Quality Assurance for ENERGY STAR
Version 3

Roger Woods
Agenda

- Definition
- Comprehensive Program QA/QC
- QA/QC under ENERGY STAR Version 3
- Q&A
Defining Quality Assurance

- **Definition** - A program for the systematic monitoring and evaluation of the various aspects of a project, service, or facility to ensure that standards of quality are being met.

- **A comprehensive approach to Quality Assurance must encompass:**
  - Program design and address program technical standards which may consist of one or all of the following:
    - ENERGY STAR, Utility EE & DSM, and RESNET.
  - Impacts on program implementation
  - Compliance and performance evaluations whose results can be used to modify program design and implementation strategies.
Comprehensive Program QA/QC
Objectives of QA/QC Processes:

- Promote a mature, self-sustaining high-performance building industry
- Ensure that participants and subcontractors are qualified for the work they perform
- Ensure that incentives are paid for qualifying units
- Assess the accuracy of efficiencies reported to the program
- Identify and correct inconsistencies or errors for training and follow-up
- Ensure the integrity of the ENERGY STAR label and HERS rating
- Evaluate performance
Key QA elements

- **Incentive application review**
  - No duplicate incentive requests
  - Meets eligibility requirements
  - Complete documentation is provided

- **Data file review (rater data file, plans, TBC)**
  - Assess accuracy and completeness of rater data file
  - Confirm that modeling utilized worst-case

- **In-field inspections**
  - Verify efficiencies of modeled measures and accuracy of information reported to program
  - Assess accuracy of checklists
  - Identify missed opportunities for energy or material/labor savings

- **Key considerations for QA program design**
  - **What will you look for?**
    - Measures that most impact building performance
    - Measures that are variable or hardest to verify
    - Measures that you suspect to be the most frequently non-compliant
  - **How will you select homes for QA?**
    - Random sampling
    - Stratified sampling
    - Dynamic sampling
    - Higher rates of inspection for new partners and partners who failed measures
Key QC elements:

- **Participation agreements for builders, raters and providers**
  - Access to homes, plans, and ratings for inspections
  - Defined corrective action process for non-compliance

- **Annual program kickoff meetings**

- **Orientation meeting for new partners**
  - Establish program expectations
  - Initiate collaboration to achieve consistent compliance
  - For builders and subcontractors: Mandatory in-field training on first home

- **Provide technical support**
  - Facilitate HERS rater classes
  - Facilitate a regional HERS organization to identify and promote consistent use of best practices
  - Provide ongoing trainings on construction, verification, and business best practices
  - Program Account Management team
  - Leverage ENERGY STAR & building science resources
QA/QC under ENERGY STAR v.3
Implementation of Version 3

- Establish program expectations for:
  - Participants, Service Providers, and Utility Sponsors
  - Establish the reason(s) for participation in the ENERGY STAR for New Homes program:
    - Homebuilder (ENERGY STAR certification, federal tax credits, utility incentives, marketing and product differentiation, other)
    - Utility (good will, legislative mandate, other)

- Initiate a Pilot Study to determine Version 3 impacts which will:
  - Gather direct, local information that will provide for adequate planning and preparation for Version 3 implementation
  - Minimize program disruptions and ensure program goal achievement
Establish Requirements and Expectations

Quality Assurance Program requirements for utility sponsored programs should adequately define the measures and processes that must be applied to participating homes, including:

- Incentive eligibility criteria
- Measures that must be applied to homes and the efficiencies of those measures
- Inspection and testing protocols
- Modeling requirements (including software and versions)
- Required supporting documentation
- Evaluation, Measurement and Verification (EMV) reporting requirements
Training

- Prior to and during construction, provide on-site program training for all subcontractors (framing, HVAC, plumbing, electrical, etc.) to clearly address:
  - Expectations, roles and responsibilities
  - Program design
  - Implementation issues
  - Checklist verification and performance testing
  - Clearly define what role Quality Assurance plays in the program
    - Example: Analyzing which checklist items most frequently required corrections suggests measures that are particularly challenging and should be addressed with additional training.
Version 3 Implementation – Checklists

Prerequisite for qualification is that the home must comply with the following requirements:

- Thermal Enclosure System Rater Checklist
- HVAC System Quality Installation Contractor Checklist
- HVAC System Quality Installation Rater Checklist
- Water Management System Builder Checklist
- Water Management System Rater Checklist

To be eligible for qualification, a home must meet the other requirements listed in the national program requirements, including all requirements by a Rater.
Thermal Enclosure System Rater Checklist

Core components:

1. High Performance Windows
2. Quality Installed Insulation
3. Fully Aligned Air Barriers
4. Reduced Thermal Bridging
5. Air Sealing
Thermal Enclosure System Rater Checklist - Version 3 Impacts

At the discretion of the Rater, the builder may assume responsibility for verifying no more than eight items. When exercised, the builder's responsibility will be formally acknowledged by signing off on the checklist for the item(s) they verified.

