

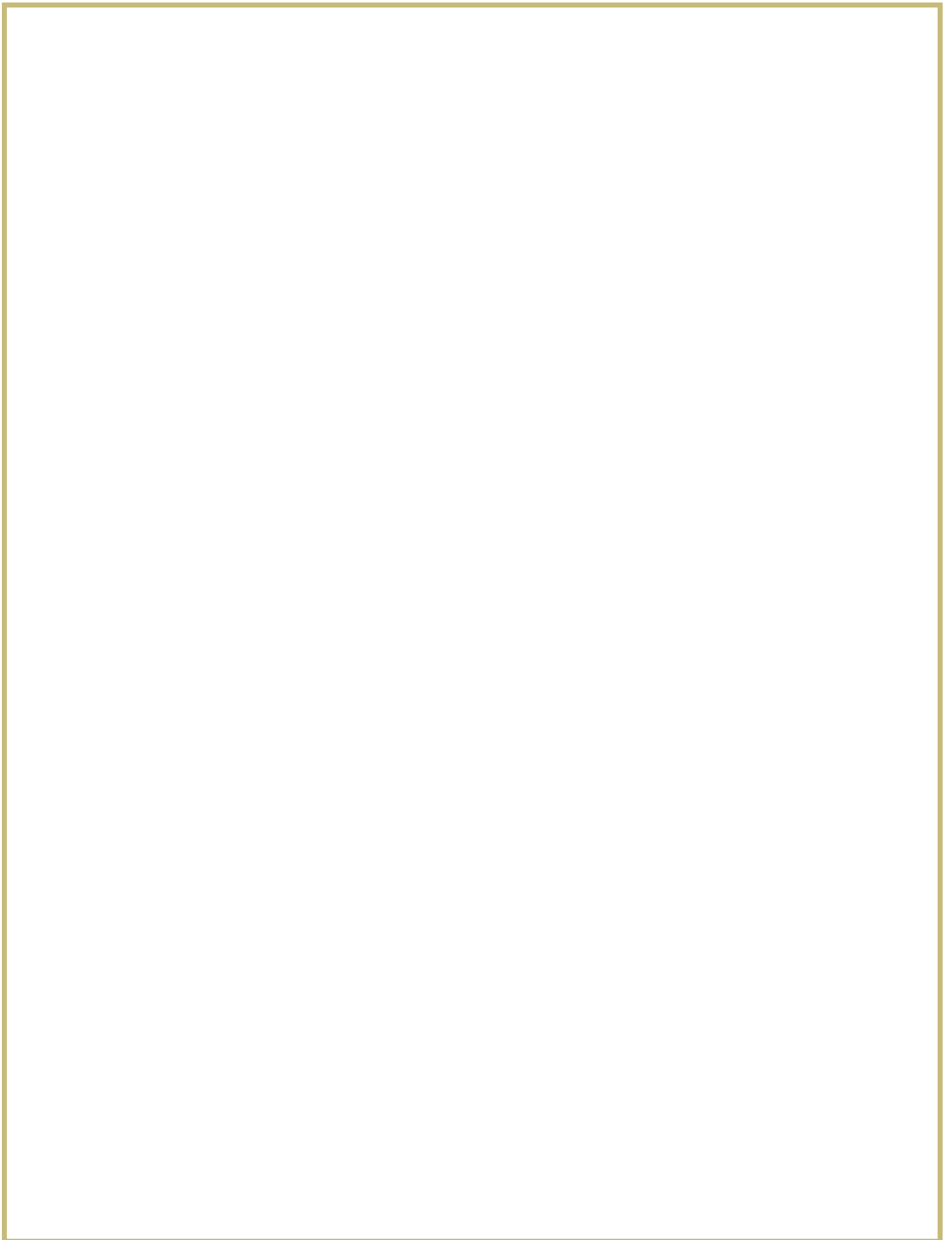
Touchstone Energy® HomeSM Program

2011 Official Building Standards



Build Tight. Ventilate Right.







TOUCHSTONE ENERGY HOME PROGRAM

OFFICIAL CERTIFICATION STANDARDS

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Attention General Contractors and Builders

It is the responsibility of the general contractor and/or builder to communicate Touchstone Energy[®] Home Standards to those subcontractors, agents and/or assigns in order to affect the successful completion of the program registered home. Member electric distribution cooperatives will coordinate general contractor/builder orientation and training at a time convenient to the parties, but the ultimate responsibility to communicate applicable program standards to subcontractors must remain the responsibility of the homeowner's general contractor and builder.

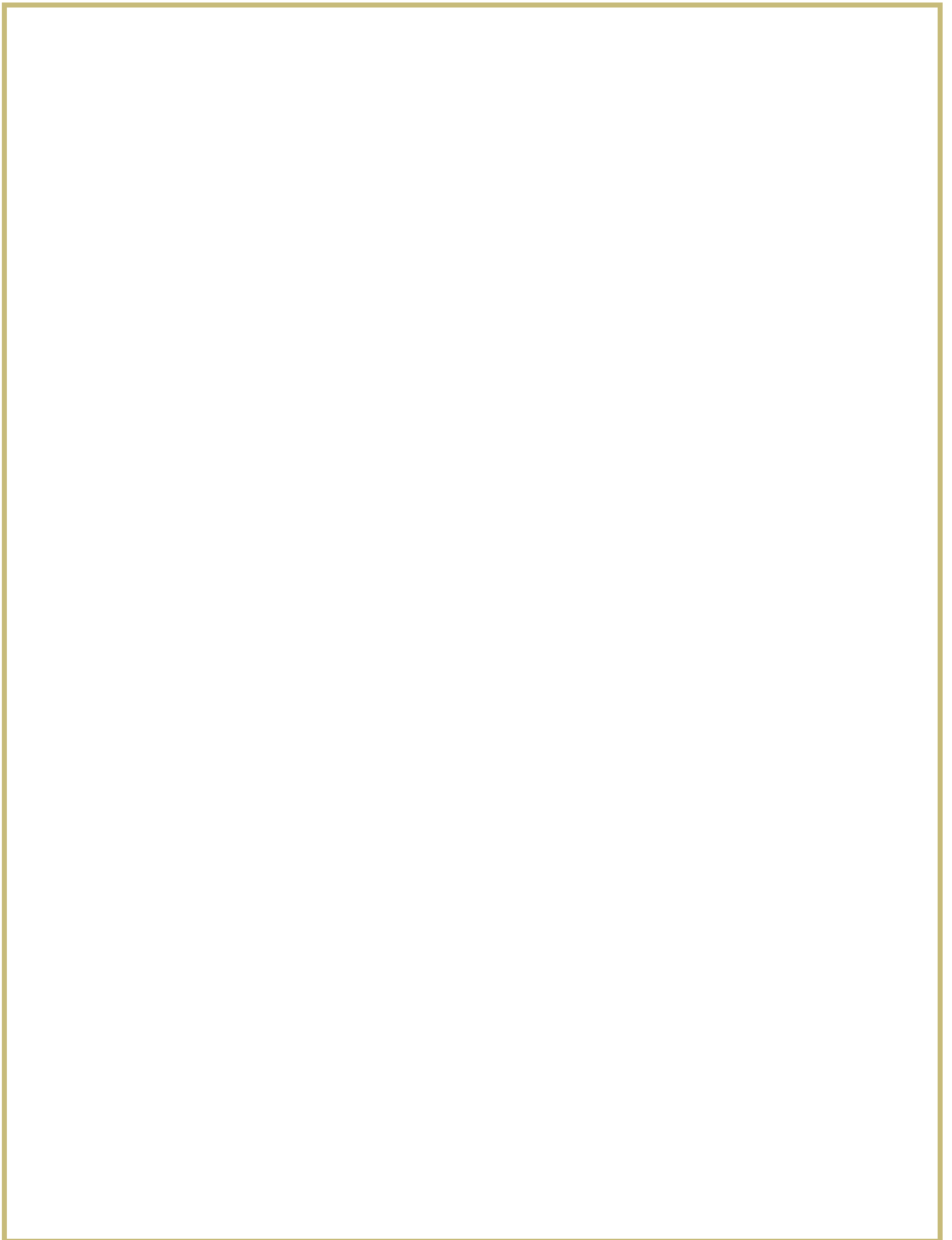


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Available To

The Touchstone Energy® HOMESM Program is available to all electric distribution cooperative member customers that construct or improve their home to meet qualifications set forth in the following HOME program standards.

