ENERGY STAR
Version 3
Made Easy
By Ross Anderson
Residential Science Resources

Agenda

- Introduction
- Proposed MN Code Changes
- Version 3 Basics
- What is a HERS Rater
- Check List Overview
- Questions

Introduction

Ross Anderson
Residential Science Resources LLC

Proposed MN Energy Code

Minnesota to Adopt 2012 IECC???

- Envelope Tightness Requirements 3>ACH50
- Duct work Tightness Requirements 4 CFM Per 100 sq’ @ 25 Pascals
- R-21 Cavity insulation
- R-15 Foundation insulation
- Hard Piping All ductwork
- Balanced ventilation
- Insulating Hot Water Pipes
- 3 out of 4 bulbs need to be High Efficacy

Version 3 Basics

Why change from version 2?

- **Challenges to continued program success**
  - Energy codes are becoming more stringent, particularly with the adoption of the 2012 IECC.
  - Energy codes are increasing more rapidly and updates will be adopted more regularly by many states.
- **Continually Improve Value Proposition**
  - To protect its value to consumers, partners, and other stakeholders, ENERGY STAR must continue to be a mark of distinction that represents significant efficiency above standard constructions practices.
  - Additionally, the guidelines needed to be augmented with building science practices that can help improve comfort, indoor air quality, and durability in qualified homes.

Key changes from v2 to v3

- **Variable vs. Fixed HERS Index Threshold**

A custom ENERGY STAR HERS Index Target is calculated for each home following the Performance Path.

- **Size Adjustment Factor**

Homes of all sizes may be labeled. However, homes larger than a benchmark size for a specified number of bedrooms (called the ‘Benchmark Home Size’) must apply a Size Adjustment Factor. This will result in reduced HERS Index Target Scores and increased requirements for larger homes.

- **New inspection checklists**

The current Thermal Bypass Checklist has been expanded into the Thermal Enclosure Checklist (TEC). New HVAC Quality Installation and Water Management Checklists have been added.

Version 3 training requirements

- **Training requirements for builders, raters, and HVAC contractors**
  - Builders, raters, and HVAC contractors must complete Version 3 training before they can work on homes qualified under Version 3.
    - One person from each builder and HVAC contractor will be required to complete the training, but the training will be open to additional staff as well.
    - All individual raters who work on homes qualified homes must complete Version 3 Training. It will not be sufficient for one rater in each organization to complete this training.

Version 3 training requirements

ACCA Costs & Fees

Charges and fees related to participation in the QA New Homes program are currently as follows:

Online Orientation Session: $59 ($39 for ACCA Members)

Application Fee: $275

Annual Participation Fee:$1,120 ($820 for ACCA Members)
After you apply, you will be required to pay both your application fee and first year participation fee in order for your application to be processed. **If your application is not accepted, the first year participation fee will be refunded.**

Version 3 training requirements

Advanced Energy QAP for HVAC

Application Fee: $199 per Contractor, one-time

Training Fee: Price varies based on location (average $175 per person), one-time for initial training

Annual Fee: $299 per Contractor, per year

Job Fee:
- $35 (1 – 50 units) per ENERGY STAR checklist (per system)
- $30 (51 – 200 units) per ENERGY STAR checklist (per system)
- $25 (201 – 500 units) per ENERGY STAR checklist (per system)
- $20 (501 – 1,000 units) per ENERGY STAR checklist (per system)
- $15 (1,000 + units) per ENERGY STAR checklist (per system)

Site Audit Fee: Minimum of $350 per site audit, based on availability of local QA provider

Documentation

- **Complete inspection checklists**

  In addition to the Version 3 energy efficiency measures, homes must include additional measures enforced with inspection checklists. These measures help ensure comprehensive systems and energy efficiency with every qualified home under v3.

Qualifying homes under v3

- **Select Version 3 energy efficiency measures**

  Energy efficiency measures can be selected using one of two paths:

  - The Prescriptive Path, based on a predefined package of improvements; OR
  - The Performance Path, based on a customized package of upgrades.

Note that homes that are larger than their Benchmark Home Size must use the Performance Path so that the Size Adjustment Factor can be applied. THEY CANNOT USE THE PRESCRIPTIVE PATH.!!!!

Benchmark Home Size

- The Benchmark Home Size represents the typical size of a home for a given number of bedrooms.
- It is determined by using the number of bedrooms and conditioned floor area (CFA) of the rated home

Bedrooms	1	2	3	4	5	6	7	8
CFA	1,000	1,600	2,200	2,800	3,400	4,000	4,600	5,200

Benchmark Home Size

Qualifying Homes under Version 3: Performance Path

Performance Path

- **Selecting upgrades**
  - Just like in Version 2, the rater/builder have flexibility to select a custom set of energy efficiency specifications, so long as the resulting HERS Index meets or exceeds the ENERGY STAR HERS Index Target.
  - They may mix and match any component, including:
    - Insulation levels;
    - Window efficiency;
    - Infiltration levels;
    - HVAC efficiency;
    - Water heating efficiency; or
    - Lighting & appliances.

v3 Performance Path changes

- **Envelope requirements**

All insulation, windows, doors, and skylights shall meet or exceed 2009 IECC requirements.

- **On-site power generation credit**

On-site power generation can be used to lower a home's HERS Index under the Performance Path, but only if:

  - The home is larger than the Benchmark Home Size; and
  - Credit for onsite power generation is used only to make up for the incremental reduction in the ENERGY STAR HERS Index Target caused by the Size Adjustment Factor.

v3 Performance Path changes

- **Credit for CFLs and pin-based fluorescents**

There is no cap on the use of CFLs or pin-based fluorescents to lower the HERS Index.

- **ENERGY STAR qualified products**
  - There is no requirement that the home include at least 1 ENERGY STAR qualified product category, however the ENERGY STAR HERS Index Target is based on an ENERGY STAR qualified refrigerator and dishwasher, qualified ceiling and exhaust fans, and fluorescent lighting in 80% of lighting fixtures in RESNET-defined Qualifying Light Fixture Locations.
  - Therefore, the ENERGY STAR HERS Index Target must be met by either including efficient appliances and lighting or by offsetting their performance with other efficiency features.

v3 Performance Path changes

- **HVAC distribution requirements**
  - Maximum leakage to outdoors has been reduced to 4 CFM_{25} per 100 ft^2 CFA.
  - A new total leakage threshold has been defined at 6 CFM_{25} per 100 ft^2 CFA.

- **Duct leakage accommodation for small homes (CFA < 1200 ft^2)**
  - Total leakage is capped at 8 CFM_{25} per 100 ft^2 CFA.
  - Leakage to outside is capped at 5 CFM_{25} per 100 ft^2 CFA.

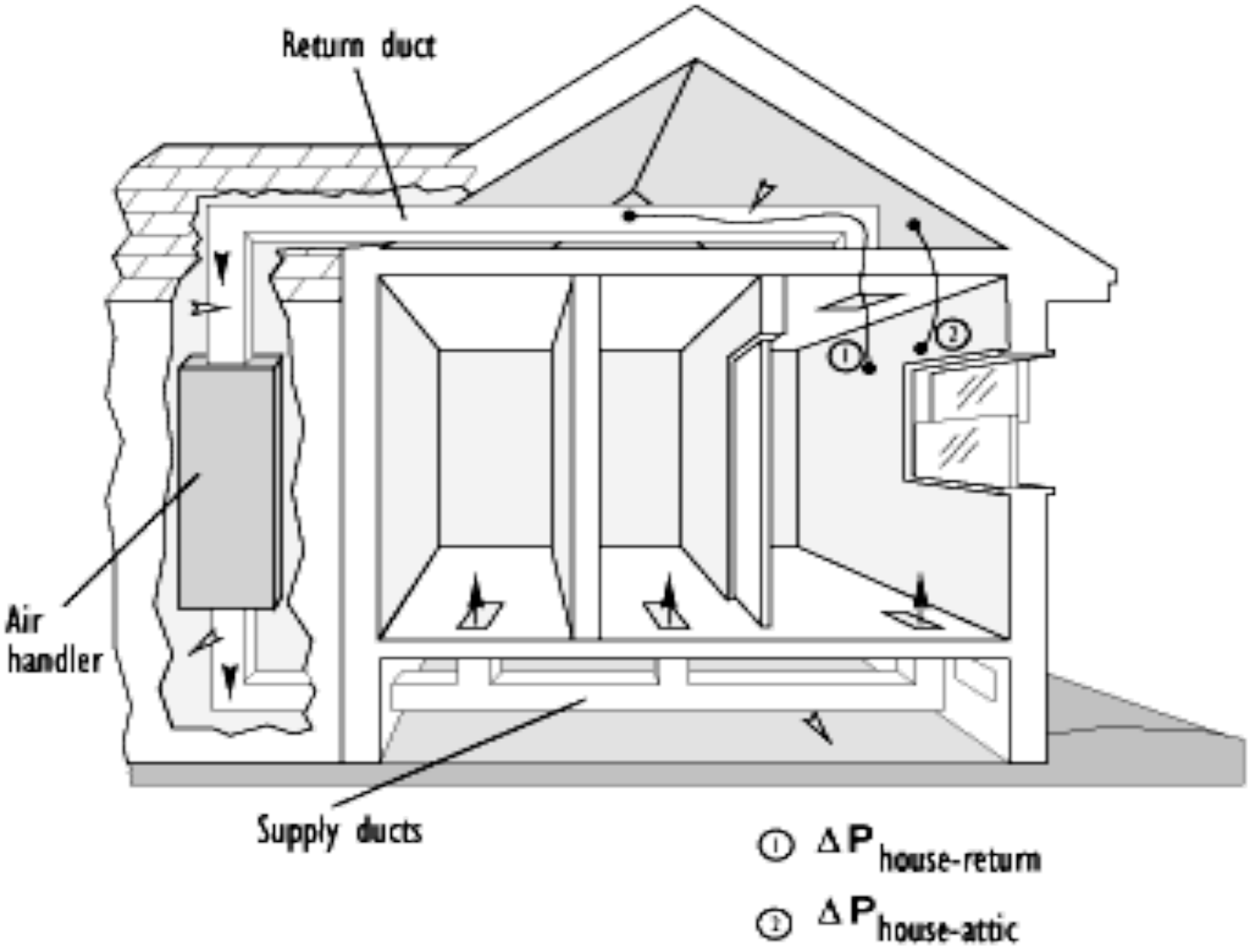
v3 Performance Path changes

- **Waiver for testing leakage to outdoors**

Leakage to outdoors does not need to be tested if total duct leakage is at or below the threshold for leakage to the outside and all Ductwork is inside of the Thermal Envelope:

  - Total leakage ≤ 4 CFM_{25} per 100 ft^2 CFA; or
  - Total leakage ≤ 5 CFM_{25} per 100 ft^2 CFA for small homes where CFA < 1200 ft^2.

Duct Leakage to The Outside



What is a Rater?

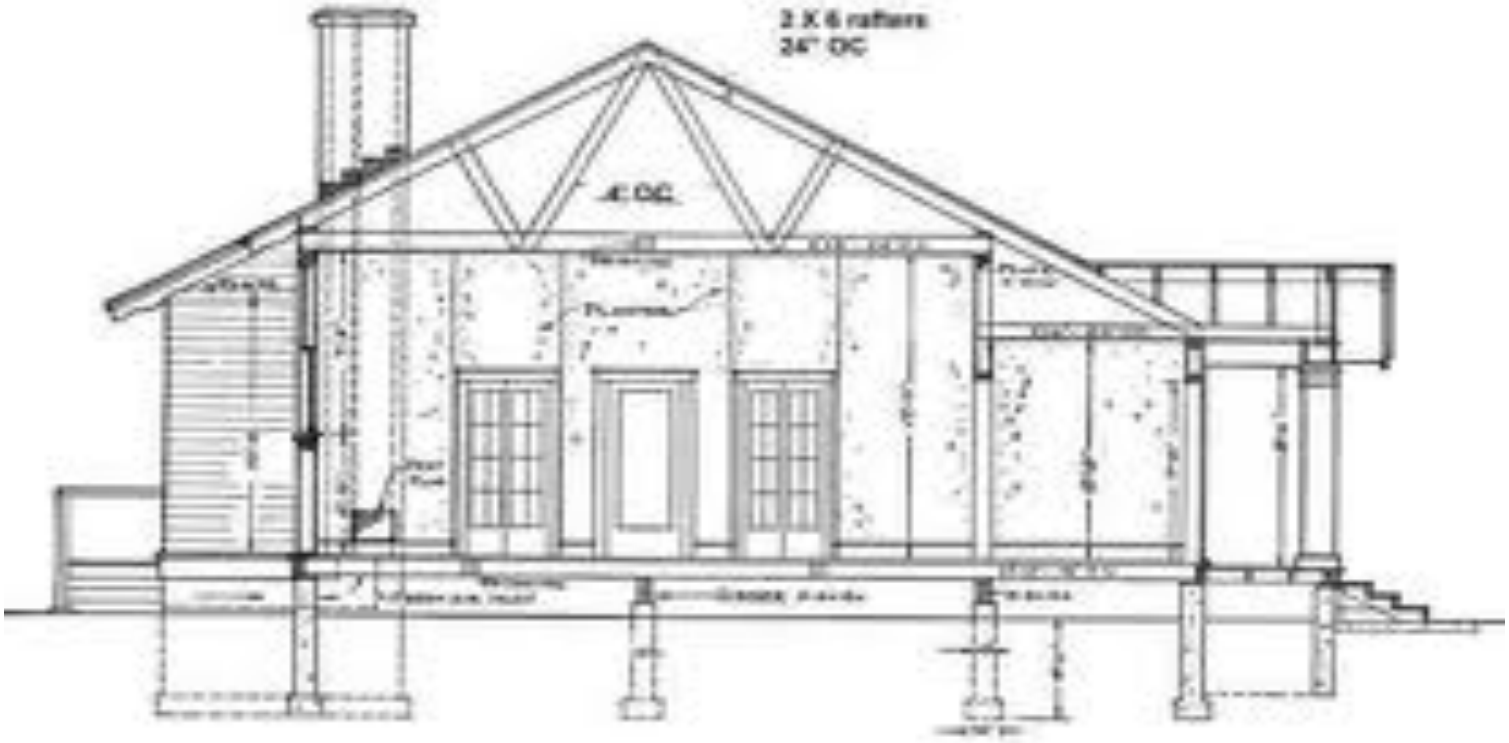
- **A Resnet Certified Home Energy Rater:**

  A Certified Home Energy Rater or Rater is a person trained and certified by an accredited Home Energy Rating Provider to inspect and evaluate a home's energy features, prepare a home energy rating and make recommendations for improvements that will save the homeowner energy and money.

