ENERGY STAR Multifamily New Construction National Rater Field Checklist [1], Version 1 / 1.1 / 1.2 (Rev. 03)

Building Name: _____ Number of Units: _____ Permit Date: _____

Building Address: _____ City: _____ State: _____

Thermal Enclosure System 1. High-Performance Fenestration & Insulation	Must Correct	Builder Verified [3]	Rater Verified [4]	N/A [5]
1.1 Fenestration meets or exceeds specification in Items 2.1 & 2.2 of the Natl Rater Design Review Checklist.	☐	☐	☐	-
1.2 Insulation meets or exceeds specification in Items 3.1 & 3.2 of the Natl Rater Design Review Checklist.	☐	☐	☐	-
1.3 All insulation achieves Grade I install. per ANSI / RESNET / ICC 301. Alternatives in Footnote 6. [7]	☐	☐	☐	-
1.4 Prescriptive Path: Window-to-wall ratio ≤ 30%. [8]	☐	☐	☐	☐
1.5 Heated plenums in unconditioned space or ambient conditions must meet the following requirements: [9]				
1.5.1 Sides of heated plenum are an air barrier and insulated to ≥ R-3ci in CZ 1-4; ≥ R-5ci in CZ 5-6; ≥ R-7.5ci in CZ 7; ≥ R-9.5ci in CZ 8, [10] **AND;**	☐	☐	☐	☐
1.5.2 Insulation at top of heated plenum meets Item 3.6 where applicable. Otherwise, meets or exceeds the R-value for mass floors from the "All Other" column of Table 502.2(1) of 2009 IECC, [10, 11] **AND;**	☐	☐	☐	☐
1.5.3 Bottom of heated plenum must have at least R-13 insulation. [11, 12]	☐	☐	☐	☐
1.6 Garages with space heating must meet the following requirements: [9]				
1.6.1 Insulation on above grade walls and walls on the first story below grade ≥ R-5ci in CZ 5-6; ≥ R-7.5ci in CZ 7; ≥ R-9.5ci in CZ 8, [10] **AND;**	☐	☐	☐	☐
1.6.2 Ceiling insulation meets Item 3.6 where applicable. Otherwise, meets or exceeds the R-value for mass floors from the "All Other" column of Table 502.2(1) of 2009 IECC. [10]	☐	☐	☐	☐
2. Fully-Aligned Air Barriers [13] At each insulated location below, a complete air barrier is provided that is fully aligned as follows:				
Ceilings: At interior or exterior horizontal surface of ceiling insulation in Climate Zones 1-3; at interior horizontal surface of ceiling insulation in Climate Zones 4-8. Also, at exterior vertical surface of ceiling insulation in all climate zones (e.g., using a wind baffle that extends to the full height of the insulation in every bay or a tabbed baffle in each bay with a soffit vent that prevents wind washing in adjacent bays). [10, 14]				
2.1 Dropped ceilings / soffits below unconditioned attics, chase / dead space, and all other ceilings.	☐	☐	☐	☐
Walls: At exterior vertical surface of wall insulation in all climate zones; also at interior vertical surface of wall insulation in Climate Zones 4-8. [10, 15]				
2.2 Walls behind showers, tubs, staircases, and fireplaces.	☐	☐	☐	☐
2.3 Architectural bump-outs, dead space, and all other exterior walls.	☐	☐	☐	-
Floors: At exterior vertical surface of floor insulation in all climate zones and, if over unconditioned space, also at interior horizontal surface including supports to ensure alignment. Alternatives in Footnotes 15 & 16. [16, 17, 18]				
2.4 Floors above garages, floors above unconditioned spaces, and cantilevered floors.	☐	☐	☐	☐
2.5 All other floors adjoining unconditioned space (e.g., rim / band joists at exterior wall or at porch roof).	☐	☐	☐	☐
3. Reduced Thermal Bridging				
3.1 For insulated ceilings with attic space above (i.e., non-cathedralized), Grade I insulation extends to the inside face of the exterior wall below and is ≥ R-21 in CZ 1-5; ≥ R-30 in CZ 6-8. [10, 19]	☐	☐	☐	☐
3.2 For insulated ceilings with attic space above, attic access panels and drop-down stairs insulated ≥ R-10 or equipped with durable ≥ R-10 cover. [20]	☐	☐	☐	☐
3.3 Insulation beneath attic platforms (e.g., HVAC platforms, walkways) ≥ R-21 in CZ 1-5; ≥ R-30 in CZ 6-8. [10]	☐	☐	☐	☐
3.4 For slabs on grade or at grade without ground contact in CZ 4-8, 100% of slab edge insulated to ≥ R-5 at the depth specified by 2009 IECC Table 502.2(1) & aligned with the thermal boundary of the walls. [10, 21, 22]	☐	☐	☐	☐
3.5 For above-grade concrete slab edges (e.g., podiums, balconies) in CZ 4-8, 100% of slab edge insulated to ≥ R-5 & aligned with the thermal boundary of the walls. At this boundary, for slabs resting on mass walls, insulation must extend ≥8 ft. below the bottom of the slab edge & for slabs resting on columns, the insulation must surround the column, at a depth of 4ft. Alternatives in Footnote 24. [10, 23]	☐	☐	☐	☐
3.6 For concrete slab floors in CZ 4-8 above ambient conditions, garages, or unconditioned spaces outside the thermal boundary, floor insulation meets the U-factor specified in Table 502.1.2 of the 2009 IECC for Group R when dwelling units are above the slab, & 'All Other' when common space is above the slab. [10, 25]	☐	☐	☐	☐
3.7 At above-grade walls and rim / band joists separating conditioned space from the exterior, one of the following options used: [26, 27]				
3.7.1 Continuous rigid insulation, insulated siding, or combination of the two is: ≥ R-3 in CZ 1-4; ≥ R-5 in CZ 5-8 [10, 27, 28, 29, 30], **OR**;	☐	☐	☐	☐
3.7.2 Structural Insulated Panels **OR**; Insulated Concrete Forms **OR**; Double-wall framing **OR**; [27, 28, 31]	☐	☐	☐	☐
3.7.3 For wood-framed walls in CZ 1-5 (all stories) & in CZ 6-8 (≤3 stories) only: 'advanced framing' details including all Items below: [27, 32]				
3.7.3a Corners insulated ≥ R-6 to edge [33], **AND**;	☐	☐	☐	☐
3.7.3b 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) [34], **AND**;	☐	☐	☐	☐
3.7.3c Interior / exterior wall intersections insulated to same R-value as rest of exterior wall. [35]	☐	☐	☐	☐
3.7.3d In CZ 4C and 5, for > 3 stories, ≥ 5.5" framing depth used with wall cavity insulated ≥R-20.0.	☐	☐	☐	☐

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4. Air Sealing (Unless otherwise noted below, "sealed" indicates the use of caulk, foam, or equivalent material.)	**Must Correct**	**Builder Verified [3]**	**Rater Verified [4]**	**N/A [5]**
The following items must be verified in dwelling units and common spaces to reduce air leakage to exterior, adjacent buildings, or unconditioned spaces.				
4.1 Ducts, flues, shafts, plumbing, piping, wiring, exhaust fans, & other penetrations to unconditioned space sealed, with blocking / flashing as needed.	☐	☐	☐	-
4.2 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 ≥ R-10 in CZ 4-8. [10]	☐	☐	☐	☐
4.3 Continuous top plate or blocking is at top of walls adjoining unconditioned space including at balloon-framed parapets, and sealed.	☐	☐	☐	☐
4.4 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.	☐	☐	☐	☐
4.5 Rough opening around windows & exterior doors sealed. [36]	☐	☐	☐	-
4.6 Assemblies that separate attached garages from occupiable space sealed and, also, an air barrier installed, sealed, and aligned with these assemblies. [37]	☐	☐	☐	☐
4.7 Doors adjacent to unconditioned space (e.g., attics, garages, basements) or ambient conditions made substantially air-tight with doorsweep and weatherstripping or equivalent gasket.	☐	☐	☐	☐
4.8 Attic access panels, roof hatches and drop-down stairs are gasketed (i.e., not caulked) or equipped with durable covers that are gasketed. [20]	☐	☐	☐	☐
The following items must be additionally verified in dwelling units, to reduce air leakage between conditioned spaces.				
4.9 Doors serving as a unit entrance from a corridor/stairwell made substantially air-tight with doorsweep and weatherstripping or equivalent gasket.	☐	☐	☐	☐
4.10 Rater-measured compartmentalization is no greater than 0.30 CFM50 per square feet of dwelling unit enclosure area, following procedures in ANSI / RESNET / ICC 380. [38]	☐	-	☐	
4.10.1 For dwelling units with forced air distribution systems without ducted returns and located in a closet adjacent to unconditioned space, the Rater-measured pressure difference between the space containing the air handler and the conditioned space during the compartmentalization test is no greater than 5 Pa. [39]	☐	-	☐	☐

