ENERGY STAR® Certified Homes, Version 3 (Rev. 07)
Prescriptive Path Design Requirements Checklist

CUSTOMER NAME or ADDRESS:_____ **HOME ID:**_____

Inspection Guidelines	Plant QC	Builder Verified	Rater Verified	N/A
Home Size				
The conditioned floor area (CFA) is _____ sq. ft., and is less than or equal to the Benchmark Home [1]	☐	☐	☐	☐
Hot Climates (2009 IECC CZs 1,2,3) [2] / **Mixed & Cold Climates (2009 IECC CZs 4,5,6,7,8)** [2]				
Cooling Equipment *(Where Provided)* [3]				
• ≥ 14.5 SEER / 12 EER ENERGY STAR certified AC, ***OR*;** • Heat pump (see Heating Equipment) / • 13 SEER AC, ***OR*;** • Heat pump (see Heating Equipment)	☐	☐	☐	☐
Heating Equipment [3]				
• ≥ 80 AFUE gas furnace, ***OR*;** • ≥ 80 AFUE oil furnace, ***OR*;** • ≥ 80 AFUE boiler, ***OR*;** • ≥ 8.2 HSPF / 14.5 SEER / 12 EER air-source heat pump, ENERGY STAR certified with electric backup or ENERGY STAR certified dual-fuel backup heating, ***OR*;** • Ground source heat pump, any product type, ENERGY STAR certified [5] / • ≥ 90 AFUE gas furnace, ***OR*;** • ≥ 85 AFUE oil furnace, ENERGY STAR certified, ***OR*;** • ≥ 85 AFUE boiler, ENERGY STAR certified, ***OR*;** • Air-source heat pump [4], ENERGY STAR certified with efficiency as follows: *CZ 4:* ≥ 8.5 HSPF / 14.5 SEER / 12 EER with electric backup, ***OR*;** *CZ 5:* ≥ 9.25 HSPF / 14.5 SEER / 12 EER with electric backup, ***OR;*** *CZ 6:* ≥ 9.5 HSPF / 14.5 SEER / 12 EER with electric backup, ***OR;*** • ≥ 8.2 HSPF / 14.5 SEER / 12 EER ENERGY STAR certified air-source heat pump with ENERGY STAR certified dual-fuel backup heating, ***OR;*** • Ground-source heat pump, any product type, ENERGY STAR certified [5]	☐	☐	☐	☐
Envelope, Windows & Doors				
Hot Climates[2] (2009 IECC CZs 1,2,3): If more than 10 linear feet of ductwork are located in an unconditioned attic, a radiant barrier or ENERGY STAR certified roof product shall be installed [6]	☐	☐	☐	☐
Ceiling, wall, floor and slab insulation levels meet or exceed 2009 IECC levels and achieve Grade I installation per RESNET Standards [7,8,9]	☐	☐	☐	☐
If home has ≤ 15% window-to-floor area, all windows, doors and skylights are ENERGY STAR certified [10]	☐	☐	☐	☐
If home has > 15% window-to-floor area, all windows, doors and skylights meet the adjusted U-Values or SHGCs outlined in note 11	☐	☐	☐	☐
For homes subject to testing, infiltration rate is less than or equal to the following values: [12] *Circle one:* **6 ACH50** in CZs 1,2 **5 ACH50** in CZs 3,4 **4 ACH50** in CZs 5,6,7 **3 ACH50** in CZ 8	☐	☐	☐	☐
Water Heater [13]				
Circle one: **30 Gal** **40 Gal** **50 Gal** **60 Gal** **70 Gal** **80 Gal**				
• Gas 0.63 EF 0.61 EF 0.59 EF 0.57 EF 0.55 EF 0.53 EF	☐	☐	☐	☐
• Electric 0.94 EF 0.93 EF 0.92 EF 0.91 EF 0.90 EF 0.89 EF	☐	☐	☐	☐
• Oil 0.55 EF 0.53 EF 0.51 EF 0.49 EF 0.47 EF 0.45 EF	☐	☐	☐	☐
Thermostat & Ductwork				
Programmable thermostat installed (unless thermostat controls a zone with electric radiant heat, for which a manual thermostat is allowed) [14]	☐	☐	☐	☐
Supply ducts in unconditioned attics have insulation ≥ R-8; all other ducts in unconditioned space have insulation ≥ R-6	☐	☐	☐	☐
Total duct leakage shall be ≤ 8 CFM25 per 100 sq. ft. of conditioned floor area [15]	☐	☐	☐	☐
Duct leakage to outdoors is ≤ 4 CFM25 per 100 sq. ft. of conditioned floor area [15,16]	☐	☐	☐	☐
Lighting & Appliances				
ENERGY STAR certified light bulbs or fixtures installed in 80% of RESNET-defined Qualifying Light Fixture Locations [17] *Alternate:* ENERGY STAR Advanced Lighting Package [18]	☐	☐	☐	☐
Where installed *(check all that apply)*, products shall be ENERGY STAR certified [17] ☐ Refrigerator ☐ Dishwasher ☐ Ceiling Fans ☐ Exhaust Fans [19]	☐	☐	☐	☐

Plant QC Signature: _____ Inspection Date: _____

Builder Signature: _____ Inspection Date: _____

Rater Signature: _____ Inspection Date: _____

ENERGY STAR® Certified Homes, Version 3 (Rev. 07)
Prescriptive Path Design Requirements Checklist

Notes

1. The average-size home with a specific number of bedrooms is termed the “Benchmark Home”. The conditioned floor area of a Benchmark Home (CFA Benchmark Home) is determined by selecting the appropriate value from Exhibit 3. For homes with more than 8 bedrooms, the CFA Benchmark Home shall be determined by multiplying 600 sq. ft. times the total number of bedrooms and adding 400 sq. ft.

   Example: CFA Benchmark Home for a 10 bedroom home = (600 sq. ft. x 10) + 400 sq. ft. = 6,400 sq. ft.

Exhibit 3: Benchmark Home Size

No. of Bedrooms in Home to be Built	0	1	2	3	4	5	6	7	8
Conditioned Floor Area Benchmark Home	1,000	1,000	1,600	2,200	2,800	3,400	4,000	4,600	5,200

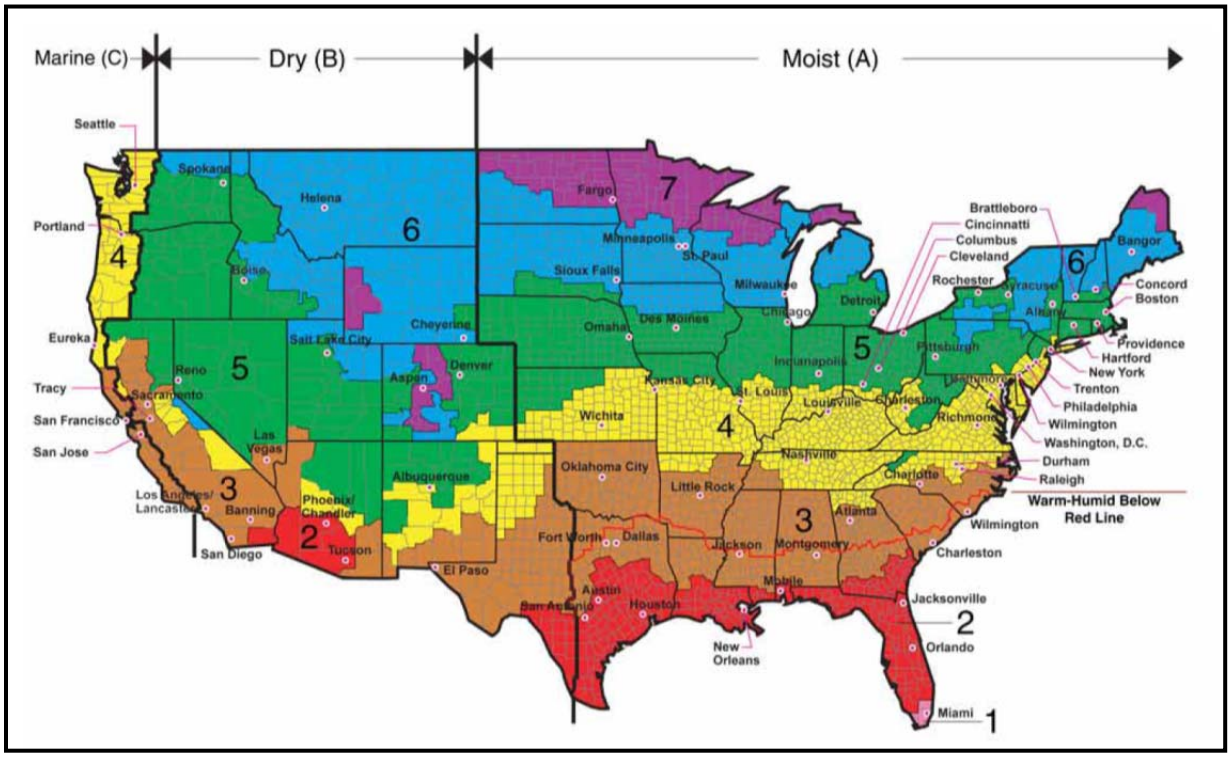
A bedroom is defined by RESNET as a room or space 70 sq. ft. or greater size, with egress window and closet, used or intended to be used for sleeping. A "den", "library", or "home office" with a closet, egress window, and 70 sq. ft. or greater size or other similar rooms shall count as a bedroom, but living rooms and foyers shall not.

An egress window, as defined in 2009 IRC section R310, shall refer to any operable window that provides for a means of escape and access for rescue in the event of an emergency. The egress window definition has been summarized for convenience. The egress window shall:

- have a sill height of not more than 44 inches above the floor; AND
- have a minimum net clear opening of 5.7 sq. ft.; AND
- have a minimum net clear opening height of 24 in.; AND
- have a minimum net clear opening width of 20 in.; AND
- be operational from the inside of the room without the use of keys, tools or special knowledge

Calculate the number of bedrooms and the CFA of the home to be built using RESNET standards with the following exceptions: floor area in basements with at least half of the gross surface area of the basement’s exterior walls below grade shall not be counted. To determine whether at least half of the basement wall area is below grade, use the gross surface area of the walls that are in contact with either the ground or ambient outdoor air, measured from the basement floor to the bottom of the basement ceiling framing (e.g., the bottom of the joists for the floor above). Note that the exception regarding the floor area in basements is only for the purpose of determining a home’s Benchmark Home Size, Size Adjustment Factor, and eligibility to use the Prescriptive Path. The full conditioned floor area, per RESNET’s standards, should be used when rating the home (e.g., determining compliance with duct leakage requirements).

2. The following map is shown to depict Climate Zone boundaries. It is for illustrative purposes only and is based on 2009 IECC Figure 301.1.



Zone 1 includes: Hawaii, Guam Puerto Rico and the Virgin Islands. All of Alaska in Zone 7 except for the following Boroughs in Zone 8: Bethel, Dellingham, Fairbanks, N. Star, Nome North Slope, Northwest Artic, Southeast Fairbanks, Wade Hampton, and Yukon-Koyukuk

3. Where ENERGY STAR certified heating or cooling systems are required, all installed equipment of that system type must be ENERGY STAR certified. For ENERGY STAR Certified Product Criteria, see www.energystar.gov/index.cfm?c=products.pr_find_es_products.

4. The required efficiency for air source heat pumps in CZs 4, 5 and 6 exceed the ENERGY STAR minimum of 8.2 HSPF. Air source heat pumps with electric resistance backup heating cannot be used in homes certified in CZs 7 and 8 using the Prescriptive Path.
5. The following efficiency levels shall be used based on ground-source heat pump product type:
   - Closed Loop Water-to-Air: ≥ 3.5 COP / 16.1 EER
   - Open Loop Water-to-Air: ≥ 3.8 COP / 18.2 EER
   - Direct Geo-Exchange (DGX): ≥ 3.6 COP / 16 EER
   - Closed Loop Water-to-Water: ≥ 3.0 COP / 15.1 EER
   - Open Loop Water-to-Water: ≥ 3.4 COP / 19.1 EER
6. Any radiant barrier with a minimum initial reflectance of 0.90 and a maximum initial remittance of 0.10 meet the requirement for a radiant barrier. For ENERGY STAR Certified Roof Product Criteria, see www.energystar.gov/index.cfm?c=roof_prods.pr_crit_roof_products
7. Insulation levels in a home shall meet or exceed the component insulation requirements in the 2009 IECC – Table 402.1.1 (see page 4.13). The following exceptions apply:
   a. Steel-frame ceilings, walls, and floors shall meet the insulation requirements of the 2009 IECC – Table 402.2.5. In CZ 1 and 2, the continuous insulation requirements in this table shall be allowed to be reduced to R-3 for steel-frame walls with studs spaced at 24 in. on center. This exception shall not apply if the alternative calculations in d) are used;
   b. For ceilings with attic spaces, R-30 shall satisfy the requirement for R-38 and R-38 shall satisfy the requirement for R-49 wherever the full height of uncompressed insulation at the lower R-value extends over the wall top plate at the eaves. This exemption shall not apply if the alternative calculations in d) are used;
   c. For ceilings without attic spaces, R-30 shall satisfy the requirement for any required value above R-30 if the design of the roof/ceiling assembly does not provide sufficient space for the required insulation value. This exemption shall be limited to 500 square ft. or 20% of the total insulated ceiling area, whichever is less. This exemption shall not apply if the alternative calculations in d) are used;
   d. An alternative equivalent U-factor or total UA calculation may also be used to demonstrate compliance, as follows:

      An assembly with a U-factor equal or less than specified in 2009 IECC – Table 402.1.3 complies (see page 4.13).