Qualifications

The program's residential building standard is intended to service weather regions 4 and 5. For more information on the newly defined weather zones, go to:

http://www.energycodes.gov/implement/pdfs/climate_paper_review_draft_rev.pdf.

Touchstone Energy Home criteria for residential buildings per the 2004 International Energy Conservation Code (IECC) includes: Detached one- and two-family dwellings; multiple single family dwellings (townhouses); and, all other residential buildings, three stories or less in height.

The Touchstone Energy® HOMETM Program addresses standards for:

1. New home construction
2. Improved/remodeled homes
3. Manufactured homes
4. Modular homes

Improved/Remodeled Homes shall adhere to the same standards as new homes. The features are required unless notated otherwise. Questions regarding these features should be addressed with your HOME Program representative or the assigned energy rater during the plans review and specification phase.

Ultimately each program registered home must undergo an energy inspection, and be rated out by an accredited HERS Provider and certified home energy rater shall use their experience and discretion in verifying that each inspection checklist item is installed per the inspection guidelines (See Section 7).

A home rating and blower door test shall be completed on all new, improved and remodeled homes. Remodeling projects that are less than whole home in scope are rated on a whole-house basis. As such, improvements may be required throughout the residence in order for the home to qualify as a Touchstone Energy Home. Builders and contractors may review the complete Touchstone Energy Home standard at www.itehome.com.

Speculative Builder and Multi-Family units shall incorporate the same Touchstone Energy® Home features as new or improved conventional homes.

STANDARD CLASSIFICATION KEY

The Touchstone Energy HOME standards incorporate energy saving features into building and remodeling plans. Touchstone Energy Home standards are: broken into seven (7) categories. Each category is classified by number, and is referred to throughout this training manual.

Standard Classification Key	
Residential building standards by section:	1. Insulation
	2. Building envelope
	3. Mechanical systems
	4. Water heating
	5. Lighting & Appliances
	6. Other
	7. Checklist
	8. Manufactured Home Building Standard

The Touchstone Energy® HomeSM Standards & Training Manual is designed to be accompanied by the following booklet when program standards are formally presented for training to builders, contractors, electric cooperative staff and/or other interested parties:

Energy & Environmental Building Association Builder's Guide, Cold Climates, Joseph Lstiburek, Ph.D., P.Eng. Building Science Corporation, 70 West Main Street, Westford, MA 01886, ©Revised 6th printing, 2004.

All cited illustrations (unless specified otherwise) are contained in the above builder's guide. Illustrative examples are provided to complement familiarity and improve retention of the cited standard.

The Energy & Environmental Building Association (EEBA) Builder's Guide is not to be construed as the standards in force under the Touchstone Energy Home Program®, but rather as a reference tool for the standards contained in this manual. Illustration and page number will be referenced in the standard to assist in topic review. The builder's guide is an excellent builder and contractor reference tool for review of today's building and home science practices.

1 INSULATION STANDARD

1A Crawl Spaces Insulation (REQUIRED Feature)

Crawlspaces shall be unvented and conditioned. Code requires that one cubic foot per minute of supply air for every 50 square feet of crawlspace floor area be present in the conditioned space.

Crawl space insulation must be R-10 or better. Perimeter wall insulation is required (rather than floor insulation). (See “Crawlspaces,” EEBA Builder’s Guide, pp. 198-201.)

A 6 mil vapor barrier (retarder) must be placed on the floor of the crawlspace over pea gravel. Joints should be overlapped 12 inches. a 10 mil vapor barrier is recommended. (See section 2D of this standard for additional building envelope requirements.)

Crawl Space Illustrations (See EEBA Builder’s Guide¹)

- **Externally insulated crawlspace: Figure 7.34, p. 220**
- **Internally Insulated crawlspace: Figure 7.35, p. 221**

For related subject-matter, see “Building Envelope” standard “2D.”

1B Basement Perimeter Wall Insulation (REQUIRED Feature)

The total for all wall components (i.e., cumulative R-value) shall be no less than R-10. Interior and/or exterior insulation may be used to achieve the desired effect. (Builders may choose the method of insulation as long as a cumulative R-10 value is reached.)

Wall insulation illustrations

Externally Insulated Concrete Basement Vinyl or Aluminum Siding	Figure 7.26, p. 212
Externally Insulated Concrete Basement Wood Siding	Figure 7.27, p. 213
Connecting crawlspace and basement	Figures 7.20-.21, pp. 206-207
Internally Insulated Concrete Basement	Figures 7.28-.29, pp. 214-215

<i>Technology Update</i>	Steel reinforced, foam wall systems offer energy features that exceed the HOME standard.
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¹ Energy & Environmental Building Association Builder’s Guide, Cold Climates, Joseph Lstiburek, Ph.D., P. Engineering Building Science Corporation, 70 West Main Street, Westford, MA 01886, © Oct., 2004, 6th printing.

INSULATION STANDARD CONTINUED

1C Floors over unheated spaces (REQUIRED Feature)

Rooms over **garage, bonus rooms and cantilevered floors (figure 11.27)** require R-30 fiberglass insulation AND proper blocking and sealing of cavity (that does not include floors over the conditioned crawlspace area). Verify permanent insulation contact with underside of sub-floor decking. An air barrier must be installed at any exposed edges of insulation. Foam and cellulose dense pack do not require R-30. (Also see, Thermal Bypass Inspection Checklist.)

- **Floor over garage illustration: Figure 11.27, p. 280**
- **There should be no open air space between floors over unheated spaces.**

1D Slabs-on-grade insulation (REQUIRED Feature)

Vertical and horizontal insulation must be under slab for the first two feet—R-10 below grade. All slabs must have a minimum 6 mil vapor barrier between ground and slab. A 10 mil vapor barrier is recommended.

Slabs-on-grade insulation illustration: Figures 7.36-.41, pp. 222-227

1E Wall Insulation (REQUIRED Feature)

All walls including attic kneewall's must be **GRADE I**. House wrap or rigid foam insulation products—including extruded polystyrene (XEPS), expanded polystyrene (EPS), and polyurethane (PUR) and/or other like products—with plastic film on both sides and sealing tape at all joints is in place must be installed in accordance with the manufacturer's guidelines. See Figure 3.3 and/or 3.4, pp. 96, 97.

Fiberglass batts shall be face-stapled to the studs. Fibrous batt insulation should not be cut short or cut long and forced/compressed into small areas. To minimize compression, fibrous batts shall be cut around electrical boxes and split around plumbing and wiring. Wet spray cellulose shall be cropped smoothly to prevent convective channels and void cavities between the insulation and sheetrock. Fiberglass shall not be used as a packing material around window or door frames, plumbing stacks or gaps in framing. These areas shall be filled with a foam product(s) or caulking.

INSULATION STANDARD CONTINUED

Interior warm wall vapor barriers are prohibited, unless local, county or state regulations mandate use. Use of these interior warm wall vapor barriers have been shown to be a primary cause of mold when used in conjunction with thermal envelope applications found in today's energy efficient built homes.

Also see Section 2C: Air Leaks, Thermal Sealing and Caulking Requirements

1F Ceiling/Attic Insulation (REQUIRED Feature)

R-42

If blown insulation is applied, it should be installed in accordance to the manufacturer's guidelines stated on the bag. Those guidelines take into account "*installed*" versus "*settled*" density in inches. The guidelines will indicate the number of bags required per 100 square feet for a given R-value.

Attic hatch/drop-down stair cover must be fully gasketed for an air-tight fit; insulation must be in complete alignment with interior wall finish and the attic side air barrier (**Figures 11.44 & 11.45, p. 296**)

For related subject-matter, see "Attic ventilation" (2H).

1G Attic Cocooning (Foam Only)

R-19

Attic cocooning qualifies with high density spray foam insulation (see figure 6.10, page 177), completely covering roof decking, attic non-vented. 2 x 6 cavity fill with ½ lb foam = 19.8 R

2 BUILDING ENVELOPE REQUIREMENTS

2A Home Mechanical Ventilation Rate

The HOME standard recognizes the need to control air infiltration while ensuring indoor air quality. Accordingly, Touchstone Energy Homes will follow ASHRAE 62.2 standards. See CFM chart below.

