



ENERGY STAR® QUALIFIED MANUFACTURED HOMES

DESIGN, MANUFACTURING, INSTALLATION, AND
CERTIFICATION PROCEDURES

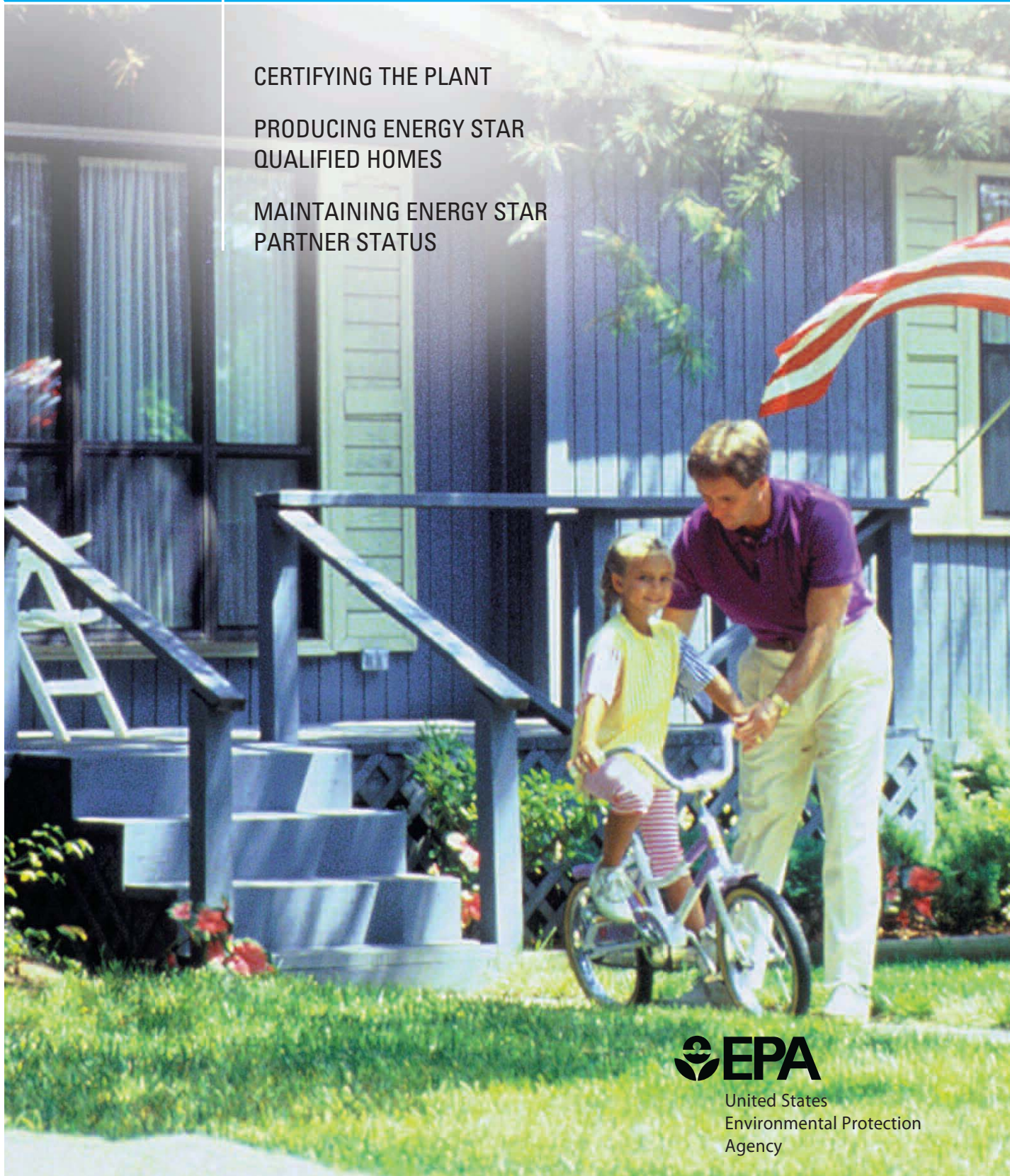
CERTIFYING THE PLANT

PRODUCING ENERGY STAR
QUALIFIED HOMES

MAINTAINING ENERGY STAR
PARTNER STATUS



United States
Environmental Protection
Agency





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CERTIFICATION PROCEDURES

Effective November 2005

Table I.1 highlights some of the more significant elements of the third edition of the Manufactured Home ENERGY STAR® Guidelines and where they may be found within this document.

Table I.1. Highlighted Features

ENERGY STAR Provision	Details	Location
Quality Assurance Provider (QAP)	<ul style="list-style-type: none"> A Quality Assurance Provider (QAP) oversees plant certification by ENERGY STAR certifiers and field spot-checking for the ENERGY STAR program for manufactured homes. MHRA has been approved by EPA to perform this function. 	Page 1.1
MHRA ENERGY STAR Information Manager™	<ul style="list-style-type: none"> Plants must use this internet site to perform plant data keeping, label printing and reporting functions. 	Page 2.4
Retaining an ENERGY STAR Certifier	<ul style="list-style-type: none"> Manufacturer must have an ENERGY STAR Certifier listed with an EPA-approved Quality Assurance Provider at all times. 	Page 3.2
Inactive Partners and Plant De-certification	<ul style="list-style-type: none"> Policy for inactive ENERGY STAR partners and for re-activating plant status; policy for de-certification of plants. 	Page 3.2
Quality Assured Label™	<ul style="list-style-type: none"> This new label must be applied to all ENERGY STAR qualified homes in addition to the EPA ENERGY STAR label. 	Page B.1

EPA wishes to acknowledge the assistance, advice, and technical guidance of the Manufactured Housing Research Alliance (MHRA). Under a grant from EPA, MHRA conducted technical work to develop climate specific construction specifications for producing energy-efficient manufactured homes. ENERGY STAR adopted these specifications after determining that they closely align with the ENERGY STAR threshold for new homes.

Under a new policy, EPA has made plant certification, third-party Certifier oversight and field performance verification for manufactured homes the responsibility of a National Quality Assurance Provider (QAP). EPA has designated MHRA as a QAP.¹ As such, this guide refers users to MHRA for information about ENERGY STAR.

Resources in this guide are available on MHRA's web site (www.mhrahome.org) as well as ENERGY STAR's web site (www.energystar.gov/homes).

¹ The Northwest Energy Efficiency Manufactured Home Program (NEEM) has been approved by EPA to be a Quality Assurance Provider in Washington, Oregon, Idaho and Montana.

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This guide provides the manufactured housing industry with the knowledge necessary to design, manufacture, and install energy-efficient manufactured homes under the ENERGY STAR® program. ENERGY STAR affords the manufactured housing industry a unique opportunity to extend the advantages of controlled-environment factory production to include exemplary energy performance. For the purposes of this guide, a manufactured home is defined as a home built in a factory meeting the federal Manufactured Home Construction and Safety Standards, commonly referred to as the HUD Code². An ENERGY STAR qualified³ manufactured home is a manufactured home that has successfully met all technical and quality control requirements set forth by the U.S. Environmental Protection Agency (EPA) in this guide. Manufacturers are encouraged to take advantage of co-marketing opportunities available with ENERGY STAR—the symbol for energy efficiency.

WHAT IS ENERGY STAR?

ENERGY STAR is a nationally recognized, voluntary program designed to identify and promote energy-efficient products, new homes, and buildings to consumers and businesses across the United States. Initiated by EPA in 1992, ENERGY STAR is now a joint effort of EPA and the U.S. Department of Energy, with each agency taking responsibility for promoting the ENERGY STAR label in particular product categories. EPA is responsible for determining energy efficiency guidelines for ENERGY STAR qualified homes.



WHAT IS AN ENERGY STAR QUALIFIED HOME?

An ENERGY STAR qualified home is significantly more energy efficient in its heating, cooling, and water heating than a comparable standard code home. This increased level of energy efficiency can be met using standard technologies and manufacturing practices by successfully integrating three key home components:

- An energy-efficient building envelope (e.g., effective insulation, tight construction, and high-performance windows).
- Energy-efficient air distribution (e.g., air-tight, well-insulated ducts).
- Energy-efficient equipment (e.g., space heating, space cooling, and hot water heating).

WHY SHOULD A PLANT PARTICIPATE IN ENERGY STAR?

There are at least four good reasons why a plant should consider making the commitment to produce ENERGY STAR qualified homes.

1. The ENERGY STAR label can be a powerful sales tool. ENERGY STAR is nationally recognized, backed and promoted by two federal agencies. Affiliating with ENERGY STAR can differentiate a manufacturer from its peers within the industry and from site-built homes in the same market. Only ENERGY STAR partners have access to ENERGY STAR logos and labels for qualified homes.
2. ENERGY STAR qualified homes, because they are highly energy efficient, have lower monthly operating costs, thereby reducing a homeowner's monthly out-of-pocket expenses and potentially increasing the resale value of the home.
3. The efficiency measures built into an ENERGY STAR qualified home have associated benefits that increase customer satisfaction. These homes are typically more comfortable, durable, quiet, and environmentally friendly than non-ENERGY STAR qualified homes.

