Systems SBRA Building Research Alliance

ENERGY STAR

ENERGY STAR Qualified Modular Homes
Model Plant Certification Process

This document describes a suggested plant certification process for the ENERGY STAR program for modular homes. Except where noted as required, this is not a mandatory process, but all items should be covered.

This model certification process is divided into four parts as follows: (1) education and training; (2) in-plant inspections; (3) field inspections and tests; and (4) completion of certification. This process may be spread out over a number of weeks or months depending on the plant's scheduled production and the builders' scheduled installation and completion of ENERGY STAR modular homes. Plant certification should contain the elements shown in Table 1.

Table 1 Certification activities and recommended participants

Topic	Participants				
	Certifier	Mgmt	QC	Eng	Prod
1. Education and training					
a. Review overall process and requirements	✓	✓	✓	✓	✓
b. Review product specifications	✓		✓	✓	
c. Review production procedure	✓		✓	✓	✓
d. Review QC process and documentation	✓		✓		
2. In-plant inspections					
a. Inspect 3 homes on the line	✓		✓	✓	✓
b. Debrief on line inspections	✓	✓	✓	✓	✓
3. Field inspections and tests					
a. Inspect 3 homes in the field	✓		✓		
b. Test 3 homes in the field	✓				
c. Debrief on field inspections and tests	✓	✓	✓	✓	✓
4. Completion of certification					
a. Label the homes	✓				
b. Issue plant qualification	✓				
c. Submit Partnership Agreement		✓			

1. Education and training

Review the following four subjects in meetings with plant personnel.

a. Review overall process and requirements

Goal: *Review the main elements of the ENERGY STAR modular homebuilding process*

- ✓ Review the certification process including goals of each part
- ✓ Review SBRA's role and resources available on the SBRA website www.research-alliance.org/pages/es_mod.htm[1]
- ✓ Review ENERGY STAR partnership and marketing resources
  - Partnership application: www.energystar.gov/index.cfm?c=bldrs_lenders_raters.nh_join
  - Promotional tools: www.research-alliance.org/pages/es_promotional_tools.htm
- ✓ Describe how the program works
  - Responsibilities of the plant and the builder/dealer
  - Plant certification process
  - Completing the ***Inspection Checklist for ENERGY STAR Qualified Modular Home*** (hereafter referred to as the Checklist)
  - Field testing requirements and role of the field Rater
  - Labeling process: Quality assurance (QA) label applied in the plant and ENERGY STAR Qualified Home label applied in the field (see ***Compliance Procedures*** document)
  - Semi-annual plant inspection

b. Review product specifications

Goal: *Develop home design(s) and specifications meeting all ENERGY STAR requirements*

- ✓ Review in detail all ENERGY STAR construction requirements of both the prescriptive (BOP) and the performance path compliance options, including the thermal bypass items and any prescriptive items mandated by the path. Ensure plant staff understand the quality control, inspection and verification procedures associated with each path so that the manufacturer has the flexibility of applying either option for a given home
- ✓ Select a set of specifications that will meet the path requirements. For the performance path, this will require computer analysis by the Certifier

c. Review production procedure

Goal: *Teach production personnel proper techniques for ENERGY STAR construction*

- ✓ Observe current practices on the production line at each relevant work station
- ✓ Review ENERGY STAR construction requirements, emphasizing insulation installation, duct sealing and the thermal bypass items
- ✓ Demonstrate proper air sealing and insulation techniques to production supervisors (refer to the Thermal Bypass Checklist Guide)
- ✓ Document required modifications to the plant's current practices

[1] See the SBRA website for all resources and publications mentioned in this document. www.research-alliance.org/pages/es_mod.htm

d. Review QC process and documentation

Goal: *Determine how the ENERGY STAR requirements will be integrated into the plant's QC process*

- ✓ Review the plant's current QC process and third-party inspection procedures
- ✓ Review examples of the plant's QC documents, such as travelers
- ✓ Determine changes in the plant's QC process required to conform to ENERGY STAR requirements, which at a minimum must include the following:
  - The traveler accompanying each module must include the ENERGY STAR requirements applicable to that module.
  - The requirements at each station must be verified and signed off on by the department supervisor, QC person or other appropriate staff as per the plant's third-party approved QC practices.
  - The completed ***Inspection Checklist*** (with signatures or initials for all plant-installed items) must accompany the home to the field along with the unsigned checklist for the builder-installed items.
- ✓ If desired, develop a customized Checklist template, identifying items to be completed in the plant and those to be completed in the field. The plant may elect to organize the checklist items by workstation to facilitate the inspection process.[2] Or, integrate items from the model ***Inspection Checklist for ENERGY STAR Qualified Modular Home*** into the existing plant QC documents. All mandatory Thermal Bypass items must appear on the Checklist. When completing the Checklist, items that do not apply to the home can be indicated by "n/a".

