

# Indoor AirPlus Verification Requirements

VERSION 2





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**NOTE:** Although these measures are designed to help improve IAQ in residences compared with residences built to minimum code, they alone cannot prevent all IAQ problems. For example, occupant behavior such as smoking/vaping indoors, routine cleaning practices, regular maintenance of mechanical systems, and the conscientious use of mechanical equipment during unusual events (e.g., power outages, wildfires, etc.) are also important factors that impact IAQ.

## Terms To Help Navigate This Document

**ADVISORIES** provide additional information to be considered or recommendations that are not program requirements. Recommendations in some advisories may become requirements in a future revision or version. While not identified as Advisories, Items distinguished as GOLD are also recommended for the CERTIFIED tier, though they are not required at this time.

**EXCEPTIONS** to the requirements described in these construction specifications are noted as appropriate. For climate exceptions, refer to the 2021 International Energy Conservation Code (IECC) Climate Zone map (Figure R301.1). Climate Zone names may include a number for the temperature zone and a letter for the moisture zone (e.g., Zone 3C refers to coastal California only).

**NOTES** provide additional information to clarify specification requirements.

**NEWLY INSTALLED** refers to a component, appliance, equipment, and/or finish that is added to the building or an assembly during construction or renovation.

**COMMON SPACE** refers to any spaces in the building being labeled 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. Common space does not include commercial space. Commercial space is not in the scope of the Indoor AirPlus Certification program.

**MULTIFAMILY** in the context of the Indoor AirPlus program requirements describes a building with three or more dwelling or sleeping units (e.g., an apartment building, a multi-unit building without common space). It does not include a row or group of townhouses.



# Indoor AirPlus Version 2 Verification Requirements

## Verification Checklist

OMB Control Number 2060-NEW  
Approval Expires: Pending Approval

(Refer to full Indoor AirPlus Verification Requirements for details)

<b>Location Information:</b>			
Home/Building Address: _____		City: _____	State: _____ Zip Code: _____
Property/Development Name: _____		Number of Units (Multifamily Only): _____	
Multifamily Units to Which This Checklist Applies: _____			
<b>Indoor AirPlus Tier (select one):</b> <input type="checkbox"/> Certified <input type="checkbox"/> Gold <b>Climate Zone (0-7):</b> _____ <b>Moisture Zone (A-C):</b> _____ <b>EPA Radon Zone (1-3):</b> _____		<input type="checkbox"/> <b>New Construction</b> <input type="checkbox"/> <b>Gut Rehabilitation</b> <input type="checkbox"/> <b>Certifying as ENERGY STAR</b> <input type="checkbox"/> <b>Sampling Protocol Used (Multifamily Only)</b>	
<b>Builder Responsibilities:</b> <ul style="list-style-type: none"> <li>It is the exclusive responsibility of builders to ensure that each certified home is constructed to meet the Indoor AirPlus requirements identified as "Builder Responsibility".</li> <li>While builders are not required to maintain documentation demonstrating compliance for each individual certified home, builders are required to develop a process to ensure compliance for each certified home (e.g., incorporate these requirements into the Scope of Work for sub-contractors, require a site supervisor to inspect each home for these requirements, and/or sub-contract the verification of these requirements to a Verifier).</li> <li>Builders are required to review these Items with a representative of the Verification Organization and attest to their compliance at least once per development/community using the IAP Builder Responsibilities form.</li> <li>In the event that the EPA determines that a certified home was constructed without meeting these requirements, the home may be decertified.</li> </ul>			
<input type="checkbox"/> <b>Verifier has received signed Builder Responsibilities document from Builder</b>			
<b>Section 1 – Moisture Control</b>			<b>Must Correct</b>
			<b>Verified</b>
			<b>N/A</b>
<b>Water-Managed Site and Foundation</b>			
1.1	1.1.1	Impermeable surfaces sloped 0.25 in. per ft. away from the building.	Builder Responsibility
	1.1.2	Newly installed backfill tamped and final grade sloped 0.5 in. per ft. Exception: ■ Swales/drains ■ Professional verified soils ■ Graded after settling	Builder Responsibility
1.2	1.2.1	Newly installed foundations, drain tile or CFDS is installed to discharge outside. Exceptions: ■ Professional verified Group I soils	Builder Responsibility
	1.2.2	Sump cover is mechanically attached.	Builder Responsibility
	1.2.3	Sump drainage discharges 5 ft. from the foundation or into approved stormwater system. Exception: ■ Discharge professionally designed or verified Group I Soils	Builder Responsibility
1.3	1.3.1	In lowest area of basement or crawlspace, install floor drain with trap seal <b>OR</b> moisture monitoring system with audible alarm.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
1.4	1.4.1	Under newly installed slabs, aggregate <b>OR</b> sand with geotextile matting is installed. Exceptions: ■ Professional verified Group I Soils	Builder Responsibility
	1.4.2	Under newly installed slabs, Class A or Class B vapor retarder is installed.	Builder Responsibility
	1.4.3	Crawlspace without slabs, Class A vapor retarder installed with penetrations/seams/edges overlapped and sealed.	Builder Responsibility
	1.4.4	Existing slabs in <u>Moist (A) Zones</u> where Items 1.4.1 and 1.4.2 cannot be confirmed, a continuous/sealed Class I vapor retarder installed on top of slab. For occupiable spaces, vapor retarder is either a durable floor surface or covered by one.	Builder Responsibility
	1.4.5	Capillary break installed between the foundation wall (or slab) and newly installed sill plates.	Builder Responsibility
	1.4.6	<b>GOLD:</b> Capillary break installed under or on top of all newly installed concrete footers.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
1.5	1.5.1	Newly installed below-grade concrete/masonry walls damp-proofed; wood framed walls waterproofed.	Builder Responsibility
<b>Water-Managed Wall Assemblies</b>			
1.6	1.6.1	Continuous water-resistive barrier installed behind cladding and a bond-break drainage plane for non-structural masonry assemblies.	Builder Responsibility
	1.6.2	Flashing/drainage system at all horizontal interruptions and bottom of exterior walls.	Builder Responsibility
	1.6.3	Weep holes for masonry veneer and/or weep screed for stucco cladding.	Builder Responsibility
1.7	1.7.1	Newly installed windows and doors fully flashed.	Builder Responsibility
<b>Water-Managed Roof Assemblies</b>			
1.8	1.8.1	Gutter system discharges 5 ft. from foundation, into underground catchment, or sewer/rainwater management system. Exceptions: ■ Slab-on-grade ■ Dry (B) Climates ■ Professional verified soils ■ Rock bed w/liner ■ Rainwater harvesting system ■ Continuous rubber membrane ■ Waterproofed foundation walls	Builder Responsibility
1.9	1.9.1	Newly installed roof-to-wall intersections and roof penetrations fully flashed.	Builder Responsibility

	1.9.2	Newly installed roofing includes kickout flashing installed at low end of roof-to-wall intersections and roof deck flashing integrated with drainage plane.	Builder Responsibility		
1.10	1.10.1	Newly installed roofing includes self-adhering bituminous membrane at valleys and roof penetrations. Exception: ■ 2021 IRC Section R905 option(s)	Builder Responsibility		
	1.10.2	Newly installed low sloped or flat roofs are sloped 0.25 in. per ft. to drains or scuppers and drains are insulated through roof assembly; roof assembly air control layers fully connected to wall air control layers and water control layers overlap.	Builder Responsibility		
1.11	1.11.1	Newly installed roofing, CZ 4 and up, include ice barrier in accordance with 2021 IRC R905.1.2. Exception: ■ Gut rehabilitation with R-49 Grade I attic insulation, if vented.	Builder Responsibility		
	1.11.2	Gaps and penetrations between vented attics and conditioned spaces are sealed.	Builder Responsibility		
Interior Moisture Management					
1.12	1.12.1	Moisture-resistant backing material behind tub and shower enclosures with tile or panel assemblies.	Builder Responsibility		
1.13	1.13.1	Condensate-producing HVAC equipment provided with corrosion-resistant drain pan and backflow prevention valve (where applicable). Exception: □ Secondary drain system for equipment meets 2021 IMC 307.2.3.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.13.2	For tank type hot water heater/storage where leakage could cause damage, drain pan and drain OR on an impervious surface with drain OR detection system with shutoff included.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.13.3	Non-vented clothes dryers plumbed to a drain.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.14	1.14.1	Supply water pipes in exterior building cavities insulated with R4 pipe wrap. Exceptions: □ CZ 1-3 in Dry (B) Zone □ Cavity insulation qualifies as air barrier	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.15	1.15.1	Water-resistant flooring installed where moisture or splash damage could occur.	<input type="checkbox"/>	<input type="checkbox"/>	-
1.16	1.16.1	No Class I vapor retarders on interior side of vapor permeable insulation in below-grade, exterior walls.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.16.2	In Warm Humid counties, no Class I vapor retarders on the interior side of vapor permeable insulation in above-grade exterior walls.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.17	1.17.1	Interior envelope inspection: moisture intrusion, leaks, and mold are not evident, or source is identified and remedied (gut rehabs only).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.17.2	Exterior inspection: above-grade surfaces are free from degradation and potential moisture intrusion, or source is identified and remedied.	<input type="checkbox"/>	<input type="checkbox"/>	-
<b>Section 2 – Radon</b>			<b>Must Correct</b>	<b>Verified</b>	<b>N/A</b>
Where one of the following exceptions are applied, check the applicable box and check "N/A" for Items 2.1-2.2: <input type="checkbox"/> Raised-pier foundation w / no conditioned ground contact. <input type="checkbox"/> Building is over garage compliant with ANSI/ASHRAE 62.1-2022, Sections 5.2 and 6.5.					
2.1	Mitigation system installed (if applicable): <input type="checkbox"/> Active system <input type="checkbox"/> Passive system <input type="checkbox"/> N/A Final radon test result (if applicable): _____(pCi/l)				
	2.1.1	In EPA Radon Zone 1, construct buildings with either an active radon mitigation system OR a passive system and a radon test upon completion.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.1.2	In EPA Radon Zone 2, either construct buildings with a passive radon reduction system OR conduct a radon test upon completion.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.1.3	In EPA Radon Zone 3, provide occupants in 1-2 family dwellings w/ EPA's <a href="#">Basic Radon Facts</a> .	Builder Responsibility		
2.2	Where an active or passive radon system is installed, the following features are included:				
	2.2.1.1	Capillary break and vapor retarder installed according to Specification Items 1.4.1 through 1.4.4.	Builder Responsibility		
	2.2.1.2	Vent pipe clearly labeled, connected to an open T-fitting with 10 ft. (min.) horizontal pipe under vapor retarder, terminating outdoors a minimum of 12 in. above the roof. No suction points on sump lids.	Builder Responsibility		
	2.2.1.3	Foundation drainage system that discharges to daylight and is connected to soil gas collection plenum has backwater valve installed.	Builder Responsibility		
	2.2.1.4	Radon fan (if active) OR electrical receptacle (if passive) installed outside thermal and air barrier boundary, meeting fan location requirements in acceptable exterior location.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.2.1.5	Branch circuit labeled at electrical panel.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.2.1.6	Where active system is installed, a system monitoring mechanism is connected to the pipe and easily observed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Section 3 – Pest Barriers</b>			<b>Must Correct</b>	<b>Verified</b>	<b>N/A</b>
3.1	3.1.1	Exterior penetrations and joints sealed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	3.1.2	Corrosion-proof pest screens installed at openings that cannot be fully sealed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	3.1.3	Corrosion-proof screen, louver, or grille for all ventilation termination fittings.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	3.1.4	Dryer ducts include weather-resistant termination or louver.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	3.1.5	GOLD: Screens provided for all operable windows.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.2	3.2.1	Multifamily buildings include a plan or contract for integrated pest management.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	3.2.2	Multifamily buildings include resident guidance on housekeeping, refuse removal and reporting pest problems in owner/tenant manual.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	3.2.3	GOLD: Multifamily buildings include sanitary floor drains in common trash/recycling rooms.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Section 4 – Heating, Cooling, and Ventilation Systems</b>			<b>Must Correct</b>	<b>Verified</b>	<b>N/A</b>
If certifying as ENERGY STAR, Indoor AirPlus requirements shown in <i>italics</i> are satisfied by meeting related ENERGY STAR requirements, and ENERGY STAR footnotes and exceptions are permitted unless otherwise specified.					
Heating and Cooling Design and Inspection					
4.1	4.1.1	Newly installed dwelling-unit heating and cooling (HAC) systems meet design/documentation requirements.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