² The guidelines in this booklet are not applicable to modular homes. For information on ENERGY STAR modular homes, visit www.energystar.gov/homes.

³ ENERGY STAR labeled homes are now known as ENERGY STAR qualified homes.

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- ENERGY STAR offers another opportunity for a manufactured housing producer to demonstrate superior energy performance compared with non-ENERGY STAR site-built and manufactured homes.

HOW CAN A PLANT PARTICIPATE IN ENERGY STAR?

Becoming an ENERGY STAR partner is a two-part process:

1. Certify the Plant (see Chapter 2)

First the plant must be certified to produce ENERGY STAR qualified homes on an ongoing basis. Plant certification must be performed by a third-party consultant called an ENERGY STAR Certifier who has been accredited by an EPA-approved Quality Assurance Provider to have met established requirements for training and credentials. This process usually requires a few weeks to complete, concluding with submission of the ENERGY STAR Partnership Agreement to EPA.

2. Produce ENERGY STAR Qualified Homes (see Chapter 3)

Once a plant has been certified, it can proceed to manufacture ENERGY STAR qualified homes on an ongoing basis. This involves implementing and maintaining manufacturing, inspection, and quality control procedures developed during the certification process in the plant and in the field.

Both parts are straightforward, but require a commitment of time and resources, backed by a commitment to marketing and selling ENERGY STAR.

ACCESS TO RESOURCES

Additional information about ENERGY STAR for Homes—including marketing materials, the ENERGY STAR Partnership Agreement, copies of forms, ENERGY STAR logos, and the ENERGY STAR label—is available on the Web from ENERGY STAR (www.energystar.gov/homes) and MHRA (www.mhrahome.org).

Producing ENERGY STAR qualified manufactured homes starts with certifying the plant. Plant certification is done once⁴ and usually requires a few weeks to complete. The certification steps are described below.

Step 1. Hire a Manufactured Housing ENERGY STAR Certifier

Who is responsible: **Plant Representative**

The first step in the certification process is for the plant to hire an independent, third-party consultant, called a Manufactured Housing ENERGY STAR Certifier who will:

- Certify that the plant meets the ENERGY STAR requirements for producing ENERGY STAR qualified homes.
- Certify that the plant's ENERGY STAR qualified home designs meet ENERGY STAR requirements.
- Certify the in-plant and in-field performance of at least three homes produced by the plant.
- Inspect a sample of each plant's ENERGY STAR qualified homes on a regular basis (see Chapter 3).

An ENERGY STAR Certifier must be accredited by an EPA-approved Quality Assurance Provider.

ENERGY STAR (www.energystar.gov/homes) and Quality Assurance Providers (e.g. MHRA; www.mhrahome.org) maintain a list of experts who are qualified to provide Manufactured Housing ENERGY STAR Certifier services. An organization may apply to the Quality Assurance Provider to be approved as a manufactured housing ENERGY STAR Certifier.

Step 2. Design Homes To Meet ENERGY STAR Requirements

Who is responsible: **Plant Design/Engineering Staff, Manufactured Housing ENERGY STAR Certifier**

The next step is for the plant to create home designs that meet ENERGY STAR requirements and to ensure that these designs and the methods used to create them are certified to be ENERGY STAR compliant by the ENERGY STAR Certifier. The Certifier must review and approve each of the qualifying home configurations and designs.

Appendix A provides options and more detailed guidance for designing homes that meet ENERGY STAR requirements.

Because a duct leakage value is needed as part of the design process, EPA recommends that the ducts be tested during this step to determine their level of leakage and their potential for improvement. The duct leakage measured in the plant can be used to estimate whether the ducts will meet required leakage levels when homes are set up in the field. Field tests will be valuable aids in verifying this estimate. (See *Manufactured Housing Duct Systems: Guide to Best Practices*, published by MHRA (www.mhrahome.org), for guidance on constructing efficient duct systems.)

Step 3. Incorporate ENERGY STAR Design Features into Quality Control and Inspection Procedures

Who is responsible: **Plant Engineering/Quality Control Staff**

Information about the ENERGY STAR features in the new home designs must now be incorporated into the Design Approval Primary Inspection Agency (DAPIA)-approved packages, the plant Quality Control Manual, and the Manufacturers' Installation Manual.

⁴ See policy on plant de-certification on page 3.2.

Step 4. Manufacture, Inspect, and Test Homes in the Plant for Duct Tightness

Who is responsible: **Plant Production/Engineering Staff, Manufactured Housing ENERGY STAR Certifier**

As part of the certification process, a plant must manufacture a minimum of three consecutive homes that meet ENERGY STAR duct system requirements. As these homes are manufactured, their ducts are tested to determine the level of leakage. The ENERGY STAR Certifier verifies that the ducts do not exceed allowable leakage levels. If one of the qualification homes fails the duct test, three additional homes are tested until three consecutive homes pass the duct leakage test. Even if the ducts are tightened to the point where they meet the ENERGY STAR target, a home that initially fails the duct test cannot be counted as one of the three qualifying in-plant test homes.

“Three consecutive homes” are defined as three homes coming through the production line that are built using the revised duct system design that is designated for the plant’s ENERGY STAR production. This is only a test of the duct system. These three consecutive homes do not need to meet all of the other requirements (e.g. insulation) to be qualified as ENERGY STAR.

The ENERGY STAR Certifier will determine whether the qualification homes are of like or unlike “type,” and whether more than one set of three homes (one set for each home “type”) must be tested. Homes are of different “types” with respect to ENERGY STAR if their design differences have the potential to impact their energy performance significantly. For example, homes with ducts located in the attic and homes with ducts located in the floor would be different “types,” as would single- and double-section homes.

Step 5. Develop Site Installation Checklist

Who is responsible: **Plant Engineering Staff, Manufactured Housing ENERGY STAR Certifier**

Every ENERGY STAR qualified home that leaves a manufacturing plant must have a Site Installation Checklist identifying items that are part of the ENERGY STAR design package, but installed and verified at the time of home installation.

The Site Installation Checklist can be automatically generated and printed for each home using the **MHRA ENERGY STAR Information Manager**.

A sample Site Installation Checklist is included in Appendix C.

The image shows a sample form titled "SAMPLE ENERGY STAR QUALIFIED MANUFACTURED HOME SITE INSTALLATION CHECKLIST" with "APPENDIX D" in the top right corner. The form is divided into several sections: "HOME MANUFACTURER" with fields for Company, Contact, Home Model Number, Address, City, State, and Telephone; "RETAILER" with fields for Company, Contact, Telephone, Address, City, and State; "HOMESUITE*" with fields for Name, Address, City, Telephone, State, and County; and "ENERGY STAR CONSTRUCTION REQUIREMENTS" which includes sections A through E. Section A is "Manifold Line Seal", B is "Rise in the Return Duct Material Required", C is "Exterior Insulation/Weatherstripping/Door Installation", D is "Final Installed Heat Pump", and E is "For Homes Meeting Heat Requirements (One of the following must be checked)". At the bottom, there are fields for "Signature (Manufacturer's Representative)", "Print Name", and "Date", followed by instructions to file the form and mail it to the manufacturer.

Step 6. Install, Inspect, and Test a Minimum of Three Qualification Homes in the Field

Who is responsible: **Installer, Plant Representative, Manufactured Housing ENERGY STAR Certifier**

Three plant certification homes are now installed in the field. These homes do not have to be the same homes tested in the plant in Step 4. EPA does not require manufacturers to test three homes of each type in the field, however, the homes selected should be representative of the types of homes the plant intends to build and label as ENERGY STAR.

The homes are then tested in the field by the ENERGY STAR Certifier for duct and whole-house air leakage. The ENERGY STAR Certifier verifies that duct and whole-house leakage levels are equal to

or lower than the ENERGY STAR requirements. If a home fails either test, modifications must be implemented and the home re-tested until it passes.

Any design or installation changes resulting from these tests must be recorded and used to update the ENERGY STAR specifications contained in the third-party-approved design package and the Site Installation Checklist. To expedite and streamline a plant's certification process, EPA permits setting up and testing certification homes at the plant or a retailer's lot as long as the marriage line is sealed and crossover ducts connected as they would be on a homeowner's site. However, when the home is permanently sited, a new Site Installation Checklist must be completed and signed by the manufacturer's plant representative in order to be an ENERGY STAR qualified home.



Step 7. Incorporate ENERGY STAR Practices into Routine Operations

Who is responsible: **Plant Management, Engineering Staff, and Installer**

Once the required number of certification homes have been installed successfully, the plant must take steps to transfer the lessons learned from the process into its routine production of ENERGY STAR qualified homes, including:

- Instruct key plant personnel on the critical processes and procedures for designing and manufacturing new ENERGY STAR qualified homes, including any corrective actions undertaken during the installation of the three qualification homes.
- Review the unique features contained in the ENERGY STAR third-party-approved design packages with the plant's third-party approval and inspection agencies.
- Instruct set-up crews on how to correctly install and inspect ENERGY STAR qualified homes in the field and the need to provide the completed Site Installation Checklist to the plant.