Note: Supply only ventilation must be installed.

$$\text{ASHRAE 62.2 formula} = [(\# \text{ of bedrooms} + 1) \times 7.5] + (\text{total Sq. Ft.} \times 0.01)$$

CFM Requirements:					
TOTAL FLOOR AREA	BEDROOMS				
	0-1	2-3	4-5	6-7	>7
< 1500	30	45	60	75	90
1501 - 3000	45	60	75	90	105
3001 - 4500	60	75	90	105	120
4501 - 6000	75	90	105	120	135
6001 - 7500	90	105	120	135	150
> 7500	105	120	135	150	165

All Touchstone Energy Homes must be verified and field-tested in accordance with HERS Guidelines by a RESNET-accredited Provider and meet all state and local codes.

General information regarding balanced ventilation systems may be reviewed under “Ventilation Requirements” on pages 314 - 316 of the builder’s guide.

The information contained in the builder’s guide is for information only. Ventilation system type is not mandated by the Touchstone Energy Home standard.

For information on balanced ventilation systems, see Figures 12.9 & 12.10, pp. 324-325)

2B Remodeled Homes

Construction standards apply as presented herein. A home rating and blower door test must be completed on all improved homes. Remodeling projects that are less than whole home in scope are rated on a whole-house basis. As such, improvements may be required throughout the residence in order for the home to qualify as a Touchstone Energy Home.

2C Air Leaks, Thermal Sealing and Caulking Requirements (REQUIRED Feature)

The “New Home Prescriptive & Thermal Bypass Inspection Checklist” must be completed.

All exterior wall system joints, gaps, seams and penetrations are to be sealed on the interior side with durable caulking materials, expanding foams, closed with gasket systems, and/or taped. This includes sealing around tubs and showers, around fireplaces, windows, sill plates, around stairs at exterior walls, at the attic and crawl space panels, at recess light and around all plumbing and electrical penetrations, above and below grade.

Figure 11.6, 11.7 pp. 261, 262
Figure 11.46 p. 297

Figure 11.11 p. 265
Figure 16.6 p. 368

Figure 11.12 p. 266
Figure 16.7 p. 369

BUILDING ENVELOPE CONTINUED

Moreover, the following infiltration practices must be completed to pass inspection. See the builder's guide to reference illustration(s) listed adjacent to requirement.

Pre-inspection criteria	
Caulk and foam basement band joists.	Figure 11.23, p. 276 Figure 11.26, p. 279 Figure 2.26, p. 87
Dropped ceiling/soffit air barrier is fully aligned with insulated framing and any gaps are fully sealed with caulk or foam or fire-rated sealant.	Figure 11.37, p. 291 Figure 11.38, p. 291 Figure 11.40, p. 292
Use blocking to seal basement from crawlspace.	Figure 7.21, p. 207
Caulk wall corners ceiling-to-floor.	Figure 11.19, p. 273
Seal at floor and ceiling HVAC supply boots.	Figure 12.15, p. 329 Figure 12.16, p. 329
Seal bottom and top plate penetrations.	Figure 14.3, p. 351
Seal gap between bottom plate and sub floor (base).	Figure 11.20, p. 274
Caulk and/or foam window/door rough-ins.	Figure 11.8 and 11.9, p. 263
Block and seal floor joist over garage. Dense pack floor joist space with emphasis on permanent insulation contact with underside of sub-floor decking. An air barrier is installed at exposed edges of insulation.	Figure 11.27, p. 280 (ref. 1C)
Caulk bottom plate to the sub-floor on all perimeter walls.	Figure 11.23, p. 276
Caulk and foam butt joints.	—
Block and seal fireplace chase. See Section 6 for "Fireplace" exception Direct vent gas fireplaces are prohibited under section 6.	Figure 11.33, p. 287 Figure 11.34, p. 288 Figure 11.35, p. 289 Figure 11.36, p. 290
Showers/tubs on exterior walls are fully insulated and sheathed with an air barrier.	Figure 11.30, p. 284 Figure 11.31, p. 285 Figure 11.32, p. 286
Air barrier is installed on attic side of insulated wall and is continuous across floor joist at knee wall base or continuous along rafters at exterior wall plate. Insulation is in complete alignment with interior wall finish and attic side air barrier.	Set-back roof: Figure 11.29 ^{-a, -b, -c} pp. 282-283 Roof knee wall: Figure 11.49, p. 300
Seal wall sheathing (foam board).	Figure 11.11, p. 265 Figure 11.12, p. 266
Block and seal wall chases.	—

BUILDING ENVELOPE CONTINUED

Pre-inspection criteria

Caulk or foam wire pulls at ceiling/wall boxes.	Figure 11.43, p. 295 Figure 114.1, p. 348 Figure 14.2, p. 349
Seal pipe shaft/penetrations as required with flashing and/or caulk or foam. (Ex.: utility chase)	Figure 11.41, p. 293
Seal wire pull thru perimeter wall corners.	Figure 14.3, p. 350

After Drywall Criteria

Caulk drywall to sill plate.	—
Caulk all electrical boxes.	Figure 14.1, 14.2, pp. 201-202
Caulk recess lights.	Figure 14.4, p. 351 Figure 14.5, p. 352
Caulk any/all drywall penetrations and recesses.	—

BUILDING ENVELOPE CONTINUED

2D Crawlspace & Moisture Barrier (REQUIRED Feature)

A minimum 6 mil polyethylene vapor diffusion retarder must be used on all crawlspace floors. A 10 mil polyethylene vapor diffusion retarder is recommended. Proper installation requires 12" overlapping seams, and carrying it up the walls and interior columns (over footer and between concrete slab, and 12"- 14" above ground). The continuous polyethylene vapor diffusion retarder is taped at all joints, and mechanically attached to the foundation wall perimeter and sealed. (See: "Vapor Retarders and Water Vapor Permeability" starting on page 107 for a review of this critical topic.)

Crawlspace vents should not be used since the crawlspace area is to be a conditioned area.

See Figures 1.11, p. 33.

Ventilation specifications are subject to state and/or local building codes.

Adherence to the local building code guidelines on the removal of bulk water is required. All steps should be taken to move bulk water away from foundation.

See Figures 7.1-3, pp. 182-184.

Also see: Sub-Grade Drainage System, Figure 10.3, p. 247

2E Exterior Walls/Vapor Barrier (REQUIRED Feature)

An external house wrap must be in place on all HOMEs; except when rigid foam insulation products—including extruded polystyrene (XEPS), expanded polystyrene (EPS), and polyurethane (PUR) and/or other like products—with plastic film on both sides and sealing tape at all joints is in place. House wrap and seals should be applied per manufacturer's guidelines. Failure to properly lap the home will result in wind-driven rain getting behind the siding and running down the house wrap until it eventually enters on the wrong side of the house wrap, facilitating the growth of mold and decay. Proper installation of the house wrap reduces the likelihood that mold will be present in the home months and years later.

House wrap is permeable to vapor, but not bulk water.

Installation Tip: Install house wrap above the top plate on gable ends. House wrap is more than an infiltration barrier; it provides the critical function of being a water drainage plane. It took the place of building paper and needs to be installed in the same way—shingle fashion.

Technology Update: External house wrap is not required over Insulated Concrete Forms (I.C.F.s). Additional ICF reference material is available in the EEBA builder's guide, chapter 19, pp. 405–426.

Interior polyethylene vapor barriers are prohibited in T.E. Homes. These vapor barriers inhibit the release of moisture in the home, creating a potential cause for hazardous mold.

Weep holes are required on Touchstone Energy Homes. Weep holes should be made using a cotton rope or biodegradable material as the moisture wick. The use of today's vapor permeable house wrap makes this feature critically important with today's brick/stone clad homes (See: Figure 2.8, p. 70.)

Landscaping must not block weep holes.