      A total building thermal envelope UA that is less than or equal to the total UA resulting from the U-factors in Table 402.1.3 also complies. The insulation levels of all non-fenestration components (i.e., ceilings, walls, floors, and slabs) can be traded off using the UA approach. Note that fenestration products (i.e., windows, skylights, doors) shall not be included in this calculation. Also, note that while ceiling and slab insulation can be included in trade-off calculations, Items 4.1 through 4.3 of the Thermal Enclosure System Checklist shall be met regardless of the UA tradeoffs calculated. The UA calculation shall be done using a method consistent with the ASHRAE Handbook of Fundamentals and shall include the thermal bridging effects of framing materials. The calculation for a steel-frame envelope assembly shall use the ASHRAE zone method or a method providing equivalent results, and not a series-parallel path calculation method.
8. Consistent with the 2009 IECC, slab edge insulation is only required for slab-on-grade floors with a floor surface less than 12 inches below grade. Slab insulation shall extend to the top of the slab to provide a complete thermal break. If the top edge of the insulation is installed between the exterior wall and the edge of the interior slab, it shall be permitted to be cut at a 45-degree angle away from the exterior wall.
9. Insulation shall be verified by a Rater to achieve Grade I installation as defined in the RESNET Standards, except for ceiling, wall, and floor assemblies with continuous rigid insulation sheathing. For such homes, Grade II installation is acceptable for the cavity insulation only if the rigid insulation sheathing meets or exceeds the following levels: R-3 in CZs 1 to 4; R-5 in CZs 5 to 8.
10. All windows, doors, and skylights shall meet or exceed ENERGY STAR Program Requirements for Residential Windows, Doors, and Skylights – Version 5.0 as outlined at www.energystar.gov/windows, and as illustrated below:

	CZs 1,2		**CZ 3**		**CZ 4**		**CZs 5,6,7,8**	
	U-Value	SHGC	U-Value	SHGC	U-Value	SHGC	U-Value	SHGC
Windows:	0.60	0.27	0.35	0.30	0.32	0.40	0.30	Any
Skylights:	0.70	0.30	0.57		0.55		0.55	

Doors:	Opaque: 0.21, No SHGC rating	≤ ½ lite: 0.27 U-Value, 0.30 SHGC	> ½ lite: 0.32 U-Value, 0.30 SHGC

11. All decorative glass and skylight window areas count toward the total window area to above-grade conditioned floor area (WFA) ratio. For homes that have a WFA ratio >15%, the following additional requirements apply:
    a. In CZs 1, 2 and 3, an improved window SHGC is required and is determined by:

       Improved SHGC = [0.15 / WFA] x [ENERGY STAR SHGC]

       Where the ENERGY STAR SHGC is the maximum allowable SHGC in Exhibit 1, ENERGY STAR Reference Design, for the Climate Zone where the home will be built.
    b. In CZs 4, 5, 6, 7 and 8, an improved window U-Value is required and is determined by:

       Improved U-Value = [0.15 / WFA] x [ENERGY STAR U-Value]

       Where the ENERGY STAR U-Value is the maximum allowable U-Value in Exhibit 1, ENERGY STAR Reference Design, for the Climate Zone where the home will be built.

12. This test is subject to the one (1) in every seven (7) sampling protocol, but must be completed for the first two (2) homes built by the builder and the three (3) required certification homes for a plant. Envelope leakage shall be determined by a Rater using a RESNET-approved testing protocol.

13. To determine domestic hot water (DHW) EF requirements for additional tank sizes, use the following equations:

    Gas DHW EF ≥ 0.69 - (0.002 x Tank Gallon Capacity)

    Electric DHW EF ≥ 0.97 - (0.001 x Tank Gallon Capacity)

    Oil DHW EF ≥0.61 - (0.002 x Tank Gallon Capacity)

    The minimum efficiency for instantaneous water heaters shall be determined using the above equations and assuming a 1 gallon capacity.

    Domestic hot water systems that are integrated with the space-heating system are permitted to be used in the following two scenarios: either the space-heating system (e.g., furnace or boiler) shall heat and circulate a fluid through an indirect storage tank, or a single integrated/combined product intended for both space heating and domestic hot water shall be used. A 'tankless coil water heater', where domestic water flows through a coil installed in the space-heating system, is not permitted.

14. For homes with heat pumps that contain an electric resistance heating element used to supplement the capacity of the heat pump, the thermostat shall have "Adaptive Recovery" technology to prevent the excessive use of electric backup heating.

15. Duct leakage shall be determined by a Rater using a RESNET-approved testing protocol. Leakage limits shall be assessed on a per-system, rather than per-home, basis.

16. For homes that have ≤ 1,200 sq. ft. of conditioned floor area, measured duct leakage to outdoors shall be ≤ 5 CFM25 per 100 sq. ft. of conditioned floor area. Testing of duct leakage to the outside can be waived if all ducts and air handling equipment are located within the home's air and thermal barriers AND envelope leakage has been tested to be less than or equal to half of the Prescriptive Path infiltration limit for the Climate Zone where the home is to be built. Alternatively, testing of duct leakage to the outside can be waived if total duct leakage is ≤ 4 CFM25 per 100 sq. ft. of conditioned floor area, or ≤ 5 CFM25 per 100 sq. ft. of conditioned floor area for homes that have less than 1,200 sq. ft. of conditioned floor area.

17. For ENERGY STAR Certified Product Criteria, see www.energystar.gov/index.cfm?c=products.pr_find_es_products.

18. The ENERGY STAR Advanced Lighting Package (ALP), which requires a minimum of 60% ENERGY STAR certified hard-wired fixtures and 100% ENERGY STAR certified ceiling fans, where installed, may also be used to comply with the lighting requirements. For more information, see www.energystar.gov/index.cfm?c=bldrs_lenders_raters.ALP_Builder.

19. All exhaust fans shall be ENERGY STAR certified, except in half bathrooms. A half bathroom is any bathroom that does not contain a bathtub, shower, spa, or similar source of moisture.

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Performance Path Design Requirements Checklist

CUSTOMER NAME or ADDRESS: _____ **HOME ID:**_____

Inspection Guidelines	Plant QC	Builder Verified	Rater Verified	N/A
HERS Index				
HERS Index _____ is less than or equal to the ENERGY STAR HERS Index Target [1] _____	☐	☐	☐	☐
The conditioned floor area (CFA) is less than or equal to the Benchmark Home [2] ***OR;*** The following Size Adjustment Factor (SAF) [3] has been applied: _____	☐	☐	☐	☐
Envelope, Windows & Doors				
Hot Climates (2009 IECC CZs 1,2,3): If more than 10 linear feet of ductwork are located in an unconditioned attic, a radiant barrier or ENERGY STAR certified roof product shall be installed [4]	☐	☐	☐	☐
Ceiling, wall, floor and slab insulation levels meet or exceed 2009 IECC levels and achieve RESNET-defined Grade I installation or, alternatively, Grade II for surfaces with insulated sheathing (see Thermal Enclosure System Checklist item 4.4.1 for required insulation levels) [5,6,7]	☐	☐	☐	☐
All windows, doors and skylights meet or exceed 2009 IECC requirements [8]	☐	☐	☐	☐
Thermostat & Ductwork				
Programmable thermostat installed (unless thermostat controls a zone with electric radiant heat, for which a manual thermostat is allowed) [9]	☐	☐	☐	☐
Supply ducts in unconditioned attics have insulation ≥ R-8; all other ducts in unconditioned space have insulation ≥ R-6	☐	☐	☐	☐
Total duct leakage shall be ≤ 8 CFM25 per 100 sq. ft. of conditioned floor area [10]	☐	☐	☐	☐
Duct leakage to outdoors shall be ≤ 4 CFM25 per 100 sq. ft. of conditioned floor area [10,11]	☐	☐	☐	☐

Plant QC Signature: _____ Inspection Date: _____

Builder Signature: _____ Inspection Date: _____

Rater Signature: _____ Inspection Date: _____

ENERGY STAR® Certified Homes, Version 3 (Rev. 07)
Performance Path Design Requirements Checklist

Notes

1. For a complete definition of the ENERGY STAR Reference Design to be used when determining the ENERGY STAR HERS Index Target, see the document titled "ENERGY STAR HERS Index Target Procedure, Version 3 (Rev. 07)".

ENERGY STAR HERS Index Target = HERS Index of ENERGY STAR Reference Design Home x SAF

2. The average-size home with a specific number of bedrooms is termed the "Benchmark Home". The conditioned floor area of a Benchmark Home (CFA Benchmark Home) is determined by selecting the appropriate value from Exhibit 3. For homes with more than 8 bedrooms, the CFA Benchmark Home shall be determined by multiplying 600 sq. ft. times the total number of bedrooms and adding 400 sq. ft.

   Example: CFA Benchmark Home for a 10 bedroom home = (600 sq. ft. x 10) + 400 sq. ft. = 6,400 sq. ft.

Exhibit 3: Benchmark Home Size

No. of Bedrooms in Home to be Built	0	1	2	3	4	5	6	7	8
Conditioned Floor Area $_{\text{Benchmark Home}}$	1,000	1,000	1,600	2,200	2,800	3,400	4,000	4,600	5,200

   A bedroom is defined by RESNET as a room or space 70 sq. ft. or greater size, with egress window and closet, used or intended to be used for sleeping. A "den", "library", or "home office" with a closet, egress window, and 70 sq. ft. or greater size or other similar rooms shall count as a bedroom, but living rooms and foyers shall not.

   An egress window, as defined in 2009 IRC section R310, shall refer to any operable window that provides for a means of escape and access for rescue in the event of an emergency. The egress window definition has been summarized for convenience. The egress window shall:

   - have a sill height of not more than 44 inches above the floor; AND
   - have a minimum net clear opening of 5.7 sq. ft.; AND
   - have a minimum net clear opening height of 24 in.; AND
   - have a minimum net clear opening width of 20 in.; AND
   - be operational from the inside of the room without the use of keys, tools or special knowledge

   Calculate the number of bedrooms and the CFA of the home to be built using RESNET standards with the following exceptions: floor area in basements with at least half of the gross surface area of the basement's exterior walls below grade shall not be counted. To determine whether at least half of the basement wall area is below grade, use the gross surface area of the walls that are in contact with either the ground or ambient outdoor air, measured from the basement floor to the bottom of the basement ceiling framing (e.g., the bottom of the joists for the floor above). Note that the exception regarding the floor area in basements is only for the purpose of determining a home's Benchmark Home Size, Size Adjustment Factor, and eligibility to use the Prescriptive Path. The full conditioned floor area, per RESNET's standards, should be used when rating the home (e.g., determining compliance with duct leakage requirements).

3. For all single-family detached homes, townhomes, rowhomes, duplexes, triplexes, and quadplexes calculate the Size Adjustment Factor (SAF) using the following equation:

$$SAF = [CFA_{\text{Benchmark Home}} / CFA_{\text{Home to Be Built}}]\ 0.25, \text{ not to exceed } 1.0$$

   Where:

   $CFA_{\text{Benchmark Home}}$ = Conditioned Floor Area of the Benchmark Home, using Exhibit 3 above
   $CFA_{\text{Home to be Built}}$ = Conditioned Floor Area of the Home to be Built

   For the purposes of this step, calculate the number of bedrooms and the CFA of the home to be built using RESNET standards with the following exceptions: bedrooms and floor area in basements with at least half of gross surface area of the basement's exterior walls below grade shall not be counted. If a home has zero bedrooms with regard to the Benchmark Home Size determination, then the Benchmark Home Size for one bedroom shall be used. If the CFA of the home to be built exceeds the CFA of the Benchmark Home, then the Performance Path shall be used. Because the SAF cannot exceed 1.0, it only modifies the HERS Index for homes with conditioned floor area greater than the Benchmark Home. For condos and apartments in multi-family buildings the SAF shall always equal 1.0.

4. Any radiant barrier with a minimum initial reflectance of 0.90 and a maximum initial remittance of 0.10 meet the requirement for a radiant barrier. For ENERGY STAR Certified Roof Product Criteria, see www.energystar.gov/index.cfm?c=roof_prods.pr_crit_roof_products.

