ENERGY STAR®
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Historical Document

This document is provided for reference because it has been superseded by a more recent Version or Revision.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.

National HVAC Design Supplement to Std. 310 for Common Spaces & Central Systems [1]

ENERGY STAR Multifamily New Construction, Version 1 / 1.1 / 1.2 (Rev. 02)

HVAC Designer Responsibilities:

- This Supplement shall be used for MFNC buildings where "Track A – HVAC Grading by Rater" is used for all dwelling unit HVAC systems.
- Complete one Supplement for Common Spaces and Central Systems for each building. This Supplement includes system design for all hydronic systems, common space heating and cooling systems that are not using HVAC Grading, and common space and central ventilation requirements not covered under ANSI / RESNET / ACCA 310 or the National HVAC Design Supplement to Std. 310 for Dwellings & Units. For projects with multiple buildings, one Supplement per building or per project is permitted. [1]
- Obtain efficiency features (e.g., window performance, insulation levels, and infiltration rate) from the builder, architect, or Rater. [2]
- Provide the completed Supplement to the Rater and the person / company completing the National HVAC Functional Testing Checklist. [2]

1. Design Overview

1.1 Designer name: ______________________________ Designer company: ____________________________ Date: __________

1.2 Select which party you are providing these design services to: ☐ Builder / Developer ☐ FT Agent ☐ MEP / Credentialed HVAC contractor

1.3 Name of company you are providing these design services to (if different than Item 1.1): ______________________________

1.4 Project address: ______________________________ City: ______________________ State: ______ Zip code: __________

2a. Common Space Mechanical Ventilation Design ("Vent System") [3] & Inlets in Return Duct [4, 5, 6]						**Designer Verified**
Airflow:						
2.1 Common space outdoor airflow design rate meet the requirements of Section 6 of ASHRAE 62.1 [5] ☐ 2010 ☐ 2013, without exceeding 2013 rates by more than 50%.						☐
List common space for which 62.1 ventilation rates were calculated in the spaces to the right: [6, 7]						
2.2 Ventilation airflow rate required by ASHRAE 62.1:						
2.3 Ventilation airflow rate designed:						
Common Space System Type & Controls: [7]						
List Ventilation System ID in the spaces to the right: [6]						
2.4 Specified system type: (e.g., supply, exhaust, balanced, ERV, HRV)						
2.5 Manufacturer:						
2.6 Model Number:						
2.7 # of Spaces Served (e.g., single, multiple)						
2.8 Area / space(s) that system serves: (e.g., common kitchens, corridor, community room)						
2.9 Specified control location: (e.g., restroom, utility):						
2.10 Specified controls allow the systems to operate automatically, without occupant intervention. A ventilation override control is specified 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). [7]						☐
Common Space Air Inlet Locations: (Complete this section if system has specified air inlet location(s); otherwise check "N/A".) [7, 8]						**Designer Verified** ☐ N/A
2.11 Inlet(s) pull ventilation air directly from outdoors and not from attic, crawlspace, garage, or adjacent dwelling unit.						☐
2.12 Inlet(s) are ≥ 2 ft. above grade or roof deck; ≥ 10 ft. of stretched-string distance from known contamination sources (e.g., stack, vent, exhaust, vehicles) not exiting the roof, and ≥ 3 ft. from dryer exhausts and sources exiting the roof.						☐
2.13 Inlet(s) are provided with rodent / insect screen with ≤ 0.5 inch mesh.						☐
2b. Common Space and Garage Minimum Exhaust Rates – System(s) are designed that mechanically exhaust air from each common space, as required by ASHRAE 62.1-2010 or 2013						☐

Location	**ASHRAE 62.1 Rate**	**Design Rate**	**Location**	**ASHRAE 62.1 Rate**	**Design Rate**
Janitor Room	1 cfm/ft^2		Common space kitchen [9]	50 cfm / 100 cfm	
Trash / Recycling Room	1 cfm/ft^2		Common space bathroom [10]	50 cfm per toilet / urinal	
Parking Garage	0.05 cfm/ft^2, standby 0.75 cfm/ft^2, full-on		☐ Shared garage exhaust fan controls include CO and NO2 sensors.		