Rating Process

1. Review House Plans
2. Model Plans into Energy Modeling Software
3. Complete onsite visits during the construction Process
4. Complete Final Performance Testing
5. Generate Reports Including HERS Score

Plan Review



Sections View

CONSULTING REPORTS

Framing

Framing Site Walk Report

Insulation

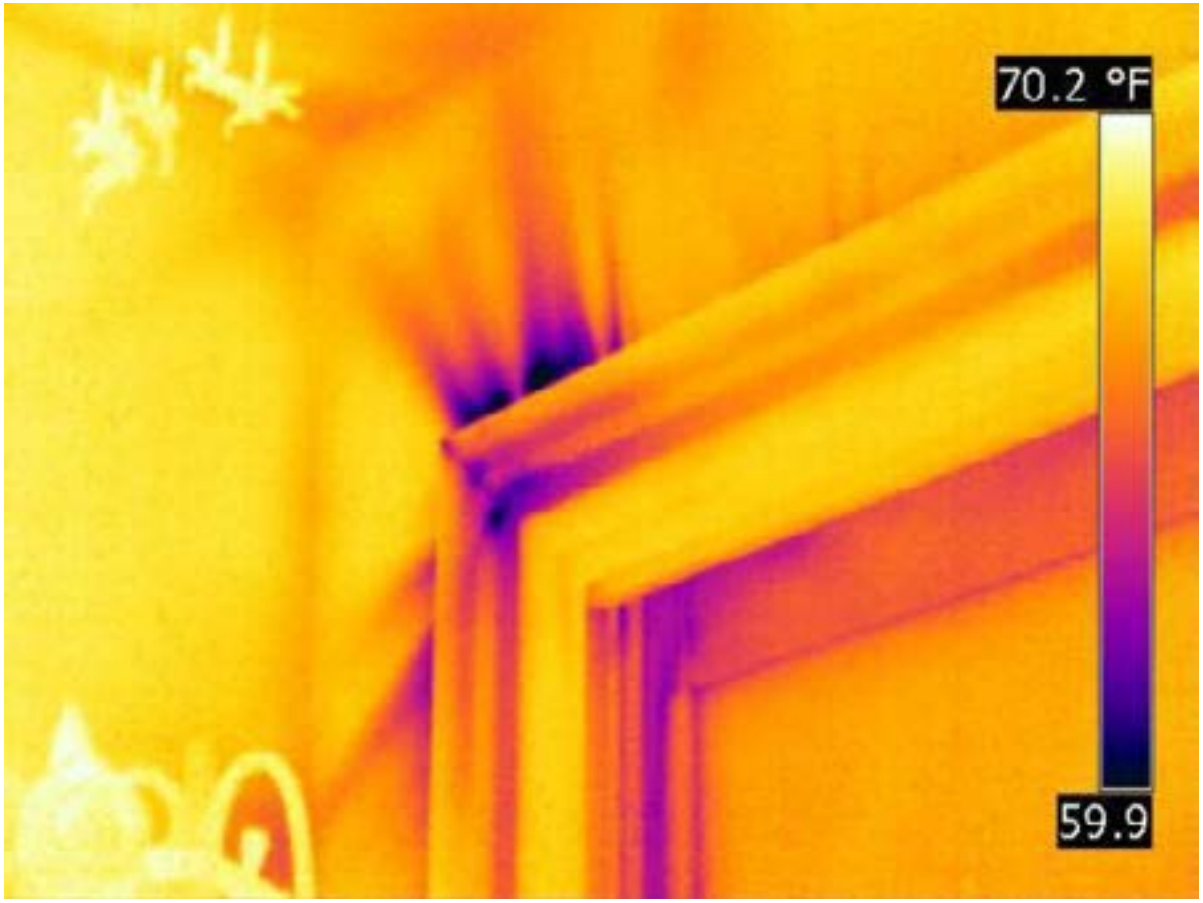
Insulation Site Walk Report

Final Testin

Final Testing and Completion Report

Testing Equipment

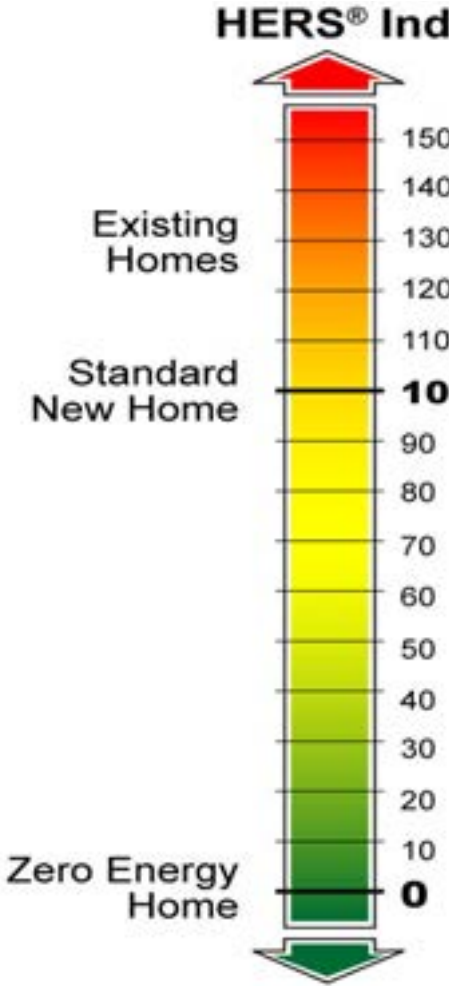
Infrared Images



HERS Index

- Home
- Energy
- Rating
- System

At the completion of the rating all homes receive a HERS Score!



LIKE GOLF, LOWER IS BETTER

LEADERS

POS	PLAYER	TODAY	THRU	TOTAL		R1	R2	R3	R4		TOTAL
1	HANSON	-7	F	-9		68	74	65			207
2	MICKELSON	-6	F	-8		74	68	66			208
3	OOSTHUIZEN	-3	F	-7		68	72	69			209
4	WATSON, B.	-2	F	-6		69	71	70			210
5	KUCHAR	-2	F	-5		71	70	70			211
T6	MAHAN	-4	F	-4		72	72	68			212
T6	HARRINGTON	-4	F	-4		71	73	68			212
T6	STENSON	-2	F	-4		71	71	70			212
T6	WESTWOOD	E	F	-4		67	73	72			212
10	LAWRIE	E	F	-3		69	72	72			213

ENERGY STAR Qualified Homes

THERMAL ENCLOSURE SYSTEM RATER CHECKLIST

ENERGY STAR® QUALIFIED HOMES

THERMAL ENCLOSURE RATER CHECKLIST

CHECKLIST SECTIONS

Section 1	High-performance windows
Section 2	Quality-installed insulation
Section 3	Fully-aligned air barriers
Section 4	Reduced thermal bridging
Section 5	Air sealing

1.2 High performance windows performance path: meet or exceed 2009 IECC standards

A

WINDOW SPECIFICATION —Ensure windows, doors and skylights meet specifications by verifying the manufacturer's stickers on site.

SECTION 2. QUALITY-INSTALLED INSULATION

2.1 Ceiling, floor, and wall insulation levels shall meet or exceed 2009 IECC levels

2.2 For climate zones 4 and higher, slab insulation shall meet or exceed 2009 IECC levels

2.3 Insulation shall achieve RESNET-defined Grade I installation or, alternatively, Grade II for walls with insulated sheathing.

THERMAL ENCLOSURE SYSTEM RATER CHECKLIST

2 QUALITY-INSTALLED INSULATION

1 INSULATION LEVELS: MEET OR EXCEED 2009 IECC LEVELS [4]

ENERGY STAR

DETAIL 2.1

Ceiling, floor, and wall insulation shall meet or exceed 2009 IECC levels

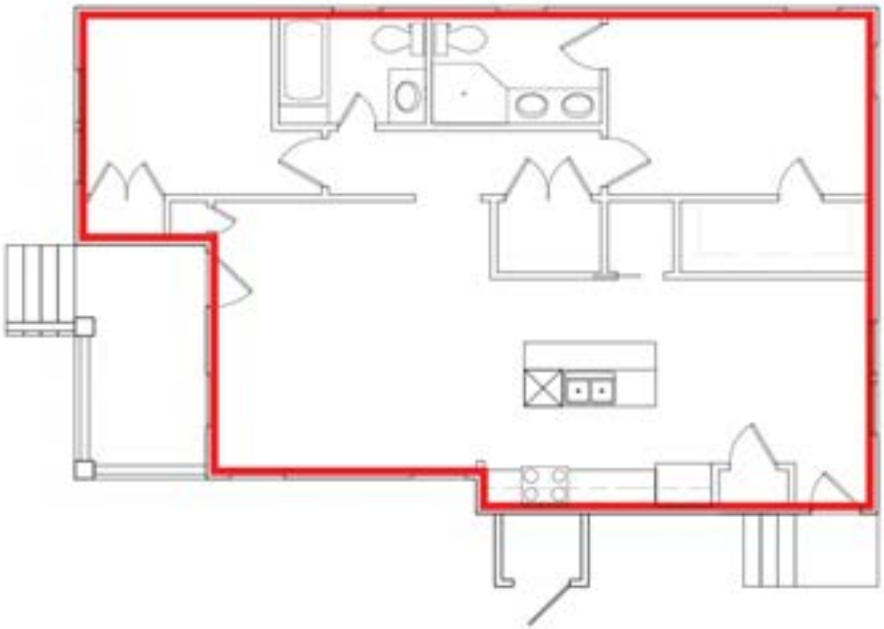
A. Install insulation in a home to meet or exceed the levels specified in the 2009 IECC and located on the back of this page.

B. Verify insulation meets standards by utilizing the guide below, looking at printed R-Values on the insulation product or consulting the insulator.

INSULATION

MATERIAL	TYPICAL R-VALUE PER IN.
Cellulose	R-3.5
Fiberglass (Batts)	R-3.5
Fiberglass (Blown)	R-3
Polyurethane Rigid Board	R-6.8
EPS Insulated Concrete Forms (ICF)	R-4.25
XPS Insulated Concrete Forms (ICF)	R-5.0
EPS Structurally Insulated Panels (SIP)	R-3.1
XPS Structurally Insulated Panels (SIP)	R-4.3
Spray Foam (Closed Cell)	R-6
Spray Foam (Open Cell)	R-3.6

Knowing the exterior boundary of the house is critical for everyone involved in aligning air barriers with insulation. The Rater should first gather all plans, elevations and sections of the house. By drawing a boundary around the exterior barrier, the Rater can see the difficult areas to insulate and better communicate the required actions in those areas with the insulator and subcontractors.