Step 8. Establish MHRA ENERGY STAR Information Manager Account

Who is responsible: **Plant Management**

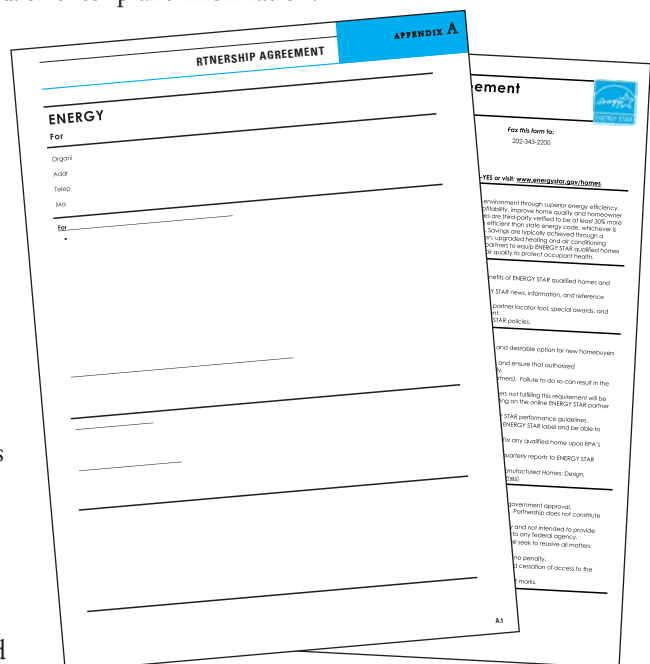
The plant representative will be contacted by the Quality Assurance Provider to establish the plant's **MHRA ENERGY STAR Information Manager** account. This involves selecting a confidential password and logging in to the account to confirm and/or enter plant information.

Once the account is set up, the plant is responsible for recording information about their ENERGY STAR production in the **MHRA ENERGY STAR Information Manager**, starting with the three qualification homes. **Information Manager** will be used to submit ENERGY STAR production data to EPA on behalf of the plant each calendar quarter.

Step 9. Submit ENERGY STAR Partnership Agreement

Who is responsible: **Plant Representative**

Certifying a plant to manufacture ENERGY STAR qualified homes concludes with submitting an ENERGY STAR Partnership Agreement to EPA. This form asks for basic contact information for the plant. Each plant must submit its own Partnership Agreement. The plant representative will receive information from EPA regarding the partnership via e-mail, including access to ENERGY STAR logos. Partners' names and contact information are displayed



on the ENERGY STAR web site (www.energystar.gov/homes). A copy of the agreement can be found in *Appendix D*. Successful completion of Steps 1 through 8 qualifies the plant as a partner with the authorization to produce ENERGY STAR qualified homes.

Once a plant has been certified, it can proceed to manufacture ENERGY STAR qualified homes based on the designs approved during the certification process. This is a simple, three-step process that builds directly on the knowledge and expertise developed during the plant certification process.

Step 1. Manufacture and Inspect Homes in the Plant

Who is responsible: **Plant Production Staff**

The plant manufactures ENERGY STAR qualified homes in accordance with the designs created during the plant certification process. The homes are inspected by the plant's third-party inspection agency. Plant quality control (QC) personnel use the new information in the plant's quality control manual to check all ENERGY STAR QC issues, particularly duct systems.

Step 2. Install and Inspect Homes in the Field

Who is responsible: **Installer, Plant Representative**

A plant representative (e.g., the factory field representative or retailer) uses the Site Installation Checklist developed during the plant certification process or custom-generated for each home by the **MHRA ENERGY STAR Information Manager** to monitor set-up. Non-compliance items are fixed on site. Following installation, the representative reviews and verifies the items on the Site Installation Checklist, signs it, and returns a copy to the plant. The plant must maintain copies of all signed installation checklists. The Site Installation Checklist must be completed, signed by the plant representative and returned to the plant in order for the home to be an ENERGY STAR qualified home.

A sample checklist is provided in Appendix C.


Step 3. Affix the ENERGY STAR Label and the Quality Assured Label

Who is responsible: **Plant Representative or Plant Field Representative**

Every ENERGY STAR qualified home must have an EPA-issued ENERGY STAR qualified home label and a Quality Assurance Provider label affixed to it. The EPA label functions as a certification mark for compliance with EPA energy efficiency requirements. The Quality Assurance Provider label certifies that the home was built and installed under the provider's quality assurance program.

The plant has two options for affixing these labels to the home. In all cases, it is the plant's responsibility to ensure that all homes receiving these labels meet ENERGY STAR requirements when installed in their final location.

Figure 3-1 EPA ENERGY STAR Label



The EPA ENERGY STAR label is a blue rectangular form. At the top left is the Energy Star logo. To its right, it says "AN ENERGY STAR QUALIFIED HOME". Below this, there are five white input fields with blue labels: "ENERGY STAR Climate Region:", "Manufacturer:", "Plant Name/Location:", "Manufacturer's Serial #:", and "Date Manufactured:". At the bottom, there is a small text box stating: "This home has been independently verified to meet ENERGY STAR's strict guidelines for energy efficiency. Each ENERGY STAR qualified home can keep 4,500 lbs of greenhouse gases out of our air each year." and the website "www.energystar.gov".

Figure 3-2 MHRA Quality Assured Label



The MHRA Quality Assured label is a grey rectangular form. At the top left is the Energy Star logo. To its right is the MHRA logo and the text "Manufactured in conformance with the MHRA Housing Research Alliance". Below this, there is a white input field labeled "This ENERGY STAR Qualified Home Built By". Underneath, there are two sections: "Quality by Design" which states "This home meets the ENERGY STAR guidelines established by the U.S. Environmental Protection Agency and was built and installed in conformance with the Manufactured Housing Research Alliance ENERGY STAR quality control procedures." and "Installation Certification" which states "I certify that this home was installed in compliance with the ENERGY STAR for Homes specifications." Below these sections are two white input fields for "Signature:" and "Date:". At the bottom, it says "Quality Assured™ Label".

- If the plant has a commitment from its retailer or installer to properly install ENERGY STAR qualified homes, then the plant may affix the labels in the factory after Step 1 (Manufacture and Inspect Homes in the Plant) above.
- The plant may provide the labels to their field representative who completes the Site Installation Checklist and affixes the labels to the home.

In either case, once the Site Installation Checklist is completed, the field representative signs and dates the Quality Assured Label and returns the completed and signed Checklist to the manufacturer.

An explanation of how to complete the information on the labels and where to place them on the home is provided in *Appendix B*.

STEP 4. Conduct Periodic Field Evaluations To Verify Performance

Who is responsible: **Manufactured Housing ENERGY STAR Certifier**

To ensure that the homes are performing as designed, a plant must at all times retain an accredited ENERGY STAR Certifier responsible for conducting field evaluations on no less than 2 percent (2%) of its ENERGY STAR qualified homes sold and installed on a homeowner's site or a minimum of one home each calendar year, whichever is greater. The plant's certifier is responsible for coordinating the quality control testing.

If the plant fails to conduct this field verification it may be de-certified under ENERGY STAR's policy for plant de-certification.

Change in Plant Status

After a plant becomes certified to produce ENERGY STAR qualified homes, it is listed on the EPA ENERGY STAR for Homes Web Site (www.energystar.gov/homes/) as an active partner. This status changes under the following two circumstances:

- **Inactive:** To maintain its active status, partner plants must label at least one home within any consecutive 12-month period starting with the date the Partnership Agreement is submitted to EPA. If 12 months elapse without the plant labeling its next ENERGY STAR qualified home, the partner's status is changed to "inactive." Active status and re-listing on the EPA web site is automatically restored when the plant resumes production and reporting of ENERGY STAR qualified homes. Plants should report their ENERGY STAR production data to their QAP. The QAP is responsible for submitting the plant's ENERGY STAR production data to EPA.
- **Plant De-Certification:** The plant's Certifier or the Quality Assurance Provider may rescind a plant's ENERGY STAR certification if they determine that the plant is not in conformance with the rules, or is compromising the integrity, of the ENERGY STAR label.

DESIGNING ENERGY STAR QUALIFIED HOMES

The information in this section is used to select the energy features for ENERGY STAR qualified manufactured homes.⁵

To qualify as ENERGY STAR, a manufactured home is required to be substantially more energy efficient than a comparable standard code home. This includes not only the thermal envelope, but also the estimate of total energy use for space heating, space cooling, and water heating.

A home designed to qualify for an ENERGY STAR label may achieve this level of performance in one of two ways:

- By incorporating pre-approved “packages” of ENERGY STAR features [or]
- By using computer analyses to create designs that meet ENERGY STAR requirements.⁶

The ENERGY STAR Certifier shall review the manufacturer’s documentation to verify that each design meets or exceeds ENERGY STAR requirements. The goal is to ensure that every home that leaves the plant with an ENERGY STAR label has been designed to meet or exceed EPA’s requirements.