BUILDING ENVELOPE CONTINUED

Weep holes are illustrated in conjunction with various foundation types:

- Internally insulated concrete basement **Figure 7.29, p. 215**
- Internally insulated masonry basement **Figure 7.30, p. 30**
- Monolithic slab **Figure 7.38, p. 224**
- Slab with concrete perimeter **Figure 7.39, p. 225**
- Slab with masonry perimeter **Figure 7.41, p. 227**

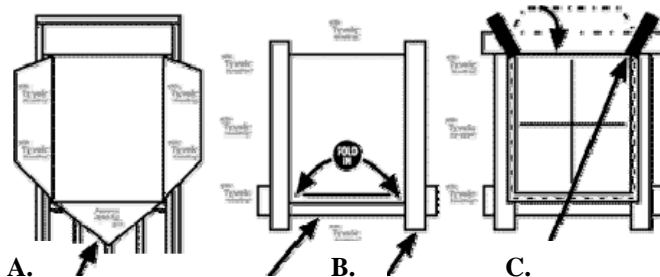
2F Exterior Door and Window Standard (REQUIRED Feature)

- ENERGY STAR qualified windows are required.
- All doors except front entry must be insulated and airtight (these include attic access doors and crawl space access doors).
- Total house-wide window area should not exceed 18% of the home's exterior total square foot wall area. Consult with the assigned energy rater to determine impact on final HERS rating.
- Weather stripping and thresholds are required on ALL exterior doors.
- House wrap must envelope window openings using the modified I fold method. See standard 2E for more on the topic of house wrap.
- When foam sheathing on a wood frame wall is in place**, apply sill flashing, corner flashing, rough opening jam flashing and window jam flashing. Install drip cap (if applicable) and head flashing. Air seal window with sealant or non-expanding foam. (See Figures 2.19-22, pp. 81-83.)

**For a complete review of recommended water management techniques, check out the "Energy & Environmental Building Association™ Water Management Guide," by Joseph W. Lstiburek, Ph.D., P.Eng. © 2002-2004. Pages 37-41.

Water management techniques may also be reviewed in the accompanying EEBA Builders' Guide, Chapter 2, pp. 53-90.

For a more complete series of illustrations, see Figures 2.4, Steps 1-8 pp. 63 -66.



A) House wrap is cut and folded around window opening in "Modified I-Fold" fashion; B) Sill and jamb flashing are put in place; and C) window is placed and self sealing membrane is placed over the top nailing flange.

- Zero (0) to low expanding foam or caulking is to be used to insulate and seal around the door, window rough-in, header and seal plates. **(Figure 2.5, p. 67)**

BUILDING ENVELOPE CONTINUED

- Header and sill plates are required in all load bearing walls. (Figure 11.5, p. 260)
- Pan flashing must be used beneath all windows and doors. (Figures 11.8 & 11.9, p. 263)

2G Glass (REQUIRED Feature)

- Double pane wood with vinyl or aluminum cladding. Aluminum windows require a thermal break.
- Windows require Low E coating (Argon gas fill exceeds the HOME Program standard).
- Touchstone Energy HOME Standard
- Windows U-Factor ≤ 0.30 ; SHGC ≤ 0.40

U-Factor: The overall heat transfer coefficient of the glazing system, U -Factor is a measure of the heat transfer that occurs through the glazing system, and its outer and inner surfaces. This value is a function of temperature, and is expressed in BTU per square foot per hour per degree Fahrenheit (BTU/ sq. ft./hr. degrees F). The lower the U- Factor, the better the insulation qualities of the glazing system.

Solar Heat Gain Coefficient (SHGC): The fraction of solar radiation admitted through a window, both directly transmitted, and absorbed and subsequently released inward. The solar heat gain coefficient has replaced the shading coefficient as the standard indicator of a window's shading ability. It is expressed as a number between 0 and 1. The lower a window's solar heat gain coefficient, the less solar heat it transmits, and the greater its shading ability. SHGC can be expressed in terms of the glass alone or can refer to the entire window assembly.

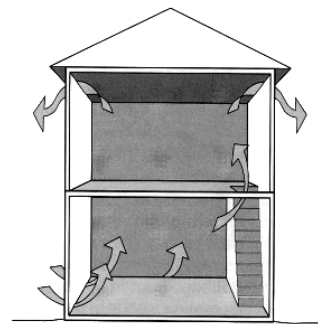
2H Attic Ventilation (Recommended Feature)

- Continuous ridge vent and soffit vent are recommended. Ventilation should equal one square foot for every 150 ft. of attic area without a vapor barrier (1 sq. ft. / 300 ft. with a vapor barrier).
- Baffles between joists at soffit vent are required to inhibit insulation from blocking ventilation, and to prevent "wind wash."
- Cathedral ceilings must be dense pack insulated. A minimum 2" x 8" rafter is required.
- ALL air leaks between house and attic MUST be sealed to inhibit complications resulting from the "Stack Effect." (See also Standard 2C.)

2I Staircase Framing at Exterior Wall/Attic (Recommended Feature)

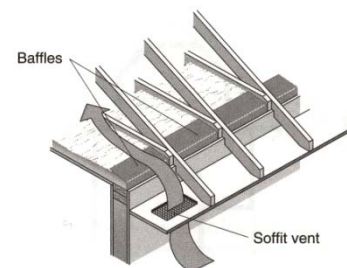
Air barrier is fully aligned with insulated framing and any gaps are fully sealed with caulk or foam.

Stack Effect



Warm air rises and leaves the home through holes near the ceiling; cold air replaces it, entering near the floor.

Baffles at Eaves



Baffles at eaves stop blown insulation from plugging up the ventilation air passageway between soffit and roof vents.

3 MECHANICAL SYSTEMS

3A Heating Equipment (REQUIRED Feature)

HVAC equipment to be sized and installed per ACCA standards. Compressor bearing unit must be sized based upon load calculations, plus 15% or 6,000 Btuh, whichever is less. This maximum oversizing limit for air conditioners applies to climate zone 4. Climate zone 5 maximum oversizing limit is 25%. This information should be provided by the professional contractor or engineer who calculated the sizing (e.g., HVAC contractor).

- **The builder/site assigned RESNET rater will disclose the “Not to Exceed” sizing for HVAC equipment upon review of the new home plans and blueprints.**
- **Over sizing of the air- or ground-source heat pump will result in program disqualification under the Touchstone Energy HOME Program.**

Geothermal Heat Pumps:

Minimum performance requirements:

Closed Loop: COP 3.3 (heating); EER: 14.1 (cooling).

Open Loop: COP 3.6 (heating); EER: 16.2 (cooling)

Air Source Heat Pumps:

Minimum performance requirements:

HSPF 9.25 (Use ARI rating). 15 SEER

Alternative HVAC systems and/or multiple systems collectively oversized per this standard must be approved by the Touchstone Energy Home (HOME) standards committee prior to order and installation of equipment. To aid communications, the “Alternate HVAC Compliance Form” should be completed and forwarded (by E-mail or facsimile) to the HOME standards committee. The form is located on www.itehome.com for the builder's/contractor's convenience. Forms may also be secured through program participating local electric cooperatives.

**GAS AND WOOD CENTRAL HEATING SYSTEMS
ARE PROHIBITED IN TOUCHSTONE ENERGY HOMES.**

MECHANICAL SYSTEMS CONTINUED

3A.1 Thermostat (REQUIRED Feature)

If a programmable thermostat(s) is in place it must have “adaptive recovery” technology to prevent the excessive use of electric back-up heating.

3B Ducts (Recommended features except when stated otherwise.)

1. All ducts should be installed in conditioned space. When ducts cannot be run in conditioned spaces, the ducts must be insulated to a minimum R-6 value and make every attempt to cover with attic insulation (See Section 1F).
2. Ducts must be sealed and tested to ≤ 4 cfm to outdoors/100 sq. ft of conditioned floor area as determined and documented by a RESNET-certified rater using a RESNET-approved testing protocol or through an equivalent ASTM-approved testing protocol.
 - a. Duct leakage testing can be waived if all ducts and the air handling equipment are located in conditioned space **AND** the envelope leakage has been tested to be ≤ 3 ACH50 **OR** ≤ 0.25 per square foot of the building envelope.
3. Transite pipe must be used for slab duct.
4. Duct sealing mastic and mesh is preferred or UL-181A aluminum tape is allowed.
See Figures 12.12 & 12.13, p. 328, Figures 12.14-18, pp. 328-330.
5. Cavities between studs or partitions to be used as return ducts must be isolated from unused spaces with tight fitting sheet metal, wood or gypsum**. **Such cavities will not be used as a plenum for supply air. Stud wall cavities shall not convey air from more than one floor level.**

**Homebuyers who suffer from allergies and dust benefit from sealed return ductwork that does not make use of wall cavities and partition pathways. “Carpet dust marking at baseboards, odor problems, mold problems and pollutant transport problems typically occurs when building cavities are used as return ducts.” [Builders Guide, p. 331]

6. Duct shaft openings to unconditioned space are sealed with solid blocking and any remaining gaps are sealed with caulk or foam.

