

# ENERGY STAR<sup>®</sup>

## Residential New Construction Programs

### Historical Document

This document is provided for reference because it has been superseded by a more recent Version or Revision. Please find current program documents on the [Program Requirements](#) webpage.

Use of older Versions and Revisions, such as this document, are typically limited to homes and buildings with a permit date (or, for manufactured homes, a production date) prior to a specified date. Consult the [Implementation Timeline](#) table to assess whether a home or apartment is still eligible to be certified using this document.

For questions or more information, contact us at [energystarhome@energystar.gov](mailto:energystarhome@energystar.gov).



# National Rater Design Review Checklist <sup>1</sup>

## ENERGY STAR Multifamily New Construction Version 1 / 1.1

Project Name: _____ Number of Units: _____ Permit Date: _____		
Project Address: _____ City: _____ State: _____		
<b>1. Partnership Status</b>	<b>Must Correct</b>	<b>Rater <sup>3</sup> Verified</b>
1.1 Rater has verified that builder or developer is an ENERGY STAR partner using <a href="http://energystar.gov/partnerlocator">energystar.gov/partnerlocator</a> Builder name: _____ Developer name: _____	<input type="checkbox"/>	<input type="checkbox"/>
1.2 ASHRAE Only: Rater has verified that modeler is listed in the online directory using <a href="http://energystar.gov/mfdirectory">energystar.gov/mfdirectory</a> Modeler name: _____	<input type="checkbox"/>	<input type="checkbox"/>
<b>2. High-Performance Fenestration</b>		
2.1 Dwelling units:		
2.1.1 Prescriptive: Specified fenestration meets or exceeds ENERGY STAR MF Reference Design requirements <sup>4</sup>	<input type="checkbox"/>	<input type="checkbox"/>
2.1.2 ERI and ASHRAE only: Specified fenestration meets or exceeds 2009 IECC residential requirements <sup>4</sup>	<input type="checkbox"/>	<input type="checkbox"/>
2.2 Common space: <sup>2</sup>		
2.2.1 ERI and Prescriptive: Specified fenestration meets or exceeds ENERGY STAR MF Reference Design requirements <sup>4</sup>	<input type="checkbox"/>	<input type="checkbox"/>
2.2.2 ASHRAE only: Specified fenestration meets or exceeds 2009 IECC commercial requirements <sup>4</sup>	<input type="checkbox"/>	<input type="checkbox"/>
<b>3. High-Performance Insulation</b>		
3.1 Dwelling unit:		
3.1.1: Prescriptive: Specified ceiling <sup>5</sup> , wall <sup>6</sup> , floor, and slab-on-grade insulation levels meet or exceed ENERGY STAR MF Reference Design requirements <sup>7, 8, 9</sup>	<input type="checkbox"/>	<input type="checkbox"/>
3.1.2: ERI and ASHRAE only: Specified ceiling <sup>5</sup> , wall <sup>6</sup> , floor, and slab-on-grade insulation levels meet or exceed values from the "Group R" column in the 2009 IECC Commercial chapter <sup>7, 8, 9</sup>	<input type="checkbox"/>	<input type="checkbox"/>
3.2 Common space: <sup>2</sup>		
3.2.1 ERI and Prescriptive: Specified ceiling <sup>5</sup> , wall <sup>6</sup> , floor, and slab-on-grade insulation levels meet or exceed ENERGY STAR MF Reference Design requirements <sup>7, 8, 9</sup>	<input type="checkbox"/>	<input type="checkbox"/>
3.2.2 ASHRAE only: Specified ceiling <sup>5</sup> , wall <sup>6</sup> , floor, and slab-on-grade insulation levels meet or exceed the values from the "All Other" column in the 2009 IECC Commercial chapter <sup>7, 8, 9</sup>	<input type="checkbox"/>	<input type="checkbox"/>
<b>4. Review of National HVAC Design Report (National HVAC Design Report Item # indicated in parenthesis) <sup>10</sup></b>		
4.1 National HVAC Design Report collected for records, with no items left blank	<input type="checkbox"/>	<input type="checkbox"/>
4.2 National HVAC Design Report reviewed by Rater for the following parameters (National HVAC Design Report Item # indicated in parenthesis):		
4.2.1 Prescriptive Path: Dwelling Unit Mechanical Ventilation (2.7) is <150% of ASHRAE 62.2-2013 requirements <sup>11</sup>	<input type="checkbox"/>	<input type="checkbox"/>
4.2.2 Cooling season and heating season outdoor design temperatures used in loads (3.4) are within the limits defined at <a href="http://energystar.gov/hvacdesigntemps">energystar.gov/hvacdesigntemps</a> for the State and County where the building will be built, or the designer has provided an allowance from EPA to use alternative values <sup>12</sup>	<input type="checkbox"/>	<input type="checkbox"/>
4.2.3 Number of occupants used in loads (3.6) is within ± 2 of the dwelling unit to be certified and total occupant gains (3.7) do not exceed 645 Btuh per occupant <sup>13</sup>	<input type="checkbox"/>	<input type="checkbox"/>
4.2.4 Conditioned floor area used in loads (3.8) is between 100 sq. ft. smaller and 300 sq. ft. larger than the dwelling unit to be certified	<input type="checkbox"/>	<input type="checkbox"/>
4.2.5 Window area used in loads (3.9) is between 15 sq. ft. smaller and 60 sq. ft. larger than the dwelling unit to be certified, or for dwelling units to be certified with > 500 sq. ft. of window area, between 3% smaller and 12% larger	<input type="checkbox"/>	<input type="checkbox"/>
4.2.6 Predominant window SHGC used in loads (3.10) is within 0.1 of predominant value in the dwelling unit to be certified <sup>14</sup>	<input type="checkbox"/>	<input type="checkbox"/>
4.2.7 Mechanical ventilation used in loads (3.12) is the same as the ventilation design (2.7) for the given unit plan	<input type="checkbox"/>	<input type="checkbox"/>
4.2.8 Non-occupant internal gains (3.13) are less than 3,600 Btuh	<input type="checkbox"/>	<input type="checkbox"/>
4.2.9 Sensible & total heat gain are documented (3.14, 3.16) for the orientation of the dwelling unit to be certified <sup>15</sup>	<input type="checkbox"/>	<input type="checkbox"/>
4.2.10 Cooling sizing % (4.18) is within the cooling sizing limit (4.19) selected by the HVAC designer	<input type="checkbox"/>	<input type="checkbox"/>
Rater Name: _____ Date of Review: _____		
Rater Signature: _____ Rater Company Name: _____		