TRADES
INSULATOR

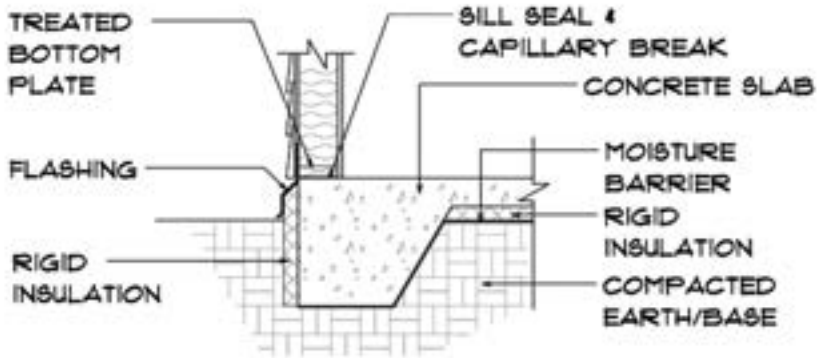
ENERGY STAR

DETAIL 2.2

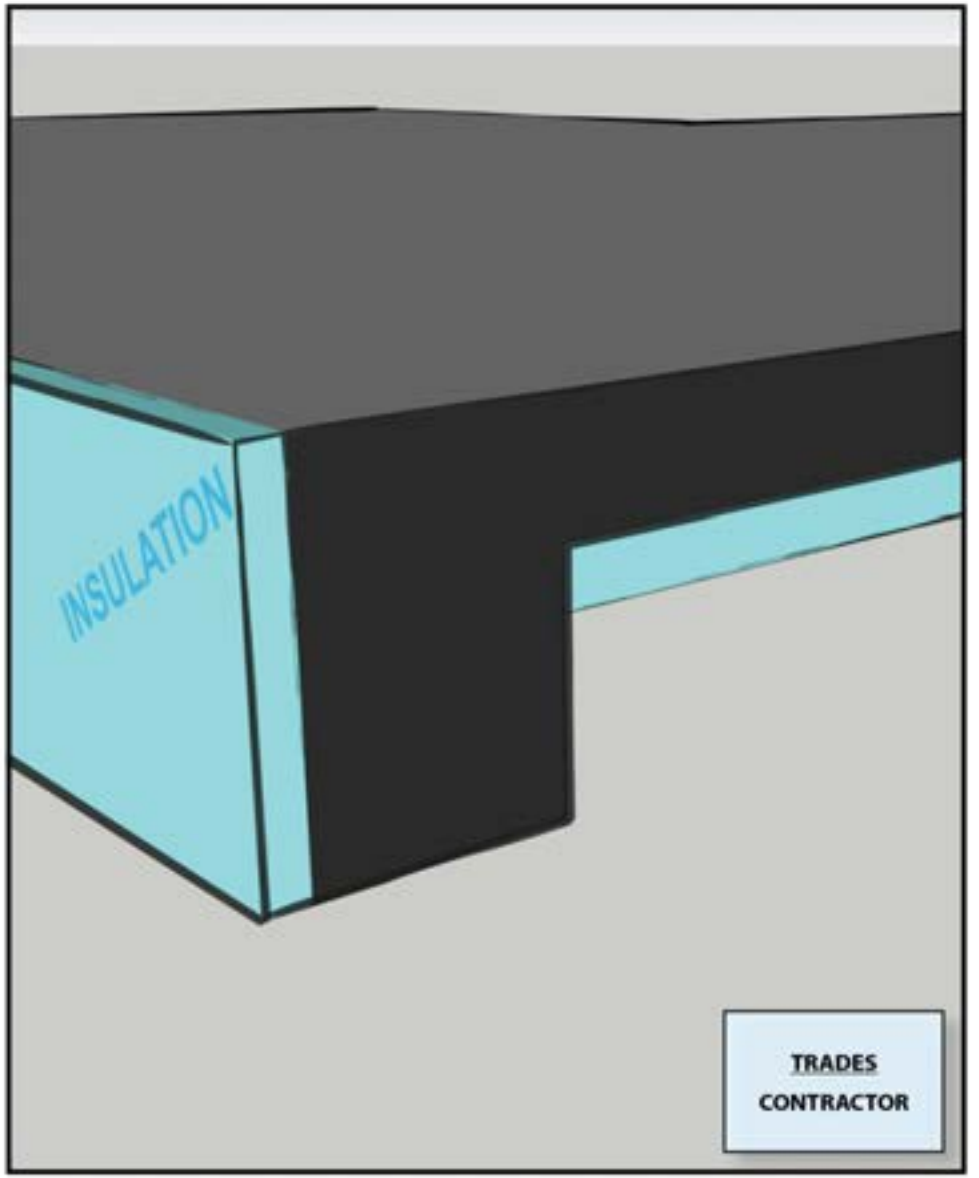
For Climate Zones 4 & higher, slab insulation shall meet or exceed 2009 IECC levels

A. Install insulation in a home to meet or exceed the levels specified in the 2009 IECC and located on the back of this page.

B. Install slab insulation to extend to the top of the slab to provide a complete thermal break.



THE INSULATION SHALL EXTEND DOWNWARD FROM THE TOP OF THE SLAB TO THE BOTTOM OF THE THICKENED EDGE.



ENERGY STAR

DETAIL 2.3

Insulation shall achieve RESNET-defined Grade I installation or, alternatively, Grade II for walls with insulated sheathing (see checklist item 4.3.1 for required insulation levels)

A. Install insulation without misalignments, compressions, gaps or voids in all wall cavities along the thermal barrier of the house.

WHAT IS GRADE I INSTALLATION?

Grade I installation requires that the insulation material uniformly fill each cavity side-to-side and top-to-bottom, without substantial gaps or voids around obstructions (such as blocking or bridging), and be split, installed and/or fitted tightly around wiring and other services in the cavity.

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.

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 the batt meets the other requirements of Grade I.

HOW DO RATERS INSPECT INSULATION?

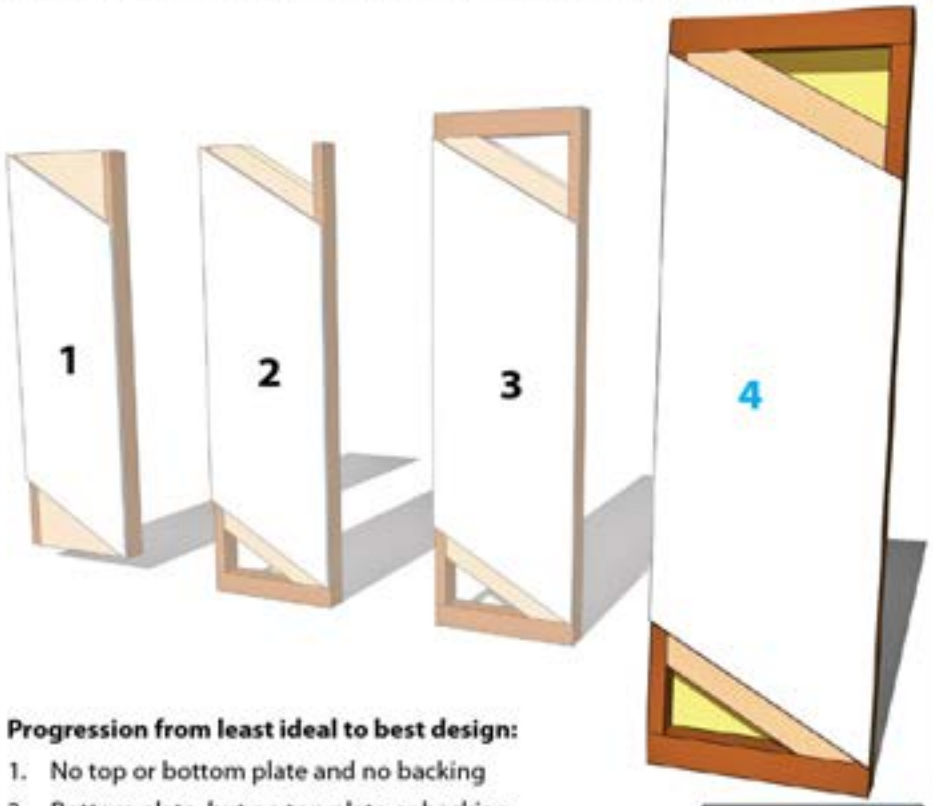
Raters are required to inspect and probe in, around, or through the insulation and/ or vapor retarder in several places to see whether these requirements are met.

During inspection, insulation and vapor retarders may be cut or pulled away so Raters can see installation details. The Raters should 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.

Text from the RESNET Mortgage Industry National HERS Standards

IDEAL INSTALLATION OF INSULATION

Properly installed insulation consists of insulation framed on all six sides, including top and bottom plates, rigid backing and sheathing. The insulator should ensure that framing is correctly installed before the start of insulation.



Progression from least ideal to best design:

1. No top or bottom plate and no backing
2. Bottom plate, but no top plate or backing
3. Top and bottom plate, but no backing
4. **Insulation surrounded on six sides, including a top and bottom plate and backing**

TRADES
FRAMER
INSULATOR

2.3

Insulation shall achieve RESNET-defined Grade I installation or, alternatively, Grade II for walls with insulated sheathing.

A

NO MISALIGNMENTS — Verify insulation is installed without misalignments and in full contact with all sides of the cavity. Ensure insulation is cut and split around blocking, plumbing, HVAC and electrical components.

2.3

Insulation shall achieve RESNET-defined Grade I installation or, alternatively, Grade II for walls with insulated sheathing.

A

NO COMPRESSIONS — Verify insulation is installed without compressions and in full contact with all sides of the cavity. Ensure insulation is cut and split around blocking, plumbing, HVAC and electrical components.

2.3

Insulation shall achieve RESNET-defined Grade I installation or, alternatively, Grade II for walls with insulated sheathing.

A

NO GAPS — Verify insulation is installed without gaps and in full contact with all sides of the cavity. Ensure insulation is cut and split around blocking, plumbing, HVAC and electrical components.

SECTION 3. FULLY ALLIGNED AIR BARRIERS

3.1.3 Attic knee walls

DETAIL 3.1.3

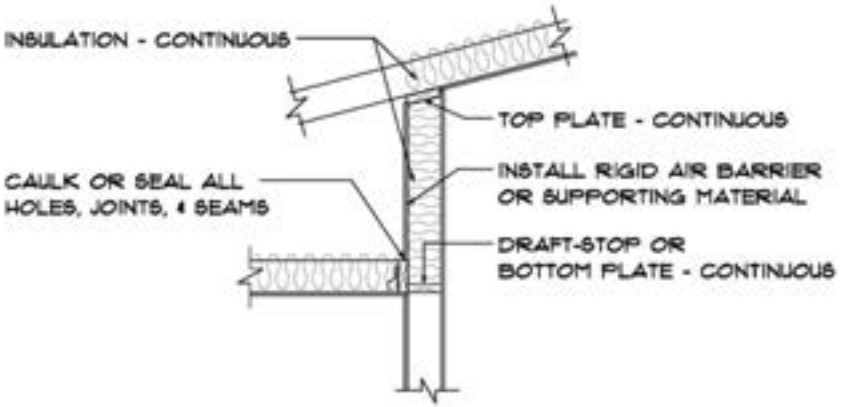
Attic knee walls

A. Install a top and bottom plate or blocking at the top and bottom of all knee wall cavities.

B. Back with a rigid air barrier or other supporting material to prevent insulation from sagging and create a continuous thermal barrier.

C. Seal all seams, gaps and holes of the air barrier with caulk or foam.

D. Install insulation without misalignments, compressions, gaps or voids in all knee wall cavities.



3.1.3 Attic knee walls

B

KNEE WALL AIR BARRIER — Verify a rigid air barrier or other supporting material is installed to hold insulation in place.

SECTION 3. FULLY ALLIGNED AIR BARRIERS

3.1.8 Garage rim / band joist adjoining conditioned space

3.1.8 Garage / rim band joist adjoining conditioned space

A

GARAGE RIM BAND JOIST AIR BARRIER — Verify a rigid air barrier or other supporting material is installed between exterior and conditioned space.

DETAIL 4.3.5a

All corners insulated ≥ R-6 to edge*

A. Utilize "California Corners" or an equivalent framing technique that uses no more than three studs per corner to allow access to insulate the cavity to ≥ R-6.

B. If the corner is conventionally framed, drill a hole and fill the cavity with insulation.

* All items of 4.3.5a-4.3.5f must be installed to comply with 4.3.5 and ENERGY STAR.

ARCHITECTURAL DETAIL

ENERGY STAR REVISION 6

Advanced Framing

•In Climate Zones 5 - 8, a minimum stud spacing of 16 in. o.c. is permitted to be used with 2x6 framing if ≥ R-20.0 wall cavity insulation is achieved.

4.3.5a

Advanced framing, including:
All corners insulated ≥ R-6 to edge

A

INSULATED CORNER INSTALLATION — Ensure "California Corners" or an equivalent framing technique that uses no more than three studs per corner is used to allow access to insulate the cavity to ≥ R-6.

4.3.5a

Advanced framing, including:
All corners insulated ≥ R-6 to edge

B

INSULATED CORNER INSTALLATION — If the corner is conventionally framed, verify the cavity has been filled with insulation.

DETAIL 4.3.5b

All headers above windows and doors insulated*

Install headers with a minimum R-3 insulation value in Climate Zones 1-4 and R-5 in Climate Zones 5-8. Use one of the methods listed below or an equivalent assembly:

A. Continuous rigid insulation.

B. SIP headers.

C. Two-member headers with insulation between.

D. Single-member headers with insulation on one side.

* All items of 4.3.5a-4.3.5f must be installed to comply with 4.3.5 and ENERGY STAR.

ARCHITECTURAL DETAIL

4.3.5b

Advanced framing, including:
All headers above windows and doors insulated

B

INSULATED HEADER— Verify two member headers with rigid insulation between are installed OR verify single member headers with insulation on one side are installed.