Each design is a unique combination of building elements, including building thermal envelope, specific duct arrangement (overhead or under floor) and maximum leakage level, space heating and cooling equipment efficiency, and hot water heater efficiency. These elements taken together will produce predictable energy use characteristics for which the manufacturer develops an ENERGY STAR-specific third-party-approved design package.

INCORPORATING PRE-APPROVED ENERGY STAR DESIGN PACKAGES

Normally, estimating total energy use requires performing a computer analysis of each home design. However, to simplify the process, this Appendix contains over 100 pre-approved design packages of energy features that meet or exceed the ENERGY STAR requirements.

As detailed below, finding the right package of energy measures is a two-step process, as follows:

1. Select the climate region where the home will be installed.
2. Select from the packages of energy options provided for the chosen climate region.

The notes below will aid in navigating through and interpreting the information provided on the map and in the tables in this section.

1. Select the climate region where the ENERGY STAR qualified homes will be sited (Figure A-1 and Table A-1)

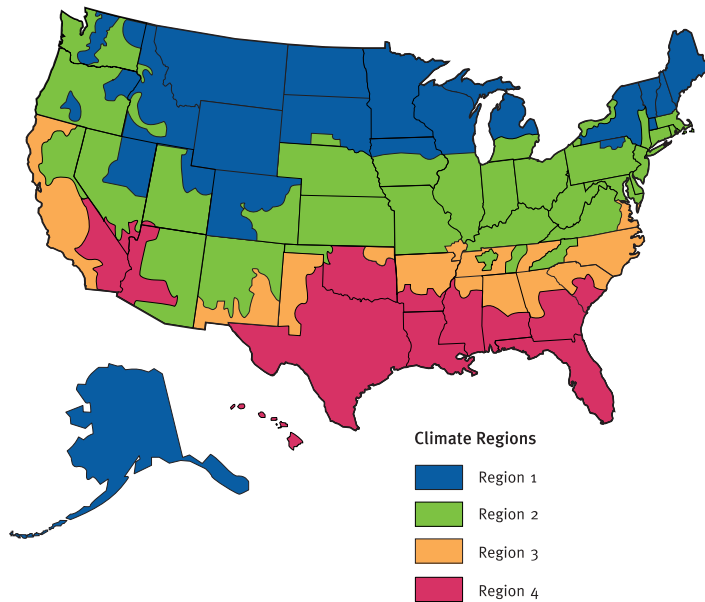
There are different requirements for each of the the four climate regions used by ENERGY STAR. These regions are NOT the same as the thermal zones contained in the HUD Standards for manufactured homes, nor do the ENERGY STAR region boundaries coincide with state boundaries. A state may include more than one ENERGY STAR climate region.

⁵ For packages that can be used for modular homes, see the ENERGY STAR web site.

⁶ Additional ENERGY STAR design packages can be developed by an ENERGY STAR Certifier. Visit the ENERGY STAR (www.energystar.gov/homes) or MHRA (www.mhrahome.org) web site for details.

The map in **Figure A-1** provides a general idea of the area covered by each climate region, and **Table A-1** provides a more precise state-by-state index (see page A.5). In cases where a state has more than one climate region, **Table A-1** provides the “primary” climate region and lists counties in the other regions as “exceptions.”

Figure A-1 Four Climate Regions Used by EPA’s ENERGY STAR



Select the region(s) that correspond to the home sites. Where the destination of a home is not known prior to manufacture, and the plant’s typical shipping radius covers more than one region, it is advisable to select an ENERGY STAR package from the region with the more stringent thermal envelope requirements (Climate Region 1 is the most stringent, Climate Region 4 the least).

2. Select an ENERGY STAR design package (Table A-2)

For each climate region, pre-approved ENERGY STAR design packages are provided. The variety of packages gives the plant fairly wide latitude in deciding how to design an ENERGY STAR qualified home.⁷

A package contains requirements for several features that must be used together to qualify as an ENERGY STAR qualified home.

Table A-2 is divided into four sub-tables, one for each climate region. Each sub-table is divided into two or three sections according to expected maximum duct loss percentages (e.g., 3%, 5%, or 7%). Each of these sections is further divided into two or three parts, one for each heating system type: gas/oil, heat pump, and electric resistance, if applicable. To use the table follow these steps:

1. Select the climate region where the home will be sited.
2. Select the duct leakage level that the plant expects can be consistently reached and has been identified by testing.
3. Select the heating source, either the gas/oil heat, heat pump, or the electric resistance section followed by the heating efficiency.
4. Select the rows containing appropriate U_o -value and, for Regions 3 and 4, the solar heat gain coefficient (SHGC) values.



In **Table A-2** the column “High Efficiency WH” indicates requirements for water heater efficiency, and the column “Programmable Thermostat” indicates if a programmable thermostat is required.

All the packages are roughly equivalent in energy terms. That is, applied to the same home, all packages will result in approximately the same total energy use. Therefore, saving energy in one area (e.g., by using tighter ducts or installing a programmable thermostat) will result in offsets elsewhere (e.g., by allowing a higher U_o -value).

⁷ Any additional ENERGY STAR design packages will be posted on the ENERGY STAR (www.energystar.gov/homes) and MHRA (www.mhrahome.org) web sites.

A more detailed description of the features on **Table A-2** follows:

- **Maximum Duct Loss:** This refers to the amount of leakage from the air distribution ducts as measured with a “Duct Blaster” or similar diagnostic device. During plant certification, the manufacturer in consultation with the certifier will determine the target leakage rate and steps required to achieve that rate (e.g., duct sealing strategies). The midrange leakage rate of 5% should be readily achievable with currently available duct design and sealing techniques. The duct leakage values on **Table A-2** are measurements of air leakage to the outside when the ducts are depressurized to negative 25 pascals. The values are based on air handler airflow rates and correlate approximately to cubic feet per minute of leakage divided by the floor area of the home. When measured in the plant, only total duct leakage can be determined. About 50 percent of total measured duct leakage will leak to the outside after the home is set.
- **Minimum Heating Equipment Efficiency:** This refers to the rated seasonal efficiency of the equipment used for space heating.
 - Heat pump efficiencies are listed by the Air-Conditioning and Refrigeration Institute (ARI) in the ARI Directory of Certified Unitary Products. Heat pumps in the heating mode are rated in terms of Heating Seasonal Performance Factor (HSPF).
 - Gas (natural and liquid petroleum) and oil burning furnace efficiencies are listed by the Gas Appliance Manufacturers Association (GAMA) in the Consumers' Directory of Certified Efficiency Ratings for Heating and Water Heating Equipment. Fossil fuel-burning furnaces are rated in terms of Annual Fuel Utilization Efficiency (AFUE).
- **Maximum U_o-value:** This refers to the ability of the home's envelope to resist heat flow and is calculated in the same manner as the U_o-value referred to in the HUD standards.
- **Solar Heat Gain Coefficient (SHGC)⁸:** This refers to the ability of the window to block solar heat from entering the home. The higher the SHGC, the more solar heat is transmitted through the window. To meet the requirement, calculate the area-weighted average of the SHGCs for all the windows (multiply each window area by its whole window SHGC, add the results together, and divide by the total window area).
- **Minimum Hot Water Equipment Efficiency:** This refers to the efficiency rating of the hot water heater (WH). Hot water heaters are rated in terms of Energy Factor (EF). Different EF levels are provided for gas and for electric equipment. In some packages a high efficiency water heater is required. This is indicated by a check mark in the "High Efficiency WH" column in **Table A-2**. The high efficiency WH requirement may be met in either of two ways:
 - An EF of at least 0.59 for gas or at least 0.91 for electric water heaters.
 - A water heater with a minimum EF of 0.56 for gas heaters and 0.88 for electric heaters heater wrapped with a minimum of R-5 insulation.⁹
- **Thermostat Type:** Programmable thermostats that can be automatically set back to lower temperatures in the heating season or set up to higher temperatures in the cooling season can generate significant energy savings. Refer to the column labeled Programmable Thermostat to see whether a programmable thermostat is needed for the home.



⁸ ENERGY STAR qualified homes do not require the use of ENERGY STAR qualified windows, nor does the use of ENERGY STAR qualified windows make a home qualify as ENERGY STAR.

⁹ Check with the water heater manufacturer about restrictions on wrapping a specific water heater.

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- **Minimum Cooling Equipment Efficiency:** This refers to the equipment rating as certified by ARI and published in the *ARI Directory of Certified Unitary Products*. Air conditioners and heat pumps in the cooling mode are rated in terms of Seasonal Energy Efficiency Ratio (SEER). Starting July 1, 2006, all ENERGY STAR qualified homes must be equipped with cooling equipment rated not less than National Appliance Energy Conservation Act (NAECA) minimum requirements (13 SEER). Before July 1, 2006 homes must be equipped with cooling equipment not less than 12 SEER, except as noted in the package descriptions. (While not an ENERGY STAR requirement, cooling equipment should be correctly sized. Visit the ENERGY STAR or MHRA web site for air conditioner and heat pump sizing guidelines and information.)
 - **Heat Recovery Ventilator:** For the electric resistance heating packages for Climate Region 1, a heat recovery ventilator (HRV) must be used to maintain the fresh air ventilation requirements of the HUD Code. A heat recovery ventilator (also called an air-to-air heat exchanger) is a ventilation system that consists of two separate air-handling systems—one collects and exhausts stale indoor air and the other draws in fresh outdoor air and distributes it throughout the home. At the core of an HRV is a heat transfer module. Both the exhaust and fresh air streams pass through this module and the heat from the exhaust air is used to preheat the fresh air stream. Only the heat is transferred; the two air streams remain physically separate. Typically, an HRV is able to recover 70-80 percent of the heat from the exhaust air and transfer it to the incoming air. This dramatically reduces the energy needed to heat fresh incoming air.