	4.1.2	<i>Newly installed common space HAC systems sized in accordance with ACCA Manual S or equivalent.</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.1.3	<i>Newly installed HAC documentation (i.e., start-up, testing) provided to Verifier.</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.1.4	Existing HAC systems assessed/serviced in accordance with ANSI/ACCA Standard 4 or ANSI/ASHRAE/ACCA Standard 180.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.2	4.2.1	GOLD: Humidity monitoring provided in the main living area of the dwelling unit is: <input type="checkbox"/> Integrated with HAC controls <b>OR</b> <input type="checkbox"/> Standalone hygrometer Exception for MF: <input type="checkbox"/> RH monitoring of each dwelling unit by building management platform.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.2.2	Moist (A) CZ 1-4: Equipment installed to maintain RH ≤ 60% in each dwelling unit is: <input type="checkbox"/> Ventilating or whole-home dehumidifier <input type="checkbox"/> RH sensor integrated w/ cooling system(s) Exception for CZ 4A: <input type="checkbox"/> RH data can be recorded for 60 days AND one of the following is provided: <input type="checkbox"/> Dehumidification readiness <b>OR</b> <input type="checkbox"/> RH modeling	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.2.3	In Moist (A) & Marine (C) Zones, basements and crawlspaces are served by a HAC system with RH controls per Item 4.2.2 <b>OR</b> provided with a supplemental dehumidification system. Exception for MF: <input type="checkbox"/> Unfinished and/or non-occupiable spaces located in basements.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.3	4.3.1	<i>Newly installed dwelling-unit duct systems sized according to:</i> <input type="checkbox"/> ACCA Manual D <input type="checkbox"/> Other (applicable to MF only)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.3.2	No building cavities used as air supplies or returns. Exception: <input type="checkbox"/> Mechanical closets meeting E4.3.2a <input type="checkbox"/> Cavities/spaces meeting E4.3.2b	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.3.3	Duct boots and visible interior of ducts inspected to be substantially free of dust and debris.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.3.4	Existing ducts inspected to be dry, with no evidence of mold and without tears/disconnections (gut rehabs only).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.3.5	Ducts installed outside thermal and air barrier boundary are sealed at joints, seams, penetrations with compliant material.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.3.6	<i>Dwelling-unit ducts tested to meet total duct leakage requirements.</i> Exceptions: <input type="checkbox"/> HAC system serves more than one dwelling unit <input type="checkbox"/> Supply ducts ≤ 10 ft.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.3.7	Dwelling-unit ducts tested to meet leakage to outdoors requirements. Exceptions: <input type="checkbox"/> Air handler and all ducts are within thermal and air barrier boundary <input type="checkbox"/> Total duct leakage 4 CFM25 per 100 sf of CFA or 40 CFM25 Exception for MF: <input type="checkbox"/> Air handler within thermal and air barrier boundary and 10 ft. of ducts outside thermal and air barrier boundary.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.4	4.4.1	HVAC air-handling equipment and/or ductwork is not located in garages.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.4.2	<i>HAC supply and return ducts outside the thermal and air barrier boundary are insulated to ≥ R-6.</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.4.3	GOLD: All HAC equipment and ductwork is located within the thermal and air barrier boundary. Exceptions (check all that apply): <input type="checkbox"/> Measured total leakage 1 CFM25 per 100sf of CFA. <input type="checkbox"/> Duct lengths are 10 ft. <input type="checkbox"/> Ducts in vented attic insulated min R-8 and measured leakage to outdoors 3 CFM25 per 100 sf of CFA and encapsulated or buried per E4.4.3c. <input type="checkbox"/> 2021 IECC Section R403.3.2 met. <input type="checkbox"/> Jump ducts, sealed per Item 4.2 and buried in insulation. <input type="checkbox"/> Located in uninsulated crawl space or basement meeting Item 4.2.3 dehumidification. <input type="checkbox"/> Rooftop MUA or DOAS.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.4.4				
4.5	4.5.1	<i>Bedrooms served by ducted HAC systems are ±3 Pa of the main body of the dwelling unit <b>OR</b> ±5 Pa allowed where bedroom supply airflow ≥150 CFM.</i> Exception for MF: <input type="checkbox"/> Testing not required where bedroom supply airflow <150 CFM.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Mechanical Ventilation</b>					
4.6	4.6.1	CERTIFIED: Mechanical ventilation is installed for each dwelling unit. GOLD: "Balanced" mechanical ventilation system is installed for each dwelling unit.	<input type="checkbox"/>	<input type="checkbox"/>	-
	4.6.2	<i>Ventilation override control is clearly labelled. In one- and two-family dwellings and townhouses, controls are readily accessible to the occupant.</i> In multifamily buildings, controls are readily accessible by occupant, building owner, or building maintenance staff.	<input type="checkbox"/>	<input type="checkbox"/>	-
	4.6.3	<i>Air inlets verified to pull air directly from outdoors.</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.6.4	<i>Outdoor air inlets ≥ 2 ft. above grade or roof deck; ≥ 3 ft. from dryer exhausts and contamination sources exiting the roof; ≥ 5 ft. distance from dwelling-unit bathroom and kitchen exhaust not exiting the roof; ≥ 10 ft. from all other contamination source exits.</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.6.5	Ventilation is measured and documented in accordance with ANSI/RESNET/ICC Std. 380 and meets Section 4 of ASHRAE 62.2-2019.	<input type="checkbox"/>	<input type="checkbox"/>	-
	4.6.6.1	For supply or balanced ventilation, prior to distribution, outdoor air passes through a filter rated: <input type="checkbox"/> MERV 8 or higher (CERTIFIED) <input type="checkbox"/> MERV 13 or higher (GOLD)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.6.6.2	Outdoor air filters are accessible for maintenance.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.6.7	Ventilation fans rated 1 sone. Exception: <input type="checkbox"/> HAC air handler <input type="checkbox"/> ERV, HRV, in-line fan <input type="checkbox"/> Remote-mounted fan with 4ft. ductwork	<input type="checkbox"/>	<input type="checkbox"/>	-
4.7	4.7.1	<i>Bathroom ventilation exhausts directly to outdoors meeting ASHRAE 62.2-2019 Section 5.</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.7.2	Bath fans rated 3 sones if intermittent and 1 sone if continuous. Exceptions: <input type="checkbox"/> ERV, HRV, in-line fan <input type="checkbox"/> Remote-mounted fan	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.7.3	Bath fans integrated with dwelling-unit ventilation have on/off controls labeled.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.7.4	GOLD: Demand-controlled bath fans include timer or occupancy/humidity sensor.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.8	4.8.1	Demand-controlled kitchen exhaust is located above the cooktop, vented to outdoors, with Verifier-measured exhaust airflow <input type="checkbox"/> 200 CFM (CERTIFIED) <input type="checkbox"/> 300 CFM (GOLD) Exceptions: <input type="checkbox"/> MF: Cooktop is electric, recirculation hood has charcoal filter, continuous exhaust rate met.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	<input type="checkbox"/> CERTIFIED only: Microwave-range hood exhaust airflow not measured; meets additional requirements. <input type="checkbox"/> CERTIFIED only: Downdraft exhaust fan installed with electric cooktop and 300 CFM.			
	4.8.2 If continuous exhaust is present in the kitchen, exhaust grille meets cooking equipment separation distance and has MERV 3 or washable filter.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.8.3 Continuous kitchen exhaust rated 1 sone at airflow 25 CFM. Demand-controlled kitchen exhaust rated 2 sone at airflow 100 CFM. Exception: <input type="checkbox"/> ERV, HRV, in-line fan <input type="checkbox"/> Remote-mounted fan	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.9	4.9.1 <i>Common space ventilation air provided directly from outdoors and inlets meet separation distances.</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.9.2 Common space ventilation and exhaust measured to meet or exceed ASHRAE 62.1-2019.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.9.3.1 Prior to distribution, common space ventilation outdoor air passes through a filter rated: <input type="checkbox"/> MERV 8 or higher (CERTIFIED) <input type="checkbox"/> MERV 13 or higher (GOLD)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.9.3.2 Outdoor air filter is accessible for maintenance.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.10	4.10.1 Central vacuum systems exhaust outdoors and 10 ft. from ventilation air inlets.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.10.2 Vented clothes dryers exhaust outdoors.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Filtration and Air Cleaning</b>				
4.11	4.11.1 At final inspection, ducted HAC systems include clean filters rated: <input type="checkbox"/> MERV 11 or higher (CERTIFIED) <input type="checkbox"/> MERV 13 or higher (GOLD) Exception for dwelling units with portable air cleaners: <input type="checkbox"/> MERV 8 (CERTIFIED) <input type="checkbox"/> MERV 11 (GOLD)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.11.2 HAC return air filters are accessible for cleaning and/or replacement.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.11.3 Filter access panels are gasketed and/or sealed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.11.4 All return air and mechanically supplied outdoor air pass through a filter.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.11.5 Electronic air cleaners do not generate ozone exceeding concentration limits of 0.005 ppm.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.11.6 Ozone generators or devices intentionally using ozone not installed.	<input type="checkbox"/>	<input type="checkbox"/>	-
4.12	4.12.1 GOLD: One of the following filtration methods provided for dwelling units with no ducted HAC system: <input type="checkbox"/> MERV 13 or higher <input type="checkbox"/> Portable air cleaners <input type="checkbox"/> Transfer fan w/ MERV 13 or higher	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.13	4.13.1 Where gas-phase air cleaning devices are installed, ozone is not intentionally used.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.14	4.14.1 Where provided, UVGI or other electronic air cleaners (e.g., plasma generators, PCOs, etc.) must not exceed ozone concentration limits of 0.005ppm.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Section 5 – Pollutant Control</b>		<b>Must Correct</b>	<b>Verified</b>	<b>N/A</b>
If certifying as ENERGY STAR, Indoor AirPlus requirements shown in <i>italics</i> are satisfied by meeting related ENERGY STAR requirements, and ENERGY STAR footnotes & exceptions are permitted unless otherwise specified.				
5.1	5.1.1 <input type="checkbox"/> CERTIFIED: Naturally drafted appliances meet max depressurization and exhaust location requirements. <input type="checkbox"/> GOLD: Combustion furnaces, boilers, water heaters mechanically drafted or direct-vented.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	5.1.2 Fireplaces mechanically drafted or direct-vented.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	5.1.2.1 Liquid or gas-burning fireplaces have tempered glass front or gasketed door.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	5.1.3 No unvented combustion appliances other than cooktops/ranges/ovens.	<input type="checkbox"/>	<input type="checkbox"/>	-
	5.1.4 Existing chimneys and flues pass professional Level II inspection per NFPA 211.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	5.1.5 Solid fuel-burning appliances meet the following requirements (check where applicable): <input type="checkbox"/> site-built masonry fireplaces sealed to prevent use or are retrofitted <input type="checkbox"/> factory-built wood burning fireplaces have dedicated outdoor air & meet UL 127 <input type="checkbox"/> wood stove/fireplace inserts meet UL 1482 and the EPA's New Source Performance Standards <input type="checkbox"/> pellet stoves meet ASTM E1509 and the EPA's New Source Performance Standards	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.2	5.2.1 CO detection installed according to 2021 IBC Section 915 or 2021 IRC Section R315.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	5.2.2 CO detectors are protected from dust, paint, and contaminants during construction.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.3	5.3.1 Occupant provided with the EPA's brochure or resource guide on secondhand smoke.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	5.3.2 For multifamily buildings, smoking/vaping prohibition is posted in common areas and communicated in lease agreement.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	5.3.3 For multifamily buildings, where provided, designated outdoor smoking/vaping areas located a minimum of 25 ft. from entries, outdoor air intakes, and operable windows.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.4	5.4.1 Crawlspace and basements not vented, and perimeter walls sealed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	5.4.2 Airtightness testing in accordance with ANSI/RESNET/ICC Std. 380 is met: CERTIFIED: <input type="checkbox"/> Detached dwelling units > 1,000 ft <sup>2</sup> , 5 ACH50 <input type="checkbox"/> All other units 0.30 CFM50/sf encl. GOLD: <input type="checkbox"/> Detached dwelling units > 1,000 ft <sup>2</sup> , 3 ACH50 <input type="checkbox"/> All other units 0.25 CFM50/sf encl.	<input type="checkbox"/>	<input type="checkbox"/>	-
5.5	5.5.1 <i>Assemblies between garages and occupiable spaces are air-sealed and doors are gasketed or weather-stripped.</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	5.5.2 One- and two-family dwellings and townhouses with attached private garages: <input type="checkbox"/> Pressure test conducted to verify effectiveness of garage-to-house air barrier; <b>OR</b> <input type="checkbox"/> Exhaust fan installed in garage and Verifier-measured airflow 100 CFM	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	5.5.3 <i>For multifamily buildings, where an exhaust system is installed in a shared parking garage, system includes CO and NO2 sensors, meeting minimum continuous ventilation rates.</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.6	5.6.1 No combustible liquid or gas fuels stored within the building's pressure boundary.	<input type="checkbox"/>	<input type="checkbox"/>	-
	5.6.2 Supplemental portable combustion equipment not operated or stored within the building's pressure boundary.	<input type="checkbox"/>	<input type="checkbox"/>	-

Section 6 – Building Materials (newly installed)			Must Correct	Verified	N/A
Download the <i>Indoor AirPlus Compliant Building Products</i> guide to help identify compliant products,					
6.1	6.1.1	Paints, finishes, and coatings meet VOC emission limits in CDPH Standard Method V1.2-2017.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.2	6.2.1	Carpet and carpet cushions meet VOC emission limits in CDPH Standard Method V1.2-2017.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.3	6.3.1	Adhesives and sealants meet VOC emission limits in CDPH Standard Method V1.2-2017.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.4	6.4.1	Hard surface flooring and underlayment meet VOC emission limits in CDPH Standard Method V1.2-2017.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.5	6.5.1	Interior gypsum board and joint compound meet VOC emission limits in CDPH Standard Method V1.2-2017.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.6	6.6.1	GOLD: Insulation materials meet VOC emission limits in CDPH Standard Method V1.2-2017.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Section 7 – Occupant Education			Must Correct	Verified	N/A
7.1	7.1.1	Instruction manuals provided for the following <u>newly installed</u> appliances and systems. <ul style="list-style-type: none"> <li>■ HAC systems and accessories</li> <li>■ Local and dwelling-unit ventilation systems</li> <li>■ Kitchen and bath exhaust systems</li> <li>■ Air cleaners</li> <li>■ Dehumidifiers</li> <li>■ Moisture and/or IAQ monitors</li> <li>■ Combustion appliances</li> <li>■ Sump pumps</li> <li>■ Radon systems</li> </ul>	Builder Responsibility		
	7.1.2	Owner-occupied units: O&M recommendations and filter change schedule provided.	Builder Responsibility		
<b>The following fields shall be completed in legible print, except for "Initials" which can be signed/initialed either manually or digitally in this format or through HCO-approved software.</b>					
<b>Verifier Organization</b>		<b>Home Certification Organization</b>			
<b>Verifier Name</b>		<b>First Inspection Date</b>		<b>Initials</b>	
<b>Verifier Name</b>		<b>Final Inspection Date</b>		<b>Initials</b>	

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## Guidance for Completing the Indoor AirPlus Verification Checklist

1. Only homes or multifamily buildings verified to comply with these specifications can earn the Indoor AirPlus certification. See the Indoor AirPlus National Program Requirements for full descriptions of the certification process; program eligibility; and partnership, training, and credentialing requirements.
2. Indoor AirPlus requirements are not intended to supersede where local jurisdictions may have more stringent requirements (e.g., duct leakage allowances).
3. Check one box per line. Check "N/A" for specifications that do not apply for specific conditions (e.g., climate, building type) according to the exceptions described in the Indoor AirPlus requirements. Items may be verified visually by the Verifier on-site during construction/rehabilitation, by reviewing photographs taken during construction/rehabilitation, by reviewing material or equipment documentation, or through equivalent methods as appropriate. Requirements that refer to existing building elements only apply to features that exist as part of gut rehabilitation.
4. Verification is not complete until this checklist is completed in full and signed/initialed. The Verifier who conducted the verification, or a responsible party from the Verifier's company, must sign the completed checklist. The Verifier shall coordinate with their HCO/Designee and/or builder/owner to provide an Indoor AirPlus label and certificate for each qualified home/unit.
5. The Verifier shall retain the Indoor AirPlus Verification Checklist for the home or multifamily building for a minimum of 3 years from final verification. If a quality assurance review indicates that items have not been successfully completed, the Verifier will be responsible for facilitating corrective action.
6. For multifamily buildings, Verifiers are permitted to use a sampling protocol if approved by the HCO and EPA. For multifamily buildings, only one verification checklist is required, in accordance with an HCO's approved sampling protocol. However, a completed and signed checklist must be able to be associated with each IAP certified home/unit. Sampling is permitted for one- and two-family dwellings and townhouses with building permit dates (as defined in the Indoor AirPlus National Program Requirements) prior to 01/01/2025. Sampling is not permitted for one- and two-family dwellings or townhouses with building permit dates on or after 01/01/2025.

For further information on the Indoor AirPlus program, visit [www.epa.gov/iap](http://www.epa.gov/iap).



# Indoor AirPlus Verification Requirements

## Version 2

ENERGY STAR certification is a pre-requisite for a dwelling unit to achieve Indoor AirPlus Gold Certification. ENERGY STAR checklist items that satisfy Indoor AirPlus requirements are italicized throughout. Please refer to the [ENERGY STAR Residential New Construction Program website](#) for more information and the full description of the requirements. Items without **CERTIFIED** or **GOLD** distinction apply to both certification schemes. Advisories, Notes, and Exceptions follow the same distinction protocol.

### 1. Moisture Control

#### Water-Managed Site and Foundation

##### 1.1 Site Drainage

- 1.1.1 Impermeable surfaces (e.g., patio, porch, or plaza slabs; sidewalks; ramps; driveways) are sloped 0.25 in. per ft. away from the building to the edge of surface, to a swale or drain, or a minimum of 10 ft.
- 1.1.2 Final grade sloped 0.5 in. per ft. away from the building either a minimum of 10 ft. **OR** to a swale or drain. Newly installed or disturbed backfill has been tamped.

**Exception:**

E1.1.2 Tamping of backfill is not required if either:

E1.1.2a Proper drainage can be achieved using non-settling compact soils, as determined by a certified hydrologist, soil scientist, or Professional Engineer; **OR**

E1.1.2b The builder has scheduled a site visit to provide in-fill and final grading after settling has occurred.

##### 1.2 Foundation Drainage

- 1.2.1 For newly installed foundations, drain tile or Composite Foundation Drainage System (CFDS) is installed at basement and crawlspace walls and sloped to discharge to outside grade (daylight) or to a sump pump, sewer, or runoff management system.

**Notes:**

N1.2.1a For drain tile: top of pipe is installed below the bottom of the concrete slab or crawlspace floor; AND pipe is pre-wrapped with filter fabric or is surrounded by 6 in. of ½ to ¾ in. washed or clean gravel, with gravel layer fully wrapped with fabric cloth. Drain tile is level or sloped to discharge to outside grade (daylight) or to a sump pump. If drain tile is on interior side of footing, then a channel is provided through footing to exterior side.

N1.2.1b For CFDS: the system must include a soil strip drain or another ICC-ES evaluated perimeter drainage system to be eligible for use.

**Exceptions:**

E1.2.1a A foundation drainage system is not required when a certified hydrologist, soil scientist, or Professional Engineer has determined that the foundation rests on Group I Soils (i.e., well-drained ground or sand-gravel mixtures), as defined by 2021 IRC Table R405.1.

E1.2.1b In buildings undergoing gut-rehabilitation, where an interior drain tile is installed to mitigate moisture intrusion in an existing foundation, a channel to the exterior through the footing is not required.

- 1.2.2 Where a sump pit is installed, a sump pump shall be installed per manufacturer's instructions, and sump covers shall be mechanically attached with full gasket seal or equivalent.

- 1.2.3 Sump drainage shall be discharged a minimum of 5 ft. from the foundation or into a stormwater system approved by the authority having jurisdiction.

**Exception:**

E1.2.3 Discharging a minimum of 5 ft. from the foundation is not required when a certified hydrologist, soil scientist, or Professional Engineer has designed an alternative management system or determined that the foundation rests on Group I Soils.

**Advisories:**

A1.2.3a The point of discharge should be as far away from the building's foundation as practically feasible and discharge piping should be installed below grade or otherwise protected.

A1.2.3b In CZ 4 and higher for wet sites with deeper foundations, a freeze guard or a similar fitting with integral openings is recommended where the pipe exits.

### 1.3 Bulk Water Prevention

- 1.3.1** In buildings with a basement or crawlspace, a floor drain or moisture monitoring system is installed in the lowest floor area to mitigate risk from internal bulk water events. Floor drains shall include trap seal protection according to 2021 IRC P3201.2.1. Sump pits are permitted to have drains integrated with the sump cover, so long as the cover is mechanically attached with a full gasket seal and the integral drain has a trap or similar means to reduce soil gas entry. A moisture monitoring system shall emit an audible alarm and/or send notifications via a web-based app when water is detected.

#### Advisories:

- A1.3a** Combination foundations (e.g., basement with separated crawlspace) are recommended to have a means of discharging bulk water from each separate foundation area in the case of interior water events (e.g., plumbing malfunction, flooding, etc.).
- A1.3b** Any trapped drains, other than floor drains, without trap seal protection that do not receive regular water input should be filled with mineral oil to reduce the potential for evaporation.
- A1.3c** Moisture monitoring systems, where installed, should have the ability to shut off the water supply in the event of a plumbing malfunction.

### 1.4 Capillary Break and Vapor Retarder

- 1.4.1** Under newly installed concrete slabs, a capillary break is installed by providing a base of either:

**1.4.1.1** A 4 in. (min.) layer of 0.5 in. diameter or greater clean aggregate; **OR**

**1.4.1.2** Continuous geotextile drainage matting installed according to the manufacturer's instructions.

#### Exception:

**E1.4.1** Buildings built on free-draining soils are recommended, but not required, to meet the above capillary break requirements. Free-draining soils are identified as Group I (Table R405.1, 2021 IRC) by a certified hydrologist, soil scientist, or Professional Engineer through a site visit.