DETAIL 4.3.5c

Framing limited at all windows and doors*

A. Limit framing to a maximum of one pair of king studs per window opening.

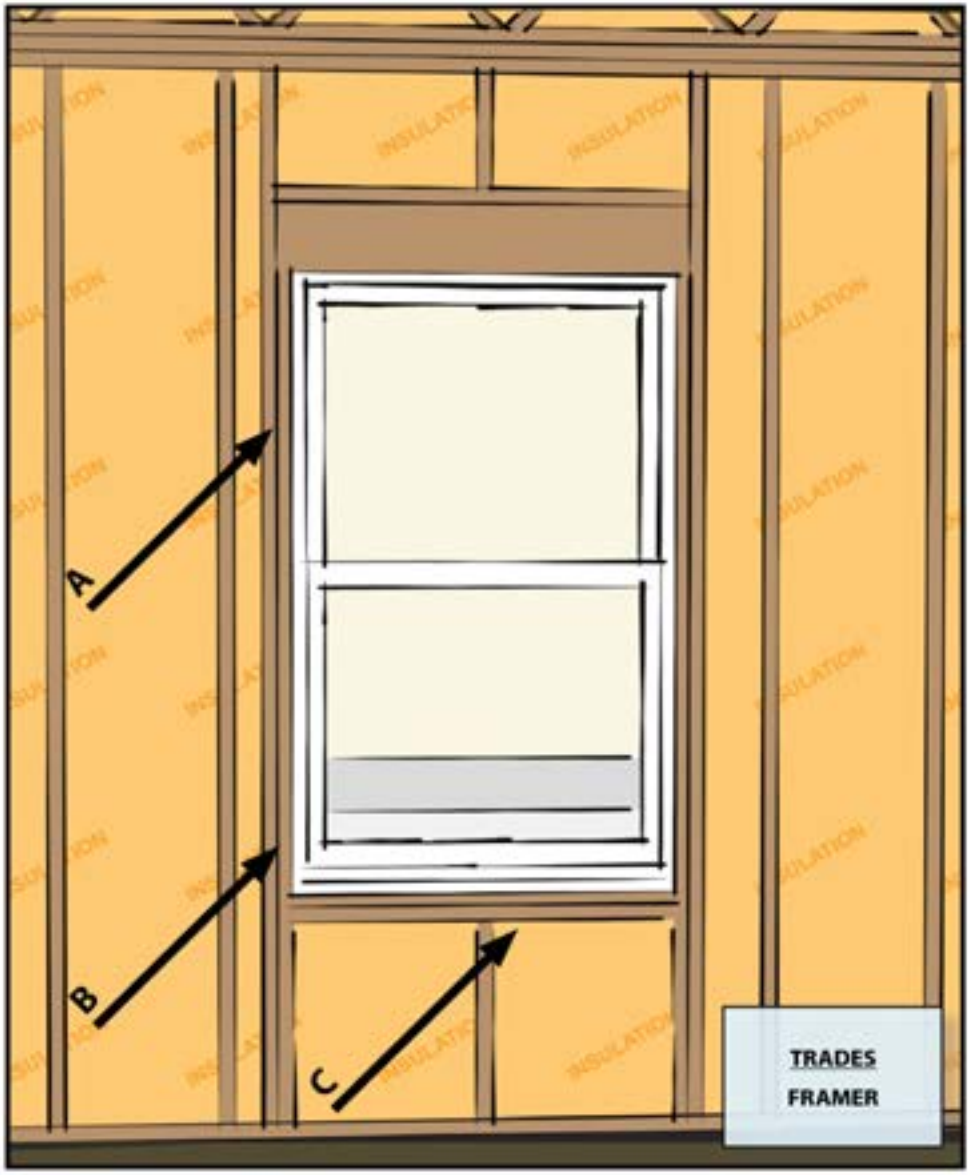
B. Limit framing to a maximum of one pair of jack studs per window opening to support the header and window sill.

C. Install additional jack studs only as needed for structural support and cripple studs only as needed to maintain on-center spacing of studs.

D. Limit framing to necessary structural requirements for each door opening.

* All items of 4.3.5a-4.3.5f must be installed to comply with 4.3.5 and ENERGY STAR.

ARCHITECTURAL DETAIL



SECTION 5. AIR SEALING

5.3.2	Attic access panels and drop-down stairs equipped with ≥ R-10 insulated cover and gasketed

DETAIL 5.3.2

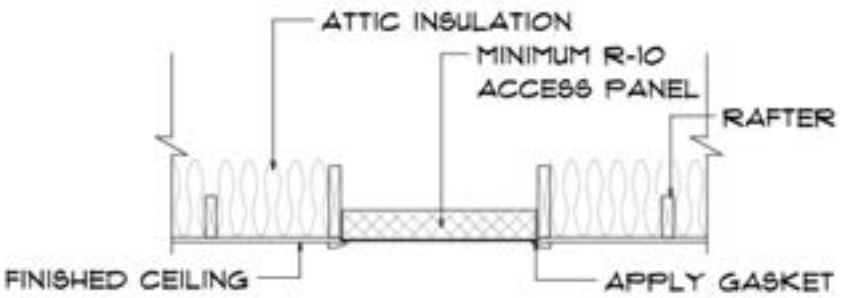
Attic access panels and drop-down stairs equipped with ≥ R-10 insulated cover and gasketed

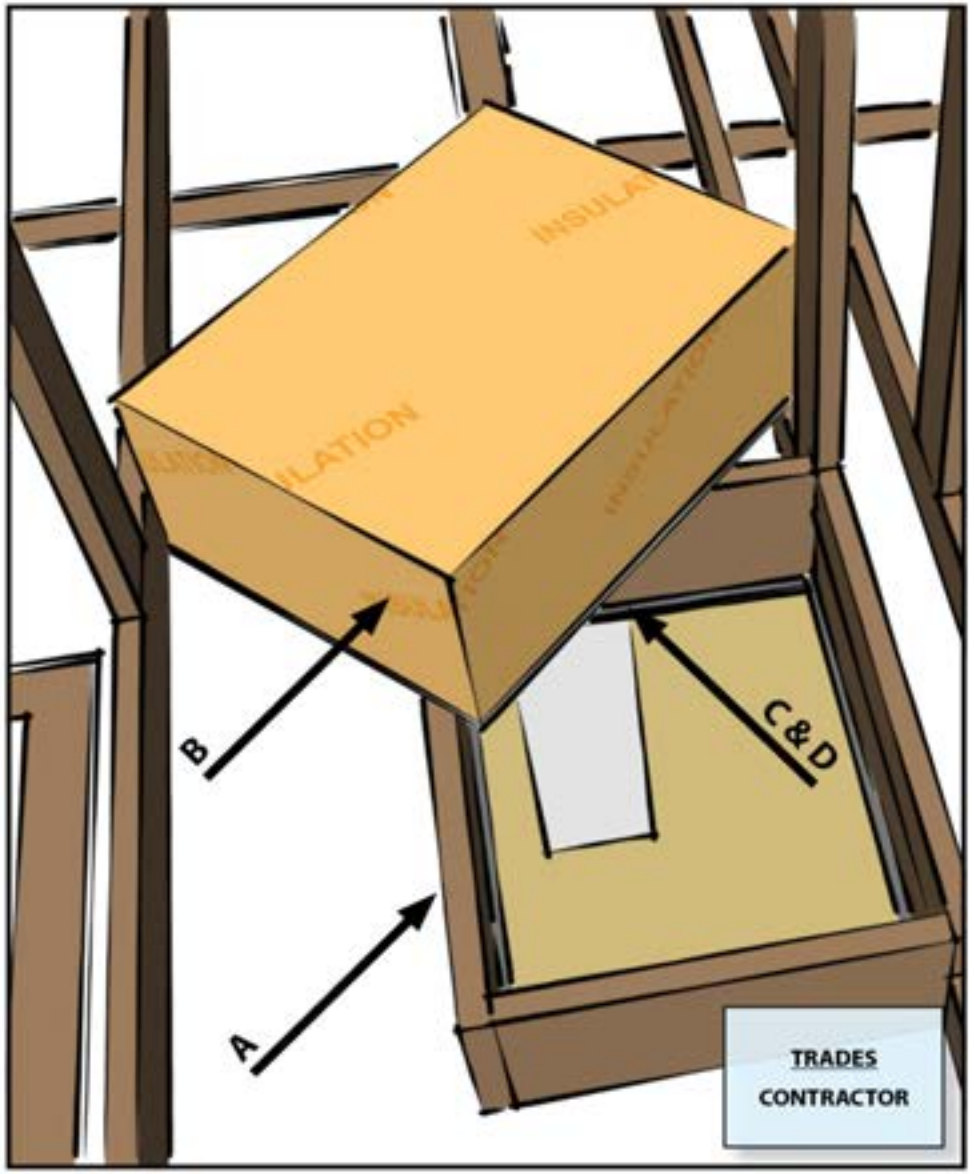
A. If installing ceiling access to the attic, building science experts recommend installing additional blocking to create insulation dams.

B. Install an attic access panel that is equipped with an insulated cover to meet or exceed R-10.

C. Seal all gaps and holes to unconditioned space with caulk or foam.

D. Install a continuous gasket around the attic access panel.





ENERGY STAR Qualified Homes

WATER MANAGEMENT SYSTEM BUILDER CHECKLIST

ENERGY STAR® QUALIFIED HOMES

THERMAL ENCLOSURE RATER CHECKLIST

CHECKLIST SECTION

Section 1	Water-managed site and foundation
Section 2	Water-managed wall assembly
Section 3	Water-managed roof assembly
Section 4	Water-managed building materials

ENERGY STAR® QUALIFIED HOMES

THERMAL ENCLOSURE RATER CHECKLIST

SECTION 1. WATER-MANAGED SITE AND FOUNDATION

1.1 Patio slabs, walks, and driveways sloped ≥ 0.25 in. per ft. away from home to edge of surface or 10 ft., whichever is less

1.2 Final grade is, or is scheduled by builder to be, sloped ≥ 0.5 in. per ft. Away from home for ≥ 10 ft. And back-fill tamped to prevent settling

1.3 Capillary break beneath all concrete slabs

1.4 Capillary break for all crawlspace floors

1.1

Patio slabs, walks, and driveways sloped ≥ 0.25 in. per ft. away from home to edge of surface or 10 ft., whichever is less

A

SLOPE SLABS — Ensure all patio slabs, walks and driveways are sloped away from the house at least .25 in. per ft. for the length of the slab.

SECTION 1. WATER-MANAGED SITE AND FOUNDATION

1.3 Capillary break beneath all concrete slabs

	WATER MANAGEMENT SYSTEM BUILDER CHECKLIST
1	WATER-MANAGED SITE AND FOUNDATION
3	CAPILLARY BREAK BENEATH ALL CONCRETE SLABS [5]

ENERGY STAR

DETAIL 1.3.1

4 in. bed of ≥ 0.5 in. clean aggregate covered with ≥ 6 mil polyethylene sheeting lapped 6-12 in. or ≥1 in. extruded polystyrene insulation with taped joints, in direct contact with concrete slab above*

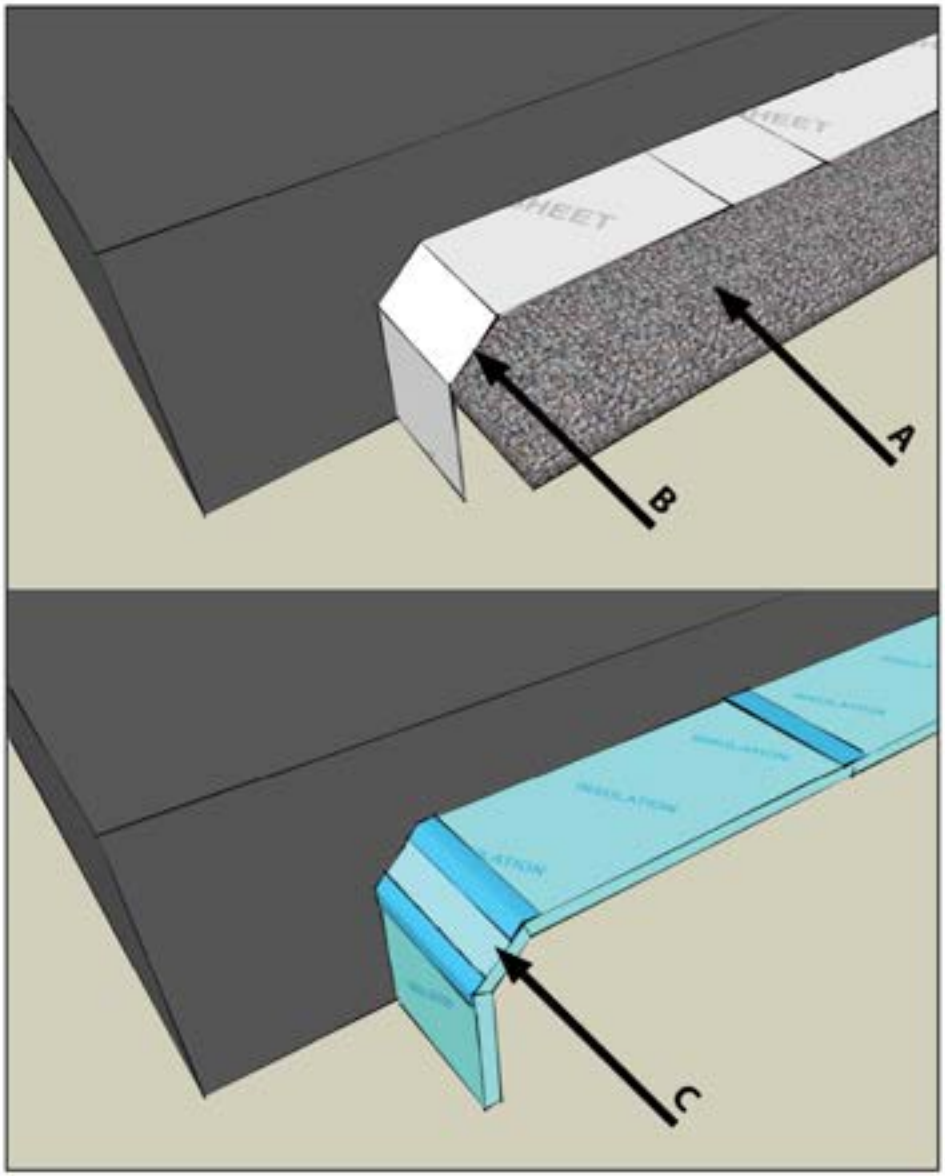
A. Install a 4 in. bed of at least 0.5 in. clean aggregate

B. Cover entire area with at least a 6 mil polyethylene sheeting and overlap the sheeting at least 6-12 in.

C. If not using polyethylene sheeting, install at least 1 in. extruded polystyrene insulation to be in contact with the slab and tape all joints.

