bag is completely full stop the stopwatch.~~

~~804.2.2.4 Calculate the airflow by dividing the bag volume by the elapsed time. Calculate the air flow in cfm as 8 X bag volume in gallons/number of seconds~~

~~804.2.2.5 Repeat measurement one or more times and average the results.~~

~~804.2.2.6 How to Choose a Bag~~

~~Plastic thickness. Bags made from thinner material often do not fill uniformly because the air flow from the register blows them about too much. If the bag sides flap a lot and measuring the same register twice gives results that differ by more than 20%, then try a bag with thicker material.~~

~~Use the right sized bags. Bags that fill in under two seconds will have increased errors because of resolution issues in timing how fast the bag is filled. Conversely, bags that are too large for a given register flow will have increased leakage around the edges of the bag before it fills completely and may not generate enough pressure to push a bag into its final shape. Aim for a fill time of 2 to 20 seconds.~~

~~804.3 Equipment Accuracy Requirements and Specification~~

~~The manometer shall measure pressure differences with a resolution of 0.1 Pa and have an accuracy of +/- 1% of the reading or 0.5 Pa, whichever is greater.~~

80~~2~~5 Combustion Safety Testing~~Procedure~~

80~~2~~5.1 These protocols contained in ANSI/ACCA 12 QH-2014, Appendix A, Sections ~~A4~~ A3 (Carbon Monoxide Test) and A~~4~~5 (Depressurization Test for the Combustion Appliance Zone) shall be followed by

RESNET-accredited Raters and Auditors (hereinafter referred to collectively as “Auditors”) performing combustion appliance testing.

80~~25~~.2 Prior to conducting any test that affects the operating pressures in the home, the Auditor shall inquire whether a person that has environmental sensitivities (asthma, allergies, chemical sensitivity, etc.) is present in the home. If such a person is present, the Auditor shall not perform such tests without written disclosure from the affected party (or responsible adult). The written disclosure shall state (at a minimum) that “during the period of testing, some amount of dust, particles, or soil gases already present in the home may become airborne.” Without a signed disclosure, the Auditor shall either reschedule the test for a time when they will not be present, or ask them to leave the home during the testing process. The Auditor shall also inquire as to the presence of pets that may potentially be affected by testing procedures.

802.3 ~~8036~~ Gas Leakage Test

80~~32~~6.3.1 If there is a noticeable odor indicating gas buildup within the home, the occupants and Auditor shall leave the house and the appropriate authorities and utility providers shall be notified from outside the home.

80~~32~~6.~~2~~ 3.2 The Auditor should use a gas detector upon entry into the home to detect the presence of natural gas. If gas is suspected or confirmed, ensure that switches are not operated while exiting and no ignition concerns are present. The audit shall not proceed until the proper authorities have deemed it safe to re-enter the home. If there is no noticeable odor indicating gas buildup within the home, the Auditor shall determine if there are gas leaks in the fittings and connections of natural gas appliances within the home and natural gas/liquid propane supply lines following these protocols.

80~~32~~6.3.3 Inspect all fittings and joints in supply lines and appliance connectors and confirm suspected leaks with leak-detection fluid. Identify for repair or replacement any kinked, corroded or visibly worn flexible gas lines and any flexible connectors manufactured prior to 1974.

80~~32~~6.~~4~~ 3.4 Equipment needed.

802.3.4.1 Combustible gas detector capable of measuring 20 ppm

802.3.4.2 Leak detection fluid (non-corrosive)

80~~34~~7 Work Scope for Contractors

80~~34~~7.1 Requirements

80~~34~~7.1.1 All work must meet applicable codes and regulations for the jurisdiction.

80~~34~~7.1.2 When air sealing is being performed the work scope shall specify CAZ depressurization testing to be performed at the end of each workday.

80~~34~~7.1.3 The work scope for recommended improvements will be determined by the Auditor and shall be based upon the findings of the assessment, the client’s needs and budget, and priorities identified during combustion appliance testing, subject to health and safety requirements.

80~~34~~7.1.4 The work scope shall clearly identify for the client any remedial actions which require prompt attention, affect safety, or require a licensed trade.

80347.1.5 The work scope shall provide sufficient specification that the client may obtain reasonably comparable bids from alternative sources for making recommended improvements.

80347.1.6 All scopes of work shall include this statement: "The estimated energy use and savings information contained in the audit report does not constitute a guarantee or warranty of actual energy cost or usage."

80347.1.7 The work scope shall be developed based on the Auditor's diagnosis and analysis. Emphasis shall be on:

bringing air distribution system components inside the building enclosure when it is feasible, or sealing and insulating ducts when it is not; improving airflow and total HVAC system efficiency as applicable; upgrades to the building enclosure as applicable; improvements to lighting and appliances as applicable.

80347.1.8 The scopes shall reflect the "house as a system" approach, recognizing measure interaction. The following statement shall be included whenever a fireplace or combustion appliance is located within the building enclosure:

"This work scope is not a list of recommendations that may be implemented independently; any exclusions or variations to this scope may increase the risk of flue gas spillage, back-drafting, carbon monoxide production and/or moisture problems within the home."

80347.1.9 When specifying equipment replacement, new equipment sizing shall be based on the proposed, upgraded condition of the building enclosure and duct system.

80347.1.10 The work scope shall call for post-work combustion appliance testing in accordance with these guidelines when any work affecting enclosure or duct tightness, or building pressures, is specified.

80347.2 Work Scope: Carbon Monoxide

80347.2.1 The source of the CO must be repaired or replaced and the problem corrected prior to commencing work on other tasks on the work scope, unless remediation of the CO production is specifically related to one or more of those tasks (such as duct repairs that will correct a large negative pressure in the CAZ).

80347.2.2 If there are combustion appliances within the building envelope, a carbon monoxide detector should be specified in the main area of each floor according to manufacturer's recommendations, typically in the hallway outside each bedroom area.

80347.2.3 If measured CO levels are higher than 100 ppm (200 for oven), or an appliance fails to meet manufacturer's specifications for CO production (whichever is higher), the work scope shall specify replacement or repair of the appliance, and the homeowner shall be notified of the need for service by a qualified technician.

80347.3 Work Scope: Worst Case Depressurization

80347.3.1 If the results of the Worst Case Depressurization Test indicate the potential for backdrafting by failing the CAZ pressure limits or spillage test, remediation of the failure must be addressed in the work scope, through one or more of the following (as applicable): targeted air- and duct-sealing, room pressure balancing, exhaust fan makeup air, or appliance replacement (with power- or direct-vented equipment). As an alternative, the combustion appliance zone may be isolated by creating a sealed combustion closet containing the combustion appliances that has the proper amount of combustion air supplied to it according to the applicable version of the IRC. Adequate sealing for isolation purposes shall include air sealing and

duct sealing (especially of adjacent platform or cavity return ducts) and confirmed by another CAZ depressurization test.

80347.3.2 The work scope should specify replacement of atmospheric-vented combustion appliances with high-efficiency sealed combustion, direct vent, or power vented appliances when feasible. If the home has unvented combustion appliances, the /Auditor shall recommend they be disconnected and replaced with vented combustion appliances.

80347.3.3 If unvented combustion appliances are not removed or replaced with vented combustion appliances or electric appliances, the work scope shall not specify measures that affect the air tightness of the envelope, including air sealing, duct sealing, sidewall insulation, or window replacements. Duct sealing outside the thermal envelope may be specified in IECC climate zones 1-3.

80458 Referenced Standards

80458.1 Auditor Referenced Standards

These referenced standards provide guidance for the Auditor in the performance of their role as an auditor or home energy rater (diagnostic testing, analysis, writing scopes of work).

1. Mortgage Industry National Home Energy Rating Systems Standards, published by the Residential Energy Services Network, latest version, http://www.resnet.us

2. ASHRAE/ANSI Standard 119-1998 RA-2004 Air Leakage Performance for Detached Single-Family Residential Buildings, published by the American Society of Heating, Refrigerating and Air-conditioning Engineers, Inc., http://www.ashrae.org

3. ASHRAE/ANSI Standard 152-2004 Method of Test for Determining the Design and Seasonal Efficiencies of Residential Thermal Distribution Systems, published by the American Society of Heating, Refrigerating and Air-conditioning Engineers, Inc., http://www.ashrae.org

24. ASTM E1998-02(2007) "Standard Guide for Assessing Depressurization-Induced Backdrafting and Spillage from Vented Combustion Appliances", published by ASTM International, http://www.astm.org

5. ASTM E1827-96(2007) "Standard Test Methods for Determining Airtightness of Buildings Using an Orifice Blower Door", published by ASTM International, http://www.astm.org

6. ASTM E1554-07 "Standard Test Methods for Determining Air Leakage of Air Distribution Systems by Fan Pressurization", published by ASTM International, http://www.astm.org

7. Reflective Insulation, Radiant Barriers and Radiation Control Coatings, published by the Reflective Insulation Manufacturers Association International, http://www.rimainternational.org

8. Protocols for Verifying HVAC Systems to the ACCA Quality Installation Standard, published by the Air Conditioning Contractors of America, http://www.acca.org (currently in draft)

9. Verifying ACCA Manual J® Procedures, published by the Air Conditioning Contractors of America, http://www.acca.org

10. Verifying ACCA Manual S® Procedures, published by the Air Conditioning Contractors of America, http://www.acca.org

~~11. Verifying ACCA Manual D® Procedures, published by the Air Conditioning Contractors of America, http://www.acca.org~~

~~12. NAIMA Fibrous Glass Duct Installation Check List, published by the North American Insulation Manufacturers Association, http://www.naima.org~~

~~13. AHRI Certification Directory, published by the Air-conditioning, Heating and Refrigeration Institute, http://www.ahridirectory.org~~

80458.2 Contractor Work Scope Referenced Standards

These referenced standards should be referenced in the work scope, as applicable to provide guidance for the contractor to perform the work scope.

14. International Residential Code for One- and Two-Family Dwellings- 2006, published by the International Code Council, Inc., http://www.iccsafe.org

215. International Energy Conservation Code- 2006, published by the International Code Council, Inc., http://www.iccsafe.org

316. International Mechanical Code- 2006, published by the International Code Council, Inc., http://www.iccsafe.org

417. International Fuel Gas Code- 2006, published by the International Code Council, Inc., http://www.iccsafe.org

518. ANSI/ACCA Standard 5 QI-2007 HVAC Quality Installation Specification, published by the Air Conditioning Contractors of America, http://www.acca.org

619. Manual J, Residential Load Calculation, 8th edition, published by the Air Conditioning Contractors of America, http://www.acca.org

720. Manual D, Residential Duct Systems,3rd edition, published by the Air Conditioning Contractors of America, http://www.acca.org

821. Manual S, Residential Equipment Selection, published by the Air Conditioning Contractors of America, http://www.acca.org

922. Manual RS, Comfort, Air Quality, & Efficiency by Design, published by the Air Conditioning Contractors of America, http://www.acca.org

1023. Manual T, Air Distribution Basics, published by the Air Conditioning Contractors of America, http://www.acca.org

1124. Manual H, Heat Pump Systems, published by the Air Conditioning Contractors of America, http://www.acca.org

1225. Manual G, Selection of Distribution Systems, published by the Air Conditioning Contractors of America, http://www.acca.org

1326. ASHRAE Standard 62.2 Ventilation and Acceptable Indoor Air Quality in Low-Rise Residential Buildings, published by the American Society of Heating, Refrigerating and Air-conditioning Engineers, Inc., http://www.ashrae.org

1427. ASHRAE Standard 52.2 Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size , published by the American Society of Heating, Refrigerating and Air-conditioning Engineers, Inc., http://www.ashrae.org

1528. ASTM Standard C1015-06 "Standard Practice for Installation of Cellulosic and Mineral Fiber Loose-Fill Thermal Insulation", published by ASTM International, http://www.astm.org

1629. ASTM Standard C1320-05 "Standard Practice for Installation of Mineral Fiber Batt and Blanket Thermal Insulation for Light Frame Construction", published by ASTM International, http://www.astm.org

1730. ASTM Standard C727-01 (2007)e1 "Standard Practice for Installation and Use of Reflective Insulation in Building Constructions", published by ASTM International, http://www.astm.org

1831. ASTM Standard C1158-05 "Standard Practice for Installation and Use of Radiant Barrier Systems in Building Constructions", published by ASTM International, http://www.astm.org

1932. ASTM Standard E2112-07 "Standard Practice for Installation of Exterior Windows, Doors and Skylights", published by ASTM International, http://www.astm.org

2033. Flexible Duct Performance and Installation Standards 4th edition, published by the Air Diffusion Council, http://www.flexibleduct.org

2134. Fibrous Glass Duct Construction Standards, 5th edition, published by the North American Insulation Manufacturers Association, http://www.naima.org

2235. FTC Trade Regulation Rule 16 CRF 460, Labeling and Advertising of Home Insulation, published by the Federal Trade Commission, http://www.ftc.gov

80548.3 Sample Work Scope Form

(This is informative and does not contain requirements necessary for conformance to these guidelines.)

Work Scope for _____

All work will be performed according to the following checked standards:

This work scope is not a list of recommendations that may be implemented independently; any exclusion to this scope may increase the risk of flue gas spillage, back-drafting, carbon monoxide production or moisture problems within the home.

What qualifications are required from contractors/technicians conducting the work:

What work needs to be performed:

Where the work needs to be performed:

How the work is to be performed (referenced Standard(s)):

Chapter 9- RESNET National Standard for Quality Assurance

901 General Provisions

901.1 Purpose

RESNET has the responsibility of accrediting Providers. This chapter outlines the quality assurance responsibilities of RESNET and Providers, the role and responsibility of the Quality Assurance Committee, the role and responsibility of the Accreditation Committee, the RESNET Accreditation Process for all Providers, the RESNET policies and procedures for Probation, Suspension and Revocation of Provider Accreditation, and the Appeals process for each of these disciplinary actions.

901.2 Scope

This document sets out the procedures for quality assurance for Rating Quality Assurance Providers by which quality assurance reviews of home energy ratings shall be conducted so their results will be acceptable to all public and private sector industries that may require an objective, cost-effective, sustainable home energy rating process.

901.3 Definitions and Acronyms

See Appendix B- Glossary of Terms.

902 RESNET Quality Assurance Review of accredited Rating Quality Assurance Providers

902.1 RESNET shall review 100% of the annual reports submitted by Rating Quality Assurance Providers (QA Providers). In addition, RESNET shall select a minimum of 25% of accredited QA Providers and conduct a more detailed review of their Quality Assurance records. This QA review may be a review of electronic files submitted to RESNET with the annual report, enhanced monitoring of QA Provider files done remotely, an on-site field review, or any combination of aforementioned. The RESNET Quality Assurance Manager shall determine which QA Providers that will be reviewed and who will provide the quality assurance review.

902.2 Records reviewed may include, but are not limited to a representative sample of the following:

902.2.1 Rating electronic files;

902.2.2 Rating quality assurance records including, but not limited to the following:

902.2.2.1 Photo and/or video documentation from on-site field reviews;

902.2.2.2 The QA Provider’s field review reports of findings submitted to Raters;

902.2.2.3 The QA Provider’s post-field review of rating results that show a comparison with original ratings selected for on-site QA review;

902.2.2.4 If remedial action is required, the QA Provider’s plan of action to correct for non-compliance with the RESNET Standards and results of any action taken

902.2.3 Complaint files

902.2.4 Rater agreements

902.2.5 Rater registry

902.2.6 Disclosure files

902.2.7 Rating databases;

902.2.8 Interviews with a QA Provider's QA Designee, Delegates, Raters or Rating Field Inspectors;

902.2.9 "Shadowing" a QA Provider's QA Designee, Raters, or Rating Field Inspectors in the field.

902.3 An accredited QA Provider has the right to challenge the findings of a RESNET Quality Assurance reviewer. The Appeals Procedures in Section 912 shall apply to the submission and consideration of a Provider's challenge to Quality Assurance findings.

902.4 Significant inconsistencies or errors in electronic records reviewed may result in an on-site review by RESNET.

903 Quality Assurance Requirements for QA Providers

903.1 No step in the QA process may be performed by the same individual that performed any part of the testing, inspection or rating of the home being subject to the QA review. If an individual performed any part of the inspection or rating process on a home, that individual cannot be the QA Designee or Delegate performing any part of the QA process specific to that home. Any ratings performed by a QA Designee that are submitted as part of a Provider's QA Submission to RESNET shall be reviewed for quality assurance by a separate individual who meets the QA Designee requirements established by RESNET.

903.2 QA Providers are responsible for completing an annual submission of QA results to RESNET. RESNET shall designate the date submissions are due, the content of each submission, and the time frame for which data shall be provided, e.g. January 1st through December 31st. QA Providers will have at least thirty (30) days from notification until the submission is due.

903.3 Quality Assurance of QA Providers

903.3.1 RESNET shall develop a "RESNET Quality Assurance Checklist" that is to be used by QA Designees for the purpose of verifying a Provider's compliance with the individual requirements for Providers set forth in the RESNET Standards. The QA Designee shall review the QA Provider's compliance with the items on the checklist annually.

903.3.1.1 For the first-time QA review completed by a QA Designee new to a Provider, including in the event that a Provider changes QA Designees, every item on the checklist should be checked for compliance, accuracy and completeness.

903.4 Quality Assurance of Raters and Ratings

903.4.1 Quality Assurance file review (QA file reviews)

903.4.1.1 For each Rater, the Provider's QA Designee shall be responsible for an annual QA file review of the greater of one (1) home or ten percent (10%) of the Rater's annual total of homes for which Confirmed or Sampled Ratings were provided. When determining the number of homes to review for a Rater, round up to the next whole number when the percentage calculation yields a decimal point, e.g. 101 homes x 10% = 10.1 means that 11 homes shall be reviewed.

903.4.1.2 A QA file review shall be conducted on an ongoing basis as appropriate for the volume of ratings being completed, and at a minimum quarterly.

903.4.1.3 The QA file review completed by a QA Designee shall consist of, at a minimum, the following:

903.4.1.3.1 Homes shall be selected using a non-biased selection process from the entire pool of homes available at the time of the review for each Rater. It may be necessary to first select homes that represent any particular area of concern in either the rating or construction process. Once it is ensured that homes from these areas of interest will be included in the QA process, a non-biased selection process can then be applied such as random selection. Special effort should be taken to make certain that the selected homes are as representative as possible of the homes being rated, i.e. new and existing homes, geographic location, builder, trade contractor, variety of floor plans, etc., which, in some instances, may require more than the minimum (1) home or ten percent (10%).

903.4.1.3.2 While Section 102.1.4.10 require that Raters submit energy simulation files for every rated home to their Providers, the QA file review does not require that Raters submit quality assurance data files, as defined in Appendix B- Glossary of Terms, to their Provider and/or QA Designee for every home that is rated. Only quality assurance data files for the homes selected for QA shall be required to be submitted to the QA Designee.

903.4.1.3.3 For of each Confirmed Rating, confirm that the values entered into the Rating Software for all Minimum Rated Features are supported by actual on-site field-verified test data;

903.4.1.3.4 QA file review for Sampled Ratings. For Sampled Ratings, annually review sample sets, the sampling process, and the worst-case projected rating energy simulation files for homes rated through sampling.

903.4.1.3.4.1 The QA file review for sampled ratings shall include an analysis and confirmation that the sampling process, as defined in Chapter 6, is being properly followed, including sample set creation and the application of testing and failure protocols.

903.4.1.3.4.1.1 QA file review of the sampling process shall be completed on the greater of one (1) sample set or ten percent (10%) of the Rater's annual total of sample sets. When determining the number of sample sets to review for a Rater, round up to the next whole number when the percentage calculation yields a decimal point, e.g. 101 sample sets x 10% = 10.1 means that 11 sample sets shall be reviewed.

903.4.1.3.4.1.2 For each sample set QA file review, the quality assurance data file(s) shall be reviewed to confirm that data collected in the field (i.e. sample controls) are equal to or better than the minimum rated feature threshold specification inputs for the worst-case energy simulation file for the home(s) that received sample controls for the sample set.

903.4.1.3.4.1.3 If a discrepancy in minimum rated features is identified that requires more stringent threshold specifications for a floor plan, then the worst case projected rating energy simulation file for that plan and home, or for the entire set of homes (as appropriate), subject to sampling shall be reviewed in accordance with 903.4.1.3.4.2.

903.4.1.3.4.2 The QA file review for sampled ratings shall include an initial review of the worst-case energy simulation file for each unique floor plan in order to confirm that minimum rated features and worst-case specifications have been entered into the rating software accurately. An energy simulation file for a particular floor plan is not subject to subsequent review after the initial QA review provided the minimum rated features and threshold specifications do not change as determined by this Section.

903.4.1.3.5 Confirm that paper and/or electronic files, are being maintained and archived by Raters for each rating and/or unique floor plan, including the Rating Software Energy Simulation File and all supporting documentation required to validate the inputs into the rating software file (e.g., architectural drawings, threshold specifications, field data).These files shall be maintained a minimum of three (3) years;

903.4.2 Quality assurance field review (QA field review).

903.4.2.1 For each Rater, the Provider's QA Designee shall be responsible for an annual on-site QA field review of the greater of one (1) home or one percent (1%) of the Rater's annual total of homes for which confirmed or sampled ratings and diagnostic testing services were provided. When determining the number of QA field reviews to complete for a Rater, round up to the next whole number when the percentage calculation yields a decimal point, e.g. 101 homes x 1% = 1.01 means that 2 QA field reviews shall be completed.

903.4.2.2 QA field reviews for Rating Field Inspectors (RFIs)

903.4.2.2.1 For Raters utilizing Rating Field Inspectors (RFI's), the QA Designee shall ensure that a QA field review is completed on the greater of one (1) home or one percent (1%) of each RFI's annual total of homes for which confirmed or sampled ratings and diagnostic testing services were provided by the RFI. The RFI QA field reviews may fulfill all or a portion of the Rater's annual QA field review requirement.

903.4.2.2.2 When determining the number of QA field reviews to complete for an RFI, round up to the next whole number when the percentage calculation yields a decimal point, e.g. 101 homes x 1% = 1.01 means that 2 QA field reviews shall be completed.

903.4.2.3 The Provider shall complete a minimum of 1% quarterly on-site QA field reviews of the Provider's ratings, based on the total number of ratings registered the previous quarter, until all annual QA requirements for the Provider have been met for each Rater. QA field reviews are not required on every Rater every quarter.

903.4.2.4 Each home selected for a QA field review for each Rater shall be randomly selected from as many different builders and communities as possible. Special effort should be taken to make certain that the selected homes are as representative as possible of the homes being rated, i.e. new and existing homes, geographic location, builder, trade contractor, variety of floor plans, etc., which, in some instances, may require more than the minimum (1) home or one percent (1%).

903.4.2.4.1 For multifamily projects, when selected, field QA shall include a comprehensive inspection of all minimum rated features that are possible to be inspected within the selected units and within the building during the time of the field QA. This means that the QAD shall inspect attic insulation via a common attic access where present, mechanical rooms that house common mechanical systems that serve multiple units, common ventilation systems, etc.

903.4.2.4.2 If the annual rating volume of a Rater is such that more than one field QA is required for that annual period's field QA quota (i.e. the Rater completed more than 100 ratings during the annual period), no more than one field QA within a particular multifamily development shall count toward meeting the total field QA quota.

903.4.2.4.2.1 An exception would be allowed if a particular multifamily development contained more than 100 units. In such an instance, one field QA per every 100 units of that development shall count towards the annual field QA quota.

903.4.2.4.2.2 Another exception would be allowed if the Rater had one or more Rating Field Inspectors (RFI) who worked with them throughout the annual period, in which case the QAD may select multiple units within a particular multifamily development to count towards the annual field QA quota for each RFI as long as those additional field QAs represent work performed by each individual RFI during the annual period.

903.4.2.4.2.3 If units within a multifamily building have multiple space conditioning configurations such that some units have ducts and other units do not, the QAD shall choose a unit with ducts for field QA. Alternatively, if the building has some units with ducts that are within Cconditioned Sspace Vvolume while others have ducts that are within Unconditioned Space Volume~~outside of the building envelope~~, the QAD shall choose a unit with ducts that are within Unconditioned Space Volume~~outside of the envelope~~ for field QA.

903.4.2.5 As part of the QA field review of confirmed ratings, the QA Designee shall ensure that the minimum rated features of a rating are independently confirmed (i.e. confirmation of geometric characteristics, inspection of minimum rated features, and completion of any necessary performance testing) to determine whether the rating and/or diagnostic testing were accurately completed by the Rater, and determine whether information was completely collected and reported as required in Chapter 3 of these Standards.

903.4.2.6 QA field review of Sampled Ratings. For the purposes of calculating the one(1) home or one percent (1%) QA field review requirement for Rater and RFI sampled ratings, all the homes rated by a Rater, or for which an RFI assisted, using sampling shall be considered and not just the number of homes tested and inspected. If at least two (2) homes are required for QA field review, a maximum of one (1) of the homes shall be a non-tested, sampled home. To ensure that QA is being completed on Raters and Rating Field Inspectors rather than builders, the balance of homes included in the field QA shall have received field testing and/or inspections.