HVAC System [40]		**Must Correct**	**Rater Verified [4]**	**N/A [5]**
5. Heating & Cooling Eqpt. Complete Track A - HVAC Grading by Rater [41] or Track B - HVAC Testing by FT Agent [42]				
Track A	5a.1 Blower fan volumetric airflow is Grade I or II per ANSI / RESNET / ACCA 310	☐	☐	☐
	5a.2 Blower fan watt draw is Grade I or II per ANSI / RESNET / ACCA 310	☐	☐	☐
	5a.3 Refrigerant charge is Grade I per ANSI / RESNET / ACCA 310. See Footnote 43 for exemptions.	☐	☐	☐
	5a.4 HVAC manufacturer & model number on installed equipment matches the HVAC Design Report in compliance with ANSI / RESNET / ACCA 310 or the HVAC Design Supplement to Std. 310 for Common Spaces and Central Systems. [44]	☐	☐	☐
Track B	5b.1 HVAC manufacturer & model number on installed equipment matches either of the following (check box): [45] ☐ National HVAC Design Report (4.6-4.9 & 4.25-4.26) ☐ Written approval received from designer	☐	☐	-
	5b.2 External static pressure measured by Rater at contractor-provided test locations and documented below: [46] Return-Side External Static Pressure: _____ IWC Supply-Side External Static Pressure: _____ IWC	☐	☐	☐
5.5 Prescriptive Path: Heating and cooling equipment serving dwelling units, common spaces, and garages meet the efficiency levels specified in the Exhibit X. Electric resistance space heating is not installed in dwelling units. [47]		☐	☐	☐
5.6 ERI Path: Heating and cooling equipment serving common spaces and garages, but not serving dwelling units, meet the efficiency levels specified in the Exhibit X. See Exhibit X for restrictions on electric resistance space heating. [47]		☐	☐	☐
5.7 National HVAC Functional Testing Checklist(s) collected prior to certification, with all HVAC systems in the building fully documented. Exception: Where credentialed HVAC Contractor(s) are completing the National HVAC Functional Testing Checklist, the checklist is not required to be collected for the systems they verify. [48]		☐	☐	☐
5.8 Rater has verified and documented that Functional Testing Agent(s) ("FT Agent(s)") completing the National HVAC Functional Testing Checklist(s) hold one of the required credentials and completed orientation, if applicable. [48] Credential(s): _____ FT Agent Name(s): _____		☐	☐	☐

Equipment Controls	**Must Correct**	**LP Verified [49]**	**Rater Verified [4]**	**N/A [5]**
5.9 All heating and cooling systems serving a dwelling unit have thermostatic controls within the dwelling unit.	☐	-	☐	☐
5.9.1 Prescriptive Path: Dwelling unit thermostats are programmable.	☐	-	☐	☐
5.10 Where present, stair and elevator shaft vents are equipped with motorized dampers that are capable of being automatically closed during normal building operation and are interlocked to open as required by fire and smoke detection systems. Dampers are verified to be closed at the time of inspection.	☐	☐	☐	☐

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Equipment Controls (Continued)	Must Correct	LP Verified[49]	Rater Verified [4]	N/A [5]
5.11 Freeze protection systems, such as heat tracing of piping and heat exchangers, including self-regulating heat tracing, and garage / plenum heaters include automatic controls that are verified to shut off the systems when pipe wall or garage / plenum temperatures are above 40°F.	☐	☐	☐	☐
5.11.1 Where heat tracing is installed for freeze-protection, controls must be based on pipe wall temperature and a minimum of R-3 pipe insulation is also required.	☐	☐	☐	☐
5.12 Snow- and ice-melting systems include automatic controls that are verified to shut off the systems when the pavement temperature is above 50°F and no precipitation is falling, and an automatic or manual control is installed that is verified to shut off system when the outdoor temperature is above 40°F, so that the potential for snow or ice accumulation is negligible.	☐	☐	☐	☐
Hydronic Distribution Requirements – Applies to heating or cooling systems serving more than one dwelling unit				
5.13 For hydronic distribution systems, all terminal heating and cooling distribution equipment are separated from the riser or distribution loop by a control valve or terminal distribution pump, so that heated or cooled fluid is not delivered to the dwelling unit distribution equipment when there is no call from the thermostat.	☐	☐	☐	☐
5.14 Terminal units in hydronic distribution systems are equipped with pressure independent balancing valves or pressure independent control valves.	☐	☐	☐	☐
5.15 Piping of a heating or cooling system is insulated in accordance with Item 4.42 on the National HVAC Design Report, including where passing through planks or any other penetrations.	☐	☐	☐	☐
5.16 For circulating pumps serving hydronic heating or cooling systems with three-phase motors, 1 horse-power or larger, motors meet or exceed efficiency standards for NEMA Premium™ motors. If 5 horse-power or larger, also installed with variable frequency drives.	☐	☐	☐	☐
6. Duct Quality Installation – *Applies to Heating, Cooling, Ventilation, Exhaust, & Pressure Balancing Ducts, Unless Noted in Footnote.*		**Must Correct**	**Rater Verified [4]**	**N/A [5]**
6.1 Ductwork installed without kinks, sharp bends, compressions, or excessive coiled flexible ductwork. [50]		☐	☐	☐
6.2 All bedrooms provided with transfer grilles, jump ducts, dedicated return ducts, and/or undercut doors. Bedrooms with a design supply airflow ≥ 150 CFM (per Item 5.2 on the National HVAC Design Report) achieve a Rater-measured pressure differential ≥ -5 Pa and ≤ +5 Pa with respect to the main body of the dwelling unit when all air handlers are operating. Townhouses only: In addition, bedrooms with a design supply airflow < 150 CFM achieve a Rater-measured pressure differential ≥ - 3 Pa and ≤ +3 Pa. See Footnote 51 for test configuration.		☐	☐	☐
6.3 All supply and return ducts in unconditioned space, including connections to trunk ducts, are insulated to ≥ R-6. [52]		☐	☐	☐
6.3.1 Prescriptive Path: Dwelling unit ductwork meets the location and insulation requirements specified in the ENERGY STAR Multifamily Reference Design.		☐	☐	☐
6.4 Rater-measured total duct leakage in dwelling units (and common spaces using ANSI / RESNET / ACCA 310) meets one of the following: [53, 54]				
6.4.1 Rough-in: Tested per allowances below, with air handler & all ducts, building cavities used as ducts, & duct boots installed. In addition, all duct boots sealed to finished surface, Rater-verified at final. [55] No ducted returns [39]: The greater of ≤ 3 CFM25 per 100 sq. ft. of CFA or ≤ 30 CFM. Additionally, the Rater-measured pressure difference between the space containing the air handler and the conditioned space, with the air handler running at high speed, is ≤ 5 Pa. For systems > 1 ton, increase by 1 Pa per half ton. One or two ducted returns [39]: The greater of ≤ 4 CFM25 per 100 sq. ft. of CFA or ≤ 40 CFM. Three or more ducted returns [39]: The greater of ≤ 6 CFM25 per 100 sq. ft. of CFA or ≤ 60 CFM.		☐	☐	☐
6.4.2 Final: Tested per allowances below, with the air handler & all ducts, building cavities used as ducts, duct boots, & register grilles atop the finished surface (e.g., drywall, floor) installed. [56] No ducted returns [39]: The greater of ≤ 6 CFM25 per 100 sq. ft. of CFA or ≤ 60 CFM. Additionally, the Rater-measured pressure difference between the space containing the air handler and the conditioned space, with the air handler running at high speed, is ≤ 5 Pa. For systems > 1 ton, increase by 1 Pa per half ton. One or two ducted returns [39]: The greater of ≤ 8 CFM25 per 100 sq. ft. of CFA or ≤ 80 CFM. Three or more ducted returns [39]: The greater of ≤ 12 CFM25 per 100 sq. ft. of CFA or ≤ 120 CFM.		☐	☐	☐
6.5 Townhouses only: Rater-measured duct leakage to the outside the greater of ≤ 4 CFM25 per 100 sq. ft. of CFA or ≤ 40 CFM25. [53, 57]		☐	☐	☐
6.6 Common Space: Supply, return, and exhaust ductwork and all plenums serving common spaces are sealed at all transverse joints, longitudinal seams, and duct wall penetrations with mastic, mastic tape, or internal aerosol-based sealant.		☐	☐	☐
6.7 Duct leakage of central exhaust systems that serve four or more dwelling units, meets one of the following two options:				
6.7.1 Rough-in: Tested including horizontal run outs, trunks, branches, and take-offs up to, but not including, the grilles, the leakage does not exceed 25% of exhaust fan flow. [58]		☐	☐	☐
6.7.2 Final: Tested inclusive of all ductwork between the fan and the grilles, the leakage does not exceed 30% of exhaust fan flow. [58]		☐	☐	☐