5. Insulation levels in a home shall meet or exceed the component insulation requirements in the 2009 IECC – Table 402.1.1 (see page 4.13). The following exceptions apply:

   a. Steel-frame ceilings, walls, and floors shall meet the insulation requirements of the 2009 IECC – Table 402.2.5. In CZ 1 and 2, the continuous insulation requirements in this table shall be permitted to be reduced to R-3 for steel-frame wall assemblies with studs spaced at 24" on center. This exception shall not apply if the alternative calculations in d) are used;

   b. For ceilings with attic spaces, R-30 shall satisfy the requirement for R-38 and R-38 shall satisfy the requirement for R-49 wherever the full height of uncompressed insulation at the lower R-value extends over the wall top plate at the eaves. This exemption shall not apply if the alternative calculations in d) are used;

   c. For ceilings without attic spaces, R-30 shall satisfy the requirement for any required value above R-30 if the design of the roof/ceiling assembly does not provide sufficient space for the required insulation value. This exemption shall be limited to 500 square ft. or 20% of the total insulated ceiling area, whichever is less. This exemption shall not apply if the alternative calculations in d) are used;

d. An alternative equivalent U-factor or total UA calculation may also be used to demonstrate compliance, as follows:

   An assembly with a U-factor equal or less than specified in 2009 IECC – Table 402.1.3 complies (see page 4.13).

   A total building thermal envelope UA that is less than or equal to the total UA resulting from the U-factors in Table 402.1.3 also complies. The insulation levels of all non-fenestration components (i.e., ceilings, walls, floors, and slabs) can be traded off using the UA approach. Note that fenestration products (i.e., windows, skylights, doors) shall not be included in this calculation. Also, note that while ceiling and slab insulation can be included in trade-off calculations, the R-value must meet or exceed the minimum values listed in Items 4.1 through 4.3 of the Thermal Enclosure System checklist to provide an effective thermal break, regardless of the UA tradeoffs calculated. The UA calculation shall be done using a method consistent with the ASHRAE Handbook of Fundamentals and shall include the thermal bridging effects of framing materials. The calculation for a steel-frame envelope assembly shall use the ASHRAE zone method or a method providing equivalent results, and not a series-parallel path calculation method.

6. Consistent with the 2009 IECC, slab edge insulation is only required for slab-on-grade floors with a floor surface less than 12 inches below grade. Slab insulation shall extend to the top of the slab to provide a complete thermal break. If the top edge of the insulation is installed between the exterior wall and the edge of the interior slab, it shall be permitted to be cut at a 45-degree angle away from the exterior wall.

7. Insulation shall be verified by a Rater to achieve Grade I installation as defined in the RESNET Standards, except for ceiling, wall, and floor assemblies with continuous rigid insulation sheathing. For such homes, Grade II installation is acceptable for the cavity insulation only if the rigid insulation sheathing meets or exceeds the following levels: R-3 in CZs 1 to 4; R-5 in CZs 5 to 8.

8. All windows, doors, and skylights shall meet or exceed the component U-factor and SHGC requirements specified in the 2009 IECC – Table 402.1.1 (see page 4.13). If no NFRC rating is noted on the window or in product literature (e.g., for site-built fenestration), select the U-factor and SHGC value from tables 4 and 14, respectively, in 2005 ASHRAE Fundamentals, Chapter 31. Select the highest U-factor and SHGC value among the values listed for the known window characteristics (e.g., frame type, number of panes, glass color, and presence of low-e coating) Note that the U-factor requirement applies to all fenestration while the SHGC only applies to the glazed portion. The following exceptions apply:

   a. An area-weighted average of fenestration products shall be permitted to satisfy the U-factor requirements;

   b. An area-weighted average of fenestration products more than 50% glazed shall be permitted to satisfy the SHGC requirements;

   c. 15 square feet of glazed fenestration per dwelling unit shall be exempt from the U-factor and SHGC requirements, and shall be excluded from area-weighted averages calculated using a) and b), above;

   d. One side-hinged opaque door assembly up to 24 square feet in area shall be exempt from the U-factor requirements and shall be excluded from area-weighted averages calculated using a) and b), above;

   e. Fenestration utilized as part of a passive solar design shall be exempt from the U-factor and SHGC requirements, and shall be excluded from area-weighted averages calculated using a) and b), above. Exempt windows shall be facing within 45 degrees of true south and directly coupled to thermal storage mass that has a heat capacity > 20 btu/ft^{3}x°F and provided in a ratio of at least 3 sq. ft. per sq. ft. of south facing fenestration. Generally, thermal mass materials will be at least 2” thick.

9. For homes with heat pumps that contain an electric resistance heating element used to supplement the capacity of the heat pump, the thermostat shall have “Adaptive Recovery” technology to prevent the excessive use of electric backup heating.

10. Duct leakage shall be determined by a Rater using a RESNET-approved testing protocol. Leakage limits shall be assessed on a per-system, rather than per-home, basis.

11. For homes that have ≤ 1,200 sq. ft. of conditioned floor area, measured duct leakage to outdoors shall be ≤ 5 CFM25 per 100 sq. ft. of conditioned floor area. Testing of duct leakage to the outside can be waived if all ducts and air handling equipment are located within the home’s air and thermal barriers AND envelope leakage has been tested to be less than or equal to half of the Prescriptive Path infiltration limit for the Climate Zone where the home is to be built. Alternatively, testing of duct leakage to the outside can be waived if total duct leakage is ≤ 4 CFM25 per 100 sq. ft. of conditioned floor area, or ≤ 5 CFM25 per 100 sq. ft. of conditioned floor area for homes that have less than 1,200 sq. ft. of conditioned floor area.

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Thermal Enclosure System Checklist

CUSTOMER NAME or ADDRESS: _____ **HOME ID:** _____

Inspection Guidelines	Must Correct	Plant QC	Builder Verified[1]	Rater Verified	N/A
1. High-Performance Fenestration					
1.1 ***Prescriptive Path:*** Fenestration shall meet or exceed ENERGY STAR requirements[2]	☐	☐	☐	☐	☐
1.2 ***Performance Path:*** Fenestration shall meet or exceed 2009 IECC requirements[2]	☐	☐	☐	☐	☐
2. Quality-Installed Insulation					
2.1 Ceiling, wall, floor and slab insulation levels shall comply with **one** of the following options:					
2.1.1 Meet or exceed 2009 IECC levels[3,4,5] **OR**;	☐	☐	☐	☐	☐
2.1.2 Achieve ≤ 133% of the total UA resulting from the U-factors in 2009 IECC Table 402.1.3, excluding fenestration and per guidance in Footnote 3d, **AND** home shall achieve ≤ 50% of the applicable infiltration rate:[4,5] **6 ACH50** in CZs 1,2 **5 ACH50** in CZs 3,4 **4 ACH50** in CZs 5,6,7 **3 ACH50** in CZ 8	☐	☐	☐	☐	☐
2.2 All ceiling, wall, floor and slab insulation shall achieve RESNET-defined Grade I installation or, alternatively, Grade II for surfaces that contain a layer of continuous, air impermeable insulation ≥ R-3 in CZs 1 to 4, ≥ R-5 in CZs 5 to 8.	☐	☐	☐	☐	☐
3. Fully-Aligned Air Barriers[6]					
At each insulated location noted below, a complete air barrier shall be provided that is fully aligned with the insulation as follows: • At interior or exterior surface of ceilings in CZs 1 to 3; at interior surface of ceilings in CZs 4 to 8. Also, include barrier at interior edge of attic eave in all climate zones using a wind baffle that extends to the full height of the insulation. Include a baffle in every bay or a tabbed baffle in each bay with a soffit vent that will also prevent wind washing of insulation in adjacent bays • At exterior surface of walls in all climate zones; and also at interior surface of walls for CZs 4 to 8[7] • At interior surface of floors in all climate zones, including supports to ensure permanent contact and blocking at exposed edges[8,9]					
3.1 Walls[10]					
3.1.1 Walls behind showers and tubs	☐	☐	☐	☐	☐
3.1.2 Walls behind fireplaces	☐	☐	☐	☐	☐
3.1.3 Attic knee walls[11]	☐	☐	☐	☐	☐
3.1.4 Skylight shaft walls	☐	☐	☐	☐	☐
3.1.5 Wall adjoining porch roof	☐	☐	☐	☐	☐
3.1.6 Staircase walls	☐	☐	☐	☐	☐
3.1.7 Double walls	☐	☐	☐	☐	☐
3.1.8 Garage rim / band joist adjoining conditioned space	☐	☐	☐	☐	☐
3.1.9 All other exterior walls	☐	☐	☐	☐	☐
3.2 Floors					
3.2.1 Floor above garage	☐	☐	☐	☐	☐
3.2.2 Cantilevered floor	☐	☐	☐	☐	☐
3.2.3 Floor above unconditioned basement or unconditioned crawlspace	☐	☐	☐	☐	☐
3.3 Ceilings[10]					
3.3.1 Dropped ceiling/soffit below unconditioned attic	☐	☐	☐	☐	☐
3.3.2 All other ceilings	☐	☐	☐	☐	☐
4. Reduced Thermal Bridging					
4.1 For insulated ceilings with attic space above (i.e., non-cathedralized), Grade 1 insulation extends to the inside face of the exterior wall below at these levels: CZs 1 to 5: ≥ R-21; CZs 6 to 8: ≥ R-30[12]	☐	☐	☐	☐	☐
4.2 For slabs on grade in CZ 4 and higher, 75% of slab edge insulated to ≥ R-5 at the depth specified by the 2009 IECC and aligned with thermal boundary of the walls[4,5]	☐	☐	☐	☐	☐
4.3 Insulation beneath attic platforms (e.g., HVAC platforms, walkways) ≥ R-21 in CZs 1 to 5; ≥ R-30 in CZs 6 to 8	☐	☐	☐	☐	☐
4.4 Reduced thermal bridging at above-grade walls separating conditioned from unconditioned space (rim / band joists are exempted) using **one** of the following options:[13]					
4.4.1 Continuous rigid insulation, insulated siding, or combination of the two; ≥ R-3 in CZs 1 to 4, ≥ R-5 in CZs 5 to 8[14,15,16] **OR**;	☐	☐	☐	☐	☐
4.4.2 Structural Insulated Panels (SIPs)[14] **OR**;	☐	☐	☐	☐	☐
4.4.3 Insulated Concrete Forms (ICFs)[14] **OR**;	☐	☐	☐	☐	☐
4.4.4 Double-wall framing[14,17] **OR**;	☐	☐	☐	☐	☐

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CUSTOMER NAME or ADDRESS: _____ **HOME ID:** _____

Inspection Guidelines	Must Correct	Plant QC	Builder Verified[1]	Rater Verified	N/A
4.4.5 Advanced framing, including **all** of the items below:					
4.4.5a All corners insulated ≥ R-6 to edge [18] **AND**;	☐	☐	☐	☐	☐
4.4.5b All headers above windows & doors insulated ≥ R-3 for 2x4 framing or equivalent cavity width, and ≥ R-5 for all other assemblies (e.g., with 2x6 framing) [19] **AND**;	☐	☐	☐	☐	☐
4.4.5c Framing limited at all windows & doors to one pair of king studs, plus one pair of jack studs per window opening to support the header and sill [20] **AND**;	☐	☐	☐	☐	☐
4.4.5d All interior / exterior wall intersections insulated to the same R-value as the rest of the exterior wall [21] **AND**;	☐	☐	☐	☐	☐
4.4.5e Minimum stud spacing of 16 in. o.c. for 2 x 4 framing in all CZs and, in CZs 5 to 8, 24 in. o.c. for 2 x 6 framing [22]	☐	☐	☐	☐	☐
5. Air Sealing					
5.1 Penetrations to unconditioned space fully sealed with solid blocking or flashing as needed and gaps sealed with caulk or foam					
5.1.1 Duct / flue shaft	☐	☐	☐	☐	☐
5.1.2 Plumbing / piping	☐	☐	☐	☐	☐
5.1.3 Electrical wiring	☐	☐	☐	☐	☐
5.1.4 Bathroom and kitchen exhaust fans	☐	☐	☐	☐	☐
5.1.5 Recessed lighting fixtures adjacent to unconditioned space ICAT labeled and fully gasketed. Also, if in insulated ceiling without attic above, exterior surface of fixture insulated to ≥ R-10 in CZ 4 and higher to minimize condensation potential.	☐	☐	☐	☐	☐
5.1.6 Light tubes adjacent to unconditioned space include lens separating unconditioned and conditioned space and are fully gasketed [23]	☐	☐	☐	☐	☐
5.2 Cracks in the building envelope fully sealed					
5.2.1 All above-grade sill plates adjacent to conditioned space sealed to foundation or sub-floor with caulk, foam or equivalent material. Foam gasket also placed beneath above-grade sill plate if resting atop concrete or masonry and adjacent to conditioned space [24, 25]	☐	☐	☐	☐	☐
5.2.2 At top of walls adjoining unconditioned spaces, continuous top plates or sealed blocking using caulk, foam, or equivalent material	☐	☐	☐	☐	☐
5.2.3 Drywall sealed to top plate at all attic/wall interfaces using caulk, foam, drywall adhesive (but not other construction adhesives), or equivalent material. Either apply sealant directly between drywall and top plate or to the seam between the two from the attic above	☐	☐	☐	☐	☐
5.2.4 Rough opening around windows & exterior doors sealed with caulk or foam [26]	☐	☐	☐	☐	☐
5.2.5 Marriage joints between modular home modules at all exterior boundary conditions fully sealed with gasket and foam	☐	☐	☐	☐	☐
5.2.6 All seams between Structural Insulated Panels (SIPs) foamed and/or taped per manufacturer's instructions	☐	☐	☐	☐	☐
5.2.7 In multi-family buildings, the gap between the common wall (e.g., the drywall shaft wall) and the structural framing between units fully sealed at all exterior boundaries	☐	☐	☐	☐	☐
5.3 Other Openings					
5.3.1 Doors adjacent to unconditioned space (e.g., attics, garages, basements) or ambient conditions gasketed or made substantially air-tight with weatherstripping or equivalent gasket	☐	☐	☐	☐	☐
5.3.2 Attic access panels and drop-down stairs equipped with a durable ≥ R-10 insulated cover that is gasketed (i.e., not caulked) to produce continuous air seal when occupant is not accessing the attic [27]	☐	☐	☐	☐	☐
5.3.3 Whole-house fans equipped with a durable ≥ R-10 insulated cover that is gasketed and either installed on the house side or mechanically operated [27]	☐	☐	☐	☐	☐

Plant QC Signature: _____ Pre-Drywall Inspection Date: _____

Rater Signature: _____ Rater Final Inspection Date: _____

Builder Signature: _____ Builder Inspection Date: _____

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Notes

1. At the discretion of the Rater, the builder may verify up to eight (8) items specified in this Checklist. 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.