903.4.2.7 Confirm that HERS Index scores for each home reviewed in accordance with 903.4.2.5 be no more than three percent (3%) (+/-) variation in the HERS Index from the HERS Index result as determined by the QA Designee. When calculating the HERS Index point variance allowed for a given Index, round down to the nearest whole Index point, with the allowable variance never less than two (2) HERS Index points.

903.4.2.8 If a QA Designee is required to complete an on-site QA inspection on at least two (2) homes for a given Rater, the QA Designee may use one centralized – proctored rating QA event, and only one, for review of the Rater in lieu of an independent confirmation of the rating for the home as required for the balance of homes evaluated for the on-site inspection process.

903.4.2.8.1 A centralized proctored rating QA event is defined as a rating that occurs at a house assigned by the QA Designee at which the QA Designee, or their Delegate, must be on site to ensure that the Rater being reviewed is working completely independently to gather all aspects of the minimum rated features of a home. The Rater being reviewed will not be allowed to communicate by any means with others while gathering information in the home or creating their rating software file and report. The review shall include, but is not limited to, the following:

1. Diagnostic equipment set-up and testing measurements

2. Insulation evaluation and R-value determination

3. Calculations of gross areas, volumes, and square footage of the home

4. Input and creation of the software rating file and reports

903.4.2.8.2 QA under this Section shall adhere to the same variance allowances provided for in Section 903.4.2.5.

903.4.3 Non-compliance of a reviewed rating shall trigger corrective action.

903.4.3.1 The rating shall be corrected in order to come into compliance with RESNET technical Standards under the supervision of the QA Designee.

903.4.3.2 The QA Designee shall develop and implement a corrective action plan for the Rater of the rating that addresses any underlying problems that led to the non-compliant rating.

903.4.3.3 The Provider shall initiate appropriate disciplinary action on the Rater in accordance with the Provider's written Rater disciplinary procedures.

903.4.3.4 Multiple instances of non-compliance with 903.4.2.5 shall, at a minimum, trigger an increased rate of file reviews or on-site inspections of homes and additional appropriate disciplinary action in accordance with the Provider's written Rater disciplinary procedures.

903.5 Significant Non-compliance by QA Providers.

It is the expectation of RESNET that Providers fully comply with all the requirements set forth in these Standards. Discovery of one or more areas of non-compliance via the RESNET QA process, reporting by a QA Designee as part of the Provider's QA process, or in the course of RESNET's research of an ethics or consumer complaint will result in the QA Designee working with a Provider to come back into compliance. However, on occasion, there may be instances where actions by a Provider are truly egregious and, as such, would be deemed to be "significant non-compliance". This Section seeks to define the thresholds when actions by a Provider are deemed to be significant non-compliance, thereby requiring that the QA Designee report the significant non-compliance to RESNET and additional action by RESNET may be taken.

903.5.1 Significant non-compliance by Providers shall include, but not be limited to, the following:

903.5.1.1 Failure to comply with multiple individual requirements, or requirements impacting multiple Raters and/or ratings, for Providers set forth in the RESNET Standards and enumerated in a RESNET Quality Assurance Checklist;

903.5.1.2 Failure of a Provider to comply with the RESNET Standards of Practice, Code of Ethics, or Conflict of Interest Disclosure;

903.5.1.3 Failure to follow a Provider's written Rater disciplinary procedures for known or obvious non-compliance with the RESNET Standards, Standards of Practice, Code of Ethics, or Conflict of Interest Disclosure.

903.5.2 Reporting of significant non-compliance to RESNET.

903.5.2.1 QA Designees must report all significant non-compliance by a Provider to RESNET when it becomes known to the QA Designee so that RESNET may assist the QA Designee in working with a Provider to come back into compliance.

903.5.2.2 Failure of a QA Designee to report significant non-compliance issues may result in actions taken by RESNET as stipulated in Section 904.10.

904 Quality Assurance Designee (QA Designee)

904.1 A Rating Quality Assurance Provider shall designate one and only one officer, employee, or contractor to be the Primary Quality Assurance Designee for the organization, responsible for quality assurance within the organization. This does not preclude a Provider from having more than one QA Designee on staff or as a contractor, as may be necessary for business models where QA Designees do Ratings. The Primary QA Designee shall have ultimate responsibility, on behalf of the QA Provider, for fulfilling the requirements listed in Section 904.8 and who shall be the single point of contact to RESNET regarding all Quality Assurance matters. All QA Designees shall meet each of the minimum requirements to be a QA Designee as stipulated in this Section.

904.2 The designated officer, employee, or contractor responsible for quality assurance shall meet the following minimum requirements:

904.2.1 Previous certification as a Home Energy Rater;

904.2.2 As a certified Home Energy Rater, complete confirmed ratings on a minimum of twenty-five (25) homes prior to becoming a QA Designee;

904.2.2.1 A QA Designee must confirm that the minimum requirements to be a QA Designee and Delegate, as set forth in this Section 904.2, have been met.

904.2.2.2 Five (5) of the twenty-five (25) required confirmed ratings for a QA Designee must be individually reviewed by a QA Designee, three (3) of which may have been included in the annual QA process for a QA Provider in the previous twenty- four (24) months. The five (5) reviewed ratings shall be field reviews in accordance with Section 903.4.2.

904.2.3 To be eligible to QA a particular rating type (e.g. sampled, survey/audit), a QA Designee must have completed a minimum of five (5) of that rating or project type or alternate qualification criteria established by RESNET in consultation with the Quality Assurance Committee;

904.2.4 Passing the RESNET Quality Assurance Designee Test.

904.2.4.1 The requirements of 904.2.2 and 904.2.3 must be met within twelve (12) months of passing the RESNET Quality Assurance Designee Test, or the individual must pass the test again prior to being recognized as a QA Designee.

904.2.5 Submit an application to RESNET and be recognized as a qualified QA Designee.

904.3 Professional Development for QA Designees

904.3.1 All QA Designees annually shall complete a two hour RESNET QA Roundtable on current information AND complete one (1) of the following activities:

904.3.1.1 Document 12 hours of attendance at the RESNET Conference; or

904.3.1.2 Complete 12 hours of RESNET approved CEUs; or

904.3.1.3 Documented field QA reviews on a minimum of 25 homes.

904.3.2 A person that is both a Rater Trainer and Quality Assurance Designee shall have to complete both the two hour RESNET Roundtable for a Rater Trainer (see Section 209) and the two hour Roundtable for Quality Assurance Designees. Rater Trainers and QA Designees selecting the conference or CEU option need only comply with the 12 hour requirement one time, i.e. 12 hours is not required for each position.

904.3.3 A QA Designee that does not complete the professional development requirements for a given calendar year must:

904.3.3.1 Attend a RESNET Roundtable;

904.3.3.2 Have the QA Designee requirements verified in accordance with 904.3;

904.3.3.3 Submit an application to RESNET and be recognized as a qualified QA Designee prior to reinstatement as a QA Designee.

904.3.3.4 If two years have lapsed without a QA Designee completing professional development, the QA Designee must also pass the RESNET Quality Assurance Designee Test again;

904.3.4 A QA Designee must renew annually with RESNET to be recognized as a qualified QA Designee.

904.4 Proof of QA Designee qualifications shall be submitted by Providers with an application for accreditation or with a notification to RESNET of a change to a Provider's QA Designee(s).

904.5 All QA Designees shall have a signed agreement with the Provider to be the Provider's QA Designee.

904.6 Changes to a QA Provider's QA Designee(s)

904.6.1 If a Provider changes Primary QA Designees or a Provider's Primary QA Designee leaves the organization, is terminated as an outside QA Designee contractor, or is no longer eligible to be the QA Designee, the following steps shall be taken:

904.6.1.1 Within five (5) business days of the Primary QA Designee change, departure, termination, or knowledge of ineligibility, the Provider shall inform RESNET of the change, departure, termination, or ineligibility;

904.6.1.2 In the case of a change in Primary QA Designee as a result of departure, termination, or ineligibility, the Provider shall have forty (40) business days from the date of departure, termination, or knowledge of ineligibility to appoint a replacement Primary QA Designee and notify RESNET of the newly designated officer, employee, or contractor, including proof of qualifications in accordance with 904.2.

904.6.2 If a Provider with multiple QA Designees adds or removes a QA Designee, the Provider shall inform RESENT within five (5) business days of the change.

904.7 Quality Assurance Designee Delegate (QA Delegate)

QA Designees may have the file review and on-site inspection responsibilities performed by a Quality Assurance Designee Delegate. The QA Designee, however, remains responsible for the accuracy and compliance of the Provider's quality assurance program, including reviews and inspections completed by a QA Delegate.

904.7.1 A QA Delegate must be a certified Home Energy Rater and have completed, on a minimum of twenty-five (25) homes, the portion of the inspection or rating process for which the individual is performing quality assurance tasks. In other words, if the QA Delegate is repeating on-site testing and inspections as part of the QA process, that individual must have at least performed these tasks on a minimum of twenty five (25) homes.

904.7.2 The QA Designee is responsible for ensuring that the QA Delegate meets and maintains their qualifications to be a QA Delegate, contained in 904.7.1.

904.8 Responsibilities of a QA Designee.

Responsibilities of the QA Designee shall include:

904.8.1 Maintenance of quality assurance files;

904.8.2 Review of ratings conducted during a new Rater's probationary period. Prior to certifying a Rater Candidate, a Provider's QA Designee shall confirm that the Candidate has satisfactorily completed Rater training from a RESNET accredited Training Provider and satisfactorily completed their probationary ratings in accordance with Section 102.1.2.2.

904.8.3 Monitor the accuracy of the QA Delegate's performance of QA tasks by reviewing the results of the QA process for each QA Delegate (i.e. 1% field verification/10% file verification).

904.8.4 Complete annual submission of QA results to RESNET in accordance with Section 904.2;

904.8.5 With the annual QA submissions to RESNET, provide a listing of the QA Designees performing QA tasks on behalf of the Provider and a listing of the QA Delegates who have undertake QA reviews on behalf of a QA Designee;

904.8.6 In accordance with Section 903.2, annually complete the RESNET QA Checklist for QA Providers;

904.8.7 In accordance with Section 903.4, monitor ratings of all types conducted by certified Raters;

904.8.8 Maintenance of QA Records for all ratings and tax credit verifications shall include:

904.8.8.1 The Quality Assurance Data File for each home that receives QA review at a minimum containing the information required by Section 903.4.1.3.

904.8.8.2 A database of results of all QA reviews for each Rater, including, at a minimum, for each home reviewed;

904.8.8.2.1 Rater name;

904.8.8.2.2 Home address or Registry ID;

904.8.8.2.3 Date rated;

904.8.8.2.4 Date QA reviewed;

904.8.8.2.5 Name of QA Designee or Delegate;

904.8.8.2.6 Whether the review was a file or field review as defined by these Standards;

904.8.8.2.7 The result, including HERS Index variance for field QA, and any action taken by the QA Designee.

904.8.8.3 The QA Record for each home shall be maintained for a minimum of three (3) years.

904.8.8.4 Upon RESNET's request, a QA Provider shall submit to RESNET the QA Records for the specified time period, and the number of homes for which ratings and tax credit verifications were provided for the specified time period. The ratings and tax credit verifications shall be identified by type (to include projected and confirmed ratings for new and existing homes and the number of homes verified for tax credits).To the extent RESNET makes this information public; it will do so only in an aggregated form.

904.9 QA Designee and Certified Home Energy Rater Whistle Blower Protection

904.9.1 A Rating QA Provider shall not retaliate against a QA Designee or Certified Home Energy Rater in the terms and conditions of their status with the Provider for any of the following reasons:

904.9.2 Reporting to a supervisor, to RESNET or to a federal, state or local agency what the QA Designee or Rater believes in good faith to be a violation of the RESNET Standards and/or a local, state or federal law; or

904.9.3 Participation in good faith in any resulting investigation or proceeding;

904.9.4 OR

904.9.5 Exercising his or her rights under any state or federal law(s) or regulation(s) to pursue a claim or take legal action to protect the QA Designees' or Rater's rights.

904.9.6 RESNET may take disciplinary action (up to and including revocation) against a QA Provider who in its assessment has engaged in retaliatory conduct in violation of this policy.

904.10 Failure of a QA Designee to Fulfill Their Responsibilities.

Failure of a QA Designee to properly fulfill their responsibilities as specified in these Standards may include one or more of the following actions by RESNET:

904.10.1 The QA Designee being placed on probation;

904.10.2 Removal of the QA Designee from the RESNET Directory of qualified QA Designees;

904.10.3 Removal of the QA Designee's credential as a QA Designee;

904.10.4 RESNET no longer recognizing the QA Designee as a Home Energy Rater;

904.10.5 At the QA Provider's expense, further oversight by RESNET of the QA Designee and the Provider's processes and procedures;

904.10.6 To the extent that the QA Provider is at fault for the QA Designee's failure to fulfill their responsibilities, the Provider may be subject to probation, suspension or revocation in accordance with Section 911;

904.10.7 The QA Designee may appeal an Action taken by RESNET under this Section using the Appeals procedures stipulated in Section 912 of these Standards.

905 Quality Assurance Requirements for Third-Party Energy Efficiency Programs

905.1 See Appendix B- Glossary of Terms for definition of Third Party Energy Efficiency Program (EEP).

905.2 Quality Assurance, as specified in Section 903, may be provided by QA Designees for EEPs as part of the RESNET QA process when RESNET and the EEP enter into a formal agreement. Where EEP QA requirements are greater than specified in Section 903, those QA requirements shall be specified in writing by an EEP and provided to RESNET for approval in order to be included in the RESNET QA process.

905.2.1 Unless formally authorized by RESNET, RESNET's oversight of a QA Designee shall only cover areas covered in these Standards and in the RESNET Home Energy Rating Standards of Practice.

905.3 Quality assurance data files and the results of on-site verification of ratings files will be made available by Providers to EEPS only for the EEP's quality assurance initiatives and, additionally, only if the EEP has agreements with rating clients in the program that allow for Raters to release rating information.

905.4 EEP files will be inspected for quality assurance pursuant to Section 903.4 and shall include those items related to energy efficiency specific to the EEP that may be in addition to the Home Energy Rating. Significant non-compliance by Providers shall be reported to EEP's when they become known to RESNET.

906 Quality Assurance Requirements for Contractor Education and Qualification (CEQ) Providers, Energy Smart Providers, Energy Smart Contractors, and Energy Smart Teams

906.1 RESNET Quality Assurance of CEQ Providers

906.1.1 RESNET shall select a limited number of CEQ Providers and conduct an annual review of their Quality Assurance records.

906.1.2 A CEQ Provider shall have the right to challenge the findings of RESNET's quality assurance review.

906.1.3 CEQ records that must be reviewed include the following:

906.1.3.1 The CEQ's Energy Smart Contractor Registry;

906.1.3.2 The CEQ's Energy Smart Contractor Agreements;

906.1.3.3 Documentation of CEQ Provider's initial training course and continuing education offerings for Energy Smart Contractors;

906.1.3.4 Documentation of Energy Smart Contractor's Designated Qualification Representative completing required training and testing;

906.1.3.5 Documentation of the Representative's continuing education;

906.1.3.6 The CEQ's Energy Smart Contractor complaint files;

906.1.3.7 Documentation of disciplinary actions.

906.1.4 In the case of an unresolved complaint brought to the RESNET Executive Director, it will be the responsibility of the CEQ to secure the Energy Smart Project files from the Energy Smart Project Manager

and present them to RESNET. Failure of the Energy Smart Project Manager to provide adequate records shall result in sanctions up to and including a 60 day suspension of the Energy Smart Contractor designation.

906.1.5 An on-site review by RESNET may be conducted if there are significant inconsistencies or errors in the reviewed CEQ files.

906.1.6 Complaints against a CEQ Provider submitted by the Complaint Resolution Officer (CRO) to RESNET shall be addressed by the Executive Director. The RESNET Executive Director shall:

906.1.6.1 Resolve the complaint in forty-five (45) calendar days.

906.1.6.2 A complaint will be considered resolved once a Complaint Resolution Form has been submitted, signed by the party who filed the complaint and the CEQ Provider.

906.1.6.3 A log of unresolved complaints shall be maintained by the RESNET Executive Director.

906.1.7 CEQ Providers are subject to Probation, Suspension, and Revocation of Accreditation by RESNET in accordance with Section 911 of these Standards.

906.1.7.1 Suspension and Revocation of Accreditation of a CEQ Provider may result from the following:

906.1.7.1.1 The provisions described in 912.3;

906.1.7.1.2 Failure to ensure that the Energy Smart Contractor followed the complaint resolution process in the case of a complaint against the Energy Smart Contractor or failure to follow required disciplinary and corrective action with respect to a contractor;

906.1.7.2 RESNET shall comply with the due process and appeals procedures contained in Section 912 of these Standards with respect to disciplinary actions against an accredited CEQ Provider.

906.2 CEQ Provider Quality Assurance of Energy Smart Contractors

906.2.1 The CEQ Provider shall annually verify that the Energy Smart Contractor's representative is still with the company.

906.2.2 Respond to complaints against Energy Smart Contractors.

906.2.3 Follow written Energy Smart Contractor Disciplinary Procedures described in the CEQ Provider's written policies and procedure for Energy Smart Contractors.

906.3 CEQ Provider Complaint Resolution Procedures

906.3.1 The CEQ Provider must conduct non-compliance resolution when a complaint is received about the work performance of an Energy Smart Contractor from any of the following: the client**,** Rater/Auditor, other Energy Smart Contractors**,** Final Verifier.

906.3.2 Complaints shall be managed and resolved by the CEQ Provider's CRO following the CEQ Provider's Complaint Response Process.

906.3.3 Each CEQ Provider shall retain records of complaints received and responses to complaints for a minimum of three (3) years after the date of the complaint.

906.3.4 The Complaint Response Process shall include, at a minimum, the following:

906.3.4.1 Consumer Complaint Form, available for submittal via the RESNET website. The form will be forwarded to the CEQ Provider to the attention of the CRO.

906.3.4.2 It is the responsibility of the CEQ Provider to secure the documentation from the Energy Smart Project Manager or Final Verifier for review by the CRO.

906.3.4.3 The CRO shall evaluate the complaint to determine if the contractor shall be deemed to be in non-compliance. Complaints must:

906.3.4.3.1 Be related to either structural or major deficiencies (over $500) and must impact the energy efficiency of the home.

906.3.4.3.2 Include the work contract(s) and copies of checklists denoting unresolved deficiencies.

906.3.4.3.3 In the event the CRO cannot make a fair evaluation of the complaint based on the information submitted, the consumer shall have the option of hiring an independent Rater/Auditor to visit the site and submit his or her report and findings.

906.3.4.3.4 The Energy Smart Contractor Complaint Resolution Process shall consist of the following:

906.3.4.3.4.1 The CRO will notify the contractor of the complaint and the contractor shall have forty five (45) calendar days to resolve the complaint.

906.3.4.3.4.2 A complaint will be considered resolved once a Complaint Resolution Form has been submitted, signed by both the client and the party against whom the complaint was filed, and the resolution verified by the CRO.

906.3.4.3.4.3 If the complaint is not resolved in the allotted time, it will be considered unresolved.

906.3.4.4 Energy Smart Contractors with three (3) unresolved complaints within a 90 day period or with five (5) or more unresolved complaints at any given time shall have their certification suspended in accordance with the provisions of 906.3.5.

906.3.4.5 A log of unresolved complaints shall be maintained by the CEQ Provider and must be made available to RESNET upon request.

906.3.5 The minimum requirements for suspension of certification procedures are the following:

906.3.5.1 First Offense: First time an Energy Smart Contractor has three (3) unresolved complaints within a 90 day period or has five (5) outstanding unresolved complaints, the CEQ Provider shall suspend the contractor's certification for a period of not less than 30 days, and:

906.3.5.1.1 Shall inform RESNET that the contractor's certification has been suspended, and shall request that RESNET remove the contractor from the Directory.

906.3.5.1.2 Shall require the contractor, prior to reinstatement, to complete two (2) hours of Continuing Education specific to conflict resolution or customer relations, or successfully resolve at least one of the 90 day old complaints and all of the complaints older than 90 days. CEQ Providers may provide exceptions for complaints that cannot be resolved.

906.3.5.1.3 Shall inform RESNET when the contractor's certification has been reinstated, clarify the resolution, or reasons for not being able to resolve the complaint, and shall request that RESNET reinstate the listing on the Directory.

906.3.5.2 Second Offense: Second time an Energy Smart Contractor has three (3) unresolved complaints within a 90 day period or has five (5) outstanding unresolved complaints, the CEQ Provider shall suspend the contractor's certification for a period of not less than 90 days, and:

906.3.5.2.1 Shall inform RESNET that the contractor's certification has been suspended, and shall request that RESNET remove the contractor from the directory.

906.3.5.2.2 Shall require the contractor prior to reinstatement to complete three (3) additional hours of Continuing Education and successfully resolve at least one of the 90 day old complaints and all of the complaints older than 90 days. CEQ Providers may provide exceptions for complaints that cannot be resolved.

906.3.5.2.3 Shall inform RESNET when the contractor's certification has been reinstated, clarify the resolution, or reasons for not being able to resolve the complaint, and shall request that RESNET reinstate the listing on the Directory.

906.3.5.3 Third Offense: Third time an Energy Smart Contractor has three (3) unresolved complaints within a 90 day period, or has five (5) outstanding unresolved complaints , the CEQ Provider shall suspend the contractor's certification for a period of not less than twelve (12) months, and:

906.3.5.3.1 Shall inform RESNET that the contractor's certification has been suspended, and shall request that RESNET remove the contractor from the Directory.

906.3.5.3.2 Shall require the contractor, prior to reinstatement, to complete three (3) additional hours of Continuing Education and successfully resolve all of the outstanding complaints. CEQ Providers may provide exceptions for complaints that cannot be resolved.

906.3.5.3.3 Shall inform RESNET when the contractor has met the requirements of 906.3.5.3.2, clarify the resolution, or reasons for not being able to resolve the complaint. RESNET approval shall be required for reinstatement of certification and RESNET shall reinstate the contractor's listing on the Directory if appropriate.

906.4 Quality Assurance Provider Quality Assurance Review of Rater Final Verification of Energy Smart Projects

906.4.1 The QA Provider will have a Quality Assurance (QA) Designee that shall perform QA review of a Raters' Final Verification of an Energy Smart Project.

906.4.2 Quality Assurance File Review (QA File Review)

906.4.2.1 For each Rater/Auditor that performs Final Verification for an Energy Smart Project, the QA Provider's QA Designee shall annually conduct QA File Review of the Final Verification documentation file(s) the greater of one (1) projects or ten percent (10%) of the Contractor's annual total of projects completed. When determining the number of projects to review for a Contractor, round up to the next whole number when the percentage calculation yields a decimal point, e.g. 101 projects x 10% = 10.1 means that 11 projects shall be reviewed.

906.4.2.1.1 Project documentation file(s) shall include

906.4.2.1.1.1 A copy of the original work scope and signed proposal;

906.4.2.1.1.2 Rater/Auditor and Contractor names and contact information;

906.4.2.1.1.3 Program sponsor name, completed final verification checklist;

906.4.2.1.1.4 Energy simulation software file;

906.4.2.1.1.5 All test out results.

906.4.2.1.2 When the QA Provider's QA Designee conducts the QA File Review, they shall review at least one (1) project documentation file for each Energy Smart Contractor and Energy Smart Team. The QA Designee shall equitably distribute the QA File Reviews of each individual Energy Smart Contractor's or Team's Projects.

906.4.2.2 The QA Designee will confirm that each Energy Smart Contractor for the project has been approved by a RESNET-approved CEQ Provider as demonstrated by listing on the RESNET Energy Smart Contractor Directory.

906.4.2.3 The QA Designee will verify the completion of the Rater Final Verification checklist.

906.4.2.3.1 There must be consistency between the Final Verification Checklist and final test out results, copy of work scope, and signed proposal.

906.4.2.3.2 Must include reported results of non-conformance by Final Verification.

906.4.2.4 The QA Designee will review 10% of the Rater/Auditor Final Verifier energy simulation software file and projected estimated energy savings.

906.4.3 Quality Assurance Field Review (QA Field Review)

906.4.3.1 For each Rater/Auditor that performs Final Verification for an Energy Smart Project the QA Designee shall annually conduct QA Field Reviews of Energy Smart Projects at a rate of 1% of verified projects or one project, whichever is greater. QA Field Review shall include the greater of one (1) project or ten percent (10%) of each Contractor's annual total of projects completed. When determining the number of projects to review for a Rater and Contractor, round up to the next whole number when the percentage calculation yields a decimal point, e.g. 101 projects x 1% = 1.01 means that 2 projects shall be reviewed.