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7. Dwelling-Unit & Common Space Mechanical Vent. Systems ("Vent Systems") [59] & Inlets in Return Duct [60] (National HVAC Design Report Item # indicated in parenthesis)	**Must Correct**	**Rater Verified [4]**	**N/A [5]**
7.1 Ventilation manufacturer & model number on installed equipment matches either of the following (check box): [45] ☐ National HVAC Design Report ☐ Written approval received from designer	☐	☐	-
7.2 Rater-measured ventilation rate is within either ± 15 CFM or ±15% of dwelling unit design values (2.7), and meets or exceeds rates required by ASHRAE 62.2-2010. [61]	☐	☐	-
7.3 Measured ventilation rate is within either ± 15 CFM or ±15% of common space design values (2.9), and meets or exceeds rates required by ASHRAE 62.1-2010 (2.8). [62, 63]	☐	☐	☐
7.4 A ventilation override control installed and also labeled if its function is not obvious (e.g., a label is required for a toggle wall switch, but not for a switch that's on the ventilation equipment). Townhouses only: In addition, the ventilation override control installed must be readily-accessible to the occupant.	☐	☐	-
7.5 For any outdoor air inlet connected to a ducted return of the dwelling unit HVAC system (Complete if present; otherwise check "N/A"): [60]			☐
7.5.1 Controls automatically restrict airflow using a motorized damper during vent. Off-cycle and occupant override. [64]	☐	☐	-
7.5.2 Rater-measured vent. Rate is ≤ 15 CFM or 15% above design value at highest HVAC fan speed. Alt. in Fn. 65. [65]	☐	☐	-
7.6 If located in the dwelling unit, system fan rated ≤ 3 sones if intermittent, ≤ 2 sones if continuous, or exempted. [66]	☐	☐	-
7.7 If dwelling-unit Vent System controller operates the dwelling unit HVAC fan, then HVAC fan operation is intermittent and either the fan type is ECM / ICM (4.12), or the controls will reduce the run-time by accounting for HVAC system heating or cooling hours. [67]	☐	☐	☐
7.8 In-unit bathroom fans or in-line fans are ENERGY STAR certified if used as part of the dwelling-unit mechanical ventilation system. [68]	☐	☐	☐
7.9 If central exhaust fans, ≤ 1 HP, are installed as part of the dwelling-unit mechanical ventilation system, then they are direct-drive, ECM, with variable speed controllers. If > 1 HP, their motors meet or exceed efficiency standards for NEMA Premium ™ motors.	☐	☐	☐
7.10 Air inlet locations (Complete if ventilation air inlet locations were installed (2.23, 2.24); otherwise check "N/A"): [69, 70]	-	-	☐
7.10.1 Inlet(s) pull ventilation air directly from outdoors and not from attic, crawlspace, garage, or adjacent dwelling unit.	☐	☐	-
7.10.2 Inlet(s) are ≥ 2 ft. above grade or roof deck; ≥ 10 ft. of stretched-string distance from known contamination sources not exiting the roof, and ≥ 3 ft. distance from dryer exhausts and sources exiting the roof. [71]	☐	☐	-
7.10.3 Inlet(s) are provided with rodent / insect screen with ≤ 0.5 inch mesh.	☐	☐	-

8. Local Mechanical Exhaust (National HVAC Design Report Item # indicated in parenthesis)

Dwelling Unit Mechanical Exhaust – In each dwelling unit kitchen and bathroom, a system is installed that exhausts directly to the outdoors and meets one of the following Rater-measured airflow and manufacturer-rated sound level standards: [59, 72]

Location		**Continuous Rate**	**Intermittent Rate [73]**	**Must Correct**	**Rater Verified [4]**	**N/A [5]**
8.1 Kitchen	Airflow	≥ 5 ACH, based on kitchen volume [74, 75]	≥ 100 CFM and, if not integrated with range, also ≥ 5 ACH based on kitchen volume [74, 75, 76]	☐	☐	-
	Sound	Recommended: ≤ 1 sone	Recommended: ≤ 3 sones			
8.2 Bathroom	Airflow	≥ 20 CFM	≥ 50 CFM	☐	☐	-
	Sound	Required: ≤ 2 sones	Recommended: ≤ 3 sones			

Mechanical Exhaust for Common Spaces [2] and Shared Garages			
8.3 Measured exhaust rates are ≥ ASHRAE 62.1-2010 rates (2c). [62]	☐	☐	☐
8.4 Where an exhaust system is installed in a shared garage, it is equipped with controls that sense CO and NO2.	☐	☐	☐
9. Filtration			
9.1 MERV 6+ filter(s) installed in each ducted mechanical system serving an individual dwelling unit, designed so all return and mechanically supplied outdoor air passes through filter(s) prior to conditioning, and located to facilitate access & regular service by the occupant, building owner, or building maintenance staff. [77]	☐	☐	☐
9.1.1 Filter access panel includes gasket and fits snugly against the exposed edge of filter when closed to prevent bypass. [78]	☐	☐	☐
10. Combustion Appliances			
10.1 Furnaces, boilers, and water heaters located within the building's pressure boundary are mechanically drafted or direct-vented. Alternatives in Footnote 81. [79, 80]	☐	☐	☐
10.2 Fireplaces located within the building's pressure boundary are direct-vented. [79, 80]	☐	☐	☐
10.3 No unvented combustion appliances other than cooking ranges or ovens are located inside the building's pressure boundary. [79]	☐	☐	☐

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Other	Must Correct	LP Verified[49]	Rater Verified [4]	N/A [5]
11. Domestic Hot Water				
11.1 Prescriptive Path: Hot Water Equipment Minimum Efficiency Levels (must meet one of the following):				
11.1.1 Where rated in EF or UEF, meet or exceed the ENERGY STAR Multifamily Reference Design [82]	☐	-	☐	☐
11.1.2 Where rated in Et or COP:				
11.1.2a For all Versions except Nat'l v1.2, ≥ 95% Et if electric and ≥ 85% Et for other fuels.	☐	-	☐	☐
11.1.2b For Nat'l v1.2, ≥ 2.0 COP for electric serving dwelling units, ≥ 95% Et for electric serving common spaces, and ≥ 90% Et for other fuels.	☐	-	☐	☐
11.2 ERI Path: Hot Water Equipment Min. Efficiency Levels for equipment serving common spaces but not dwelling units nor shared laundry:				
11.2.1 For non-electric equipment: if rated in EF or UEF, meet the efficiency levels specified in the ENERGY STAR Multifamily Reference Design; if rated in Et ≥85%, or for Nat'l v1.2 ≥ 90%. [82]	☐	-	☐	☐
11.2.2 For electric equipment: ≥ 0.93 UEF, 0.95 EF or 95% Et. [82]	☐	-	☐	☐
11.3 For in-unit storage water heaters, confirm presence of heat trap by visual inspection or on AHRI cert.	☐	-	☐	☐
11.4 Rater-measured delivery temperatures at faucets do not exceed 125°F. [83]	☐	-	☐	-
12. Lighting				
12.1 Common Space [2] Lighting Controls:				
12.1.1 ERI and Prescriptive Path: All common spaces [2] (including shared garages), except the building lobby, mechanical equipment rooms, and where automatic shutoff would endanger the safety of occupants [84], have occupancy sensors or automatic bi-level lighting controls installed and operation has been verified.	☐	☐	☐	☐
12.1.2 ASHRAE Path only: All common spaces [2] (including shared garages), except the building lobby, mechanical equipment rooms, corridors, and stairwells and where automatic shutoff would endanger the safety of occupants [84], have occupancy sensors or automatic bi-level lighting controls installed and operation has been verified.	☐	☐	☐	☐
12.2 Exterior lighting controls: Fixtures, including parking lot fixtures, must include automatic switching on timers or photocell controls except fixtures intended for 24-hour operation, required for security, or associated with the electric meter for an individual dwelling unit.	☐	☐	☐	☐
12.3 Common Spaces [2] and Garages: 90% of installed lighting fixtures are integrated LED fixtures or contain LED lamps. See Footnote 85 for alternate options.	☐	☐	☐	☐
12.4 ERI Path: All exterior and common space lighting fixtures meet the efficiency requirements in the ENERGY STAR Multifamily Reference Design, except fixtures located on dwelling unit balconies. [88, 89]	☐	-	☐	☐
12.5 Prescriptive Path: All lighting fixtures (i.e., dwelling units, common spaces, and exterior) meet the efficiency requirements in the ENERGY STAR Multifamily Reference Design. [88, 89]	☐	-	☐	☐
12.6 Prescriptive Path: Dwelling unit overall in-unit lighting power density ≤ 0.75 W/ft^2. When calculating overall lighting power density, use 1.1 W/ft^2 where lighting is not installed. [86]	☐	-	☐	☐
13. Appliances and Plumbing Fixtures		**Must Correct**	**Rater Verified [4]**	**N/A [5]**
13.1 Prescriptive Path: Installed appliances are ENERGY STAR certified. Installed bathroom faucets, bathroom aerators, and showerheads are WaterSense labeled. [90]		☐	☐	☐
13.2 ERI Path: Where installed in common spaces, refrigerators and dishwashers are ENERGY STAR certified and showerheads are WaterSense labeled.		☐	☐	☐
13.3 Prescriptive Path: Shower compartments with multiple fixtures cannot be operated simultaneously OR the total flow rate per shower compartment must not exceed 1.75 gallons per minute, as rated at 80 psi.		☐	☐	☐
14. Whole Building Energy Consumption Data Acquisition Strategy				
14.1 For buildings 50,000 ft^2 and larger, a strategy that enables the collection of monthly or annual building-level energy consumption data (electricity, natural gas, chilled water, steam, fuel oil, propane, etc.) has been confirmed. [91]		☐	☐	☐