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<b>5. Additional Construction Document Review – Recommended, not required</b>	
5.1 Air Sealing: Review construction documents to verify that air-sealing details at assemblies adjacent to exterior and unconditioned spaces are represented which, at a minimum, demonstrate compliance with checklist items in Section 4 of the National Rater Field Checklist (noted with an asterisk below). Items 5.1.9 and 5.1.10 are not verified by the Rater in the field, but are recommended.	
5.1.1 Ducts, flues, shafts, plumbing, piping, wiring, exhaust fans, & other penetrations to unconditioned space sealed, with blocking / flashing as needed*	<input type="checkbox"/>
5.1.2 Recessed lighting fixtures adjacent to unconditioned space ICAT labeled and gasketed. Also, if in insulated ceiling without attic above, exterior surface of fixture insulated to $\geq R-10$ in CZ 4-8*	<input type="checkbox"/>
5.1.3 Continuous top plate or blocking is at top of walls adjoining unconditioned space including at balloon-framed parapets, and sealed*	<input type="checkbox"/>
5.1.4 Drywall sealed to top plate at all unconditioned 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*	<input type="checkbox"/>
5.1.5 Rough opening around windows & exterior doors sealed* <sup>16</sup>	<input type="checkbox"/>
5.1.6 Assemblies that separate attached garages from occupiable space sealed and, also, an air barrier installed, sealed, and aligned with these assemblies*	<input type="checkbox"/>
5.1.7 Attic access panels, roof hatches and drop-down stairs are gasketed (i.e., not caulked) or equipped with durable covers that are gasketed* <sup>17</sup>	<input type="checkbox"/>
5.1.8 Doors adjacent to unconditioned space (e.g., attics, garages, basements), ambient conditions, or a unit entrance to a corridor / stairwell, made substantially air-tight with doorsweep and weatherstripping or equivalent gasket*	<input type="checkbox"/>
5.1.9 Above-grade sill plates adjacent to conditioned space sealed to foundation or sub-floor. Gasket also placed beneath above-grade sill plate if resting atop concrete / masonry & adjacent to conditioned space <sup>18, 19</sup>	<input type="checkbox"/>
5.1.10 The gap between the common wall (e.g., the drywall shaft wall) and the structural framing between units sealed at all exterior boundaries	<input type="checkbox"/>
5.2 Dwelling Unit Compartmentalization	
5.2.1 Review construction documents to verify that air-sealing details <sup>20</sup> are represented such that air exchange between the dwelling unit and outside as well as the dwelling unit and other adjacent spaces is minimized and designed to achieve compartmentalization less than or equal to 0.30 CFM50 per square feet of dwelling unit enclosure area, following procedures in ANSI / RESNET / ICC Std. 380	<input type="checkbox"/>
5.2.2 Seal all spaces 5.1.1-5.1.10 on adiabatic unit enclosure assemblies	<input type="checkbox"/>
5.3 Prescriptive Path: Verify that Window-to-wall ratio $\leq 30\%$ <sup>21</sup>	<input type="checkbox"/>
5.4 Verify that fully-aligned air barrier details are in compliance with checklist items in Section 2 of the National Rater Field Checklist	<input type="checkbox"/>
5.5 Verify that thermal bridging details are in compliance with checklist items in Section 3 of the National Rater Field Checklist	<input type="checkbox"/>
5.6 Verify that HVAC details are in compliance with checklist items in Sections 5 - 10 of the National Rater Field Checklist	<input type="checkbox"/>
5.6.1 Verify that HVAC design includes access and means to measure the dwelling-unit mechanical ventilation airflow rate	<input type="checkbox"/>
5.6.2 Verify that bedrooms with design airflow $\geq 150$ CFM are specified with a combination of transfer grilles, jump ducts dedicated return ducts, and/or undercut doors to achieve a Rater-measured pressure differential $\geq -5$ Pa and $\leq +5$ Pa with respect to the main body of the dwelling unit when all air handlers are operating	<input type="checkbox"/>
5.6.3 Verify that Functional Testing Agent holds credential required to complete the National HVAC Functional Testing Checklist <sup>22</sup>	<input type="checkbox"/>
5.7 Verify that Domestic Hot Water, Lighting, Appliances, Ceiling Fans, Plumbing Fixtures, and Whole Building Utility Data Acquisition Strategy details are in compliance with checklist items in Sections 11 – 14 of the National Rater Field Checklist	<input type="checkbox"/>