3. Heating & Cooling Loads

3.1 Common Space Heating & Cooling Loads [6, 7]

Common Space Name: ______________ Design Conditions: Total Heat Gain: _______(kBtuh) Total Heat Loss: _______(kBtuh)

Common Space Name: ______________ Design Conditions: Total Heat Gain: _______(kBtuh) Total Heat Loss: _______(kBtuh)

Common Space Name: ______________ Design Conditions: Total Heat Gain: _______(kBtuh) Total Heat Loss: _______(kBtuh)

3.2 Building Heating & Cooling Loads [6] (only required when shared systems such as central boilers or chillers are specified.)	**Designer Verified** ☐ N/A

System Name: ______________________Design Conditions: Total Heat Gain: _______(kBtuh) Total Heat Loss: _______(kBtuh)

System Name: ______________________Design Conditions: Total Heat Gain: _______(kBtuh) Total Heat Loss: _______(kBtuh)

4. Heating & Cooling Equipment Selection

4.1 Equipment selected per ☐ ACCA Manual S, or where not applicable, ☐ Other: ____________. [7]	☐	
4.2 Prescriptive and ERI Path: Equipment serving common spaces but not serving dwelling units meet the efficiency levels specified in the Exhibit X of the National Rater Field Checklist. Also see Exhibit X for restrictions on electric space resistance. [7]	☐	☐ N/A

Common Space Cooling Equipment [6, 7] (Complete all applicable items, noting "N/A" as needed; where the same Equipment ID is used in multiple spaces (columns), identical data is not required to be repeated and can be left blank; where cooling is not provided, check "N/A".)

List Cooling Equipment ID in the spaces to the right; duplicating as needed for each unique space served:							
4.3 Equipment type: (e.g., PTAC / AC, Chiller / CT, PTHP / WLHP / GSHP / ASHP / VRF)							
4.4 Area / Space(s) that system serves:							
4.5 Chiller / condenser / outdoor unit manufacturer:							
4.6 Chiller / condenser / outdoor unit model #:							
4.7 Evaporator / indoor unit manufacturer:							
4.8 Evaporator / indoor unit model #:							
4.9 AHRI reference #: [11]							
4.10 Listed efficiency:							
4.11 Evaporator fan type: PSC, ECM / ICM, Other							
4.12 Compressor speed: Single, Two, Variable							
4.13 Turn down ratio (for variable speed equipment):							
4.14 Latent capacity at design conditions (kBtuh): [12]							
4.15 Sensible capacity at design conditions (kBtuh): [12]							
4.16 Total capacity at design conditions (kBtuh): [12]							
4.17 Cooling sizing % = Total capacity (Item 4.16) divided by Total Heat Gain (Item 3.2) of space(s) in Item 4.4:							

Common Space Heating Equipment [6, 7] (Complete all applicable items, noting "N/A" as needed; where the same Equipment ID is used in multiple spaces (columns), identical data is not required to be repeated and can be left blank; where heating is not provided, check "N/A".)	**Designer Verified** ☐ N/A

List Heating Equipment ID in the spaces to the right; duplicating as needed for each unique space served:							
4.18 Electric equipment type: PTHP, WLHP, GSHP, ASHP, VRF, Boiler, Furnace, Electric Resistance							
4.19 Gas Equipment type: HW PTAC / fan coil, Gas-Fired PTAC, Boiler, Furnace							
4.20 Area / Space(s) that system serves:							
4.21 Manufacturer:							
4.22 Model Number:							
4.23 Listed efficiency:							
4.24 Equipment output capacity (kBtuh):							
4.25 Air-source heat pump output capacity (17°F) (kBtuh):							
4.26 Type of Venting: Natural Draft, Mechanically Drafted, Direct Vent [13]							
4.27 Furnace heating sizing % = Total capacity (Item 4.24) divided by Total Heat Loss of space(s) in Item 4.20:							

Equipment Controls

4.28 All equipment controls below have been included where applicable in the HVAC Design.	☐
4.29 Stair and elevator shaft vents shall be 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.	