Rater Name: _____ Rater Pre-Drywall Inspection Date(s): _____ Rater Initials: _____

Rater Company Name: _____

Rater Name: _____ Rater Final Inspection Date(s): _____ Rater Initials: _____

Rater Company Name: _____

Builder/Developer Employee: _____ Builder Inspection Date(s): _____ Builder Initials: _____

Builder/Developer Name: _____

Licensed Professional: _____ LP Inspection Date(s): _____ LP Initials: _____

Footnotes:

1. This Checklist applies to all dwelling units, sleeping units, common spaces [2], and garages (open or enclosed) in the building being certified, and where specified, parking lots. These requirements apply to all Paths, unless otherwise specified. These requirements do not apply to parking garages or lots where the cost of the energy use of the parking garage or lot is not the responsibility of the Builder/Developer, Building Owner or Property Manager. This Checklist does not apply to commercial or retail spaces. This Checklist does not apply to common spaces [2] that are located in buildings on the property without any dwelling or sleeping units. A 'sleeping unit' as defined by ANSI / RESNET / ICC 301, is 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 that encompasses dwelling/sleeping units and (if present) common spaces, sharing one or more of the following attributes: a common street address, a common entrance or exit, central/shared mechanical systems, or structurally interdependent wall or roof systems. Attached structures such as townhouses and 4-story two-unit structures (commonly referred to as "2-over-2s") may be considered separate buildings if they are divided by a vertical fire separation wall from the foundation to the roof sheathing and share none of the other attributes listed above. A skyway or a breezeway that connects two structures is not considered a common entrance or exit.
2. The term 'common space' refers to any spaces in the building being certified 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, and dining halls, as well as offices and other spaces used by building management, administration or maintenance in support of the residents.
3. At the discretion of the Rater, the builder or developer may verify up to eight items in Sections 1-4 of this Checklist. For the purpose of this Checklist, "Builder" represents either the builder or the developer. When exercised, the builder's responsibility will be formally acknowledged by the builder, or their designated agent, signing off on the checklist for the item(s) that they verified. However, if a quality assurance review indicates that Items have not been successfully completed, the Rater will be responsible for facilitating corrective action.
4. The term 'Rater' refers to the person(s) completing the third-party verification required for certification. The person(s) shall: a) be a Certified Rater, Approved Inspector, as defined by ANSI / RESNET / IECC 301, or an equivalent designation as determined by a Home Certification Organization (HCO) or Multifamily Review Organization (MRO); and, b) have attended and successfully completed an EPA-recognized training class. See www.energystar.gov/mftraining. As stated in the National Program Requirements, Raters who operate under an MRO or an HCO Sampling Protocol are permitted to verify any Checklist Item designated "Rater Verified" using an HCO-approved sampling protocol. No parties other than Raters are permitted to use sampling to complete this Checklist.
5. The column titled "N/A," which denotes items that are "not applicable," should be used when the checklist Item is not present in the building or conflicts with local requirements.
6. Two alternatives are provided: a) Grade II cavity insulation is permitted to be used for assemblies that contain a layer of continuous, air impermeable insulation ≥ R-3 in Climate Zones 1 to 4, ≥ R-5 in Climate Zones 5 to 8; [10] b) Grade II batts are permitted to be used in floors if they fill the full width and depth of the floor cavity, 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 Grade I is the compression caused by the excess insulation.
7. Ensure compliance with this requirement using ANSI / RESNET / ICC 301 including all Addenda and Normative Appendices, with new versions and Addenda implemented according to the schedule defined by the HCO or MRO that the building is certified under, with approved exceptions listed at www.energystar.gov/ERIExceptions.
8. 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.
9. Compliance with Items 1.5 and 1.6 is not required for buildings pursuing the ASHRAE Path, but the energy used by the heating systems must be modeled following the requirements in the Simulation Guidelines, available at www.energystar.gov/mfguidance.
10. For all Versions except National v1.2, the 2009 IECC Climate Zone designations are applicable, as defined and illustrated in Section R301 of the code. For National v1.2, the 2021 IECC Climate Zone designations are applicable, as defined and illustrated in Section R301 of the code. Note that some locations have shifted to a different Climate Zone in the 2021 IECC compared to prior editions.
11. Where conditioned space is above the plenum, in lieu of insulating the top of the plenum, the bottom of the plenum may be used to comply with Items 1.5.2 and 1.5.3, if its insulation meets the requirements of Item 1.5.2 and, where applicable, Item 3.6. When using this alternative, the bottom of the plenum must meet all the requirements for floor insulation which include a fully-aligned air barrier as described in Footnote 13 and Grade I installation per Item 1.3.
12. The bottom of the heated plenum is permitted to be suspended ceiling tiles or other non-air barrier material. If fiberglass insulation is installed, it must be paper-faced. This insulation shall achieve a Grade I or Grade II install.
13. 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.
14. 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, unless the ceiling is adiabatic.
15. All insulated vertical surfaces are considered walls (e.g., above and below grade exterior walls, knee walls) and must meet the air barrier requirements for walls. The following exceptions apply: air barriers recommended, but not required, in adiabatic walls; and, in Climate Zones

4 through 8, an air barrier at the interior vertical surface of insulation is recommended but not required in basement walls or crawlspace walls. For the purpose of these exceptions, a basement or crawlspace is a space for which ≥ 40% of the total gross wall area is below-grade.

16. EPA highly recommends, but does not require, an air barrier at the interior vertical surface of floor insulation in Climate Zones 4-8. [10]
17. Examples of supports necessary for permanent contact include staves for batt insulation or netting for blown-in insulation. Alternatively, supports are not required if batts fill the full depth of the floor cavity, 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.
18. Alternatively, an air barrier is permitted to be installed at the exterior horizontal surface of the floor insulation if the insulation is installed in contact with this air barrier, the exterior vertical surfaces of the floor cavity are also insulated, and air barriers are included at the exterior vertical surfaces of this insulation.
19. The minimum designated R-values must be achieved regardless of the trade-offs determined using an equivalent U-factor or UA alternative calculation. Note that if the minimum designated values are used, then higher insulation values may be needed elsewhere to meet Item 1.2. 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.
20. 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. Low-slope roof hatch covers to be insulated to R-5 minimum.
21. Slab edge insulation is required for slab-on-grade floors with a floor surface less than 24 inches below grade. Slab edge insulation is also required for slab floors with a floor surface less than 24 inches below grade, even if the slab itself is not in contact with the ground. Slab 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 ≥ R-3 rigid insulation on top of the slab. 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).
22. Where an insulated wall separates a garage, patio, courtyard, 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, ambient, or unconditioned space 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 and non-exempted details is available at: www.energystar.gov/slabedge.
23. Item 3.5 does not apply to the repeated concrete floor perimeter edges of a multistory building as those are subject to Item 3.7.1. Item 3.5 also does not apply where floor insulation meeting the requirements of Item 3.6 is installed above the slab and provides a continuous thermal boundary where it intersects the wall. 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 and non-exempted details is available at: www.energystar.gov/slabedge.
24. EPA has developed the following alternatives for projected slabs and podiums to comply with Item 3.5:
    For projected slabs (e.g., podiums, balconies), where a minimum of R-5 slab edge insulation is not installed between conditioned space and the unconditioned projected slab, use one of the options below:
    a) Modify the UA calculation for the wall assembly that accounts for this projected slab when demonstrating compliance with Item 1.2.
        a. Where no insulation is installed, modify the UA calculation such that the area of the wall that is uninsulated due to the projected slab is calculated as 400% of that actual area. For example, for a projected slab without any thermal break that is 20 feet wide, and has a thickness of 1 foot, the area to be used in the UA calculation is 80 ft^2 instead of 20 ft^2.
        b. Where insulation R-2 and greater is installed, the area is not required to be modified.
    b) Install minimum R-5 insulation, above and below the slab that extends horizontally for a minimum of 4 ft. Insulation installed on top of slab shall be covered by a durable floor surface. When demonstrating compliance with Item 1.2, R-1 insulation may be associated with the area of the wall that is uninsulated due to the projected slab.