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### Footnotes:

1. This Checklist applies to all dwelling units, sleeping units, most common spaces<sup>2</sup> on the property, and parking lots. This Checklist does not apply to commercial or retail spaces. This Checklist does not apply to common spaces that are located in buildings on the property without any dwelling or sleeping units. The term 'sleeping unit' refers to a room or space in which people sleep, which can also include permanent provisions for living, eating, and either sanitation or kitchen facilities but not both. Where the term 'dwelling unit' is used in this Checklist, the requirement is also required of 'sleeping' units. The term 'building' refers to a structure utilized or intended for supporting or sheltering occupancy for a residential purpose; a structure with no dwelling or sleeping units connected to a structure with dwelling or sleeping units by less than 10% of its exterior wall area is not to be included in the 'building'.
2. The term 'common space' refers to any spaces on the property that serve a function in support of the residential part of the building that is not part of a dwelling or sleeping unit. This includes spaces used by residents, such as corridors, stairs, lobbies, laundry rooms, exercise rooms, residential recreation rooms, or parking garages used exclusively by residents, building staff, and their guests. This also includes offices used by building management, administration or maintenance and all special use areas located on the property to serve and support the residents such as day-care facilities, gyms, dining halls, etc.
3. The term 'Rater' refers to the person completing the third-party inspections required for certification. This person shall: a) be a Certified Rater, Approved Inspector, or an equivalent designation as determined by a "Multifamily Oversight Organization" and, b) have attended and successfully completed an EPA-recognized training class. See [energystar.gov/mftraining](http://energystar.gov/mftraining).
4. All windows, doors and skylights must meet or exceed the U-factor and SHGC requirements specified in the table below. 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 10, respectively, in 2013 ASHRAE Handbook of Fundamentals, Chapter 15. 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.