906.4.3.2 The QA Designee shall confirm the results of the Final Verifier's combustion appliance testing where applicable.

906.4.3.2.1 Where there are vented combustion appliances that use indoor air to vent combustion gases, re-test Worst Case Depressurization in accordance with the QH Standard.

906.4.3.2.2 Where any spaces contain combustion appliances, re-test for Carbon Monoxide in accordance with the QH Standard.

906.4.3.3 The QA Designee shall review the work scope and signed proposal, and shall confirm installed measures are consistent with selected measures and work scope in accordance with the QH Standard.

906.4.3.4 The QA Designee shall confirm the Final Verifier's Estimate of Project Energy Savings as follows:

906.4.3.4.1 Calculate an independent estimate of projected energy savings for the Energy Smart Project using the same RESNET-approved software used by the Final Verifier.

906.4.3.4.2 Compare the Final Verifier's final estimated energy savings against the QA Designee's independent calculation of estimated energy savings.

906.4.3.4.3 The QA Designee's results must be no more than three percent (3%)(+/-) variation in the HERS Index from the HERS Index result as determined by the QA Designee.

906.4.4 Non-Compliance and Resolution

906.4.4.1 Reporting: Non-compliance of an Energy Smart Project with respect to installed measures or estimate of projected energy savings shall be reported to the CEQ Provider's Compliant Resolution Officer (CRO).

906.4.4.2 Discipline: Non-compliance of the Final Verifier's Final Verification of an Energy Smart Project with respect to installed measures or estimate of projected energy savings shall result in additional action in accordance with the QA Provider's written Disciplinary Procedures.

906.4.4.3 Record-Keeping: Rating Providers shall maintain Quality Assurance records for every Energy Smart Project that has received Documentation or On-Site QA Review for a period of no less than three (3) years and that will include the following:

906.4.4.3.1 Copy of work scope and signed proposal;

906.4.4.3.2 Names and contact information of the Rater/Auditor, ES Contractors, and Final Verifier;

906.4.4.3.3 Program sponsor name;

906.4.4.3.4 Completed final verification checklist;

906.4.4.3.5 All test out results;

906.4.4.3.6 QA Review Results.

907 Quality Assurance Committee and Ethics and Appeals Committee

907.1 Quality Assurance Committee

907.1.1 Committee Membership. The Quality Assurance Committee (QA Committee) shall be chaired by a member of the RESNET Board of Directors. The Chair shall be approved by the RESNET Board. Nominations of Committee members shall be made by the Chair.

907.1.2 Committee Responsibilities. The QA Committee shall have:

907.1.2.1 Oversight of RESNET's rating quality assurance program as defined in this chapter. The Committee shall report to the RESNET Board of Directors.

907.2 Ethics and Appeals Committee

The Ethics and Appeals Committee shall have the responsibility of investigating ethics and consumer complaints and hearing appeals of an Application or Renewal Application that has been denied, or if a Provider has been placed on probation, or if a Provider's accreditation has been suspended or revoked. The Committee shall report to the RESNET Board of Directors.

907.2.1 **Committee membership.** The Ethics and Appeals Committee shall be chaired by a member of the RESNET Board of Directors. The Chair shall be approved by the RESNET Board. Nomination of Committee members shall be made by the Chairman. The Committee shall be composed of a minimum of five (5) members, but no more than seven (7) members including the chairman. The Committee shall consist of a minimum of two (2) Home Energy Raters and a minimum of two (2) representatives of Provider organizations.

907.2.2 **Committee Responsibilities.** The Ethics and Appeals Committee shall have the responsibility of investigating ethics and consumer complaints and hearing appeals of an Application or Renewal Application that has been denied, or if a Provider has been placed on probation, or if a Provider's accreditation has been suspended or revoked.

908 Ethics and Compliance Complaints

908.1 Filing of Ethics and Compliance Complaints

908.1.1 Ethics complaints may be filed for violation of the RESNET Code of Ethics.

908.1.2 Compliance Complaints may be filed for failures to comply with the RESNET Standards

908.1.3 Complaints shall document the alleged violation(s) or compliance issue(s).The complaint shall also be specific about which section(s) of the Code of Ethics or the RESNET Standards have been violated. To be considered, the full and complete complaint shall be submitted on the RESNET's online ethics or compliance complaint form posted on the RESNET web-site and contain the following information:

908.1.3.1 The name of the complainant and contact information;

908.1.3.2 The name of the party that is the subject of the complaint;

908.1.3.3 A complete description of the alleged violation(s);

908.1.3.4 A recitation of all the facts documenting the complaint;

908.1.3.5 Copies of all relevant documents.

908.2 Investigation of Complaints

908.2.1 Upon receipt of a complaint, the RESNET Executive Director shall assign a case number and RESNET staff shall review the evidence submitted. The Chair of the Ethics and Appeals Committee shall be informed. RESNET staff shall consider the documentation contained in 908.1 in making a decision whether to proceed or dismiss the complaint.

908.2.2 In cases where RESNET staff finds the documentation submitted does not meet the minimum standards for an ethics or compliance complaint, the complaint may be dismissed. Both parties shall be notified of RESNET staff's finding by electronic mail.

908.2.3 Upon a decision by RESNET staff that the complaint should proceed to the next step, the RESNET Executive Director shall send a copy of the complaint by electronic mail to the subject of the complaint immediately. The respondent has 20 business days to submit a full and complete response to the complaint. All relevant information and documentation shall be included in the response. The response shall be in writing and sent to RESNET by electronic mail.

908.2.4 Upon receipt of the response, the RESNET Executive Director shall immediately forward the response to the RESNET Ethics and Appeals Committee for consideration and action. Within thirty (30) business days of receiving the complaint, the Ethics and Appeals Committee shall take action on the complaint. The action may include, but is not limited to:

908.2.4.1 Dismissal of complaint;

908.2.4.2 Require that steps be taken by the subject of the complaint to correct the problem; and/or

908.2.4.3 Specify sanctions under Section 911 (Probation, Suspension and Revocation of Accreditation) of this chapter.

908.2.4.4 All parties to the complaint shall be informed by electronic mail of the Ethics and Appeals Committee's action.

908.2.4.5 Complainants shall have the right to appeal the decision of RESNET Staff and the Ethics and Appeals Committee in accordance with Section 912 of these Standards.

908.2.4.6 All complaints, responses, and supporting documentation received by RESNET shall be handled in strict confidence by RESNET staff, the Ethics and Appeals Committee and the Board of Directors.

909 Accreditation Committee

909.1 Committee Membership.

The Accreditation Committee shall be chaired by a member of the RESNET Board of Directors. The Chair shall be approved by the RESNET Board. Nominations of Committee members shall be made by the Chair.

909.2 Committee Responsibilities

The Accreditation Committee shall be responsible for the review and approval of all Applications for Provider accreditation.

910 Provider Accreditation and Renewal Process

910.1 National Registry of Accredited Providers

RESNET shall maintain a national registry of organizations accredited as Providers in each Provider accreditation category and will post the registry on its web site. The registry for each Provider accreditation shall serve as the current and definitive list of RESNET accredited providers.

910.2 Provider Accreditation Process

910.2.1 An entity seeking accreditation must file with RESNET an application for the specific Provider category for which they seek accreditation. RESNET shall create the applications for each accreditation category.

910.2.2 Confidentiality of Information. Any applicant for a Provider accreditation who wishes to have certain information in their application treated as confidential in order to limit disclosure shall, at the time of submission, attach a statement specifying the proprietary information and requesting confidentiality.

910.2.3 Review and Notification.

910.2.3.1 RESNET staff action. Within twenty (20) business days of receipt of an application, RESNET staff will review the application to determine whether the applicant and its Raters are eligible for accreditation in accordance with the specific requirements for each Provider category. Upon completion of the review, RESNET staff shall do one of the following:

910.2.3.1.1 Request for additional information. If additional information is required in order to complete the review of the application, the application shall be returned to the applicant along with a written request for additional information. Upon receipt of additional information, RESNET staff shall have twenty (20) business days to take action in accordance with 910.2.3.1.2 or 910.2.3.1.3

910.2.3.1.2 Recommendation for approval. If RESNET staff is satisfied that an application is complete and meets all the requirements for accreditation, they shall make a recommendation to the Accreditation Committee that the application be approved.

910.2.3.1.3 Recommendation for denial. If RESNET staff is not satisfied that an application is worthy of approval for accreditation, they shall make a recommendation to the Accreditation Committee that the application be denied and provide an explanation of the reasons for the recommendation (i.e. incompleteness, failure to meet/comply with a specific accreditation requirement, etc.).

910.2.3.2 Accreditation Committee action. Within fifteen (15) business days of receipt of a recommendation for approval or denial from RESNET staff, the Committee shall do one of the following:

910.2.3.2.1 Request for additional information. If the Committee requires additional information, the application shall be returned to the applicant along with a written request for additional information. Upon receipt of additional information, the Committee shall have twenty (20) business days to render a decision in accordance with 910.2.3.2.2 or910.2.3.2.3.

910.2.3.2.2 Approve the application.

910.2.3.2.3 Deny the application. If an application is denied, RESNET staff shall inform the applicant in writing of the reasons for denial. Additionally, the applicant shall be informed of their right of appeal under Section 913 of this chapter.

910.2.3.3 Within ten (10) business days of a decision by the Committee, RESNET staff shall inform the applicant in writing of the status of their application.

910.2.3.4 For each approved Provider accreditation application, RESNET shall issue a unique Accreditation Identification Number (AIN) to the Provider. In accordance with 911.1, the accredited Provider will be incorporated into the respective national registry of accredited Providers.

910.2.3.5 Term of accreditation.

910.2.3.5.1 All Provider accreditations shall be valid for a term of one calendar year and shall be renewed annually on January 1st upon successful completion and approval by RESNET of an application for renewal in accordance with Section 910.3.

910.2.3.5.2 For first time applicants approved after September 1st, for any Provider category, initial accreditation is valid through the end of the calendar year, i.e. renewal of the accreditation shall not be required for the calendar year in which the application was approved.

910.3 Accreditation Renewal Process

910.3.1 Accredited Providers must submit an "application for renewal" (renewal application) with RESNET no later than October 1st of each calendar year. By September 1st, RESNET shall send to each Provider a renewal application and reminder of the deadline for submission.

910.3.2 Program element changes.

At the time of submitting a renewal application, it is the accredited Provider's responsibility to inform RESNET of any substantive changes in the Provider's operating policies and procedures or other information that affects meeting the minimum accreditation criteria for each Provider category for which it is seeking renewal. Changes will be evaluated by RESNET in the same manner as the original application for accreditation.

910.3.3 Successful renewals

Successful renewals will be posted on the national registry and communicated to the applicant by RESNET.

910.3.4 Late applications.

910.3.4.1 Renewal applications received after the deadline for submission are not guaranteed to be approved prior to the end of the calendar year. Should an accreditation with a late renewal application expire prior to approval, the RESNET Accreditation Committee, at its sole discretion, may grant an extension with a grace period not to exceed twenty (20) business days.

910.3.4.2 Renewal applications not given an extension or not approved prior to the end of the grace period shall be noted as "pending" on the national registry and the applicant will be advised to cease representing themselves as accredited until the application receives approval.

910.3.5 Accreditation not renewed.

Accredited Providers that elect not to renew or fail to meet renewal requirements will be removed from the national registry and be so advised in writing. Providers have the right to appeal a non-renewal decision in accordance with Section 912 of this chapter.

910.3.6 Accreditations in appeal.

Provider accreditations that have not been renewed and are under appeal will be noted as "pending" on the national registry until the appeal is resolved. Providers will be advised to cease representing themselves as accredited.

911 Probation, Suspension, and Revocation of Accreditation

911.1 Notification.

RESNET shall provide written notification to Providers of any decisions under this section. All notices shall be sent by certified mail, or other method which provides evidence of delivery. All notices shall clarify the procedures being followed, as stipulated in this Standard, and include, where applicable, a statement of the Provider's rights to appeal under Section 912 of this chapter.

911.2 Probation

If RESNET determines at any time that a Provider has failed to adhere to the accreditation requirements set forth in these Standards, RESNET shall notify the Provider of the specified deficiencies and shall require that specific corrective action, set forth in the notification, be taken within a specified time after the date set forth in such notification. A notice of probation may be appealed under Section 912 of this chapter.

911.2.1 Types of probation:

911.2.1.1 Administrative Probation. Results from violations found through a Provider's QA process, RESNET quality assurance monitoring or through the RESNET complaint resolution process. RESNET shall notify the Provider of the specified deficiencies and shall require that specific corrective action, set forth in the notification, be taken not later than twenty (20) business days after the date set forth in such notification. Probations resulting from these violations shall remain confidential. These violations may include but not limited to:

911.2.1.1.1 Failure to submit to RESNET any material information required to be submitted by the Provider, in accordance with obtaining or maintaining accreditation;

911.2.1.1.2 Failure to make changes/updates to a Provider's Policies and Procedures;

911.2.1.1.3 Failure to report a change in any QA Designee to RESNET;

911.2.1.1.4 Failure to adhere to requirements for quality assurance of Raters that causes a minor deficiency in the QA of one or more Raters;

911.2.1.1.5 Failure to adhere to requirements for Rater certification and re-certification;

911.2.1.1.6 Failure to enforce corrective action requirements for Raters having non-conforming QA results;

911.2.1.1.7 Failure to adhere to one or more provisions of the RESNET Standards.

911.2.1.2 Disciplinary Compliance Probation.

More serious compliance violations found through a Provider's QA process, RESNET quality assurance monitoring or through the RESNET complaint resolution process. RESNET shall, at its discretion, make a final determination regarding the necessity of posting a probation resulting from these violations on the RESNET web site. These violations may include but are not limited to:

911.2.1.2.1 Failure to correct the terms of an administrative probation during the time period defined in the issuance of probation;

911.2.1.2.2 Failure to replace a Primary QA Designee within the time frame required by these Standards;

911.2.1.2.3 Investigated and validated ethics or compliance complaints against a Provider;

911.2.1.2.4 Failure to follow complaint resolution process regarding actions of the Provider or their Raters;

911.2.1.2.5 Failure to follow a Provider's Rater Disciplinary procedures.

911.3 Suspension

911.3.1 At the discretion of RESNET, any Provider accredited by RESNET may have their accreditation suspended in any of the following circumstances but are not limited to:

911.3.1.1 A Provider has had more than one (1) Disciplinary Probation violation within a twelve-month period;

911.3.1.2 Failure to correct the terms of a Disciplinary Probation during the time period defined in the notice of probation;

911.3.1.3 Submission of false information to RESNET in accordance with obtaining or maintaining accreditation;

911.3.1.4 Misrepresentation of any accreditation or certification status in marketing materials, or services offered or actually provided, for which the Provider organization does not possess the appropriate RESNET accreditation or affiliated individuals do not possess the appropriate RESNET certification;

911.3.1.5 Knowingly registering fraudulent ratings to the RESNET Registry by Rating Providers;

911.3.1.6 Willful misconduct;

911.3.1.7 A Provider shall at a minimum be placed on suspension if they have any Disciplinary Probation violations within twelve months of reinstatement from a suspension.

911.3.2 RESNET shall notify the Provider that their accreditation has been suspended and, unless the Provider chooses to appeal, the Provider shall be removed from the RESNET Provider Directory.

911.3.3 RESNET shall post Providers whose accreditation has been suspended. The Provider's suspension listing shall be removed when the Provider successfully complies with the terms of the suspension.

911.3.4 RESNET shall electronically inform accredited QA Providers, Rating Software Providers, Rater Trainers and Home Energy Raters of a QA Provider's accreditation suspension.

911.3.4.1 Prior to reinstatement, the Provider shall:

911.3.4.1.1 Successfully resolve the issue(s) that resulted in the Provider being suspended;

911.3.4.1.2 Inform RESNET in writing as follows:

911.3.4.1.2.1 That 911.3.4.1.1 has been completed;

911.3.4.1.2.2 Stating the steps taken to resolve the issue(s);

911.3.4.1.2.3 Stating the steps that will be taken to prevent the issue(s) from occurring again in the future; and

911.3.4.1.2.4 Requesting that RESNET reinstate the Provider's listing on the Directory.

911.4 Revocation

911.4.1 At the discretion of RESNET, any Provider accredited by RESNET may have their accreditation revoked in any of but not limited to the following circumstances:

911.4.1.1 A Provider has had more than two (2) Disciplinary Probation violations within a twelve month period;

911.4.1.2 In the event that deficiencies stipulated in a notice of suspension have not been remedied within the period set forth in such notice;

911.4.1.3 Pursuant to any of the express provisions of Section 910.3.5 non renewal;

911.4.1.4 Provider goes out of business;

911.4.1.5 Upon expiration of a Provider's right to appeal a suspension of accreditation pursuant to Section 912 of this chapter;

911.4.1.6 Fraud.

911.4.2 RESNET shall notify the Provider that their accreditation has been revoked and, unless the Provider chooses to appeal, the Provider shall be removed from the RESNET Provider Directory.

911.4.3 RESNET shall post Providers whose accreditation has been revoked. The Providers revocation listing shall be removed when the Provider successfully complies with the terms of the revocation.

911.4.4 RESNET shall electronically inform accredited QA Providers, Rating Software Providers, Rater Trainers and Home Energy Raters of a QA Provider's accreditation revocation.

911.5 Probation/Suspension/Revocation Due Process

RESNET shall comply with the following due process procedures in considering any probation, suspension or revocation actions against an accredited Provider.

911.5.1 RESNET may, at its discretion, initiate a probation, suspension or revocation action against an accredited Provider by providing the Provider written notice of the action. Such notice shall inform the subject Provider of the entire basis and justification for the action.

911.5.2 Providers have the right to appeal a probation, suspension or revocation action in accordance with Section 912 of this chapter.

911.5.3 Upon the expiration of the notice to appeal period, failure to submit appeal documentation, as stipulated in Section 912, or the conclusion of the appeals process in which a Provider's appeals are unsuccessful. RESNET will remove the Provider's name and any directory listing from the RESNET website and post their probation, suspension or revocation status on the RESNET website with other Providers and Raters who are under probation, suspension or revocation, and will, at a minimum, inform the EEP of their suspended/revoked status.

911.5.4 For any QA Providers who have their accreditation revoked or suspended in accordance with Section 911.3 or Section 911.4,

911.5.4.1 RESNET will inform the Provider's known clients, Raters, rating software suppliers and any known affected EEP's of the Provider's suspended/revoked status. To the extent practicable, the Provider shall assist RESNET with notifications.

912 Appeals

912.1 Procedures

912.1.1 Appeals shall be made first to the RESNET Ethics and Appeals Committee, then to the RESNET Board of Directors.

912.1.2 Within five (5) business days after receipt of an appealable action by RESNET, the Appellant shall notify the RESNET Executive Director of their intent to appeal. The Appellant shall then have ten (10) business days after the date of notice to submit appeal documentation to the RESNET Executive Director.

912.1.3 Appeals shall include all relevant information and documentation and be sent in writing by electronic mail to the RESNET Executive Director.

912.1.4 During the appeals process, all parties to the appeal may petition the body hearing the appeal (i.e. the RESNET Ethics and Appeals Committee or RESNET Board of Directors) for a stay of action upon expiration of the appeals process. A decision on the petition shall be rendered by the hearing body not later than ten (10) business days after receipt of the petition. In the event that additional information is requested, an extension of ten (10) business days may be applied in order to allow the appellant sufficient time to respond.

912.1.5 At the time of noticing its appeal to the RESNET Ethics and Appeals Committee, the Appellant may request a telephonic hearing, which gives the Appellant the opportunity to provide oral arguments in favor of their appeal. In such an event, RESNET shall, not later than ten (10) business days after the filing of the notice of appeal, notify all parties to the appeal of the date of the hearing, which shall be held as expeditiously as possible, but not later than twenty (20) business days after the receipt of the notice of appeal.

912.1.6 Within ten (10) business days of receiving the appeal, or the date of a hearing, the Ethics and Appeals Committee or Board of Directors shall render a decision on the appeal. In the event that additional information is requested, a one-time extension of ten (10) business days may be applied in order to allow the appellant sufficient time to respond.

912.1.7 All parties to the appeal shall be informed by electronic mail of the decision.

912.1.8 All appeals documentation received by RESNET shall be handled in strict confidence by RESNET staff, the Ethics and Appeals Committee and the Board of Directors.

Chapter 10- RESNET STANDARD FOR ENERGY SMART PROJECTS AND ENERGY SMART CONTRACTORS

1001 General Provisions

1001.1 Purpose

This standard defines a framework for designating contractors as RESNET Energy Smart Contractors, defines an Energy Smart Project, and establishes requirements for the final verification and quality assurance review of an Energy Smart Project.

1001.2 Scope

This document details:

Requirements for Contractor Education and Qualification Providers;

The process by which a contractor shall receive and maintain designation as a RESNET Energy Smart Contractor;

The process by which RESNET Energy Smart Contractors working in partnership with a certified RESNET Home Energy Rating System (HERS) Rater must complete an Energy Smart Project;

The requirements of an Energy Smart Project.

1001.2.1 Relationship to State Law

There may be instances in which state laws or regulations differ from these provisions. In such instances, state law or regulation shall take precedence over these provisions.

1001.3 Definitions and Acronyms

See Appendix B- Glossary of Terms.

1002 Participants Roles and Responsibilities

1002.1 RESNET

Residential Energy Services Network (RESNET) is responsible for the following:

1002.1.1 Accreditation of Contractor Education and Qualification (CEQ) Providers

1002.1.2 Quality Assurance Review of Accredited CEQ Providers

1002.1.3 Quality Assurance Review of Accredited Quality Assurance Providers

1002.1.4 Develop a National Energy Smart Contractors test. The competency categories covered on the 50 question multiple-choice test and the percentage of questions devoted to each category are as follows:

Air sealing (10%)

Client communication (6%)

Combustion safety (6%)

Ducts/distribution (10%)

Energy fundamentals (10%)

Ethics (6%)

Health/safety (6%)

Insulation (10%)

Lighting/appliances (4%)

Moisture management (10%)

Structure (6%)

Ventilation (6%)

Heating/AC (10%)

1002.2 Contractor Education and Qualification (CEQ) Provider

1002.2.1 The CEQ Provider must be an accredited RESNET Rating Provider or Home Energy Audit Provider in good standing.

1002.2.2 The CEQ Provider must have a staff member or representative with at least 10 years of residential construction or home improvement contractor experience.

1002.2.3 The CEQ Provider must provide its Energy Smart Contractor Registry to RESNET.

1002.2.4 The CEQ Provider is responsible for the Quality Assurance review of the Energy Smart Contractors.

1002.2.5 The CEQ Provider must have written policies and procedure for designating Energy Smart contractors in accordance with the following provisions:

1002.2.5.1 Energy Smart Contractor course: Develop and provide an initial eight (8) hour RESNET Accredited Qualified Energy Smart Contractor course that covers the following topics:

1002.2.5.2 The importance of Energy Smart Contractors

1002.2.5.3 The house as a system

1002.2.5.4 Building science basics/ building shell fundamentals

1002.2.5.5 Energy efficiency concepts

1002.2.5.6 Energy related consequences of inefficient construction design and application

1002.2.5.7 Introduction on how a Rater/Auditor utilizes air leakage testing, duct leakage testing, and IR technology during energy audits

1002.2.5.8 Understanding and completing scopes of work as defined in the RESNET combustion appliance testing and writing work scope contained in Chapter 8 of RESNET Standards

1002.2.5.9 Work order, sequences and priority of work, and respect for other contractors

1002.2.5.10 Introduction to RESNET Standards and RESNET Code of Ethics

1002.2.5.11 Quality Homes (QH) Standard

1002.2.6 Continuing Education

Provide at least four (4) hours of Continuing Education (CE) courses per year that are relevant to energy efficiency, home improvement contracting, standards updates, technology updates, new incentive programs, retrofit lessons learned and/or other topics deemed applicable and appropriate by the CEQ Provider.

1002.2.7 De-listing: De-list an Energy Smart Contractor that does not renew every three (3) years.

1002.2.8 Energy Smart Contractor Agreement: Enter into a written agreement with each Energy Smart Contractor, and send an un-executed copy of the agreement to RESNET. The agreement shall contain, at a minimum, the following:

1002.2.8.1 A written commitment by the Energy Smart Contractor to comply with the guidelines in the RESNET Energy Smart Contractor Pledge and Code of Ethics;

1002.2.8.2 A requirement for the Energy Smart Contractor to inform clients about the CEQ Provider's complaint process;

1002.2.8.3 A requirement for the Energy Smart Contractor to provide the client with a disclosure statement for jobs not performed to industry standards;

1002.2.8.4 A requirement for the Energy Smart Contractor to inform the CEQ Provider within 60 days if Energy Smart Contractor's representative leaves the company or is replaced.