MECHANICAL SYSTEMS CONTINUED

3C Kitchen and Bath Exhaust systems (REQUIRED Feature)

All exhaust fans must be vented to the outside air with no terminations in the attic or crawlspace, and all vents must include a damper. Fan CFM should be in adherence to manufacturers' sizing guidelines.

- Includes kitchen [indoor electric grills], electric clothes dryers and bath vents.
- All pipe should be smooth walled with minimum elbows and bends (no fiber based on non-metal flex duct or plastic tubing). It should slope downward to the termination outside. Pipe must be insulated. The fan CFM should be rated at 0.25 inches water gauge static pressure or better. The CFM rating is not always stated on the fan or packaging. Builders should consult with their local supplier to confirm fan standard compliance.

Reference Tool: An excellent book on the subject of “understanding ventilation” may be sourced through the Energy and Environmental Builder Association (EEBA) Bookstore, entitled: Understanding Ventilation, by John Bower, published by The Healthy House Institute, Bloomington, IN 47408, ©Copyright 1995. EEBA catalogue #: HH-1565. www.eeba.org/bookstore. Tel.: 952.881.1098; Fax: 952.881.3048.

Build Tight. Ventilate Right.

4 ELECTRIC WATER HEATING

4 Electric Water Heating (REQUIRED Feature)

Gas & Tankless water heaters are prohibited in Touchstone Energy Homes.

- Units must be located in conditioned space.
- New home minimum tank size: 40 gallons.
- Minimum unit energy factor requirements are listed in the table below:

Primary Tank Size	Minimum Energy Factor
40-79 gallon tank	0.92
≥ 80 gallon tank	.91

Note: Energy factor may be less if a manufactured home.

- Pressure relief valves are required.
- Heat traps are required.

Expansion tank placement is highly recommended for those homes featuring a geothermal de-super heater and secondary water holding tank. Minimum EF does not apply.

5 LIGHTING & APPLIANCES

5 Lighting (Airtight IC-Rated Can Lights are REQUIRED; Other Listed Features are Recommended)

ENERGY STAR® qualified lighting fixtures are recommended. Under 2006 guidelines, a maximum of 20% of all screw-in light bulb sockets in the home may use compact fluorescent lamps (CFLs) to increase the HERS Score for ENERGY STAR compliance. CFLs used for this purpose must be ENERGY STAR qualified. Fixtures located in the following locations cannot be counted: storage rooms (like closets, pantries, and sheds) or garages.

Can Lights

When used, these lights are required to be air tight, insulation cover rated fixtures (IC-rated that meet ASTM E283 requirements).

Seal airtight fixtures to drywall with gasket, caulk or foam **required**.

****ALL outlets and boxes must be sealed to drywall.****

For more on recessed lighting, see **Figures 14.4 & 14.5, pp. 351–352.**

Appliances

ENERGY STAR rated appliances are recommended in Touchstone Energy Homes

If you CUT it, CAULK it

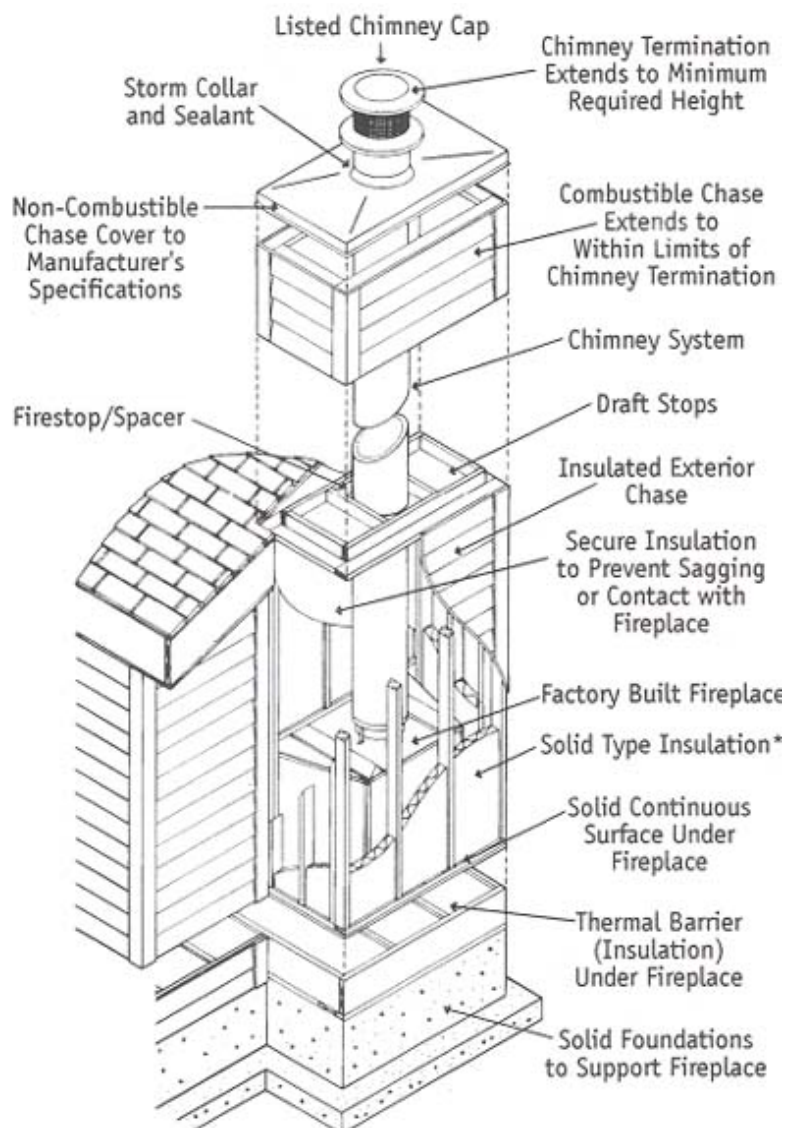
6 OTHER

Fireplace (When placed in home, REQUIRED Feature)

VENTLESS COMBUSTION FIREPLACES ARE PROHIBITED

- Combustion fireplaces must meet the following criteria:
- Unit draws 100% outside air for combustion
- Tight fitting damper is in place
- Tempered door(s) are in place
- Insulated chimney flues are preferred
- Air barrier and thermal barriers are in place (The air barrier is fully aligned with insulated framing in framed shaft behind fireplace and any gaps are fully sealed with caulk or foam.)
- Block and seal fireplace chase.

Fire rated caulk or sealant should be used to seal gaps. Flue is fully sealed with flashing and UL approved metal collars are used between flue and combustible materials.



For other illustrations to that shown, see Figures 11.33-11.26, pp. 287-290.

7 THERMAL BYPASS INSPECTION CHECKLIST

7a. Required Checklist

The Touchstone Energy HOME Program Inspection Checklist is designed in conjunction with the Thermal Bypass Inspection Checklist. This combined form must be completed for program homes to earn the Touchstone Energy Home designation.

- ❖ Conditioned crawlspace with an R-10 insulation perimeter and 6 mill vapor barrier are in place. (No vents are in place and/or existing vents are closed and sealed air-tight)
- ❖ Complete cavity-fill floor insulation over cantilevered floors and unheated spaces are in place (excludes floors over crawlspaces).
- ❖ Electric heat pump (HP) features:
 - Air Source HP: HSPF 9.25; 15 SEER Minimum.
 - Geothermal Heat Pump
 - Electric heat pump must be sized and installed per ACCA standards. Unit is sized based upon rater load calculation, plus 15% or 6,000 Btuh, whichever is less.
- ❖ Electric water heating.
- ❖ Program defined infiltration controls must be in place.
- ❖ R-42 or greater ceiling insulation must be in place.
- ❖ Kitchen/bath externally vented exhaust system is used (fan cfm \geq .25 inches water gauge static pressure or better).
- ❖ Exterior house wrap and window wrap or rigid foam insulation products are used with plastic film on both sides, and sealing tape at all joints is in place.
- ❖ When brick or stone clad, weep holes are in place.
- ❖ HOME Program standard defined ductwork is in place throughout the home (no flex duct).
- ❖ Exterior insulated doors (excludes primary entrance); windows do not exceed 18% of the home's exterior total sq. ft. wall area.
- ❖ Double pane, Low E glass is used for all windows/doors.
- ❖ Airtight, IC-rated recessed light fixtures are sealed to drywall with gasket, caulk or foam.
- ❖ **Grade I** wall insulation is used. (Base on the average calculation method).
- ❖ R-10 basement walls and slab on grade insulation is used.

