



VERSION 2

Indoor airPLUS

November 10, 2020

Agenda

Indoor airPLUS Version 2 Timeline

Program Intent for V2

Version 2 Significant Changes

- Newly proposed requirements
- Both single-family and multifamily projects
- Integration with ENERGY STAR Multifamily New Construction (MFNC)
- Opportunity to provide input to EPA

Marketing and Sales Resources

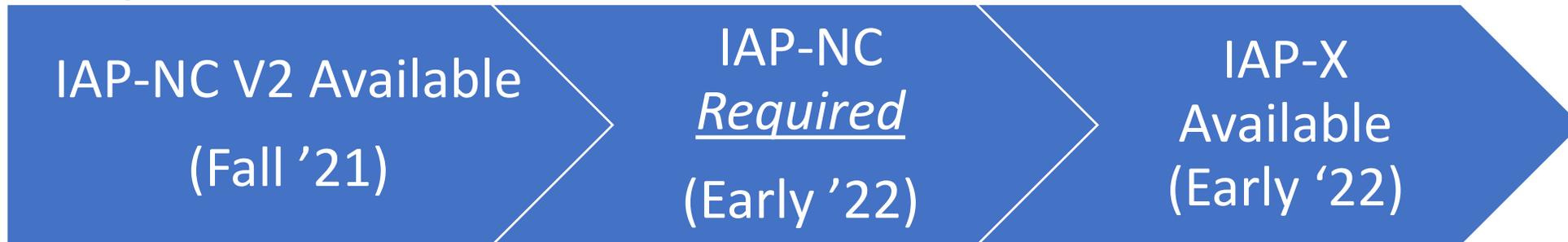


Indoor airPLUS Version 2 Timeline

- Public Comment & Final Development



- Implementation



**Caveat – Does anyone really know what 2021 holds?*



What's New in Version 2?

Project Eligibility

- Full alignment with ENERGY STAR MFNC, buildings of all heights

Quality Assurance Infrastructure

- Alignment with other EPA programs (ENERGY STAR, WaterSense)
- Training requirements for partners (late 2021)

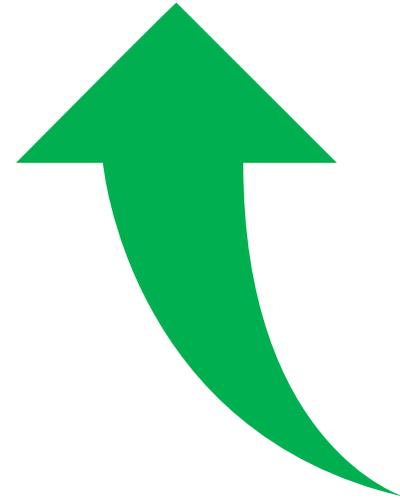
Similar Format but New Proposed Requirements and Advisories

- Checklist will appear to be longer



What's the Intent of a Version Change?

1. Respond to changes in the industry.
2. Incorporate new research and evolving best practices in building science.
3. “Raise the bar” after establishing a viable program.
4. Increase guidance and training for industry.
5. Spur innovation where it's needed.
6. **Bring more indoor air protections to homeowners and occupants.**



How to “Raise the Bar”

Same Key Strategies

Source Control
(reduction/elimination)



Ventilation
(dilution)



Filtration
(removal)

Low-emitting materials

More product categories

Radon reduction

Increased rigor in each Radon Zone

Moisture control

Additional focus on RH monitoring and dehumidification

Ventilation

Move industry toward improved operation, balanced strategies, and automation

Filtration

Improved capture in both recirculation and ventilation



Proposed Changes to the Technical Requirements

Section 1: Moisture Control

Section 2: Radon

Section 3: Pest Barriers

Section 4: Heating, Cooling, & Ventilation Systems

Section 5: Combustion Pollutant Control

Section 6: Low-Emission Materials

Section 7: Occupant Education



1. Moisture Control

Key Changes Proposed in Version 2:

Site Drainage vs. Foundation Drainage

Capillary Break

Moisture Vapor



1.3 Water-Managed Site and Foundation

Foundation Drainage

All Radon Zones, if foundation drainage system discharges to daylight & is connected to the radon system, include a backwater valve (check valve) to isolate the soil gas collection plenum

Floor Drain

Locate drains in the lowest area of basement or crawl; sump pits can be utilized to meet this requirement if they include a trapped drain in the lid

Key Takeaway:

Include an interior floor drain. Ensure sump pits are sealed and radon systems can work properly with foundation drains.