All ENERGY STAR qualified homes must also meet the following requirements:

- **Minimum Duct Insulation:** This refers to the rated insulation value (R-value) of materials used for insulating all ductwork, including the exterior crossover duct. Attic and floor insulation covering ductwork may count towards this requirement.
 - Climate Regions 1 and 2: a minimum of **R-8** is required
 - Climate Regions 3 and 4: a minimum of **R-6** is required
- **Whole-house leakage:** All ENERGY STAR qualified homes must have whole-house leakage rates, calculated based on blower door measurements, that do not exceed **7.0 ACH50**.¹⁰ Whole-house leakage rates are determined by the ENERGY STAR Certifier during plant certification and as part of random-sample field evaluations.
- **Basements:** All ENERGY STAR qualified homes placed over basements must also meet the following requirements:
 - **Unconditioned basement:** Unconditioned basements are separated from the living area and not intentionally heated. The walls of the interior stairwell are insulated to the same levels as the exterior walls of the home. Doors to the basement are insulated and weather-stripped.
 - **Semi-conditioned and conditioned basements:** For heated basements and basements separated from the main living space by uninsulated stairwells are required to have exterior basement wall insulation with the following nominal (insulation material) R-values:
 - Climate Region 1: R-13
 - Climate Region 2: R-10
 - Climate Region 3: R-10
 - Climate Region 4: R-0

¹⁰ Electric resistance packages in Region 1 require a maximum shell leakage rate of 4.0 ACH50.

Table A-1		State-by-State Climate Region Index					
State	Primary Region	Exception	Counties				
Alabama	3	Region 4:	Baldwin	Coffee	Escambia	Lowndes	Perry
			Barbour	Conecuh	Geneva	Macon	Pike
			Bullock	Covington	Greene	Marengo	Russell
			Butler	Crenshaw	Hale	Mobile	Sumter
			Choctaw	Dale	Henry	Monroe	Washington
			Clarke	Dallas	Houston	Montgomery	Wilcox
Alaska	1	None					
Arizona	4	Region 2:	Apache	Coconino	Graham	Navajo	Santa Cruz
			Cochise	Gila	Greenlee	Pima	Yavapai
Arkansas	3	Region 4:	Ashley	Cleveland	Hempstead	Little River	Pike
			Bradley	Columbia	Howard	Miller	Sevier
			Calhoun	Dallas	Jefferson	Montgomery	Union
			Chicot	Desha	Lafayette	Nevada	
			Clark	Drew	Lincoln	Ouachita	
California	3	Region 2:	Alpine	Lake	Nevada	Sierra	Yolo
			Butte	Lassen	Placer	Solano	Yuba
			Colusa	Modoc	Plumas	Sutter	
			Glenn	Mono	Shasta	Tehama	
		Region 4:	Imperial	Inyo	Riverside	San Bernardino	
Colorado	1	Region 2:	Baca	Custer	Kit Carson	Phillips	Washington
			Bent	El Paso	Lake	Prowers	Yuma
			Chaffee	Fremont	Las Animas	Pueblo	
			Cheyenne	Huerfano	Lincoln	Sedgwick	
			Crowley	Kiowa	Otero	Teller	
Connecticut	2	None					
Delaware	2	None					
Florida	4	None					
Georgia	4	Region 3:	Banks	Dawson	Habersham	Marion	Stephens
			Barrow	DeKalb	Hall	Meriwether	Talbot
			Bartow	Douglas	Haralson	Murray	Taylor
			Carroll	Elbert	Harris	Muscogee	Towns
			Catoosa	Fannin	Hart	Oconee	Troup
			Chattahoochee	Fayette	Heard	Oglethorpe	Union
			Chattooga	Floyd	Henry	Paulding	Upson
			Cherokee	Forsyth	Jackson	Pickens	Walker
			Clarke	Franklin	Lamar	Pike	Walton
			Clayton	Fulton	Lincoln	Polk	White
			Cobb	Gilmer	Lumpkin	Rabun	Whitfield
			Coweta	Gordon	Macon	Schley	Wilkes
			Dade	Gwinnett	Madison	Spalding	
Hawaii	4	None					
Idaho	1	Region 2:	Ada	Gooding	Lemhi	Minidoka	Payette
			Canyon	Jerome	Lincoln	Nez Perce	Washington
			Gem				
Illinois	2	None					

State	Primary Region	Exception Counties
Indiana	2	None
Iowa	2	Region 1: Allamakee Cherokee Emmet Kossuth Pocahontas Black Hawk Chickasaw Fayette Lyon Sioux Bremer Clay Floyd Mitchell Winnebago Buchanan Clayton Franklin O'Brien Winneshiek Buena Vista Delaware Hancock Osceola Worth Butler Dickinson Howard Palo Alto Wright Cerro Gordo Dubuque Humboldt Plymouth
Kansas	2	None
Kentucky	2	None
Louisiana	4	None
Maine	1	None
Maryland	2	None
Massachusetts	2	Region 1: Berkshire Franklin Hampden Hampshire
Michigan	2	Region 1: Alcona Clare Iosco Mason Ontonagon Alger Crawford Iron Mecosta Osceola Alpena Delta Isabella Menominee Oscoda Antrim Dickinson Kalkaska Midland Otsego Arenac Emmet Keweenaw Missaukee Presque Isle Baraga Gladwin Lake Montcalm Roscommon Bay Gogebic Leelanau Montmorency Saginaw Benzie Grand Taverse Luce Muskegon Sanilac Charlevoix Gratiot Mackinac Newaygo Schoolcraft Cheboygan Houghton Manistee Oceana Tuscola Chippewa Huron Marquette Ogemaw Wexford
Minnesota	1	None
Mississippi	4	Region 3: Alcorn Grenada Marshall Prentiss Tishomingo Benton Itawamba Panola Tate Union Calhoun Lafayette Pontotoc Tippah Yalobusha DeSoto Lee
Missouri	2	Region 3: Butler Mississippi Pemiscot Scott Stoddard Duncan New Madrid
Montana	1	None
Nebraska	2	
Nevada	4	Region 1: Elko Eureka Lander White Pine Region 2: Carson City Esmeralda Lyon Nye Storey Churchill Humboldt Mineral Pershing Washoe Douglas Lincoln
New Hampshire	1	None
New Jersey	2	None
New Mexico	2	Region 3: Chaves Dona Ana Guadalupe Lea Otero DeBaca Eddy Hidalgo Luna

Designing ENERGY STAR Qualified Homes

State	Primary Region	Exception Counties					
New York	2	Region 1:	Allegany Broome Cattaraugus Cayuga Chemung Chenango Clinton	Cortland Delaware Essex Franklin Fulton Hamilton Herkimer	Lewis Livingston Madison Montgomery Oneida Onondaga Ontario	Otsego Schoharie Schuyler Seneca St. Lawrence Steuben Sullivan	Tioga Tompkins Warren Wyoming Yates
North Carolina	3	Region 2:	Alleghany Ashe Avery Buncombe Burke	Caldwell Cherokee Clay Graham Haywood	Henderson Jackson McDowell Macon Madison	Mitchell Polk Rutherford Surry Swain	Transylvania Watauga Wilkes Yadkin Yancey
North Dakota	1	None					
Ohio	2	None					
Oklahoma	4	Region 2:	Beaver	Cimarron	Ellis	Harper	Texas
		Region 3:	Craig Delaware Mayer	Nowata Osage	Ottawa Pawnee	Rogers Tulsa	Wagoner Washington
Oregon	2	Region 1:	Baker	Klamath	Union	Wallowa	
Pennsylvania	2	Region 1:	Bradford	Sullivan	Susquehanna	Tioga	Wyoming
Rhode Island	2	None					
South Carolina	3	Region 4:	Allendale Bamberg Barnwell Beaufort	Berkeley Calhoun Charleston Clarendon	Colleton Dorchester Hampton	Jasper Lee Lexington	Orangeburg Richland Sumter
South Dakota	1	Region 2:	Gregory	Mellette	Todd	Tripp	
Tennessee	3	Region 2:	Bledsoe Coffee Cumberland Fentress	Franklin Grundy Marion	Morgan Overton Pickett	Putnum Scott Sequatchie	Van Buren Warren White
Texas	4	Region 3:	Andrews Armstrong Bailey Briscoe Carson Castro Cochran Crosby	Dallam Dawson Deaf Smith Floyd Gaines Glasscock Gray Hale	Hansford Hartley Hemphill Hockley Howard Hutchinson Lamb Lipscomb	Lubbock Lynn Martin Midland Moore Ochiltree Oldham Parmer	Potter Randall Roberts Sherman Swisher Terry Yoakum
Utah	2	Region 1:	Cache Carbon	Daggett Duchesne	Morgan Rich	Summit Uintah	Wasatch
		Region 4:	Washington				
Vermont	1	None					
Virginia	2	Region 3:	Accomack Charles City Essex Gloucester Greensville	Isle of Wight James City King and Queen King George King William	Lancaster Mathews Middlesex New Kent Northampton	Northumberland Prince George Richmond Southampton Stafford	Surry Sussex Westmoreland York