2. ***For Prescriptive Path***: All windows, doors, and skylights shall meet or exceed ENERGY STAR Program Requirements for Residential Windows, Doors, and Skylights – Version 5.0 as outlined at www.energystar.gov/windows.

   For Performance Path: All windows, doors and skylights shall meet or exceed the component U-factor and SHGC requirements specified in the 2009 IECC – Table 402.1.1 (see page 4.13). If no NFRC rating is noted on the window or in product literature (e.g., for site-built fenestration), select the U-factor and SHGC value from tables 4 and 14, respectively, in 2005 ASHRAE Fundamentals, Chapter 31. Select the highest U-factor and SHGC value among the values listed for the known window characteristics (e.g., frame type, number of panes, glass color, and presence of low-e coating). Note that the U-factor requirement applies to all fenestration while the SHGC only applies to the glazed portion. The following exceptions apply:

   a. An area-weighted average of fenestration products shall be permitted to satisfy the U-factor requirements;

   b. An area-weighted average of fenestration products ≥ 50% glazed shall be permitted to satisfy the SHGC requirements;

   c. 15 square feet of glazed fenestration per dwelling unit shall be exempt from the U-factor and SHGC requirements, and shall be excluded from area-weighted averages calculated using a) and b), above;

   d. One side-hinged opaque door assembly up to 24 square feet in area shall be exempt from the U-factor requirements and shall be excluded from area-weighted averages calculated using a) and b), above;

   e. Fenestration utilized as part of a passive solar design shall be exempt from the U-factor and SHGC requirements, and shall be excluded from area-weighted averages calculated using a) and b), above. Exempt windows shall be facing within 45 degrees of true south and directly coupled to thermal storage mass that has a heat capacity > 20 btu/ft3x°F and provided in a ratio of at least 3 sq. ft. per sq. ft. of south facing fenestration. Generally, thermal mass materials will be at least 2" thick.

3. Insulation levels in a home shall meet or exceed the component insulation requirements in the 2009 IECC – Table 402.1.1 (see page 4.13). The following exceptions apply:

   a. Steel-frame ceilings, walls, and floors shall meet the insulation requirements of the 2009 IECC – Table 402.2.5. In CZ 1 and 2, the continuous insulation requirements in this table shall be permitted to be reduced to R-3 for steel-frame wall assemblies with studs spaced at 24 in. on center. This exception shall not apply if the alternative calculations in d) are used;

   b. For ceilings with attic spaces, R-30 shall satisfy the requirement for R-38 and R-38 shall satisfy the requirement for R- 49 wherever the full height of uncompressed insulation at the lower R-value extends over the wall top plate at the eaves. This exemption shall not apply if the alternative calculations in d) are used;

   c. For ceilings without attic spaces, R-30 shall satisfy the requirement for any required value above R-30 if the design of the roof/ceiling assembly does not provide sufficient space for the required insulation value. This exemption shall be limited to 500 square ft. or 20% of the total insulated ceiling area, whichever is less. This exemption shall not apply if the alternative calculations in d) are used;

   d. An alternative equivalent U-factor or total UA calculation may also be used to demonstrate compliance, as follows:

      An assembly with a U-factor equal or less than specified in 2009 IECC – Table 402.1.3 complies (see page 4.13).

      A total building thermal envelope UA that is less than or equal to the total UA resulting from the U-factors in Table 402.1.3 also complies. The insulation levels of all non-fenestration components (i.e., ceilings, walls, floors, and slabs) can be traded off using the UA approach under both the Prescriptive and the Performance Path. Note that fenestration products (i.e., windows, skylights, doors) shall not be included in this calculation. Also, note that while ceiling and slab insulation can be included in trade-off calculations, Items 4.1 through 4.3 of the Checklist shall be met regardless of the UA tradeoffs calculated. The UA calculation shall be done using a method consistent with the ASHRAE Handbook of Fundamentals and shall include the thermal bridging effects of framing materials. The calculation for a steel-frame envelope assembly shall use the ASHRAE zone method or a method providing equivalent results, and not a series-parallel path calculation method.

4. Consistent with the 2009 IECC, slab edge insulation is only required for slab-on-grade floors with a floor surface less than 12 inches below grade. Slab insulation shall extend to the top of the slab to provide a complete thermal break. If the top edge of the insulation is installed between the exterior wall and the edge of the interior slab, it shall be permitted to be cut at a 45-degree angle away from the exterior wall. Alternatively, the thermal break is permitted to be created using ≥ R-3 rigid installation on top of an existing slab (e.g., in a home undergoing a gut rehabilitation). In such cases, up to 10% of the slab surface is permitted to not be insulated (e.g., for sleepers, for still plates). Insulation installed on top of slab shall be covered by a durable floor surface (e.g., hardwood, tile, carpet).

5. Where an insulated wall separates a garage, patio, porch, or other unconditioned space from the conditioned space of the house, slab insulation shall also be installed at this interface to provide a thermal break between the conditioned and unconditioned slab. Where specific details cannot meet this requirement, partners shall provide the detail to EPA to request an exemption prior to the home's certification. EPA will compile exempted details and work with industry to develop feasible details for use in future revisions to the program. A list of currently exempted details is available at: www.enegystar.gov/slabedge.

6. For purposes of this checklist, an air barrier is defined as any durable solid material that blocks air flow between conditioned space and unconditioned space, including necessary sealing to block excessive air flow at edges and seams and adequate support to resist positive and negative pressures without displacement or damage. EPA recommends, but does not require, rigid air barriers.

Open-cell or closed-cell foam shall have a finished thickness ≥ 5.5 in. or 1.5 in., respectively, to qualify as an air barrier unless the manufacturer indicates otherwise.

If flexible air barriers such as house wrap are used, they shall be fully sealed at all seams and edges and supported using fasteners with caps or heads ≥ 1 in. diameter unless otherwise indicated by the manufacturer. Flexible air barriers shall not be made of kraft paper, paper-based products, or other materials that are easily torn. If polyethylene is used, its thickness shall be ≥ 6 mil.

7. EPA highly recommends, but does not require, inclusion of an interior air barrier at rim / band joists in Climate Zones 4 through 8.
8. Examples of supports necessary for permanent contact include staves for batt insulation or netting for blown-in insulation. Alternatively, batts that completely fill floor cavities enclosed on all six sides may be used to meet Items 2.2 and 3.2, even when compression occurs due to excess insulation, as long as the R-value of the batts has been appropriately assessed based on manufacturer guidance and the only defect preventing the insulation from achieving the required installation grade is the compression caused by the excess insulation.
9. Fully-aligned air barriers may be installed at the exterior surface of the floor cavity in all Climate Zones if the insulation is installed in contact with this exterior air barrier and the perimeter rim and band joists of the floor cavity are also sealed and insulated to comply with the fully-aligned air barrier requirements for walls.
10. All insulated vertical surfaces are considered walls (e.g., above grade and below grade exterior walls, knee walls) and must meet the air barrier requirements for walls with the exception of adiabatic walls in multifamily dwellings. All insulated ceiling surfaces, regardless of slope (e.g., cathedral ceilings, tray ceilings, conditioned attic roof decks, flat ceilings, sloped ceilings), must meet the requirements for ceilings.
11. Exterior air barriers are not required for attic knee walls that are ≤ 24 in. height if an interior air barrier is provided and insulation extends in all directions from the top of this interior air barrier into unconditioned space at the following levels: CZ 1-5: ≥ R-21; CZ 6-8: ≥ R-30.
12. The minimum designated R-values must be achieved regardless of the trade-offs determined using an equivalent U-factor or UA alternative calculation, with the following exception *for homes sold before 12/31/2012*: CZ 1-5: For spaces that provide less than 5.5 in. of clearance, R-15 Grade I insulation is permitted. CZ 6-8: For spaces that provide less than 7.0 in. of clearance, R-21 Grade I insulation is permitted.

    Note that if the minimum designated values are used, then higher insulation values may be needed elsewhere to meet Item 2.1 Also, note that these requirements can be met by using any available strategy, such as a raised-heel truss, alternate framing that provides adequate space, and /or high-density insulation.
13. Mass walls utilized as the thermal mass component of a passive solar design (e.g., a Trombe wall) are exempt from this item. To be eligible for this exemption, the passive solar design shall be comprised of the following five components: an aperture or collector, an absorber, thermal mass, a distribution system, and a control system. For more information, see: http://www.energy.gov/sites/prod/files/guide_to_passive_solar_home_design.pdf.

    Mass walls that are not part of a passive solar design (e.g., CMU block or log home enclosure) shall either utilize the strategies outlined in Item 4.4 or the pathway in the assembly with the least thermal resistance, as determined using a method consistent with the 2009 ASHRAE Handbook of Fundamentals, shall provide ≥ 50% of the applicable assembly resistance, defined as the reciprocal of the mass wall equivalent U-factor in the 2009 IECC – Table 402.1.3. Documentation identifying the pathway with the least thermal resistance and its resistance value shall be collected by the Rater and any Builder Verified or Rater Verified box under Item 4.4 shall be checked.
14. Up to 10% of the total exterior wall surface area is exempted from the reduced thermal bridging requirements to accommodate intentional designed details (e.g., architectural details such as thermal fins, wing walls, or masonry fireplaces; structural details, such as steel columns). It shall be apparent to the Rater that the exempted areas are intentional designed details or the exempted area shall be documented in a plan provided by the builder, architect, designer, or engineer. The Rater need not evaluate the necessity of the designed detail to qualify the home.
15. If used, insulated siding shall be attached directly over a water-resistive barrier and sheathing. In addition, it shall provide the required R-value as demonstrated through either testing in accordance with ASTM C 1363 or by attaining the required R-value at its minimum thickness. Insulated sheathing rated for water protection can be used as a water resistant barrier if all seams are taped and sealed. If non-insulated structural sheathing is used at corners, advanced framing details listed under Item 4.4.5 shall be met for those wall sections.
16. Steel framing shall meet the reduced thermal bridging requirements by complying with Item 4.4.1 of the checklist.
17. Double-wall framing is defined as any framing method that ensures a continuous layer of insulation covering the studs to at least the R-value required in Item 4.4.1 of the Checklist, such as offset double-stud walls, aligned double-stud walls with continuous insulation between the adjacent stud faces, or single-stud walls with 2x2 or 2x3 cross-framing. In all cases, insulation shall fill the entire wall cavity from the interior to exterior sheathing except at windows, doors and other penetrations.
18. All exterior corners shall be constructed to allow access for the installation of ≥ R-6 insulation that extends to the exterior wall sheathing. Examples of compliance options include standard-density insulation with alternative framing techniques, such as using three studs per corner, or high-density insulation (e.g., spray foam) with standard framing techniques.
19. Compliance options include continuous rigid insulation sheathing, SIP headers, other prefabricated insulated headers, single-member or two-member headers with insulation either in between or on one side, or an equivalent assembly, except where a framing plan provided by the builder, architect, designer, or engineer indicates that full-depth solid headers are to be used. The Rater need not evaluate the structural necessity of the details in the framing plan to certify the home. Also, the framing plan need only encompass the details in question and not necessarily the entire home. R-value requirement refers to manufacturer's nominal insulation value.
20. Additional jack studs shall be used only as needed for structural support and cripple studs only as needed to maintain on-center spacing of studs.