Image: LSU Ag Center

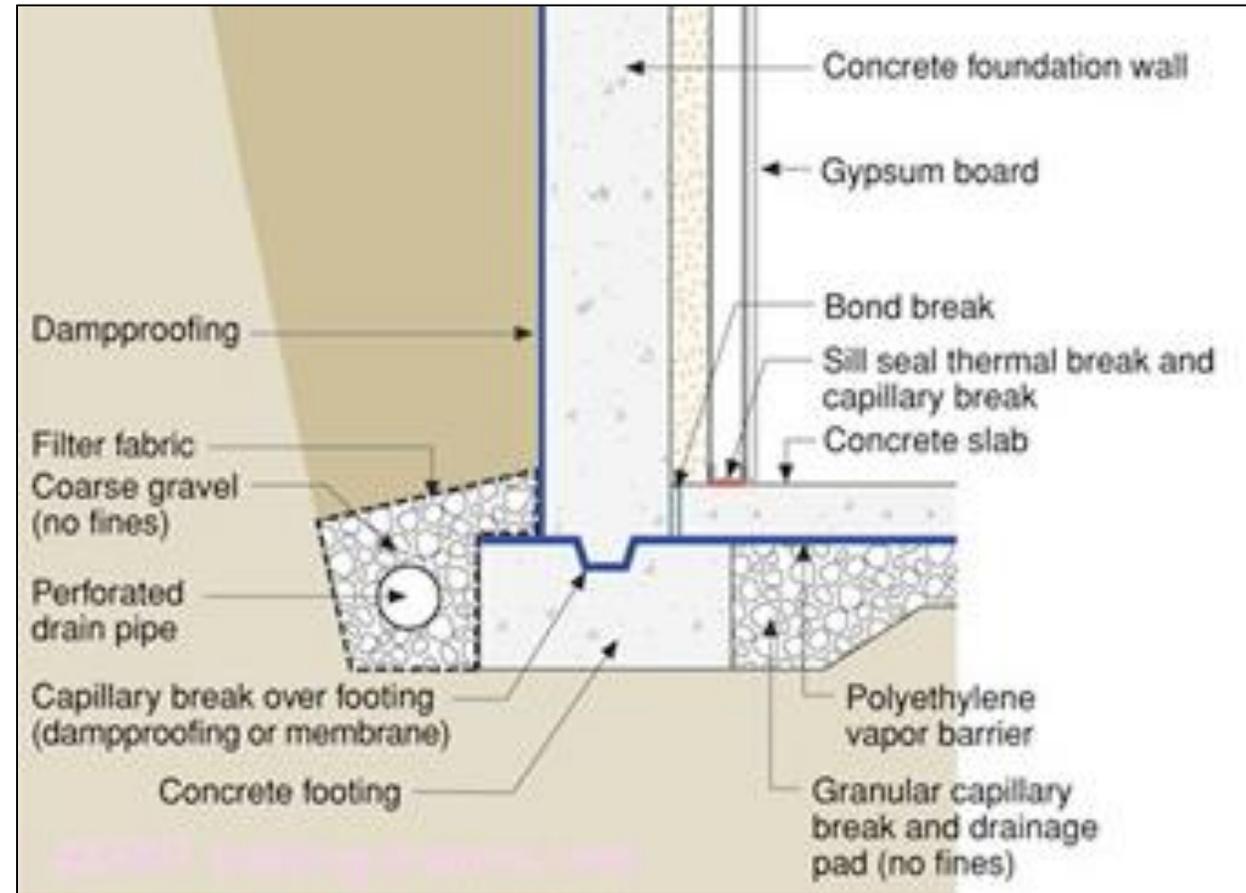


Image: Super Sump

1.4 Capillary Break – Below Grade

Capillary Break - Footers

Install capillary break under or on top of footings (i.e. poly, bituminous, liquid) in new construction



1.9 Water-Managed Wall Assemblies

Water-Managed Wall Assemblies

Changed 'drainage plane' to **Water-Resistive Barrier (WRB)**

Advisory: liquid or fluid applied membranes & integrated sheathing systems **sealed/taped** seams on clean surfaces according to manufacturer instruction to perform as **WRB**

Advisory: rainscreen assemblies with a min. 3/16" air gap or matting between the drainage plane and cladding



Key Takeaway:

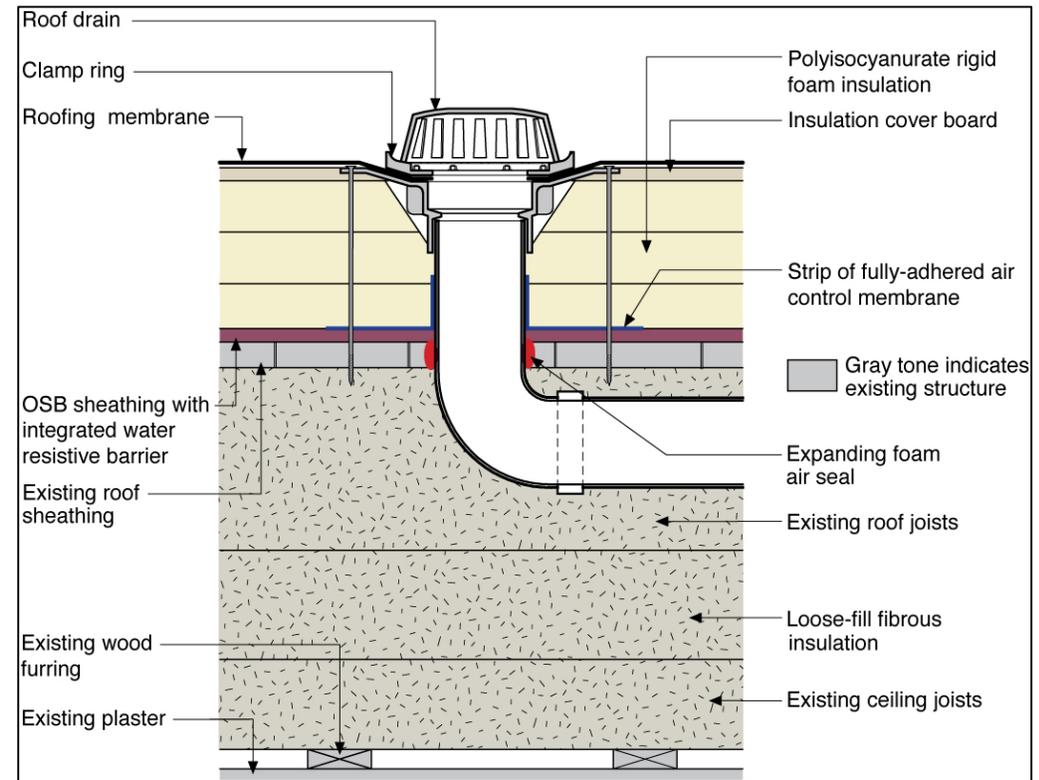
Advisories are best practice and likely to become requirements in the next Version—consider using rainscreens for improved durability.



1.13 Water-Managed Roof Assemblies

Roof Valleys and Decking

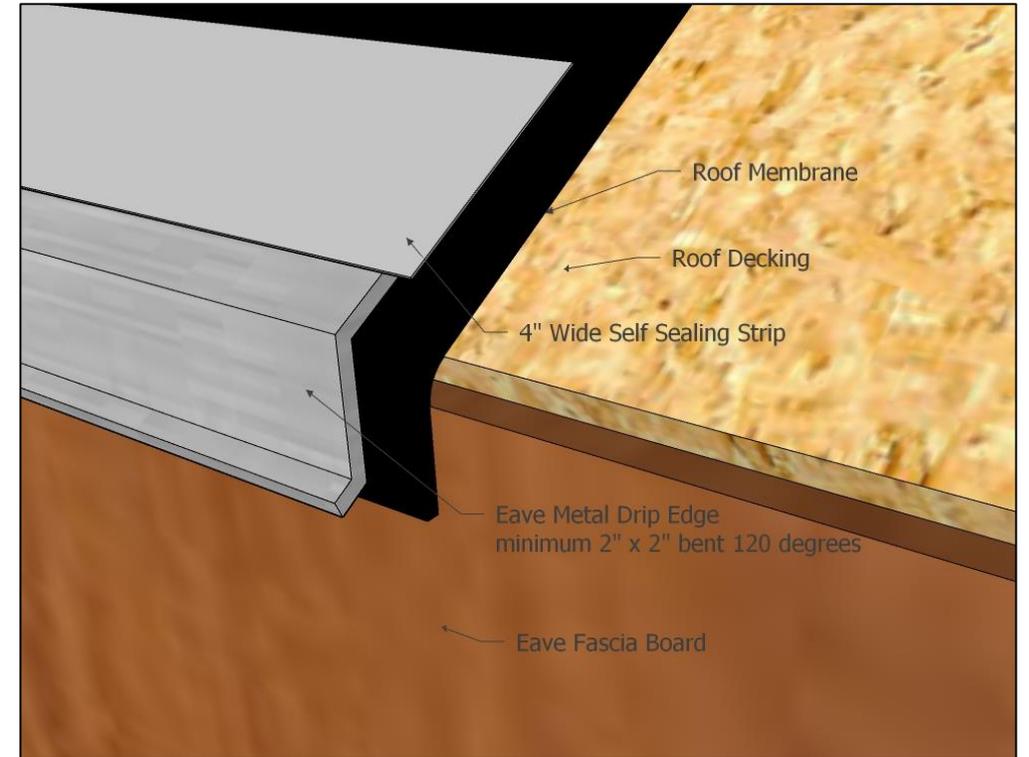
- Low or Flat roofs must be sloped to drain ¼"/ft
- Drains insulated
- Full connection over roof elements (curbs blocking) of air control layer and connected to wall air control layer ~ fully integrated air-barrier
- Roof Penetrations Integrated with the drainage plane, air sealed & fully flashed
- Water Control Layer must overlap each other