* Only one item of DETAIL 1.3 must be met to comply with ENERGY STAR.

ARCHITECTURAL DETAIL



SECTION 1. WATER-MANAGED SITE AND FOUNDATION

1.5 Exterior surface of below-grade finished as follows: For poured concrete, concrete masonry, and insulated concrete forms, finish with damp-proof coating

1.5

Exterior surface of below-grade walls finished as follows: For poured concrete, concrete masonry, and insulated concrete forms, finish with damp-proof coating

A

POURED CONCRETE — If below-grade poured concrete without damp proof coating are installed, verify the mixture is customized to yield concrete impermeable to water migration.

SECTION 2. WATER-MANAGED WALL ASSEMBLY

2.1 Flashing at bottom of exterior walls with weep holes included for masonry veneer and weep screed for stucco cladding systems, or equivalent drainage system

2.2 Fully sealed continuous drainage plane behind exterior cladding that laps over flashing in section 2.1

2.3 Window and door openings fully flashed

THERMAL ENCLOSURE RATER CHECKLIST

SECTION 3. WATER-MANAGED ROOF ASSEMBLY

3.1 Step and kick-out flashing at all roof-wall intersections, extending > 4” on wall surface above roof deck and integrated with drainage plane above

3.2 Gutters & downspouts empty to lateral piping that deposits water on sloping finish grade ≥ 5 ft. from foundation or to underground catchment system > 10 ft. from foundation

3.3 Self-sealing bituminous membrane or equivalent at all valleys and roof deck penetrations

3.1

Step and kick-out flashing at all roof-wall intersections extending ≥ 4” on wall surface above roof deck and integrated with drainage plane above

B

FLASHING INSTALLATION — Ensure step and kick-out flashing is installed to extend at least 4 in. above the roof deck along the wall. Step and kick-out flashing are not required in Dry (B) climates as defined by the 2009 IECC.

SECTION 4. WATER-MANAGED BUILDING MATERIALS

4.4 Building materials with visible signs of water damage or mold not installed

4.5 Interior walls not enclosed (e.g., with drywall) if either the framing members or insulation products have high moisture content

4.5

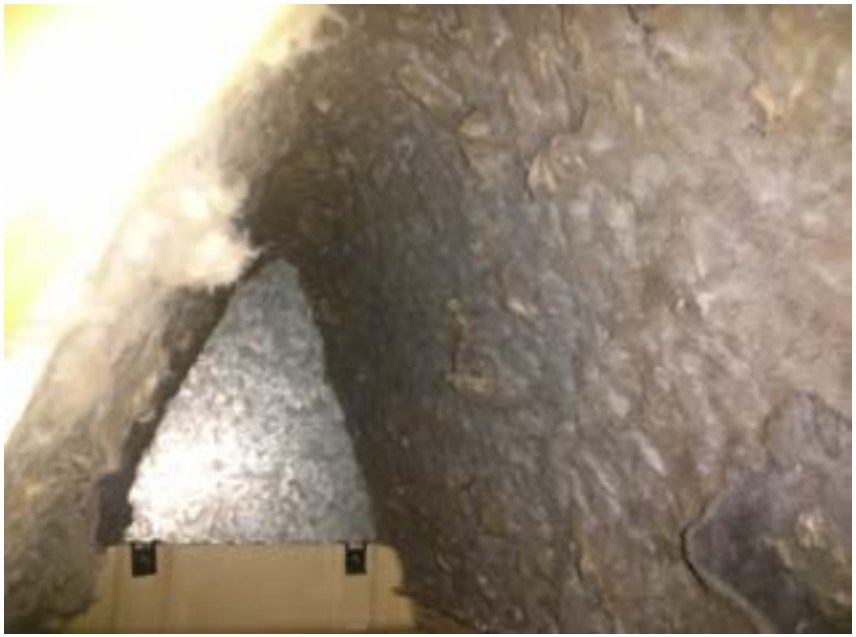
Interior walls not enclosed (e.g., with drywall) if either the framing members or insulation products have high moisture content

C

LOW MOISTURE CONTENT — Ensure interior walls are enclosed only if moisture content of framing and insulation is low. It is recommended that lumber does not exceed 18% moisture content.

ENERGY STAR Qualified Homes

HVAC SYSTEM QUALITY INSTALLATION RATER CHECKLIST



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THERMAL ENCLOSURE RATER CHECKLIST

CHECKLIST SECTION

Section 1	Review of HVAC System Quality Installation Contractor Checklist
Section 2	Duct quality installation
Section 3	Duct insulation
Section 4	Duct leakage
Section 5	Whole-building delivered ventilation

THERMAL ENCLOSURE RATER CHECKLIST

CHECKLIST SECTION

Section 6	Ventilation controls
Section 7	Air inlets & ventilation source
Section 8	Local mechanical exhaust
Section 9	Ventilation & exhaust fan ratings (exemptions for HVAC and remote-mounted fans)
Section 10	Combustion appliances

CHECKLIST SECTION

Section 11 Filtration

HVAC SYSTEM QUALITY INSTALLATION RATER CHECKLIST

1 REVIEW OF HVAC SYSTEM QUALITY INSTALLATION CONTRACTOR CHECKLIST

1 CHECKLIST COMPLETED [2]

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DETAIL 1.1

HVAC System Quality Installation Contractor Checklist completed in its entirety

A. Check the Contractor Checklist to ensure it is completed. It is not required to assess the accuracy of the load calculations or field verifications.

B. It is the Contractor's exclusive responsibility to ensure the system design and installation comply with the Contractor Checklist specifications.

ENERGY STAR Qualified Homes, Version 3 (Rev. 01)
HVAC System Quality Installation Contractor Checklist[1]

Home Address: City: State:

1. Whole-Building Mechanical Ventilation Design[3]	Cont. Verified	Rater Verified	NA
1.1 Ventilation system designed to meet ASHRAE 62.2-2007 requirements [4]	☐	☐	-
1.2 Ventilation system does not utilize an intake duct to the return side of the HVAC system unless the system is designed to operate intermittently and automatically based on a timer and to restrict outdoor air intake when not in use (e.g., motorized damper)	☐	☐	-
1.3 Documentation is attached with ventilation system type, location and design rate	☐	☐	-
1.4 If present, continuously-operating vent. & exhaust fans designed to operate during all occupiable hrs.	☐	☐	☐
1.5 If present, intermittently-operating whole-house ventilation system designed to automatically operate at least once per day and at least 10% of every 24 hours	☐	☐	☐

2. Heating & Cooling System Design[5] - Parameters used in the design calculations shall reflect home to be built, specifically, outdoor design temperatures, home orientation, number of bedrooms, conditioned floor area, window area, predominant window performance, and insulation levels, infiltration rate, mechanical ventilation rate, presence of MERV6 or better filter, and indoor temperature setpoints = 75°F for heating; 78°F for cooling							
2.1 Heat Loss / Gain Method:	☐ Manual J v8	☐ ASHRAE 2005	☐ Other:		☐	☐	-
2.2 Duct Design Method:	☐ Manual D	☐ Other:			☐	☐	☐
2.3 Equipment Selection Method:	☐ Manual S	☐ OEM Rec.	☐ Other:		☐	☐	-
2.4 Outdoor Design Temperatures Used:[6]	1%:	°F	99%:	°F	☐	☐	-
2.5 Orientation of Rated Home (e.g., North, South):					☐	☐	-
2.6 Number of Bedrooms in Rated Home:					☐	☐	-
2.7 Conditioned Floor Area in Rated Home:				Sq. Ft.	☐	☐	-
2.8 Window Area in Rated Home:				Sq. Ft.	☐	☐	-
2.9 Predominant Window SHGC in Rated Home:[7]				SHGC	☐	☐	-
2.10 Infiltration Rate in Rated Home:[7]	Summer:		Winter:		☐	☐	-
2.11 Mechanical Ventilation Rate in Rated Home:				CFM	☐	☐	-
2.12 Design Latent Heat Gain:				BTUh	☐	☐	-
2.13 Design Sensible Heat Gain:				BTUh	☐	☐	-
2.14 Design Total Heat Gain:				BTUh	☐	☐	-
2.15 Design Total Heat Loss:				BTUh	☐	☐	-
2.16 Design Airflow:				CFM	☐	☐	-
2.17 Design Duct Static Pressure:[8]				Inches Water Column (IWC)	☐	☐	☐
2.18 Copy of Load Calculations Attached					☐	☐	-

3. Selected Cooling Equipment, If Cooling Equipment to be Installed							
3.1 Condenser Manufacturer & Model:					☐	☐	☐
3.2 Condenser Serial #:					☐	☐	☐
3.3 Evaporator / Fan Coil Manufacturer & Model:					☐	☐	☐
3.4 Evaporator / Fan Coil Serial #:					☐	☐	☐
3.5 AHRI Reference #:[9]					☐	☐	☐
3.6 Listed Efficiency:		EER		SEER	☐	☐	☐
3.7 Metering Device Type:	☐ TXV	☐ Fixed orifice	☐ Other:		☐	☐	☐
3.8 Refrigerant Type:		☐ R-410a	☐ Other:		☐	☐	☐
3.9 Fan Speed Type: [10]	☐ Fixed	☐ Variable (ECM/ICM)	☐ Other:		☐	☐	☐
3.10 Listed Sys. Latent Capacity at Design Cond.[11]				BTUh	☐	☐	☐
3.11 Listed Sys. Sensible Capacity at Design Cond.[11]				BTUh	☐	☐	☐
3.12 Listed Sys. Total Capacity at Design Cond.[11]				BTUh	☐	☐	☐
3.13 If Listed Sys. Latent Capacity (Value 3.10) < Design Latent Heat Gain (Value 2.12), ENERGY STAR qualified dehumidifier installed?					☐	☐	☐
3.14 Listed Total Cap. (Value 3.12) is 95-115% of Design Total Heat Gain (Value 2.14) or next nom. size					☐	☐	☐
Or for Heat Pumps in Climate Zones 4-8, 95-125% or next nominal size					☐	☐	☐
3.15 AHRI Certificate Attached [9]					☐	☐	☐

4. Selected Heat Pump Equipment, If Heatpump to be Installed							
4.1 AHRI Listed Efficiency:			HSPF		☐	☐	☐
4.2 Performance at 17°F:	Capacity:	BTUh	Efficiency:	COP	☐	☐	☐
4.3 Performance at 47°F:	Capacity:	BTUh	Efficiency:	COP	☐	☐	☐

Version 3 (Rev. 01) - Effective 1/1/2011 Revised 10/15/2010 6

HVAC SYSTEM QUALITY INSTALLATION RATER CHECKLIST

1	REVIEW OF HVAC SYSTEM QUALITY INSTALLATION CONTRACTOR CHECKLIST
1	CHECKLIST COMPLETED

ENERGY STAR

ENERGY STAR Qualified Homes
HVAC System Quality Installation Contractor Checklist[1]