    For the following podium constructions, a minimum of 8ft is not required:
    a) Where podium wall is less than 8ft in height, insulation must instead be installed for the full height of the podium.
    b) For podiums that continue below-grade, insulate to a minimum of 8ft below the bottom of the slab edge, or to the depth below-grade specified for slab edge insulation by Table 502.2(1) of the 2009 IECC.
    c) Where a minimum of 4ft of insulation is installed on both interior and exterior surfaces of the wall.
    d) For podiums where the horizontal slab is not in direct contact with the exterior wall and R-5 insulation is provided at the slab edge, continuous with the under-slab insulation. See energystar.gov/slabedge for example.
25. Where structural columns without thermal breaks cause a discontinuity in the installed floor insulation, the UA calculation for the floor assembly must account for this uninsulated area of the floor. For the purpose of this UA calculation, the area of the floor that is uninsulated due to the structural columns is required to be calculated as 400% of that actual area. For example, for a 4'x4' column, the area to be used in the UA calculation is 64 ft^2 instead of 16 ft^2. The height of the column is not used in this calculation. Alternatively, if the structural column is insulated for a minimum of R-5 for 4 vertical feet, the modification to the UA calculation is not required, and R-5 may be associated with the area of the floor that is uninsulated due to the column. If the structural column has a thermal break, the R-value of the thermal break shall be associated with the area of the floor that is uninsulated due to the column.

    While EPA recommends insulating vertically along other areas of discontinuity, such as where walls intersect the concrete slab; this is not required. These uninsulated areas of the floor are not subject to the UA modification.

26. Item 3.7 is applicable to walls that are adjacent to other buildings. 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: 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 3.7 or the pathway in the assembly with the least thermal resistance, as determined using a method consistent with the 2013 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 502.1.2. 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 3.7 shall be checked.

27. Walls and rim / band joists using steel or other metal framing shall meet the reduced thermal bridging requirements by complying with Item 3.7.1 of the Checklist and may not demonstrate compliance using Item 3.7.2 or 3.7.3.

28. 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, brick returns, stone window sills, metal panels, or masonry fireplaces; structural details, such as fasteners (e.g., shelf angles, metal clips, z-girts, brick ties), projected balconies, and service openings (e.g., PTACs or PTHPs), but not steel columns or wall area occupied by intermediate floors). 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, or engineer. The entire area of the wall area that is bypassed by the fastener must be used in the calculation. The Rater need not evaluate the necessity of the designed detail to certify the building.

29. 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, the advanced framing details listed in Item 3.7.3 shall be met for those wall sections.

30. In a building undergoing a gut rehabilitation, continuous interior insulation may be used in lieu of continuous exterior rigid insulation or insulated siding. This alternative does not require continuous interior insulation where a floor intersects an exterior wall, it only requires it from floor to ceiling. Continuous interior insulation is required where the demising wall intersects the exterior wall; however, it may be exempted per Footnote 28.

31. 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 3.7.1 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.

32. Rim / band joists are exempt from this requirement. For the purpose of this requirement, "≤ 3 stories" refers to any portion of the building elevation where the wood-framed walls do not exceed 3 stories in height. Partial floors that meet the definition of a mezzanine or loft, as defined by the 2012 IRC, do not count as a story. All 'advanced framing' details shall be met except where the builder, architect, or engineer provides a framing plan that encompasses the details in question, indicating that structural members are required at these locations and including the rationale for these members (e.g., full-depth solid framing is required at wall corners or interior / exterior wall intersections for shear strength, a full-depth solid header is required above a window to transfer load to jacks studs, or additional jack studs are required to support transferred loads). The Rater shall retain a copy of the detail and rationale for their records, but need not evaluate the rationale to certify the building.

33. 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.

34. 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. R-value requirement refers to manufacturer's nominal insulation value.

35. 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.

36. 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. [10]

37. For dwelling or sleeping units adjacent to garages, EPA recommends, but does not require, carbon monoxide (CO) alarms installed in a central location in the immediate vicinity of each separate sleeping zone and according to NFPA 720.

38. Where a sampling protocol is permitted in accordance with the National or California Program Requirements, at least 20% of the dwelling or sleeping units adjacent to a garage shall be selected for testing.

39. A 'ducted return' is defined as a continuous duct made of sheet metal, duct board, or flexible duct that connects one or more return grilles to the return-side inlet of the air handler. Any other approach to convey air from return or transfer grille(s) to the air handler, such as the use of building cavities, does not constitute a 'ducted return'.

40. This section of the Checklist is designed to meet ASHRAE 62.1-2010 or later, ASHRAE 62.2-2010 or later, and ANSI / ACCA's 5 QI-2015 protocol, thereby improving the performance of HVAC equipment in new multifamily buildings when compared to multifamily buildings 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 or by occupant behavior). Therefore, this Checklist is not a guarantee of proper ventilation, indoor air quality, or HVAC performance.

41. To be eligible for Track A – HVAC Grading by Rater, dwelling units must have at least one unitary HVAC system including air conditioners or heat pumps up to 65 kBtuh, or furnaces up to 125 kBtuh (i.e., within the scope of ANSI / RESNET / ACCA Standard 310). Track A – HVAC Grading by Rater shall use ANSI / RESNET / ACCA 310 including all Addenda and Normative Appendices, with new versions and Addenda implemented according to the schedule defined by the HCO or MRO that the building is being certified under for all dwelling units.

42. For Track A, all unitary HVAC Systems including air conditioners and heat pumps up to 65 kBtuh and furnaces up to 125 kBtuh serving individual dwelling units shall comply with 5a.1 through 5a.4 for the building to be certified. Common spaces with those systems may choose to use ANSI / RESNET / ACCA 310 and complete Items 5a.1 through 5a.3, or to complete Item 5a.4 and Sections 2 and 3 on the National HVAC Functional Testing Checklist.

    For Track B, Item 5b.1 is applicable for all systems. Item 5b.2 is applicable to split air conditioners, unitary air conditioners, air-source heat pumps, and water-source (i.e., geothermal) heat pumps up to 65 kBtuh with forced-air distribution systems (i.e., ducts) and to furnaces up to 225 kBtuh with forced-air distribution systems (i.e., ducts). All systems shall comply with 5b.1 and 5b.2, as applicable, for the building to be certified.

    If, based on the selected Track, an Item in Section 5 is not applicable to any systems in the building, the Rater shall mark 'N/A' for that Item.

43. If the non-invasive procedure in ANSI / RESNET / ACCA 310 is not permitted to be used during the final inspection of a unit (i.e., due to the equipment type or to outdoor air temperatures that do not meet the requirements of the non-invasive method), then the unit is permitted to be certified with a default refrigerant charge designation of Grade III. Note that in these circumstances, the weigh-in method procedure in ANSI / RESNET / ACCA 310 may still be used to pursue a Grade I designation.

44. While this verification is completed as part of ANSI / RESNET / ACCA 310, it must also be documented in this checklist.

45. If installed equipment does not match the National HVAC Design Report, then prior to certification the Rater shall obtain written approval from the designer (e.g., email, updated National HVAC Design Report) confirming that the installed equipment meets the requirements of the National HVAC Design Report. In addition, the Rater shall verify that all installed equipment are still exempted types per Footnote 25 of the National HVAC Design Report or, if no longer an exempted type, shall re-review Section 4b of the National Rater Design Review Checklist to ensure compliance with all requirements (e.g., full completion of HVAC Design Report, HVAC design tolerances). 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 or Functional Testing Agent after installation is complete.

46. The Rater shall measure and record the external static pressure in the return-side and supply-side of the system using the contractor-provided test locations. However, at this time, the Rater need not assess whether these values are within a specific range to certify the dwelling unit. Ductless systems and systems with a total amount of supply ductwork or distribution building cavities ≤ 10 ft. in length are exempted from this requirement. The Rater is also not required to measure external static pressure for multi-split systems and may mark "N/A".

47. These requirements apply to systems that provide primary space heating and cooling. Electric resistance limitations do not apply to systems dedicated to heating outdoor air supplied by a mechanical ventilation system, as long as the space served is primarily heated by a non-electric-resistance system that meets the efficiency requirements noted in Exhibit X. Electric resistance limitations apply to garages, but do not apply to heated plenums meeting Item 5.11, or stairwells where automatic thermostatic controls prevent operation above 50°F.

48. Functional Testing Agents must hold an approved credential, as listed at www.energystar.gov/ftas, or must be 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, nor employed by the same company as 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 www.energystar.gov/findhvac. A directory of other FT Agents can be found at www.energystar.gov/ftas. Raters can confirm FT Agents have met the requirements by documenting they are listed in a directory. For Track A Sections 2 and 3 of the National HVAC Functional Testing Checklist do not need to be completed for systems using ANSI / ACCA / RESNET 310 and meeting Items 5a.1 – 5a.3.

49. At the discretion of the Rater, a Licensed Professional (LP), (i.e., a Registered Architect or Professional Engineer in good standing and with a current license), may verify any of the items in Sections 5, 11, and 12 of this Checklist, where a checkbox is provided for "LP Verified". When exercised, the LP's responsibility will be formally acknowledged by the LP signing off on the checklist for the item(s) that they verified. However, if a quality assurance review indicates that Items have not been successfully completed, the Rater will be responsible for facilitating corrective action.