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21. Insulation shall run behind interior/exterior wall intersections using ladder blocking, full length 2x6 or 1x6 furring behind the first partition stud, drywall clips, or other equivalent alternative.
22. 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. Regardless, all vertical framing members shall either be on-center or have an alternative structural purpose (e.g., framing members at the edge of pre-fabricated panels) that is apparent to the Rater or documented in a framing plan that encompasses that member and is provided by the builder architect, designer, or engineer. The Rater need not evaluate the structural necessity of the framing plan to qualify the home. However, all 2x6 framing with stud spacing of 16 in. o.c. in Climate Zones 5-8 shall have ≥ R-20.0 wall cavity insulation installed regardless of any framing plan or alternative equivalent total UA calculation.
23. Light tubes that do not include a gasketed lens are required to be sealed and insulated ≥ R-6 for the length of the tube.
24. Existing sill plates (e.g., in a home undergoing a gut rehabilitation) on the interior side of structural masonry or monolithic walls are exempt from this item. In addition, other existing sill plates resting atop concrete or masronry, and adjacent to conditioned space are permitted, in lieu of using a gasket, to be sealed with caulk, foam, or equivalent material at both the interior seam between the sill plate and the subfloor and the seam between the top of the sill plate and the sheathing.
25. In Climate Zones 1-3, a continuous stucco cladding system adjacent to sill and bottom plates is permitted to be used in lieu of sealing plates to foundation or sub-floor with caulk, foam, or equivalent material.
26. In Climate Zones 1-3, a continuous stucco cladding system sealed to windows and doors is permitted to be used in lieu of sealing rough openings with caulk or foam.
27. Examples of durable covers include, but are not limited to, pre-fabricated covers with integral insulation, rigid foam adhered to cover with adhesive, or batt insulation mechanically fastened to the cover (e.g., using bolts, metal wire, or metal strapping).

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HVAC System Quality Installation (Contractor) Checklist [1]

Description [2]: _____ **For temporary occupant load?** [3] **Yes** ☐ **No** ☐ **HOME ID:** _____

1. Whole-Building Mechanical Ventilation Design [4]	**Plant QC**	**Builder Verified** [5]	**HVAC Cont.** [6]	**N/A**
1.1 Ventilation system installed that has been designed to meet ASHRAE 62.2-2010 requirements including, but not limited to, requirements in Items 1.2 to 1.5 [7]	☐	☐	☐	–
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, design rate, and frequency and duration of each ventilation cycle	☐	☐	☐	–
1.4 If present, continuously-operating ventilation and exhaust fans designed to operate during all occupiable hours	☐	☐	☐	☐
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 [4, 8] *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 set points = 70°F for heating; 75°F for cooling*				
2.1 Heat Loss / Gain Method: ☐ Manual J v8 ☐ 2009 ASHRAE ☐ Other: _____	☐	☐	☐	–
2.2 Duct Design Method: ☐ Manual D ☐ Other: _____	☐	☐	☐	☐
2.3 Equipment Selection Method: ☐ Manual S ☐ OEM Rec. ☐ Other: _____	☐	☐	☐	–
2.4 Outdoor Design Temperatures: [9] Location:_____ 1%:_____°F 99%:_____°F	☐	☐	☐	–
2.5 Orientation of Rated Home (e.g., North, South): _____	☐	☐	☐	–
2.6 Number of Occupants Served by System: [10] _____	☐	☐	☐	–
2.7 Conditioned Floor Area (CFA) in Rated Home: _____ Sq. Ft.	☐	☐	☐	–
2.8 Window Area in Rated Home: _____ Sq. Ft.	☐	☐	☐	–
2.9 Predominant Window SHGC in Rated Home: [11] _____ SHGC	☐	☐	☐	–
2.10 Infiltration Rate in Rated Home: [12] 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: [13] _____ CFM	☐	☐	☐	–
2.17 Design Duct Static Pressure: [14] _____ Inches Water Column (IWC)	☐	☐	☐	☐
2.18 Full Load Calculations Report Attached [15]	☐	☐	☐	–
3. Selected Cooling Equipment, If Cooling Equipment to be Installed				
3.1 Condenser Manufacturer & Model: _____	☐	☐	☐	☐
3.2 Evaporator / Fan Coil Manufacturer & Model: _____	☐	☐	☐	☐
3.3 AHRI Reference No.: [16] _____	☐	☐	☐	☐
3.4 Listed Efficiency: _____ EER _____ SEER	☐	☐	☐	☐
3.5 Metering Device Type: ☐ TXV ☐ Fixed orifice ☐ Other: _____	☐	☐	☐	☐
3.6 Refrigerant Type: ☐ R-410a ☐ Other: _____	☐	☐	☐	☐
3.7 Fan Speed Type: [17] ☐ Fixed ☐ Variable (ECM/ICM) ☐ Other: _____	☐	☐	☐	☐
3.8 Listed Sys. Latent Capacity at Design Cond. [18] _____ BTUh	☐	☐	☐	☐
3.9 Listed Sys. Sensible Capacity at Design Cond. [18] _____ BTUh	☐	☐	☐	☐
3.10 Listed Sys. Total Capacity at Design Cond. [18] _____ BTUh	☐	☐	☐	☐
3.11 If Listed Sys. Latent Capacity (Value 3.8) ≤ Design Latent Heat Gain (Value 2.12), ENERGY STAR certified dehumidifier installed	☐	☐	☐	☐
3.12 Listed Sys. Total Capacity (Value 3.10) is 95-115% of Design Total Heat Gain (Value 2.14) or next nom. size [8,19]	☐	☐	☐	☐
3.13 AHRI Certificate Attached [16]	☐	☐	☐	☐
4. Selected Heat Pump Equipment, If Heat Pump to be Installed				
4.1 AHRI Listed Efficiency: _____ HSPF or Ground Source: _____ COP	☐	☐	☐	☐
4.2 Performance at 17°F: Capacity: _____ BTUh Efficiency: _____ COP [20]	☐	☐	☐	☐
4.3 Performance at 47°F: Capacity: _____ BTUh Efficiency: _____ COP [20]	☐	☐	☐	☐

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HVAC System Quality Installation (Contractor) Checklist [1]

5. Selected Furnace, If Furnace to be Installed	Plant QC	Builder Verified [5]	HVAC Cont. [6]	N/A
5.1 Furnace Manufacturer & Model: _____	☐	☐	☐	☐
5.2 Listed Efficiency: _____ AFUE	☐	☐	☐	☐
5.3 Listed Output Heating Capacity: _____ BTUh	☐	☐	☐	☐
5.4 Listed Output Heat. Capacity (Value 5.3) is 100-140% of Design Total Heat Loss (Value 2.15) or next nominal size [8,21]	☐	☐	☐	☐
6. Refrigerant Tests – *Run system for 15 minutes before testing* Note: If outdoor ambient temperature at the condenser is < 55°F or, if known, below the manufacturer-recommended minimum operating temperature for the cooling cycle, then the system shall include a TXV, and the contractor shall mark "N/A" on the Checklist for Sections 6 & 7. [22]				
6.1 Outdoor ambient temperature at condenser: _____°F DB			☐	☐
6.2 Return-side air temperature 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 temperature: _____°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 temperature: _____°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			☐	☐
7.10 An OEM test procedure (e.g., as defined for a ground-source heat pump) has been used in place of sub-cooling or super-heat process and documentation has been attached that defines this procedure			☐	☐
8. Electrical Measurements – *Taken at electrical disconnect while component is in operation*				
8.1 Evaporator or furnace air handler fan: _____ amperage _____ line voltage			☐	☐
8.2 Condenser fan: _____ amperage _____ line voltage			☐	☐
8.3 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 duct static pressure: _____ IWC Test Hole Location [23] _____			☐	☐
9.4 Supply duct static pressure: _____ IWC Test Hole Location [23] _____			☐	☐
9.5 Test hole locations are well-marked and accessible [23]			☐	☐
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 2.16) or within range recommended by OEM			☐	☐
10. Air Balance				
10.1 Balancing report prepared and attached indicating the room name and design airflow for each supply and return register. In addition, final individual room airflows measured and documented through **one** of the following options:				
10.1.1 Measured by contractor using ANSI / ACCA 5 QI-2007 protocol, documented by contractor on the balancing report, & verified by contractor to be within the greater of ± 20% or 25 CFM of design airflow [24] **OR**;			☐	☐
10.1.2 To be measured, documented, and verified by a Rater per Item 1.4.2 of the HVAC System QI (Rater) Checklist			☐	☐
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 with each HVAC component that produces condensate [25]			☐	☐

Plant QC Signature: _____ Date: _____

HVAC Contractor Signature: _____ Date: _____

Builder Signature: _____ Date: _____

ENERGY STAR® Certified Homes, Version 3 (Rev. 07)
HVAC System Quality Installation (Contractor) Checklist [1]

Notes

1. This Checklist is designed to align with the requirements of ASHRAE 62.2-2010 and published addenda and ANSI / ACCA's 5 QI-2007 protocol, thereby improving the performance of HVAC equipment in new homes when compared to homes built to minimum code. However, these features alone cannot prevent all ventilation, indoor air quality and HVAC problems (e.g., those caused by a lack of maintenance by occupants). Therefore, this Checklist is not a guarantee of proper ventilation, indoor air quality or HVAC performance.

   This Checklist applies to ventilation systems; to split air conditioners, unitary air conditioners, air-source / water-source (i.e., geothermal) heat pumps up to 65,000 Btu/h with forced-air distribution systems (i.e., ducts) and to furnaces up to 225,000 Btu/h with forced-air distribution systems (i.e., ducts). All other permutations of equipment (e.g., boilers, mini-split /multi-split systems) and distribution systems are exempt. If the ventilation system is the only applicable system installed in the home, then only Section 1 shall be completed.

   One Checklist shall be completed for each system and provided to the Rater.

2. Description of HVAC system location or area served (e.g., "whole-house", "upper level", "lower-level").

3. Check "Yes" if this system is to handle temporary occupant loads. Such a system may be required to accommodate a significant number of guests on a regular or sporadic basis and shall be handled by a supplemental cooling system (e.g., a small, single-package unit or split-coil unit) or by a system that can shift capacity from zone to zone (e.g., a variable volume system).

4. The person responsible for the heating, cooling and ventilation design shall be responsible for completing Sections 1 and 2 of this Checklist.

5. The "Plant QC" column shall only be used to indicate items verified by the plant. For Sections 1 through 5, the "Builder Verified" column shall be used to indicate items verified by the builder (or a firm or HERS Rater hired by the builder). If any items in have been marked "Builder Verified", then the builder is responsible for these Items and must sign this Checklist. Only credentialed HVAC Contractors may complete items in Sections 6 through 12.

6. For Sections 1 through 5, the "HVAC Cont." column shall be used to indicate items verified by the credentialed contractor (or a firm or HERS Rater hired by the contractor). In contrast, for Sections 6 through 12, the "HVAC Cont." column shall ***only*** be used to indicate Items verified by the credentialed contractor (i.e., neither a builder, nor a firm, nor a HERS Rater are permitted to verify Sections 6-12). The credentialed contractor is responsible for these items and shall sign this Checklist.

7. For proper procedures, exceptions, and selection methods see ASHRAE 62.2-2010 and published addenda. All components shall be designed and installed per local codes, manufacturers' installation instructions, engineering documents, and regional ENERGY STAR program requirements.

   The system shall have at least one supply or exhaust fan with associated ducts and controls. Local exhaust fans are allowed to be part of an exhaust ventilation system. Outdoor air ducts connected to the return side of an air handler are allowed to be part of a supply ventilation system if manufacturer requirements for return air temperature are met.

8. Heating and cooling loads shall be calculated, equipment shall be selected, and duct systems shall be sized according to the latest editions of ACCA Manuals J, S, & D, respectively, ASHRAE 2009 Handbook of Fundamentals, or other methodology approved by the Authority Having Jurisdiction. The HVAC system design shall be completed for the specific configuration (e.g., plan, elevation, option and orientation) of the home to be built except as permitted herein.

   For each house plan with multiple configurations (e.g., orientations, elevations, options), the loads shall be calculated for each potential configuration. If the loads across all configurations vary by ≤ 25%, then the largest load shall be permitted to be used for equipment selection for all configurations, subject to the over-sizing limits of ACCA Manual S. Otherwise, the contractor shall group the load for each configuration into a set with ≤ 25% variation and equipment selection shall be completed for each set of loads.

   For each house plan with multiple configurations, the room-level design airflows shall be calculated for each potential configuration. If the design airflows for each room vary across all configurations by ≤ 25% or 25 CFM, then the average room-level design airflow shall be permitted to be used when designing the duct system. Otherwise, the contractor shall group the room-level design airflow for each configuration into a set with ≤ 25% or 25 CFM variation and the duct design shall be completed for the average airflow of that set.

9. If the design conditions are dictated by a code or regulation, then the requirements of the lawful or controlling authority supersedes the Manual J or ASHRAE default design values. Otherwise, the default values shall be used. The values for the geographically closest location shall be selected or a justification provided for the selected location.

10. The number of occupants among all HVAC systems in the home must be equal to the number of bedrooms, as defined below, plus one. Occupants listed for systems that are indicated in the header as a cooling system for temporary occupant loads, as described in footnote 3, shall be permitted to exceed this limit.

    A bedroom is defined by RESNET as a room or space 70 sq. ft. or greater size, with egress window and closet, used or intended to be used for sleeping. A "den", "library", or "home office" with a closet, egress window, and 70 sq. ft. or greater size or other similar rooms shall count as a bedroom, but living rooms and foyers shall not.