	Dwelling unit doors and windows that are not classified "Class AW"*	Dwelling unit windows that are classified as "Class AW"*	Common Space†
ERI	2009 IECC Table 402.1.1	2009 IECC Table 502.3	ENERGY STAR MF Reference Design – for Class AW
ASHRAE	2009 IECC Table 402.1.1	2009 IECC Table 502.3	2009 IECC Table 502.3
Prescriptive	ENERGY STAR MF Reference Design	ENERGY STAR MF Reference Design – for Class AW	ENERGY STAR MF Reference Design – for Class AW

\* Classified as "Class AW" under the North American Fenestration Standard (AAMA / WDMA / CSA 101 / I.S.2 / A440).

† Opaque doors in common spaces in CZ1-6 shall not exceed U-0.70, and in CZ 7-8, shall not exceed U-0.5.

The following exemptions apply:

- i. An area-weighted average of fenestration products shall be permitted to satisfy the U-factor requirements;
  - ii. An area-weighted average of fenestration products  $\geq 50\%$  glazed shall be permitted to satisfy the SHGC requirements; and
  - iii. 5% of all combined fenestration area (glazed and opaque) shall be exempt from the U-factor and SHGC requirements, and shall be excluded from area-weighted averages calculated using i) and ii), above.
- In PHIUS+ or PHI certified buildings, where triple-glazed window assemblies with thermal breaks / spacers between the panes are used, such windows meet the intent of Items 2.1 and 2.2 and shall be excluded when assessing compliance of a) through d), above.
5. Where the term 'ceiling' is used, the component insulation levels for "roofs" shall be used and does not apply to adiabatic ceilings, such as the insulated or uninsulated ceiling between two dwelling units in a multistory building.
  6. Items 3.1 and 3.2 are also applicable to walls that are adjacent to other buildings or adjacent to unconditioned spaces within the building. Where the wall assembly includes continuous insulation that is interrupted by fasteners or service openings, an assembly U-factor must be calculated. For the interrupted portions, the continuous insulation cannot contribute to the assembly U-factor and an overall U-factor shall be calculated based on an area weighted ratio. Thermally broken shelf-angles are exempt from de-rating.
  7. Specified levels shall meet or exceed the component insulation levels in 2009 IECC Table 502.2(1) or the table specified in the ENERGY STAR Multifamily Reference Design. The following exceptions apply:
    - a. 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;
    - b. For ceilings without attic spaces, that are not roofs with insulation above deck, 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 20% of the total insulated ceiling area. This exemption shall not apply if the alternative calculations in d) are used;
    - c. Common spaces following the ENERGY STAR Multifamily Reference Design should use the "All Other" column and also use the row of the table that best corresponds to the common space features. Unlike Prescriptive Path dwelling units, the common spaces do not need to follow the row corresponding to a wood-framed building.
    - 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 502.1.2 complies.

A total building thermal envelope UA that is less than or equal to the total UA resulting from the U-factors in Table 502.1.2 also complies. The performance of all components (i.e., roofs, walls, floors, slabs-on-grade, and fenestration) can be traded off using the UA approach. Note that Items 1.5, 1.6, and 3.1 through 3.7 of the National Rater Field 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



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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 24 inches below grade. Slab-on-grade perimeter 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  $\geq$  R-3 rigid insulation on top of an existing slab (e.g., in a building 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 sill plates). Insulation installed on top of slab shall be covered by a durable floor surface (e.g., hardwood, tile, carpet).
9. Where an insulated wall separates a garage, patio, porch, or other unconditioned space from the conditioned space of the building, slab perimeter insulation shall also be installed at this interface to provide a thermal break between the conditioned and unconditioned slab, if the slab is in contact with the ground at that interface. Where specific details cannot meet this requirement, partners shall provide the detail to EPA to request an exemption prior to the building'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: [energystar.gov/slabeledge](http://energystar.gov/slabeledge).
10. The Rater shall collect one National HVAC Design Report per building / project. Regardless of whether the "unit-specific design", "group design", or "worst-case design" box has been checked in Item 3.2 of the National HVAC Design Report, the system design as documented on the National HVAC Design Report must fall within the tolerances in Item 4.2 for the unit to be certified. The Rater is only responsible for verifying that the designer has not left any items blank on the National HVAC Design Report and for verifying the discrete objective parameters in Item 4.2 of this Checklist, not for verifying the accuracy of every input on the National HVAC Design Report.
11. Raters may use this table to determine the maximum ventilation rate allowed.