- 1.4.2** Under newly installed concrete slabs, a Class A or Class B vapor retarder as defined by ASTM E1745, is installed in direct contact with the concrete slab by overlapping seams and/or sealing joints and penetrations.

#### Advisory:

**A1.4.2** The EPA recommends a vapor retarder meeting ASTM E1745 Class A with a minimum 10-mil thickness.

- 1.4.3** For crawlspaces without concrete slabs, a Class A vapor retarder as defined by ASTM E1745, is installed by sealing or taping all seams and penetrations and sealing to walls and piers (e.g., with adhesive and furring strips or similar mechanical fasteners and sealant).

#### Advisory:

**A1.4.3** Prior to installing the vapor retarder, prepare the ground by leveling and removing obstructions capable of causing tears or punctures.

- 1.4.4** For existing slabs located in Moist (A) Zones, where the presence of a capillary break (Item 1.4.1) and below slab vapor retarder (Item 1.4.2) cannot be visually verified, a continuous and sealed Class I vapor retarder is installed on top of the slab. In such cases, up to 10% of the slab surface may be exempted from this requirement (e.g., for the bottom plates in walls). In addition, for existing slabs in occupiable space, the vapor retarder shall also be a durable floor surface or covered by a durable floor surface.

- 1.4.5** A continuous capillary break is installed between the foundation wall (or slab) and newly installed sill plates.

- 1.4.6** **GOLD:** Capillary break installed under or on top of all newly installed concrete footers using either 6 mil (or thicker) polyethylene sheeting, bituminous membrane, or liquid waterproofing.

#### Note:

**N1.4.6** A capillary break can be achieved at the footer by encapsulating the entire stem wall with bituminous membrane wrapping from the exterior, over the sill, and down the interior of the stem wall.

#### Exception:

- E1.4** Unheated storage areas of less than 70 sq. ft., garages, and utility areas are not subject to the requirements under Item 1.4.

### 1.5 Damp-Proofing and Waterproofing Below-Grade Exterior Walls

- 1.5.1** Exterior surface of below-grade walls of basements and unvented crawlspaces finished as follows:

**1.5.1.1** For poured concrete, masonry, and insulated concrete forms, finish with damp-proofing coating.

**1.5.1.2** For wood framed walls, finish with polyethylene and adhesive or other equivalent waterproofing.

#### Exception:

**E1.5.1** Interior surface of an existing below-grade wall listed in 1.5.1.1 (e.g., in a home undergoing a gut rehab) is permitted to be finished by:

**E1.5.1a** Installing a continuous and sealed drainage plane, capillary break, Class I Vapor Retarder and air barrier that terminates in a foundation drainage system as specified in Item 1.2; **OR**

**E1.5.1b** If a drain tile is not required as specified in Item 1.2, adhering a capillary break and Class I Vapor Retarder directly to the wall with the edges taped/sealed to make it continuous. Note that no alternative compliance option is provided for existing below-grade wood-framed walls in Item 1.5.1.2.

## Water-Managed Wall Assemblies

### 1.6 Drainage Plane and Flashing

**1.6.1** A continuous Water-Resistive Barrier (WRB) is installed behind exterior wall cladding that overlaps flashing and is fully sealed at all penetrations. Behind all stucco and non-structural masonry cladding wall assemblies, an additional bond-break drainage plane is provided between WRB and cladding.

**1.6.2** Flashing or an equivalent drainage mechanism is installed at all horizontal interruptions and the bottom of exterior walls to direct water away from the WRB and foundation.

**1.6.3** Weep holes for masonry veneer and weep screed for stucco cladding systems are included, per manufacturer specifications.

#### Advisories:

**A1.6a** Liquid or fluid applied membranes and integrated sheathing systems with sealed/taped seams should be applied and/or sealed on clean surfaces and according to manufacturer's instructions to perform as a WRB.

**A1.6b** Rainscreen assemblies with a minimum of 0.5 in. air space or drainage mat are recommended between the cladding and drainage plane.

### 1.7 Exterior Window and Door Openings

**1.7.1** Newly installed windows and doors must be fully flashed. Apply a formed pan, flexible tape, or liquid applied pan flashing from the interior edge of sill framing, terminating over the front edge of framing and WRB and covering the sill corners, to direct the movement of water away from the opening and wall assembly. Install side flashing that extends over pan flashing and top flashing that extends over side flashing, or equivalent details for structural masonry or structural concrete walls.

#### Advisories:

**A1.7.1a** Where flexible tape or liquid applied pan flashing is utilized to form a pan, a pitched sill is recommended.

**A1.7.1b** When selecting new fenestration, the ANSI/NFRC 500-2020 Condensation Index (CI) should be used to limit surface condensation based on the local design temperature, Relative Humidity (RH), and the dew point.

## Water-Managed Roof Assemblies

### 1.8 Gutters, Downspouts, and Roof Water Drainage

**1.8.1** Direct roof water away from the building using gutters, downspouts, and lateral piping or other non-porous diverters that discharge either:

**1.8.1.1** A minimum of 5 ft. from the foundation on a sloping finish grade, **OR**

**1.8.1.2** Into an underground catchment system not connected to the foundation drain system that discharges water 10 ft. from foundation, **OR**

**1.8.1.3** Into an approved sewer or rainwater management system.

#### Exceptions:

**E1.8.1a** Buildings with slab-on-grade foundations.

**E1.8.1b** Buildings in Dry (B) climates as shown in 2021 IECC Figure R301.1 and Table R301.1.

**E1.8.1c** Building sites with no expansive or collapsible soils, as determined by a certified hydrologist, soil scientist, or Professional Engineer.

**E1.8.1d** A roof design that deposits rainwater to a grade-level rock bed with a waterproof liner and a lateral drain pipe that meets the above discharge requirements.

**E1.8.1e** A rainwater harvesting system that drains overflow to meet the above discharge requirements.

**E1.8.1f** A continuous rubber membrane (e.g., EPDM) aligned with the foundation wall from final grade to 8 in. below grade and sloping 0.5 in. per ft. away from the building for at least 5 ft., with Group I Soils (as defined by 2021 IRC Table R405.1), covering the membrane to within 3 in. of final grade.

**E1.8.1g** Buildings with concrete and masonry foundation waterproofing installed in accordance with 2021 IRC Section R406.2.

## 1.9 Roof to Wall Intersections and Roof Penetrations

- 1.9.1** Fully flash all newly installed roof-to-wall intersections and all newly installed roof penetrations using step flashing for conventional roofs or continuous flashing for metal and rubber membrane roofs.
- 1.9.2** Install kickout flashing at the low end of newly installed roof-to-wall intersections. Flashing shall extend at least 4 in. on the wall surface above the roof deck and shall be integrated with the drainage plane above. Intersecting wall siding shall terminate a minimum of 1 in. above roof, or higher per manufacturer's recommendations.

## 1.10 Roof Valleys and Decking

- 1.10.1** Newly installed roofing includes a self-adhering polymer-modified bituminous membrane or the equivalent at all valleys and roof decking penetrations.

### Exceptions:

**E1.10.1a** Any valley flashing option in 2021 IRC Section R905, according to the appropriate roof covering, is permitted.

- 1.10.2** Newly installed low sloped or flat roofs (<2:12 pitch) shall meet the following criteria:

**1.10.2.1** Sloped to drains or scuppers at a minimum of 0.25 in. per ft.

**1.10.2.2** Roof drains insulated through roof assembly to reduce the possibility of condensation.

### Advisory:

**A1.10.2.2** The EPA recommends installing 3 in. of vapor impermeable insulation (i.e., ccSPF) for a length (vertical and/or horizontal) of 3 ft. from the drain penetration at the roof deck.

**1.10.2.3** Roof assembly air control layer must be connected over other roof elements (e.g., curbs and blocking) and connected to the wall air control layer.

**1.10.2.4** Materials that form the water control layer must overlap each other in shingle fashion or be sealed in a watertight manner.

## 1.11 Ice Dam Prevention

- 1.11.1** In 2021 IECC Climate Zones 4 & higher, for all newly installed roofing, extend a self-sealing bituminous membrane (or equivalent ice barrier) in accordance with 2021 IRC R905.1.2.

### Exception:

**E1.11.1** For gut rehabilitations in 2021 IECC Climate Zones 4 & higher, where ice flashing per Item 1.11.1 cannot be verified under existing roofing in homes with vented attics, install insulation to meet or exceed R-49 (or equivalent U-factor). Ensure Grade I insulation per ANSI/RESNET/ICC 301-2022 installed throughout and terminates at the interior face of the exterior wall below.

### Advisory:

**A1.11.1a** The EPA recommends installing roof membrane prior to the drip edge installation and lapped down a minimum of 1 in. onto the face of the fascia. After installation of the membrane and drip edge, install an additional self-sealing strip at least 4 in. wide on top of the drip edge.

**A1.11.1b** For attics vented at the eaves, wind baffles are installed in every rafter cavity that extend up the roofline from the outside edge of the exterior wall and terminates inside the attic above the level of the insulation. Either the baffle, or other blocking type, shall fully block the vertical edge of the insulation between the width of the bay from the vented eave to prevent wind washing.

- 1.11.2** Gaps and penetrations between vented attics and the conditioned spaces are substantially sealed (e.g., tops of balloon-framed cavities, chases, wiring, and plumbing penetrations, top plates, etc.).

## Interior Moisture Management

### 1.12 Moisture-Resistant Backing Materials

- 1.12.1** Where installed, backers for wall tile and wall panels in tub and shower enclosures shall be cement board complying with ASTM C1288 or ISO 8336, Category C, or equivalent moisture-resistant material. Paper-faced backerboard shall not be used.

### Note:

**N1.12.1** In addition to fiber-cement board, fiber-mat reinforced cementitious panels complying with ASTM C1325; glass mat water-resistant gypsum panels complying with ASTM C1178; water-resistant fiber-reinforced gypsum panels complying with Section 6 of ASTM C1278; or materials that have been evaluated by ICC-ES per AC 115 may also be used to meet this requirement. Paper-faced backerboard may only be used behind monolithic enclosures or waterproof membranes that have been evaluated by ICC-ES per AC 115, and then only if it has received a rating of 10 when tested in accordance with ASTM D3273.

### 1.13 Appliance Drainage

**1.13.1** For each condensate-producing HVAC component, a corrosion-resistant drain pan (e.g., galvanized steel, plastic) included that drains to a drainage system or conspicuous point of disposal in case of blockage. Backflow prevention valve is included if connected to a shared drainage system.

**Exception:**

**E1.13.1** Any auxiliary protection method specified in 2021 IMC section 307.2.3 is permitted.

**1.13.2** Tank-type water heaters and hot water storage tanks located where water leakage from the tank could cause damage, shall be installed:

**1.13.2.1** Over a corrosion-resistant drain pan that drains to a conspicuous point of disposal; **OR**

**1.13.2.2** On an impervious surface with a floor drain within 2 ft. and moisture proof material at least 6 in. high installed around the room perimeter; **OR**

**1.13.2.3** With a leak detection system including an automatic water supply shutoff installed at the water tank.

**1.13.3** Non-vented (condensing or heat pump) clothes dryers shall be plumbed to a drain according to the manufacturer's instructions.

### 1.14 Water Supply Pipes

**1.14.1** Insulate hot and cold water supply pipes in exterior building cavities with minimum R4 pipe wrap.

**Exceptions:**

**E1.14.1a** Climate Zones 1-3 located in Dry (B) Zones, as defined by 2021 IECC Figure R301.1.

**E1.14.1b** When cavity insulation qualifies as an air barrier and pipes are located within the interior 50% of the wall cavity.

**Advisories:**

**A1.14.1a** Pipes should be installed as close as possible to conditioned space while maintaining Grade I insulation installation to reduce risk of freezing and/or condensation.

**A1.14.1b** Insulate hot and cold water supply pipes in exterior building cavities with minimum R4 pipe wrap in all climate zones.

### 1.15 Water-Resistant Flooring

**1.15.1** In areas where moisture or splash damage could occur (e.g., kitchens, bathrooms, entryways, laundry areas, and utility rooms) water-resistant hard-surface flooring is installed within 4 ft. of any plumbing fixture or exterior door. Wall-to-wall carpeting is permitted in adjacent spaces (e.g., hallways) beginning at the interior of the jamb or opening.

**Note:**

**N1.15.1** Wood flooring, either pre-finished or site-finished, or sub-flooring rated APA "Exposure 1" or "Exterior" can be utilized in these areas, as long as any site-applied finish complies with Items 6.1.

### 1.16 Class I Vapor Retarders

**1.16.1** Class I vapor retarders not installed on the interior side of vapor permeable insulation in below-grade exterior walls.

**1.16.2** In Warm Humid counties as defined by 2021 IECC Section R301.2, Class I vapor retarders are not installed on the interior side of vapor permeable insulation in above-grade exterior walls except at shower and tub walls.

**Note:**

**N1.16.2** Class I vapor retarders, such as mirrors, may be used if mounted with clips or other spacers that allow air to circulate behind.

### 1.17 Moisture Management Inspection

**1.17.1** Interior Inspection (gut rehabs only)

**1.17.1.1** The Verifier shall perform an inspection to identify areas of moisture intrusion in the building envelope. Inspection of wall sheathing behind exterior cladding must be done prior to insulation and interior finishes. Where moisture intrusion is evident behind cladding and fenestrations, cladding must be removed to address the integrity of flashing and the WRB. In all accessible attic and roof assemblies, visually verify no active water leaks, as evidenced from active water intrusion or staining on roof decking and/or ceiling materials. Where moisture intrusion is evident through roof assemblies, sufficient roofing materials must be removed to adequately repair leaks.

**Note:**

**N1.17.1.1** Where preliminary interior inspection reveals areas of building envelope degradation or potential moisture intrusion, the Verifier shall determine if envelope repairs are required. Surfaces are not required to appear "new" cosmetically; however, areas of rot and decay must be repaired, including proper flashing and/or



sealant to minimize moisture intrusion into the building assembly. Structural materials with staining from former leaks are permitted to remain uncoated/untreated, so long as they are not in the occupiable spaces of the building. Roof sheathing and materials with visible water stains within an unoccupied attic do not need to be replaced unless the structural integrity of the material has been compromised by water damage.

- 1.17.1.2** If visual mold and/or stains from water or fungal growth or moisture issues (e.g., condensation on pipes, leaks around windows, doors, wall penetrations, roofs, flashing, foundations, plumbing components, and fixtures, etc.) are evident, the source is identified, addressed, and remedied. Remediation of mold shall be addressed by one of the following options:
- 1.17.1.2a** If an area of suspected mold is less than 10 sq. ft., remediation can be addressed by the building owner (Refer to Mold Cleanup Tips and Techniques).
- 1.17.1.2b** Areas of suspected mold larger than 10 sq. ft., or areas of any size that have been damaged by water containing sewage, shall be remediated in accordance with the recommendations in the EPA guide, “Mold Remediation in Schools and Commercial Buildings” or the guidelines of the American Conference of Governmental Industrial Hygienists (ACGIH). States and local agencies may require certification, training, or examinations for practitioners in the industry of mold remediation and environmental management. See the EPA’s list of state contacts to inquire about local requirements and recommended credentials at [www.epa.gov/indoor-air-quality-iaq/epa-regional-office-and-state-indoor-air-quality-information](http://www.epa.gov/indoor-air-quality-iaq/epa-regional-office-and-state-indoor-air-quality-information).
- 1.17.1.3** During construction and/or renovation, building materials with visible signs of water damage or mold are not installed or allowed to remain. Lumber with “sap stain fungi” is exempt from Item 1.18.1 as long as the lumber is structurally intact.
- 1.17.1.4** Framing members and insulation products having high moisture content are not enclosed (e.g., with drywall).

**Note:**

**N1.17.1.4** For wet-applied insulation, follow the manufacturer’s drying recommendations.

**Advisory:**

**A1.17.1.4** The EPA recommends that the lumber moisture content be 18%.

**1.17.2** Exterior Inspection

- 1.17.2.1** Exterior above-grade surfaces (e.g., fenestrations, siding, flashing, roof-to-wall connections) are visually verified to be free from degradation or potential moisture intrusion. If evident, the source is identified, addressed, and remedied.

**Note:**

**N1.17.2** Exterior surfaces can be inspected from the ground or from building openings (e.g., fenestrations). Where preliminary exterior inspection reveals areas of building envelope degradation or potential moisture intrusion, the Verifier shall determine if closer inspection and/or envelope repairs are required. Surfaces are not required to appear “new” cosmetically; however, areas of rot and decay must be repaired, including proper flashing and/or sealant to minimize moisture intrusion into the building assembly.

**Advisories:**

- A1.17a** Exterior wood surfaces should be back primed and coated with stain, paint, or equivalent.
- A1.17b** Install water-resistive barriers and protect building openings/fenestration immediately following rough framing.
- A1.17c** Remove standing water and use fans and/or dehumidifiers to remove moisture.
- A1.17d** If standing water or ice is found to be present following the completion of rough framing and dry-in activities, the Verifier should request a root cause analysis and corrective action plan to be included with final verification documents.

## 2. Radon

**Introduction:** Items 2.1 and 2.2 are not required for garage spaces that comply with ANSI/ASHRAE 62.1-2022, Sections 5.2 and 6.5, nor for buildings with raised-pier foundations (i.e. no solid perimeter foundation wall) with no ground contact. Where a building has a mechanical room(s) or conditioned walk-up entry with ground contact, the home/building must comply with Items 2.1. and 2.2. Consult the [EPA’s radon zone maps by state](https://www.epa.gov/radon/radon-zone-maps-by-state) to determine requirements below based on the location of the home or building being constructed. Voluntary consensus standards referenced below for best practices in radon resistant new construction (RRNC) and radon testing can be found at <https://standards.aarst.org/>.