7b. Required Checklist Features

Touchstone Energy HOME Program Qualified Homes Thermal Bypass Inspection Checklist Features

The Thermal Bypass Inspection Checklist must be completed for homes to earn the Touchstone Energy HOME Program label. The Checklist requires visual inspection of framing areas where air barriers are commonly missed and inspection of insulation to ensure proper alignment with air barriers, thus serving as an extra check that the air and thermal barriers are continuous and complete. State, local, and regional codes, as well as regional Touchstone Energy HOME program requirements, supersede the items specified in this Checklist.

Guidance on Completing the Thermal Bypass Inspection Checklist:

1. Accredited HERS Providers and certified home energy raters shall use their experience and discretion in verifying that each Inspection Checklist item is installed per the inspection guidelines (e.g., identifying minor defects that the Provider or rater deems acceptable versus identifying major defects that undermine the intent of the Checklist item).
2. Alternative methods of meeting the Checklist requirements may be used if the Provider deems them to be equivalent, or more stringent, than the Inspection Checklist guidelines.
3. In the event an item on the Checklist cannot be verified by the rater, the home cannot be qualified as a Touchstone Energy HOME, unless the builder assumes responsibility for verifying, under the direction and oversight of the Provider, that the item has met the requirements of the Checklist. This option is available at the discretion of the Provider or rater but may not be used to verify more than four (4) items on the Inspection Checklist. This responsibility will be formally acknowledged by the builder signing-off on the Checklist for the item(s) that they verified.
4. In the event that a Provider or rater finds an item that is inconsistent with the Checklist Inspection guidelines, the home cannot be qualified as a Touchstone Energy HOME until the item is corrected in a manner that meets the HOME Program requirements. If correction of the item is not possible, the home cannot earn the Touchstone Energy HOME certification.
5. The Provider or rater is required to keep a hard copy record of the completed and signed Checklist. The signature of a builder employee is also required if the builder verified compliance with any item on the Checklist.

For purposes of this Checklist, an air barrier is defined as any solid material that blocks air flow between a conditioned space and an unconditioned space, including necessary sealing to block excessive air flow at edges and seams. Additional information on proper air sealing of thermal bypasses can be found in the EEBA Builder's Guides (www.eeba.org) and on the Building America Web site (www1.eere.energy.gov/buildings/building_america). These references include guidance on identifying and sealing air barriers, as well as details on many of the items included in the Checklist.

Touchstone Energy® HOMESM Program



www.itehome.com

New Home Prescriptive & Thermal Bypass Inspection Checklist

(Energy Rater Control Document — 01/2011)

Attention General Contractors and Builders

It is the responsibility of the general contractor /builder to communicate Indiana Touchstone Energy® Home Standards to subcontractors, agents and/or assigns in order to affect the successful rating of the program registered home. Moreover, the ultimate responsibility to communicate program standards to subcontractors must remain the responsibility of the general contractor/builder.

Step 1: Assignment	Builder Name:				Builder ID:	
	Homeowner Name:			Spouse Name	Site ID:	
	Mailing Address/Street				Address/Street2	
	Mailing Address City			Zip	Email	
	Telephone 1 (Day)				Telephone 2 (Evening)	
Step 2: Pre-Inspection	Assigned RESNET – Certified Rater				Pre-drywall home site inspection date	
	Rater Assignment Date		Rater ID		Post-carpet home site inspection date	
	HVAC Equipment Sizing Based on “Plans & Blueprints” <i>Unit must be sized per ACCA Manual J and S standards and upon rater load calculation, plus 15% or 6,000 Btuh, whichever is less. See “Official Standards,” section 3 for additional information.</i>					
	Total air source or geothermal heat pump capacity:	Cooling Btu/hr		Heating Btu/hr		
Step 3: Inspection	Prescriptive Checklist	Inspection Guidelines			Rater Verified	Builder Verified
	Crawlspace	R-10 or better insulation is in place			<input type="checkbox"/>	<input type="checkbox"/>
		No vents are in place/existing vents are closed and sealed air-tight			<input type="checkbox"/>	<input type="checkbox"/>
		6 mil vapor barrier is in place			<input type="checkbox"/>	<input type="checkbox"/>
	Heat Pump	ASHP is ≥ an HSPF 9.25; 15 SEER			<input type="checkbox"/>	<input type="checkbox"/>
		Geothermal Heat Pump			<input type="checkbox"/>	<input type="checkbox"/>
	Water Heating	0.92 EF for 40-70 gallon; 0.91 EF for ≥ 80 gallon electric water heating unit is in place			<input type="checkbox"/>	<input type="checkbox"/>
	Ceiling Insulation	R-42 or greater insulation is in place			<input type="checkbox"/>	<input type="checkbox"/>
	Vented kitchen/ bath exhaust	Exhaust fans are vented to the outside air with no terminations in the attic or crawlspace. Back dampers are in place.			<input type="checkbox"/>	<input type="checkbox"/>
		All pipe is smooth walled			<input type="checkbox"/>	<input type="checkbox"/>
Exterior wrap/seal	Exterior house wrap/window wrap OR rigid foam insulation is used with plastic film on both sides and sealing tape in place at all joints.			<input type="checkbox"/>	<input type="checkbox"/>	
Weep holes	If brick or stone clad, weep holes are in place			<input type="checkbox"/>	<input type="checkbox"/>	