1002.2.8.4.1 Complaint Resolution Officer: Have signed agreement with a dedicated Complaint Resolution Officer (CRO) to conduct Non-Compliance Resolution in accordance with Section 1006.5.4.The CEQ Provider shall have sixty (60) days to notify RESNET if the CRO leaves the CEQ Provider, or be subject to suspension of accreditation under provisions of Section 908 of the Mortgage Industry National Home Energy Ratings Standard.

1002.2.8.4.2 Written Energy Smart Contractor discipline procedures, including:

1002.2.8.4.2.1 Probation and minimum requirements for duration and corrective action;

1002.2.8.4.2.2 Suspension of certification and minimum requirements for duration and corrective action that at least meet 1006.4.5 Termination of certification

1002.2.9 Energy Smart Contractor Registry: Maintain an Energy Smart Contractor Registry that contains Energy Smart Contractors' representative's name, company name, mailing address, voice phone number, fax number, and email address.

1002.2.10 Reciprocity with the Air Conditioning Contractors of America (ACCA): RESNET shall recognize contractors trained and designated by ACCA to be Energy Smart Contractors.

1002.3 Complaint Resolution Officer (CRO)

1002.3.1 Shall manage and resolve consumer and Rater/Auditor complaints about Energy Smart Contractors and Energy Smart Contractor or Rater/Auditor complaints about the CEQ Provider.

1002.3.2 Shall submit complaints against the CEQ Provider to RESNET to the attention of the Executive Director.

1002.4 Energy Smart Contractor

1002.4.1 Energy Smart Contractors must be designated as such by a CEQ Provider in accordance with Section 1004.2.5 of this standard[1].

1002.4.2 Energy Smart Contractors must be licensed in the state(s) in which they conduct business if that state requires a license.

1002.4.3 An Energy Smart Contractor company shall assign an employee as its representative. The Energy Smart Contractor's representative shall:

1002.4.3.1 Take an initial accredited eight (8) hour Qualified Contractor Course from a RESNET accredited CEQ Provider;

1002.4.3.2 Pass the RESNET National Energy Smart Contractors test administered by a CEQ Provider;

1002.4.3.3 Enter into a written agreement with the CEQ Provider in which the Energy Smart Contractor agrees to comply with the program requirements contained in the RESNET Standards and RESNET Code of Ethics;

1002.4.3.4 Complete a minimum of four hours of Continuing Education annually delivered by the CEQ Provider;

1002.4.3.5 Renew with the CEQ Provider not less than every three years. Failure to do so will result in the Energy Smart Contractor being deleted from the CEQ's Registry and from the RESNET Directory;

1002.4.3.6 Within 60 days of losing their previous representative, the Energy Smart Contractor must notify the CEQ Provider of their new representative.

1002.4.4 Only companies with the Energy Smart Contractor designation from an accredited CEQ Provider are eligible for posting and promotion on the RESNET Directory.

1002.4.5 A company with the Energy Smart Contractor designation must carry a minimum of $1,000,000 in general liability insurance.

1002.4.6 Energy Smart Contractors will install the energy-saving measures from the final, homeowner approved work scope prepared by the Rater/Auditor.

1002.4.7 All Energy Smart Contractors shall have their clients signify that they understand a disclosure statement indicating that all work will or will not meet recognized industry standards.

1002.4.8 All Energy Smart Contractors shall have their clients signify on a disclosure statement that a whole-house audit is recommended.

1002.5 Energy Smart Home Performance Team (Energy Smart Team)

An Energy Smart Team is comprised of the following, as necessary:

1002.5.1 One Project Manager;

1002.5.2 A certified CHERS Rater/BPA;

1002.5.3 An HVAC contractor who is a recognized ACCA QA Program Participant[2];

1002.5.4 A RESNET Energy Smart Contractor that specializes in Air Sealing and Insulation who employs at least one senior technician who is an ICAA Certified Insulation Installer or another RESNET recognized quality installation training program;

1002.5.5 Any number of other Energy Smart contractor companies working under the oversight of the Project Manager according to work scope requirements of a certified Rater and applicable RESNET Standards of Practice.

1002.5.6 A Final Verifier who is a 3rd party certified HERS Rater who has passed both the CAZ written and simulation exams.

1002.6 Energy Smart Project Manager

The ES Team will be led by an Energy Smart Project Manager. The following are the requirements for being the Project Manager:

1002.6.1 Shall be certified as either an Energy Smart Contractor or a Rater who has passed both the CAZ written and simulation exams.

1002.6.2 The Energy Smart Project Manager, if not the Rater, shall use a certified RESNET Rater for the diagnosis and preparation of energy retrofit recommendation.

1002.6.3 Is an employee of or contractor to the company with whom the homeowner is under contract for the completion of the Energy Smart Project.

1002.6.4 Must ensure that the initial rating or audit is performed on each Project in accordance with the QH Standard.

1002.6.5 Must ensure that preliminary and post-installation combustion safety testing and inspection of all combustion appliances are completed in accordance with the QH Standard.

1002.6.6 Must provide general oversight of all contractors performing work on the Energy Smart Project to ensure proper sequence and compliance with the work scope prepared by the Rater/Auditor, along with ensuring that industry best practices are followed for all work performed.

1002.6.7 Must deliver the initial rating or audit report along with documentation of all work performed to the Final Verifier.

1002.6.8 Must verify that each project has final verification and calculation of estimated projected energy savings conducted by a Final Verifier.

1002.6.9 Must provide all results and Energy Smart Project documentation to the client.

1002.6.10 Must maintain the initial rating or audit report, documentation of all energy-saving retrofits and installations, and the final verification report with all test-out and estimated energy savings results for each individual Energy Smart Project for a period of no less than three years. This documentation must be made available to the HEA, Rating, or CEQ Provider upon request.

1002.6.11 Ensure that all Energy Smart Team participants are eligible to serve on the team.

1002.6.11.1 Eligible HVAC contractors must be listed on the ACCA QA Contractor Registry.

1002.6.11.2 Energy Smart Contractors must be listed on the RESNET Registry.

1002.7 Rating QA Provider

1002.7.1 The Rating QA Provider will be responsible for performing Quality Assurance (QA) Review of the Rater Final Verification of an Energy Smart Project in accordance with Chapter 9 of these Standards.

1002.7.2 The Rating QA Provider must be RESNET-accredited and in good standing in accordance with RESNET Standards.

1002.7.3 The Rating QA Provider must be independent of the following:

1002.7.3.1 HERS Rater that evaluated the home and prepared the recommendations and work scope;

1002.7.3.2 The Energy Smart Contractors that installed the approved recommended measures.

1002.7.3.3 The independent Rater/Auditor that performed the Final Verification of the Energy Smart Project (the Final Verifier).

1002.7.3.4 Any financial compensation for any of the retrofits performed on the project.

1002.8 HERS Rater

The HERS Rater is responsible for following the QH Standard procedures to complete the following:

1002.8.1 Conducting the initial, comprehensive evaluation of a home.

1002.8.2 Presenting prioritized energy saving measures recommendations to the homeowner.

1002.8.3 Developing a work scope to be approved by the homeowner.

1002.9 Final Verifier

1002.9.1 The Final Verifier must be an independent certified RESNET HERS Rater that does not have a financial interest in any of retrofit work done for the Energy Smart Project, or that is not employed by a company who performs any part of the retrofit work.

1002.9.2 The Final Verifier is responsible for the following:

1002.9.2.1 Must perform applicable combustion appliance testing.

1002.9.2.2 Where there are vented combustion appliances that use indoor air to vent combustion gases, test Worst Case Depressurization in accordance with the QH Standard.

1002.9.2.3 Where any space contains combustion appliances, test for Carbon Monoxide in accordance with the QH Standard.

1002.9.3 Verification of installed measures. The Final Verifier will review the work scope and signed proposal, and confirm that the installed measures are consistent with selected measures and work scope in accordance with the QH Standard.

1002.9.4 Calculation of estimated project energy savings using a RESNET-approved software.

1002.9.5 Must report any non-conformance of an Energy Smart Project with respect to combustion safety testing, installed measures, or estimate of projected energy savings to the Energy Smart Contractors' CEQ

Provider's Complaint Resolution Officer (CRO) and the Rating Provider's Quality Assurance (QA) Designee.

1002.9.6 Must report non-conformance of HVAC QA Contractors to the QI Standard to ACCA.

1002.9.7 Must maintain Final Verification records, for a period of no less than three years, for every Energy Smart Project for which final verification was performed. These records include:

1002.9.7.1 Copy of the work scope and signed proposal,

1002.9.7.2 Name and contact information for the Rater/Auditor and Energy Smart Contractors,

1002.9.7.3 Completed final verification checklist,

1002.9.7.4 Energy simulation software file, and

1002.9.7.5 All test-out results.

1. Energy Smart Contractors providing HVAC services must be recognized ACCA QA Program Participants within 90 days of the adoption of this standard.
2. Energy Smart Contractors providing HVAC services must be recognized ACCA QA Program Participants within 90 days of the adoption of this standard.

1003 Energy Smart Projects

1003.1 Energy Smart Project

An Energy Smart Project shall employ an Energy Smart Team and comply with the following:

1003.1.1 Follows accepted industry standards and OEM instructions.

1003.1.2 Includes disclosure statements for work performed that does not meet recognized industry standards.

1003.1.3 Verified and validated by a Final Verifier.

1003.1.4 Consists of work performed by either an Energy Smart Contractor or, for work done on HVAC systems or components, the contractor must be a participant in the ACCA QA Recognition Program.

1003.1.5 Is comprised of two or more trades.

1003.1.6 Has an Energy Smart Project Manager that complies with Section 1004.6.

1003.2 Energy Smart Home

A home designated as an Energy Smart Home shall be recognized by RESNET if:

1003.2.1 The project is in compliance with Section 1003.1 except for the following:

1003.2.1.1 Must undergo an initial rating or audit that is performed in accordance with QH Standard.

1003.2.1.2 The homeowner is provided an estimate of percentage energy savings and a reduction in estimated energy usage of not less than 30% based upon actual installed measures.

1003.2.2 A Final Verifier conducts an independent verification of the project and a calculation of estimated energy savings.

1004 Quality Assurance Oversight

1004.1 The CEQ Provider shall be responsible for providing quality assurance of Energy Smart Contractors and Teams in accordance with the requirements set forth in Chapter 9.

Appendix A- On-Site Inspection Procedures for Minimum Rated Features

A-1 Building Element: Foundation

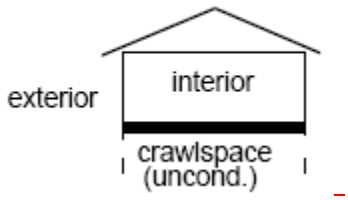
A-1.1 Rated Feature: Conditioning of space

A-1.1.1 Task: Determine whether a crawl space or basement is ~~conditioned or~~ a Conditioned Space Volume or an U~~u~~nconditioned Sspace V~~v~~olume~~, indirectly conditioned or directly conditioned~~.

A-1.1.1.1 On-Site Inspection Protocol:

To determine whether a crawl space or basement is~~ conditioned~~ Conditioned ~~s~~Space ~~v~~Volume, assess whether it meets the definition of Conditioned Space Volume in Appendix B.~~the insulation placement in the walls or floor/ceiling assembly., the ability to be serviced by a space heating or cooling system designed to maintain space conditions at 78 °F (26 °C) for cooling and 68 °F (20 °C) for heating (see Appendix B for Definition of Conditioned Space Volume).~~

~~A vented crawl space is considered unconditioned regardless of the location or existence of insulation. This is because the ambient temperature of the crawl space is close to the outdoor ambient temperature.~~



To determine whether a crawl space or basement is Unconditioned Space Volume, assess whether it meets the definition of Unconditioned Space Volume in Appendix B.~~An unvented crawl space or basement may be considered either unconditioned, indirectly conditioned, or fully conditioned, based on the following criteria:~~

~~***Unconditioned*** Foundation walls are not insulated, floor/ceiling assembly is insulated, and any heating or plumbing distribution systems in the space is insulated. The intention in an unconditioned crawl space or basement is to minimize the heating system losses into the space~~

by means of the distribution and plumbing insulation, and to minimize heat flow through the insulated floor/ceiling assembly.

Conditioned, indirectly - Foundation walls are not insulated with floor/ceiling assembly insulated and distribution system in the space uninsulated, or foundation walls insulated with floor ceiling assembly insulated or non-insulated and distribution system uninsulated. In an indirectly conditioned crawl space or basement, heating or cooling is unintentionally delivered to the space either through the floor/ceiling assembly or by unintentional losses from the heating/cooling system. Indirectly conditioned spaces are typically between the temperature of the outdoor ambient temperature and the indoor conditioned space temperature.

Conditioned, directly - The volume within a building serviced by a space heating or cooling system designed to maintain space conditions at 78 °F (26 °C) for cooling and 68 °F (20 °C) for heating. The following specific spaces are addressed to ensure consistent application of this definition:

- If the volume both above and below a floor cavity meets this definition, then the volume of the floor cavity shall also be included. Otherwise the volume of the floor cavity shall be excluded.

- If the volume of one or both of the spaces horizontally adjacent to a wall cavity meets this definition, then the volume of the wall cavity shall also be included. Otherwise, the volume of the wall cavity shall be excluded.

- The volume of an attic that is not air sealed and insulated at the roof deck shall be excluded.

- The volume of a vented crawlspace shall be excluded.

- The volume of a garage shall be excluded, even if it is conditioned.

- The volume of a thermally isolated sunroom shall be excluded.

- The volume of an attic that is air sealed and insulated at the roof deck or an unvented crawlspace shall only be included if the party conducting evaluations has obtained an ACCA Manual J, S, and either B or D report and verified that both the heating and cooling equipment and distribution system are designed to offset the entire design load of the volume.

- The volume of a basement shall only be included if the party conducting evaluations has either:

  - Obtained an ACCA Manual J, S, and either B or D report and verified that both the heating and cooling equipment and distribution system are designed to offset the entire design load of the volume, or,

  - Verified through visual inspection that both the heating and cooling equipment and distribution system serve the volume and, in the judgement of the party conducting evaluations, are capable of maintaining the heating and cooling temperatures specified by the Thermostat section in Table 4.2.2(1) of ANSI/RESNET 301-2104.

Foundation walls insulated or uninsulated and basement or crawl space is intentionally or unintentionally conditioned, by means of a forced air heating or cooling system, hydronic heat,

~~electric resistance, etc. Fully conditioned spaces are typically maintained at the same temperature as the above grade spaces. The distinction between indirectly and directly conditioned basement spaces may be difficult, but is important from a heat transfer perspective. Rater judgment will have to be utilized in many cases. Interview the owner about the temperature in the basement during the heating season, and assess the potential for standby loss from the heating equipment and distribution system, e.g., jacket insulation, leakiness of ducts, insulation on distribution systems, etc.~~

A-1.2 Rated Feature: Construction Type

A-1.2.1 Task: Identify floor over crawl space.

A-1.2.1.1 On-Site Inspection Protocol:

A crawl space is typically defined as a foundation condition with a clear vertical dimension 4 feet high or less. Crawl spaces may be vented or unvented. Vented crawl spaces have some form of vent or louver in the crawl space walls, or are constructed in such a manner so that air moves freely from outside the walls to inside the crawl space. Unvented crawl spaces are constructed without any form of vents or louvers in the wall, and are constructed to exclude, to the greatest extent possible, air leakage from outside the walls to inside the crawl space. Crawl spaces may be accessed by a hatchway in the floor of the house or in the wall of the crawl space. To identify a crawl space, look for foundation vents and/or stairs leading up to floor levels from the outside of the building.

A-1.2.2 Task: Identify floor over full basement

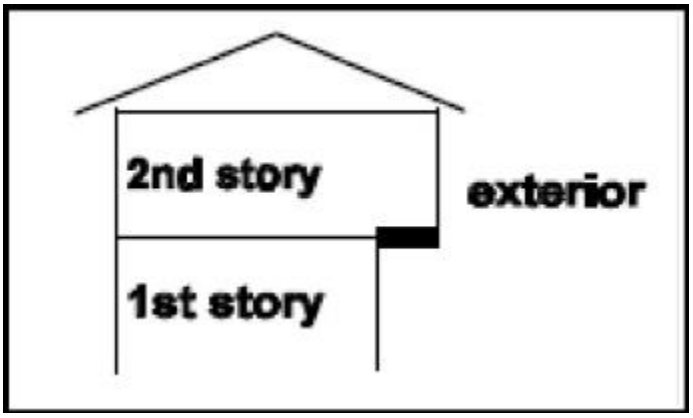
A-1.2.2.1 On-Site Inspection Protocol:

A full basement has characteristics similar to an unvented crawl space, except that the clear vertical dimension is typically greater than 4 feet. Stairs that lead from the main floor to a below grade space are an indication of a basement in a house, although a house may have a basement with access similar to a crawl space access.

A-1.2.3 Task: Identify floor over exterior space

A-1.2.3.1 On-Site Inspection Protocol:

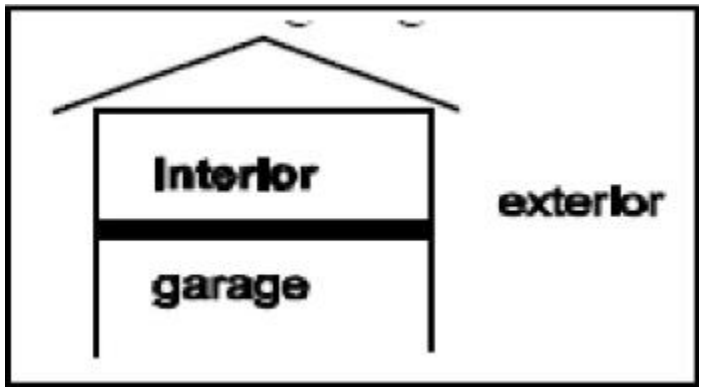
Floor area that borders exterior unenclosed space above grade is considered floor to exterior. For example, in a two story house, the second story may extend horizontally further than the first story, creating some floor area that is exposed to the exterior.



A-1.2.4 Task: Identify floor over unconditioned garage.

A-1.2.4.1 On-Site Inspection Protocol:

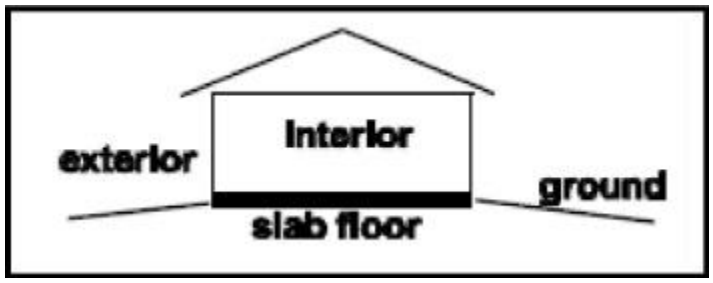
Identify floors over an unconditioned garage.



A-1.2.5 Task: Identify slab on grade foundation.

A-1.2.5.1 On-Site Inspection Protocol:

A slab on grade can be recognized by the absence of either a crawl space or basement. A slab on grade is constructed by pouring a concrete slab directly on the ground as the floor for the house.



A-1.2.6 Task: Identify walkout basement.

A-1.2.6.1 On-Site Inspection Protocol:

A walkout basement, if fully conditioned, is typically considered partially slab on grade construction (where the floor level is above grade) and partially a basement (where the floor level is below grade).

A-1.3 Rated Feature: Interior surface condition

A-1.3.1 Task: Determine the inside surface condition of floor (exposed or covered)

A-1.3.1.1 On-Site Inspection Protocol:

Covered -If floor is covered with wall-to-wall carpet, consider it covered. Floors with only area rugs are not considered covered.

Exposed -If the floor has tile, linoleum or wood, consider it exposed.

A-1.4 Rated Feature: Surface area

A-1.4.1 Task: Measure floor dimensions

A-1.4.1.1 On-Site Inspection Protocol:

Measure floor dimensions in accordance with ANSI Z765-1996 with the exception of Section 3 Paragraph 6 (floor areas with ceiling heights of less than 5’ will be included in finished square footage).

For conditioned basements and crawl spaces, find dimensions of basement walls and floor. Divide walls into above and below grade sections.

Measure the house or assembly element (window, wall, ceiling, etc.) to the nearest inch, and record the square footage to the nearest square foot. Use exterior measurements; those measurements should start at the exterior finished surface of the outside wall. Openings to the floor below should not be included in the square footage calculation, with the exception of stairways; stairways and associated landings are counted as square footage on both the starting and ending levels. Do not include the "footprint" of protruding chimneys or bay windows. Do include the "footprint" of other protrusions like a cantilever when it includes finished floor area. Do include the square footage of separate finished areas that are connected to the main body of the house by conditioned hallways or stairways.

Note to divide basement and crawl space walls into above and below grade.

A-1.5 Rated Feature: Thermal mass

A-1.5.1 Task: Determine presence of thermal mass

A-1.5.1.1 On-Site Inspection Protocol:

Concrete slabs and basement walls when uninsulated or insulated on the exterior can be considered as thermal storage mass when combined with solar gain from south fenestration. Note type of thermal mass: concrete, brick, tile, water.

South fenestration is defined as fenestration oriented between 45E SE to 45E SW.

Slab-on-grade construction in climates with more than 3600 HDD (65) may not be considered solar storage mass unless properly insulated (edge, perimeter, or under slab).

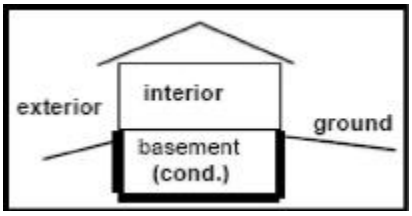
A-2 Building Element: Floor of conditioned basement or crawl space

A-2.1 Rated Feature: Insulation

A-2.1.1 Task: Determine insulation in walls and floor of conditioned basement or crawl space

A-2.1.1.1 On-Site Inspection Protocol:

If basement or crawl space is determined to be fully conditioned, its walls and floor are considered part of the building envelope. (The floor between the house's ground floor and the basement or crawl space is considered an interior boundary with no associated heat transfer calculated.)

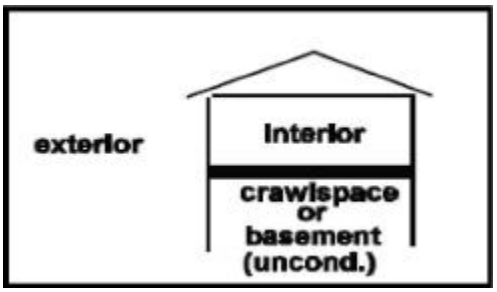


Determine insulation type, thickness and R-value in walls. Wall insulation may be located inside foundation wall (studs and batts, foam under drywall, etc.), integral with foundation wall (insulated cores of block wall, insulating concrete block such as insulating form-work) or outside the foundation wall (rigid foam insulation).

A-2.1.2 Task: Determine amount of floor insulation

A-2.1.2.1 On-Site Inspection Protocol:

Use the inspection guidelines under “Walls—Insulation value” to assess “Grade I”, “Grade II”, or “Grade III” installation. Note: in addition to the inspection guidelines under “Walls”, “Grade I” installation for floor insulation also requires that the insulation be installed in complete contact with the subfloor surfaces it is intended to insulate. For loose fill applications, multiply the thickness of the insulation (in inches) by the appropriate R-value per inch based on the insulation type in order to calculate the total existing floor insulation R-value. Floor insulation over unconditioned basements or enclosed (vented or unvented) crawlspaces need not be enclosed to attain a “Grade II” or “Grade I” assessment; floor insulation over ambient conditions does.



A-3 Building Element: Slab-on-grade

A-3.1 Rated Feature: Perimeter

A-3.1.1 Task: Determine perimeter of slab foundation

A-3.1.1.1 On-Site Inspection Protocol:

Determine the perimeter of the slab foundation by measuring each dimension to the nearest ½ foot and adding them together.

A-3.1.2 Task: Determine if slab perimeter insulation exists

A-3.1.2.1 On-Site Inspection Protocol:

If present, slab perimeter insulation is usually installed on the outside of the slab and extends both above and below grade.

To identify slab perimeter insulation, look for a protective coating above grade as opposed to the usual exposed slab edge at any conditioned space(s).

Move a little bit of dirt away from an edge of the slab where conditioned space is located. If present, the rigid insulation around the perimeter of the slab may be seen. However, it may be difficult to visually verify the existence of slab perimeter insulation because of the protective covering which may be installed over the rigid insulation.

Slab insulation may also occur between the foundation wall and the slab itself, although this is harder to assess and verify. If the floor has carpeting, a sharp needle may be poked through the carpet near the baseboard on an outside wall. If the needle penetrates beyond the depth of the carpet, there is probably foam insulation between the slab and foundation wall.

Under slab insulation cannot be assumed to exist unless visually verified by a photograph of construction, at chase way, at sump opening or at plumbing penetrations.