### 2.1 Radon Risk Reduction Strategy

- 2.1.1** In EPA Radon Zone 1, construct buildings with either:

**2.1.1.1** An active radon mitigation system meeting the requirements outlined in Item 2.2; **OR**

2.1.1.2 A passive radon reduction system meeting the requirements outlined in Item 2.2, and conduct testing upon completion of construction confirming that radon levels are below 4 picocuries per liter (pCi/l).

2.1.2 In EPA Radon Zone 2, construct buildings with either:

2.1.2.1 A passive or active radon reduction system meeting the requirements outlined in Item 2.2; **OR**

2.1.2.2 Conduct testing upon completion of construction confirming that radon levels are below 4 pCi/l.

2.1.3 In EPA Radon Zone 3:

2.1.3.1 Provide the occupants of one- and two-family dwellings and townhouses with the EPA's [Basic Radon Facts](#) along with the owner and occupant information kit (see Section 7).

**Note:**

**N2.1** Where radon testing is performed to meet the above requirements, testing shall follow protocols outlined in [ANSI/AARST MAH 2023](#) for single-family dwellings **OR** [ANSI/AARST/MA-MFLB 2023](#) for other residential or mixed-use buildings. Where radon levels are above 4 pCi/l, mitigation with an active radon system is required, followed by post-mitigation testing to confirm levels below 4 pCi/l. Radon test results shall be furnished to the Verifier and maintained with certification documentation.

## 2.2 Radon-Resistant Construction

2.2.1 During the installation of a newly installed passive or active radon system, builders are required to include the features in Items 2.2.1.1 through 2.2.1.3. While builders are not required to maintain documentation demonstrating compliance for each individual certified home, builders are required to develop a process to ensure compliance for each certified home (e.g., incorporate these requirements into the Scope of Work for relevant sub-contractors, require the site supervisor to inspect each home for these requirements, and/or sub-contract the verification of these requirements to a Verifier):

2.2.1.1 Capillary break and vapor retarder installed according to Items 1.4.1 through 1.4.4, irrespective of climate zone or soil drainage.

2.2.1.2 A 3- or 4-in. diameter gas-tight vertical vent pipe is installed, clearly labeled upon installation as a component of a radon reduction system. The vent pipe shall be connected to an open T-fitting in the aggregate layer (or connected to geotextile drainage matting according to the manufacturer's instructions) beneath the vapor retarder, terminating outdoors a minimum of 12 in. above the roof. At least 10 ft. of horizontal perforated drain tile shall be attached to the T-fitting beneath the vapor retarder placed over earthen crawlspaces and below concrete slabs. Suction points are not permitted on sump lids.

2.2.1.3 Where a foundation drainage system discharges to daylight and is also connected to the soil gas collection plenum of a passive or active radon system, a backwater valve (i.e. check valve or other means) is installed in the foundation drainage system to isolate the soil gas collection plenum from any openings to atmosphere (e.g. drain tile outfall, window wells).

**Where a passive or active radon system is installed, Verifiers shall visually verify the following features:**

2.2.1.4 Radon fan (in the case of an active system) **OR** an electrical receptacle (in the case of a passive system) is installed in an accessible location outside the thermal and air barrier boundary of the building. Additionally, fan location is prohibited in a basement, crawlspace, or garage that is below conditioned space, unless the garage complies with [ANSI/ASHRAE 62.1-2022](#), Sections 5.2 and 6.5.

2.2.1.5 The branch circuit supply shall be labeled at the electrical panel indicating its intended use.

2.2.1.6 Where an active radon system is installed, a system monitoring mechanism (e.g. negative pressure meter, such as a manometer type pressure gauge) shall be connected to the fan piping and located where it can be easily observed by the occupants or maintenance personnel.

**Exceptions for gut-rehabilitations:**

**E2.2.1** Where the requirements in Item 2.2.1 cannot be verified for existing homes/buildings in Radon Zones 1 and 2, radon testing is permitted upon completion of construction/renovation to verify radon levels are below the EPA action level (4pCi/l). Single-family homes shall be tested following procedures outlined in ANSI/AARST MAH 2023, and all other residential or mixed-use buildings shall be tested following procedures outlined in ANSI/AARST MA-MFLB 2023. Where radon testing results in levels  $\geq$  4 pCi/l, an active radon mitigation system shall be installed with verification of Items 2.2.1.4 to 2.2.1.6, followed by post-testing to verify radon levels are below 4pCi/l. Radon test results shall be furnished to the Verifier and maintained with certification documentation.

**Note:**

**N2.2** Consult local building codes to determine whether additional radon requirements or regulations apply. Also consult the EPA's [Building Radon Out](#) (EPA 402-K-01-002) for general guidance on installing radon-resistant features.

**Advisories:**

- A2a** Elevated levels of radon have been found in buildings built in all three zones on the EPA's Map of Radon Zones. The EPA recommends radon-resistant features for buildings in all EPA Radon Zones, and that all buildings with or without radon-resistant features be tested for radon prior to occupancy.
- A2b** While it is commonly assumed that the lowest levels in the building will have the highest concentration of radon, that is not always the case; elevated levels of radon may be found on all levels in buildings. Consult the [EPA's list of regional, state, and tribal radon programs](#) for contact information and current data about radon in your area.
- A2c** Radon levels below 4 pCi/L still pose some risk, and radon levels can be reduced to 2 pCi/L or below in most homes with radon-resistant construction and/or mitigation. If short-term testing results indicate radon levels  $\geq$  2 pCi/L, consider mitigating or performing a long-term test (  $\geq$  90 days) to acquire a more accurate representation of annual radon exposure in the home.
- A2d** Larger buildings and multifamily properties may share mitigation systems across multiple units or may require multiple soil gas vent systems to accommodate large building footprints. Radon mitigation systems should be installed in multiple locations when building components, such as structural beams, interrupt movement of soil gases to the vent system. See ANSI/AARST CC-1000 for electric metering guidance in shared (collateral) mitigation systems, as well as for maximum nominal sizes of soil gas collection plenums and corresponding pipe sizes.
- A2e** The EPA recommends the use of radon monitors and/or alarms to inform occupants of potentially elevated levels of radon gas in the home. Radon monitoring devices may be subject to error and/or drift if not calibrated according to manufacturer's instructions. As such, the EPA recommends testing and/or monitoring with devices listed by either the National Radon Proficiency Program (NRPP) or the National Radon Safety Board (NRSB).

### 3. Pest Prevention

**Introduction:** Builders are required to promptly remediate pest infestations that are found during construction and to deliver IAP certified buildings without visible signs of active termites, pest infestation, or structural damage. Where active pest infestation or structural damage is visible or suspected, the Verifier may withhold certification until pest infestations and/or pest contaminated materials are remediated.

#### 3.1 Pest Barriers

- 3.1.1** Exterior penetrations (i.e., plumbing, electrical, chimney flashing, etc.) and joints between the foundation and exterior wall assemblies are sealed where accessible.
- 3.1.2** Rodent/bird screens provided for all architectural openings that cannot be fully sealed.
- 3.1.3** Screen, louver, or grille provided for all ventilation termination fittings. Openings in the screen/louver/grille must be no smaller than 0.25 in. square and no larger than 0.5 in. in any dimension in accordance with 2021 IRC 303.6. Screens for radon exhaust systems are not required, but where provided, screen mesh shall be no smaller than 0.5 in. square.
- 3.1.4** Dryer ducts include a weather-resistant termination or louver in accordance with the dryer manufacturer's instructions. Where dryer vents include a grille, the majority of openings must be no less than 0.5 in. in any direction.
- 3.1.5** **GOLD:** Screens are provided for all operable windows.

#### Advisories:

- A3.1a** In jurisdictions designated by the code official as having a "Moderate to Heavy" termite infestation probability (e.g., 2021 IRC Table R301.2):
  - i. Foundation walls are recommended to be solid concrete or masonry with a top course of solid block, bond beam, or concrete-filled block.
  - ii. Interior, ground-contact concrete slabs are recommended to be constructed with 6 x 6 in. welded wire fabric, or the equivalent, and concrete walls should be constructed with reinforcing rods to reduce cracking.
- A3.1b** In jurisdictions designated by the code official as having a "Very Heavy" termite infestation probability (e.g., 2021 IRC Table R301.2):
  - i. Foam plastic insulation is not recommended to be installed on the exterior face of below-grade foundation walls or under slabs.
  - ii. Foam plastic insulation installed on the exterior of above-grade foundation walls should be covered with moisture-resistant, pest-proof material (e.g., fiber cement board or galvanized insect screen at the bottom-edge of openings) and should be kept a minimum of 6 in. above the final grade and landscape bedding materials.
  - iii. Foam plastic insulation applied to the interior side of conditioned crawlspace walls is recommended to be kept a minimum of 3 in. below the sill plate.
  - iv. Install a sealed termite shield extending a minimum of 0.75 in. past the edges of the foundation wall assembly.
- A3.1c** When sealing gaps larger than ¼ in., which can provide potential points of entry for rodents, copper or stainless-steel wool is recommended in addition to sealant.

**A3.1d** Install a steel mesh barrier termite control system and implement bi-annual inspections for termite nests and shelter tubes.

### 3.2 Multifamily Pest Management

**3.2.1** Multifamily buildings include a pest management plan for the building maintenance staff or a documented contract with a pest management company aligning with the principles outlined in the EPA's guide on [Integrated Pest Management in Buildings](#).

**3.2.2** In owner/tenant manual, provide guidance for residents on housekeeping practices, refuse removal, and reporting pest problems promptly to building management.

**3.2.3** **GOLD:** Multifamily buildings include sanitary floor drains in common trash/recycling rooms 70 sq. ft. Floor drains shall include trap seal protection according to 2021 IRC P3201.2.1.

## 4. Heating, Cooling, and Ventilation Systems

**Introduction:** If certifying as ENERGY STAR, Indoor AirPlus requirements shown in *italics* are satisfied by meeting related ENERGY STAR requirements, and ENERGY STAR footnotes & exceptions are permitted unless otherwise specified.

### Heating and Cooling Design and Inspections

#### 4.1 Heating and Cooling (HAC) System

**Introduction:** Item 4.1 addresses design load calculations and system sizing specific to heating and cooling systems. For requirements related to ventilation, see Items 4.6-4.9.

##### System Design

**4.1.1** All newly installed HAC systems serving dwelling units shall meet the design and documentation requirements of Sections 3-4 of ANSI/ACCA 5 QI – 2015. As an alternative, calculate dwelling unit design loads in accordance with ASHRAE Standard 183 or Chapter 17 of the 2021 ASHRAE Handbook of Fundamentals and select the smallest available equipment size that meets the loads.

**4.1.2** *All newly installed HAC systems serving common spaces shall be selected in accordance with ACCA Manual S or equivalent equipment sizing procedure.*

##### **Notes:**

**N4.1a** Where heating equipment also provides domestic hot water, calculations must be performed to determine how to size the system to satisfy both loads in accordance with manufacturer's guidance.

**N4.1b** While heating-dominant climates are allowed to over-size with respect to the cooling load to achieve higher energy efficiency in the winter, this design choice may impact the ability of the system to effectively provide humidity control (see Item 4.2).

**N4.1c** If certifying as ENERGY STAR, ENERGY STAR HVAC Design requirements satisfy Item 4.1.1 for ducted residential HAC systems. Where the ENERGY STAR program does not require heating and cooling design loads to be calculated due to the type of space conditioning system specified, design loads must still be calculated to meet Indoor AirPlus requirements. Design loads may be calculated using Unabridged ACCA Manual J v8, Chapter 17 of the 2021 ASHRAE Handbook of Fundamentals, or ASHRAE Standard 183.

**N4.1d** If certifying as ENERGY STAR, where the ENERGY STAR program does not require certain equipment to be selected per ACCA Manual S, systems such as boilers and mini-split / multi-split systems must be selected per ACCA Manual S to meet Indoor AirPlus requirements. For all heating and cooling systems in the building not within the scope of ACCA Manual S, the output capacity of heating and cooling equipment shall not be greater than that of the smallest available equipment size that exceeds the loads calculated.

##### System Performance

**4.1.3** *For all newly installed HAC systems, documentation shall be provided to the Verifier, including start-up reports or results of functional performance tests.*

**4.1.4** All existing HAC system components shall be assessed in accordance with the applicable minimum inspection standards of ANSI/ACCA Standard 4 (Maintenance of Residential HVAC Systems) or ANSI/ASHRAE/ACCA Standard 180 (Standard Practice for Inspection and Maintenance of Commercial HVAC Systems), and the associated maintenance and service tasks shall be performed in accordance with the standard.

##### **Note:**

**N4.1.4** Where inspection of existing HAC equipment reveals significant dirt, debris, biofilm, or fungal growth, clean and repair in accordance with ANSI/ACCA Standard 6 (Restoring the Cleanliness of HVAC Systems) or replace the system according to the newly installed criteria above.

##### **Advisories:**

**A4.1a** Air-handling equipment that moves less than 3,000 CFM of air should have a manufacturer's designation for air leakage less than or equal to 2% of the design airflow rate when tested in accordance with ANSI / ASHRAE Std. 193.

- A4.1b** Although not required to meet this specification, Chapter 1 of the ASHRAE Handbook of Fundamentals or ACCA Manual P should be used to identify conditions that might lead to moisture issues and to verify that the design specifications fall within the 'Comfort Zone' on the psychrometric chart as defined by ANSI/ASHRAE 55.
- A4.1c** The EPA recommends but does not require that airflows from air balancing reports for all HAC supply registers and return grilles are measured using ANSI / ACCA 5 QI-2015 protocol and verified within the greater of  $\pm 20\%$  or  $\pm 25$  CFM of the design airflow.
- A4.1d** Multi-zone ductless systems may require supplementary dehumidification due to a lack of general distribution or circulation, the use of individual room controls, and the impact of door closures.

## 4.2 Humidity Control

**4.2.1 GOLD:** A humidity monitoring device is provided in the main living area of the dwelling unit that includes a digital display of indoor temperature and relative humidity (RH) either on-board or via a web-based app. This requirement shall be met by either:

**4.2.1.1** An RH monitor integrated with a thermostat or other central HAC controls; **OR**

**4.2.1.2** A standalone digital hygrometer, either permanently mounted or portable.

### Exception:

**E4.2.1** Dwelling units in multifamily buildings are not required to include a digital display, so long as remote RH monitoring of each dwelling unit is achieved by a building management platform.

### Advisory:

**A4.2.1** The ability to record RH data, either on-board or via a web-based app, for a minimum of 30 days is recommended.

**4.2.2** Dwelling units in Moist (A) climate zones 1-4, as defined by 2021 IECC Figure R301.1, shall be served by equipment designed and installed with sufficient latent capacity to maintain indoor RH at or below 60% in each dwelling unit. This requirement shall be met by either:

**4.2.2.1** A dehumidification system (e.g., ventilating, or whole-home dehumidifier, or a central system with an added coil for dehumidification) plumbed to a discharge drain, and either integrated with the HVAC system or sized to serve the main body of the dwelling unit; **OR**

**4.2.2.2** All cooling systems serving dwelling units equipped with additional controls to operate in dehumidification mode (i.e., systems that utilize humidity sensor feedback in the control algorithm to provide dehumidification, either automatically or on-demand, even when cooling is not required).

### Notes:

**N4.2.2a** "Whole-building dehumidifiers" are typically installed within the HAC ductwork to dehumidify multiple rooms and are often permanent. They may be installed separately from the HAC system and generally process indoor air only. "Ventilating dehumidifiers" process both indoor and outdoor air.

**N4.2.2b** Cooling systems only meet this requirement if they contain RH sensors that automatically turn the system off upon reaching the RH setpoint AND either prevent over-cooling or provide re-heat to maintain indoor temperature setpoints. For systems that prevent over-cooling, the system is allowed to turn off without reaching the RH setpoint. Cooling systems with on-demand 'dry mode', like ductless mini-splits, must still meet the same requirements above.

### Exception:

**E4.2.2** Dwelling units in Climate Zone 4A are exempt from Item 4.2.2 if the following are met:

**E4.2.2a** Humidity monitoring device is installed to meet Item 4.2.1 and has the ability to record RH data for a minimum of 60 days; **AND**

**E4.2.2b** Dedicated space, drain, and electrical hook-up is provided to facilitate the future installation of a supplemental dehumidification system; **OR**

**E4.2.2c** Estimate is provided to the Verifier using residential building modeling tools with hourly simulations that the dwelling unit will not exceed 60% RH for more than 876 hours (i.e., 10% of the year).

**4.2.3** In Moist (A) Zones and Marine (C) Zones, as defined by 2021 IECC Figure R301.1, where a basement or crawlspace is not served by a cooling system with humidity controls as outlined in Item 4.2.2.2, provide supplemental active dehumidification, sized for the total volume of the basement and/or crawlspace according to manufacturer's recommendations. Dehumidifiers shall be programmed to maintain relative humidity (RH) at or below 60% and shall be continuously drained to the outside or to a sump pump.

### Exception:

**E4.2.3** In multifamily buildings, basement spaces that are unfinished and/or not occupiable are recommended, but not required, to meet Item 4.2.3.