			Cont. Verified	Rater Verified	N/A
5. Selected Furnace, If Furnace to be Installed					
5.1	Furnace Manufacturer & Model:		☐	☐	☐
5.2	Furnace Serial #:		☐	☐	☐
5.3	Listed Efficiency:	AFUE	☐	☐	☐
5.4	Listed Output Heating Capacity:	BTUh	☐	☐	☐
5.5	Listed Output Heat. Cap. (Value 5.4) is 100-140% of Design Heat Loss (Value 2.14) or next nom. size		☐	☐	☐
6. Refrigerant Tests - Run system for 15 minutes before testing Note: if cold weather makes it impossible to verify proper refrigerant charge, system must include a TXV[21]					
6.1	Outdoor ambient temp. at condenser:	°F DB	☐	☐	☐
6.2	Return-side air temp. inside duct near evaporator, during cooling mode:	°F WB	☐	☐	☐
6.3	Liquid line pressure:	psig	☐	☐	☐
6.4	Liquid line temperature:	°F DB	☐	☐	☐
6.5	Suction line pressure:	psig	☐	☐	☐
6.6	Suction line temperature:	°F DB	☐	☐	☐
7. Refrigerant Calculations					
For System with Thermal Expansion Valve (TXV)					
7.1	Condenser saturation temp.:	°F DB (Using Value 6.3)	☐	☐	☐
7.2	Subcooling value:	°F DB (Value 7.1 - Value 6.4)	☐	☐	☐
7.3	OEM subcooling goal:	°F DB	☐	☐	☐
7.4	Subcooling deviation:	°F DB (Value 7.2 - Value 7.3)	☐	☐	☐
For System with Fixed Orifice:					
7.5	Evaporator saturation temp.:	°F DB (Using Value 6.5)	☐	☐	☐
7.6	Superheat value:	°F DB (Value 6.6 - Value 7.5)	☐	☐	☐
7.7	OEM superheat goal:	°F DB (Using superheat tables and Values 6.1 & 6.2)	☐	☐	☐
7.8	Superheat deviation:	°F DB (Value 7.6 - Value 7.7)	☐	☐	☐
7.9	Value 7.4 is ±3°F or Value 7.8 is ±5°F		☐	☐	☐
8. Electrical Measurements					
8.1	Evaporator air handler fan:	amps volts watts	☐	☐	☐
8.2	Condensor fan:	amps volts watts	☐	☐	☐
8.3	Compressor:	amps volts watts	☐	☐	☐
8.4	Electrical measurements within OEM specified tolerance of nameplate value		☐	☐	☐
9. Air Flow Tests					
9.1	Air volume at evaporator:	CFM	☐	☐	☐
9.2	Test performed in which mode?	☐ Heating ☐ Cooling	☐	☐	☐
9.3	Return static pressure:	IWC Location[9]:	☐	☐	☐
9.4	Supply static pressure:	IWC Location[9]:	☐	☐	☐
9.5	Measurement method used:	☐ Anemometer ☐ Pressure matching[10] ☐ Flow grid ☐ Fan curve ☐ Other:	☐	☐	☐
9.6	Airflow volume at evaporator (Value 9.1), at fan design speed and full operating load, +/- 15% of the airflow required per system design (Value 2.15) or within range recommended by OEM		☐	☐	☐
10. Air Balance					
10.1	Individual room airflows within the greater of ±20% or 25 CFM of the design / application requirements for the supply and return ducts		☐	☐	☐
10.2	Balancing report indicating quantity of supply and return terminals per room attached		☐	☐	☐
11. System Controls					
11.1	Operating and safety controls meet OEM requirements		☐	☐	☐
12. Drain pan					
12.1	Corrosion-resistant drain pan, properly sloped to drainage system, included[24]		☐	☐	☐

Technician Name: _____ Equipment Installation Date: _____
Technician Signature: _____ Company: _____
Designer Name[25]: _____ System Design Date: _____
Designer Signature[25]: _____ Company: _____

ENERGY STAR Qualified Homes
Inspection Checklists
For National Program Requirements, Version 3.0

As described in the ENERGY STAR Qualified Homes National Program Requirements, Version 3.0, one prerequisite for qualification is that a home must meet the requirements of the four attached checklists:

- Thermal Enclosure System Rater Checklist
- HVAC System Quality Installation Contractor Checklist
- HVAC System Quality Installation Rater Checklist
- Water Management System Builder Checklist (or Indoor airPLUS Verification Checklist)[1]

To be eligible for qualification, a home must also meet the other requirements listed in the national program requirements document, including verification of all requirements by a Rater.[7] Note that compliance with these guidelines is not intended to imply compliance with all local code requirements that may be applicable to the home to be built. Where requirements of the local codes, manufacturers' installation instructions, engineering documents, or regional ENERGY STAR programs overlap with the requirements of these guidelines, EPA offers the following guidance:

a. In cases where the overlapping requirements exceed the ENERGY STAR guidelines, these overlapping requirements shall be met.

b. In cases where overlapping requirements conflict with a requirement of these ENERGY STAR guidelines (e.g., slab insulation is prohibited to allow visual access for termite inspections), then the conflicting requirement within these guidelines shall not be met. Qualification shall only be allowed if the rater has determined that no equivalent option is available that could meet the intent of the conflicting requirement of these ENERGY STAR guidelines (e.g., switching from exterior to interior slab edge insulation).

Raters are expected to use their experience and discretion to verify that each checklist item is installed per the inspection guidelines (i.e., identifying major defects that undermine the intent of the checklist item versus identifying minor defects that the Rater may deem acceptable). Alternative methods of meeting the checklist requirements may be used if the Provider deems them to be equivalent to or more stringent than the checklist guidelines. However, in all cases, these "equivalent" determinations shall be reported prior to project completion to energystarhomes@energystar.gov. This will allow EPA to make formal policy decisions, as needed, to ensure consistent enforcement of the guidelines and to provide a resource for other partners with similar questions.

The Rater must review all items on the Rater checklists. The column titled "N/A," which denotes items that are "not applicable," should be used when the checklist item is not present in the home or conflicts with local requirements.

In the event that a Rater finds an item that is inconsistent with the checklist guidelines, the home cannot earn the ENERGY STAR until the item is corrected. If correction of the item is not possible, the home cannot earn the ENERGY STAR. In the event that an item on a Rater checklist cannot be inspected by the Rater, the home also cannot earn the ENERGY STAR. The only exceptions to this rule are in the Thermal Enclosure System Rater Checklist, where the builder may assume responsibility for verifying a maximum of eight items. This option shall only be used at the discretion of the Rater. When exercised, the builder's responsibility will be formally acknowledged by the builder signing off on the checklist for the item(s) that they verified.

The Rater is required to keep hard copies of the completed and signed checklists. The signature of the HVAC technician is required if any of the HVAC equipment specified on the HVAC System Quality Installation Contractor Checklist is installed in the home.

All checklists, including the HVAC System Quality Installation Contractor Checklist and Water Management System Builder Checklist may be completed for a batch of homes using a RESNET-approved sampling protocol to qualify homes as ENERGY STAR. For example, if the approved sampling protocol requires rating one in seven homes, then all of the checklists must be completed for the one required rating.

Rater Name: _____
Rater Company Name: _____
Builder Company Name: _____
HVAC Company Name: _____

SECTION 2. DUCT QUALITY INSTALLATION

2.1 Connections and routing and duct work completed without kinks or sharp bends.

2.1 Connections and routing of ductwork completed without kinks or sharp bends

B

DUCT SHARP BENDS — Verify ducts are installed without sharp bends.

SECTION 2. DUCT QUALITY INSTALLATION

2.1 Connections and routing and duct work completed without kinks or sharp bends.

2.2 No excessive coiled or lopped flexible duct work.

2.3 Flexible ducts in unconditioned space not be installed in cavities smaller than outer duct diameter in conditioned space not installed in cavities smaller than inner duct diameter.

2.4 Flexible ducts supported at intervals as recommended by manufacturer but at a distance $\leq$ 5 ft.

2.1 Connections and routing of ductwork completed without kinks or sharp bends

A

VENTILATION DUCTS — For ease of duct installation, recommend coordination between the framer, plumber, electrician and HVAC contractor.

SECTION 2. DUCT QUALITY INSTALLATION

2.5 Building cavities shall not be used as supply or return ducts unless they meet items 3.2, 3.3, 4.1, and 4.2 of this checklist.

2.6 HVAC ducts, cavities used as ducts, and combustion inlets and outlets may pass perpendicularly through exterior walls but shall not be run within exterior walls unless at least R-6 continuous insulation is provided on exterior side of the cavity, along with an interior and exterior air barrier where required by the thermal enclosure checklist.

SECTION 2. DUCT QUALITY INSTALLATION

2.8 Bedrooms pressure-balanced by one of the following methods:

B. Using dedicated return ducts.

C. Bedrooms pressure-balanced by achieving a measured pressure differential < 3 Pa (0.012 in. w.c.) with respect to the outside when bedroom doors are closed and the air handler is operating.

SECTION 3. DUCT INSULATION

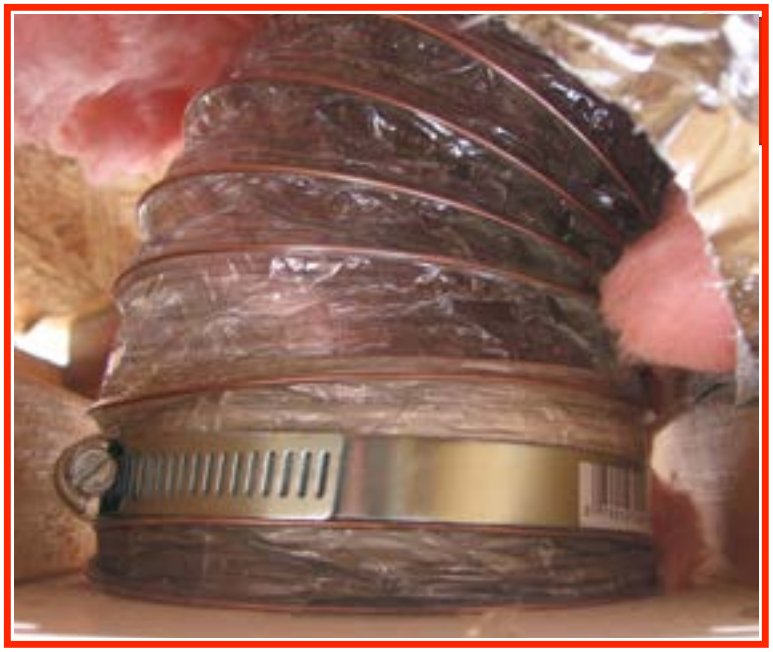
3.1 All connections to trunk ducts in unconditioned space insulated

3.2 Prescriptive Path: Supply ducts in unconditioned attic have insulation ≥ R-8

Performance Path: Supply ducts in unconditioned attic have insulation ≥ R-6

3.3 All other supply ducts and all return ducts in unconditioned space have insulation ≥ R-6

3.1 All connections to trunk ducts in unconditioned space insulated



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DUCT CONNECTIONS — Verify all seams, gaps and holes of all trunk duct connections are sealed with mastic prior to the installation of insulation.

SECTION 4. DUCT LEAKAGE

4.1 Total measured duct leakage ≤ 6 CFM 25 per 100 sq. ft. of conditioned floor area

4.2 Measured duct leakage to outdoors ≤ 4 cfm25 per 100 sq. ft. of conditioned floor area

SECTION 4. DUCT LEAKAGE

4.3 Duct boots are sealed to floor, wall, or ceiling using caulk, foam mastic tape, or mastic paste

4.3 Duct boots sealed to floor, wall, or ceiling using caulk, foam, mastic tape, or mastic paste

A

DUCT BOOT SEALING — Verify all seams, gaps and holes of all duct boots are sealed to the floor, wall or ceiling, preferably with mastic.