1.14 Water-Managed Roof Assemblies

Roof Eaves

Advisory: Install the roof membrane before the drip edge at a min of 1" down the fascia



1.20 Interior Moisture Management

Appliance Drainage

- ✓ *HVAC equipment producing condensate must have a drain pan connected to a drain*
- Plumb non-vented dryers (i.e. heat pump, condensing) to a drain
- Hot water storage tanks located in, above, or adjacent to finished spaces must have a drain pan connected to a drain

Materials with Signs of Water Damage or Mold

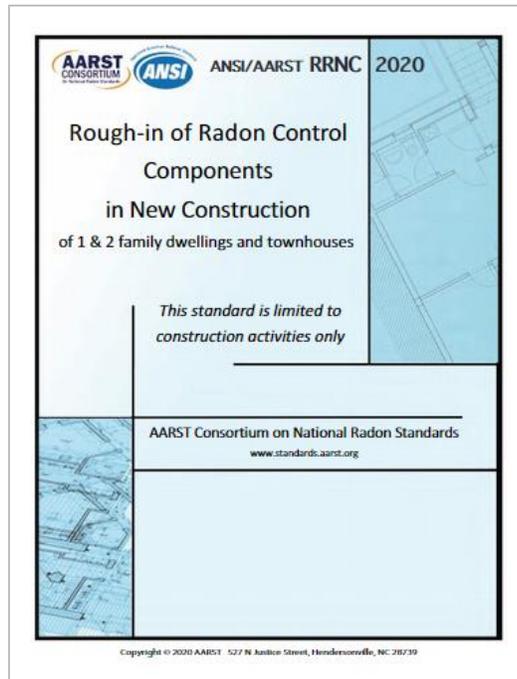
Advisory: Dry-out during construction

- Remove standing water
- Remove moisture using fans or dehumidifiers
- Store materials out of wet areas