2. In-plant inspections

a. Inspect homes in the plant

Goal: *Verify that the plant is consistently capable of constructing homes to ENERGY STAR requirements and has an acceptable ENERGY STAR QC system in place*

Inspect a minimum of three ENERGY STAR modular homes on the production line for ENERGY STAR requirements, focusing on those elements that will not be visible in the completed home and those that were identified as potential problem areas based on earlier review of the plant's production practices. Inspection should cover all ENERGY STAR requirements, including:

- ✓ Insulation installation quality in walls, floors and ceilings
- ✓ Air sealing at penetrations in floors, ceiling and walls
- ✓ Duct construction and sealing, if applicable
- ✓ Insulation and air sealing behind tubs, showers and fireplaces, and in shafts and chases

Line inspections may occur over multiple days depending on the plant production rate and schedule. All required items must be inspected at least once and representative modules from all homes must be inspected at least once, however all items need not be inspected on all modules/homes.

[2] Although the order of the items may be rearranged, it is recommended that the wording and numbering of the Thermal Bypass items be kept intact so that the customized Checklist template corresponds to EPA's Thermal Bypass Inspection Checklist Guide.

In addition to checking construction compliance, observe the implementation of the QC system and confirm that it is operating in accordance with the approved plan.

If inspections reveal non-compliance with ENERGY STAR requirements (either construction or QC process), the plant has the option of either fully correcting the problem so that the home complies or selecting a new home for inspection (in which case the non-compliant home would not qualify as ENERGY STAR). If, in the Certifier's judgment, the plant is not currently able to produce homes that are ENERGY STAR compliant or to properly implement the QC system, then re-training may be required.

b. Debrief on line inspections

Goal: *To provide feedback to plant management regarding the results of the line inspections*

Review with plant staff the results of the line inspections. Results should cover all items in the plant's ***Inspection Checklist for ENERGY STAR Qualified Modular Home*** and the operation of the QC system with integration of ENERGY STAR requirements.

3. Field inspections and testing

a. Inspect homes in the field

Goal: *Confirm that the Builder is capable of constructing homes to ENERGY STAR requirements*

Inspect a minimum of three assembled ENERGY STAR modular homes.[3] (These do not have to be the same homes that were inspected in the plant.) Verify proper completion of all field-installed items on the Checklist including:

- ✓ Marriage line seals
- ✓ Site constructed portions of the home (dormers, conditioned basements, etc.)
- ✓ Builder-provided equipment

Select the best time to visit the site to inspect as many items on the Checklist as possible. Review any remaining items with the builder and complete the Checklist. (Certifiers should attempt to inspect as many critical items as possible but may delegate a Builder's representative to verify select items.)

If any of the inspection results do not meet requirements, instruct the builder or the plant (as applicable) as to the required corrective measures and re-inspect after corrections. If the deficiencies are related to plant-constructed items, determine the appropriate course of action. Re-inspect and re-train the relevant plant department.

b. Test homes in the field

Goal: *Confirm that the certification homes pass ENERGY STAR performance tests*

Conduct tests on the three homes inspected in the field to verify that the homes meet or exceed the target performance levels.[3] Testing includes the following:

- ✓ Envelope leakage test to confirm conformance to ENERGY STAR requirements
- ✓ Measurement of duct air leakage to the outside (not required if all ducts and air handling equipment are in conditioned space and envelope has been tested to no more than 3 ACH50 or 0.25 CFM50 per square foot of building envelope[4])

[3] Certifiers may designate local certified HERS Raters to act as their field representative for the purpose of conducting on-site inspections and tests on the three plant certification homes.
[4] A fresh air ventilation system may be required for homes with this level of leakage.

If any of the test results do not meet requirements noted on the Checklist, instruct the builder or the plant (as applicable) as to the required corrective measures. Re-test after repairs have been made. If the deficiencies are related to plant-constructed items, determine the appropriate course of action. Re-inspect and re-train the relevant plant department.

c. Debrief on field inspections and tests

Goal: *Provide feedback to plant management regarding the results of the field inspections and tests*

Provide a brief written report(s) to the plant containing the numerical results of field tests and a description of any ENERGY STAR-related installation or construction deficiencies (observed during inspections) and an explanation of remedial actions taken. Indicate whether or not each home passed the inspection and tests.

4. Completion of certification

a. Label the homes

Goal: *Qualify the certification homes by applying ENERGY STAR labels to the homes*

Submit the completed and signed Checklist together with a ***Completion Report for ENERGY STAR Modular Home*** to SBRA. SBRA will review the documentation and issue the maroon SBRA quality assurance (QA) and the blue ENERGY STAR Qualified Home labels and the ENERGY STAR Home Certificate to the Certifier. Provide the labels to the Builder for application to the home on or near the electrical panel box or other suitable interior location in the home. This may be done for each home as completed and need not wait for completion of all three certification homes.

b. Issue plant qualification

Goal: *Complete the plant certification process*

If all aspects of the certification process are successfully completed (including successful completion of three homes), issue the ***Qualification to Produce ENERGY STAR Modular Homes*** and provide copies to the plant and to SBRA.

c. Submit ENERGY STAR Partnership Agreement

Goal: *Register plant as ENERGY STAR Partner with EPA*

The plant should now register as an ENERGY STAR Partner by completing the Partnership Agreement online at (www.energystar.gov/index.cfm?c=bldrs_lenders_raters.nh_join).