    An egress window, as defined in 2009 IRC section R310, shall refer to any operable window that provides for a means of escape and access for rescue in the event of an emergency. The egress window definition has been summarized for convenience. The egress window shall:

    - have a sill height of not more than 44 inches above the floor; AND
    - have a minimum net clear opening of 5.7 sq. ft.; AND
    - have a minimum net clear opening height of 24 in.; AND
    - have a minimum net clear opening width of 20 in.; AND
    - be operational from the inside of the room without the use of keys, tools or special knowledge

11. "Predominant" is defined as the SHGC value used in the greatest amount of window area in the home.

12. Infiltration rate shall reflect value used in confirmed or projected HERS rating for rated home. Alternatively, use “Average” or “Semi-loose” values for the cooling season infiltration rates and “Semi-tight” or “Average” values for the heating season infiltration rates, as defined by ACCA Manual J, Eighth Edition, Version Two.
13. Design airflow is the design value(s) for the blower in CFM, as determined by using the manufacturer’s expanded performance data to select equipment, per ACCA Manual S procedures.
14. Design duct static pressure shall account for the installation of a MERV6 or higher filter.
15. The load calculation for the home shall be provided, documenting all design elements and all resulting loads, including but not limited to the values listed in Items 2.1 through 2.17.
16. All evaporators and condensing units shall be properly matched as demonstrated by an attached AHRI certificate. If an AHRI certificate is not available, a copy of OEM-provided catalog data indicating acceptable combination selection and performance data shall be attached.
17. If whole-house ventilation system utilizes the HVAC air handler, then the fan speed type shall be ECM / ICM and variable speed, or include a controller (e.g., smart cycler) that reduces the ventilation run time by accounting for hours when HVAC system is heating or cooling the home.
18. Listed system capacity at design conditions is to be obtained from the OEM expanded performance data.
19. For cooling systems, the next largest nominal piece of equipment may be used that is available to satisfy the latent and sensible requirements. Single-speed systems generally have OEM nominal size increments of one-half (½) ton. Multi-speed or multi-stage equipment may have OEM nominal size increments of one (1) ton. Therefore, the use of these advanced system types can provide extra flexibility to meet the equipment sizing requirements.
20. Items 4.2 and 4.3 are not applicable to ground-source heat pumps.
21. For warm air heating systems, the output capacity must be between 100% and 140% of calculated system load unless a larger size is dictated by the cooling equipment selection.
22. Either factory-installed or field-installed TXVs may be used. For field-installed TXVs, ensure that sensing bulbs are insulated and tightly clamped to the vapor line with good linear thermal contact at the recommended orientation, usually 4 or 8 o’clock.
23. Examples of return or supply duct static pressure measurement locations are: plenum, cabinet, trunk duct, as well as front, back, left or right side. Test hole locations shall be well marked and accessible.
24. Ducts shall not include coiled or looped ductwork except to the extent needed for acoustical control. Balancing dampers or proper duct sizing shall be used instead of loops to limit flow to diffusers. When balancing dampers are used, they shall be located at the trunk to limit noise unless the trunk will not be accessible when the balancing process is conducted. In such cases, Opposable Blade Dampers (OBD) or dampers located in the duct boot are permitted.
25. Condensate pan shall be made of corrosion-resistant materials, to include galvanized steel and plastic. Drain pan shall drain condensate to a conspicuous point of disposal to alert occupants in the event of a stoppage of the primary drainage system; and shall be equipped with a backflow prevention valve when drained to a shared drainage system, such as a storm water management system.

ENERGY STAR® Certified Homes, Version 3 (Rev. 07)

HVAC System Quality Verification (Rater) Checklist [1]

CUSTOMER NAME or ADDRESS: _____ **HOME ID:** _____

Inspection Guidelines	Must Correct	Plant QC	Rater	N/A
1. Review of HVAC System Quality Installation Checklist [2]				
1.1 HVAC System Quality Installation (Contractor) Checklist completed in its entirety and collected for records, along with documentation on ventilation system (1.3), full load calculations (2.18), and AHRI certificate (3.13)	☐	☐	☐	☐
1.2 Review the following parameters related to system cooling design, selection, and installation from the HVAC System Quality Installation (Contractor) Checklist (Contractor Checklist Item # indicated in parenthesis): [3]				
1.2.1 Outdoor design temperatures (2.4) are equal to the 1% and 99% ACCA Manual J design temperatures for contractor-designated design location [4]	☐	☐	☐	☐
1.2.2 Home orientation (2.5) matches orientation of rated home	☐	☐	☐	☐
1.2.3 Number of occupants (2.6) equals number of occupants in rated home [5]	☐	☐	☐	☐
1.2.4 Conditioned floor area (2.7) is within ± 10% of conditioned floor area of rated home	☐	☐	☐	☐
1.2.5 Window area (2.8) is within ± 10% of calculated window area of rated home	☐	☐	☐	☐
1.2.6 Predominant window SHGC (2.8) is within 0.1 of predominant value in rated home [6]	☐	☐	☐	☐
1.2.7 Listed latent cooling capacity (3.8) exceeds design latent heat gain (2.12)	☐	☐	☐	☐
1.2.8 Listed sensible cooling capacity (3.9) exceeds design sensible heat gain (2.13)	☐	☐	☐	☐
1.2.9 Listed total cooling capacity (3.10) is 95-115% (or 95-125% for Heat Pumps in CZs 4-8) of design total heat gain (2.14), or next nominal size [7]	☐	☐	☐	☐
1.2.10 HVAC manufacturer and model numbers on installed equipment, Contractor Checklist (3.1, 3.2, 5.1), and AHRI certificate or OEM catalog data all match [8]	☐	☐	☐	☐
1.2.11 Using reported liquid line (6.3) or suction line (6.5) pressure, corresponding temperature (as determined using pressure/temperature chart for refrigerant type) matches reported condenser (7.1) or evaporator (7.5) saturation temperature (± 3 degrees) [9]	☐	☐	☐	☐
1.2.12 Calculated subcooling (7.1 minus 6.4) value is within ±3 °F of the reported target temperature (7.3) or calculated superheat (6.6 minus 7.5) value is within ±5 °F of the reported target temperature (7.7). [9]	☐	☐	☐	☐
1.3 Rater-verified supply & return duct static pressure ≤110% of contractor values (9.3, 9.4)	☐	☐	☐	☐
1.4 Contractor-prepared balancing report indicating the room name and design airflow for each supply and return register collected by Rater for records. In addition, final individual room airflows measured and documented on balancing report through **one** of the following options:				
1.4.1 Measured and documented by contractor (10.1.1), **OR**;	☐	☐	☐	☐
1.4.2 Measured by Rater using Section 804.2 of the Mortgage Industry National HERS Standard, documented by Rater, and verified by Rater to be within the greater of ± 20% or 25 CFM of design airflow (10.1.2)	☐	☐	☐	☐
1.5 HVAC contractor holds credentials necessary to complete the HVAC System QI Verification (Contractor) Checklist [10]	☐	☐	☐	☐
2. Duct Quality Installation – *Applies to all Heating, Cooling, Ventilation, Exhaust and Pressure Balancing Ducts* [11]				
2.1 Connections and routing of ductwork completed without kinks or sharp bends [12]	☐	☐	☐	☐
2.2 No excessive coiled or looped flexible ductwork [13]	☐	☐	☐	☐
2.3 Flexible ducts in unconditioned space not 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 ≤ 5 ft.	☐	☐	☐	☐
2.5 Building cavities not 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 System Checklist	☐	☐	☐	☐
2.7 Quantity and location of supply and return duct terminals match contractor balancing report [11]	☐	☐	☐	☐
2.8 Bedrooms pressure-balanced using any combination of transfer grills, jump ducts, dedicated return ducts, and/or undercut doors to either: (a) provide 1 sq. in. of free area opening per 1 CFM of supply air, as reported on the contractor-provided balancing report; or (b) achieve a Rater-measured pressure differential ≤ 3 Pa with respect to the main body of the house when all bedroom doors are closed and all air handlers are operating [11, 14]	☐	☐	☐	☐
3. Duct Insulation – *Applies to all Heating, Cooling, Supply Ventilation, and Pressure Balancing Ducts* [15]				
3.1 All connections to trunk ducts in unconditioned space are 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	☐	☐	☐	☐
4. Duct Leakage – *Applies to all Heating, Cooling and Balanced Ventilation Ducts*				
4.1 Total Rater-measured duct leakage meets **one** of the following two options: [16]				
4.1.1 Rough-in: ≤ 4 CFM25 per 100 sq. ft of CFA with air handler and all ductwork, building cavities used as ductwork, and duct boots installed. In addition, all duct boots sealed to finished surface. Rater-verified at final. [17]	☐	☐	☐	☐
4.1.2 Final: ≤ 8 CFM25 per 100 sq. ft of CFA with the air handler and all ductwork, building cavities used as ductwork , duct boots, and register grilles atop the finished surface (e.g., drywall, flooring) installed. [18]	☐	☐	☐	☐
4.2 Rater-measured duct leakage to outdoors ≤ 4 CFM25 per 100 sq. ft. of conditioned floor area [16,19]	☐	☐	☐	☐

ENERGY STAR® Certified Homes, Version 3 (Rev. 07)

HVAC System Quality Verification (Rater) Checklist[1]

CUSTOMER NAME or ADDRESS: _____ **HOME ID:** _____

Inspection Guidelines	Must Correct	Plant QC	Rater	N/A
5. Whole-Building Delivered Ventilation				
5.1 Rater-measured ventilation rate is within 100-120% of HVAC contractor design value (2.11)[20]	☐	☐	☐	☐
6. Controls				
6.1 Air flow is produced when central HVAC fan is energized (set thermostat to "fan")	☐	☐	☐	☐
6.2 Cool air flow is produced when the cooling cycle is energized (set thermostat to "cool")[21, 22]	☐	☐	☐	☐
6.3 Heated air flow is produced when the heating cycle is energized (set thermostat to "heat")[21]	☐	☐	☐	☐
6.4 Continuously-operating ventilation & exhaust fans include readily accessible override controls	☐	☐	☐	☐
6.5 Function of ventilation controls is obvious (e.g., bathroom exhaust fan) or, if not, controls have been labeled	☐	☐	☐	☐
7. Ventilation Air Inlets & Ventilation Source				
7.1 All ventilation air inlets located ≥10 ft. of stretched-string distance from known contamination sources such as stack, vent, exhaust hood, or vehicle exhaust. ***Exception:*** ventilation air inlets in the wall ≥ 3 ft. from dryer exhausts and contamination sources exiting through the roof.[23]	☐	☐	☐	☐
7.2 Ventilation air inlets ≥ 2 ft. above grade or roof deck in CZs 1-3 or ≥ 4 ft. above grade or roof deck in CZs 4-8 and not obstructed by snow, plantings, condensing units or other material at time of inspection[24]	☐	☐	☐	☐
7.3 Ventilation air inlets provided with rodent / insect screen with ≤ 0.5 inch mesh.[25]	☐	☐	☐	☐
7.4 Ventilation air comes directly from outdoors, not from adjacent dwelling units, garages, crawlspaces or attics	☐	☐	☐	☐
8. Local Mechanical Exhaust				
In each kitchen and bathroom, a system shall be installed that exhausts directly to the outdoors and meets one of the following Rater-measured airflow standards:[20, 26, 27]				
Location / **Continuous Rate** / **Intermittent Rate**[28]				
8.1 Kitchen — ≥ 5 ACH, based on kitchen volume[29, 30] — ≥ 100 CFM, and if not integrated with range, also ≥ 5 ACH based on kitchen volume[29, 30, 31]	☐	☐	☐	☐
8.2 Bathroom — ≥ 20 CFM — ≥ 50 CFM	☐	☐	☐	☐
8.3 If fans share common exhaust duct, back-draft dampers installed	☐	☐	☐	☐
8.4 Common exhaust duct not shared by fans in separate dwellings[32]	☐	☐	☐	☐
8.5 Clothes dryers vented directly to outdoors, except for ventless dryers equipped with a condensate drain	☐	☐	☐	☐
9. Ventilation & Exhaust Fan Ratings (Exemptions for HVAC and Remote-Mounted Fans)[33]				
9.1 Intermittent supply and exhaust fans rated at ≤ 3 sones by manufacturer when producing no less than the minimum airflow rate required by Section 8 of this Checklist, unless rated flow ≥ 400 CFM	☐	☐	☐	☐
9.2 Continuous supply and exhaust fans rated at ≤ 1 sone by manufacturer when producing no less than the minimum airflow required by Section 8 of this Checklist	☐	☐	☐	☐
9.3 Bathroom fans used as part of a whole-house mechanical ventilation system shall be ENERGY STAR certified; unless rated flow rate ≥ 500 CFM	☐	☐	☐	☐
10. Combustion Appliances				
10.1 Furnaces, boilers, and water heaters located within the home's pressure boundary are mechanically drafted or direct-vented. As an exception, naturally drafted equipment is allowed in CZs 1-3. For naturally drafted furnaces, boilers, and water heaters, the Rater has followed RESNET or BPI combustion safety test procedures and met the selected standard's limits for depressurization, spillage, draft pressure, and CO concentration in ambient air, as well as a CO concentration in the flue of ≤ 25 ppm[34, 35, 36]	☐	☐	☐	☐
10.2 For fireplaces that are not mechanically drafted or direct-vented to outdoors, total net rated exhaust flow of the two largest exhaust fans (excluding summer cooling fans) is ≤ 15 CFM per 100 sq. ft. of occupiable space when at full capacity or the Rater has verified that the pressure differential is ≤ −5 Pa using BPI's or RESNET's worst-case depressurization test procedure[26, 36, 37,38]	☐	☐	☐	☐
10.3 If unvented combustion appliances other than cooking ranges are located inside the home's pressure boundary, the Rater has operated the appliance for at least 10 minutes and verified that the ambient CO level does not exceed 35 ppm[39]	☐	☐	☐	☐
11. Filtration				
11.1 At least one MERV 6 or higher filter installed in each ducted mechanical system[40]	☐	☐	☐	☐
11.2 All return air and mechanically supplied outdoor air pass through filter prior to conditioning	☐	☐	☐	☐
11.3 Filter located and installed so as to facilitate access and regular service by the owner[41]	☐	☐	☐	☐
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[42]	☐	☐	☐	☐