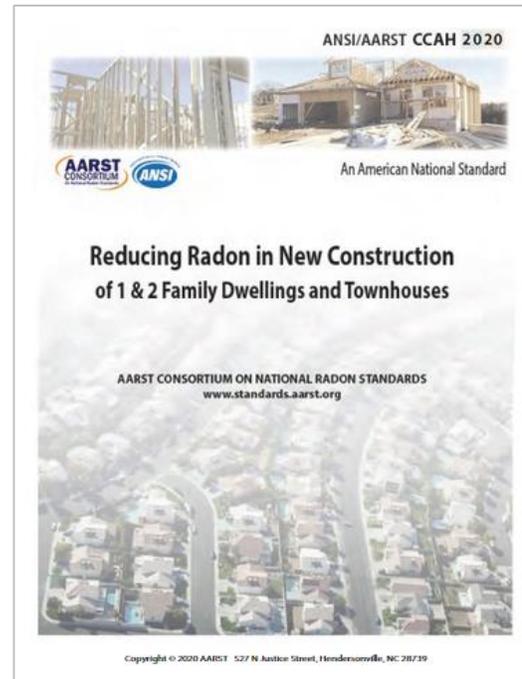


2. Radon

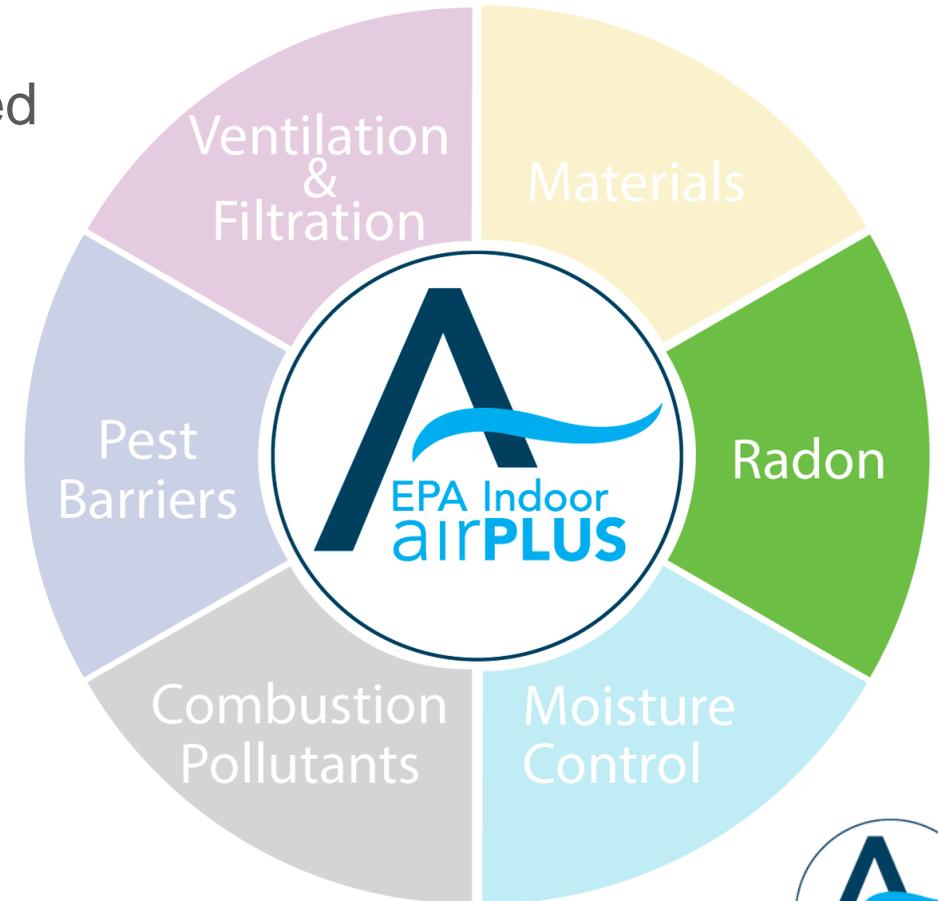
Following ANSI/AARST standards is recommended



“RRNC” - Passive Systems



“CAAH” - Active Systems



Indoor Air Quality (IAQ)

Available for web view - <https://standards.aarst.org/>

2. Radon

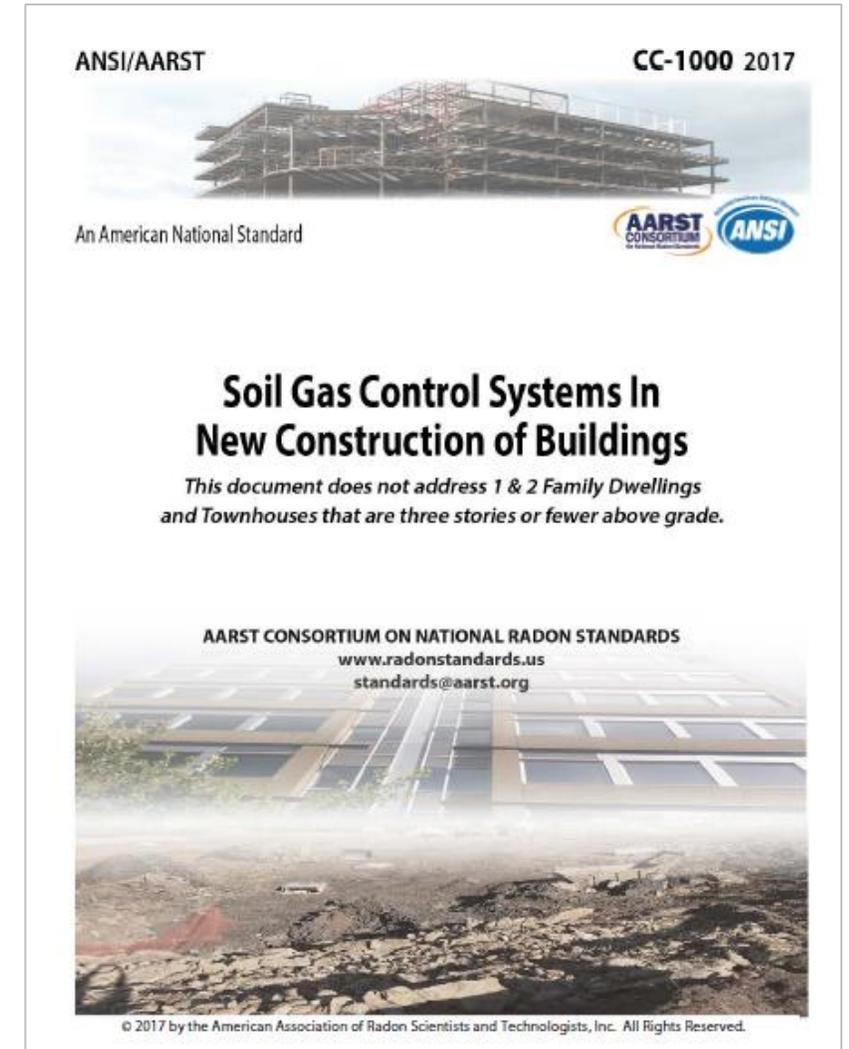
Following ANSI/AARST standards is recommended