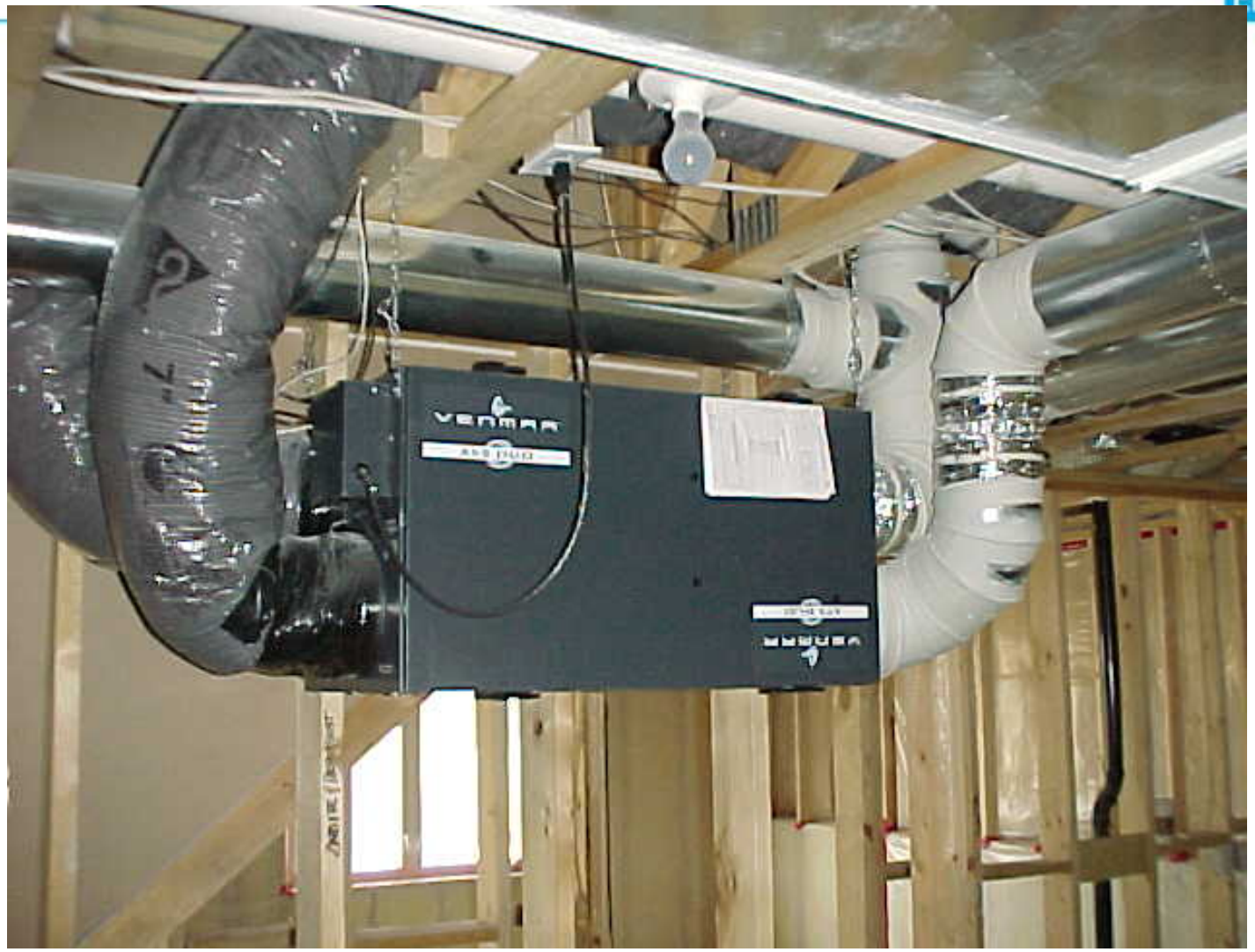
SECTION 5. WHOLE-BUILDING DELIVERED VENTILATION

5.1 Measured ventilation rate is within 100-120% of HVAC contractor design values

5.2 In warm-humid climates, measured net exhaust flow ≤ 7.5 CFM per 100 sq. ft.

5.3 In very cold climates (i.e. Climate Zones 7-8), measured net supply flow ≤ 7.5 CFM per 100 sq. ft.

Controlled Air flow



SECTION 6. VENTILATION CONTROLS

6.1 Air flow is produced when central HVAC fan is energized (set thermostat to “fan”)

6.2 Controls labeled, unless function is obvious (e.g., bathroom exhaust fan)

6.3 Cool air flow is produced when the cooling cycle is energized (set thermostat to “cool”)

6.4 Controls labeled, unless function is obvious (e.g., bathroom exhaust fan).

HVAC SYSTEM QUALITY INSTALLATION RATER CHECKLIST

6 CONTROLS

1-3 THERMOSTAT CONTROLS

DETAIL 6.1

Air flow is produced when central HVAC fan is energized (set thermostat to "fan")

A. Turn the fan on at the thermostat.

B. Reset the thermostat to the original settings before continuing.

C. Are there types of systems where you won't be checking this?

DETAIL 6.2

Cool air flow is produced when the cooling cycle is energized (set thermostat to "cool")

D. Turn the system on to cool and change the set point temperature to 3 degrees below the ambient temperature. The temperature

E. Reset the thermostat to the original settings before continuing.

F. If the system does not have air conditioning, this item does not need to be verified.

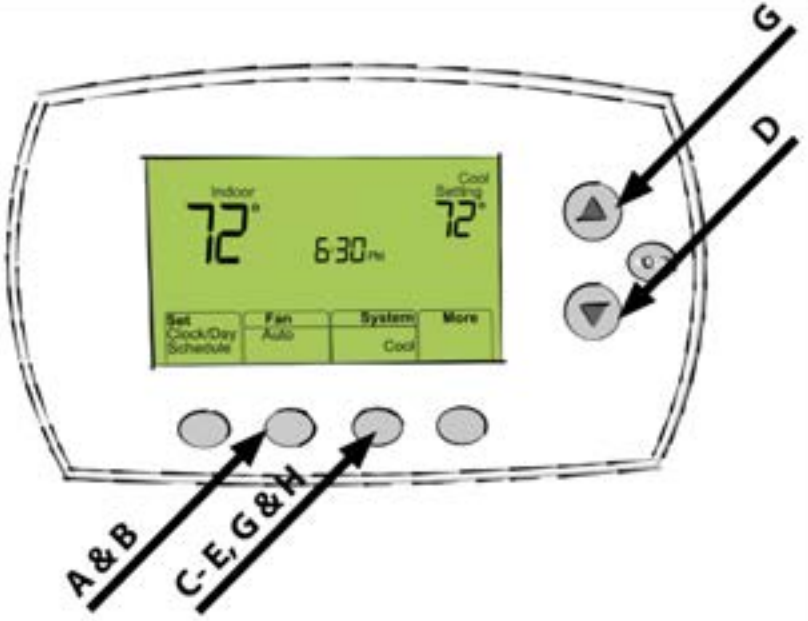
DETAIL 6.3

Heated air flow is produced when the heating cycle is energized (set thermostat to heat)

G. Turn the system on to heat and change the set point temperature to 3 degrees above the ambient temperature.

H. Reset the thermostat to the original settings before continuing.

I. Are there types of systems where you won't be checking this? Radiant?



SYSTEM OUTPUT TEMPERATURE

Raters should verify that the heating and cooling systems are working properly by measuring the output temperature of the systems.

System Type	Heating	Cooling
Air Conditioner		
Boiler		
Electric Resistance		
Heat Pump		
Natural Gas Furnace		
Oil Furnace		

SECTION 7. AIR INLETS & VENTILATION SOURCE

7.1 Air inlets located ≥ 10 ft. from contamination sources such as stack, vent, exhaust hood, or locations where vehicle exhaust may be present and ≥ 3 ft. from dryer exhausts and contamination sources exiting through the roof.

7.2 Air inlets ≥ 2 ft. above grade or roof deck in Climate Zones 1-3 or ≥ ft. Above grade or roof deck in Climate Zones 4-8 and not obstructed by snow, plantings, or other material at the time of inspection.

7.1

Air inlets located ≥ 10 ft. from contamination sources such as stack, vent, exhaust hood, or locations where vehicle exhaust may be present and ≥ 3 ft. from dryer exhausts and contamination sources exiting through the roof

A

AIR INLET LOCATION — Verify air inlets are installed at least 3 ft. away from dryer exhausts and contamination sources exiting through the roof.

SECTION 7. AIR INLETS & VENTILATION SOURCE

7.3 Air inlets provided with mesh rodent/insect screen with mesh ≤ 0.5 in.

7.4 Ventilation air comes directly from outdoors and not from adjacent dwelling units, garages, unconditioned crawlspaces, or attics.

SECTION 8. LOCAL MECHANICAL EXHAUST

8.1 Kitchen continuous rate: > 5 ACH, based on kitchen volume

Kitchen intermittent rate: > 100 CFM

8.2 Bathroom continuous rate: > 20 CFM

Bathroom intermittent rate: > 50 CFM

8.3 If fans share common exhaust duct, back-draft dampers installed.

THERMAL ENCLOSURE RATER CHECKLIST

SECTION 9. VENTILATION & EXHAUST FAN RATINGS (EXEMPTIONS FOR HVAC AND REMOTE-MOUNTED FANS)

9.1 Intermittent supply & exhaust fans rated at ≤ 3 sones by manufacturer, unless rated flow ≥ 400 CFM.

9.2 Continuous supply & exhaust fans rated at ≤ 1 sone by manufacturer.

9.3 Bathroom fans used as part of a whole-house mechanical ventilation system shall be energy star qualified; unless rated flow rate ≥ 500 CFM.

SECTION 10. COMBUSTION APPLIANCES

10.1	Furnaces, boilers, and water heaters located within the home's pressure boundary are mechanically drafted or direct-vented to outdoors. As an exception,	
allowed in Climate Zone 1-3. For atmospherically vented furnaces, boilers, and water heaters, the rater has conducted BPI's combustion safety test procedure and determined that the CO test results are less than 25 ppm and the combustion appliance zone depressurization limit is not exceeded.		

THERMAL ENCLOSURE RATER CHECKLIST

SECTION 11. FILTRATION

11.1 MERV 6 or better filter installed in ducted mechanical systems.

11.2 All return air and mechanically supplied outdoor air pass through service by the owner.

11.3 Filter located and installed so as to facilitate access and regular service by the owner.

11.4 Filter access panel includes gasket or comparable sealing mechanism and fits snugly against the exposed edge of filter when closed to prevent bypass.

11.1-4 MERV 6 or better filter installed in ducted mechanical systems

A

PROPER FILTER SPECIFICATIONS — Verify all filters installed have at least a MERV 6 rating.

Why Energy Star Now

?

CONSUMER EXPECTATIONS

Comfort

Affordability

What do we want in a home?

Durability

Sustainability

Healthy conditions

Learn more at energystar.gov

Mc Graw Hill

Green home certification will increase five-fold (500%) in the next 5 years.

In 2016 **90% of all homes** in the US will boast green features – over half will be certified.

ENERGY STAR is positioned to meet this surging demand.

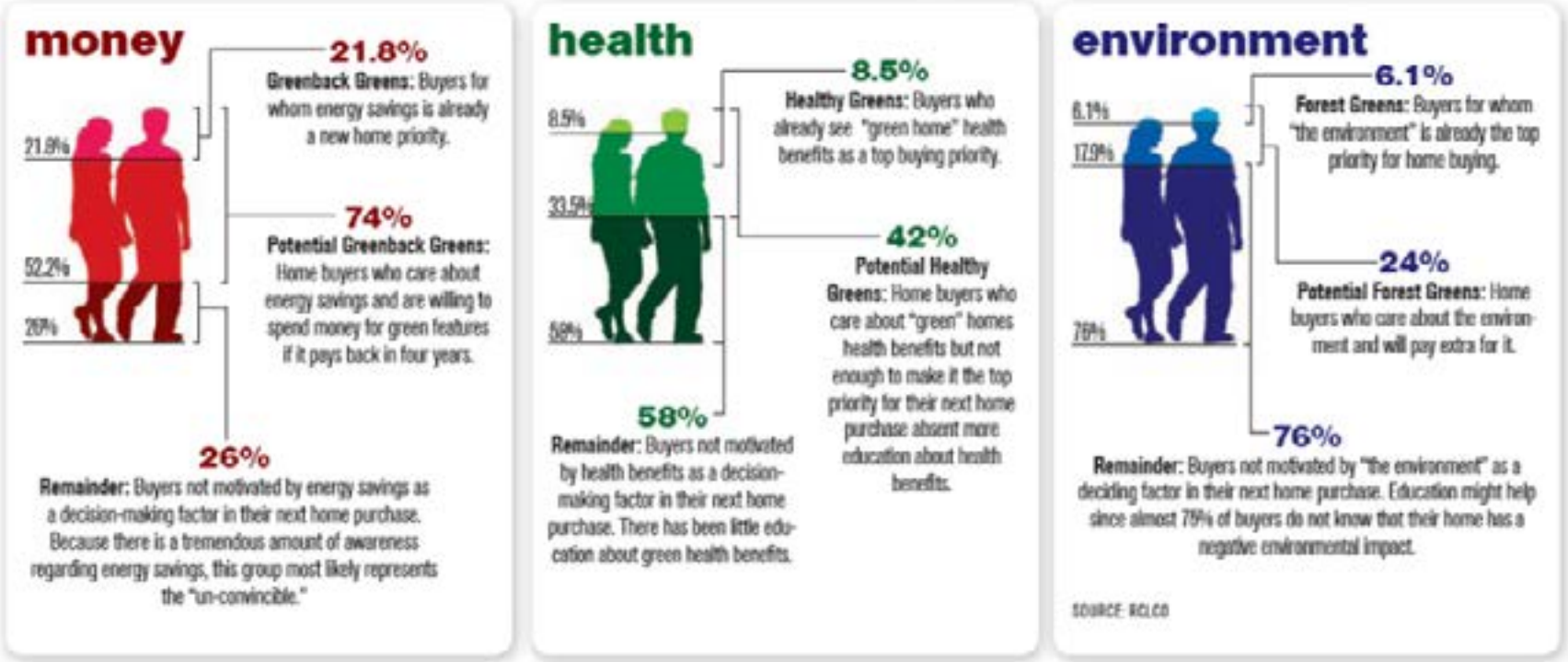
Learn more at **energystar.gov**

ENERGY STAR support

DEMOGRAPHICS

home buyer motivations

An analysis of the emerging patterns of the market demand for green homes.