### Advisories:



- A4.2.3a** To avoid humidity issues during “swing seasons” or low-load periods where space conditioning systems may not be operating regularly, the EPA recommends an active dehumidification system (in lieu of or in addition to the HAC system) in crawlspaces and basements.
- A4.2.3b** Where whole-home dehumidification or HAC systems are utilized to condition below-grade spaces, the EPA recommends locating the humidity sensor in the basement or crawlspace.
- A4.2.3c** A humidity monitoring device that includes a digital display of indoor temperature and RH and the ability to record data, either on-board or via a web-based app, is recommended in basements and crawlspaces in addition to similar RH monitoring in the main living area of the dwelling unit.
- A4.2.3d** In multifamily buildings, the EPA recommends meeting Item 4.2.3 for all basement spaces, including those that are not finished or occupiable.

**Advisories:**

- A4.2a** The EPA recommends, but does not require, that cooling systems in hot/humid climates use controls for immediate blower shutoff after condenser shutoff, to prevent re-evaporation of moisture off the wet coil.
- A4.2b** An additional dehumidification system (in lieu of additional HAC controls) is recommended in “Warm-Humid” climates, as defined by 2021 IECC Figure R301.1.
- A4.2c** The EPA recommends maintaining indoor relative humidity (RH) between 40%-60% during most times of the year. In some instances, particularly during winter months, buildings may have extremely low humidity levels. In such cases, humidification may be helpful to improve occupant comfort and/or to reduce cracking of wood flooring, furniture, or instruments. Humidification is currently neither required nor prohibited to earn the Indoor AirPlus label. In cases where humidification is included in a ducted HAC system, the EPA recommends including automatic controls that limit the indoor relative humidity to 40%. If condensation is discovered on windows or ductwork, the humidifier should be adjusted to a lower maximum RH set point. Builders should also provide owners/occupants with instructions from the manufacturer on proper use and maintenance of the humidifier, including the recommendation to use distilled water.
- A4.2d** The EPA recommends that the indoor dew point temperature be maintained below 60 °F (15 °C) whenever the outdoor air dew point is above 60 °F (15 °C).
- A4.2e** Where installed, the EPA recommends whole-home or portable dehumidifier(s) are ENERGY STAR certified.

**4.3 Heating and Cooling (HAC) Duct Systems**

**Introduction:** Item 4.3 applies to all ducted systems providing heating and/or cooling (HAC) to the building. HAC ductwork must be inspected and tested per the following requirements.

**Duct Design**

- 4.3.1** *In one- and two-family dwellings and townhouses, all newly installed duct systems are sized according to ACCA Manual D. All other dwelling units with newly installed duct systems may use an equivalent duct design standard.*
- 4.3.2** Building cavities, such as any framing space (e.g., between wall studs, floor joists, or ceiling joists) or other interstitial spaces (e.g., dropped ceilings, plenums, open floor truss cavities), shall not be used to directly supply air to a space or return air to the air-handling equipment.

**Note:**

- N4.3.2** Building cavities/spaces can be used as “duct chases” that contain supply or return ducts, if those ducts are entirely made of sheet metal, duct board, and/or flexible duct. For more information, visit: <https://basc.pnnl.gov/resource-guides/building-cavities-not-used-supply-or-return-ducts>.

**Exceptions:**

- E4.3.2a** Mechanical closets that contain air-handling equipment without ducted returns and instead utilize louvered doors or openings as the only return air pathway, are permitted if the Verifier-measured pressure difference between the closet containing the air-handling equipment and the conditioned space, with the air-handling equipment running at high speed, is ≤ 5 Pa.
- E4.3.2b** Building framing cavities and other interstitial spaces may be used to return air directly to the air-handling equipment only where the HAC filter is installed downstream of the cavity/space and the cavity/space is within the building thermal boundary. In addition, the cavity/space must be included in duct sizing and must be inspected in accordance with Item 4.3.3. Where the return air pathway is not included in the duct leakage test, the sum of the Verifier-measured airflows from all return grilles shall be within 20% of the total system return airflow as measured at the air-handling equipment or as reported in Manual D reports or TAB reports.

**Advisory:**

- A4.3.2** A right-sized, fully ducted return is recommended to help ensure adequate return air through the filter to the air-handling equipment, rather than a transfer grille or louvered door to the space containing the air-handling equipment.

## Duct Inspection

**4.3.3** After all dust-producing construction activities are complete (e.g., drywall, trim carpentry, floor sanding), all duct boots and ductwork that are visible from the duct opening are verified to be dry and substantially free of dust and debris. Diffusers/grilles are recommended, but not required, to be removed for inspection. Alternatively, verification is permitted with photo documentation from the builder or HVAC contractor at the time of diffuser/grille installation, including a photo of each return opening and at least one supply opening in the dwelling unit.

### **Note:**

**N4.3.3** Where visible portions of ducts and boots are not substantially free of dust and debris, they must be thoroughly vacuumed prior to final inspection. Where duct systems are found to have visible mold growth or vermin infestation, ducts shall be cleaned in accordance with [ANSI/ACCA Standard 6 \(Restoring the Cleanliness of HVAC Systems\)](#). Prior to cleaning, retrofitting, or replacing any ducts or components of the duct system, the cause or causes of moisture or mold growth must be determined and corrected.

### **Advisory:**

**A4.3.3** To reduce the likelihood of contaminating the ducts, the EPA recommends covering duct openings during all phases of construction.

**4.3.4** Existing ducts (gut rehabs only) shall be in good condition (e.g., connected to boots, no tears in flex ducts), and exterior surfaces of ducts and insulation in and around insulated ducts shall be dry and free of mold.

### **Advisory:**

**A4.3.4** Metal supply ductwork that provides space cooling should be insulated (R-4 or greater) even when located within conditioned space.

**4.3.5** Ductwork installed outside the thermal and air barrier boundary is sealed at transverse joints, longitudinal seams, duct wall penetrations, and duct boots sealed to drywall or subfloor using mastic systems, internal aerosol-based sealant, or UL-listed tapes used in accordance with their listing. Cloth duct tape is prohibited in all locations.

### **Advisory:**

**A4.3.5** Where tape is used for duct sealing, the EPA recommends that it meet the applicable requirements of UL 181A or UL 181B.

## Duct System Performance

**4.3.6** *For duct systems serving individual dwelling units, Verifier-measured total duct leakage tested in accordance with ANSI/RESNET/ICC Std. 380, with air handler & all ducts, building cavities used as ducts, & duct boots installed, meets one of the following two options:*

### **4.3.6.1** *Rough-in:*

**4.3.6.1a** *For duct systems with no ducted returns, the greater of  $\leq 4$  CFM25 per 100 sf of CFA or  $\leq 40$  CFM25.*

**4.3.6.1b** *For duct systems with one or two ducted returns, the greater of  $\leq 4$  CFM25 per 100 sf of CFA or  $\leq 40$  CFM25.*

**4.3.6.1c** *For duct systems with three or more ducted returns, the greater of  $\leq 6$  CFM25 per 100 sf of CFA or  $\leq 60$  CFM25.*

### **4.3.6.2** *Final (with register grilles atop the finished surface (e.g., drywall, floor) installed):*

**4.3.6.2a** *For duct systems with no ducted returns, the greater of  $\leq 8$  CFM25 per 100 sf of CFA or  $\leq 80$  CFM25.*

**4.3.6.2b** *For duct systems with one or two ducted returns, the greater of  $\leq 8$  CFM25 per 100 sf of CFA or  $\leq 80$  CFM25.*

**4.3.6.2c** *For duct systems with three or more ducted returns, the greater of  $\leq 12$  CFM25 per 100 sf of CFA or  $\leq 120$  CFM25.*

### **Exception:**

**E4.3.6** *Total duct leakage testing is not required for ducted HAC systems serving more than one dwelling unit or for ducted HAC systems where the total supply duct length is  $\leq 10$  ft.*

### **Notes:**

**N4.3.6a** *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'. Where there are no 'ducted returns', the duct leakage test shall include the leakage from the air handler and the supply side of the forced*

*air system. Where building cavities used to return air to the air handler are included in the duct leakage test, the allowances for "One or two ducted returns" shall be permitted.*

**N4.3.6b** Registers atop carpets are permitted to be removed and the face of the duct boot temporarily sealed during testing.

**4.3.7** For duct systems serving individual dwelling units, Verifier-measured duct leakage to outdoors (DLTO) is 4 CFM25 per 100 sf of CFA or 40 CFM25 as tested in accordance with ANSI/RESNET/ICC Std. 380.

**Note:**

**N4.3.7** If certifying as ENERGY STAR SFNH, meeting SFNH requirements satisfies Item 4.3.7. If certifying as ENERGY STAR MFNC, Item 4.3.7 exceeds MFNC requirements and testing is required, unless specifically exempted below.

**Exception:**

**E4.3.7a** DLTO is not required if all ducts and the air handler are within the thermal and air barrier boundary of the dwelling unit.

**E4.3.7b** DLTO testing can also be waived if total duct leakage at rough-in or final is 4 CFM25 per 100 sf of CFA or 40 CFM25, whichever is larger.

**E4.3.7c** For dwelling units in multifamily buildings, testing DLTO is not required if the air handler is within the thermal and air barrier boundary of the dwelling unit and less than 10 ft. of the dwelling-unit ducts are located outside the thermal and air barrier boundary of the dwelling unit.

#### 4.4 Location of Heating, Cooling, and Ventilation (HVAC) Air-Handling Equipment and Ductwork

**4.4.1** Do not locate HVAC air-handling equipment or ductwork in garages.

**Note:**

**N4.4.1** In one- and two-family dwellings and townhouses with attached garages, ducts and equipment for heating, cooling, or ventilation may be located in building framing cavities adjacent to garage walls or ceilings if they are separated from the garage space with a continuous thermal barrier and air barrier. Mechanical rooms with air-handling equipment adjacent to the garage are permitted to have a garage-side access door, so long as the door is insulated, gasketed or weather-stripped, and has self-closing hinges. These allowances are not permitted for dwelling units that are above or adjacent to parking garages in multifamily buildings.

**Note:**

**N4.4.1** This item does not apply where the system provides space conditioning and/or ventilation only for the garage, independent of systems that serve dwelling units.

**Advisories:**

**A4.4.1a** Air-handling equipment should be installed in a location accessible to the occupant, HVAC technician, or building maintenance staff to facilitate cleaning, maintenance, and to provide access to the heating and cooling cores and condensate pans. The EPA recommends that access to an unvented attic should be provided by a permanent stair, a pull-down stair or ladder with a minimum capacity of 300 pounds (136 kg), or direct access to the equipment from a door (e.g., knee wall or unfinished mechanical room).

**A4.4.1b** In flood-prone areas, the HVAC air-handling equipment is recommended to be installed above the 100-year flood level.

**4.4.2** All HAC supply and return ducts located outside the building's thermal and air-barrier boundary shall be insulated to  $\geq R-6$ .

**4.4.3** **GOLD:** All newly installed and existing HAC air-handling equipment and ductwork must be located within the thermal and air barrier boundary to minimize the potential for future leakage to outdoors and associated pressure imbalances.

**Note:**

**N4.4.3** This item does not apply to equipment or ductwork that only provide ventilation.

**Exceptions:**

**E4.4.3a** Ducts (but not air handlers) are permitted to be outside of the home/unit's thermal and air barrier boundary if total duct leakage is measured 1 CFM25 per 100 sf of conditioned floor area, at rough-in or final, with or without the air handler.

**E4.4.3b** Up to 10 ft. of total duct length is permitted to be outside of the home/unit's thermal and air barrier boundary.

**E4.4.3c** Ducts (but not air handlers) may be located in a vented attic if minimum R-8 duct insulation is used, duct leakage to outdoors is measured 3 CFM25 per 100 sf of conditioned floor area, and:

- i. In Moist (A) climate zones (per 2021 IECC Figure R301.1), an additional 1.5 in. (min.) of closed-cell spray foam encapsulates the ducts and ductwork is buried under 2 in. (min.) of blown-in insulation; **OR**
- ii. In Dry (B) and Marine (C) climate zones (per 2021 IECC Figure R301.1), ductwork is buried under at least 3.5 in. of blown-in insulation.

- E4.4.3d** Systems which meet the criteria for “Ducts Located in Conditioned Space” as defined by the 2021 IECC Section R403.3.2.
- E4.4.3e** Jump ducts which do not directly deliver conditioned air from the HAC unit may be located in attics if all joints, including boot-to-drywall, are sealed per Item 4.2, and the jump duct is fully buried under the attic insulation.
- E4.4.3f** Ducts and air-handling equipment may be located within an uninsulated and unvented crawl space or basement when dehumidification is used to meet the requirement of Item 4.2.3.
- E4.4.3g** Ducts and air-handling equipment associated with rooftop make-up air units or dedicated outdoor air systems (DOAS) that provide ventilation, but also provide supplemental heating and cooling, are permitted to be outside of the building’s thermal and air barrier boundary.

#### 4.5 Pressure-Balanced Bedrooms

- 4.5.1** *Where ducted systems provide heating and/or cooling to the bedroom, bedrooms shall be pressure-balanced using any combination of transfer grilles, jump ducts, dedicated return ducts, and undercut doors. In one-and two-family dwellings and townhouses, bedrooms shall achieve a Verifier-measured pressure differential  $\geq -3$  Pa and  $\leq +3$  Pa with respect to the main body of the dwelling unit when all air handlers are operating. As an alternative to the  $\pm 3$  Pa limit, a Verifier-measured pressure differential  $\geq -5$  Pa and  $\leq +5$  Pa is permitted to be used for bedrooms with a design airflow  $\geq 150$  CFM. In dwelling units in multifamily buildings, bedrooms with a design airflow  $\geq 150$  CFM shall achieve a Verifier-measured pressure differential  $\geq -5$  Pa and  $\leq +5$  Pa with respect to the main body of the dwelling unit when all air handlers are operating.*

**Exception:**

- E4.5.1** *In dwelling units in multifamily buildings, testing is not required where bedroom supply airflow  $< 150$  CFM.*

**Note:**

- N4.5.1** *Item 4.5.1 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. For an HVAC system with multiple zones, this requirement shall be verified with all zones calling for heating or cooling simultaneously; additional testing of individual zones is not required. When verifying this requirement, doors separating bedrooms from the main body of the house (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 Verifier-measured pressure shall be rounded to the nearest whole number to assess compliance.*

#### Mechanical Ventilation

- A4.6** The EPA recommends using a CO<sub>2</sub> monitor to help occupants and/or building managers identify to improve ventilation operation based on occupancy. (see also: [Air Sensor Technology and Indoor Air Quality](#)).

#### 4.6 Dwelling-Unit Mechanical Ventilation

##### Ventilation System Design

- 4.6.1 CERTIFIED:** Provide each dwelling unit with a mechanical ventilation system that meets the requirements in Items 4.6.2 through 4.6.7.

**GOLD:** Provide each dwelling unit with a “balanced” mechanical ventilation system, that meets the requirements in Items 4.6.2 through 4.6.7.

**Notes:**

- N4.6.1a GOLD:** A “balanced” ventilation system shall be designed and installed to provide ventilation air directly to the dwelling unit from the outdoors. A “balanced” system may be an HRV or ERV, but may also be a combination of mechanical supply and exhaust systems, with no heat or energy recovery. Exhaust-only or supply-only ventilation systems are prohibited.
- N4.6.1b GOLD:** The system is considered “balanced” if the total supply and exhaust airflows measured in the dwelling unit are within 20% or 10 CFM (whichever is greater) of each other. When calculating the percentage, use the higher airflow as the basis. Where the supply and exhaust systems operate independently, the EPA recommends, but does not require, simultaneous operation. If they operate on schedules with different airflow rates and run-times, apply the run-time to the measured airflow to calculate the average rate when determining if they are “balanced”.
- N4.6.1c GOLD:** Outdoor air supplied through the HAC air handler is permitted as part of the “balanced” ventilation system, so long as controls are installed to operate the air handler intermittently & automatically based on a timer and to restrict intake when not in use (e.g., motorized damper), and outdoor airflow can be measured. To balance the outdoor air supplied through the HAC air handler, a separate exhaust system is needed, that runs continuously or intermittently and automatically based on a timer or using controls interlocked with the motorized damper.

**N4.6.1d GOLD:** Where a powered supply fan is connected directly to the HAC ducting, the supply fan and the HAC air handler shall be interlocked to run simultaneously, without allowing the HAC air handler to run continuously.

**Advisories:**

**A4.6.1a** The EPA recommends installing ventilation equipment with automated fault detection and diagnostics for airflow rate, filter maintenance, and automatic balancing features to maintain the design airflow rate in variable conditions and through the equipment life. The EPA also recommends installing ventilation equipment with the capability to modify ventilation rates and run-times in response to monitored pollutants. Also note that IAQ contaminant monitoring systems may require regular maintenance, calibration, and/or replacement of sensor equipment.

**A4.6.1b** Where installing balanced or supply ventilation systems, the EPA recommends multiple supply points to properly distribute outdoor air to all living spaces for all system types.

**A4.6.1c** Where installing heat or energy recovery ventilation systems, the EPA recommends the following:

- i. Minimize intake and exhaust duct length.
- ii. Install the room exhaust points high on the walls or in the ceiling.

**A4.6.1d** Where installing powered supply ventilation, the EPA recommends the following:

- i. Locate the supply air grille(s) where it will not deliver unconditioned air near occupants, **OR**
- ii. Supply outdoor air at a minimum temperature of 60°F for a floor diffuser or minimum temperature of 54°F for a high wall or ceiling diffuser.