ANSI/AARST CC-1000 provides design detail for buildings 4+ stories above grade

Exceptions for some buildings with ventilated garages that meet IMC Section 404

Key Takeaway:

Some exceptions apply to multifamily--use consensus-based standards for design guidance.



“CC-1000” - Active Systems for Large Buildings

Available for web view - <https://standards.aarst.org/>

2.1 Radon Zone Identification and Strategy

Radon strategies outlined for **ALL ZONES**

➤ In EPA Radon **Zone 1**

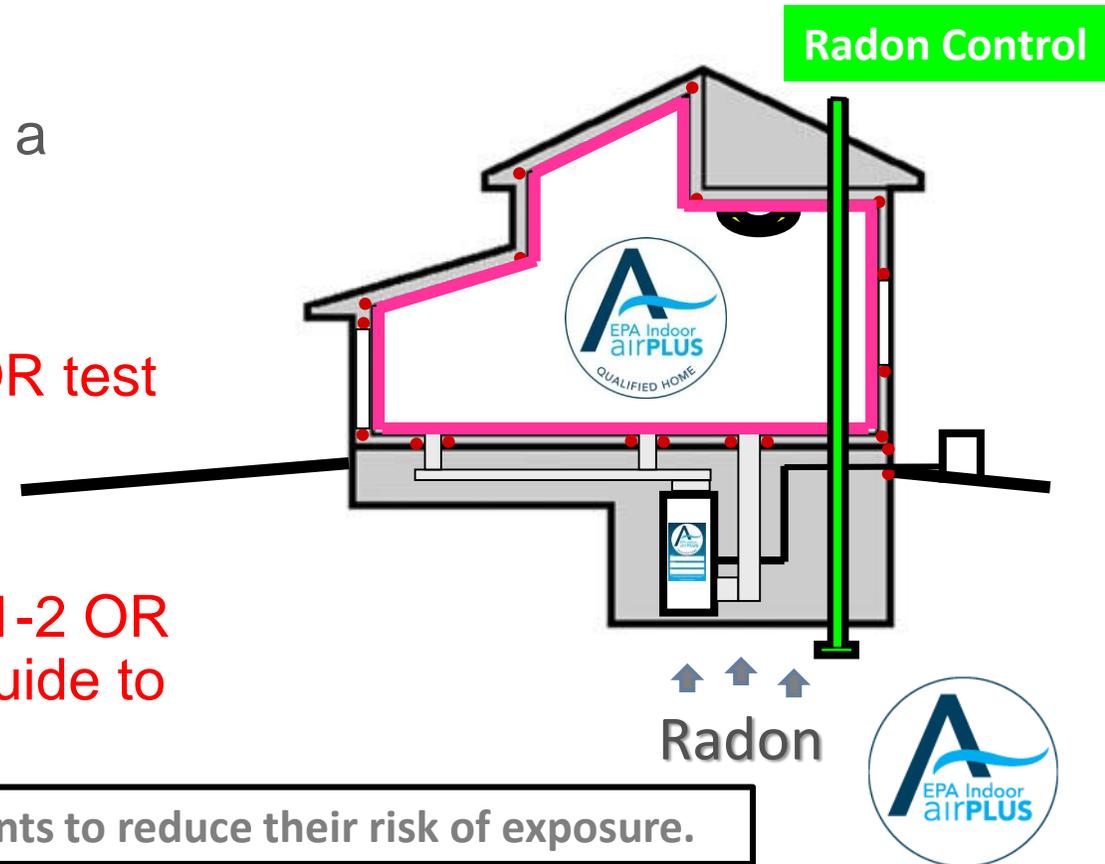
Include **active** radon mitigation system **OR** a **passive system and test** upon completion