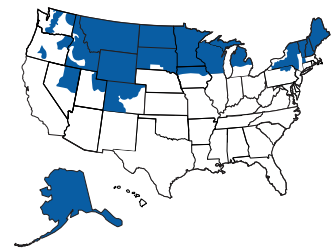
State	Primary Region	Exception Counties
Washington	2	Region 1: Chelan Ferry, Kittitas Okanogan, Pend Orielle Skamania, Spokane Stevens, Yakima
West Virginia	2	None
Wisconsin	1	None
Wyoming	1	None

Table A-2 ENERGY STAR Design Packages

CLIMATE REGION 1

Basic Requirements:

- Maximum shell leakage: 7.0 ACH₅₀
- Minimum cooling SEER: 12.0¹¹
- Window SHGC: any
- Minimum duct insulation: R-8



Packages for homes with maximum 3% duct losses

Heating Type	Minimum Heating Efficiency	Maximum Envelope Heat Resistance U _o -value	High Efficiency WH ¹²	Programmable Thermostat	Package Number
Gas/Oil Furnace	0.80 AFUE	0.054			1-1
		0.056		✓	1-2
		0.058	✓		1-3
	0.90 AFUE	0.060	✓	✓	1-4
		0.063	✓	✓	1-5
Heat Pump	7.6 HSPF	0.052		✓	1-6
		0.053	✓	✓	1-7
Electric Resistance (Forced Air) ¹³	1.0 EF	0.048		✓ ¹⁴	1-8
		0.050	✓	✓ ¹⁴	1-9

Packages for homes with maximum 5% duct losses

Heating Type	Minimum Heating Efficiency	Maximum U _o -value	High Efficiency WH ¹²	Programmable Thermostat	Package Number
Gas/Oil Furnace	0.80 AFUE	0.052			1-10
		0.054		✓	1-11
		0.056	✓	✓	1-12
	0.90 AFUE	0.058	✓	✓	1-13
		0.061	✓	✓	1-14
Heat Pump	7.6 HSPF	0.050		✓	1-15
		0.051	✓	✓	1-16
	8.0 HSPF	0.052		✓	1-17
		0.053	✓	✓	1-18

¹¹ SEER 13.0 after July 1, 2006

¹² The high efficiency WH requirement may be met by using a 0.59 EF gas WH or a 0.91 EF electric WH or by wrapping a lower-rated WH with a minimum of R-5 insulation.

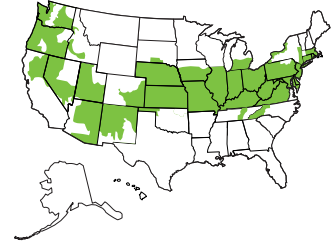
¹³ Electric resistance packages in Region 1 require a maximum shell leakage rate of 4.0 ACH₅₀ and a 70% efficient heat recovery ventilator to ensure that total ventilation rate is maintained at 0.35 ACH at all times. They also require a cooling SEER of 13.0.

¹⁴ A programmable thermostat is required for a forced air all-electric heating system. Zone controls are required for baseboard electric resistance heating systems.

CLIMATE REGION 2

Basic Requirements:

- Maximum shell leakage: 7.0 ACH₅₀
- Minimum cooling SEER: 12.0¹⁵
- Maximum window SHGC: 0.55
- Minimum duct insulation: R-8



Packages for homes with maximum 3% duct losses

Heating Type	Minimum Heating Efficiency	Maximum U _o -value	High Efficiency WH ¹⁶	Programmable Thermostat	Package Number
Gas/Oil Furnace	0.80 AFUE	0.061			2-1
		0.065		✓	2-2
		0.067	✓	✓	2-3
Heat Pump	7.2 HSPF	0.058			2-4
		0.059		✓	2-5
		0.061		✓	2-6
		0.063	✓	✓	2-7

Packages for homes with maximum 5% duct losses

Heating Type	Minimum Heating Efficiency	Maximum U _o -value	High Efficiency WH ¹⁶	Programmable Thermostat	Package Number
Gas/Oil Furnace	0.80 AFUE	0.057			2-8
		0.061		✓	2-9
		0.063	✓	✓	2-10
	0.90 AFUE	0.063		✓	2-11
		0.065	✓	✓	2-12
Heat Pump	7.2 HSPF	0.056			2-13
		0.057		✓	2-14
		0.061	✓	✓	2-15
	7.6 HSPF	0.059		✓	2-16
		0.062	✓	✓	2-17
	8.0 HSPF	0.062		✓	2-18
		0.064	✓	✓	2-19

Packages for homes with maximum 7% duct losses

Heating Type	Minimum Heating Efficiency	Maximum U _o -value	High Efficiency WH ¹⁶	Programmable Thermostat	Package Number
Gas/Oil Furnace	0.80 AFUE	0.056			2-20
		0.060		✓	2-21
		0.062	✓	✓	2-22
	0.90 AFUE	0.062		✓	2-23
		0.064	✓	✓	2-24
Heat Pump	7.2 HSPF	0.054			2-25
		0.055		✓	2-26
		0.059	✓	✓	2-27

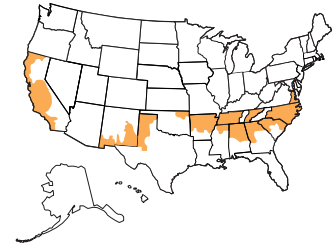
¹⁵ SEER 13.0 after July 1, 2006

¹⁶ The high efficiency WH requirement may be met by using a 0.59 EF gas WH or a 0.91 EF electric WH or by wrapping a lower-rated WH with a minimum of R-5 insulation.

CLIMATE REGION 3

Basic Requirements:

- Maximum shell leakage: 7.0 ACH₅₀
- Minimum cooling SEER: 12.0¹⁷
- Minimum duct insulation: R-6



Packages for homes with maximum 3% duct losses

Heating Type	Minimum Heating Efficiency	Maximum U _o -value	Maximum Window SHGC	High Efficiency WH ¹⁸	Programmable Thermostat	Package Number
Gas/Oil Furnace	0.80 AFUE	0.075	0.50			3-1
		0.082	0.50		✓	3-2
		0.084	0.50	✓	✓	3-3
		0.084	0.40		✓	3-4
		0.086	0.40	✓	✓	3-5
Heat Pump	7.2 HSPF	0.071	0.50			3-6
		0.072	0.50		✓	3-7
		0.073	0.50	✓	✓	3-8
		0.074	0.40		✓	3-9
		0.075	0.40	✓	✓	3-10

Packages for homes with maximum 5% duct losses

Heating Type	Minimum Heating Efficiency	Maximum U _o -value	Maximum Window SHGC	High Efficiency WH ¹⁸	Programmable Thermostat	Package Number
Gas/Oil Furnace	0.80 AFUE	0.073	0.50			3-11
		0.080	0.50		✓	3-12
		0.082	0.50	✓	✓	3-13
		0.082	0.40		✓	3-14
		0.084	0.40	✓	✓	3-15
Heat Pump	7.2 HSPF	0.070	0.50			3-16
		0.071	0.50		✓	3-17
		0.072	0.50	✓	✓	3-18
		0.072	0.40		✓	3-19
		0.073	0.40	✓	✓	3-20
	7.6 HSPF	0.074	0.50			3-21
		0.075	0.50	✓	✓	3-22
		0.076	0.40	✓	✓	3-23
	8.0 HSPF	0.077	0.50			3-24
		0.078	0.50	✓	✓	3-25
		0.079	0.40	✓	✓	3-26

Packages for homes with maximum 7% duct losses

Heating Type	Minimum Heating Efficiency	Maximum U _o -value	Maximum Window SHGC	High Efficiency WH ¹⁸	Programmable Thermostat	Package Number
Gas/Oil Furnace	0.80 AFUE	0.068	0.50			3-27
		0.075	0.50		✓	3-28
		0.077	0.50	✓	✓	3-29
		0.078	0.40		✓	3-30
		0.080	0.40	✓	✓	3-31
Heat Pump	7.2 HSPF	0.066	0.50			3-32
		0.067	0.50		✓	3-33
		0.068	0.50	✓	✓	3-34
		0.070	0.40		✓	3-35
		0.071	0.40	✓	✓	3-36

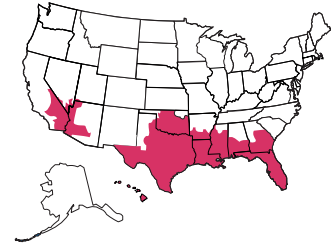
¹⁷ SEER 13.0 after July 1, 2006

¹⁸ The high efficiency WH requirement may be met by using a 0.59 EF gas WH or a 0.91 EF electric WH or by wrapping a lower-rated WH with a minimum of R-5 insulation.