		<i>Rater</i>	<i>Builder</i>
Ductwork	Cavities between studs or partitions to be used as return ducts are isolated from unused spaces with tight fitting sheet metal, wood or gypsum. Stud wall cavities do not convey air from more than one floor level.	<input type="checkbox"/>	<input type="checkbox"/>
	Duct sealing mastic and mesh or UL-181A aluminum tape is used	<input type="checkbox"/>	<input type="checkbox"/>
	Ducts must be sealed and tested to ≤ 4 cfm to outdoors/100 sq. ft. of conditioned floor area.	<input type="checkbox"/>	<input type="checkbox"/>
	Transite pipe is used for slab ducts	<input type="checkbox"/>	<input type="checkbox"/>
Windows	Exterior insulated doors with weather stripping and thresholds are in place. (Excludes primary entrance)	<input type="checkbox"/>	<input type="checkbox"/>
	Windows do not exceed 18% of the home's exterior total sq. ft. wall area. Double pane, Low E windows/glass doors: <ul style="list-style-type: none"> • Minimum windows U-Factor ≤ 0.30; SHGC ≤ 0.40 	<input type="checkbox"/>	<input type="checkbox"/>
Wall Insulation	Grade I wall insulation is in place.	<input type="checkbox"/>	<input type="checkbox"/>
	Minimum R-10 basement wall insulation is in place.	<input type="checkbox"/>	<input type="checkbox"/>
	An interior warm-wall vapor barrier is <u>not in place</u> anywhere in the home.	<input type="checkbox"/>	<input type="checkbox"/>
	Slab on grade insulation is in place.	<input type="checkbox"/>	<input type="checkbox"/>
Lighting	IC-rated air-tight recessed lighting fixtures sealed airtight to drywall with gasket, caulk or foam	<input type="checkbox"/>	<input type="checkbox"/>
Infiltration Control	<ul style="list-style-type: none"> ▪ Basement band joists are caulked and foamed 	<input type="checkbox"/>	<input type="checkbox"/>
	<ul style="list-style-type: none"> ▪ Dropped ceiling/soffit air barrier is fully aligned with insulated framing and any gaps are fully sealed with caulk, foam or fire-rated sealant 	<input type="checkbox"/>	<input type="checkbox"/>
	<ul style="list-style-type: none"> ▪ Wall corners are caulked ceiling to floor 	<input type="checkbox"/>	<input type="checkbox"/>
	<ul style="list-style-type: none"> ▪ HVAC supply boots are sealed at floor and ceiling 	<input type="checkbox"/>	<input type="checkbox"/>
	<ul style="list-style-type: none"> ▪ Bottom and top plate penetrations are sealed 	<input type="checkbox"/>	<input type="checkbox"/>
	<ul style="list-style-type: none"> ▪ The gap between bottom plate and subfloor (base) is sealed 	<input type="checkbox"/>	<input type="checkbox"/>
	<ul style="list-style-type: none"> ▪ Window/door rough-in's are caulked and/or foamed 	<input type="checkbox"/>	<input type="checkbox"/>
	<ul style="list-style-type: none"> ▪ Floor joists over garage are blocked and sealed. Floor joist space should be dense – packed with emphasis on permanent insulation contact with the underside of the subfloor. 	<input type="checkbox"/>	<input type="checkbox"/>
	<ul style="list-style-type: none"> ▪ Bottom plate to the subfloor is caulked at all perimeter walls 	<input type="checkbox"/>	<input type="checkbox"/>
	<ul style="list-style-type: none"> ▪ Butt joints are caulked and foamed 	<input type="checkbox"/>	<input type="checkbox"/>
	<ul style="list-style-type: none"> ▪ Showers/tubs on exterior walls are fully insulated and sheathed with an air barrier 	<input type="checkbox"/>	<input type="checkbox"/>
	<ul style="list-style-type: none"> ▪ An air barrier is installed on attic side of insulated wall and is continuous across floor joist at knee wall base or continuous along rafters at exterior wall plate. Insulation is in complete alignment with interior wall finish and attic side air barrier. 	<input type="checkbox"/>	<input type="checkbox"/>
	<ul style="list-style-type: none"> ▪ Wall sheathing (foam board) is fully sealed 	<input type="checkbox"/>	<input type="checkbox"/>
	<ul style="list-style-type: none"> ▪ Wall chases are blocked and sealed 	<input type="checkbox"/>	<input type="checkbox"/>
	<ul style="list-style-type: none"> ▪ Wire pulls at ceiling/wall boxes are caulked or foamed 	<input type="checkbox"/>	<input type="checkbox"/>
	<ul style="list-style-type: none"> ▪ Pipe shaft/penetrations are sealed with flashing and/or caulk or foam 	<input type="checkbox"/>	<input type="checkbox"/>
	<ul style="list-style-type: none"> ▪ Wire pull thru perimeter wall corners are sealed 	<input type="checkbox"/>	<input type="checkbox"/>
	<ul style="list-style-type: none"> ▪ Drywall to sill plate is caulked (Post Drywall Criteria) 	<input type="checkbox"/>	<input type="checkbox"/>
<ul style="list-style-type: none"> ▪ All electrical boxes are caulked (Post Drywall Criteria) 	<input type="checkbox"/>	<input type="checkbox"/>	
<ul style="list-style-type: none"> ▪ Recess lights are caulked (Post Drywall Criteria) 	<input type="checkbox"/>	<input type="checkbox"/>	
<ul style="list-style-type: none"> ▪ Any/all drywall penetrations are caulked (Post Drywall Criteria) 	<input type="checkbox"/>	<input type="checkbox"/>	
Mechanical Ventilation	The home's air exchange rate does not exceed a minimum rate of 0.35 natural air changes per hour; Or the air exchange rate is less than 0.35 natural air changes per hour and heat recovery ventilator or air-to-air heat exchanger is installed.	<input type="checkbox"/>	<input type="checkbox"/>
Fireplace	Combustion fireplaces unit draws 100% outside air; glass tempered doors are in place; tight fitting damper is in place; air barrier and thermal barriers are in place.	<input type="checkbox"/>	<input type="checkbox"/>
Signatures	Energy Rater:	Builder/Employee:	

8 MANUFACTURED HOMES BUILDING STANDARDS

The HOME™ Program recognizes the need for improved performance features in the manufactured housing market above that declared in the 1993 Model Energy Code and by the Manufactured Housing Research Alliance (MHRA), the authoritative reference source in the manufactured home building industry. Notably, those published building performance targets are recognized by the DOE and ENERGY STAR. For purposes of this standard, manufactured homes and modular homes are considered the same.

The Touchstone Energy Home Program does not distinguish manufactured homes from new home construction methods. Manufactured/modular homes shall adhere to the same standards as new homes. The features are required unless notated otherwise. Questions regarding these features should be addressed to your HOME Program representative or the assigned energy rater during the plans review and specification phase.

Ultimately each program registered home must undergo an energy inspection, and be rated out by an accredited HERS Provider. The certified home energy rater shall use their experience and discretion in verifying that each inspection checklist item is installed per inspection guidelines (see Section 7). Note that field energy raters will not be able to conduct the pre-drywall and insulation inspection since modules typically arrive pre-finished.

Additional Energy Rater Inspection Guidelines

- Marriage line areas must be filled with non-porous insulating gasket to form a permanent air barrier (i.e., ceiling, end walls and floor).
- All penetrations and tears in the bottom board material must be repaired with durable patch to prevent air leakage (i.e., small holes, utility line and plumbing penetrations and bolt holes).
- For multi-section homes, the crossover ducts must be sealed with a permanent connection as per the manufacturer's installation manual.
 - All crossover ducts have been installed and wrapped with insulation
 - Crossover collars are secured with at least three screws and cannot rotate or move
 - All crossover duct insulation is R-4 in conditioned space and R-10 in unconditioned space
 - Nylon or metal straps and saddles are used to support the crossover duct; duct does not touch the ground
- Rigid skirting and skirting R-10 insulation must be in place if unit is not placed over foundation or basement.
 - Home is skirted with R-10 insulation
 - Home has an unheated basement (insulation is an R-10)
 - Home has a heated basement (insulation is an R-10)

The "Touchstone Energy HOME Manufactured Home Supplemental Inspection Checklist" has been completed in addition to the "New Home Prescriptive & Thermal Bypass Inspection Checklist.

Touchstone Energy® HOMESM Program



Manufactured Home Prescriptive & Thermal Bypass Inspection Checklist

(Energy Rater Control Document — 01/2011)

www.itehome.com

NOTICE

This supplemental form is to be used in conjunction with the Indiana Touchstone Energy New Home Prescriptive & Thermal Bypass Inspection Checklist.

Contacts	Builder Name:				Builder ID:		
	Homeowner Name:				Site ID:		
	Mailing Address/Street			Address/Street2			
	Mailing Address City		Zip		Email		
	Telephone 1 (Home)			Telephone 2 (Cell)			
	Assigned RESNET – Certified Rater						
	Rater Assignment Date		Rater ID				
	Manufacturer Name & Address		Contact				
Telephone							
Notes & Exceptions	Field Rater Inspection Notes						
	Recorded Exceptions					<i>Rater Verified</i>	
	0.92 EF for 40-70 gallon; 0.91 EF for ≥ 80 gallon electric water heating unit is in place					<input type="checkbox"/>	
	Standard thermostat is in place rather than programmable thermostat					<input type="checkbox"/>	

Inspection	Prescriptive Checklist	Inspection Guidelines	Rater Verified
	Marriage Lines Marriage line areas must be filled with non-porous insulating gasket to form a permanent air barrier.	Ceiling	<input type="checkbox"/>
		End walls	<input type="checkbox"/>
		Floor	<input type="checkbox"/>
	Tears in the Bottom Board Material Repaired Durable patch used to prevent air leakage in ...	Small holes	<input type="checkbox"/>
		Utility line and plumbing penetrations	<input type="checkbox"/>
		Bolt holes	<input type="checkbox"/>
	Crossover Ducts For multi-section homes, the crossover ducts must be sealed with a permanent connection as per the manufacturer's installation manual.	All Crossover ducts have been installed and wrapped with insulation	<input type="checkbox"/>
		Crossover collars are secured with at least three screws and cannot rotate or move	<input type="checkbox"/>
		All crossover duct insulation is R-4 in conditioned space and R-10 in unconditioned space	<input type="checkbox"/>
Nylon or metal straps and saddles are used to support the crossover duct; duct does not touch the ground		<input type="checkbox"/>	
Skirting & Insulation Rigid skirting and skirting R-10 insulation must be in place if unit is not placed over foundation or basement.	Home is skirted with R-10 insulation	<input type="checkbox"/>	
	Home has an unheated basement (insulation is an R-10)	<input type="checkbox"/>	
	Home has a heated basement (insulation is an R-10)	<input type="checkbox"/>	
New Home Inspection Checklists	The "New Home Prescriptive & Thermal Bypass Inspection Checklist" AND the "Touchstone Energy Manufactured Home Supplemental Inspection Checklist" have been completed		<input type="checkbox"/>
Signatures/ Date	Energy Rater:	Builder/Employee:	
	Date:	Date:	

DEFINITIONS

Air Retarder: An air retarder is different from a vapor retarder in that it blocks only air and liquid water, not water vapor. Air retarders block drafts of hot or cold air caused by winds and pressure differences between the inside and outside of the house. A house wrap is one form of an air retarder. Typical exterior house wraps are not vapor retarders.