➤ In EPA Radon **Zone 2**

Install a passive radon reduction system OR test upon completion

➤ In EPA Radon **Zone 3**

Comply with one of the **options for Zones 1-2 OR provide** the occupants with the **Citizen's Guide to Radon**



Key takeaway: Identify your radon zone and help the occupants to reduce their risk of exposure.



3. Pest Barriers

Air Sealing in accordance with the ENERGY STAR Rater Field Checklist Section 4.



3.1 Minimize Pathways for Pest Entry

Moderate to Heavy Termite Infestation Areas

- Foundation walls of solid concrete, masonry with solid block top course, bond beam, or concrete-filled block
- Interior concrete slabs with welded wire fabric (or equivalent) & concrete walls with reinforcing rods

Very Heavy Termite Infestation Areas

- No foam plastic insulation on below-grade walls exterior or under slabs
- Foam plastic insulation on above-grade foundation walls covered with moisture-resistant, pest-proof material and kept min 6" above-grade
- Foam plastic insulation on interior of conditioned crawlspace walls kept a min 3" below sill plate



Image: Green Building Advisor



3.2 Rodent & Bird Screens

Rodent/Bird Screens for Building Openings

- **Screens** for operable Windows
- **Screens** for all ventilation Terminations

Exception: Dryer ducts must include a weather resistant termination or louver but do not require screens.



3.3 Multifamily – Pest Management

Multifamily projects must include a Pest Management Plan or have a contract with a Pest Management Company

Include sanitary floor drains in common trash & recycling rooms

Provide guidance in the owner/tenant manual on pest-proof practices & reporting



Key takeaway: Verify floor drains are located in plans and specifications when doing initial plan reviews.

4. HVAC Systems

Same intent as Version 1:

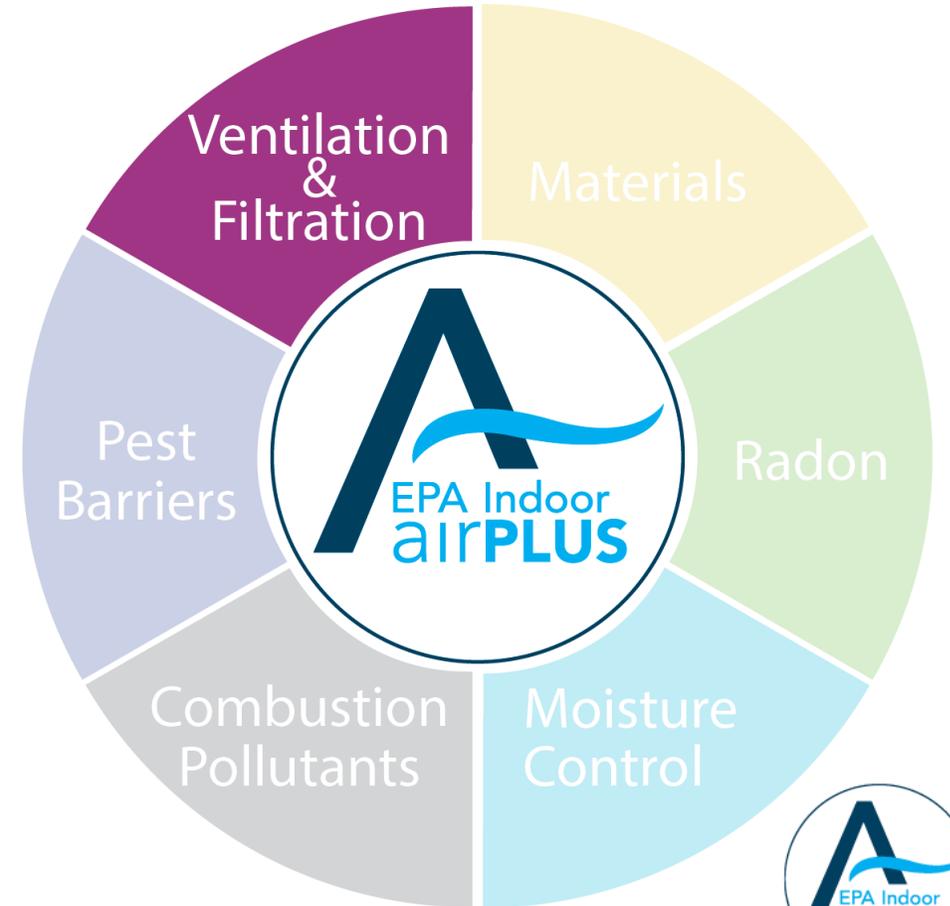
Cost-effectively balance the energy efficiency approaches of tighter dwelling units with the indoor air quality requirements of Indoor airPLUS.