**A4.6.1e** Where outdoor air ducts are connected to the return side of an air handler, manufacturers' requirements for return air temperature should be met (e.g., most manufacturers recommend a minimum of 60 degrees Fahrenheit air flow across furnace heat exchangers).

**4.6.2** *Mechanical ventilation systems serving dwelling units shall have a manual override control installed (e.g., wall switch, circuit breaker), that is clearly labeled to identify its function (e.g., to temporarily turn off ventilation during adverse outdoor conditions). In one- and two-family dwellings and townhouses, the override control shall be readily accessible to the occupant.*

In multifamily buildings, the override control shall be readily accessible to the occupant, building owner, or building maintenance staff.

**4.6.3** *Where included in the system design, outdoor air inlets are visually verified to pull air directly from outdoors, and not from attics, crawlspaces, garages, adjacent dwelling units, or common spaces.*

**4.6.4** *Where included in the system design, outdoor air inlets are located  $\geq 2$  ft. above grade or roof deck;  $\geq 3$  ft. distance from dryer exhausts and sources exiting the roof;  $\geq 5$  ft. stretched-string distance from outlets of both dwelling-unit mechanical exhaust and local mechanical exhaust not exiting the roof; and  $\geq 10$  ft. of stretched-string distance from other contamination sources not exiting the roof. The outlet and inlet of ERV's and HRV's may use a smaller distance if allowed by the ERV/HRV manufacturer.*

**Advisories:**

**A4.6.4a** Ventilation equipment should be installed in a location accessible to the occupant, HVAC technician, or building maintenance staff to facilitate cleaning, maintenance, and to provide access to the heat exchange cores and/or condensate pans (if applicable).

**A4.6.4b** Outdoor air inlets should be located so that entering air is not obstructed by snow, plantings, or other material, and in such a location to promote periodic cleaning.

**Ventilation Rates and Run Times**

**4.6.5** Total outdoor air supplied to or exhausted from the dwelling unit shall be measured in accordance with ANSI/RESNET/ICC Std. 380 and documented to meet or exceed the dwelling-unit mechanical ventilation rates and run-time (continuous or intermittent) required in Section 4 of ASHRAE 62.2-2019, or later versions. Alternatively, the Verifier may collect and review a report provided by a certified third-party air-balancing contractor.

**Note:**

**N4.6.5** If certifying as ENERGY STAR, compliance with rates and run-times required in ASHRAE 62.2-2010, 2013 or 2016 does not automatically satisfy Item 4.6.5.

**Ventilation Filtration**

**4.6.6** Ventilation filtration shall be designed as follows:

**4.6.6.1** Where supply or balanced ventilation systems are installed, prior to distribution, outdoor air supplied to the dwelling unit shall pass through a filter rated:

**CERTIFIED:** MERV 8 or higher according to ASHRAE 52.2-2017 or ISO ePM10 according to ISO 16890.



**GOLD:** MERV 13 or higher according to ASHRAE 52.2-2017 or ISO ePM1 according to ISO 16890.

**Note:**

**N4.6.6.1** Outdoor air supplied directly to a duct system that passes through the filter of the HAC air handler satisfies this requirement.

**Advisory:**

**A4.6.6.1** The ventilation system should be designed to account for the pressure drop associated with the filter.

**4.6.6.2** The ventilation filter shall be installed in locations accessible to the occupant, HVAC technician, or building maintenance staff.

**Advisory:**

**A4.6.6.2** The outdoor air intake, fan unit, and heat exchanger (if applicable) should be installed in locations accessible to the occupant or building maintenance staff to facilitate cleaning, maintenance, and to provide access to the heat exchange cores and/or condensate pans (if applicable).

### Sound Rating

**4.6.7** Dwelling-unit mechanical ventilation fans located within the dwelling unit shall be rated for sound at a maximum of 1 sone.

**Note:**

**N4.6.7** If certifying as ENERGY STAR MFNC, the maximum sones allowed in Item 4.6.7 are lower (more stringent) than those allowed by the ENERGY STAR MFNC program, however, the same exceptions are allowed.

**Exception:**

**E4.6.7** *Sound ratings are not required for ERVs, HRVs, in-line fans, and HAC air handlers used as part of the ventilation system and remote-mounted fans located outside the habitable space, bathrooms, toilets, and hallways, with at least 4 ft. of ductwork between the fan and the intake grille.*

### **4.7 Dwelling-Unit Bathroom Exhaust**

**4.7.1** *In each bathroom, provide local mechanical exhaust ventilation directly to the outdoors, with exhaust airflow rates meeting ASHRAE 62.2-2019 Section 5 requirements. Bathroom exhaust airflow shall be Verifier-measured in accordance with ANSI/RESNET/ICC Std. 380.*

**Note:**

**N4.7.1** *Per ASHRAE 62.2, a bathroom is any room containing a bathtub, a shower, a spa, or a similar source of moisture.*

**4.7.2** Continuously operating bathroom exhaust fans shall be rated for sound at a maximum of 1 sone at an airflow of 20 CFM or greater. Demand-controlled (i.e., intermittent or resident-operated) bathroom exhaust fans shall be rated for sound at a maximum of 3 sones at an airflow no less than 50 CFM.

**Note:**

**N4.7.2** If certifying as ENERGY STAR, the maximum sones allowed in Item 4.7.2 may be lower (more stringent) than those allowed by the ENERGY STAR Residential New Construction programs, however the same exceptions are allowed.

**Exception:**

**E4.7.2** *Sound ratings are not required for ERVs, HRVs, in-line fans, and remote-mounted fans located outside habitable spaces, bathrooms, toilets, and hallways, with at least 4 ft. of ductwork between the fan and the intake grille.*

**4.7.3** Where the bathroom exhaust fan is part of the dwelling-unit mechanical ventilation, the on/off control must be labelled or marked to clearly identify its dual function.

**4.7.4** **GOLD:** For bathroom exhaust that does not operate continuously, fans shall be provided with a manually operated timer or automatic controls based on humidity or occupancy, such that the fan can be operated when the bathroom is occupied and either for a minimum of 20 minutes after vacated, or until humidity is less than 60%.

### **4.8 Dwelling-Unit Kitchen Exhaust**

**4.8.1** In each kitchen, provide demand-controlled (i.e., intermittent, or resident-operated) mechanical exhaust above each cooktop or range vented directly to the outdoors, by a range hood or appliance-range hood combination. Kitchen exhaust airflow shall be Verifier-measured in accordance with ANSI/RESNET/ICC Std. 380 to meet the following rates:

**CERTIFIED:** Verifier-measured exhaust rate of 200 CFM or greater.

**GOLD:** Verifier-measured exhaust rate of 300 CFM or greater.

**Note:**

**N4.8.1a** If certifying as ENERGY STAR, the minimum exhaust airflow required in Item 4.8.1 is greater than those required by the ENERGY STAR Residential New Construction programs, and demand-controlled exhaust is required unless Exception E4.8.1a applies.

**N4.8.1b** Where microwave-range hoods or under-cabinet range hoods are installed, the Verifier shall verify that the range hood is configured to vent outdoors, rather than recirculate.

**Exceptions:**

**E4.8.1a** While demand-controlled kitchen exhaust is recommended, for dwelling units in multifamily buildings, continuous kitchen exhaust vented to the outdoors (e.g., HRV/ERV or ceiling/wall mounted fan) may be used in lieu of a demand-controlled kitchen exhaust fan at the cooktop, if the following requirements are met:

- i. Cooktop is electric,
- ii. A recirculation range hood with a charcoal filter is installed over the cooktop,
- iii. Continuous kitchen exhaust rate of either:
  - a. 5 ACH, **OR**
  - b. 50 CFM if the edge of the exhaust fan or intake grille is located within 10 ft. of the edge of the cooktop or range, as measured horizontally on the floor plan, **OR**
  - c. 25 CFM if local mechanical kitchen exhaust is provided using a balanced system and the building has a Verifier-measured whole-building infiltration rate 1.0 ACH50 or 0.085 CFM50 per sq. ft. of enclosure area.

Exception 4.8.1a does not apply to one- and two-family dwellings or townhouses. (See Item 4.8.2)

**E4.8.1b CERTIFIED:** Where microwave-range hoods are installed in the Certified tier only, measuring the exhaust airflow is not required if the following requirements are all met:

- i. Cooktop is electric,
- ii. Measured duct length does not exceed 25 ft. and contains no more than 3 elbows,
- iii. Duct sizing meets Compliance Option 3 of the [ENERGY STAR Kitchen Exhaust Guidance](#),
- iv. Microwave-range hood is HVI or AHAM certified, or equivalent, and rated for at least 200 CFM at 0.25 in. WC (ratings at 0.1 in. WC are not acceptable for airflow but are permitted for sound).

**E4.8.1c CERTIFIED:** For electric cooktops in the Certified tier only, a downdraft kitchen exhaust fan with a minimum Verifier-measured exhaust rate of 300 CFM (or 5 ACH for enclosed kitchens) may be used in lieu of a range hood or appliance-range hood at the cooktop.

**4.8.2** For all dwelling units, where continuous exhaust is present in the kitchen area and separate from the range hood, do not locate ventilation grilles above or inside a 45-degree angle projected outwards from the cooking equipment element closest to the grille and install a MERV 3 or washable filter in the ventilation grille to trap grease. In one- and two-family dwellings and townhouses, continuous exhaust may be present in the kitchen, but may not be used in lieu of a demand-controlled exhaust fan.

**4.8.3** Continuous kitchen exhaust fans shall be rated for sound at a maximum of 1 sone at an airflow no less than 25 CFM.

Demand-controlled kitchen exhaust fans shall have at least one speed setting that is rated for sound at a maximum of 2 sones at an airflow setting no less than 100 CFM. For exhaust fans with multiple speeds, the setting used to comply with Item 4.8.1 may be different from the setting used to comply with Item 4.8.3. For an exhaust fan with a single speed, this setting must comply with both Items.

**Exception:**

**E4.8.3** Sound ratings are not required for ERVs, HRVs, in-line fans, and remote-mounted fans located outside habitable spaces, bathrooms, toilets, and hallways, with at least 4 ft. of ductwork between the fan and the intake grille.

**Advisories:**

**A4.8a** Range hoods and microwave-range hoods are recommended to have a minimum capture efficiency of 70%, as tested in accordance with current (or amended) editions of ASTM E3087, or equivalent.

**A4.8b** Range hoods with “smart” controls that meet UL requirements for safety are recommended that will activate/deactivate the hood automatically based on operation or using sensors such as temperature, humidity, mixed gas, or a combination thereof.

**A4.8c** To improve installed performance, the EPA recommends the following:

- i. Select products that are rated for airflow and sound in accordance with HVI 920, or equivalent, by an administration and certification body that is accredited in accordance with ISO 17065 and accredited by an accreditation body operating in accordance with ISO 17011.

- ii. Select products that are rated for airflow at a minimum static pressure of 0.375 in. WC.
- iii. For kitchen exhaust fans, even when Verifier-measurement of airflow is required, follow the prescriptive duct sizing requirements in Table 5-3 of ASHRAE 62.2-2019 or the [ENERGY STAR Kitchen Exhaust Guidance](#).
- iv. Select static vents and termination fittings certified to meet the required CFM at 0.05 in. WC in accordance with HVI 916 or equivalent.

#### 4.9 Common Space Ventilation Requirements

##### Ventilation System Design

**4.9.1** *Provide outdoor air ventilation and exhaust in common spaces of multifamily buildings. Air inlets are visually verified to pull outdoor air directly from outdoors, and not from attics, crawlspaces, garages, adjacent dwelling units, or other common spaces. Inlet(s) are  $\geq 2$  ft. above grade or roof deck;  $\geq 10$  ft. of stretched-string distance from known contamination sources not exiting the roof, and  $\geq 3$  ft. distance from dryer exhausts and sources exiting the roof.*

##### Ventilation Rates and Run Times

**4.9.2** Ventilation and exhaust airflows shall be measured and documented to meet or exceed rates required by ASHRAE 62.1-2019. Alternatively, the Verifier may collect and review a report provided by a certified third-party air-balancing contractor.

##### Note:

**N4.9.2** If certifying as ENERGY STAR, compliance with rates required in ASHRAE 62.1-2010, 2013 or 2016 does not automatically satisfy Item 4.9.2.

##### Ventilation Filtration and Maintenance

**4.9.3** Ventilation filtration shall be designed as follows:

**4.9.3.1** Prior to distribution, outdoor air supplied to common spaces in multifamily buildings shall pass through a filter rated:

**CERTIFIED:** MERV 8 or higher according to ASHRAE 52.2-2017 or ISO ePM10 according to ISO 16890.

**GOLD:** MERV 13 or higher according to ASHRAE 52.2-2017 or ISO ePM1 according to ISO 16890.

##### Advisory:

**A4.9.3.1** The ventilation system should be designed to account for the pressure drop associated with the filter.

**4.9.3.2** The ventilation filter shall be installed in locations accessible to the building maintenance staff.

##### Advisory:

**A4.9.3.2** The outdoor air intake, fan unit, and heat exchanger (if applicable) should be installed in locations accessible to the building maintenance staff to facilitate cleaning, maintenance, and to provide access to the heat exchange cores and/or condensate pans (if applicable).

#### 4.10 Other Ventilation Requirements

**4.10.1** Central vacuum systems, where installed, shall exhaust outdoors at least 10 ft. from ventilation system air inlets.

**4.10.2** Vented clothes dryers shall exhaust outdoors per the manufacturer's instructions.

##### Advisories:

**A4.10a** If the dryer exhaust duct exceeds the manufacturer's recommendations in length, diameter, turns, etc., a dryer exhaust duct power ventilator (DEDPV) certified for safety under UL507 should be installed.

**A4.10b** Vented clothes dryers can exhaust in excess of 200 CFM when in use, causing depressurization. Providing a make-up air system with a tight fitting back-draft damper and automatic switch or timer switch is recommended.

#### Filtration and Air Cleaning

##### 4.11 Particle Filtration for Ducted Heating and Cooling (HAC) Serving Dwelling Units and Common Spaces

**4.11.1** For all ducted HAC systems serving dwelling units and common spaces, filters shall be installed and verified to be clean upon final inspection with the following ratings:

**CERTIFIED:** MERV 11 or higher according to ASHRAE 52.2-2017 or ISO ePM2.5 according to ISO 16890. Alternatively, MERV 8 filters are permitted where a stand-alone portable air cleaner is provided for each of the two largest living spaces in the home/apartment. See Item 4.12 for design criteria.

**GOLD:** MERV 13 or higher according to ASHRAE 52.2-2017 or ISO ePM1 according to ISO 16890. Alternatively, MERV 11 filters are permitted where a stand-alone portable air cleaner is provided for each of the two largest living spaces in the home/apartment. See Item 4.12 for design criteria.

##### Note:

**N4.11.1** If certifying as ENERGY STAR, the minimum filter ratings in Item 4.11.1 exceed ENERGY STAR requirements.

**Advisories:**

**A4.11.1a** While not required, filter slots are recommended to be a minimum of 4 in. in width to allow for deeper pleated filters and reduced pressure drop across the filter.

**A4.11.1b** Air filter installation locations should be labeled to disclose the rating of the installed filter, applicable design airflow rate, and the maximum allowable clean-filter pressure drop. The labels should be permanently affixed to the air filter installation location and visible to the person replacing the air filter.

**A4.11.1c** To reduce the likelihood of construction dust contaminating the ducts and air handler, the HAC system should not be used as temporary space conditioning during construction activities with increased dust (e.g., drywall sanding, floor sanding).

**A4.11.1d** The EPA recommends that filters tested according to ASHRAE Standard 52.2 also utilize the conditioning methods prescribed by optional Appendix J.

**4.11.2** Return air filters shall be installed in locations accessible to the occupant or building maintenance staff for cleaning and/or replacement.

**4.11.3** *Filter access panels are equipped with gasket material or comparable sealing mechanism to ensure access panels fit snugly against the exposed edge of the installed filter to prevent air bypass.*

**Advisory:**

**A4.11.3** Filters perform best when the filter rack design includes the following features, which are also included in some manufacturers' filter media boxes:

**A4.11.3a** Flexible, airtight (e.g., closed-cell foam) gasket material on the surface that contacts the air-leaving (downstream) side of the filter.

**A4.11.3b** Friction fit or spring clips installed on the upstream side of the filter to hold it firmly in place.

**4.11.4** All return air and mechanically supplied outdoor air pass through the filter prior to conditioning.

**Advisory:**

**A4.11.4** To improve filtration during time periods where the HAC is not operating frequently (e.g., shoulder seasons), the EPA recommends operating the air handler daily at a minimum runtime (20-30%) to provide filtration or the alternatives in Item 4.12 that do not utilize the HAC system.

**4.11.5** Ducted electronic air cleaners (i.e., duct-mounted electrostatic air cleaners, air ionizers, and lamps that emit ultraviolet (UV) radiation between 100 and 280 nm (UVC)) are tested according to UL 2998 or CSA Standard C22.2 No. 187:20 and must not generate ozone exceeding concentration limits of 0.005 parts per million. Such devices are permitted, but are not required, in Indoor AirPlus labeled buildings and apartments.