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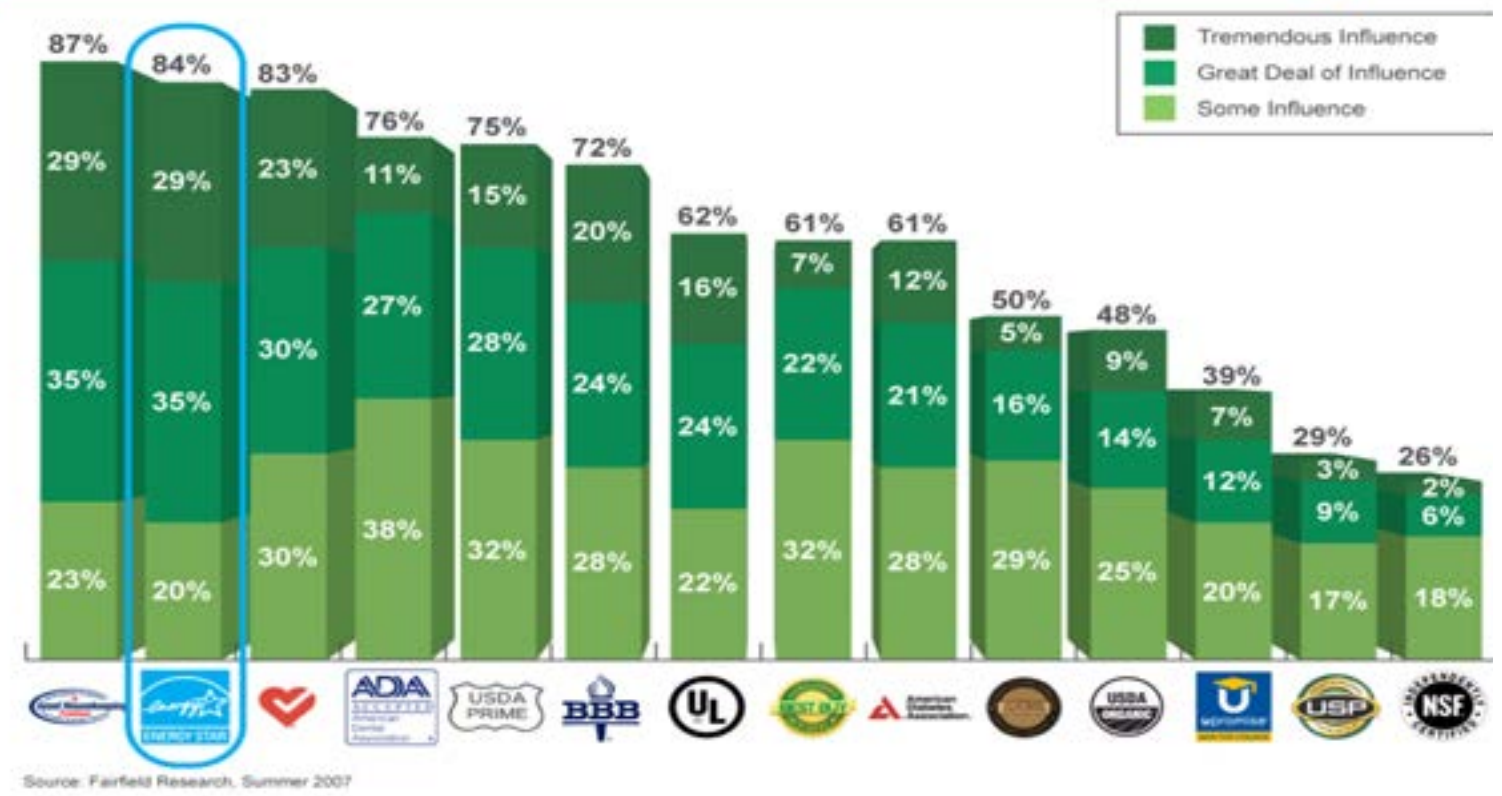
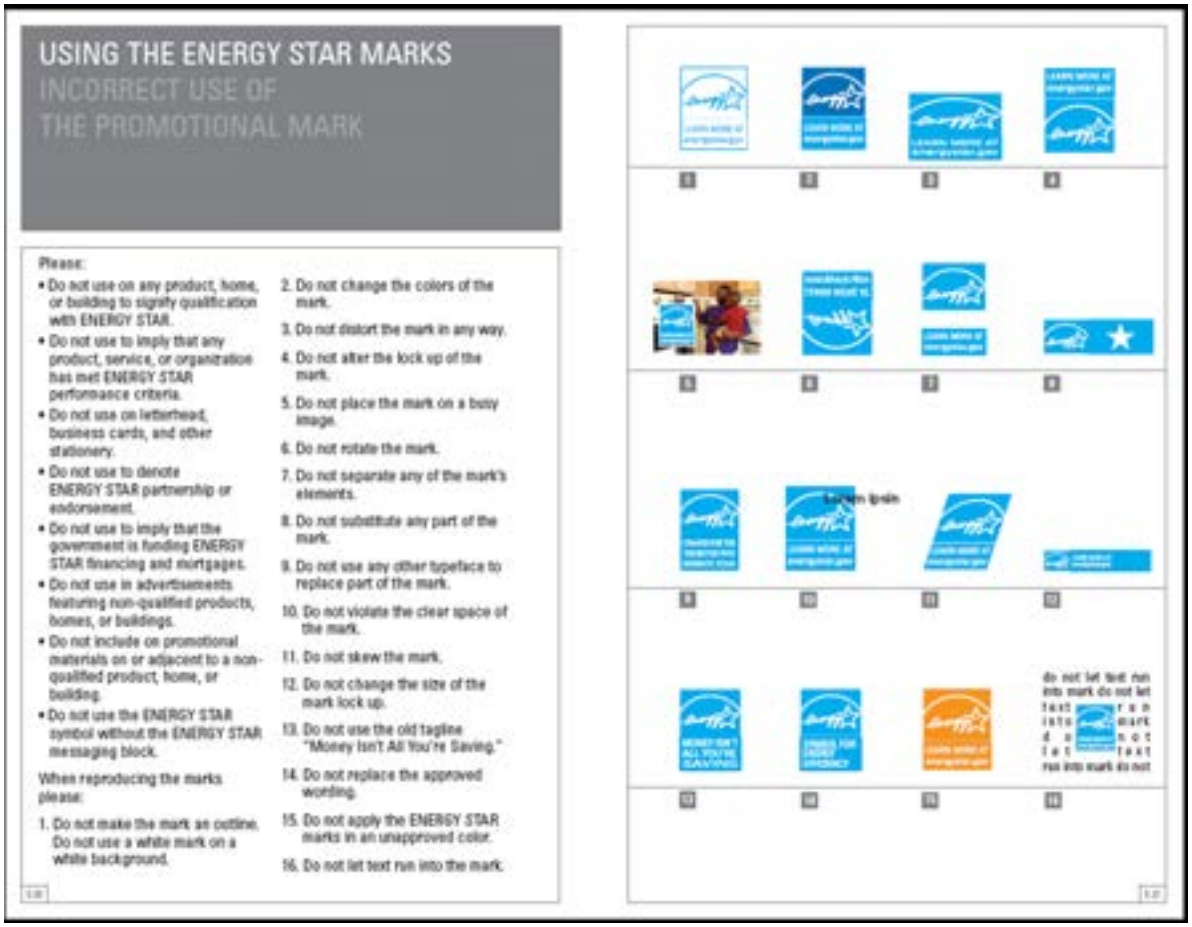


EPA

The ENERGY STAR mark ranks among the highest level of influence on product purchase among all consumer emblems, similar in ranking to the *Good Housekeeping* Seal.

BRAND IDENTITY GUIDELINES



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THE PROMOTIONAL MARK

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- Do not use on letterhead, business cards, and other stationery.
- Do not use to denote ENERGY STAR partnership or endorsement.
- Do not use to imply that the government is funding ENERGY STAR financing and mortgages.
- Do not use in advertisements featuring non-qualified products, homes, or buildings.
- Do not include on promotional materials on or adjacent to a non-qualified product, home, or building.
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14. Do not replace the approved wording.
15. Do not apply the ENERGY STAR marks in an unapproved color.
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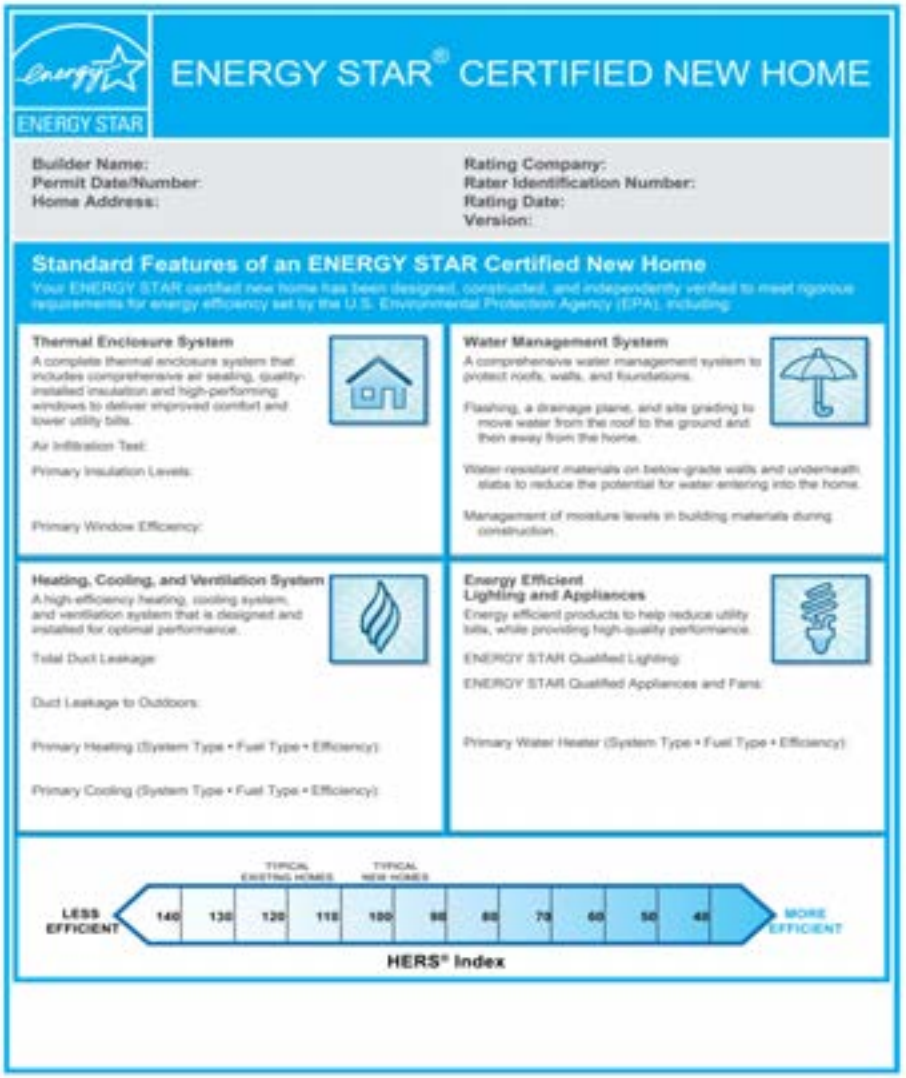

ENERGY STAR® CERTIFIED NEW HOME

Builder Name:
Permit Date/Number:
Home Address:

Rating Company:
Rater Identification Number:
Rating Date:
Version:

Standard Features of an ENERGY STAR Certified New Home

Your ENERGY STAR certified new home has been designed, constructed, and independently verified to meet rigorous requirements for energy efficiency set by the U.S. Environmental Protection Agency (EPA), including:

Thermal Enclosure System

A complete thermal enclosure system that includes comprehensive air sealing, quality-installed insulation and high-performing windows to deliver improved comfort and lower utility bills.

Air Infiltration Test:

Primary Insulation Levels:

Primary Window Efficiency:

Water Management System

A comprehensive water management system to protect roofs, walls, and foundations.

Flashing, a drainage plane, and site grading to move water from the roof to the ground and then away from the home.

Water resistant materials on below-grade walls and underneath slabs to reduce the potential for water entering into the home.

Management of moisture levels in building materials during construction.

Heating, Cooling, and Ventilation System

A high-efficiency heating, cooling system, and ventilation system that is designed and installed for optimal performance.

Total Duct Leakage:

Duct Leakage to Outdoors:

Primary Heating (System Type • Fuel Type • Efficiency):

Primary Cooling (System Type • Fuel Type • Efficiency):

Energy Efficient Lighting and Appliances

Energy efficient products to help reduce utility bills, while providing high-quality performance.

ENERGY STAR Qualified Lighting:

ENERGY STAR Qualified Appliances and Fans:

Primary Water Heater (System Type • Fuel Type • Efficiency):

TYPICAL EXISTING HOMES

TYPICAL NEW HOMES

LESS EFFICIENT 140 130 120 110 100 90 80 70 60 50 40 MORE EFFICIENT

HERS® Index

ENERGY STAR support

- **ENERGY STAR for Homes Website**
  - www.energystar.gov/homes
  - The website is your gateway to marketing and technical resources, trainings, the Partner Locator, and program updates.

- **Contacting ENERGY STAR**
  - General questions about ENERGY STAR can be sent to the ENERGY STAR Hotline.
    - 1.888.STAR.YES
    - hotline@energystar.gov
  - Questions about ENERGY STAR for Homes, including requests for marketing support, reporting issues, and questions about the technical guidelines, can be sent to the ENERGY STAR for Homes Team.
    - energystarhomes@energystar.gov

Questions

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