4.30 Freeze protection systems, such as heat tracing of piping and heat exchangers, including self-regulating heat tracing, and garage / plenum heaters shall include automatic controls capable of shutting off the systems when pipe wall or garage / plenum temperatures are above 40°F. Where heat tracing is specified for freeze protection, controls must be based on pipe wall temperature and a minimum of R-3 pipe insulation is also required.	
4.31 Snow- and ice-melting systems shall include automatic controls capable of shutting off the systems when the pavement temperature is above 50°F and no precipitation is falling, and an automatic or manual control that will allow shutoff when the outdoor temperature is above 40°F so that the potential for snow or ice accumulation is negligible.	
Hydronic Distribution	☐ N/A
4.32 All hydronic distribution requirements below have been included where applicable in the HVAC Design.	☐
4.33 All terminal heating and cooling distribution equipment must be 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.	
4.34 Terminal units must be equipped with pressure independent balancing valves or pressure independent control valves.	
4.35 Piping of a heating or cooling system (e.g., steam, hot or chilled water, brine, refrigerant) shall be thermally insulated in accordance with ASHRAE 90.1-2007, Table 6.8.3. Construction documents must account for piping total thickness including required insulation when passing through planks or any other penetrations and shall specify that the piping must be inspected before access is covered up: Heating System: Pipe size:____ inches Insulation thickness:___ inches Pipe size:____ inches Insulation thickness:___ inches Cooling System: Pipe size:____ inches Insulation thickness:___ inches Pipe size:____ inches Insulation thickness:___ inches	
4.36 For circulating pumps serving hydronic heating or cooling systems with three-phase motors, 1 horse-power or larger, motors shall meet or exceed efficiency standards for NEMA Premium™ motors. If 5 horse-power or larger, must also be specified with variable frequency drives.	
4.37 If a variable speed pumping system is installed, system designed to prevent “dead-heading” and a method of water flow bypass is provided, such as a minimum flow bypass valve or 3-way valves on specific terminal units.	
4. For shared boilers, chillers, and cooling towers, temperature and pressure gauges, air eliminator, expansion tank, and check valves are clearly shown on the drawings. A complete sequence of operations for all systems indicating recommendations for all setpoints is provided.	
5. Duct Quality Installation - *Applies to Heating, Cooling, Ventilation, Exhaust, & Pressure Balancing Ducts, Unless Noted in Footnote*	
Common Spaces [7]	
5.1 All duct quality installation requirements below have been included where applicable in the HVAC Design.	☐
5.2 Ductwork specified without kinks, sharp bends, compressions, or excessive coiled flexible ductwork. [14]	
5.3 All supply and return ducts not in conditioned space, including connections to trunk ducts, are insulated to ≥ R-6. [15]	
5.3.1 Prescriptive Path: Dwelling unit ductwork meets the location and insulation requirements specified in the ENERGY STAR MF Reference Design.	
5.4 Duct design specifies that all supply, return, and exhaust ductwork and all plenums serving common spaces shall be sealed at all transverse joints, longitudinal seams, and duct wall penetrations.	
Duct Testing for Central Systems Serving Dwelling Units	
5.5 Central exhaust systems (that serve four or more dwelling units): Ductwork air-sealing specified such that measured duct leakage does not exceed 25% of exhaust fan flow at rough-in (e.g., including trunks, branches, and take-offs) or 30% of exhaust fan flow at final (e.g., inclusive of all ductwork between the fan and the grilles). [16]	

Footnotes:

1. This report shall represent system design for all unique common spaces, hydronic systems, central ventilation systems serving common spaces or dwelling units, and where applicable, parking garages. 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. As an alternative, for common spaces using Track A-HVAC grading by Rater, project teams may instead choose to complete an ANSI / RESNET / ACCA 310 HVAC Design Report and National HVAC Design Supplement to Std. 310 for Dwellings & Units for each unique common space. For those spaces, Items 2.2-2.13, 3.1, 4.1-4.27, and 5.1-5.4 of this Report are not required to be completed. All other systems serving common spaces, must be documented in this Design Report.
2. 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 Standard 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.
3. A 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 outdoor air at a known or measured airflow rate.
4. In “Warm-Humid” climates as defined by 2009 IECC Figure 301.1 (i.e., CZ 1 and portions of CZ 2 and 3A below the white line), it is recommended, but not required, that equipment be specified with sufficient latent capacity to maintain indoor relative humidity at ≤ 60%.
5. Airflow design rates shall be determined using ASHRAE 62.1-2010 or later. Designers are permitted, but not required, to use published addenda and/or the 2013 version of the standard to assess compliance.
6. If the tables provided cannot accommodate all the unit plans, spaces, or systems in the project, use the tables in Appendix A to supplement the Design Report.
7. Items 2.2-2.13, 3.1, 4.1-4.27, and 5.1-5.4 are N/A if all applicable systems are documented in a National HVAC Design Supplement to Std. 310 for Dwellings & Units.
8. 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 maintenance staff.
9. For continuous system operation, the lower rate may be used. Otherwise, use the higher rate. Commercial kitchens shall be designed to provide a minimum continuous rate of 0.70 cfm/ft^2.
10. As an alternative, for a toilet room intended to be occupied by one person at a time, a minimum continuous rate of 25 cfm is permitted.
11. If an AHRI Reference # is not available, OEM-provided documentation shall be attached with the rated efficiency. For split air conditioners and heat pumps, the rated efficiency shall be for the specific combination of indoor and outdoor components of the air conditioner or heat pump, along with confirmation that the two components are designed to be used together.
12. Capacity will be listed as the capacity at design conditions, from OEM expanded performance data, and shall include the capacity of all systems providing space cooling to the dwelling unit.
13. Per the 2009 International Mechanical Code, a direct-vent furnace or boiler 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 non-positive static vent pressure entirely by natural draft. 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.
14. 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.
15. Item 5.3 does not apply to ducts that are a part of local mechanical exhaust or exhaust-only dwelling-unit 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.
16. 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. This test is not required of central exhaust systems serving clothes dryers.