**4.11.6** Ozone generators and devices intentionally using ozone to treat or condition air are prohibited.

**Advisory:**

**A4.11.6** Ozone is a lung irritant that poses health risks. Even at concentrations below public health standards, ozone reacts with chemicals emitted by common indoor sources such as household cleaning products, air fresheners, deodorizers, certain paints, polishes, wood flooring, carpets, and linoleum. The chemical reactions produce harmful byproducts that may be associated with adverse health effects in some sensitive populations.

#### **4.12 Particle Filtration for Non-Ducted HAC Systems Serving Dwelling Units**

**4.12.1 GOLD:** In dwelling units with no ducted HAC system (e.g., ductless mini-splits, hydronic systems, electric resistance heat, or combinations thereof), provide one of the following methods of indoor air filtration to reduce exposure to particles of indoor origin:

**4.12.1.1** Non-ducted, forced-air HAC systems include a filter rated MERV 13 or higher according to ASHRAE 52.2-2017 or rated ePM1 according to ISO 16890; **OR**

**4.12.1.2** A stand-alone portable air cleaner is provided for each of the two largest living spaces in the home/apartment, sized to meet the square footage of each room, based on the verified Clean Air Delivery Rate and room size calculation per ANSI/AHAM Standard AC-1. (Maximum room size for a verified air cleaner is equal to the verified Smoke CADR value x 1.55.) Air cleaners must meet ozone emission limits of UL 2998; **OR**

**4.12.1.3** Transfer fan is installed with a minimum MERV 13 filter designed to operate during all occupiable hours and to exchange air between the two largest living spaces (at minimum).

**Advisory:**

**A4.12a** In common spaces with no ducted HAC system, the EPA recommends one of the above strategies to improve particle filtration.

#### 4.13 Gas-Phase Air Cleaning Devices

**4.13.1** Where installed, gas-phase air cleaning devices do not intentionally use ozone to treat or condition air.

##### Advisories:

**4.13a** Gaseous pollutants include inorganic gases such as combustion gases (e.g., carbon monoxide and nitrogen dioxide), ozone, and organic chemicals that are not attached to particles. Hundreds of different gaseous pollutants have been detected in indoor air. Gas-phase air cleaning technology includes adsorbent media (e.g., activated carbon), chemisorbent media (e.g., media coated or impregnated with reactive compounds), catalytic oxidation, plasma, and intentional ozone generation. A summary of gas-phase cleaning technology can be found in [Residential Air Cleaners – A Technical Summary \(EPA, 2018\)](#), along with other resources on [Air Cleaners and Air Filters in the Home](#).

**4.13b** When utilized with in-duct HAC systems, gas-phase filters that contain sorbents should generally be located downstream of particle air filters.

#### 4.14 Microbial Disinfection

**4.14.1** Where installed, ultraviolet germicidal irradiation (UVGI) or other electronic air cleaners (e.g., plasma generators, photocatalytic oxidizers (PCOs), etc.) must not exceed ozone concentration limits of 0.005 parts per million as specified in UL 2998.

##### Note:

**N4.14** When UVGI is used, it must be used in addition to—not as a replacement for—conventional particle filtration systems.

##### Advisories:

**A4.14a** Ultraviolet germicidal irradiation (UVGI) air cleaners are designed to use UV lamps to kill or deactivate microorganisms such as viruses, bacteria, and fungal spores and fragments that are airborne or growing on surfaces (e.g., cooling coils, drain pans, ductwork, filters). UVGI lamps for in-duct airstream irradiation are tested using ANSI/ASHRAE Standard 185.1, and UVGI lamps for in-duct surface irradiation are tested using ANSI/ASHRAE Standard 185.2. Prolonged direct UVGI exposure can destroy vegetative microbial growth. However, typical UVGI air cleaners designed for use in buildings do not deliver sufficient UV doses to effectively kill or deactivate most airborne microorganisms because the exposure period is too short and/or the intensity is too low. Thus, UVGI does not appear to be effective as a sole control device. A summary of UVGI cleaning technology can be found in [Residential Air Cleaners – A Technical Summary \(EPA, 2018\)](#), along with other resources on [Air Cleaners and Air Filters in the Home](#).

**A4.14b** When UVGI lamps are installed in HAC systems, access panels for AHUs should be interlocked with automatic shutoff mechanisms to prevent accidental exposure to UV radiation, and an inspection window that blocks UV energy (e.g., plastic or glass) is recommended to be installed to be able to confirm lamp operation. Builders should ensure that homeowners and occupants are aware of the hazards related to accidental UV exposure and should brief them on the maintenance and usage requirements for any UVGI system installed.

**A4.14c** Ozone is a lung irritant that poses health risks. Even at concentrations below public health standards, ozone reacts with chemicals emitted by common indoor sources such as household cleaning products, air fresheners, deodorizers, certain paints, polishes, wood flooring, carpets, and linoleum. The chemical reactions produce harmful byproducts that may be associated with adverse health effects in some sensitive populations, including formaldehyde, other aldehydes, ketones, and peroxides. Usage of technologies that emit ozone should be carefully considered before being installed in buildings, and builders should ensure that homeowners and occupants are fully informed about the potential hazards and emission byproducts that may result from the usage of these devices.

## 5 Pollutant Control

**Introduction:** If certifying as ENERGY STAR, Indoor AirPlus requirements shown in *italics* are satisfied by meeting related ENERGY STAR requirements, and ENERGY STAR footnotes & exceptions are permitted unless otherwise specified.

**A5.** The EPA recommends using a PM 2.5 monitor to help occupants identify high-polluting events of both indoor and outdoor sources of particulate matter (see also: [Low-Cost Air Pollution Monitors and Indoor Air Quality](#)).

### 5.1 Combustion Appliances

**5.1.1** **CERTIFIED:** Where naturally drafted furnaces, boilers, and water heaters are installed within the building's pressure boundary, they must pass the maximum depressurization testing per ANSI/BPI 1200-S-2017 Standard or ANSI/ACCA 12 QH-2018 and shall exhaust to the outdoors no less than 2 ft. higher than any obstructions within a 10 ft. radius.

**GOLD:** Combustion furnaces, boilers, and water heaters located within the building's pressure boundary are mechanically drafted or direct-vented.

##### Advisory:

**A5.1.1** The EPA recommends installing mechanically drafted or direct vent appliances, in lieu of naturally drafted appliances.

- 5.1.2 Fireplaces located within the building's pressure boundary are mechanically drafted or direct vented.
  - 5.1.2.1 Liquid or gas-burning fireplaces shall have an affixed glass front or gasketed door.
- 5.1.3 No unvented combustion appliances other than cooktops, ranges, or ovens are located within the building's pressure boundary. (See Item 4.8.1 for range and kitchen exhaust ventilation requirements).
- 5.1.4 Existing chimneys and flues still in service have passed a Level II inspection according to NFPA 211, as performed by a CSIA certified chimney sweep (or other similar certification).

#### **Solid fuel burning fireplaces and appliances**

- 5.1.5 Meet the following energy efficiency and emissions standards and restrictions for all fireplaces and other solid fuel-burning and space-heating appliances located within the building's pressure boundary:
  - 5.1.5.1 Site-built masonry fireplaces designed for open fires are sealed to prevent use or retrofitted with other compliant appliances;
  - 5.1.5.2 Factory-built wood-burning fireplaces shall have a dedicated outside air supply and meet the certification requirements of UL 127.
    - Advisory:**
      - A5.1.5.2** Factory-built wood-burning fireplaces qualified under the EPA's wood-burning fireplace program are recommended. See: <https://www.epa.gov/burnwise/voluntary-fireplace-program>.
  - 5.1.5.3 Wood stove and fireplace inserts are tested to meet the safety requirements of UL 1482, AND they shall meet the emission requirements of the EPA's New Source Performance Standards for new residential wood heaters. See: <https://www.epa.gov/residential-wood-heaters/final-2020-new-source-performance-standards-residential-wood-heaters>.
  - 5.1.5.4 Pellet stoves shall meet the requirements of ASTM E1509, AND they shall meet the emission requirements of the EPA New Source Performance Standards for new residential wood heaters.

#### **5.2 Carbon Monoxide Detection**

- 5.2.1 All dwelling units equipped with a fuel-burning appliance, a fuel-burning fireplace, or an attached garage shall have carbon monoxide (CO) detection installed in accordance with the 2021 IBC Section 915 or the 2021 IRC Section R315 (only applicable for one- and two-family dwellings and townhouses).

##### **Notes:**

- N5.2.1a** The above requirements are not intended to supersede or replace applicable laws or codes in force by the authority having jurisdiction. Additional local requirements may apply.
- N5.2.1b** Where CO detection is installed prior to construction finishes, alarms/detectors shall be protected from dust, paint, and other contaminants.

##### **Advisory:**

- A5.2** For added protection for young children, expectant parents, older adults, and persons with medical conditions who may be more vulnerable to lower levels of carbon monoxide, the EPA recommends that CO detectors are installed that display and alarm at levels that are lower than UL 2034 alarm thresholds.

#### **5.3 Pollutant Control from Smoking and Vaping**

- 5.3.1 Occupant has been provided with the EPA's brochure on [Secondhand Tobacco Smoke and the Health of Your Family](#) or with a link to the EPA's resources on [Secondhand Smoke and Smoke-free Homes](#).
- 5.3.2 In multifamily buildings, smoking and vaping are prohibited in indoor common areas, including but not limited to corridors, vestibules, stairwells, and community rooms, and the prohibition is posted in a prominent entryway or lobby. The prohibition is explicitly communicated in the building rental or lease agreements or in condo or co-op association covenants and restrictions, with provisions for enforcement.
- 5.3.3 In multifamily buildings, when designated outdoor smoking/vaping areas are provided, they are located a minimum of 25 ft. from entries, outdoor air intakes, and operable windows, and signage is provided.

##### **Advisories:**

- A5.3a** The EPA recommends prohibiting smoking and vaping of tobacco or other substances throughout the entire building, including within living units, on patios, and balconies. Communicate these additional prohibitions in the building rental or lease agreements or in condo or co-op association covenants and restrictions and include provisions for enforcement.
- A5.3b** Exposure to contaminants is not limited to tobacco smoke. The EPA advises building owner manuals to include information on the dangers of personal-use products, which produce harmful contaminants, such as smoking tobacco and other substances, vaping, and burning candles or incense.

#### **5.4 Pollutant Control through Minimized Infiltration**



- 5.4.1 Seal crawlspace and basement perimeter walls to prevent outside air infiltration. Vented crawlspaces and basements are not permitted.

**Note:**

- N5.4.1** Homes/buildings in areas designated as 100-year flood zones may need to utilize insulated, weather-stripped flood vents to meet the above requirement. Additional local requirements may also apply per jurisdiction. For more information on designated 100-year flood zones, see FEMA's definition of Special Flood Hazard Areas: [www.fema.gov/flood-zones](http://www.fema.gov/flood-zones).

- 5.4.2 *Conduct airtightness testing in accordance with procedures in ANSI/RESNET/ICC Std. 380.* Verifier-measured airtightness shall demonstrate compliance with the following leakage rates, as applicable to the type of dwelling unit:

- 5.4.2.1 **CERTIFIED:** For detached dwelling units > 1,000 ft<sup>2</sup>, Verifier-measured airtightness shall be no greater than 5 ACH50. For detached dwelling units ≤ 1,000 ft<sup>2</sup>, Verifier-measured airtightness shall be no greater than 0.30 CFM50 per sq. ft. of dwelling-unit enclosure area.

**GOLD:** For detached dwelling units > 1,000 ft<sup>2</sup>, Verifier-measured airtightness shall be no greater than 3 ACH50. For detached dwelling units ≤ 1,000 ft<sup>2</sup>, Verifier-measured airtightness shall be no greater than 0.25 CFM50 per sq. ft. of dwelling-unit enclosure area.

- 5.4.2.2 **CERTIFIED:** For all other dwelling units, the average compartmentalization of all Verifier-measured airtightness test results shall be no greater than 0.3 CFM50 per sq. ft. of dwelling-unit enclosure area. In multifamily buildings, where sampling of compartmentalization tests is permitted, test at least 20% of the dwelling units that are adjacent to the garage.

**GOLD:** For all other dwelling units, the average compartmentalization of all Verifier-measured airtightness test results shall be no greater than 0.25 CFM50 per sq. ft. of dwelling-unit enclosure area. In multifamily buildings, where sampling of compartmentalization tests is permitted, test at least 20% of the dwelling units that are adjacent to the garage.

## 5.5 Attached Garages and Parking Structures

- 5.5.1 *Assemblies between attached garages and occupiable spaces, including common spaces, are air-sealed before installing insulation. Doors between occupiable spaces, including common spaces, and attached garages are made substantially air-tight with weather stripping or equivalent gasket.*

- 5.5.2 In one- and two-family dwellings and townhouses with attached, private garages, meet one of the following requirements:

- 5.5.2.1 Verify that the garage-to-unit air barrier can maintain a pressure difference of greater than 45 Pa while the dwelling unit maintains a 50 Pa pressure difference with respect to the outdoors. All operable garage openings shall be closed during this test; **OR**

- 5.5.2.2 Equip the attached garage with an exhaust fan that is vented directly outdoors. The installed fan shall have a minimum Verifier-measured airflow of 100 CFM, or greater if required by the authority having jurisdiction. The fan shall be wired for continuous operation or with automatic fan controls (e.g., a motion detector) that activate the fan whenever the garage is occupied and operate for at least 1 hour after the garage has been vacated.

- 5.5.3 *In multifamily buildings, where an exhaust system is installed in a shared parking garage, the system shall be equipped with controls that sense CO and NO<sub>2</sub>, providing a minimum continuous ventilation rate of 0.05 CFM/ft<sup>2</sup> in standby mode, and 0.75 CFM/ft<sup>2</sup> otherwise.*

### Advisories

- A5.5a** The EPA recommends installing a garage exhaust fan capable of moving 0.75 CFM/ft<sup>2</sup> if the occupant is expected to occupy the garage for work or recreational activities over extended periods of time.

- A5.5b** The EPA recommends installing ENERGY STAR certified exhaust fans to reduce energy consumption and sound levels.

- A5.5c** The EPA recommends providing occupants with information in the Owner and Occupant Information Kit on the importance of, and methods for, ensuring adequate ventilation in the garage while occupied for extended periods of time.

## 5.6 Combustible Fuels

- 5.6.1 There shall be no combustible liquid or gas fuels (e.g., fuel oil, gasoline, kerosene, propane, ethanol, etc.) stored within the pressure boundary upon final verification.

- 5.6.2 Supplemental portable combustion equipment (e.g., portable generators, lawn maintenance equipment, etc.) shall not be operated or stored within the pressure boundary upon final verification.

## 6. Building Materials

**Introduction:** The following section applies to newly installed materials and finishes. Surfaces in garages are exempt for the purpose of these requirements. Download [How to Find Indoor AirPlus Compliant Low Emission Products](#), which provides guidance on identifying products that comply with these specifications, including the identification of product certification and labeling programs that are

acceptable. *[Note: This guidance will be updated when these new specifications are finalized. The current version of this document is applicable to Version 1 of the Indoor AirPlus Construction Specifications.]*

#### Notes:

**N6a** For Items 6.1 – 6.6, verification of compliance with this section may occur using records provided to the verifier from the builder, documenting the specific products that will be used throughout the home/building. The verifier must confirm the products listed in the record meet the requirements of this section. The builder is responsible for notifying the verifier of any product substitutions that occur through the course of construction/development and providing the verifier with documentation for re-verification and retention. Documentation may be provided to the verifier once for multiple homes in a specific development or community project (or for multiple units in a multifamily building). Such records may include, but are not limited to a cut sheet, purchase order, or corporate-wide declaration or sales agreement, documenting the product selection(s) for the specified development/community.

**N6b** Interior architectural coatings, gypsum board, and other products that are formulated to remove formaldehyde and other aldehydes in indoor air and are tested and labeled in accordance with ISO 16000-23, Indoor air – Part 23, may or may not comply with the VOC standards in this section. The EPA has not independently evaluated data on the relative efficacy and long-term impacts of sorptive materials addressed by the ISO 16000-23 standard. Compliance with ISO 16000-23 alone does not confer compliance with the requirements in IAP Section 6.

**N6c** During construction of gut rehabilitations, builders and raters are reminded to remain vigilant to avoid hazards from asbestos and lead-based paint, and must follow all relevant federal, state, and local regulations.

Asbestos can be found in a variety of building materials, including but not limited to roofing and siding shingles, insulation of various types, ceiling tiles, floor tiles, textured paint, and wall patching compounds. Asbestos fibers may be released into the air by the disturbance of asbestos-containing material during demolition work, repair, and remodeling. Many states administer an asbestos program and [state departments of environmental protection or health](#) will be the best place to address asbestos questions specific to one's locality. See also <https://www.epa.gov/asbestos> for additional information and resources.

Exposure to lead comes from human activities, including past use of lead-based paint in homes. In 1978, the federal government banned consumer uses of lead-based paint, but some states banned it even earlier. Any renovation, repair, or painting (RRP) project in a pre-1978 home or building can easily create dangerous lead dust. The EPA requires that RRP projects that disturb lead-based paint in homes built before 1978 be performed by lead-safe certified contractors. Learn more about lead at <https://www.epa.gov/lead>. Learn more about the RRP rule at <https://www.epa.gov/lead/lead-renovation-repair-and-painting-program>.

#### Advisory:

**A6** The EPA recommends ventilating the building with outside air at the highest rate and duration practical during the installation of products that are known sources of contaminants (e.g., composite woods, carpet and padding, adhesives, site-applied finishes) and during the period between finishing and occupancy.