Plant QC Signature: _____ In-Plant Inspection Date: _____

Rater Signature: _____ Date Checklist Inspected: _____

ENERGY STAR® Certified Homes, Version 3 (Rev. 07)
HVAC System Quality Verification (Rater) Checklist[1]

Notes

1. This Checklist is designed to align with the requirements of ASHRAE 62.2-2010 and published addenda and ANSI / ACCA's 5 QI-2007 protocol, thereby improving the performance of HVAC equipment in new homes when compared to homes built to minimum code. However, these features alone cannot prevent all ventilation, indoor air quality, and HVAC problems, (e.g., those caused by a lack of maintenance by occupants). Therefore, this Checklist is not a guarantee of proper ventilation, indoor air quality, or HVAC performance.
2. The Rater is only responsible for ensuring that the Contractor has completed the Contractor Checklist in its entirety and verifying the discrete objective parameters referenced in Section 1 of this Checklist, not for assessing the accuracy of the load calculations or field verifications included or for verifying the accuracy of every input on the Contractor Checklist.
3. For each house plan with multiple configurations (e.g., orientations, elevations, options), the Rater shall confirm that the parameters listed in Items 1.2.2 to 1.2.6 are aligned with either: the rated home or with the plans for the configuration used to calculate the loads, as provided by the contractor.
4. Item 1.2.1 shall match the 1% and 99% ACCA Manual J design temperatures for the contractor-designated design location The Rater shall either confirm that the contractor selected the geographically closest available location or collect from the contractor a justification for the selected location. The Rater need not evaluate the legitimacy of the justification to certify the home.
5. The number of occupants among all HVAC systems in the home shall be equal to the number of RESNET-defined bedrooms plus one. Occupants listed for systems for which the header of the Contractor Checklist indicates that it is designed to handle temporary occupant loads, as defined in Footnote 3 of the Contractor Checklist, shall be permitted to exceed this limit.
6. "Predominant" is defined as the SHGC value used in the greatest amount of window area in the home.
7. For cooling systems, the next largest nominal piece of equipment may be used that is available to satisfy the latent and sensible requirements. Single-speed systems generally have OEM nominal size increments of one-half (½) ton. Multi-speed or multi-stage equipment may have OEM nominal size increments of one (1) ton. Therefore, the use of these advanced system types can provide extra flexibility to meet the equipment sizing requirements.
8. In cases where the condenser unit is installed after the time of inspection by the Rater, the HVAC manufacturer and model numbers on installed equipment can be documented through the use of photographs provided by the HVAC contractor after installation is complete.
9. If contractor has indicated that an OEM test procedure has been used in place of a sub-cooling or super-heat process and documentation has been attached that defines this procedure, then the box for "N/A" shall be checked for this item.
10. If any Item in Sections 6 through 12 of the HVAC System QI (Contractor) Checklist is applicable to the home and, therefore, completed by an HVAC contractor, then the Rater must confirm that the contractor holds the necessary credentials. HVAC contractors must be credentialed by an EPA-recognized HVAC Quality Installation Training and Oversight Organization (H-QUITO). An explanation of this credentialing process and links to H-QUITOs, which maintain lists of credentialed contractors, can be found at www.energystar.gov/newhomesHVAC.
11. Items 2.7 and 2.8 do not apply to ventilation ducts.
12. Kinks are to be avoided and are caused when ducts are bent across sharp corners such as framing members. Sharp bends are to be avoided and occur when the radius of the turn in the duct is less than one duct diameter.
13. Ducts shall not include coiled or looped ductwork except to the extent needed for acoustical control. Balancing dampers or proper duct sizing shall be used instead of loops to limit flow to diffusers. When balancing dampers are used, they shall be located at the trunk to limit noise unless the trunk will not be accessible when the balancing process is conducted. In such cases, Opposable Blade Dampers (OBD) or dampers that are located in the duct boot are permitted.
14. For HVAC system with multi-speed fans, the highest design fan speed shall be used when verifying this requirement.
15. EPA recommends, but does not require, that all metal ductwork not encompassed by Section 3 (e.g., exhaust ducts, duct boots, ducts in conditioned space) also be insulated and that insulation be sealed to duct boots to prevent condensation.
16. Duct leakage shall be determined and documented by a Rater using a RESNET-approved testing protocol. Leakage limits shall be assessed on a per-system, rather than per-home, basis. For *balanced ventilation ducts* that are not connected to space heating or cooling systems, a Rater is permitted to visually verify, in lieu of duct leakage testing, that all seams and connections are sealed with mastic or metal tape and all duct boots are sealed to floor, wall, or ceiling using caulk, foam, or mastic tape.
17. Cabinets (e.g., kitchen, bath, multimedia) or ductwork that connect duct boots to toe-kick registers are not required to be in place during the 'rough-in' test. *For homes sold through 12/31/2013*: Homes are permitted to be certified if rough-in leakage is ≤ 6 CFM25 per 100 sq. ft. of CFA with air handler and all ductwork, building cavities used as ductwork, and duct boots installed.
18. Registers atop carpets are permitted to be removed and the face of the duct boot temporarily sealed during testing. In such cases, the Rater shall visually verify that the boot has been durably sealed to the subfloor (e.g., using duct mastic or caulk) to prevent leakage during normal operation.
19. For homes that have ≤ 1,200 sq. ft. of conditioned floor area, measured duct leakage to outdoors shall be ≤ 5 CFM25 per 100 sq. ft. of conditioned floor area. Testing of duct leakage to the outside can be waived if all ducts and air handling equipment are located within the home's air and thermal barriers **AND** envelope leakage has been tested to be less than or equal to half of the Prescriptive Path infiltration limit for the Climate Zone where the home is to be built. Alternatively, testing of duct leakage to the outside can be waived if total duct leakage is ≤ 4 CFM25 per 100 sq. ft. of conditioned floor area, or ≤ 5 CFM25 per 100 sq. ft. of conditioned floor area for homes that have less than 1,200 sq. ft. of conditioned floor area.
20. The whole-house ventilation air flow and local exhaust air flows shall be measured by the Rater using a flow hood, flow grid, anemometer (in accordance with AABC, NEBB or ASHRAE procedures), or substantially equivalent method.
21. In cases where the condenser unit is installed after the time of inspection by the Rater, the Rater is exempt from verifying Item 6.2 when the condenser is for an AC unit and also item 6.3 when the condenser is for a heat pump unit.

22. To prevent potential equipment damage, the Rater shall not conduct this test if the outdoor temperature is ≤ 55°F or, if known, below the manufacturer-recommended minimum operating temperature for the cooling cycle. When this occurs, the Rater shall mark "N/A" on the Checklist for this item.
23. The outlet and inlet of balanced ventilation systems shall meet these spacing requirements unless manufacturer instructions indicate that a smaller distance may be used. However, if this occurs, the manufacturer's instructions shall be collected for documentation purposes.
24. EPA will permit the use of reduced ventilation air inlet heights in North Carolina. The minimum required height in North Carolina for Climate Zone 4 will be reduced from 4 feet to 2 feet and in Climate Zone 5 from 4 feet to 2.5 feet based on historical snowfall data for this state. Note that EPA is evaluating the potential to reduce inlet heights in other regions based upon historical snowfall data.
25. Without proper maintenance, ventilation air inlet screens often become filled with debris. Therefore, EPA recommends, but does not require, that these ventilation air inlets be located so as to facilitate access and regular service by the owner.
26. Per ASHRAE 62.2-2010, an exhaust system is one or more fans that remove air from the building, causing outdoor air to enter by ventilation inlets or normal leakage paths through the building envelope (e.g., bath exhaust fans, range hoods and clothes dryers).
27. Per ASHRAE 62.2-2010, a bathroom is any room containing a bathtub, shower, spa, or similar source of moisture.
28. An intermittent mechanical exhaust system, where provided, shall be designed to operate as needed by the occupant. Control devices shall not impede occupant control in intermittent systems.
29. Kitchen volume shall be determined by drawing the smallest possible rectangle on the floor plan that encompasses all cabinets, pantries, islands, and peninsulas and multiplying by the average ceiling height for this area. Cabinet volume shall be included in the kitchen volume calculation.
30. *For homes sold before 01/01/2014*: Homes are permitted to be certified without enforcement of this Item to provide partners with addition time to integrate this feature into their homes. *For homes sold on or after 01/01/2014*: Homes shall meet this Item. Alternatively, the prescriptive duct sizing requirements in Table 5.3 of ASHRAE 62.2-2010 are permitted to be used for kitchen exhaust fans based upon the rated airflow of the fan at 0.25 IWC. If the rated airflow is unknown, ≥ 6 in. smooth duct shall be used, with a rectangular to round duct transition as needed. Guidance to assist partners with these alternatives is available at www.energystar.gov/newhomesresources. As an alternative to Item 8.1, homes that are PHIUS+ certified are permitted to use a continuous kitchen exhaust rate of 25 CFM per 2009 IRC Table M1507.3.
31. All intermittent kitchen exhaust fans must be capable of exhausting at least 100 CFM. In addition, if the fan is not part of a vented range hood or appliance-range hood combination (i.e., if the fan is not integrated with the range), then it must also be capable of exhausting ≥ 5 ACH, based on the kitchen volume.
32. Exhaust outlets from more than one dwelling unit may be served by a single exhaust fan if the fan runs continuously or if each outlet has a back-draft damper to prevent cross-contamination when the fan is not running.
33. Fans exempted from this requirement include kitchen exhaust fans, HVAC air handler fans, and remote-mounted fans. To be considered for this exemption, a remote-mounted fan must be mounted outside the habitable spaces, bathrooms, toilets, and hallways and there shall be ≥ 4 ft. ductwork between the fan and intake grill. Per ASHRAE 62.2-2010, habitable spaces are intended for continual human occupancy; such space generally includes areas used for living, sleeping, dining, and cooking but does not generally include bathrooms, toilets, hallways, storage areas, closets, or utility rooms.
34. Per the 2009 International Mechanical Code, a direct-vent appliance is one that is constructed and installed so that all air for combustion is derived from the outdoor atmosphere and all flue gases are discharged to the outside atmosphere; a mechanical draft system is a venting system designed to remove flue or vent gases by mechanical means consisting of an induced draft portion under non-positive static pressure or a forced draft portion under positive static pressure; and a natural draft system is a venting system designed to remove flue or vent gases under nonpositive static vent pressure entirely by natural draft.
35. The pressure boundary is the primary air enclosure boundary separating indoor and outdoor air. For example, a volume that has more leakage to outside than to conditioned space would be outside the pressure boundary.
36. Raters shall use either the Building Performance Institute's (BPI's) Combustion Safety Test Procedure for Vented Appliances or RESNET's Interim Guidelines for Combustion Appliance Testing & Writing Work Scope and be BPI-certified or RESNET-certified to follow the protocol. If using RESNET's worst-case depressurization protocol to evaluate fireplaces, per Item 10.2, the blower door shall not be set to exhaust 300 CFM to simulate the fireplace in operation, but the remainder of the protocol shall be followed.
37. Per ASHRAE 62.2-2010 and published addenda, the term "net-exhaust flow" is defined as flow through an exhaust system minus the compensating outdoor airflow through any supply system that is interlocked to the exhaust system. "Net supply flow" is intended to represent the inverse. If net exhaust flow exceeds allowable limit, it shall be reduced or compensating outdoor airflow provided.
38. Per ASHRAE 62.2-2010, occupiable space is any enclosed space inside the pressure boundary and intended for human activities, including, but not limited to, all habitable spaces, toilets, closets, halls, storage and utility areas, and laundry areas. See footnote 31 for definition of "habitable spaces".
39. The minimum volume of combustion air required for safe operation by the manufacturer and/or code shall be met or exceeded. Also, in accordance with the National Fuel Gas Code, ANSI Z223.I / NFPA54, unvented room heaters shall not be installed in bathrooms or bedrooms.
40. Per ASHRAE 62.2-2010, ducted mechanical systems are those that supply air to an occupiable space through ductwork exceeding 10 feet in length and through a thermal conditioning component, except for evaporative coolers. Systems that do not meet this definition are exempt from this requirement. Also, mini-split systems typically do not have MERV-rated filters available for use and are, therefore, also exempted under this version of the guidelines.
41. HVAC filters located in the attic shall be considered accessible to the owner if drop-down stairs provide access to attic and a permanently installed walkway has been provided between the attic access location and the filter.
42. The filter media box (i.e., the component in the HVAC system that houses the filter) may be either site-fabricated by the installer or pre-fabricated by the manufacturer to meet this requirement. These requirements only apply when the filter is installed in a filter media box located in the HVAC system, not when the filter is installed flush with the return grill.