CLIMATE REGION 4

Basic Requirements:

- Maximum shell leakage: 7.0 ACH₅₀
- Minimum cooling SEER: 12.0¹⁹ (Except as noted)
- Minimum duct insulation: R-6



Packages for homes with maximum 3% duct losses

Heating Type	Minimum Heating Efficiency	Maximum Uo-value	Maximum Window SHGC	High Efficiency WH ²⁰	Programmable Thermostat	Package Number
Gas/Oil Furnace	0.80 AFUE	0.111	0.50			4-1
Heat Pump	7.2 HSPF	0.097	0.50			4-2
		0.104	0.50		✓	4-3
		0.108	0.50	✓	✓	4-4
Electric Resistance ²¹	1.0 EF	0.074	0.40		✓ ²²	4-5
		0.075	0.40	✓	✓ ²²	4-6
Electric Resistance (Florida Only) ²¹	1.0 EF	0.111	0.40		✓ ²²	4-7
		0.114	0.40	✓	✓ ²²	4-8

Packages for homes with maximum 5% duct losses

Heating Type	Minimum Heating Efficiency	Maximum Uo-value	Maximum Window SHGC	High Efficiency WH ²⁰	Programmable Thermostat	Package Number	
Gas/Oil Furnace	0.80 AFUE	0.102	0.50			4-9	
		0.116	0.50		✓	4-10	
Heat Pump	7.2 HSPF	0.093	0.50			4-11	
		0.100	0.50		✓	4-12	
		0.105	0.50	✓	✓	4-13	
	7.6 HSPF	0.102	0.50		✓	✓	4-14
		0.106	0.50	✓	✓	4-15	
		0.104	0.50		✓	✓	4-16
		0.108	0.50	✓	✓	4-17	
Electric Resistance ²¹	1.0 EF	0.070	0.40		✓ ²²	4-18	
		0.071	0.40	✓	✓ ²²	4-19	
Electric Resistance (Florida Only) ²¹	1.0 EF	0.116	0.40		✓ ²²	4-20	

Packages for homes with maximum 7% duct losses

Heating Type	Minimum Heating Efficiency	Maximum Uo-value	Maximum Window SHGC	High Efficiency WH ²⁰	Programmable Thermostat	Package Number
Gas/Oil Furnace	0.80 AFUE	0.092	0.50			4-21
		0.106	0.50		✓	4-22
		0.109	0.40		✓	4-23
		0.111	0.50	✓	✓	4-24
		0.115	0.40	✓	✓	4-25
Heat Pump	7.2 HSPF	0.086	0.50			4-26
		0.093	0.50		✓	4-27
		0.095	0.40		✓	4-28
		0.099	0.50	✓	✓	4-29
		0.101	0.40	✓	✓	4-30

¹⁹ SEER 13.0 after July 1, 2006

²⁰ The high efficiency WH requirement may be met by using a 0.59 EF gas WH or a 0.91 EF electric WH or by wrapping a lower-rated WH with a minimum of R-5 insulation.

²¹ These packages require a cooling SEER of 13.0.

²² A programmable thermostat is required for a forced air all-electric heating system. Zone controls are required for baseboard electric resistance heating systems.

To find information about additional packages that may have been prequalified under the ENERGY STAR program, visit the ENERGY STAR (www.energystar.gov/homes) or MHRA (www.mhrahome.org) web site.

USING COMPUTER ANALYSIS TO CREATE OTHER ENERGY STAR DESIGNS

As an alternative to the packages of energy features contained in this Appendix, manufacturers have the option of developing designs using computer software or procedures from the list of software available on the Residential Energy Services Network (RESNET) web site (www.natresnet.org); also available on the MHRA (www.mhrahome.org) web site. Designs generated through the use of these procedures and/or software must be approved by the plant's ENERGY STAR Certifier.

The major advantage of the computer analysis option is the ability to tailor the design to a specific location and design considerations. For example, lower equipment efficiencies than those provided on **Table A-2** can be combined with a lower home U_o -value using this approach. The principal disadvantage of this alternative is the cost and time associated with conducting the analysis.

LABELING ENERGY STAR QUALIFIED HOMES

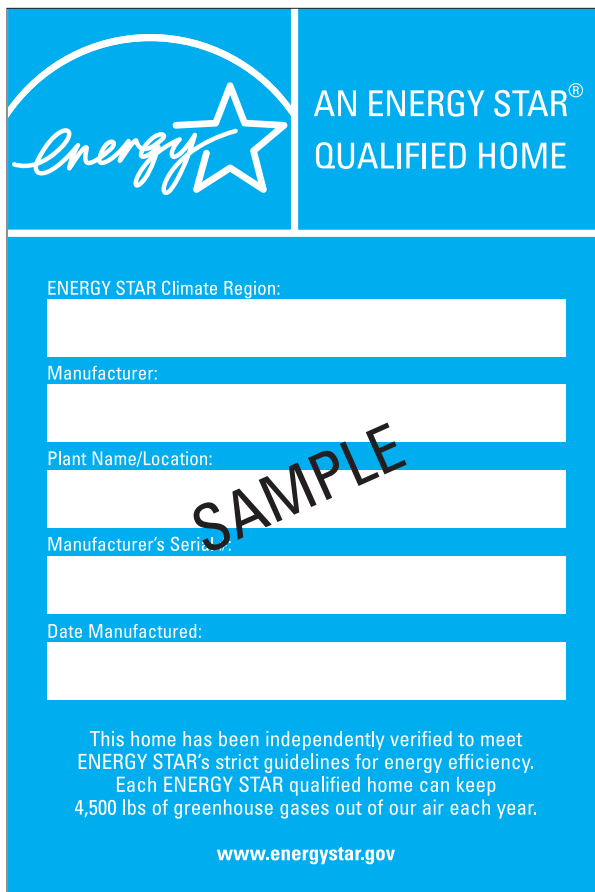
The instructions below explain how to obtain and complete the ENERGY STAR label and the MHRA Quality Assured Label.²³ Both of these labels are required on every ENERGY STAR qualified home.²⁴

OBTAINING ENERGY STAR LABELS

Both the EPA ENERGY STAR label and the MHRA Quality Assured Label are obtained from MHRA. Ordering information can be found on the MHRA web site.

The **MHRA ENERGY STAR Information Manager** may be used to automatically print the information in the blank spaces on the EPA ENERGY STAR label.

The completed ENERGY STAR label and the MHRA Quality Assured Label should be placed adjacent to the HUD Data Plate or inside the electric panel cover.



AN ENERGY STAR[®] QUALIFIED HOME

ENERGY STAR Climate Region:

Manufacturer:

Plant Name/Location:

Manufacturer's Series:

Date Manufactured:

This home has been independently verified to meet ENERGY STAR's strict guidelines for energy efficiency. Each ENERGY STAR qualified home can keep 4,500 lbs of greenhouse gases out of our air each year.

www.energystar.gov



ENERGY STAR

Manufactured **MHRA** Housing Research Alliance

This ENERGY STAR Qualified Home Built By

Quality by Design
 This home meets the ENERGY STAR guidelines established by the U.S. Environmental Protection Agency and was built and installed in conformance with the Manufactured Housing Research Alliance ENERGY STAR quality control procedures.

Installation Certification
 I certify that this home was installed in compliance with the ENERGY STAR for Homes specifications.

Manufacturer's field representative:
 Signature: Date:

Quality Assured[™] Label

²³ The Quality Assured label is required as part of the Quality Assurance Provider's program for ENERGY STAR qualified manufactured homes.

²⁴ Plants in the Northwest will use a label provided by the Northwest Energy Efficiency Alliance instead of the MHRA label.

SAMPLE SITE INSTALLATION CHECKLIST FOR ENERGY STAR QUALIFIED MANUFACTURED HOMES

Note: This form can be automatically custom-generated for each home by the MHRA ENERGY STAR Information Manager

HOME MANUFACTURER

Company	Contact	Home serial number	
Address	City	State	Telephone

Instructions for manufacturer's field representative:

1. Fill in retailer and homeowner contact information.
2. Verify that all **ENERGY STAR CONSTRUCTION REQUIREMENTS** listed below have been successfully completed.
3. Confirm that the EPA ENERGY STAR and MHRA Quality Assured labels are affixed to the home (near the HUD data plate or the main electrical panel).
4. When all ENERGY STAR construction requirements have been successfully completed:
 - Sign and date this form.
 - Sign and date the MHRA Quality Assured™ label.
 - Promptly return this completed form to the manufacturer.

If there are any discrepancies, contact the manufacturer immediately.

RETAILER*

Company	Contact	Telephone	
Address	City	State	

HOMEOWNER*

Name	Telephone		
Address	City	State	County

ENERGY STAR CONSTRUCTION REQUIREMENTS

A. Marriage Line Seal

The marriage line areas must be filled with a continuous non-porous insulating gasket creating a permanent air barrier at joints in the ceiling, walls and floor. Acceptable gaskets can be one or two-part systems, including proprietary gaskets, foams, insulation wrapped in poly, and insulation covered by butyl or other long-life tape on one side. In addition, there must be no visible signs of gaps or tears.