### 6.1 Interior Paints, Finishes, and Coating

**6.1.1** Site-applied paints, finishes, and coatings (including such products with sealing or waterproofing properties) shall not exceed maximum VOC emission levels in accordance with and determined by California Department of Public Health (CDPH), "[Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers, Version 1.2—2017](#)."

#### Note:

**N6.1** Some liquid finishing products labeled as "sealants" by the manufacturer may be better categorized as a coating or finish. For the purposes of this requirement, Indoor AirPlus references the SCAQMD definition of "coating" in Rule 1113—"a material which is applied to a surface in order to beautify, protect, or provide a barrier to such surface." A low emission "sealant," as required by Indoor AirPlus Item 6.3, is defined by SCAQMD Rule 1168 as "any material with adhesive properties that is designed to fill, seal, waterproof, or weatherproof gaps or joints between two surfaces. Sealants include caulks."

### 6.2 Carpets and Carpet Cushions

**6.2.1** Carpet and carpet cushions must be low-emitting products with maximum VOC emission levels in accordance with and determined by [CDPH Standard Method V1.2-2017](#).

### 6.3 Adhesives and Sealants

**6.3.1** Site-applied interior adhesives and sealants shall not exceed maximum VOC emission levels in accordance with and determined by CDPH Standard Method V1.2-2017.

#### Note:

**N6.3** Some liquid finishing products labeled as "sealants" by the manufacturer may be better categorized as a coating or finish, and thus apply to Item 6.1. For the purposes of this requirement, Indoor AirPlus references the SCAQMD definition of "sealant" in Rule 1168—"any material with adhesive properties that is designed to fill, seal, waterproof, or weatherproof gaps or joints between two surfaces. Sealants include caulks."

## 6.4 Hard Surface Flooring

- 6.4.1 Interior hard surface flooring materials and underlayment shall not exceed maximum VOC emission levels in accordance with and determined by [CDPH Standard Method V1.2-2017](#).

### Exception:

- E6.4.1 Materials that are inherently non-emitting sources of VOCs, which include stone, ceramic, metal, glass, concrete, and clay brick.

## 6.5 Gypsum Board

- 6.5.1 Interior gypsum board and joint compound shall not exceed maximum VOC emission levels in accordance with and determined by [CDPH Standard Method V1.2-2017](#).

## 6.6 Insulation

- 6.6.1 **GOLD:** Insulation materials installed in wall, floor, ceiling, or rafter cavities, as well as on the interior surface of foundation walls shall not exceed maximum VOC emission levels in accordance with and determined by [CDPH Standard Method V1.2-2017](#).

### Exceptions:

- E6.6.1a Pipe insulation.  
E6.6.1b Board insulation installed outside of other exterior sheathing.

## 7. Occupant Education

### 7.1 Owner and Occupant Information Kit

Builders are required to provide the following information to occupants, building/home owners, or property managers:

- 7.1.1 Instruction manuals for the following newly installed appliances and systems: HAC systems and accessories, ventilation systems (both local and dwelling-unit), air cleaners, dehumidifiers, moisture and/or IAQ monitors, combustion appliances, sump pumps, and radon systems (if installed).
- 7.1.2 Operations and maintenance recommendations, including suggested schedules and sources for the replacement of filters in all ventilation and air handling equipment.

### Advisory

- A7.1 Provide the homebuyer or building manager with information that addresses the importance of ensuring that manually controlled ventilation options (e.g., bathroom, kitchen, or garage exhaust fans; operable windows, doors, etc.) are used when strong pollutant sources are present, such as when using common household products (e.g., cleaning products, pesticides) and when using the garage for hobbies or other pollutant generating activities.

## Abbreviations and Acronyms

AARST	American Association of Radon Scientists and Technologists	HAC	Heating and cooling
ANSI/AARST CC-1000	Soil Gas Control Systems in New Construction of Buildings	HCO	Home Certification Organization
ANSI/ AARST CCAH	Reducing Radon in New Construction of One- & Two-Family Dwellings & Townhouses	HUD	Department of Housing and Urban Development
ANSI/AARST MAH	Protocol for Conducting Measurement of Radon and Radon Decay Products in Homes	HVAC	Heating, ventilating, and air conditioning
ANSI/AARST MAMF	Protocol for Conducting Measurement of Radon and Radon Decay Products in Multifamily Buildings	IAQ	Indoor air quality
AC115	Acceptance Criteria for Waterproof Membranes for Flooring and Shower Lining	ICC	International Code Council
ACCA	Air Conditioning Contractors of America	IECC	International Energy Conservation Code
ACCA Manual D	Residential duct design	IMC	International Mechanical Code
ACGIH	American Conference of Governmental Industrial Hygienists	In.	Inches
ACM	Asbestos containing materials	IRC	International Residential Code
AHAM	Association of Home Appliance Manufacturers	ISO	International Organization for Standardization
ANSI	American National Standards Institute	MERV	Minimum Efficiency Reporting Value defined in ASHRAE 52.2-2017
ANSI/ASHRAE 62.1-2019	Ventilation for Acceptable Indoor Air Quality	MF	Multifamily
ANSI/ASHRAE 62.2-2019	Ventilation and Acceptable Indoor Air Quality in Low-Rise Residential Buildings	mil	Common term to describe plastic sheeting thickness; 1 mil equals 0.001 in.
APA	The Engineered Wood Association	min.	Minimum
ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers	NFPA	National Fire Protection Association
ASTM	American Society for Testing and Materials	NO <sub>2</sub>	Nitrogen dioxide
CADR	Clean air delivery rate	NFRC	National Fenestration Rating Council
CARB	California Air Resources Board	Pa	Pascal
CSIA	Chimney Safety Institute of America	pCi/L	Picocuries per liter
ccSPF	Closed cell spray polyurethane foam	RH	Relative humidity
CDPH	California Department of Public Health	SCAQMD	South Coast Air Quality Management District
CFDS	Composite foundation drainage system	spec.	Specification
CFM	Cubic feet per minute	sq. ft.	Square foot or square feet
CI	Condensation index	UL	Underwriter Laboratories
CO	Carbon monoxide	UV	Ultraviolet light
CO <sub>2</sub>	Carbon dioxide	UVC	UV: 200 nm to 280 nm
CZ	Climate zone	UVGI	Ultraviolet germicidal irradiation
DLTO	Duct leakage to outdoors	VOC	Volatile organic compound
EPA	Environmental Protection Agency	w.c.	Water column
FEMA	Federal Emergency Management Agency	WRB	Water resistive barrier
ft.	Foot or feet		

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ACCA Manual D: Residential Duct Systems. Third Edition Version 2.5- 2016. Air Conditioning Contractors of America.

ACCA Manual P: Psychrometrics.

ANSI/AARST CCAH 2020: ANSI/AARST Standard: Reducing Radon in New Construction of 1 & 2 Family Dwellings and Townhouses. 2020. American Association of Radon Scientists and Technologists.

ANSI/AARST CC-1000 2018: ANSI/AARST Standard: Soil Gas Control Systems in New Construction of Buildings. 2018. American National Standards Institute / American Association of Radon Scientists and Technologists.

ANSI/AARST MAH 2019: Protocol for Conducting Measurements of Radon and Radon Decay Products in Homes.

ANSI/AARST MAMF 2017: Protocol for Conducting Measurements of Radon and Radon Decay Products in Multifamily Buildings.

ANSI/AARST RMS-MF 2018: Radon Mitigation for Multifamily Buildings

ANSI/AARST SGM-SF 2017: Soil Gas Mitigation Standards for Exiting Homes

ANSI/ACCA 5 QI – 2015: ANSI/ACCA HVAC Quality Installation Specifications

ANSI/ACCA 12 QH – 2018: Home Evaluation and Performance Improvement

ANSI/ACA Standard 6: Restoring the Cleanliness of HVAC Systems

ANSI/ASHRAE Standard 55-2020. Thermal Environmental Conditions for Human Occupancy

ANSI/ASHRAE Standard 185.1-2020: Method of Testing UV-C Lights for Use in Air-Handling Units or Air Ducts to Inactivate Airborne Microorganisms

ANSI/ASHRAE Standard 185.2-2020: Method of Testing Ultraviolet Lamps for Use in HVAC&R Units or Air Ducts to Inactivate Microorganisms on Irradiated Surfaces

ANSI/BPI 1200-S 2017: Standard Practice for Basic Analysis of Buildings

ANSI/RESNET/ICC Standard 380-2019: Standard for Testing Airtightness of Building, Dwelling Unit, and Sleeping Unit Enclosures; Airtightness of Heating and Cooling Air Distribution Systems; and Airflow of Mechanical Ventilation Systems.

ANSI/RESNET/ICC 301-2022: Standard for the Calculation and Labeling of the Energy Performance of Dwelling and Sleeping Units

ANSI/ASHRAE/ACCA Standard 4-2013: Maintenance of Residential HVAC Systems

ANSI/ASHRAE/ACCA Standard 183, 2013 or 2017: Peak Cooling and Heating Load Calculations in Buildings Except Low-Rise Residential Buildings.

ANSI/NFRC 500-2020: Procedure for Determining Fenestration Product Condensation Index Ratings

APA: American Plywood Association provides a voluntary product standard for structural plywood and oriented strand board (OSB). <http://www.apawood.org/plywood>

ASHRAE Handbooks: ASHRAE Handbook Series. American Society of Heating, Refrigerating, and Air-Conditioning Engineers.

ASHRAE 52.2: ANSI/ASHRAE Standard 52.2-2017: Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size. 2017. American Society of Heating, Refrigerating, and Air-Conditioning Engineers.

ASHRAE 62.1: ANSI/ASHRAE Standard 62.1-2022: Ventilation and Acceptable Indoor Air Quality. 2022. American Society of Heating, Refrigerating, and Air-Conditioning Engineers

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ASTM C1178: Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel. 2013. American Society for Testing and Materials.

ASTM C1278: Standard Specification for Fiber-Reinforced Gypsum Panel. 2006. American Society for Testing and Materials.

ASTM C1325: Standard Specification for Fiber-Mat Reinforced Cementitious Backer Units. 2022. American Society for Testing and Materials.

ASTM D3273: Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber. 2021. American Society for Testing and Materials.

ASTM E1745: Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs. 2017. American Society for Testing and Materials.

ASTM E1509: ASTM Standard E1509-04: Standard Specification for Room Heaters, Pellet Fuel-Burning Type. 2004 (RA2013). American Society for Testing and Materials.

ASTM E1602: ASTM Standard E1602-03(2010) e1: Standard Guide for Construction of Solid Fuel Burning Masonry Heaters. 2010. American Society for Testing and Materials.

ASTM D3273-2000: Fungal Resistance Test for Coated Surfaces

ASTM E3087-2018: Standard Test Method for Measuring Capture Efficiency of Domestic Range Hoods

CA Section 01350: CDPH Standard Method V1.2-2017; California Section 01350: Special Environmental Requirements Specification: Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Environmental Chambers. 2017. State of California. [https://archive.cdph.ca.gov/programs/IAQ/Documents/CDPH-IAQ\\_StandardMethod\\_V1\\_2\\_2017.pdf](https://archive.cdph.ca.gov/programs/IAQ/Documents/CDPH-IAQ_StandardMethod_V1_2_2017.pdf).

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California Air Resources Board: Suggested Control Measure for Architectural Coatings. May 2020.

CSA 6.19-01: CAN/CSA Standard 6.19-01 (R2016): Residential Carbon Monoxide Alarming Devices. 2001 (Reaffirmed 2016). Canadian Standards Association.

CSA Standard C22.2: Electrostatic air cleaners. 2020. Canadian Standards Association.

ENERGY STAR Residential New Construction Programs: U.S. Environmental Protection Agency. [https://www.energystar.gov/partner\\_resources/residential\\_new/program\\_reqs?s=mega](https://www.energystar.gov/partner_resources/residential_new/program_reqs?s=mega).

ENERGY STAR Kitchen Exhaust Guidance: Item 8.1 of the National Rater Field Checklist requires that a local mechanical exhaust system be installed in each kitchen and exhaust directly to the outdoors.

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HVI 920: Product Performance Certification Procedure Including Verification and Challenge updated February 28, 2020.

HVI 916: Air Flow Test Procedure updated September 29, 2015

ICC: International Builders Code 2018

ICC-ES per AC 115 (from N1.14.1)

IECC: International Energy Conservation Code. 2021. International Code Council, Inc.

IMC: International Mechanical Code. 2021. International Code Council, Inc.

IRC: International Residential Code for One- and Two-Family Dwellings. 2021. International Code Council, Inc.

ISO ePM1: Based on ISO 16890 refers to the particle size fraction in the range from 0.3 µm to 1 µm

ISO ePM2.5: Based on ISO 16890 refers to the particle size fraction in the range from 0.3 µm to 2.5 µm

ISO 16890-1: 2016: Establishes an efficiency classification system of air filters for general ventilation based upon particulate matter (PM).

ISO 17065: Product Certification Bodies Accreditation

ISO 17011: 2004: Specifies general requirements for accreditation bodies assessing and accrediting conformity assessment bodies (CABs).

ISO 16000-23:2018: Specifies a general laboratory test method for evaluating the reduction of formaldehyde and other carbonyl compounds.



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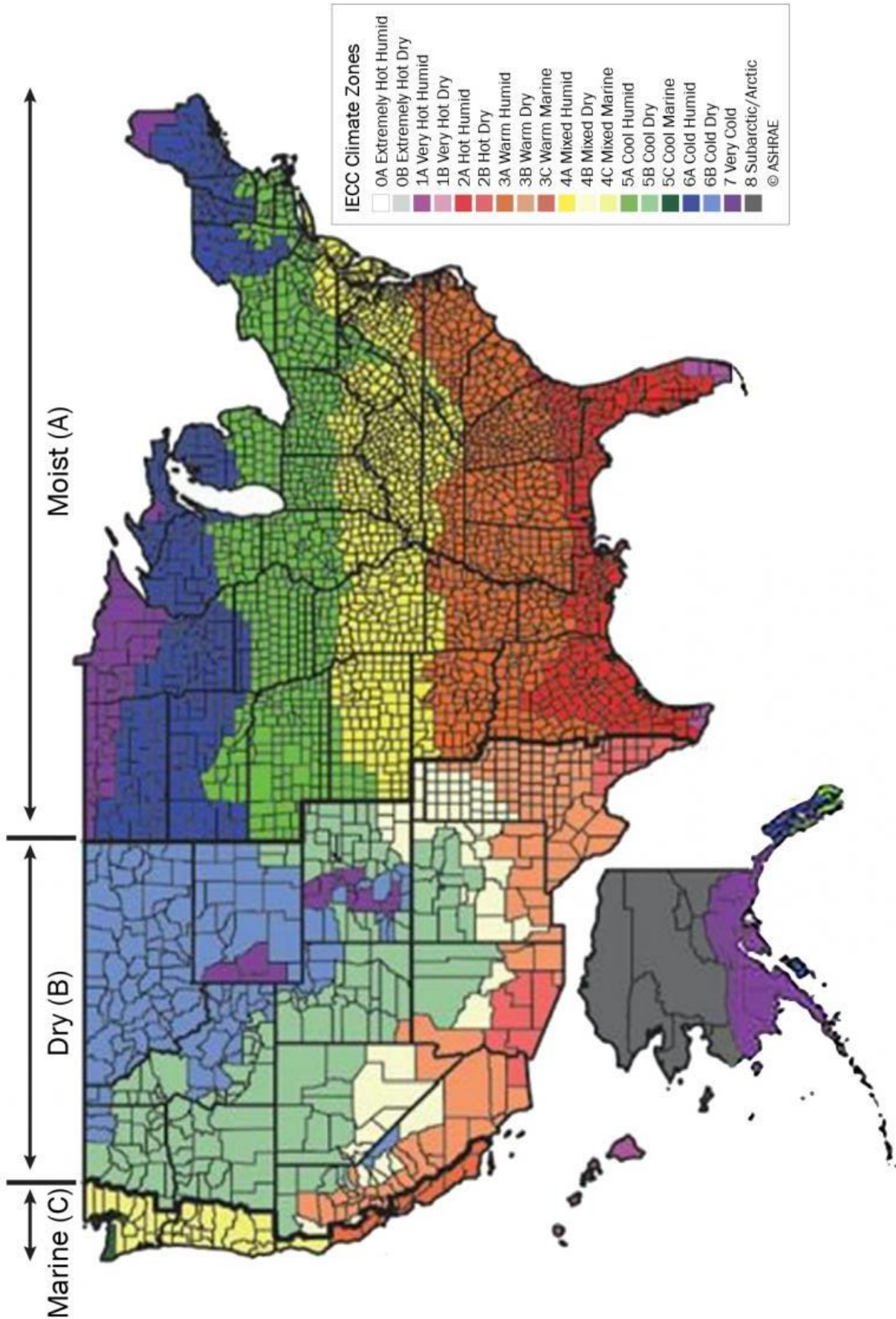
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UL 1482: (ANSI Approved 2022): Standard for Solid-Fuel Type Room Heaters. 2011. Underwriters Laboratories, Inc.

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UL 2998 2020: Zero Ozone Emissions Validation

# IECC Climate Zones of the United States





Office of Air and Radiation

EPA 402/K-24/003



Homes with the Indoor airPLUS label are designed and verified for improved indoor air quality compared to homes built to minimum code.

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