ENERGY STAR® Certified Homes, Version 3 (Rev. 07)

Water Management System Checklist [1,2]

CUSTOMER NAME or ADDRESS: _____ **HOME ID:** _____

Inspection Guidelines	Must Correct	Plant QC	Builder	Rater	N/A
1. Water-Managed Site and Foundation					
1.1 Patio slabs, porch slabs, walks, and driveways sloped ≥ 0.25 in. per ft. away from home to edge of surface or 10 ft., whichever is less [3]	☐	☐	☐	☐	☐
1.2 Back-fill has been tamped and final grade sloped ≥ 0.5 in. per ft. away from home for ≥ 10 ft. See Footnote for alternatives [3]	☐	☐	☐	☐	☐
1.3 Capillary break beneath all slabs (e.g., slab on grade, basement slab) except crawlspace slabs using either ≥ 6 mil polyethylene sheeting lapped 6-12 in., or ≥ 1 in. extruded polystyrene insulation with taped joints. [4, 5, 6]	☐	☐	☐	☐	☐
1.4 Capillary break at all crawlspace floors using ≥ 6 mil polyethylene sheeting, lapped 6-12 in., and installed using **one** of the following options: [4, 5, 6]					
1.4.1 Placed beneath a concrete slab; **OR**,	☐	☐	☐	☐	☐
1.4.2 Lapped up each wall or pier and fastened with furring strips or equivalent; **OR**,	☐	☐	☐	☐	☐
1.4.3 Secured in the ground at the perimeter using stakes	☐	☐	☐	☐	☐
1.5 Exterior surface of below-grade walls of basements & unvented crawlspaces finished as follows: a) For poured concrete, masonry, & insulated concrete forms, finish with damp-proofing coating [7] b) For wood framed walls, finish with polyethylene and adhesive or other equivalent waterproofing	☐	☐	☐	☐	☐
1.6 Class 1 vapor retarders *not* installed on the interior side of air permeable insulation in exterior below-grade walls [8]	☐	☐	☐	☐	☐
1.7 Sump pump covers mechanically attached with full gasket seal or equivalent	☐	☐	☐	☐	☐
1.8 Drain tile installed at the exterior side of footings of basement and crawlspace walls, with the top of the drain tile pipe below the bottom of the concrete slab or crawlspace floor. Drain tile surrounded with ≥ 6 in. of ½ to ¾ in. washed or clean gravel and with gravel layer fully wrapped with fabric cloth. Drain tile level or sloped to discharge to outside grade (daylight) or to a sump pump. [9]	☐	☐	☐	☐	☐
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. [10]	☐	☐	☐	☐	☐
2.2 Fully sealed continuous drainage plane behind exterior cladding that laps over flashing in Section 2.1 and fully sealed at all penetrations. Additional bond-break drainage plane layer provided behind all stucco and nonstructural masonry cladding wall assemblies [10, 11]	☐	☐	☐	☐	☐
2.3 Window and door openings fully flashed. [12]	☐	☐	☐	☐	☐
3. Water-Managed Roof Assembly					
3.1 Step and kick-out flashing at all roof-wall intersections, extending ≥ 4 in. on wall surface above roof deck and integrated with shingle-style with drainage plane above; boot / collar flashing at all roof penetrations [13]	☐	☐	☐	☐	☐
3.2 For homes that do not have a slab-on-grade foundation and do have expansive or collapsible soils, gutters and downspouts provided that empty to lateral piping that discharges water on sloping final grade ≥ 5 ft. from foundation, or to underground catchment system not connected to the foundation drain system that discharges water ≥ 10 ft. from foundation. See Footnote for alternatives & exemptions. [4, 14]	☐	☐	☐	☐	☐
3.3 Self-sealing bituminous membrane or equivalent at all valleys and roof deck penetrations [4]	☐	☐	☐	☐	☐
3.4 In 2009 IECC CZs 5-8, self-sealing bituminous membrane or equivalent over sheathing at eaves from the edge of the roof line to > 2 ft. up roof deck from the interior plane of the exterior wall [4]	☐	☐	☐	☐	☐
4. Water-Managed Building Materials					
4.1 Wall-to-wall carpet *not* installed within 2.5 feet of toilets, tubs and showers	☐	☐	☐	☐	☐
4.2 Cement board or equivalent moisture-resistant backing material installed on all walls behind tub and shower enclosures composed of tile or panel assemblies with caulked joints. Paper-faced backerboard shall *not* be used [13]	☐	☐	☐	☐	☐
4.3 In Warm-Humid climates, Class 1 vapor retarders *not* installed on the interior side of air permeable insulation in above-grade walls, except at shower and tub walls [6]	☐	☐	☐	☐	☐
4.4 Building materials with visible signs of water damage or mold *not* installed or allowed to remain [16]	☐	☐	☐	☐	☐
4.5 Framing members and insulation products having high moisture content *not* enclosed (e.g., with drywall) [17]	☐	☐	☐	☐	☐

Plant QC Signature: _____ Date: _____

Builder Signature: _____ Date: _____

Plant and Builder have completed checklist in its entirety, except for the items that are checked in the Rater column (if any) [2]

Rater Signature: _____ Date: _____

ENERGY STAR® Certified Homes, Version 3 (Rev. 07)
Water Management System Checklist[1,2]

Notes

1. The specifications in this checklist are designed to help improve moisture control in new homes compared with homes built to minimum code. However, these features alone cannot prevent all moisture problems. For example, leaky pipes or overflowing sinks or baths can lead to moisture issues and negatively impact the performance of this checklist's specified features.
2. Upon completion, the builder shall return the Checklist to the Rater for review. Alternatively, at the discretion of the builder and Rater, the Rater may verify any item on this Checklist. When this occurs, the Rater shall check the box of the verified Items in the "Rater" column. The Rater is only responsible for ensuring that the builder has completed this Checklist in its entirety and for verifying the items that are checked in the "Rater" column (if any). The Rater is not responsible for assessing the accuracy of the field verifications for items in this Checklist that are not checked in the "Rater" column. Instead, it is the builder's exclusive responsibility to ensure the design and installation comply with the Checklist.
3. Swales or drains designed to carry water from foundation are permitted to be provided as an alternative to the slope requirements for any home, and shall be provided for a home where setbacks limit space to less than 10 ft. Also, tamping of back-fill is not required if either: proper drainage can be achieved using not-settling compact soils, as determined by a certified hydrologist, soil scientist, or engineer; OR, the builder has scheduled a site visit to provide in-fill and final grading after settling has occurred (e.g., after the first rainy season).
4. Not required in Dry (B) climates as shown in 2009 IECC Figure 301.1 and Table 301. 1.
5. Not required for raised pier foundations with no walls. To earn the ENERGY STAR, EPA recommends, but does not require, that radon-resistant features be included in homes built in EPA Radon Zones 1, 2 & 3. For more information, see www.epa.gov/indoorairplus.
6. For an existing slab (e.g., in a home undergoing a gut rehabilitation), in lieu of a capillary break beneath the slab, a continuous and sealed Class I or Class II Vapor Retarder (per Footnote 8) is permitted to be installed on top of the entire slab. In such cases, up to 10% of the slab surface is permitted to be exempted from this requirement (e.g., for sill plates). In addition, for existing slabs in occupiable space, the Vapor Retarder shall be, or shall be protected by, a durable floor surface. If Class I Vapor Retarders are installed, they shall not be installed on the interior side of air permeable insulation or materials prone to moisture damage.
7. Interior surface of existing below-grade wall (e.g., in a home undergoing a gut rehabilitation) listed in Item 1.5a is permitted to be finished by:
   - Installing a continuous and sealed drainage plane, capillary break, Class I Vapor Retarder (per Footnote 8) and air barrier that terminates into a foundation drainage system as specified in Item 1.8; OR
   - If a drain tile is not required as specified in Footnote 9, adhering a capillary break and Class I Vapor Retarder (per Footnote 6) directly to the wall with the edges taped/sealed to make it continuous.

   Note that no alternative compliance option is provided for existing below-grade wood-framed walls in Item 1.5b.
8. The 2009 IRC defines Class I vapor retarders as a material or assembly with a rating of ≤ 0.1 perm, as defined using the desiccant method with Procedure A of ASTM E 96. The following materials are typically rated at ≤ 0.1 perm and therefore shall not be used on the interior side of air permeable insulation in above-grade exterior walls in warm-humid climates or below-grade exterior walls in any climate: rubber membranes, polyethylene film, glass, aluminum foil, sheet metal, foil-faced insulating sheathings, and foil-faced non-insulating sheathings. These materials can be used on the interior side of walls if air permeable insulation is not present (e.g., foil-faced rigid foam board adjacent to a below-grade concrete foundation wall is permitted).

   Note that this list is not comprehensive and other materials with a perm rating ≤ 0.1 also shall not be used. Also, if manufacturer specifications for a specific product indicate a perm rating above 0.1, then the material may be used, even if it is in this list. Also note that open-cell and closed-cell foam generally have perm ratings above this limit and may be used unless manufacturer specifications indicate a perm rating ≤ 0.1. Several exemptions to these requirements apply:
   - Class I vapor retarders, such as ceramic tile, may be used at shower and tub walls;
   - Class I vapor retarders, such as mirrors, may be used if they are mounted with clips or other spacers that allow air to circulate behind them.
9. Alternatively, either a drain tile that is pre-wrapped with a fabric filter or a Composite Foundation Drainage System (CFDS) that has been evaluated by ICC-ES according to AC 243 are permitted to be used to meet this Item. Note that the CFDS must include a soil strip drain or another ICC-ES evaluated perimeter drainage system to be eligible for use. In an existing home (e.g. in a home undergoing a gut rehabilitation) a drain tile installed only on the interior side of the footings is permitted. Additionally, a drain tile is not required when a certified hydrologist, soil scientist, or engineer has determined that a crawlspace foundation, or an existing basement foundation (e.g., in a home undergoing a gut rehabilitation), is installed in Group I Soils (i.e., well-drained ground or sand-gravel mixture soils), as defined by 2009 IRC Table R405.1.
10. These Items not required for existing structural masonry walls (e.g., in a home undergoing a gut rehabilitation). Note this exemption does not extend to existing wall assemblies with masonry veneers.
11. Any of the following systems may be used: a monolithic weather-resistant barrier (i.e., house wrap) shingled at horizontal joints and sealed or taped at all joints; weather resistant sheathings (e.g., faced rigid insulation) fully taped at all "butt" joints; lapped shingle-style building paper or felts; or other water-resistive barrier recognized by ICC-ES or other accredited agency.
12. Apply pan flashing over the rough sill framing, inclusive of the corners of the sill framing; side flashing that extends over pan flashing; and top flashing that extends over side flashing or equivalent details for structural masonry walls.
13. Intersecting wall siding shall terminate 1 in. above the roof or higher, per manufacturer's recommendations. Continuous flashing shall be installed in place of step flashing for metal and rubber membrane roofs.

14. The assessment of whether the soil is expansive or collapsible shall be completed by a certified hydrologist, soil scientist, or engineer. As an alternative, a roof design is permitted to be used that deposits rainwater to a grade-level rock bed with a waterproof liner and a lateral drain pipe that meets discharge requirements per Item 3.2. As another alternative, a rainwater harvesting system is permitted to be used that drains overflow to meet discharge requirements per Item 3.2.
15. In addition to cement board, materials that have been evaluated by ICC-ES according to AC 115 may also be used to meet this requirement. Monolithic tub and shower enclosures (e.g., fiberglass with no seams) are exempt from this backing material requirement unless required by the manufacturer. Paper-faced backerboard may only be used behind monolithic enclosures or waterproof membranes that have been evaluated by ICC-ES according to AC 115, and then only if it meets ASTM mold-resistant standards ASTM D3273 or ASTM D6329.
16. If mold is present, effort should be made to remove all visible signs of mold (e.g., by damp wipe with water and detergent). If removal methods are not effective, then the material shall be replaced. However, stains that remain after damp wipe are acceptable. Lumber with “sap stain fungi” is exempt from this Item as long as the lumber is structurally intact.
17. For wet-applied insulation, follow manufacturer’s drying recommendations. EPA recommends that lumber moisture content be ≤ 18%.