B. Tears in Bottom Board Material Repaired

All tears in the bottom board material must be covered and sealed with a durable, permanent patch to prevent air leakage. (Foam sealant can be used on lag bolt and other small holes.)

C. Exterior (Including Crossover) Duct Installation

For multi-section homes, the exterior ducts must be sealed with a permanent connection per the Manufacturer's Installation Manual. Identify that the following items are completed:

- All exterior ducts have been installed and wrapped with insulation.
- Crossover collar is secured to the trunk with at least three screws and cannot rotate or move.
- All exterior duct insulation is a minimum of R-_____.
- Nylon or metal straps and saddles are used to support the exterior duct; duct does not touch the ground.
- Three or more screws are placed below the straps through the flexible duct and into the crossover collar.
- Exterior duct insulation is pushed into the floor cavity and sealed with tape or foam sealant at all bottom board penetrations.

D. Field Installed Heat Pump

- Heating equipment efficiency meets or exceeds the following specification: HSPF-_____.

E. For Homes Installed Over Basements (One of the following must be checked)

- This home has an UNHEATED BASEMENT. All interior stairwells from the heated space into the basement are constructed in the same manner as an exterior wall with full insulation and a weather-stripped, insulated exterior door.
- This home has a HEATED BASEMENT. The basement wall insulation level is a minimum of: R-_____.

Signature (Manufacturer's Representative)

Print Name

Date

Fax this completed form to _____ or mail to the home manufacturer at the address above.
 Fax Number

A copy of the Sample Site Installation Checklist for ENERGY STAR Manufactured Home is available on the web at: <http://www.mhrahome.org>. This is a model checklist. Manufacturers may have their own.

* The retailer and/or homeowner may be contacted as part of the ENERGY STAR for Homes quality assurance program.

ENERGY STAR® Partnership Agreement

For Home Builders and Verification Organizations



Organization Name¹: _____

Address: _____ City/State¹/ZIP: _____

Telephone¹: _____ Fax: _____ Web Site¹: _____

Major Metro Area Served¹: _____ ¹ To be displayed on the ENERGY STAR Web site

For HOMEBUILDERS: Please Complete the Following Section

- Please specify your partner type (select only one):

Site-Built Home Builder: Local Builder Division/Subsidiary Corporate (National)

Community Developer*: Community Developer

*To be eligible for partnership, a community developer must require all builders in the development to commit to construct 100% ENERGY STAR qualified homes.

Manufactured Home Builder*: Plant Retailer/Community Corporate (HQ/Division)

*Applies to manufacturers and installers of HUD-code homes. Modular plants and installers fall under the Site-Built Home Builder partner type (above). Plants producing manufactured and modular homes should select both Site-Built and Manufactured Home Builder partner types.

- Average number of homes built per year: _____
- 100% Commitment Option.** EPA offers special recognition to builders who commit to building 100% of their homes as ENERGY STAR. This commitment will be denoted with a special 100% icon on the ENERGY STAR partner locator when at least two ENERGY STAR qualified homes have been reported to EPA. To make this commitment, please initial here: _____
- ENERGY STAR Advanced Lighting Package (ALP) Option.** EPA offers special recognition to builders who commit to offering an ENERGY STAR Advanced Lighting Package to their homebuyers. This commitment will be denoted with a special ALP icon on the ENERGY STAR partner locator. Please refer to the ALP program requirements document to learn more. To make this commitment, please initial here: _____

For VERIFICATION ORGANIZATIONS: Please Complete the Following Section

- Please specify your partner type: Accredited HERS/BOP Provider Certified HERS Rater/BOP Inspector
- For Raters and Inspectors, please specify your Accredited Provider: _____

Marketing / Sales Contact

Name: _____ Title: _____

Phone: _____ E-mail: _____

²A valid e-mail address is required for online access to the ENERGY STAR marks

Purchasing / Construction Contact

Name: _____ Title: _____

Phone: _____ E-mail: _____

²A valid e-mail address is required for online access to the ENERGY STAR marks

Authorized Company Representative (printed name): _____

Title: _____ E-mail: _____

²A valid e-mail address is required for online access to the ENERGY STAR marks

Signature: _____ Date: _____

To be completed by US EPA:

Kathleen Hogan; Director, Climate Protection Partnerships Division, U.S. Environmental Protection Agency

Signature: _____ Date: _____

ENERGY STAR® Partnership Agreement

For Home Builders and Verification Organizations



Mail this form to:
ENERGY STAR for Homes
US EPA (mail code 6202J)
1200 Pennsylvania Ave, NW
Washington, DC 20460

Or

Fax this form to:
202-343-2200

For more information please call the ENERGY STAR Hotline at 1-888-STAR-YES or visit: www.energystar.gov/homes

ENERGY STAR Background Information

EPA's **ENERGY STAR** helps consumers, businesses, and public organizations protect the environment through superior energy efficiency. **ENERGY STAR for Homes** promotes energy-efficient homes that can improve builder profitability, improve home quality and homeowner comfort, lower energy demand, and reduce air pollution. ENERGY STAR qualified homes are third-party verified to be significantly more energy efficient than homes built to code.* Savings are typically achieved through a combination of envelope upgrades, high performance windows, controlled air infiltration, upgraded heating and air conditioning systems, tight duct systems, upgraded water-heating equipment, and efficient lighting and appliances.

* Please visit the ENERGY STAR Web site at www.energystar.gov for information on current ENERGY STAR guidelines.

ENERGY STAR's Commitments to Partners

1. Increase awareness of the ENERGY STAR label by distributing key messages on the benefits of ENERGY STAR qualified homes and homes-related products.
 2. Provide current ENERGY STAR news, information, and reference documents (via the ENERGY STAR Web site, Hotline, e-mail or other means).
 3. Provide ENERGY STAR partners with public recognition for their involvement in ENERGY STAR and role in protecting the environment through the online ENERGY STAR partner locator tool, special awards, and other media.
 4. Respond swiftly to any partner requests for information or clarification on ENERGY STAR policies.
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General Commitments for ENERGY STAR Partners

1. Use the partnership and the ENERGY STAR label to promote energy efficiency as an easy and desirable option for new homebuyers to prevent pollution, protect the environment, and save money on energy bills.
 2. Adhere to the *ENERGY STAR Identity Guidelines* (available at www.energystar.gov/marks) and ensure that authorized representatives, such as advertising agencies, distributors, and subcontractors, also comply.
 3. Adhere to the *ENERGY STAR Web Linking Guidelines* (available at www.energystar.gov/partners). Failure to do so can result in the loss of linking privileges from the ENERGY STAR Web site.
 4. Build at least one ENERGY STAR qualified home within any ongoing 12-month period. Partners not fulfilling this requirement will be deemed 'inactive,' thereby forfeiting all rights to the ENERGY STAR name and mark, their listing on the online ENERGY STAR partner locator tool, and any inclusion in ENERGY STAR promotional materials.
 5. Affix an ENERGY STAR label to all homes that are independently verified to meet the ENERGY STAR performance guidelines.
 6. BUILDER PARTNERS: Clearly inform homebuyers when their new homes have qualified for the ENERGY STAR label and be able to describe the features and benefits of these ENERGY STAR qualified homes.
 7. BUILDER PARTNERS: Provide a home energy rating report or relevant Builder Option Package for any qualified home upon EPA's request.
 8. ACCREDITED HERS or BOP PROVIDERS: Submit quarterly reports to ENERGY STAR, specifying the number of homes verified as meeting ENERGY STAR performance guidelines.
 9. MANUFACTURED HOMES PARTNERS: Comply with the terms set forth in *ENERGY STAR Qualified Manufactured Homes: Design, Manufacturing, Installation and Certification Procedures* (available at www.energystar.gov/homes), including submitting ENERGY STAR qualified home data to an EPA-approved Quality Assurance Provider.
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General Terms and Disclaimers

1. The partner will not construe, claim, or imply that its participation in ENERGY STAR constitutes federal government approval, acceptance, or endorsement of anything other than the partner's commitment to ENERGY STAR. Partnership does not constitute federal government endorsement of the partner or its homes or services.
 2. The partner understands that the activities it undertakes in connection with ENERGY STAR are voluntary and not intended to provide services to the federal government. As such, the partner will not submit a claim for compensation to any federal agency.
 3. The partner and ENERGY STAR will assume good faith as a general principle for resolving conflict and will seek to resolve all matters informally, so as to preserve maximum public confidence in ENERGY STAR.
 4. This agreement is voluntary and can be terminated by either party at any time for any reason, with no penalty.
 5. Failure to comply with any of the terms of this partnership agreement can result in its termination and cessation of access to the benefits of ENERGY STAR, including use of the marks.
 6. ENERGY STAR will actively pursue resolution of noncompliance related to the use of the ENERGY STAR marks.
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Air and Radiation 6202J
EPA-430-B-05-002
www.epa.gov
November 2005