Blower Door Test: This test is performed by a Home Energy Rating System (HERS) professional to check the leakiness of a house. Results of the blower door test and a duct test (to test the leakiness of ducts), along with other information about your house, are entered into a computer simulation program to generate a score, estimate annual energy costs and recommend home improvement.

British Thermal Unit (Btu): A Btu is the amount of heat required to raise the temperature of one pound of water (about 1 pint) by one degree Fahrenheit.

Cubic Feet per Minute (CFM) A unit of measurement of airflow that indicates how many cubic feet of air pass by a stationary point in one minute. In other words, it is a unit for measuring the rate of flow of a gas or air volume into or out of a space at a given temperature. This measurement is often used in measuring air flow from heating or cooling diffusers. It is a rating attributed to fan size.

Coefficient of Performance (COP): A ratio calculated by dividing the total heating capacity provided by the refrigeration system, including circulating fan heat but excluding supplementary resistance (Btu's per hour), by the total electric input (watts) x 3.412.

COP-Cooling: 1) The ratio of the rate of heat removal to the rate of energy input in consistent units, for a complete cooling system or factory-assembled equipment, as tested under a nationally recognized standard or designated operating conditions. 2) COP (Coefficient of Performance) indicates how many times more efficient a particular heat pump is compared to electric resistance. Heating COPs range from 1.5 to 4, depending on climate and location of the unit. A COP of 3.0 corresponds to 300% efficiency and means that the heat pump delivers 3 kW-hours of heat for every kW-hour of electricity it uses.

COP-Heat Pump—Heating: The ratio of the rate of heat delivered to the rate of energy input, in consistent units, for a complete heat pump system under designated operating conditions. Supplemental heat shall not be considered when checking compliance with the heat pump equipment.

DOE: Department of Energy

Duct Sealing: The process which refers to stopping air leaks at joints, seams and other holes, especially in return ducts and plenums. The best method is to use water based latex mastic that meets UL std.181.

Energy Efficiency Ratio (EER): A ratio calculated by dividing the cooling capacity in Btu's per hour (Btuh) by the power input in watts at any given set of rating conditions, expressed in Btuh per watt (Btuh/watt).

Energy Factor (ER): The energy rating of a storage water heater is indicated by its energy factor (EF), an overall efficiency based on the use of 64 gallons of hot water per day. The national appliance standards, which took effect in 1990, require a minimum energy factor by model for all new storage water heaters

DEFINITIONS Continued

Envelope: The term used to refer to the outer structure of a building. The construction of the envelope is critical because it affects the transfer of heat between the inside and outside. The tighter the envelope, the more likely a building is going to be energy-efficient.

Home Energy Rating System (HERS): This rating system offers an objective, standardized evaluation of the energy efficiency of a home, compared to a simulated reference house (same size and shape as the rated home) that meets minimum energy code requirements. The HERS rating results in a score between 0 and 100. The reference house is assigned a score of 80. For every 5% reduction in energy use (compared to the reference house) the score increases by one point. Thus, a Touchstone Energy HOME has a minimum HERS rating of 86, i.e., 30% more energy efficient than the reference house.

Heating Seasonal Performance Factor (HSPF): 1) The factor is determined by the total heating output of a heat pump during its normal annual usage period for heating divided by the total electric power input in watt-hours during the same period. 2) Heating Seasonal Performance Factor (HSPF) is an efficiency rating published by the Air Conditioning & Refrigeration Institute (ARI). The HSPF gives the number of Btus that the heat pump moves for each kilowatt-hour of electricity it uses. The HSPF rating is listed on the Energy Guide Label of every heat pump sold in the United States.

Insulating Concrete Forms (ICFs): Lightweight blocks, commonly made of expanded polystyrene or extruded polystyrene that are filled with concrete and remain in place to provide thermal insulation for concrete walls.

Insulation Cover Rated (IC-Rate): IC-rated lights are typically “double can” fixtures, with one can inside another. The outer can (in contact with insulation) is tested to make sure it remains cool enough to avoid a fire hazard. Look closely at product literature for the IC rating. The IC rating is also stamped on the fixture. If you don't see “IC,” the fixture cannot be installed in cavities that are intended to be insulated.

Low-E Glazing: The term refers to glass surface which is treated with a low-emittance (Low-E) coating. Microscopically thin, virtually invisible, metal or metallic oxide layers are deposited on a window or skylight glazing surface primarily to reduce the U-factor by suppressing radiative heat flow. A typical type of low-E coating is transparent to the solar spectrum (visible light and short-wave infrared radiation) and reflective of long-wave infrared radiation. See www.efficientwindows.org for more information.

Oriented Strand Board (OSB): A board sheathing which is a layered, mat-formed panel product made of strands, flakes or wafers sliced from small diameter, round wood logs and bonded under heat and pressure. OSB's strength comes mainly from the uninterrupted wood fiber, interweaving of the long strands or wafers, and degree of orientation of strands in the surface layers.

R-Value: R-value is a measure of the rate of resistance to non-solar heat loss or gain through a material or assembly. The higher the R-value, the greater the material's resistance to heat flow and the better its insulating value. R-value is the inverse of U-value.

Structural Insulating Panels (SIPs): SIPs consist of two exterior structural panels adhered to a rigid foam insulation core that replaces traditional framing. SIPs typically range in thickness from 4-12" and can be a package system with precut windows and doors

DEFINITIONS Continued

Seasonal Energy Efficiency Ratio (SEER): 1) Seasonal Energy Efficiency Ratio (SEER) is the efficiency measure for centralized heat pump systems. Individual room units heat pump efficiency is rated by Energy Efficient Ratio or EER. SEER and EER are measured in roughly the same way as HSPF. A minimum SEER rating of 13 is required in Touchstone Energy Homes in Indiana. 2) The total cooling output of an air conditioner during its normal annual usage period for cooling, in Btu/h (W), divided by the total electric energy input during the same period, in watt-hours, as determined by DOE 10 CFR Part 430, Subpart B, Test Procedures—the total cooling of a central unitary air conditioner or unitary heat pump in Btu's during its normal annual usage period for cooling divided by the total electric energy input in watt-hours during the same period.

Solar Heat Gain Coefficient (SHGC): The fraction of solar radiation admitted through a window or skylight, both directly transmitted, and absorbed and subsequently released inward. The solar heat gain coefficient has replaced the shading coefficient as the standard indicator of a window's shading ability. It is expressed as a number between 0 and 1. The lower a window's solar heat gain coefficient, the less solar heat it transmits, and the greater its shading ability. SHGC can be expressed in terms of the glass alone or can refer to the entire window assembly.

U-Value (or U-factor): ¹ A measure of the rate of non-solar heat loss or gain through a material or assembly. In windows, the U-value may be expressed for the glass alone or the entire window, which includes the effect of the frame and the spacer materials. For a wall assembly, the U-value typically reflects all the components such as studs, concrete blocks, insulation, and wall board. The lower the U-factor, the greater the material's resistance to heat flow and the better its insulating value. U-value is the inverse of R-value. ² **U-Factor:** The overall heat transfer coefficient of the glazing system, U - Factor is a measure of the heat transfer that occurs through the glazing system, and its outer and inner surfaces. This value is a function of temperature, and is expressed in BTU per square foot per hour per degree Fahrenheit (BTU/ sq. ft. /hr. degrees F). The lower the U- Factor, the better the insulation qualities of the glazing system.

Vapor Diffusion Retarder (a/k/a Vapor Retarder): A vapor retarder is defined by ASTM Standard C755 as a material or system that adequately retards the transmission of water vapor under specified conditions. The permeance of an adequate retarder for residential construction will not exceed 1 perm. A perm rating is a measure of the flow of water vapor through a material. Vapor diffusion accounts for only a small amount of the total moisture in a building. Therefore, other mechanisms should be utilized to retard moisture migration.

A vapor retarder slows the rate of water vapor diffusion but does not totally prevent its movement. Building occupants, certain appliances, and plumbing equipment generate moisture that is carried in the air as vapor. As water vapor moves from a warm interior through construction materials to a cooler surface, the water vapor may condense as liquid water that could damage the building. It is for this reason vapor retarders that retard the flow of moisture through construction materials are installed in buildings.



This publication is provided courtesy of:

Touchstone Energy® HOME Program Committee

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