50. 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. Compression is to be avoided and occurs when flexible ducts in unconditioned space are installed in cavities smaller than the outer duct diameter and ducts in conditioned space are installed in cavities smaller than inner duct diameter. Ducts shall not include coils or loops except to the extent needed for acoustical control.

51. Item 6.2 does not apply to ventilation ducts, exhaust ducts, or non-ducted systems. For an HVAC system with a multi-speed fan, the highest design fan speed shall be used when verifying this requirement. When verifying this requirement, doors separating bedrooms from the main body of the dwelling unit (e.g., a door between a bedroom and a hallway) shall be closed and doors to rooms that can only be entered from the bedroom (e.g., a closet, a bathroom) shall be open. The Rater-measured pressure shall be rounded to the nearest whole number to assess compliance.

52. Item 6.3 does not apply to ducts that are a part of local mechanical exhaust or exhaust-only dwelling-unit mechanical ventilation systems. EPA recommends, but does not require, that all metal ductwork not encompassed by Section 6 (e.g., exhaust ducts, duct boots, ducts in conditioned space) also be insulated and that insulation be sealed to duct boots to prevent condensation.

53. Items 6.4 and 6.5 generally apply to the ducts of space heating, space cooling, and dwelling-unit mechanical ventilation systems.

    However, visual inspection is permitted in lieu of testing for the following system types: 1) a dwelling-unit mechanical ventilation system not connected to the space heating or space cooling system, regardless of the number of dwelling units it serves; 2) a space heating or space cooling system for which the ducts and air handler are in conditioned space and the total supply duct length of the system, including all supply trunks and branches, is ≤ 10 ft; and 3) a space heating or space cooling system that serves more than one dwelling unit. In such cases, a Rater shall visually verify 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.

    For duct systems requiring testing, duct leakage shall be determined and documented by a Rater using ANSI / RESNET / ICC 380 including all Addenda and Normative Appendices, with new versions and Addenda implemented according to the schedule defined by the HCO or MRO that the building is being certified under. Leakage limits shall be assessed on a per-system, rather than per-dwelling unit, basis.

54. Note that compliance with Item 6.4.1 or 6.4.2 in conjunction with Section 4a of the National Rater Design Review Checklist automatically achieves Grade I total duct leakage per ANSI / RESNET / ACCA 310.
55. Cabinets (e.g., kitchen, bath, multimedia) or ducts that connect duct boots to toe-kick registers are not required to be in place during the 'rough-in' test.
56. 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.
57. Testing of duct leakage to the outdoors can be waived in accordance with the 2nd or 3rd alternative of ANSI / RESNET / ICC 301, Table 4.2.2 (1), footnote (w). Alternatively, testing of duct leakage to outdoors can be waived in accordance with Section 5.5.2 of ANSI / RESNET / ICC 380 if total duct leakage, at rough-in or final, is ≤ 4 CFM25 per 100 sq. ft. of conditioned floor area or 40 CFM25, whichever is larger. Guidance to assist partners with these alternatives, including modeling inputs, is available at www.energystar.gov/newhomesguidance.
58. For the purpose of computing leakage allowance, exhaust fan flow shall be the lesser of the rated fan flow and at rough-in, 133% of the sum of the design exhaust airflow of the dwelling units that are exhausted by that central fan or at final, 143% of the sum of the design exhaust airflow of the dwelling units that are exhausted by that central fan. Measured fan flow (either at the fan itself or the total airflow measured from all exhaust grilles served by the fan) may be used in lieu of the rated fan flow to determine the leakage allowance. Duct leakage shall be tested at the design or average operating pressure and shall use the procedures in the *RESNET Guidelines for Multifamily Energy Ratings*, available at www.resnet.us/blog/resnet-adopts-guidelines-for-multifamily-energy-ratings/. Where testing at the design or average operating pressure is not feasible, testing at 50 Pa is permitted, however the following flow equation must be used to determine the leakage allowance at 50 Pa.

$$CFM_{50} = CFM_{design} / [P_{design}^{(0.65)} / 50^{(0.65)}]$$

No less than 50% of the ductwork, based on total linear feet, shall be tested and must include ductwork other than the main trunks. Where portions of ductwork are tested, rather than entire risers, the percentage of leakage allowed is based upon the design airflow of the dwelling units that are exhausted in that portion. Where failures occur, the percentage of total linear feet required to be tested increases by 10%. Where aerosol-based sealant is used on some but not all risers, the ductwork selected for testing must be representative of all sealing strategies used. This test is not required of central exhaust systems serving clothes dryers but is required for the central exhaust portion of balanced systems such as HRVs and ERVs.

59. As defined by ANSI / RESNET / ICC 301-2019, a Dwelling Unit Mechanical Ventilation System is a ventilation system consisting of powered ventilation equipment such as motor-driven fans and blowers and related mechanical components such as ducts, inlets, dampers, filters and associated control devices that provides dwelling-unit ventilation at a known or measured airflow rate.
60. Item 7.5 applies to any outdoor air inlet connected to a ducted return of the dwelling unit HVAC system, regardless of its intended purpose (e.g., for ventilation air, make-up air, combustion air). This Item does not apply to HVAC systems without a ducted return.
61. The dwelling-unit ventilation air flows and local exhaust air flows shall be determined and documented by a Rater using ANSI / RESNET / ICC 380 including all Addenda and Normative Appendices, with new versions and Addenda implemented according to the schedule defined by the HCO or MRO that the building is being certified under. In Item 7.2, the dwelling-unit ventilation rates required by ASHRAE 62.2-2010 can be calculated using the Multifamily Workbook or the following equation: 0.01 x Conditioned Floor Area + 7.5 x (number of bedrooms + 1). For sleeping units, the following equation may be used: 0.01 x Conditioned Floor Area + 7.5 x (number of beds). Where local codes do not permit dwelling-unit ventilation to exceed ASHRAE 62.2-2010 rates, Rater-measured ventilation rate is permitted to be 0-15 CFM less than rates required by ASHRAE 62.2-2010.
62. While common spaces are not under the scope of ANSI / RESNET / ICC 380, the ventilation air flow and exhaust air flows in common spaces shall be measured in accordance with the procedures in ANSI / RESNET / ICC 380. The air flows may be measured by a Rater or a certified air-balancing contractor under the observation of a Rater. Where a system provides supply air that is a mix of return and outdoor air, and not 100% outdoor air, the outdoor air airflow shall be measured and compared to the total supply airflow to determine percentage of outdoor air supplied. This percentage shall be applied to airflow measured at supply registers to determine outdoor air provided for comparison to design airflow rates.
63. For permits on or before 01/01/2024, where outdoor air is supplied via a PTAC or PTHP, in lieu of measurement, the design CFM shall meet or exceed the ventilation rates required by ASHRAE 62.1-2010 and the space served by the PTAC or PTHP shall have at least one operable window. For permits after 01/01/2024, both the runtime and measurement of outdoor air through these systems will be required to demonstrate compliance with ASHRAE 62.1-2010 or alternative ventilation system specified (e.g., ducted supply).
64. For example, if an outdoor air inlet connected to a ducted return is used as a dedicated source of outdoor air for an exhaust ventilation system (e.g., bath fan), the outdoor airflow must be automatically restricted when the exhaust fan is not running and in the event of an override of the exhaust ventilation system.

    In dwelling / sleeping units in multifamily buildings, but not townhouses, automatic restriction of airflow is exempted if a manual shutoff damper is used with a continuous exhaust ventilation system and is readily-accessible, labeled as the override, and not used as a balancing damper.
65. When assessing the ventilation rate, the highest HVAC fan speed applicable to ventilation mode shall be used (e.g., if the inlet only opens when the HVAC is in 'fan-only' mode, then test in this mode). If the inlet has a motorized damper that only opens when the local mechanical kitchen exhaust is turned on, then testing is not required.

    When required, the ventilation airflow through the inlet shall be measured and documented by a Rater using ANSI / RESNET / ICC 380 including all Addenda and Normative Appendices, with new versions and Addenda implemented according to the schedule defined by the HCO or MRO that the building is being certified under. As an alternative, measurement of the outdoor airflow can be waived if a Constant Airflow Regulating (CAR) damper with a manufacturer-specified maximum flow rate no higher than 15 CFM or 15% above the ventilation design value is installed on the inlet.
66. Dwelling-unit mechanical ventilation fans shall be rated for sound at no less than the airflow rate in Item 2.7 of the National HVAC Design Report. Fans exempted from this requirement include HVAC air handler fans, remote-mounted fans, and intermittent fans rated ≥ 400 CFM. 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 grille. 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.