A-4 Building Element: Walls

A-4.1 Rated Feature: Color

A-4.1.1 Task: Determine the color of the wall

A-4.1.1.1 On-Site Inspection Protocol:

Identify the color of the wall as light, medium, or dark.

A-4.2 Rated Feature: Construction type

A-4.2.1 Task: Determine the structural system of walls

A-4.2.1.1 On-Site Inspection Protocol:

Wood framing -is very common in residential construction. Wood studs are located 16" or 24" on center all along the wall. Knocking on the wall will give a "hollow" sound in the cavities between the studs and a "solid" sound at the stud locations.

Metal framing -can be found in some newer residential construction. A strong magnet slid against the wall will hold to metal framing. Also check inside the attic at the edges for evidence of metal wall framing. *Masonry walls* - include walls constructed of concrete or brick. A wood framed wall with brick veneer would not be considered a masonry wall. Also note the siding or finish material on the wall.

Foam core walls - are a sandwich panel consisting of a foam center with outer layers of structural sheathing, gypsum board or outer finish materials. Foam core panels may be structural (load bearing) or non-structural. Non-structural panels are frequently used in post and beam construction.

Log walls - are typically solid wood walls, using either milled or rough logs or solid timbers. Some homes may have the appearance of solid log walls, yet may actually be wood frame walls with siding that looks like solid logs inside and out. Some log walls are manufactured with insulated cores. Unless manufacturer's documentation is available or visual inspection of insulation type and thickness can be made, assume no added insulation exists in a log wall.

A-4.3 Rated Feature: Framing members

A-4.3.1 Task: Determine framing member size for all framed walls exposed to unconditioned space

A-4.3.1.1 On-Site Inspection Protocol:

To determine whether 2x4 or 2x6 framing exists:

Measure the width of the window jambs;

Subtract the widths of the wall coverings and sheathing materials (approximately 0.25" to 1.0" for stucco, 0.5" to 0.6" for interior drywall, and 0.5" to 0.75" for other exterior siding materials);

Compare the remaining width to 3.5" for a 2x4 wall or 5.5" for a 2x6 wall;

If exposed garage walls exist, examine them for reference (although they will not *always* be the same as other walls);

If a wall does not come close to the framing width of a 2x4 or 2x6, inspect for foam sheathing on the inside or outside of the walls. In super-insulated construction, "double-stud" or "strapped" walls may account for thickness greater than 5.5". For brick veneer walls, assume 4.5" - 5" for brick, airspace and sheathing material.

Check the framing member size on all sides of the house. If an addition has been added, be sure to check the walls of the addition separately. If the house has more than one story, check the framing member size for each floor.

A-4.4 Rated Feature: Insulation value

A-4.4.1 Task: Determine type and thickness of existing insulation and resultant R-value

A-4.4.1.1 On-Site Inspection Protocol:

Framed Walls:

Check at plumbing outlet under sink or, in order of preference, remove cable outlet plate, telephone plate, electrical switch plates and/or electrical outlet plates on exterior walls.

Probe the cavity around the exposed plate with a non-metal device (such as a plastic crochet hook or wooden skewer). Determine type of insulation (fiberglass, cellulose insulation, foam, etc.). Inspect outlets/switch plates on each side of the house to verify that all walls are insulated.

Multiply the wall framing member size (in inches) by the R-value per inch. Be sure to use the actual thickness of the insulation when calculating the total insulation R-values. Use 3.5" for 2 x 4 walls and 5.5" for 2 x 6 walls constructed after 1945.

Parts of the house that were added later must be checked separately from the original walls.

Sheathing:

Insulated sheathing may exist on walls, but can be difficult to verify. Walls with insulated sheathing may be thicker than walls without insulated sheathing. Visual verification of insulated sheathing may be found in the attic at the top of the wall, exterior wall penetrations, and at the connection between the foundation and the wall.

A-4.5 Rated Feature: Insulation Installation

A-4.5.1 Task: Determine cavity insulation installation characteristics

A-4.5.1.1 On-Site Inspection Protocol:

When it is possible to inspect insulation as installed (i.e., new construction), inspectors shall rate the installation as “Grade I, II, or III” according to the following guidelines, regardless of insulation material or installation process. Note that all insulation installation techniques require proper care to ensure they are completed correctly; if they are not, thermal performance can suffer dramatically. These guidelines apply to cavity fill insulation, continuous rigid insulation, and any other field-installed insulation products.

1. “Grade I” shall be used to describe insulation that is generally installed according to manufacturers instructions and/or industry standards. A “Grade I” installation requires that the insulation material uniformly fills each cavity side-to-side and top-to-bottom, without substantial gaps or voids around obstructions (such as blocking or bridging), and is split, installed, and/or fitted tightly around wiring and other services in the cavity. To inspect, probe in, around, or through the insulation and/or vapor retarder in several places to see whether these requirements are met. Replace or repair the vapor retarder and insulation as necessary. During inspection (typically before drywall is installed), if the exterior sheathing is visible from the building interior through gaps in the cavity insulation material, it is not considered a “Grade I” installation.

To attain a rating of “Grade I”, wall insulation shall be enclosed on all six sides, and shall be in substantial contact with the sheathing material on at least one side (interior or exterior) of the cavity. Exception: the interior sheathing/enclosure material is optional in climate zones 1-3, provided insulation is adequately supported and meets all other requirements.

For rim or band joist insulation, use the inspection guidelines under “Walls—Insulation value” to assess “Grade I”, “Grade II”, or “Grade III” installation. Exception: the interior sheathing/enclosure material is optional in all climate zones, provided insulation is adequately supported and meets all other requirements.

For exterior applications of rigid insulation, insulation shall be in firm contact with the structural sheathing materials, and tightly fitted at joints to be considered a “Grade I” installation.

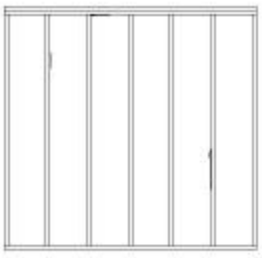
For faced batt insulation, Grade I can be designated for side-stapled tabs, provided the tabs are stapled neatly (no buckling), and provided the batt is only compressed at the edges of each cavity, to the depth of the tab itself, and provided it meets the other requirements of Grade I.

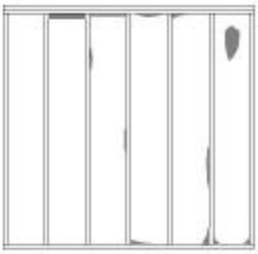
For sprayed or blown-in products, density shall be sufficient that the fill material springs back when compressed slightly with a hand or finger, and provided it meets the other requirements of Grade

Interpretation:

The following illustrations represent the boundary conditions between Grade I and Grade II, that is, the installation shall be at least this good to be labeled as “Grade I”:

Occasional very small gaps are acceptable for “Grade I”.





Compression or incomplete fill amounting to 2% or less, if the empty spaces are less than 30% of the intended fill thickness, are acceptable for “Grade I”.

The following standards may be applied as a reference: NAIMA, Recommendations for Installation in Residential and Other Light-Frame Construction—Fiber Glass Home Insulation (PUB # BI402), Recommendations for Installation in Residential and Other Light-Frame Construction—Fiber Glass Loose Fill Insulation (PUB # BI403), CIMA, Technical Bulletin #2 -- Standard Practice for Installing Cellulose Building Insulation, Technical Bulletin #3-- Standard Practice for Installation of Sprayed Cellulosic Wall Cavity Insulation. For other products and materials, manufacturer's installation instructions will apply.

2. “Grade II” shall be used to describe an installation with moderate to frequent installation defects: gaps around wiring, electrical outlets, plumbing and other intrusions; rounded edges or “shoulders”; or incomplete fill amounting to less than 10% of the area with 70% or more of the intended thickness (i.e., 30% compressed); or gaps and spaces running clear through the insulation amounting to no more than 2% of the total surface area covered by the insulation. To attain a rating of “Grade II”, wall insulation shall be enclosed on all six sides, and shall be in

substantial contact with the sheathing material on at least one side (interior or exterior) of the cavity.

Interpretation:

The following illustrations represent the boundary conditions between Grade II and Grade III, that is, the installation shall be at least this good to be labeled as “Grade II”:

No more than 2% of surface area of insulation missing is acceptable for “Grade II”

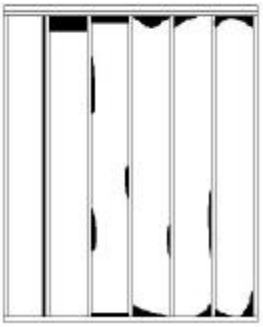
No more than 10% of surface area of insulation compressed or incomplete fill, by up to 30% (70% or more of intended thickness) is acceptable for “Grade II”.

3. “Grade III” shall be used to describe an installation with substantial gaps and voids, with missing insulation amounting to greater than 2% of the area, but less than 5% of the surface area is intended to occupy. More than 5% missing insulation shall be measured and modeled as separate, uninsulated surfaces according to 3.B.5.p.

This designation shall include wall insulation that is not in substantial contact with the sheathing on at least one side of the cavity, or wall insulation in a wall that is open (unsheathed) on one side and exposed to the exterior, ambient conditions or a vented attic or crawlspace. The presence of an air-impermeable barrier such as house-wrap will be considered to enclose the building cavities.

Interpretation:

The following illustration represents the boundary conditions between Grade III and the situation whereby one must measure the uninsulated areas; that is, the installation shall be at least this good to be labeled as “Grade III”:

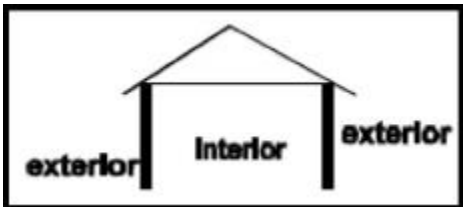


A-4.6 Rated Feature: Location

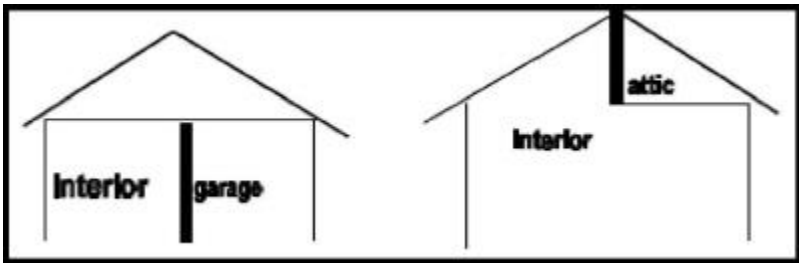
A-4.6.1 Task: Determine whether walls border exterior space, attic, garage or crawl space

A-4.6.1.1 On-Site Inspection Protocol:

Wall to exterior -Walls border exterior space.



Wall to enclosed Uunconditioned Sspace Vvolume -Walls that border unconditioned attics, garages and crawl spaces.



A-4.7 Rated Feature: Surface area

A-4.7.1 Task: Determine surface area of all walls exposed to Uunconditioned Sspace Vvolume

A-4.7.1.1 On-Site Inspection Protocol:

Measure linear perimeter of the walls to the nearest ½ foot. Measure the interior wall height of the walls to the nearest 1/4 foot. Use these measurements to calculate surface area.

A-4.8 Rated Feature: Thermal mass

A-4.8.1 Task: Determine type and thickness of all mass walls

A-4.8.1.1 On-Site Inspection Protocol:

If the dwelling's walls are constructed of concrete, masonry or brick, determine their type and thickness.

Solid concrete walls (poured): Measure the thickness of the poured concrete wall in inches.

Concrete Masonry Unit: Cinder block or uninsulated concrete wall - hollow in the middle. May contain vermiculite or perlite insulation. Check for additional insulation (interior furring, foam board, foam fill). Measure the thickness of the wall in inches.

A-5 Building Element: Roof/Ceiling

A-5.1 Rated Feature: All ceiling areas between ~~conditioned~~ Conditioned and U~~u~~nconditioned S~~s~~pace V~~v~~olumes

A-5.1.1 Task: Obtain measurements of all ceiling areas

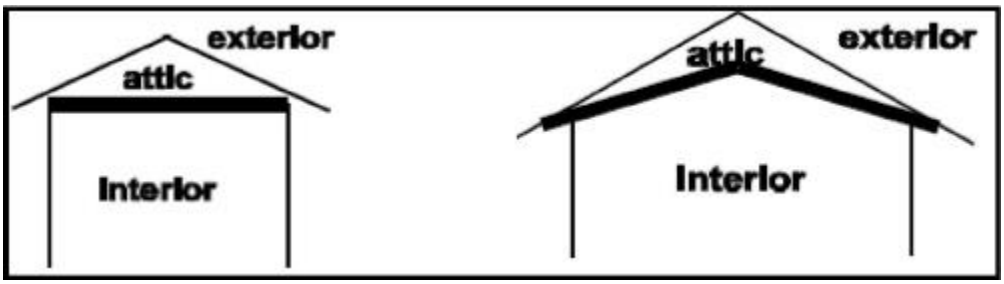
A-5.1.1.1 On-Site Inspection Protocol:

Measure the linear perimeter of the ceiling area to the nearest ½ foot and use these measurements to calculate surface area of the ceiling.

If a ceiling area is vaulted, it may be necessary to calculate dimensions geometrically.

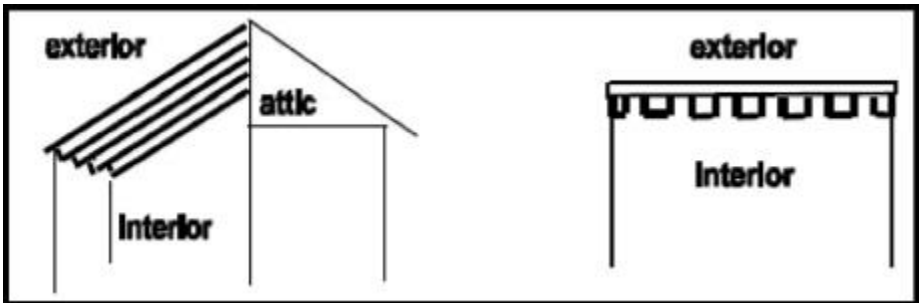
Identify the ceiling as one of the following types.

Ceiling to attic: If the ceiling has attic space above (even if the ceiling is vaulted, as in a scissor truss) it is considered ceiling to attic. If there is a vaulted ceiling check it's angle against the angle of the roof -- if the ceiling angle is gentler there is attic space above the ceiling. Also check for an attic access, either separate or from an attic over another part of the house.



Framed ceilings fall into two categories:

Roof on exposed beams or rafters - when you look up from inside the room, you will see exposed beams or rafters.



Finished framed ceiling -if the ceiling is framed (has no attic space above it, but you cannot see the rafters because the ceiling is finished with drywall, plaster, paneling, etc.) consider it a finished framed ceiling.

A-5.1.2 Task: Determine the size of the framing members for framed ceilings

A-5.1.2.1 On-Site Inspection Protocol:

Determine the framing member size for framed ceilings exposed to unconditioned spaces.

Check the framing by looking for an access through an attic over another part of the house or by looking at the rafters from the outside.

A-5.2 Rated Feature: Color

A-5.2.1 Task: Determine the color of the roof

A-5.2.1.1 On-Site Inspection Protocol:

Identify the color of the roof as light, medium or dark. Also check for a special reflective roof coating.

A-5.3 Rated Feature: Construction type

A-5.3.1 Task: Determine the roof's construction type

A-5.3.1.1 On-Site Inspection Protocol:

Identify the type of roofing surface. Some common types include:

- Asphalt shingle;
- Pebble/gravel built-up roof;
- Tile roof;
- Wood shingle roof;
- Rubber roof/roof coating;
- Metal.

A-5.4 Rated Feature: Insulation value

A-5.4.1 Task: Determine R-value of insulation in attic

A-5.4.1.1 On-Site Inspection Protocol:

Measure the average depth in four places.

Use the inspection guidelines under “Walls—Insulation value” to assess “Grade I”, “Grade II”, or “Grade III” installation.

Note: in addition to the inspection guidelines under “Walls”, “Grade I” installation for ceiling insulation also requires that the insulation be installed in complete contact with the drywall or sheathing surfaces it is intended to insulate. For loose fill applications, be sure to get four

readings which accurately reflect the insulation level (the depth should be representative of the entire attic area being examined). Multiply the minimum depth of insulation by its R-value per inch to obtain the total R-value. Insulation in ceilings with attic above need not be enclosed to attain a “Grade II” or “Grade I” assessment. For sealed, unvented attic/roof assemblies, the interior sheathing/enclosure material is optional in climate zones 1-3, provided insulation is adequately supported and meets all other requirements, including full contact with the exterior (roof) sheathing. For ceiling insulation, eave baffles or equivalent construction is required to prevent wind washing to be considered “Grade I”.

Note whether the cavity insulation leaves the framing elements exposed, or covers them; if covered, note the thickness that covers the framing.

A-5.4.2 Task: Determine the R-value of insulation in framed ceiling

A-5.4.2.1 On-Site Inspection Protocol:

Determine the insulation R-value which exists in the ceiling area (cavity). Use the following method for calculating the overall ceiling R-value:

Determine the type of ceiling insulation present (may be a combination of more than one type);

Multiply the R-value of the material by the depth of the insulation;

If there is no access to the framed ceiling, ask the customer for documentation of insulation or use a default value based on age.

A-5.4.3 Task: Determine insulation value

A-5.4.3.1 On-Site Inspection Protocol:

The rim joist is the band joist around the perimeter of the floor joists over a basement or crawl space, or between 2 stories of a house.

Crawl space or Basement: From the basement or crawl space, visually identify and measure the depth of insulation at the rim joist. The insulation used is generally fiberglass batts, often folded in an L-shape and attached to the rim joist. Rigid board insulation may also be found.

Between Stories: Look for access to the area from a garage or a utility access trap door. Visually identify and measure insulation if it exists. If no access can be found, assume insulation exists at the rim joist between stories if:

- Insulation was found at the rim joist at the top of the crawl space or basement in the same house; or
- Insulation is found in the walls of the same house.

Otherwise, assume no rim joist insulation exists.

A-6 Building Element: Doors

A-6.1 Rated Feature: Construction type

A-6.1.1 Task: Determine construction type of doors

A-6.1.1.1 On-Site Inspection Protocol:

Determine if the exterior door(s) is fiberglass, metal, or wood by making a close inspection of its texture, distinguishing the sound produced when knocking on it, and checking its side view.

A-6.2 Rated Feature: Insulation

A-6.2.1 Task: Determine whether doors are insulated

A-6.2.1.1 On-Site Inspection Protocol:

Judge whether the exterior door(s) is insulated (or not) by its sound, temperature transfer, labeling, or thermal break.

Sound - Insulated/solid door will sound dull when knocked on. An uninsulated/hollow door will sound hollow.

Heat transfer - Feel the inside and outside of the door with flat palms. Insulated/solid door will less readily transfer heat. The inside will feel warmer in cold outside weather and cooler in hot outside weather than an uninsulated/hollow door.

Labeling - Check the side view of the door at the hinges for a descriptive label.

Thermal break - Check the side view of metal doors for thermal breaks.

A-6.3 Rated Feature: Surface area

A-6.3.1 Task: Determine surface area of doors

A-6.3.1.1 On-Site Inspection Protocol:

Measure the surface area of the door(s) to the nearest ½ square foot.

A-7 Building Element: Windows

A-7.1 Rated Feature: Area

A-7.1.1 Task: Determine area of windows

A-7.1.1.1 On-Site Inspection Protocol:

Measure the area of the window openings using width times height to the nearest inch.

Window openings are measured from the outside edge of the framing and include the frame width.

A-7.2 Rated Feature: Construction type

A-7.2.1 Task: Determine window framing and glazing characteristics

A-7.2.1.1 On-Site Inspection Protocol:

Framing Type: Examine each window frame in order to determine the type of material used. Open the window and examine it to see whether the frame is made of metal, wood, or vinyl. Tap the frame with fingernail or knuckle to test if it's vinyl or metal. Wood frames are usually thicker than metal.

If the window is dual-pane or multiple-pane and is metal framed, determine if a thermal break is present by looking for two separated metal extrusions connected by a rubber spacer. Ask the customer for documentation if you can't tell.

Some wood windows may have vinyl or aluminum cladding. Check both the inside and outside, since some windows will have vinyl cladding on one side only.

Glazing Type: Check all windows in the house for number of panes and existence of tint and/or low-e coating.

To determine whether the windows are single-paned or multiple-paned:

- Look at frame width and spacers;
- Look at reflections;
- Look at edge thickness.

To determine if glazing has a tint or low-e coating:

- Check the customer's product literature if available;
- Perform a “match test” - there should be one reflection per pane or coating, including low-e and tinting (e.g., a double-paned window with low-e and tint should show 4 reflections);
- Compare to glazing samples with and without tinting;
- Compare the windows within the space, since tinting is often applied only to certain windows in a house;
- Look for a low-e label or etching on the glass.

A-7.3 Rated Feature: Orientation

A-7.3.1 Task: Determine orientation of all windows

A-7.3.1.1 On-Site Inspection Protocol:

Use a compass (adjusting for magnetic deviation) to determine orientation of all windows.

A-7.4 Rated Feature: Shading

A-7.4.1 Task: Determine shading of windows

A-7.4.1.1 On-Site Inspection Protocol:

Identify shading by external shade screens, house overhangs/awnings, and shade from trees and other buildings.

External Shade Screens: The most common screen is an insect screen that covers some or all of the window. If it is a full-coverage type screen, assume it is a shade screen. Compare samples of the screen's mesh pattern to those of a window screen sample to determine the type and shading coefficient of the screen. Ask customer for documentation for the shading coefficient (SC) of the screen.

If you cannot determine the shading coefficient of the screen, use 36% SC as a default.

Projection (Overhang): The shading impact of an overhang can be found by measuring the distance of the projection from the exterior wall surface and the distance (height) between the top of the window and the bottom edge of the overhang.

Measure the length of the overhangs over each exterior wall.

Measure the height above the window to the bottom edge of the overhang.

Exterior Shading: *Full (40% SC)* -Consider a 40% SC for an entire side of a house as being roughly equivalent to having a shade screen over a window. For trees and/or bushes to equal this effect, there should be a very dense amount of trees and/or bushes along the entire side of the house that shade both its vertical and horizontal surfaces almost totally.

Partial (70% SC) -Based on the above definition for full shading, partial shading is considered to be anything in between full and none (no shading).

None (100% SC) - No shading indicates there may be small plants or shrubs only,

A-7.5 Rated Feature: Solar heat gain factor

A-7.5.1 Task: Determine solar heat gain factor of glazing

A-7.5.1.1 On-Site Inspection Protocol:

Check product information and consult NFRC guide.

A-7.6 Rated Feature: U-value

A-7.6.1 Task: Determine window U-value

A-7.6.1.1 On-Site Inspection Protocol:

Look for an NFRC label on new windows (it will display full window U-value). If no label can be found but customer has documentation, look up product information in NFRC Certified Products Directory to determine U-value, or consult manufacturer's literature.

A-8 Building Element: Skylights

A-8.1 Rated Feature: Area

A-8.1.1 Task: Determine area of skylights

A-8.1.1.1 On-Site Inspection Protocol:

See Section A-7 Windows.

A-8.2 Rated Feature: Construction type

A-8.2.1 Task: Determine framing and glazing characteristics of skylights

A-8.2.1.1 On-Site Inspection Protocol:

See Section A-7 Windows.

A-8.3 Rated Feature: Orientation

A-8.3.1 Task: Determine orientation of skylights

A-8.3.1.1 On-Site Inspection Protocol:

Determine the orientation of the lower edge of the skylight. Use this direction as the orientation of the skylight.

A-8.4 Rated Feature: Shading

A-8.4.1 Task: Determine shading of skylights

A-8.4.1.1 On-Site Inspection Protocol:

See Section A-7 Windows.

A-8.5 Rated Feature: Solar heat gain coefficient

A-8.5.1 Task: Determine solar heat gain coefficient of skylights

A-8.5.1.1 On-Site Inspection Protocol:

See Section A-7 Windows.

A-8.6 Rated Feature: Tilt

A-8.6.1 Task: Determine tilt of skylights

A-8.6.1.1 On-Site Inspection Protocol:

Measure the tilt of the skylight relative to horizontal. This can be done with a level and angle finder instrument, or geometrically with a protractor (from the ceiling length and heights).

A-8.7 Rated Feature: U-value

A-8.7.1 Task: Determine skylight U-value

A-8.7.1.1 On-Site Inspection Protocol:

See Section A-7 Windows.