Appendix A – Supplementary tables for Section 2 and 3

2a. Common Space Mechanical Ventilation Design [4]						
List common space for which 62.1 ventilation rates were calculated in the spaces to the right:						
2.2 Ventilation airflow rate required by ASHRAE 62.1:						
2.3 Ventilation airflow rate designed:						

System Type & Controls:						
List Ventilation System ID in the spaces to the right:						
2.4 Specified system type: (e.g., supply, exhaust, balanced, ERV, HRV)						
2.5 Manufacturer:						
2.6 Model Number:						
2.7 # of Spaces Served (e.g., single, multiple)						
2.8 Area / space(s) that system serves: (e.g., Unit A kitchens, corridor, community room)						
2.9 Specified control location: (e.g., Master bath, utility):						

3. Heading & Cooling Loads

3.1 Common Space Heating & Cooling Loads

Common Space Name: _______________ Design Conditions: Total Heat Gain: _______(kBtuh) Total Heat Loss: _______(kBtuh)

Common Space Name: _______________ Design Conditions: Total Heat Gain: _______(kBtuh) Total Heat Loss: _______(kBtuh)

Common Space Name: _______________ Design Conditions: Total Heat Gain: _______(kBtuh) Total Heat Loss: _______(kBtuh)

Common Space Name: _______________ Design Conditions: Total Heat Gain: _______(kBtuh) Total Heat Loss: _______(kBtuh)

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Common Space Name: _______________ Design Conditions: Total Heat Gain: _______(kBtuh) Total Heat Loss: _______(kBtuh)

Common Space Name: _______________ Design Conditions: Total Heat Gain: _______(kBtuh) Total Heat Loss: _______(kBtuh)

Common Space Name: _______________ Design Conditions: Total Heat Gain: _______(kBtuh) Total Heat Loss: _______(kBtuh)

3.2 Building Heating & Cooling Loads (only required when shared systems such as central boilers or chillers are specified)

System Name: _______________________Design Conditions: Total Heat Gain: _______(kBtuh) Total Heat Loss: _______(kBtuh)

System Name: _______________________Design Conditions: Total Heat Gain: _______(kBtuh) Total Heat Loss: _______(kBtuh)

System Name: _______________________Design Conditions: Total Heat Gain: _______(kBtuh) Total Heat Loss: _______(kBtuh)

System Name: _______________________Design Conditions: Total Heat Gain: _______(kBtuh) Total Heat Loss: _______(kBtuh)

Appendix A – Supplementary tables for Section 4

4. Heating & Cooling Equipment Selection							
Common Space Cooling Equipment (Complete all applicable items, noting “N/A” as needed; where the same Equipment ID is used in multiple spaces (columns), identical data is not required to be repeated and can be left blank; where cooling is not provided, check “N/A”.) ☐ N/A							
List Cooling Equipment ID in the spaces to the right; duplicating as needed for each unique space served:							
4.3 Equipment type: (PTAC / AC, Chiller / CT, PTHP / WLHP / GSHP / ASHP / VRF)							
4.4 Area / Space(s) that system serves:							
4.5 Chiller / condenser / outdoor unit manufacturer:							
4.6 Chiller / condenser / outdoor unit model #:							
4.7 Evaporator / indoor unit manufacturer:							
4.8 Evaporator / indoor unit model #:							
4.9 AHRI reference #: [11]							
4.10 AHRI listed efficiency:							
4.11 Evaporator fan type: PSC, ECM / ICM Other:							
4.12 Compressor speed: Single, Two, Variable							
4.13 Turn down ratio (for variable speed equipment):							
4.14 Latent capacity at design conditions (kBtuh): [12]							
4.15 Sensible capacity at design conditions (kBtuh): [12]							
4.16 Total capacity at design conditions (kBtuh): [12]							
4.17 Cooling sizing % = Total capacity (Item 4.16) divided by Total Heat Gain (Item 3.2) of space(s) in Item 4.4:							

Common Space Heating Equipment (Complete all applicable items, noting “N/A” as needed; where the same Equipment ID is used in multiple spaces (columns), identical data is not required to be repeated and can be left blank; where heating is not provided, check “N/A”.) ☐ N/A							
List Heating Equipment ID in the spaces to the right; duplicating as needed for each unique space served:							
4.18 Electric equipment type: PTHP, WLHP, GSHP, ASHP, VRF, Boiler, Furnace, Electric Resistance							
4.19 Gas Equipment type: HW PTAC / fan coil, Gas-Fired PTAC, Boiler, Furnace							
4.20 Area / Space(s) that system serves:							
4.21 Manufacturer:							
4.22 Model Number:							
4.23 Listed efficiency:							
4.24 Equipment output capacity (kBtuh):							
4.25 Air-source heat pump output capacity (kBtuh) (17°F):							
4.26 Type of Venting: Natural Draft, Mechanically Drafted, Direct Vent [13]							
4.27 Furnace heating sizing % = Total capacity (Item 4.24) divided by Total Heat Loss of space(s) in Item 4.20:							