67. Note that the 'fan-on' setting of a thermostat would not be an acceptable controller because it would continuously operate the HVAC fan.
68. Bathroom fans with a rated flow rate ≥ 500 CFM and heat/energy recovery ventilation fans are exempted from the requirement to be ENERGY STAR certified.
69. Ventilation air inlets that are only visible via rooftop access are exempted from Item 7.10 and the Rater shall mark "N/A". 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.
70. 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 building owner or maintenance staff.
71. Known contamination sources include, but are not limited to, stacks, vents, exhausts, and vehicles.
72. Continuous bathroom local mechanical exhaust fans shall be rated for sound at no less than the airflow rate in Item 8.2. Intermittent bathroom and both intermittent and continuous kitchen local mechanical exhaust fans are recommended, but not required, to be rated for sound at no less than the airflow rate in Items 8.1 and 8.2. 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, clothes dryers). Per ASHRAE 62.2-2010, a bathroom is any room containing a bathtub, shower, spa, or similar source of moisture.
73. 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.
74. Kitchen volume shall be determined by drawing the smallest possible rectangle on the floor plan that encompasses all cabinets, pantries, islands, peninsulas, ranges / ovens, and the kitchen exhaust fan, and multiplying by the average ceiling height for this area. In addition, the continuous kitchen exhaust rate shall be ≥ 25 CFM, per 2009 IRC Table M1507.3, regardless of the rate calculated using the kitchen volume. Cabinet volume shall be included in the kitchen volume.
75. Alternatively, the prescriptive duct sizing requirements in Table 5.3 of ASHRAE 62.2-2010 or later 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/newhomesguidance. As an alternative to Item 8.1, dwelling units are permitted to use a continuous kitchen exhaust rate of 25 CFM per 2009 IRC Table M1507.3, if they are either a) Phius or PHI certified, or b) provide both dwelling-unit ventilation and local mechanical kitchen exhaust using a balanced system, and have a Rater-verified whole-building infiltration rate ≤ 1.0 ACH50 or ≤ 0.05 CFM50 per sq. ft. of Enclosure Area. 'Enclosure Area' is defined as the area of the surfaces that bound the volume being pressurized / depressurized during the test.
76. 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.
77. Based upon, ASHRAE 62.2-2010, ducted mechanical systems are those that supply air to an occupiable space with a total amount of supply ductwork exceeding 10 ft. in length and through a thermal conditioning component, except for evaporative coolers. Systems that do not meet this definition are exempt from this requirement. While filters are recommended for mini-split systems, HRV's, and ERV's, these systems, ducted or not, typically do not have MERV-rated filters available for use and are, therefore, also exempted under this version of the requirements. HVAC filters located in the attic shall be considered accessible to the occupant, building owner, or building maintenance staff if either 1) drop-down stairs, a pull-down ladder, or door provide access to attic and a permanently installed walkway has been provided between the attic access location and the filter or 2) the filter location enables arm-length access from a portable ladder without the need to step into the attic and the height of the ceiling access panel or the bottom of the wall access panel where access is provided is ≤ 12 ft.
78. Sealing mechanisms comparable to a gasket are also permitted to be used. 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 grille.
79. The pressure boundary is the primary 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.
80. 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.
81. Naturally drafted equipment is only allowed if located in a space outside the pressure boundary, where the envelope assemblies separating it from conditioned space are insulated and air-sealed.
82. Where water heater efficiency is rated in Uniform Energy Factor (UEF) rather than Energy Factor (EF), the EF may be calculated from the Uniform Energy Factor (UEF) using the RESNET EF Calculator 2017. The calculated EF must meet the efficiency levels specified in the ENERGY STAR Multifamily Reference Design.
83. To measure the delivery temperature, turn the hot water at any faucet completely on and place a digital thermometer in the stream of water. Observe the thermometer and when no additional rise in temperature occurs after 10 seconds, confirm this temperature does not exceed 125°F.
84. For common spaces where automatic lighting controls are not installed due to safety concerns associated with automatic lighting shutoff, the architect or engineer must provide the specific location(s) where this concern is applicable. The Rater shall retain a copy of the email or letter

that documents the location(s) for their records and check the box in the "Rater Verified" column. For Item 12.1.1, this exemption does not apply to corridors or stairwells; where safety is a concern in those spaces, the ASHRAE Path should be pursued.

85. As an alternative to the efficiency requirements in Item 12.3, installed lighting may instead meet the following lighting power allowances. In common spaces (except garages), for ERI and Prescriptive Path, total installed lighting power for the combined common spaces [2] must not exceed ASHRAE 90.1-2007 allowances for those combined spaces, using the Space-by-Space or Building Area Method. For ASHRAE Path, total installed lighting power for the combined common spaces [2] must not exceed ASHRAE 90.1-2007 allowances for those combined spaces, using the Space-by-Space or Building Area Method, by more than 20%. For all Paths, see Footnote 86 and 87 for allowances.

    In shared garages, installed lighting shall not exceed 0.24 W/ft^2.

86. Senior housing buildings can use the space-by-space allowances for 'facilities for the visually impaired' in ASHRAE 90.1-2016 Appendix G Table G3.7 for spaces used primarily by building residents. For example, 1.15 W/SF lighting power allowance may be used for the corridors in the baseline. To qualify for the increased allowance, the building must be designed to comply with the light levels in ANSI / IES RP-28 and must provide housing for seniors and/or people with special visual needs. Prescriptive Path dwelling unit overall in-unit lighting power density is permitted to be ≤ 1.3 W/SF, using 1.65 W/SF where lighting is not installed.

87. Lighting power density values from ASHRAE 90.1-2007 Section 9 for Space-by-Space Method for typical common spaces in multifamily properties are shown in the table below. Buildings following the Building Area method, the lighting power density is 0.7 W/ft^2. For spaces not shown, refer to ASHRAE 90.1-2007 Section 9.

ASHRAE Space Type	Lighting Power Densities (W/ft^2)	ASHRAE Space Type	Lighting Power Densities (W/ft^2)	ASHRAE Space Type	Lighting Power Densities (W/ft^2)
Lobby / Elevator	1.3	Corridor / Transition	0.5	Office	1.1
Active Storage (e.g., trash chute / room, janitor closet)	0.8	Stairs – Active	0.6	Lounge / Recreation / Community Room / Computer Room	1.2
Inactive Storage (e.g., tenant storage)	0.3	Restroom	0.9	Electrical / Mechanical	1.5
Exercise Area / Room	0.9	Laundry Room	1.3	Workshop	1.9

88. This requirement applies to exterior lighting fixtures that are attached to the building, but does not apply to landscape or parking lot lighting fixtures.

89. For Prescriptive Path dwelling units, ENERGY STAR certified fixtures or light bulbs are required; however, the Rater is only responsible for verifying that the installed lighting meets the Tier I or Tier II definition specified in ANSI / RESNET / ICC 301. For locations outside the dwelling unit, as an alternative to ENERGY STAR certified fixtures or light bulbs, integrated LED fixtures or fixtures containing LED or fluorescent lamps are permitted. Note that for all locations in Version 1.2, light fixtures must be integrated LED fixtures or contain LED lamps and not fluorescent.

90. Appliances include refrigerators, dishwashers, clothes washers, and clothes dryers. Where an appliance type is not eligible for ENERGY STAR certification, (e.g., commercial dryers) the appliance is exempt from this requirement. Where a bathroom faucet or aerator is not eligible for WaterSense certification, (e.g., public use lavatory faucets) the fixture is exempt from this requirement.

91. Building area shall be calculated according to Gross Floor Area as defined by ENERGY STAR Portfolio Manager, which specifies to measure from the outside surface of exterior walls and includes all areas inside the building and excludes parking areas. Refer to the ENERGY STAR Portfolio Manager Glossary for a complete definition. Strategies include: an agreement with the utility companies to provide the aggregated building-level data, in a spreadsheet format or directly through Portfolio Manager; OR evidence that securing signed utility data release forms will be a mandatory component of all lease agreements; OR installation of a building-level energy monitor, data acquisition system, or utility-owned energy meter. If an energy monitor is installed, the builder shall provide the building operator with the manufacturer's documentation and operations manual. EPA recommends, but does not require, that one of these strategies also be implemented in buildings 25,000-49,999 ft^2.