A-9 Building Element: Air leakage

A-9.1 Rated Feature: Blower door test

A-9.1.1 Task: Determine effective leakage area from a blower door test

A-9.1.1.1 On-Site Inspection Protocol:

~~Use t~~The testing protocol ~~described~~ contained in ANSI/RESNET/ICC 380-2016~~RESNET/ICC/ANSI Standard 380-2016~~ shall be used. ~~in ASHRAE Standard 119 Section 5.1, with the modifications described below:~~

~~The following protocol shall be followed in preparing the building envelope for testing:~~

1. ~~Leave all supply registers and return grills open and uncovered.~~
2. ~~Leave all bathroom and kitchen fans open (i.e., in their normal operating condition). Only a permanently installed back draft damper in its normal condition may impede the flow of air.~~
3. ~~Leave any combustion air ducts or louvers to the exterior open. (If a homeowner or builder has sealed them off, open them for the test.)~~
4. ~~Leave any make-up air ducts with in-line dampers (e.g., for large kitchen exhaust fans or combustion air) as-is (unsealed).Only a permanently installed back draft damper or motorized damper, in its normal condition may impede the flow of air.~~
5. ~~Leave the dryer vent as-is, whether or not the dryer is in place during the test. Only a permanently installed back draft damper in its normal condition may impede the flow of air.~~
6. ~~Leave open any outside air duct supplying fresh air for intermittent ventilation systems (including a central-fan-integrated distribution system)~~
7. ~~Operable crawl-space vents, where present, are to be left in the open position.~~
8. ~~Open all interior doors within the conditioned space, including doors to conditioned basements. (Closet doors may be left closed unless the closet contains windows or access to the attic or crawl space).~~
9. ~~Leave louvered openings of a whole-house fan as is.(If there is a seasonal cover in place during the test, leave it in place.)~~
10. ~~Close all doors to the exterior or unconditioned spaces; if any door to the exterior or unconditioned space lacks weather-stripping at testing time, it can be temporarily taped off.~~
11. ~~Close and latch all windows.~~
12. ~~Close chimney dampers.~~
13. ~~Either seal or fill with water plumbing drains with p-traps that may be empty.~~
14. ~~Seal off exterior duct openings to *continuously operating* fresh-air or exhaust-air ventilation systems (preferably at the exterior envelope).~~
15. ~~Close any adjustable window trickle ventilators and/or adjustable through-the-wall vents.~~
16. ~~If an evaporative cooler has been supplied with a device used to seal openings to the exterior during the winter, that device should be installed for the test.~~

~~Use the testing protocol described in ASHRAE Standard 119 Section 5.1. Blower door and associated pressure testing instruments, which include but are not limited to hoses, and Manometers, gauges and fans shall be field tested annually for calibration by the HERS provider or rater. The provider shall use a standard for field testing of calibration provided by the equipment manufacturer. Magnehelic Gauges cannot be field tested and shall be re-calibrated by the Blower Door manufacturer annually. Field check the fan and flow measuring systems for defects and maintain them according to manufacturers recommendations~~

~~The HERS provider shall maintain a written log of the annual calibration check to verify all equipment accuracy for a period of three (3) years. These records shall be made available within 24 hours to a RESNET Quality Assurance Committee member upon request.~~

~~It is recommended all pressure equipment be field checked for calibration more frequently than is required in these standards, i.e., monthly, quarterly, etc.~~

A-9.2 Rated Feature: Conditioned volume of space

A-9.2.1 Task: Determine conditioned volume of space

A-9.2.1.1 On-Site Inspection Protocol:

Determine ~~conditioned~~ Conditioned Space Volume and ~~indirectly~~ Unconditioned Space V~~v~~olume ~~of space~~ using definitions in Appendix B~~by multiplying conditioned floor area by ceiling height~~. The house may need to be split into different spaces with different ceiling heights and added to each other ~~for both conditioned and indirectly conditioned spaces~~. For areas with vaulted ceilings, volume must be calculated geometrically.

A-9.3 Rated Feature: Estimate

A-9.3.1 Task: If diagnostic equipment is not used, determine window type and distribution system to estimate leakage

A-9.3.1.1 On-Site Inspection Protocol:

To be determined.

A-9.4 Rated Feature: Tracer gas test

A-9.4.1 Task:

A-9.4.1.1 On-Site Inspection Protocol:

To be determined.

A-10 Building Element: Heating & Cooling/Distribution System

A-10.1 Rated Feature: Air leakage (ducts)

A-10.1.1 Task: Determine air leakage from ducts

A-10.1.1.1 On-Site Inspection Protocol:

The testing protocol ~~described~~contained in ANSI/RESNET/ICC 380-2016~~RESNET/ICC/ANSI Standard 380-2016~~ shall be used.~~The application of ASHRAE Standard 152 for testing of ducted distribution systems shall be implemented with the following additions and exceptions:~~

~~Air Handler Fan Flow Measurement using either of the methods specified in Annex A of the standard is preferred. If such measurement is not made, default values of 275 CFM per 12,000 BTU/hour of nominal HVAC capacity shall be used. For fossil-fired furnace systems, a default~~

~~value of 200 CFM for every 12,000 BTU/hour of nominal furnace capacity shall be used for heating.~~

~~Supply and return leakage may be determined by measuring the leakage of each side as in Annex B, or as an alternate the leakage of the entire system may be measured, with the duct pressurization device in the return and the duct pressure probe in the supply side. The ratio of supply side leakage to return side leakageQ25,s toQ25,r shall be selected separately for heating and cooling based on a worst case determination. The supply side of the system shall be assigned 67% of the leakage and the return shall be assigned 33%, and the overall distribution efficiency determined; then the efficiency with the reverse conditions (67% return and 33% supply) shall be determined, and the lower of the two efficiencies will be applied.~~

~~Total leakage (Annex C) .The limitation of applicability of Annex C (Section C1) to leakage measurement of 10% or less of air handler air flow shall be based on tested air flow or default air flow, as appropriate according to (1) above. The calculations of 2.5% of air flow in Section C1.1,2, and 3 shall use tested air flow, or nominal air flow of 400 CFM per ton. If the register grilles are not installed during the test (C1.2), the 2.5% of fan flow added to the measured leakage may be waived, on condition that a visual inspection, verifying effective sealing of register boot to drywall and/or boot to subfloor connections, is conducted prior to issuing the final rating.~~

A-10.2 Rated Feature: Insulation

A-10.2.1 Task: Determine the value of distribution system insulation

A-10.2.1.1 On-Site Inspection Protocol:

Air ducts may be insulated with insulation blankets or rigid insulation board. Inspect the duct or pipe insulation for R-value labeling (printed on the insulation by the manufacturer). If the insulation is not marked with the R-value, identify type and measure the thickness of the insulation to determine R-value. Check for internal insulation by tapping on the exterior and listening to the sound.

A-10.3 Rated Feature: Location of air ducts

A-10.3.1 Task: Determine the location of ducts

A-10.3.1.1 On-Site Inspection Protocol:

Air ducts may be located in the attic, crawl space, basement or in ~~a~~ another Conditioned or Unconditioned Space Volume~~conditioned space volume~~area~~area~~. You must locate and differentiate between supply and return ducts. Ducts may be located in more than one space~~area (e.g., some return ducts in attic and some in conditioned space, etc.)~~.

A-10.4 Rated Feature: Type

A-10.4.1 Task: Identify type of distribution system used to provide space heating and cooling

A-10.4.1.1 On-Site Inspection Protocol:

Forced air - a central fan unit connected to ducts which supply heated or cooled air to each room in the home. Forced air systems have supply and return duct work. Supply ducts typically run to each room; return duct work may come from each room or from one or more central locations in the home.

Forced hot water - heated water is pumped through a series of radiator elements to supply heat. The radiator elements may be conventional radiators, baseboard “fin tube” radiators, cast iron baseboards or radiant hot water panels located at the baseboards or on walls or ceilings.

Hot water radiant system - heated water is circulated through plastic or metal tubing which is installed in a concrete slab or finished floor or, occasionally, in walls or ceilings.

Unit heater/air conditioner - heating or cooling is supplied directly from a heating or cooling device located within the space it serves. Window air conditioners and through-the-wall heaters are common examples. Unitary equipment typically has no distribution system.

Steam heating - steam systems utilize a distribution system with cast iron radiators connected to a boiler that creates steam. The steam rises into the radiators through one set of pipes, condenses into water, and drains back to the boiler through another set of pipes.

Electric radiant system - electric cables are installed in concrete floor slabs or in the ceiling. Electric current is passed through the cables, causing them to heat up, heating the floor or ceiling assembly which radiates the heat to the space. Electric radiant systems may also be comprised of individual radiant panels mounted on the walls or ceilings.

Baseboard electric resistance - electric elements are installed in baseboard enclosures. Electric current is passed through the electric element to provide heat to the space.

A-11 Building Element: Heating and Cooling/Energy Source

A-11.1 Rated Feature: Fuel type

A-11.1.1 Task: Determine fuels used for heating and cooling

A-11.1.1.1 On-Site Inspection Protocol:

Heating systems may use natural gas, propane, oil, electricity, or some other fuel. Typically the homeowner will know what type of heating fuel is used. Cooling is typically driven by electricity, however some cooling equipment may use natural gas or propane. Look for electric cables and dedicated fuses or circuit breakers for the cooling equipment or gas lines running to the equipment. Note that gas equipment will also have electric cables to power some of the components. Be sure to distinguish between refrigerant lines and possible gas supply lines.

Oil - look for a large storage tank (typically oblong-shaped) or fill pipes which would indicate a buried tank. Oil is typically supplied to the heating equipment via a 1/4" - 3/8" copper line. A fuel filter may be evident in the line.

Natural gas - look for a meter connected to piping on the exterior of the home. Piping to the heating equipment is typically done with ½" - 1" iron piping.

Propane - look for storage tank(s) (typically cylindrical-shaped). Large tanks may be buried with a 12" - 18" cap exposed above grade. Fuel is typically supplied to equipment through 1/4" - 3/8" diameter copper piping.

Electric - look for large gauge cables running to a central piece of equipment or look at circuit breaker panel for circuits marked for resistance heat circuits (electric resistance or electric radiant systems).

Other fuels - include coal, wood, processed wood pellets, or other combustible products.

A-11.2 Rated Feature: Control system

A-11.2.1 Task: Identify the control system for the heating and cooling system(s)

A-11.2.1.1 On-Site Inspection Protocol:

Determine the type of control systems. There may be separate controls for the heating and cooling systems.

Thermostat controls may be programmable. Note types of features available and/or utilized.

A-11.3 Rated Feature: Efficiency

A-11.3.1 Task: Determine the heating and cooling equipment efficiency

A-11.3.1.1 On-Site Inspection Protocol:

Check nameplate for efficiency rating. If the nameplate is missing, use appropriate directories to determine an appropriate default value.

SEER is used to measure the efficiency of central air conditioning and air source heat pump systems. AFUE is used to measure the efficiency of furnaces and boilers. EER is used to determine the efficiency of room air conditioners and ground source heat pumps. Check nameplate for SEER or AFUE rating. EER can be calculated from nameplate information by dividing BTU output by watt input.

A-11.4 Rated Feature: Equipment type

A-11.4.1 Task: Identify type(s) of equipment for heating and/or cooling

A-11.4.1.1 On-Site Inspection Protocol:

Furnace - comprised of a combustion chamber and heat exchanger (natural gas, propane or oil) or an electric resistance element (electric) and a fan which forces air across the heat exchanger or resistance element to provide heat in a forced air system.

Fan coil unit - hot water from a boiler, domestic water heater, or heat pump is circulated through a coil. A fan blows air over the coil to provide heating. This device is used in a forced air system.

Boiler - this device creates hot water or steam, and can be powered by any fuel type. Can be used with forced air (in conjunction with a fan coil unit), forced hot water, steam, or hot water radiant slab systems.

Split system central air source heat pump - these systems move energy from one location to another using the vapor compression cycle. They are electrically driven, and can provide heating in winter and cooling in summer by reversing the direction of heat flow. Split system heat pumps consist of an outdoor unit and an indoor air handling unit, resembling a furnace. These systems require ductwork for air distribution. Most air source heat pumps incorporate electric resistance supplemental heat in the indoor section. However, some heat pump systems use fossil fuel furnace for supplemental heating. These are known as “dual fuel” or add-on systems.

Single package central air source heat pump - a single package central heat pump is similar to a split system, except it combines the functions of the indoor and outdoor units into one cabinet, usually mounted on the roof or on the ground. It also requires a separate distribution system. These are uncommon in single-family residences, however they are sometimes found in multi-family dwellings.

Ground source heat pumps - are coupled to the ground through the use of a water well sometimes the same well as used for domestic water (known as “open loop” which water or a water/antifreeze mixture is circulated (known as “closed loop”). Look for 3/4” or larger diameter piping going to and from the heat pump. Circulating pumps may be installed in this piping (closed loop systems) or the pump for the water well may be used for circulating water through the heat pump (open loop). The same piece of equipment can be used in either open or closed loop applications, however given the same piece of equipment, closed loop applications typically have lower efficiency ratings than open loop applications. Ground source heat pumps can also

utilize a direct expansion of the refrigerant with copper piping buried in the ground. Look for 0.25" - 0.50" copper piping leading from the unit to the outdoors with no outdoor unit.

Split system central air conditioner - similar to a split system air source heat pump. Consists of an outdoor unit and a coil in the forced air distribution system, usually in a fossil fuel furnace. These systems are electrically powered and provide cooling.

Single packaged central air conditioner - similar to single packaged air source heat pumps, providing cooling only.

Through-the-wall ductless air source heat pump - a single packaged air source heat pump designed to be installed without a distribution system. Provides both heating and cooling and is usually installed through an exterior wall.

Window/through-the-wall air conditioner - a single packaged ductless air conditioner designed to be installed without a distribution system.

Direct evaporative cooler - is used primarily in very dry climates. Evaporative coolers work by blowing air over a damp pad or by spraying a fine mist of water into the air. Direct evaporative coolers add moisture to the home.

Indirect evaporative cooler - evaporation takes place on only one side of a heat.

Absorption cooler - this is a gas air conditioner. Look for a cooling tower, an exhaust pipe, a gas burner to evaporate refrigerant and a heat exchanger similar to an electric air conditioner.

Unitary space heater - these are fossil fuel burning heaters which have individual controls and no distribution system. They may be equipped with a fan for forcing air circulation over a heat exchanger, or they may use simple convective forces. These heaters are typically mounted on outside walls in order to facilitate venting and can use natural gas, kerosene, propane, or other types of fossil fuel.

A-11.5 Rated Feature: Location

A-11.5.1 Task: Determine the location of heating and cooling equipment

A-11.5.1.1 On-Site Inspection Protocol:

Note whether systems are located in conditioned or unconditioned space.

A-12 Building Element: Domestic Hot Water System

A-12.1 Rated Feature: Efficiency

A-12.1.1 Task: Determine the Energy Factor or Seasonal Efficiency of the water heater

A-12.1.1.1 On-Site Inspection Protocol:

Storage Water Heater: Look for the water heater's rating plate and product literature. Some water heaters will list their EF right on the rating plate.

If the water heater is wrapped and there is no accessible information, approximate the age of the unit and use a default efficiency.

If accessible, record the Make and Model #.

Look up the EF rating of that model in an appropriate efficiency rating directory.

If the EF rating is not listed in the directory use a default based on the estimated age of the water heater.

Instantaneous Water Heaters: Check the unit's nameplate for the RE (Recovery Efficiency). If a gas model, note whether there is a standing pilot light.

A-12.2 Rated Feature: Extra tank insulation value

A-12.2.1 Task: Determine the insulation value of any exterior wrap

A-12.2.1.1 On-Site Inspection Protocol:

Visually determine if the water heater is wrapped with exterior insulation. If so, measure thickness of the wrap and determine R-value.

A-12.3 Rated Feature: Location

A-12.3.1 Task: Determine location of storage tank

A-12.3.1.1 On-Site Inspection Protocol:

Determine whether water heater is located in conditioned or unconditioned space.

A-12.4 Rated Feature: Pipe insulation value

A-12.4.1 Task: Determine the insulation value of the pipes

A-12.4.1.1 On-Site Inspection Protocol:

Determine whether pipe insulation is installed on all 3/4" or larger, non-recirculating hot water mains. Measure depth of insulation and identify material to determine R-value.

A-12.5 Rated Feature: System type

A-12.5.1 Task: Determine type and heat source of water heater

A-12.5.1.1 On-Site Inspection Protocol:

Storage

These water heaters are the most common type. Water is heated in an insulated tank that typically ranges in capacity from 30 to 75 gallons. Storage water heaters may use electric resistance, gas, propane, oil or electric heat pump.

Storage electric -look for rigid or flexible 240 A/C conduit, UL seal, no vent, no burner or pilot tubing. Thermostats are usually hidden behind metal access doors. Often there is both an upper and a lower thermostat.

Storage gas -look for a vent connection (top of tank), gas connector and line valve, thermostat, burner and pilot tubing, burner compartment doors, and "AGA" seal rating plate. Most gas water heaters have legs to lift the unit above the floor level to provide combustion air to the burner.

Storage propane -look for the same features as those listed for gas water heaters. Also, look for a rating plate or tag that states "For Use with LP Gas Only".

Storage oil -look for features that are similar to a gas water heating storage system. In addition, oil systems are usually furnished with draft regulators which are attached to the vent pipe between the tank and chimney (hinged metal flap with counterweight to allow for variations in flue gas pressure). Vent dampers may also be apparent on the vent pipe.

Storage heat pump -water heaters remove heat from the air in the room where they are located and then release the heat to the water in the storage tank. Look for the same features as those

found on electric water heating systems. In addition, there will be a fan, condenser and evaporator. Also, the system may be one single unit, or may be a split system. Combination DHW/furnace system - natural gas combo systems use heat drawn from a hot water tank circulating through an air handling module to heat the space.

Geothermal heat pump de-superheaters - devices which utilize heat pump cycle superheater to heat domestic hot water. Look for insulated lines between air handler unit and storage water heater tank.

Instantaneous

These water heaters heat water on demand, instead of storing pre-heated water in a large tank. They are usually small units, with storage of no more than 2 gallons, and are often attached to a wall close to the point of use. Instantaneous water heaters may be used in addition to a primary storage water heater to serve fixtures in a distant location of the house, so check for a main storage unit as well. Determine if the instantaneous heater uses gas or electricity.

Instantaneous gas - look for a connector and line valve, vent connection, thermostat, burner and pilot tubing, and AGA seal. Check whether unit has a pilot light or intermittent ignition device.

Instantaneous electric - look for the absence of a gas line, vent or pilot light. Look for a UL seal.

Super-heater - check for this supplementary heat source.

A-13 Building Element: Solar Domestic Hot Water System

A-13.1 Rated Feature: Collector

A-13.1.1 Task: Determine area, orientation, and tilt of collector

A-13.1.1.1 On-Site Inspection Protocol:

Determine the area of the collector.

Determine the orientation of the solar collector by taking a compass reading (adjusting for magnetic deviation) in the direction toward which the collector faces.

Determine the tilt of the collector. A site selection and angle finder instrument can be used to determine the tilt of the collector. Geometric calculations based on horizontal length and vertical height measurements can also be used.

A-13.2 Rated Feature: Efficiency

A-13.2.1 Task: Determine efficiency of solar system

A-13.2.1.1 On-Site Inspection Protocol:

Look for SRCC label. Check for SRCC system and component name plates. Refer to the Directory of SRCC Certified Solar Collector and Water Heating System Ratings, or other SRCC literature for energy factor (EF) and other performance data.

A-13.3 Rated Feature: Extra tank insulation value

A-13.3.1 Task: Determine the insulation value of any exterior wrap

A-13.3.1.1 On-Site Inspection Protocol:

See Section A-12 Domestic Hot Water System.

A-13.4 Rated Feature: Pipe insulation value

A-13.4.1 Task: Determine the insulation value of the pipes

A-13.4.1.1 On-Site Inspection Protocol:

Determine the R-value of insulation installed on pipes.

A-13.5 Rated Feature: Solar collector type

A-13.5.1 Task: Identify type of solar collector

A-13.5.1.1 On-Site Inspection Protocol:

Identify the type of solar collector by checking for the SRCC label or manufacturer's information.

A-13.6 Rated Feature: Storage tank size and location

A-13.6.1 Task: Determine the capacity of the storage tank and location

A-13.6.1.1 On-Site Inspection Protocol:

To determine the size of the storage tank refer to documentation or a label indicating the tank capacity.

Note if storage is inside or outside of conditioned space.

A-13.7 Rated Feature: System type

A-13.7.1 Task: Determine type of solar systems

A-13.7.1.1 On-Site Inspection Protocol:

Identify whether a solar domestic hot water system exists. These systems collect and store solar thermal energy for domestic water heating applications. If a solar water heating system exists, determine system type. For systems manufactured after Jan. 1, 1995, system type, energy factor (EF), and other performance characteristics shall be determined from the SRCC label (usually affixed to the solar storage tank) and by referring to SRCC literature. For systems lacking an SRCC label, energy factor and other performance characteristics can be determined using a certified HERS modeling tool, or appropriate default values. Identify as passive or active. Base your evaluation on these criteria:

Passive - No purchased electrical energy is required for recirculating water through a passive solar collector. Three types of passive systems are integrated collector storage (ICS), thermosiphon systems and self-pumped systems.

Integrated Collector Storage (ICS) - consists of a single unit which incorporates both collector and water storage. An example is the common "bread box" design. Storage is usually outside the Cconditioned Sspace Vvolume.

Thermosiphon - consists of a flat-plate solar collector and hot water storage tank. Instead of using a pump, circulation of the fluid is achieved by natural convection action. The storage tank must be located above the collector, and is usually outside the Cconditioned Sspace Vvolume.

Self-pumped - circulates fluid from storage to collectors without purchased electrical energy. Photovoltaic and percolating systems are examples of self-pumped systems. The storage tank is usually inside the Cconditioned Sspace Vvolume.

Active -Also known as pumped systems.

Pumped -purchased electrical energy input is required for operation of pumps or other components. The storage tank is usually inside the Cconditioned Sspace Vvolume.

A-14 Building Element: Passive Solar Heating System

A-14.1 Rated Feature: Direct gain

A-14.1.1 Task: Identify system type and determine solar aperture orientation, aperture area

A-14.1.1.1 On-Site Inspection Protocol:

A solar direct gain system can reduce heating, cooling, and lighting energy requirements through proper sizing, placement, orientation, and/or control of windows, skylights, shading devices, and solar storage mass within the building.

To determine aperture area, measure width and height of south-facing glazing and indicate tilt angle. Note glass type(s) (e.g., double glazing) and presence of night insulation (if any).

Determine orientation with a compass reading (adjusted for magnetic deviation).

Determine the type of thermal mass, its thickness and dimensions. Determine if the mass will be lit by direct solar rays between the hours of 9:00 a.m. and 3:00 p.m. during the winter. Note any trees or other obstructions to solar gain.

A-14.2 Rated Feature: Greenhouse or solarium

A-14.2.1 Task: Identify system type and determine solar aperture orientation, aperture area and information about thermal mass

A-14.2.1.1 On-Site Inspection Protocol:

A greenhouse or solarium creates a South-glazed buffer zone between the house and the exterior and can help heat the living area. They may be used in conjunction with thermal mass (such as bricks or drums filled with water) to store heat and reradiate it at night.

See Section A-14.1 Direct gain, for specific inspection items.

A-14.3 Rated Feature: Thermal storage mass

A-14.3.1 Task: Identify system type and determine solar aperture orientation, aperture area and information about thermal mass

A-14.3.1.1 On-Site Inspection Protocol:

Thermal mass systems consist of solar-exposed heavyweight materials with high heat capacitance and relatively high conductance (high thermal diffusivity) such as masonry, brick, concrete, tile, stone, or water placed in the same zones(s) as the solar collection area(s). These elements may be integral with the building or distinct elements within the building.

Distinct components:

Trombe wall -uses a heat storage mass placed between the glass and the space to be heated. Measure area of storage mass, determine material, thickness, and capacitance.

Water wall - Replaces the existing wall, or parts of it, with containers that hold water.

A-14.4 Rated Feature: Thermosiphon Air Panel (TAP)

A-14.4.1 Task: Identify system type

A-14.4.1.1 On-Site Inspection Protocol:

Thermosiphon air panel (TAP) -has one or more glazing layers of glass or plastic, an air space, an absorber, another air space, and (often) an insulated backing. These are similar in appearance to active flat-plate collectors, often mounted vertically on walls, or ground-mounted, so that the living space is higher than the collector to facilitate convection from the TAP to the house.

See Section A-14.2 Greenhouse or solarium, for specific inspection items.

Appendix B- Glossary of Terms
Glossary of Terms

Abnormal
Some defect exists in the construction and operation of the building enclosure.

ACCA
Air Conditioning Contractors of America

ACCA QA Program
A quality assurance recognition program for HVAC contractors, in which participants (1) attest that they have implemented written policies and procedures in the ANSI/ACCA 5 QI-2010 Standard to effect quality on a consistent basis in the field, (2) complete and submit a detailed HVAC system installation checklist, and (3) have specific elements of the installation validated by a 3rd party Rater for compliance to the ENERGY STAR® New Homes Program requirements. More information can be found at http://www.acca.org/qa

Accreditation Identification Number (AIN)
A unique accreditation number assigned to each Rating Quality Assurance Provider.