1. Project Scheduling
2. Project Costs (increased labor and material costs for insulation; decreased material cost for framing)
3. Verification (e.g. Thermal Enclosure System Rater Checklist)

- Insulation Contractor (insulation shall meet 2009 IECC requirements and achieve RESNET Grade 1 installation)
- Framing Contractor (advanced framing techniques required to reduce thermal bridging; raised heel trusses required; re-design of attic platforms for full depth insulation installation; continuous rigid insulation sheathing)

- Checklist (Thermal Enclosure System Rater Checklist)
- Educational component for the Rater should include demonstration of advanced framing techniques by the framing contractor

1 At the discretion of the Rater, the builder may assume responsibility for verifying no more than eight items. When exercised, the builder's responsibility will be formally acknowledged by signing off on the checklist for the item(s) they verified.
HVAC System Quality Installation Contractor Checklist

Requirements:
1. Whole Building Mechanical Ventilation Design
2. Heating and Cooling System Design
3. Selected Cooling Equipment (if applicable)
4. Selected Heat Pump Equipment (if applicable)
5. Selected Furnace (if applicable)
6. Refrigerant Tests
7. Refrigerant Calculations
8. Electrical Measurements
9. Air Flow Tests
10. Air Balance
11. System Controls
12. Drain Pan
HVAC System Quality Installation Contractor Checklist - Version 3 Impacts

**Homebuilder**
- Project Scheduling
- Project Costs (e.g., high efficiency HVAC equipment)
- Verification (a copy of the HVAC System Quality Installation Contractor Checklist should be maintained on-site in the project file)

**Subcontractor**
- HVAC Contractor (documentation supporting quality installation per ACCA standards)
- Manual J, D and S calculations; AHRI certificate; refrigerant tests, electrical measurements, air flow tests, air balance, and system controls

**HERS Rater**
- Rater must verify that the HVAC System Quality Installation Contractor Checklist is completed in its entirety.
- Additional education regarding HVAC design and installation would benefit the rater.
HVAC System Quality Installation Rater Checklist

Requirements:
1. Review of HVAC System Quality Installation Contractor Checklist
2. Duct Quality Installation
3. Duct Insulation
4. Duct Leakage
5. Whole Building Delivered Ventilation
6. Ventilation Controls
7. Air Inlets and Ventilation Source
8. Local Mechanical Exhaust
9. Ventilation and Exhaust Fan Ratings
10. Combustion and Non-combustion Pollutants
11. Filtration
HVAC System Quality Installation Rater Checklist - Version 3 Impacts

- **Homebuilder**
  - Project Scheduling (subcontractor and HERS rater)
  - Project Costs
  - Verification (a copy of the HVAC System Quality Installation Rater Checklist should be maintained on-site in the project file)

- **Subcontractor**
  - HVAC Contractor (corrective action may be required if installation is determined to be non-compliant with program guidelines)

- **HERS Rater**
  - Rater (additional testing and verification requirements: e.g. bedroom pressure balance; ventilation controls; inspection of air inlets and ventilation source; combustion and non-combustion pollutants; filtration, sone ratings, etc.)
Water Management System
Builder Checklist - Version 3 Impacts

Requirements:

1. Water Managed Foundation Assembly
2. Water Managed Roof Assembly
3. Water Managed Building Materials

Water management should be incorporated into the project at the design stage and verified throughout the construction cycle.
Water Management System Builder Checklist

**Homebuilder**
- Design
- Project Scheduling
- Project Costs
- Verification (a copy of the Water Management System Builder Checklist should be maintained on-site in the project file)

**Subcontractor**
- Foundation Contractor (capillary breaks; exterior surface of below grade walls)
- Roofing Contractor (flashing and self-sealing membranes at valleys and roof decking penetrations)
- Window and Door installer (flashing around all exterior openings in the building shell)

**HERS Rater**
- Rater must verify that the Water Management System Contractor Checklist is completed in its entirety.
Water Management System
Rater Checklist - Version 3 Impacts

Requirements:
1. Review of Water Managed System Builder Checklist
2. Water Managed Foundation Assembly
3. Water Managed Roof Assembly
4. Water Managed Building Materials
Water Management System Rater Checklist

**Homebuilder**
- Design
- Project Scheduling
- Project Costs
- Verification (a copy of the Water Management System Rater Checklist should be maintained on-site in the project file)

**Subcontractor**
- Foundation Contractor (capillary breaks; exterior surface of below grade walls)
- Roofing Contractor (flushing and self-sealing membranes at valleys and roof decking penetrations)
- Window and Door installer (flushing around all exterior openings in the building shell)

**HERS Rater**
- Rater must verify that the Water Management System Contractor Checklist is completed in its entirety.
- Additional education regarding Water Management Systems design and installation would benefit the rater.

---

1 At the discretion of the Rater, the builder may assume responsibility for verifying no more than two items. When exercised, the builder’s responsibility will be formally acknowledged by signing off on the checklist for the item(s) they verified.
Quality Assurance On-site Inspections

- On-site inspections provide a quick and reliable snapshot of the construction quality and program compliance of the project.
  - On-site inspections verify a number of the rated features contained in the data file for the home.
  - Thermal Enclosure Systems inspections will verify the accuracy of submitted TES forms (e.g. fully aligned air barriers, reduced thermal bridging, air sealing, etc.).
  - Duct leakage and air leakage testing can proactively identify deficiencies prior to and after encapsulation without the need for future destructive corrections.
  - Floor plans and elevations should be collected when available. This information is typically uploaded as supporting document in PDF format.
  - The plans, combined with the inspection data and photos of the home, allow the program to independently generate HERS Indices for the homes.
Adapting and Improving Quality Assurance

- Quality Assurance procedures should include established mechanisms for evolving program designs based on the results of on-site inspections and plan analysis.

- Continued outreach and training opportunities ensure that expectations are being met, program compliance is achieved and program goals are being met.

- The Quality Assurance program should also include procedures for addressing non-compliant participants, subcontractors and HERS raters.

- If program requirements are not being met these procedures typically include the following:
  - Probation
  - Suspension
  - Expulsion
Questions & Answers

Roger Woods
rwoods@icfi.com