Exhibit X – Prescriptive Minimum Heating and Cooling Equipment Efficiencies based on Version the building is certified to. Version 1, Version 1.1, and Oregon and Washington Version 1.2: †

Equipment Type	Minimum Efficiency
Room AC (window, through-wall, ductless mini-splits)	ENERGY STAR certified
Air conditioners, air cooled (<13 Kbtu/h)	13 SEER
Air conditioners, air cooled (≥13 and <65 Kbtu/h)	See Reference Design
Air conditioners, air cooled (≥65 and <240 Kbtu/h)	11.5 EER/12.0 IEER
Air conditioners, air cooled (≥240 and < 760 Kbtu/h)	10.0 EER/10.5 IEER
Electric resistance space heating	• Not permitted in any dwelling unit using the Prescriptive Path • Electric resistance heating specified in common spaces and garages have a total heating capacity ≤ 12 kBtu/h (3.5 kW) per enclosed space and has automatic thermostatic controls
Warm-Air Furnace (<225 KBtu/h, common spaces)	78% AFUE or 80% Et
Warm-Air Furnace (<225 KBtu/h, dwelling units)	See Reference Design. For PTAC, use 80% Et
Warm-Air Furnace (≥225 KBtu/h)	80% Et (gas) or 81% Et (oil)
Packaged Terminal Air Conditioner (PTAC < 7 kBtu/h)	11.9 EER
Packaged Terminal Air Conditioner (PTAC > 15 kBtu/h)	9.5 EER
Packaged Terminal Air Conditioner (≥7 and ≤15 KBtu/h)	14.0 – (0.300 X Cap/1000) EER
Packaged Terminal Heat Pump (PTHP)	Cooling: 14.0– (0.3 X Cap/1000) EER Heating: 3.7– (0.052 X Cap/1000) COP
Air cooled heat pump (≥13 and <65 KBtu/h)	See Reference Design
Air cooled heat pump (≥65 and <240 KBtu/h)	Cooling: 11.1 EER/11.6 IEER Heating: 3.3 COP (@47°F DB)
Air cooled heat pump (≥240 KBtu/h)	Cooling: 9.6 EER/9.6 IEER Heating: 3.2 COP (@47°F DB)
Water-source heat pump (<135 KBtu/h)	Cooling: 14.0 EER(86°F entering water) Heating: 4.2 COP(68°F entering water)
Boilers, hot water (<300,000 Btu/h)	See Reference Design
Boilers, hot water (≥300,000 Btu/h)	86% E_t (89% E_t if using heat pumps)
VRF Air Conditioners and Heat Pumps	See Tables 6.8.1I and 6.8.1J of ASHRAE 90.1-2010
Air-cooled chillers with or without condenser	10.0 EER / 12.5 IPLV
Water-cooled chiller, positive displacement (<75 tons)	0.780 kW/ton (Full load) / 0.630 kW/ton (IPLV)
Water-cooled chiller, positive displacement (75-150 tons)	0.775 kW/ton (Full load) / 0.615 kW/ton (IPLV)
Water-cooled chiller, positive displacement (150-300tons)	0.680 kW/ton (Full load) / 0.580 kW/ton (IPLV)
Water-cooled chiller, positive displacement (>300 tons)	0.620 kW/ton (Full load) / 0.540 kW/ton (IPLV)
Water-cooled, centrifugal (<300 tons)	0.634 kW/ton (Full load) / 0.596 kW/ton (IPLV)
Water-cooled, centrifugal (≥300 and <600 tons)	0.576 kW/ton (Full load) / 0.549 kW/ton (IPLV)
Water-cooled, centrifugal (≥600 tons)	0.570 kW/ton (Full load) / 0.539 kW/ton (IPLV)
Air-cooled absorption single effect chiller	0.6 COP
Water-cooled absorption single effect chiller	0.7 COP
Absorption double effect indirect-fired chiller	1.0 COP (Full load) / 1.05 COP (IPLV)
Absorption double effect direct-fired chiller	1.0 COP (Full load) / 1.00 COP (IPLV)
Open-loop propeller or axial fan cooling towers*	>40 gpm/hp (@95°F entering water, 85°F leaving water, 75°F wb entering air)
Closed-loop propeller or axial fan cooling towers*	>15 gpm/hp (@102°F entering water, 90°F leaving water, 75°F wb entering air)
Open-loop centrifugal fan cooling towers*	>22 gpm/hp (@95°F entering water, 85°F leaving water, 75°F wb entering air)
Closed-loop centrifugal fan cooling towers*	>8 gpm/hp (@102°F entering water, 90°F leaving water, 75°F wb entering air)
Air source DX-DOAS (dehumidification mode)	4.0 ISMRE
Air source DX-DOAS (heat pump, heating mode)	2.7 ISCOP
Other DX-DOAS (e.g., water source)	See ASHRAE 90.1-2016; Table 6.8.1-15

Cap means the rated capacity of the product in Btu/h. If < 7,000 Btu/h, use 7,000; if > 15,000, use 15,000 in calculation.
† For Equipment Types not listed here, minimum efficiencies shall be based on those listed in ASHRAE 90.1-2010.
*Cooling tower fan motors must be equipped with VFD controlled by a temperature sensor on the condenser water supply pipe.

Version 1.2:

For Equipment Types not listed here, minimum efficiencies shall be based on 5% improvement over those listed in ASHRAE 90.1-2019. Use the efficiency values for "after 1/1/2023" where listed.

Equipment Type	CZ 1-4 [10]	CZ 4C-8 [10]
Room AC (window, through-wall)	ENERGY STAR certified	
Air conditioners, air cooled (Split system & single package)		
Air conditioners, air cooled (<65 kBtu/h)	See Reference Design	
Air conditioners, air cooled (≥65 and <135 kBtu/h)	15.7 IEER	14.6 IEER
Air conditioners, air cooled (≥135 and <240 kBtu/h)	15.1 IEER	14.0 IEER
Air conditioners, air cooled (≥240 and < 760 kBtu/h)	14.1 IEER	13.0 IEER
Electric resistance space heating	• Not permitted in any dwelling unit using the Prescriptive Path • Electric resistance heating specified in common spaces has a total heating capacity ≤ 12 kBtu/h (3.5 kW) per enclosed space and has automatic thermostatic controls	
Warm-Air Furnace (<225 kBtu/h, common spaces)	See Reference Design	CZ 5-8 90% AFUE
Warm-Air Furnace (≥225 kBtu/h, common spaces)	80% Et	81% Et
Warm-Air Furnace (dwelling units)	See Reference Design	
Packaged Terminal Air Conditioner (PTAC), w/gas-fired heat (dwelling units)	80% Et	82% Et, AND 0.25 cfm50/ft2 avg per unit
PTAC (dwelling units)	12.5 EER	11.9 EER
PTAC (common spaces)	<7 kBtu/h: 12.5 EER	<7 kBtu/h: 11.9 EER
	≥7 and ≤15 kBtu/h: 14.7 - (0.320 X Cap/1000) EER	≥7 and ≤15 kBtu/h: 14.0 - (0.300 X Cap/1000) EER
	>15 kBtu/h: 10.0 EER	>15 kBtu/h: 9.5 EER
Packaged Terminal Heat Pump (PTHP) (cooling) †	<7 kBtu/h: 12.5 EER	<7 kBtu/h: 11.9 EER
PTHP (dwelling units, cooling) †	≥7 and ≤ 10 kBtu/h: 14.7 - (0.320 X Cap/1000) EER	≥7 and ≤ 15 kBtu/h: 14.0 - (0.300 X Cap/1000) EER
	> 10 kBtu/h: 11.5 EER	> 15 kBtu/h: 9.5 EER
PTHP (common spaces, cooling) †	≥7 and ≤ 15 kBtu/h: 14.7 - (0.320 X Cap/1000) EER	≥7 and ≤ 15 kBtu/h: 14.0 - (0.300 X Cap/1000) EER
	>15 kBtu/h: 10.0 EER	>15 kBtu/h: 9.5 EER
PTHP (dwelling units, heating) †	< 8 kBtu/h: 3.3 COP ≥ 8 kBtu: 3.7– (0.052 X Cap/1000)	3.4 COP
PTHP (common spaces, heating) †	<7 kBtu/h: 3.3 COP	<10.5 kBtu/h: 3.4 COP
	≥7 and ≤15 kBtu/h: 3.7– (0.052 X Cap/1000) COP	≥10.5 and ≤12 kBtu/h: 3.3 COP
	> 15 kBtu/h: 2.9 COP	> 12 kBtu/h: 3.2 COP
Air cooled heat pump (Split system and single package) †		
Air cooled heat pump (<65 kBtu/h)	See Reference Design	
Air cooled heat pump (≥65 and <135 kBtu/h)	15.1 IEER, 3.5 COP	
Air cooled heat pump (≥135 and <240 kBtu/h)	14.4 IEER, 3.4 COP	
VRF Air Conditioners and Heat Pumps†	16.2 IEER, 3.3 COP	
Water-loop heat pump (WLHP) (<135 kBtu/h) †	15.0 EER, 4.5 COP	
Boilers, hot water (<300,000 Btu/h, dwelling units)	See Reference Design	
Boilers, hot water (≥300,000 Btu/h, dwelling units)	CZ 1-3 80% Et CZ 4 86% Et (89% Et with WLHP)	95% Et (90% Et with WLHP)
Boilers, hot water (common Spaces)	CZ 1-3 80% AFUE or Et CZ 4 86% AFUE or Et	86% AFUE or Et

Cap means the rated capacity of the product in Btu/h.

† Where domestic hot water is provided by heat pump water heaters, the systems noted above with an † may instead meet the efficiency listed in ASHRAE 90.1-2019. Use the efficiency values for “after 1/1/2023” where listed.