Accreditation Committee
A Standing Committee of the RESNET organization that is responsible for the review and approval of all Applications for Provider accreditation submitted to RESNET.

Accredited Rating Quality Assurance or QA Provider
A Rating Quality Assurance Provider accredited by RESNET in accordance with Chapter 1 and Chapter 9 of the RESNET Standards to certify and perform quality assurance of Raters.

Accredited Rater Training Provider or Training Provider
A Rater Training Provider accredited by RESNET in accordance with Chapter 2 and Chapter 9 of RESNET Standards to train individuals to become Raters certified by Accredited Rating Quality Assurance Providers. Only RESNET Accredited Rater Training Providers can offer rater training and set up the national rater tests.

Acrylic Adhesive Tape
Any tape composed of an acrylic nature used as a sealing material primarily for moisture intrusion for house wraps, around windows, and to seal sheets of polyethylene covering the dirt on the floor of a crawl space or a basement

Additional Failure
When additional instances of initial failure(s) are identified in one or more of the other homes in the sample set being tested or inspected.

Air Barrier
Any solid material installed to control air leakage either into or out of the building envelope. The material used shall have an air permeability not to exceed 0.004 cubic feet per minute per square foot under a pressure differential of 0.3 in. water (1.57 psf) (0.02 L/s.m^2 @ 75 Pa.) when tested in accordance with ASTM E 2178-01.

Air Exfiltration
Air from the Cconditioned Sspace Vvolume leaking outside of the thermal boundary of a structure.

Air-free Carbon Monoxide
A unit of measurement designed to compensate for the excess air to the burner and is only used to express CO levels in a flue gas sample as opposed to ambient air testing. The measurement represents the CO levels with no excess air in the sample or with “perfect” combustion (an unrealistic situation).The measurement

incorporates an adjustment to the as-measured CO ppm (parts per million) value to simulate oxygen-free conditions in the sample. (See "as-measured carbon monoxide.")

Air Infiltration
Air from outside the thermal boundary of a structure, which enters the Cconditioned Sspace Vvolume.

Air Leakage Site
A specific location in a structure where the air barrier has irregularities in it allowing both air infiltration and exfiltration depending on the interior pressures of the building.

Air Pressure Boundary
Any part of the building shell that offers resistance to air leakage. The most effective Air Pressure Boundary consists of a series of air barriers of interior and/or exterior sheeting material that resists airflow through it. An effective air pressure boundary is nearly airtight.

Air Wash
The movement of air through insulation.

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

Anomaly (defect)
An area of a building where the temperature distribution seen with an infrared imaging system differs by more than 4°F from the temperature distribution expected for the type of construction being viewed, denoting a possible problem area; an inconsistency.

ANSI
American National Standards Institute

Approved Rating Provider
Shall mean a RESNET-accredited Quality Assurance Provider who is listed in good standing in the National RESNET Registry.

Approved Software Rating Tool
Shall mean a RESNET-accredited HERS® Rating Tool that has been tested and approved in accordance with RESNET Publication 002-13 and that is listed in the RESNET National Registry of Accredited Rating Software Programs http://www.resnet.us/professional/programs/energy_rating_software

Approved Tester
Shall mean a RESNET Rater or Rating Field Inspector (RFI) who has been certified by a RESNET-accredited Quality Assurance Provider and who is listed in good standing in the National RESNET Registry.

As-measured Carbon Monoxide
A direct measurement of carbon monoxide CO in a sample of air or flue gas, usually measured in ppm (parts per million) units. (See "air-free carbon monoxide.")

ASHRAE
American Society of Heating, Refrigerating and Air-Conditioning Engineers

ASNT
American Society for Nondestructive Testing

ASTM
ASTM International, originally known as the American Society for Testing and Materials (ASTM)

Atmospherically-Vented
An appliance using a natural draft venting system.

Atmospheric Pressure
The weight of air and its contained water vapor on the surface of the earth; at sea level, this pressure is 14.7 pounds per square inch.

Auxiliary Electric Consumption
The annual auxiliary electrical energy consumption for a fossil fuel fired furnace or boiler in kilowatt-hours per year, derived from the Eae as follows: Auxiliary Electric Consumption (kWh/yr) = Eae * (HLH) / 2080)

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

Back Draft

Sustained downdraft during burner operation.

Base Load

An estimate of fuel consumption that does not include cooling or heating fuel consumption.

Bedroom

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

Biomass Fuel

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

Biomass System

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

Blackbody

An object or surface which absorbs all radiant energy, within a specific spectral band, coming into contact with the surface and does not reflect or transmit any. Thus, the surface has an emissivity of 1.

Boiler

A space heating appliance that heats water with hot combustion gases that pass through a heat exchanger.

BPI

Building Performance Institute

Building Analyst (BA), Certified

An individual who successfully passes the BPI written and field examination requirements for certification in order to evaluate the performance of a home, taking into account systems, physical conditions and other energy and non-energy characteristics of the home.

Building Envelope

The components of a building (walls, ceilings, windows, doors, floors, and foundations) that separate the ~~conditioned~~ Conditioned ~~space~~ Space ~~v~~Volume from the ~~unconditioned~~ Unconditioned ~~space~~ Space ~~v~~Volume~~s~~ or ~~conditioned~~ Conditioned ~~space~~ Space ~~v~~Volume from outside.

CAZ

See "Combustion appliance zone"

Carbon Monoxide (CO)

An odorless, colorless gas that can cause illness or death.

Carbon Monoxide Emissions

Carbon monoxide (CO) resulting from combustion as measured in ppm (parts per million. The measurement of CO emissions in flue gas requires a sample to be taken before dilution air enters the venting system. (See "air-free carbon monoxide" and "as-measured carbon monoxide.")

Certified Rater

Shall mean a RESNET Rater who has become qualified to conduct home energy ratings through certification by a RESNET-accredited Quality Assurance Provider and who is listed in good standing in the National RESNET Registry.

Climate Zone

A geographical area defined as having similar long-term climate

Code Approved HVAC Tape

Any tape that is approved by current International Codes (UL181 A or 181 B) used for the air sealing of a heat and air duct system.

Combustion Appliance Zone (CAZ)

A contiguous air volume within a building that contains a combustion appliance; the zone may include, but is not limited to, a mechanical closet, mechanical room, or the main body of a house, as applicable.

Complaint Resolution Officer (CRO)

The individual assigned to manage complaint and resolution procedures for the CEQ Provider.

Comprehensive Home Energy Audit

A level of the RESNET Home Energy Audit process defined by this standard to include the evaluation, diagnosis and proposed treatment of an existing home. The Comprehensive Home Energy Audit may be based on a Home Performance Assessment ("Comprehensive Home Performance Energy Audit") or Home Energy Rating ("Comprehensive HERS Audit"), in accordance with the criteria established by this Standard. A homeowner may elect to go through this process with or without a prior Home Energy Survey or Diagnostic Home Energy Survey.

Compression (insulation)

This condition includes but is not limited to batt insulation compressed behind plumbing, heat and air, electrical, and other in cavity obstructions that results in the loss of R-value of the installed insulation. This condition can also occur within a wall cavity without obstructions. See also "Misalignment".

Conditioned Floor Area (CFA)

The floor area of the Conditioned Space Volume within a building, minus the floor area of attics, floor cavities, crawlspaces, and basements below air sealed and insulated floors. The following specific spaces are addressed to ensure consistent application of this definition:

- The floor area of a wall cavity that is Conditioned Space Volume shall be included.
- The floor area of a basement shall only be included if the party conducting evaluations has either:
  - Obtained an ACCA Manual J, S, and either B or D report and verified that both the heating and cooling equipment and distribution system are designed to offset the entire design load of the volume, or,
  - Verified through visual inspection that both the heating and cooling equipment and distribution system serve the volume and, in the judgment of the party conducting evaluations, are capable of maintaining the heating and cooling temperatures specified by the Thermostat section in Table 4.2.2(1) of ANSI/RESNET/ICC 301-2104.
- The floor area of a garage shall be excluded, even ~~if~~when it is conditioned.
- The floor area of a thermally isolated sunroom shall be excluded.
- The floor area of an attic shall be excluded, even ~~if~~when it is Conditioned Space Volume.
- The floor area of a floor cavity shall be excluded, even ~~if~~when it is Conditioned Space Volume.
- The floor area of a crawlspace shall be excluded, even ~~if~~when it is Conditioned Space Volume.

~~*Conditioned Floor Area (CFA)*~~

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

Conditioned Space Volume

The volume within a building serviced by a space heating or cooling system designed to maintain space conditions at 78 °F (26 °C) for cooling and 68 °F (20 °C) for heating. The following specific spaces are addressed to ensure consistent application of this definition:

- If the volume both above and below a floor cavity meets this definition, then the volume of the floor cavity shall also be included. Otherwise the volume of the floor cavity shall be excluded.
- If the volume of one or both of the spaces horizontally adjacent to a wall cavity meets this definition, then the volume of the wall cavity shall also be included. Otherwise, the volume of the wall cavity shall be excluded.
- The volume of an attic that is not air sealed and insulated at the roof deck shall be excluded.
- The volume of a vented crawlspace shall be excluded.
- The volume of a garage shall be excluded, even ~~if~~when it is conditioned.

- The volume of a thermally isolated sunroom shall be excluded.
- The volume of an attic that is air sealed and insulated at the roof deck or an unvented crawlspace shall only be included if the party conducting evaluations has obtained an ACCA Manual J, S, and either B or D report and verified that both the heating and cooling equipment and distribution system are designed to offset the entire design load of the volume.
- The volume of a basement shall only be included if the party conducting evaluations has either:
  - Obtained an ACCA Manual J, S, and either B or D report and verified that both the heating and cooling equipment and distribution system are designed to offset the entire design load of the volume, or,
  - Verified through visual inspection that both the heating and cooling equipment and distribution system serve the volume and, in the judgment of the party conducting evaluations, are capable of maintaining the heating and cooling temperatures specified by the Thermostat section in Table 4.2.2(1) of ANSI/RESNET/ICC 301-2104.

~~*Conditioned Space*~~

~~Any directly conditioned space or indirectly conditioned space, as defined in this standard.~~

~~*Conditioned Space Boundary*~~

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

Confirmed Rating

A Rating accomplished using data gathered from verification of all rated features of the home in accordance with Chapter 3- National Home Energy Rating Technical Standards and ANSI/RESNET/ICC ~~RESNET/ICC/ANSI~~ Standard 380-2016 ~~and~~Chapter 8 ~~of this Standard~~ (e.g., on-site visual inspections, on-site diagnostic test results or default values for envelope air leakage rates and distribution system efficiencies).

Contractor, Certified

A contractor accredited by the Building Performance Institute (BPI) or an equivalent certification organization recognized by the Home Performance with ENERGY STAR® Program to complete specific home performance improvement work.

Contractor Education and Qualification Provider (CEQ Provider)

An organization approved by RESNET in accordance with the requirements of these guidelines to train and prepare individuals to be an Energy Smart Contractor's Designated Qualification Representative and to perform the other duties of a Contractor Education and Qualification Provider established herein.

COP

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

Crawl Space

A shallow unfinished space, beneath the first floor or under the roof of a building allowing access to wiring or plumbing.

Data Collection

The gathering of information on building energy features, energy use history and other relevant building and building operation information.

Defect

See Anomaly

Design Temperature

A high or low outdoor temperature equaled or exceeded 97.5% of the time, used for designing heating and cooling systems.

Detached One- and Two-Family Dwelling

A building with one or two independent dwelling units with an individual or central HVAC system.

Dewpoint

The temperature at which a given air/water vapor mixture is saturated with water vapor (i.e. 100% relative humidity). Consequently, if air is in contact with a surface below this temperature, condensation (dew) will form on the surface.

Diagnostic Testing

The use of building performance-testing equipment (e.g. blower door, duct blaster, flow hood, infrared camera, CO monitor, etc.) to measure, assess and document specific performance characteristics of the building system.

Dilution Air

Air that enters a draft diverter or draft regulator from the room in which the appliance is located.

Directly Conditioned Space

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

Direct Vent Appliance

A combustion appliance for which all combustion gases are vented to the outdoors through an exhaust vent pipe and all combustion supply air is vented to the combustion chamber from the outdoors through a separate, dedicated supply-air vent.

Distribution System Efficiency

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

Downdraft

Air flow from a chimney or venting system into an enclosed building space.

Draft

A pressure difference that causes combustion gases or air to move through a vent connector, flue, chimney, or combustion chamber.

Draft Diverter

A nonadjustable device built into an appliance or a part of a vent connector that is intended to (1) permit the escape of flue gases in the event of a blockage or backdraft; (2) prevent a downdraft of outdoor air from entering the combustion chamber of an appliance; (3) reduce the effect of the chimney's stack action; and (4) lower the dew point temperature of the flue gas by the infusion of room air.

Draft Regulator

A self-regulating damper attached to a chimney or vent connector for the purpose of controlling draft: A draft regulator can reduce draft; it cannot increase draft.

Drainage Plane

A seamless or overlapping membrane designed to redirect water away from vulnerable building materials.

EAE

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

Emissivity

The ability of a surface to emit radiation, measured as the ratio of the energy radiated within a specific spectral band by a surface to that radiated within that same specific spectral band by a blackbody at the same temperature.

Energy Efficiency Program, or EEP

See "Third-Party Energy Efficiency Program"

Energy Efficiency Rating

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

Energy Analysis Tool

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

Energy Efficiency Ratio, or EER

the ratio of net equipment cooling capacity in Btu/h to total rate of electric input in watts under designated operating conditions.

Energy Efficiency Rating, or Energy Rating

See Home Energy Rating.

Energy Factor, or EF

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

Energy Saving Measure, or Feature

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

Energy Simulation File

The complete set of input data used by a RESNET-accredited rating software tool to determine the Home Energy Rating for the specified home as listed in Section 102.1.4.11 of these Standards.

Energy Smart Contractor

A home improvement contracting company that has been approved by a CEQ Provider to implement energy-saving work scope recommendation prescribed by a certified CHERS Rater or Building Performance Auditor. A home improvement company from any of the trade categories defined on the Directory, who is compliant with the RESNET training, examination and the program requirements contained herein is eligible for designation as Energy Smart and may be listed on the Directory

Energy Smart Contractor Directory (Directory)

A listing of approved Energy Smart Contractors that is posted on the RESNET website.

Energy Smart Contractor Candidate for Recognition (Candidate)

A company with a Designated Qualification Representative who intends to become an Energy Smart Contractor, who shall list itself in the Candidate section, and who shall have 90 days to complete its qualification requirements and receive approval by a CEQ Provider. If the Candidate has not been approved within the time limits, their listing will be removed.

Energy Smart Contractor Representative (Representative)

An individual employed by or a representative of an Energy Smart Candidate, with the necessary level of authority who shall take the required course, pass the RESNET core exam, and otherwise ensure that the contractor, once approved as an Energy Smart Contractor, complies with the terms and conditions of the Directory.

Energy Smart Improved Home

A home that has undergone an Energy Smart Project for which the estimated energy savings calculated by an Independent Rater/Auditor using RESNET-approved software amounts to no less than a 30% reduction in estimated energy usage as a result of the improvements. A home that meets these requirements shall be labeled with the language, "This home is designated as an Energy Smart Home. As such, the estimated energy usage of the home has been reduced by XX%. It is estimated that the improvements to this home will save approximately $XXX per year."

Energy Smart Project

A home performance improvement project with the goal of achieving a 30% reduction in estimated energy usage. The project shall be completed by an Energy Smart Home Performance Team; as such it must involve at least one Energy Smart Contractor and an Independent RESNET Rater/Auditor, one of which acts as the Project Manager, and in which applicable improvement measures are installed by one or more Energy Smart Contractors based upon the assessment and work scope from a RESNET Rater/Auditor. An Energy

Smart project shall include Final Verification of the project post-improvement by an Independent Rater/Auditor, who shall calculate the estimated energy savings using RESNET-approved software.

Energy Smart Project Manager

The company or individual with whom the homeowner contracts for the coordinated installation of comprehensive energy-saving retrofits prescribed by a certified Rater/Auditor, and who is responsible for the duties of Project Manager. The Energy Smart Project Manager could be the Rater/Auditor or an Energy Smart Contractor that meets the additional qualification defined in Section 1004.6.

Energy Smart Home Performance Team (Energy Smart Team)

A team consisting of Energy Smart contracting companies and a RESNET certified Rater/Auditor who can collectively prescribe, complete and verify an Energy Smart Home Project.

EPAct

The U.S. Energy Policy Act of 1992.

Equivalent Electric Energy

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

Estimated Annual Energy Cost Savings

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

Ethics & Appeals Committee

A Committee that is responsible for investigating ethics and consumer complaints and hearing a Provider's appeal of its non-approval or renewal of an application, probation, suspension, or revocation.

Evaluation

An analysis of the data collected from any survey or audit, on-site data collection and performance testing, available energy usage records to determine energy use and potential savings from improvements.

Examination

Test administered by an accredited Rater Training Provider from questions developed by Training and Education Committee.

Excess Air

Air supplied to a burner in excess of the amount needed for complete combustion.

Exposed Wall

Walls subjected to heat loss or gain.

Failed Item

A "failed item" constitutes a category of failure, such as insulation installation, duct leakage, prescriptive air sealing requirements, insulation enclosure, eave baffles, mechanical system efficiency, window specifications, etc. For the purpose of follow-up inspections, a "failed item" is not limited to the specific instance in a home but to that category of the minimum rated features as it applies to that home design.

Failure

When one or more of the threshold specifications is not met during the testing and inspection process.

Fenestration

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

Fan-assisted Combustion

A combustion appliance with an integral fan that draws combustion supply air through the combustion chamber.

Field-of-View (FOV)

The total area of height by width, normally expressed in either degrees or radians, in which an infrared imaging system is capable of displaying, imaging, and recording objects.

Final Verifier

The Final Verifier must be an independent RESNET Rater/Auditor that did not conduct the initial Energy Smart Project rating/audit, or that does not have a financial interest in any of retrofit work done for the Energy Smart Project, or that is not employed by a company who performs any part of the retrofit work

Flame Rollout

A condition in which burner flames discharge from the cabinet of a combustion appliance.

Flashing

sheet material used to cover building joints to prevent bulk water entry

Framing Spacing

The distance from center to center of wall studs, ceiling joists, floor joists and roof rafters.

Furnace

A space heating appliance that heats indoor air with hot combustion gases that pass through a heat exchanger.

Gaps (insulation)

An insulation defect where installed insulation does not completely fill areas of the building enclosure, which allows for conductive and convective heat loss and a reduced R-value of the overall building enclosure.

Heat Exchanger

A device built for heat transfer from one medium to another. The medium may be separated by a solid wall, so that they never mix, or they may be in direct contact. Furnaces contain heat exchangers, of referred to as combustion chambers, made from stamped steel. Air is directed around the exchanger while the combustion process is occurring inside the heat exchanger, allowing the exchange of heat into the air medium, which is then transferred into the home.

Heat Pump

A vapor-compression refrigeration device that includes a reversing valve and optimized heat exchangers so that the direction of heat flow may be reversed in order to transfer heat from one location to another using the physical properties of an evaporating and condensing fluid known as a refrigerant. Most commonly, heat pumps draw heat from the air or from the ground moving the heat from a low temperature heat source to a higher temperature heat sink.

Heating Seasonal Performance Factor, or HSPF

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

HERS-BESTEST

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

HERS Index

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

Home

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

Home Energy Assessment

Defined by this standard as one of two levels of energy assessment of a home, including Home Energy Survey and Comprehensive Home Energy Audit.

Home Energy Rater, or HERS Rater or Rater

An individual meeting the minimum training requirements for Raters set forth in Chapter 2 of these Standards, documented by an Accredited RESNET Training Provider, and certified by an Accredited Rating

Quality Assurance Provider to inspect a home to evaluate the minimum rated features and complete Home Energy Ratings (see also Rating Field Inspector and Senior Certified Rater).

Home Energy Rater Candidate, or Rater Candidate

An individual who has completed two (2) supervised ratings with a RESNET Accredited Training Provider, passed the National Core Rater Test and is in the process of completing three (3) additional probationary ratings necessary for certification by an Accredited Rating Quality Assurance Provider as a Home Energy Rater.

Home Energy Rating, or Rating

An unbiased indication of a home's relative energy performance based on consistent inspection procedures, operating assumptions, climate data and calculation methods in accordance with the "National Energy Rating Technical Standards" (Chapter 3 of this Standard). See also "Rating, Confirmed" and "Rating, Projected".

Home Energy Rating Provider, or HERS Provider, or Rating Provider

See Accredited Rating Quality Assurance Provider.

Home Energy Rating (HERS) Software Provider

An organization that develops software accredited by RESNET for use in home energy ratings.

Home Energy Rating System, or HERS®

The procedures, rules and guidelines by which Home Energy Ratings are conducted by accredited Providers (Rating Quality Assurance, Software, Training, Sampling), as specified in these Standards.

Home Energy Survey

A level of the RESNET Home Energy Audit process defined by this standard to include one of the following: Diagnostic Home Energy Survey, In-Home Home Energy Survey, On-Line Home Energy Survey

Home Energy Survey, Diagnostic

A level of the RESNET Home Energy Survey in accordance with this standard, consisting of an In-Home Home Energy Survey and additional diagnostic testing.

Home Energy Survey, In-Home

A level of the RESNET Home Energy Assessment process defined by this standard intended to assess both the general energy performance of the home and the level of the commitment to action on the part of the homeowner. The survey may include data be collected and reported on-line by the homeowner or by a home energy survey professional for the purpose of further analysis and general identification of home performance problems. The intent of the energy survey is to refer homeowners to the next level if it is determined that the home needs further analysis, and the homeowner is motivated to invest in improvements. The On-Line or In-Home Home Energy Survey is not required if the homeowner wishes to directly pursue a Diagnostic Home Energy Survey or Comprehensive Home Energy Audit.

Home Energy Survey, On-Line

A basic energy review of a home using an internet-based tool or software.

Home Energy Survey Provider

An organization accredited by RESNET in accordance with Section 703 of the Mortgage Industry National Home Energy Rating Systems Standards to certify Home Energy Survey Professionals to perform Home Energy Surveys and Auditors to perform Comprehensive Home Energy Audits in accordance with this Standard, and to maintain QUALITY assurance of the Home Energy Survey.

Home Energy Survey Professional (HESP)

An individual certified by an accredited Home Energy Survey Provider to conduct Home Energy Surveys.

Home Performance Assessment

A detailed evaluation of the condition of a home as a building system, including evaluation of all materials, components, features, systems and subsystems that affect the energy use of the home.

Home Performance with ENERGY STAR®, or HPwES

A national program developed by the Environmental Protection Agency (EPA) and the Department of Energy (DOE), that offers a comprehensive, whole-house approach to improving energy efficiency and comfort of homes, while maintaining or improving safety.

House Wrap

A weather-resistant material, intended to serve as an air/moisture barrier if sealed carefully at seams.

HVAC

Heating, Ventilating and Air Conditioning.

IECC

International Energy Conservation Code.

Inches of Water Column (IWC)

A unit of pressure difference; 1 IWC = 250 Pascals (see "Pascal.")

Independent Rater/Auditor

A RESNET Rater/Auditor who performs Final Verification of an Energy Smart Project in accordance with these sections and is certified by a RESNET-accredited Rating Provider in accordance with RESNET Standards. Independent Rater/Auditors shall be independent of the Auditor/Rater or Contractors(s) who installed the recommended measures, and may receive no financial compensation for any of the retrofits performed on the project.

~~*Indirectly Conditioned Space*~~

~~A space within a building that is not directly conditioned, but meets one of the following criteria: (1) the area-weighted U-factor of the boundary between it and directly conditioned space exceeds that of the boundary between it and the outdoors or the ground, where U = sum (UA)/sum(A); (2) air to or from directly conditioned spaces is mechanically transferred at a rate exceeding 3 air changes per hour; or (3) any unvented basement or crawl space that contains heating equipment or distribution systems, and for which 50% or more of the floor separating it from conditioned space has no thermal insulation installed.~~

Induced combustion

See "fan-assisted combustion."