Floor area	Number of Bedrooms				
	1	2	3	4	5
<500	45	57	67.5	79.5	90
501-1000	67.5	79.5	90	102	112.5
1001-1500	90	102	112.5	124.5	135
1501-2000	112.5	124.5	135	147	157.5
2001-2500	135	147	157.5	169.5	180
2501-3000	157.5	169.5	180	192	202.5
3001-3500	180	192	202.5	214.5	225
3501-4000	202.5	214.5	225	237	247.5
4001-4500	225	237	247.5	259.5	270
4501-5000	247.5	259.5	270	282	292.5

12. Visit [energystar.gov/hvacdesigntemps](http://energystar.gov/hvacdesigntemps) for the maximum cooling season design temperature and minimum heating season design temperature permitted and the process for a designer to obtain an allowance from EPA. The same design report is permitted to be used in other counties, as long as the design temperature limits in those other counties meet or exceed the cooling and heating season temperature limits for the county selected. For example, if Fauquier County, VA, is used for the load calculations, with a 1% cooling temperature limit of 93 °F, then the same report could be used in Fairfax County (which has a higher limit of 94 °F) but not in Arlington County (which has a lower limit of 92 °F).
13. To determine the number of occupants among all HVAC systems in the dwelling unit, calculate the number of bedrooms, as defined below, and add one. The number of occupants used in loads must be within  $\pm$  2 of the dwelling unit to be certified.  
 A bedroom is defined by ANSI / RESNET / ICC Standard 301-2014 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.
14. "Predominant" is defined as the SHGC value used in the greatest amount of window area in the dwelling unit.
15. Orientation represents the direction that the front door of the dwelling unit is facing. The designer is only required to document the loads for the orientation(s) that the dwelling unit might be built in. For example, if a unit plan will only be built in a specific orientation (e.g., facing South), then the designer only needs to document the loads for this one orientation.
16. In Climate Zones 1 through 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.
17. 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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18. Existing sill plates (e.g., in a building undergoing a gut rehabilitation) on the interior side of structural masonry or monolithic walls may not be able to complete this Item. In addition, other existing sill plates resting atop concrete or masonry and adjacent to conditioned space can in lieu of using a gasket, 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.
19. In Climate Zones 1 through 3, a continuous stucco cladding system adjacent to sill and bottom plates is an alternate option of sealing plates to foundation or sub-floor with caulk, foam, or equivalent material.
20. Recommended air leakage paths to be sealed include, but are not limited to the following:
  - a. Plumbing penetrations, including those from water piping, drain waste and vent piping, HVAC piping, and gas line piping.
  - b. Electrical penetrations, including those for receptacle outlets, lighting outlets / fixtures, communications wiring, thermostats, and smoke alarms.
  - c. HVAC penetrations, including those for fans and for exhaust, supply, transfer, and return air ducts.
  - d. Envelope penetrations, including at the intersection of baseboard trim and floor, at the intersection of walls and ceilings, around window trim and dwelling unit doors, including the door latch hole.
21. Window-to-Wall ratio is taken as the sum of all window area divided by the total exterior above-grade wall area. All decorative glass and skylight window area contribute to the total window area to above-grade wall ratio (WWR). Spandrel sections of curtain wall systems contribute to the above-grade wall area.
22. Functional Testing Agents must be a Certified Commissioning Professional (CCP), a Certified Building Commissioning Professional (CBCP), a Building Commissioning Professional (BCxP, formerly the Commissioning Process Management Professional (CPMP)), a NEBB Certified Technician (BSC CxCT) or Certified Professional (BSC CP or CxPP), a representative of the Original Equipment Manufacturer (OEM), or a contractor credentialed by an HVAC Quality Installation Training and Oversight Organization (H-QUITO), if not completing Sections 6 and higher. Functional Testing Agents may not be the installing contractor unless they are a credentialed contractor. An explanation of the credentialing process and links to H-QUITOs, which maintain lists of credentialed contractors, can be found at [energystar.gov/credentialedhvac](http://energystar.gov/credentialedhvac). A directory of other FT Agents can be found at [energystar.gov/mfdirectory](http://energystar.gov/mfdirectory).