Industry Accepted Standards for Chapter 10

Industry recognized standards that include the following:
ACCA - Air Conditioning Contractors of America (2800 Shirlington Road, Suite 300, Arlington, VA, 22206; tel: 703/575-4477; http://www.acca.org)
ACCA 4 QM - 2007 Maintenance of Residential HVAC Systems in One- and Two-Family Dwellings Less Than Three Stories
ACCA 5 QI -2010 HVAC Quality Installation Specification
ACCA 6 QR- 2007 Standard for Restoring the Cleanliness of HVAC Systems
ACCA 9 QIvp. 2011 HVAC Quality Installation Verification Protocols
ACCA 12 QH 201X Existing Home Evaluation and Performance Improvement
RESNET - Residential Energy Services Network (P.O. Box 4561, Oceanside, CA, 92052-4561; 1-800-836-7057; http://www.resnet.us)
Mortgage Industry National Home Energy Rating Standard, 2009
RESNET National Standard for Home Energy Audits, 2005
Rating and Home Energy Survey Ethics and Standards of Practice, 1996
RESNET Standards for Qualified Contractors and Builders, 2010

Infiltration Volume

The sum of the Conditioned Space Volume and Unconditioned Space Volume in the dwelling unit, minus the volume of:

- Floor cavities that have Unconditioned Space Volume both above and below,
- Unconditioned wall cavities,
- Attics,
- Vented Crawlspaces,
- Garages,
- Basements, where the door between the basement and Conditioned Space Volume is closed during enclosure air leakage testing ~~(Section 3.2.5)~~, and,

- Thermally isolated sunrooms.

Infrared Imaging System

An instrument that converts radiation differences associated with surface temperature variations into a two dimensional image by assigning specific colors or tones to the differing temperatures.

Infrared Thermography

The process of using an infrared imaging system to generate thermal images of the surfaces of objects, which can be viewed electronically or printed.

In-Home Home Energy Survey

A level of the RESNET Home Energy Assessment process defined by this standard intended to assess both the general energy performance of the home and the level of the commitment to action on the part of the homeowner. The survey may include data be collected and reported on-line by the homeowner or by a home energy survey professional for the purpose of further analysis and general identification of home performance problems. The intent of the energy survey is to refer homeowners to the next level if it is determined that the home needs further analysis, and the homeowner is motivated to invest in improvements. The On-Line or In-Home Home Energy Survey is not required if the homeowner wishes to directly pursue a Diagnostic Home Energy Survey or Comprehensive Home Energy Audit.

Initial Failure

When one or more failure(s) are first identified in a home during the sampling process.

Instantaneous Field of View (IFOV)

The instantaneous spatial resolutions characteristics of thermal imagers (expressed in angular degrees or radians per side if rectangular and if round, in angular degrees or radians), or the smallest object able to be viewed by the imaging system at a given distance.

Instantaneous Water Heater

A water heater that initiates heating based on sensing water flow and has a manufacturer's specified storage capacity of less than 2 gallons.

Internal Gains

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

International Energy Conservation Code (IECC)

The model code for building energy conservation as promulgated by the International Code Council.

Isolated Combustion Appliance Zone

A combustion appliance zone that is not a part of, nor directly connected to, habitable space. It is either outdoors, or is a mechanical room or attached garage that is supplied with outdoor combustion air and separated from habitable space, and which complies with the criteria in Section B.3.2 of this standard.

Knob and Tube Wiring

An early method of electrical wiring in buildings, used from about 1880 to the 1930s. It consisted of single insulated copper conductors run within wall or ceiling cavities, passing through joist and stud drill-holes via protective porcelain insulating tubes, and supported on nailed-down porcelain knob insulators.

KBtu

1,000 British Thermal Units (Btu)

Labeled Ceiling Fan

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

Labeled Ceiling Fan Standardized Watts (LCFSW)

The power consumption in watts of a Labeled Ceiling Fan “standardized” to a medium speed air delivery of 3000 cfm.

Lead Based Paint

Paint containing the heavy metal lead, that was used as pigment, to speed drying, increase durability, retain a fresh appearance, and resist moisture that causes corrosion. Although the United States has regulation that prohibits the manufacture or use of lead based paints in residential or applications with direct human

exposure, lead paint may still be found in older properties painted prior to the introduction of such regulation introduced in 1978. Paint with significant lead content is still used in industry and by the military.

Light Fixture

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

Low-Volume Raters

Raters which complete less than twenty five (25) ratings per year or less than fifty (50) ratings over a two year period.

MBtu

One million British thermal units (Btu)

Metropolitan Area

Metropolitan and micropolitan statistical areas as defined by the United States Office of Management and Budget (OMB) and published by the United States Census Bureau athttp://www.census.gov (the most current edition).In areas not included in any defined Metropolitan Area, individual counties may be substituted for the purpose of applying the sampling process.

Misalignment (insulation)

A defect which occurs when installed insulation is not in contact with the air barrier and air intrusion between the insulation and the air barrier seriously compromises the effectiveness of the insulation in framed buildings.

Model Energy Code: 1993 (MEC '93)

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

Mechanical Ventilation

The active process of supplying or removing air to or from an indoor space by powered equipment such as motor-driven fans and blowers but not by devices such as wind-driven turbine ventilators and mechanically operated windows.

Mechanical Ventilation System

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

Balanced- One or more fans that supply outdoor air and exhaust building air at substantially equal rates from the space. This makes heat recovery possible via an air to air heat exchanger.

Exhaust-Only- One or more fans that remove air from the building, causing outdoor air to enter by ventilation inlets or normal leakage paths through the building envelope.

Supply-Only- One or more fans that supply outdoor air to the building, causing indoor air to leave by normal leakage paths through the building envelope

Minimum Rated Features

The characteristics of the building elements which are the basis for the calculation of end use loads and energy consumption for the purpose of a home energy rating, and which are evaluated by Home Energy Raters in to order collect the data necessary to create a home energy rating using accredited simulation tools.

NFPA

National Fire Protection Association

NASEO

National Association of State Energy Officials

National Accreditation Body

The Residential Energy Services Network (RESNET) is the National Accreditation Body for all Providers designated in this Standard.

National Core Rater Test

Computer-based examination developed by the Residential Energy Services Network's (RESNET) Training and Education Committee and administered by RESNET.

National Home Energy Rating Technical Guidelines

Voluntary home energy rating system technical guidelines adopted by the National Association of State Energy Officials (NASEO).

National RESNET Buildings Registry

The national online registry of all rated homes and Certified Raters and Accredited Home Energy Rating Providers which is maintained by RESNET.

Natural Draft Venting System

A venting system that relies on buoyancy to move combustion gases to the outdoors.

NIOSH

National Institute for Occupational Safety and Health.

Normal

The building shell is functioning as designed.

NREL

National Renewable Energy Laboratory.

On-Line Home Energy Survey

A level of the RESNET Home Energy Survey in accordance with this Standard that is a basic energy review of a home using an internet-based tool or software.

On-site Power Production (OPP)

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

OSHA

Occupational Safety and Health Administration.

Pascal (Pa)

The metric unit of pressure equaling 1 Newton per square meter, or 0.004 inch W.G.

Performance Testing

Testing conducted to evaluate the performance of a system or component using specified performance metrics.

Polyethylene Sheeting

Any sheet material made of polyethylene, often called Visqueen™, used as a moisture barrier either on the walls of a structure built in an extreme northern climate or as a barrier covering the dirt on the floor of a basement or crawl space.

Power Burner

A burner for which air is supplied at a pressure greater than atmospheric pressure; includes most oil-fired burners and gas burners used as replacements for oil burners.

Power-Vented

An appliance that operates with positive static pressure in the vent, and is constructed and installed with a fan or blower to push all the products of combustion directly to the outdoors through independent sealed vents connected directly to the appliance.

Predicted Depressurization

Calculated house depressurization after improvements, accounting for estimated change in house tightness and exhaust fan flow.

Projected Rating

A Rating accomplished using minimum rated feature data derived from home plans and specifications or based on a site audit for a to-be-improved home which have not yet been implemented in the field. Projected Ratings are commonly generated prior to the construction of a new building or prior to the implementation of energy-efficiency improvements to an existing building.

Purchased Energy

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

Purchased Energy Fraction (PEfrac)

The fraction of the total energy consumption of the Rated Home that is purchased energy, wherein all site fossil energy uses are converted to their Equivalent Electric Power using the Reference Electricity Production Efficiency of 40%.

QH Standard BSR/ACCA 12 QH 201x (Existing Home Evaluation and Performance Improvement).

A standard that establishes the minimum criteria by which deficiencies in existing residential buildings are identified by audit, improvement opportunities are assessed, scopes of work are finalized, work is performed in accordance with industry recognized procedures, and improvement objectives were met.

Qualitative (insulation)

In relation to insulation inspections, determining general areas of anomalies without assigning temperature values to the patterns.

Qualifying Light Fixture

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

Qualifying Light Fixture Locations

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

Quality Assurance (QA)

The planned and systematic processes intended to ensure compliance with current applicable standards in a systematic, reliable fashion.

Quality Assurance Data File (QA Data File)

The collection of data that comprises the complete quality assurance information for a specific Home Energy Rating, including take-off forms, field data collection forms, energy simulation files, building plans, RESNET Standard Disclosure Forms, rating certificates, rating reports, QA records (including findings and the resolution of any issues), photo documentation, as well as any documentation required by Third-Party Energy Efficiency Programs (EEP's) such as checklists, copies of labels or third-party certificates), and the names of each certified individual (i.e. Raters and/or Rating Field Inspectors) who worked on the rating (field inspections, modeling, etc.).

Quality Assurance Designee (QA Designee)

An officer, employee, or contractor responsible for quality assurance within a Provider organization, who has met the requirements of section 905.3 of this Chapter and has signed an agreement with the Provider to be the Provider's QA Designee.

Quality Assurance Designee Delegate (QA Delegate)

An individual certified as a Home Energy Rater, appointed by a Quality Assurance Designee to complete a portion of the Quality Assurance process, who has met the requirements of section 904.7 of this Chapter.

Quality Assurance Designee, Primary (Primary QA Designee)

The one QA Designee for a Provider who shall have ultimate responsibility, on behalf of the Provider, for fulfilling the Provider's QA requirements/responsibilities and who shall be the single point of contact to RESNET regarding all Quality Assurance matters.

Quality Assurance Committee (QA Committee)

A Standing Committee of the RESNET organization that is responsible for the oversight of RESNET's rating quality assurance program, review and ruling on the merits of formal Ethics and Consumer Complaints received by RESNET, and review and rule on the merits of all appeals of non-approval or renewal of an application, probation, suspension, or revocation.

Quality Assurance Plan

A QA Provider's written quality assurance processes and procedures as specifically required in Chapter 9 of these Standards.

Quantitative

In relation to insulation inspections, determining the total square footage of anomalies of a structure as a percentage of the total surface area of the structure in square feet.

Radon Mitigation

The method(s) for reducing radon entry into attached and detached residential buildings. This practice is intended for use by trained, certified or licensed, or both, or otherwise qualified individuals, following ASTM E 2121-09, Standard Practice for Installing Radon Mitigation Systems in Existing Low-Rise Residential Buildings.

Radon Testing

Typically one of two approaches is used: 1) Approved radon test kit is purchased and used by the person responsible for the building, 2) Certified and/or licensed independent radon tester to perform the required radon test. A short-term test remains in the home for 2 to 90 days, whereas a long-term test remains in your home for more than 90 days.

There are two types of radon testing devices. **Passive** radon testing devices do not need power to function and include; charcoal canisters, alpha-track detectors, charcoal liquid scintillation devices, and electric ion chamber detectors. Both short- and long-term passive devices are generally inexpensive. **Active** radon testing devices require power to function and usually provide hourly readings and an average result for the test period. These include continuous radon monitors and continuous working level monitors, and these tests may cost more. All radon tests should be taken for a minimum of 48 hours. A short term test will yield faster results, but a long-term test will give a better understanding of the home's year round average radon level. Regardless of the approach used if the radon level is confirmed to be 4 picoCuries per liter (pCi/L) or higher, the mitigation should occur.

Rated Home

The specific home being evaluated using the rating procedures contained in the National Home Energy Rating Technical Guidelines.

Rater

See Home Energy Rater.

Rater Candidate

See Home Energy Rater Candidate.

Rater Test Identification Number (RTIN)

The unique numerical identifier for each individual who has passed the RESNET National Home Energy Rater Exam as assigned by RESNET through the RESNET Buildings Registry. This number also serves as the Rater's ID number once they have been certified by a Rating QA Provider.

Rater Specialty Certification

Professional building performance certification recognized by RESNET as part of a Home Energy Rater's advanced certification.

Rater Trainer, Certified

An individual designated by an Accredited Rater Training Provider to provide instruction and assistance to trainees. A class instructor who has demonstrated, by means of passing the RESNET National Rater Trainer Competency Test, mastery of the building science and rating system and competency necessary to effectively teach Rater training courses. Only RESNET certified Rater Trainers can provide rater training instruction under the auspices of a RESNET accredited Rater Training Provider.

Rater Training Provider or Training Provider

See Accredited Rater Training Provider

Rating

See Home Energy Rating**.**

Rating Field Inspector (RFI)

A Field Inspector is the entry level of Rater certification. A Field Inspector under the direct supervision of a certified home energy Rater may conduct the inspections and necessary basic performance tests (blower door& duct blaster) to produce a home energy rating. This category requires the ability to identify and quantify building components and systems.

Rating Index

See HERS Index.

Rating Quality Assurance Provider or QA Provider

See Accredited Rating Quality Assurance Provider.

Rating, Projected

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

Rating Sampling Provider

See Sampling Provider.

Rating Software

A computerized procedure that is accredited by RESNET for the purpose of conducting home energy ratings and calculating the annual energy consumption, annual energy costs and a HERS Index for a home.

Rating Tool

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

Reference Electricity Production Efficiency

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

Reference Home

A hypothetical home configured in accordance with the specifications set forth in the National Home Energy Rating Technical Guidelines for the purpose of calculating rating scores.

Refrigerant

A compound that absorbs heat when it under goes a phase change, e.g**.** gas to a liquid. Traditionally, the chlorofluorocarbon (CFC) R-22 was used as a refrigerant for residential air conditioners and heat pumps. Since 1992 time frames have been established for replacing chlorofluorocarbon refrigerants, with non chlorofluorocarbon refrigerants often referred to as R-410A. The ideal refrigerant has a boiling point somewhat below the target temperature, a high heat of vaporization, a moderate density in liquid form, a relatively high density in gaseous form, and a high critical temperature. Since boiling point and gas density are affected by pressure, refrigerants may be made more suitable for a particular application by choice of operating pressure.

Refrigerant Charge

Quantity of refrigerant in a vapor compression refrigeration/heating system, determined by measuring the discharge and suction pressures/temperatures in the system.

Registry

The database maintained by a CEQ Provider of all Energy Smart Contractors they have approved.

Relative Humidity (RH)

The water vapor pressure in the air expressed as a proportion of the saturated water vapor pressure (i.e. the highest possible value) at the current air temperature.

RESNET

Residential Energy Services Network

RESNET JobWerks RFI Tool

Tablet-based software adopted by RESNET, residing in the cloud, used for coaching, tracking and assessment of RESNET RFI Candidates.

RESNET National Buildings Registry

The national online registry of all rated homes and Certified Home Energy Raters which is maintained by RESNET.

RESNET Executive Director (Executive Director)

A person elected by the Board of Directors of the Residential Energy Services Network (RESNET) to be the Chief Executive Officer of RESNET.

RESNET National Rater Trainer Competency Test

Certification test developed and administered by RESNET to ensure that accredited Rater Training Providers' trainers have the requisite knowledge and competence to serve as trainers for prospective certified Raters. The test is based on the national core competency exam developed and maintained by RESNET.

RESNET Recognized Home Performance Standard

Technical standard developed to offer a comprehensive, whole-house approach to improving energy efficiency and comfort of existing homes, while maintaining or improving and durability safety.

RESNET Quality Assurance Checklist

Checklist developed by RESNET for use by a Quality Assurance Designee in evaluating a Rating Quality Assurance Provider's compliance with the requirements of accreditation and quality assurance as stipulated by Section 904.3 of these Standards, and which enumerates the individual requirements that must be verified annually.

Return Duct

Duct carrying air back (return) to the heating and cooling equipment.

Room Pressure Differential

In many parts of the country, supply air is delivered to individual rooms, but return air is located only or primarily in the central body of the home. The absence of return air in closeable spaces causes positive pressure in the closed rooms and negative pressure in the central zone. These positive and negative pressure differentials create a number of unwanted impacts, which may include; contaminants in the soil (e.g., radon), sewer gases in poorly trapped drain lines, and air contaminants (e.g., pesticides, mold odors, chemicals, auto exhaust, dust) in unconditioned zones such as crawl spaces and garages being drawn into the conditioned living space. Negative pressure can also produce combustion venting problems such as; very high levels of Carbon Monoxide or push the flame out of the combustion chamber in a process referred to as flame roll-out. These combustion system impacts can create serious dangers for both home and occupants. In order to alleviate the differentials, "jumper ducts", "transfer grilles" or individual returns are installed to alleviate or balance the pressures differential between zones.

R-Value

Thermal resistance value measured in h-ft^2-F/Btu.

Sample Set

A specific group of homes from which one or more individual homes are randomly selected for sampling controls.

Sampling

An application of the Home Energy Rating process whereby fewer than 100% of a builder's new homes are randomly inspected and tested in order to evaluate compliance with a set of threshold specifications.

Sampling Controls

A collection or set of required tests and inspections performed for a sample set of homes in order to confirm that the threshold specifications have been met. "Sampling controls" may refer to the entire set of tests and inspections, or to a particular phase that constitutes a defined subset of those tests and inspections (e.g. pre-drywall, final, HVAC, windows and orientation, etc).

Sampling Provider

An entity, accredited through these standards, that oversees the sampling process and issues the sampling certifications that homes meet a particular set of threshold specifications such as the ENERGY STAR® specifications adopted by the U.S. Environmental Protection Agency.

Seasonal Energy Efficiency Ratio, or SEER

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

Senior Certified Rater

A senior Rater is the first category of advanced Rater certification. Senior Certified Raters have demonstrated that they have the increased experience and knowledge base to interpret the findings of a rating and make recommendations on how the home can be improved.

Sensible Heat Ratio (SHR)

The sensible heat or cooling load divided by the total heat or cooling load.

Shall

As used in this Standard, the word 'shall' means that the action specified is mandatory and must be accomplished by the responsible party.

Spectral Wavelength

The electromagnetic wavelength interval or equivalent over which observations are made when using an infrared imaging system.

Spillage, Spill

Combustion gases emerging from an appliance or venting system into the combustion appliance zone during burner operation.

Standard Ceiling Fan

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

Standards (HERS Standards)

The "Mortgage Industry National Home Energy Rating System Standards", as maintained by the Residential Energy Services Network (RESNET).

Standards Committee

A Standing Committee of the RESNET organization that is responsible overseeing the Standards Amendment process.

Super Heat

Heat added to a vapor under pressure, raising the temperature of the vapor above the temperature pressure reference point

Technical Committee

A Standing Committee of the RESNET organization that is responsible for review and oversight of the RESNET Technical Standards (Chapter 3).

Thermal Boundary

The line or boundary where the air barrier and insulation are installed in a building assembly. The air barrier and insulation should be adjacent to one another in a building assembly to prevent airflow from circumventing insulation.

~~*Thermal Boundary Wall*~~

~~Any wall that separates directly or indirectly conditioned space from unconditioned space or ambient conditions.~~

~~*Thermal Boundary Wall (Above-Grade)*~~

~~Any thermal boundary wall, or portion of such wall, not in contact with soil~~.

Thermal Expansion Valve (TXV)

A component of a vapor compression refrigeration system that varies the amount of refrigerant flow into the evaporator coil based on temperature and pressure, thereby controlling the superheat at the outlet of the evaporator coil.

Thermal Storage Mass

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

Thermal bridging

Heat conduction through building components, typically framing, that are more conductive than the insulated envelope.

Thermal Bypass

Air movement, air leakage or convection "cell", that circumvents the thermal barrier, is usually hidden and is the result of an incomplete or compromised air barrier.

Thermal Image

A recorded electronic or printed image provided by an infrared imaging system of the thermal surface variations of an object or a surface.

Thermal Resolution, or Noise Equivalent Temperature Difference (NETD)

The minimum temperature difference, typically specified in degrees Centigrade at 30 degrees Centigrade, an infrared imaging system is able to distinguish between two blackbody points on a thermal image.

Thermogram

An infrared picture obtained through the use of an infrared imaging system or other means of recording such images.

Thermographer, Level I

A person who is qualified by training, experience and testing to gather high-quality data and, where pass/fail guidance is provided, to interpret that data. The American Society for Nondestructive Testing (ASNT) defines a Level I as one who can, 1) Perform calibrations, tests, and evaluations for determining the acceptance or rejection of tested items in accordance with specific written instructions, 2) Record test results but have no authority to sign reports for the purpose of signifying satisfactory completion of NDT operations, and 3) Receive instructions or supervision from a Level III or designee.

Thermography

The process of generating and interpreting thermal images.

Third-Party Energy Efficiency Program, or EEP

A national or local program that has set a standard for energy efficiency in building performance and requires a HERS analysis for verification (e.g. ENERGY STAR® Qualified Homes, Building America's Builders Challenge, building code, International Code Council, utility companies, etc.)

Threshold Specifications

A set of qualification criteria which are established for a sample set based on Worst-Case Analysis or a set of prescriptive specifications such as the ENERGY STAR® prescriptive path adopted by the U.S. Environmental Protection Agency.

Training and Education Committee

A Standing Committee of the RESNET organization that is responsible for overseeing RESNET training, RESNET tests, and education and professional development for RESNET Providers and Raters.

Transfer Duct

Properly sized ducting and register grilles installed in the wall or door between the central body of a home and an isolated area, in order to reduce room pressure differentials.

Transfer Grille

Properly sized grilles installed in the wall or door between the central body of a home and an isolated area, in order to reduce room pressure differentials.

Typical Meteorological Year, or TMY Data

Hourly climate data published by the National Climatic Center, Asheville, NC, based on historical climate data in 216 locations.

U-factor

Coefficient of thermal transmittance (expressed as Btu/h-ft2-oF (W/m2-oC)) of a building envelope component or system, including indoor and outdoor air film transmission coefficients.

Unconditioned Space Volume

The volume within a building that is not Conditioned Space Volume but which ~~may~~ contains heat sources or sinks that influence the temperature of the area or room. The following specific spaces are addressed to ensure consistent application of this definition:

- The volume of a floor cavity shall be included, unless the volume both above and below the floor cavity meets the definition of Conditioned Space Volume.
- The volume of a wall cavity shall be included, unless the wall cavity meets the definition of Conditioned Space Volume.
- The volume of a vented attic shall be included.
- The volume of a vented crawlspace shall be included.
- The volume of a garage shall be included, even ~~if~~when it is conditioned.
- The volume of a thermally isolated sunroom shall be included.
- The volume of an attic sealed and insulated at the roof deck, an unvented crawlspace, or a basement shall be included unless it meets the definition of Conditioned Space Volume.

~~*Unconditioned Space*~~

~~Any enclosed space within a building that is neither directly nor indirectly conditioned.~~

Unresolved Complaint

A complaint deemed by the CEQ Provider to require corrective action by the Energy Smart Contractor.

Unvented Combustion Appliance

Any appliances not used with a duct, chimney, pipe, or other device that carry the combustion pollutants outside the home. These appliances can release large amounts of pollutants directly into a home.

U-Value

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

Vapor barrier/retarder

A material used in the construction process to either slow or stop the movement of moisture, whether in liquid or vapor form, into or out of the building envelope or the wall structure.

Vapor-Cycle Refrigerant-Based Equipment

The most widely used method for air-conditioning of private residences in the United States. System uses a circulating liquid refrigerant as the medium which absorbs and removes heat from the space to be cooled and subsequently rejects that heat elsewhere, typically includes four components: a compressor, a condensing coil, an expansion valve (also called a thermal expansion valve), and an evaporator coil.

Vent Connector

The pipe that connects a combustion appliance to a vent or chimney.

Venting System

A passageway or passageways from a combustion appliance to the outdoors through which combustion gases pass.

Voids (insulation)

Areas where no insulation has been installed.

Wind Wash(ing)

Air intrusion between the insulation and the air barrier seriously compromises the effectiveness of the insulation in framed buildings. The long path exfiltration on the cold side of insulation allows moisture from the air to be deposited in the building assembly.

Weather Resistant Barrier (WRB)

Is designed to keep water from entering the building through the walls and is made up of several individual materials: house wrap or building paper (with weather resistive coating), flashings, sealants and tapes. When installed properly, these materials combine to protect the building from rain-induced moisture damage. If the WRB is sealed to block air flow it also contributes to the air barrier system of a home.

Work Scope

A set of written recommendations, including specifications detailing repairs and improvements to be made to a home; a work scope may include pre- and post-work performance testing and acceptance criteria.

Worst-Case Analysis

A home energy rating from a specified home plan for which the minimum rated features of the home are configured to provide the poorest energy performance of the home (i.e. the largest HERS Index) when four ordinal home orientations and the least energy efficient minimum rated features for the specified home plan are considered by the Rating. A Worst-Case analysis may use threshold diagnostic values to determine the least efficient minimum rated features for the specified home plan.