Key Changes Proposed in Version 2:

New requirements (12 total, instead of 7)

Not just for dwelling units, but in common spaces

Distinguish between HVAC and HAC



4.1 Heating and Cooling (HAC) Sizing & Design

- ✓ *Comply with ENERGY STAR*
 - ✓ *Heating & cooling design load calculations still required for dwelling units, but for some MF may be done at the unit level, rather than room-by-room*
 - ✓ *Exceptions remain when using boilers & mini-splits*

Additional IAP Requirements proposed in V2:

Where ENERGY STAR doesn't require heating and cooling design loads to be calculated for a dwelling unit due to system type, **loads must still be calculated**, and exempted systems **must be sized per Manual S.**



4.1 Heating and Cooling (HAC) Sizing & Design

✓ *Comply with ENERGY STAR*

✓ *Heating & cooling design loads now required to be listed on HVAC Design Report for common spaces; no sizing limits*

Additional IAP Requirements proposed in V2:

For multifamily buildings, common space design loads calculated in accordance with ANSI/ASHRAE/ACCA Standard 183

For multifamily buildings, common space equipment sizing has limits, based on those loads



4.1 Heating and Cooling (HAC) Sizing & Design

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

Dehumidification requirement moved to Item 4.10, Humidity Control



Key takeaway: Load calcs needed for all dwelling units and all common spaces, regardless of system type, with systems sized according to standards, and over-sizing is limited.



4.2 HAC Duct System Design and Installation

- ✓ *Comply with ENERGY STAR*
 - ✓ *For MF dwelling units with HAC systems, adds a lower total duct leakage allowance for non-ducted returns & extra pressure measurements*
 - ✓ *For common space HAC systems, adds a visual inspection, but no test*



4.2 HAC Duct System Design and Installation

- ✓ *Comply with ENERGY STAR*
 - ✓ *For MF dwelling units with HAC systems, adds a lower total duct leakage allowance for non-ducted returns & extra pressure measurements*
 - ✓ *For common space HAC systems, adds a visual inspection, but no test*

Additional IAP Requirements proposed in V2:

In-unit HAC ducts still get tested per ENERGY STAR, but **Version 2 adds text related to duct sealing, including sealing duct boots to finished surfaces**



4.2 HAC Duct System Design and Installation

Additional IAP Requirements proposed in V2:

For multifamily, **common space ducts sized in accordance with ASHRAE Handbook of Fundamentals** (or equivalent)

Version 2 requires **both** the covering of ducts during construction **AND ALSO** vacuuming out duct boots prior to installing registers



4.2 HAC Duct System Design and Installation

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For multifamily, **common space ducts sized in accordance with ASHRAE Handbook of Fundamentals** (or equivalent)

Version 2 requires **both** the covering of ducts during construction **AND ALSO** vacuuming out duct boots prior to installing registers



Key takeaway: Requirements added to ensure tight, clean HAC ducts, with sealing practices that are more durable and comprehensive than Version 1.



4.3 Location of Air Handling Equipment & Ductwork

In single family, AHU & ductwork still can't be in a garage, but an AHU in a mechanical closet, accessed from the garage, **is permitted** if it's separated from the garage by a thermal and air barrier, and **the door to the closet is insulated, gasketed, and has self-closing hinges**

In multifamily, dwelling unit ductwork **cannot be in assemblies adjacent to a shared parking garage**



4.3 Location of Air Handling Equipment & Ductwork

Air handling equipment must be located **to facilitate cleaning, maintenance, filter replacement, and access to cores and condensate pans.**

- If located in attics, access opening must be 20" x 30" AND passageway needs solid flooring, at least 2' wide.
- "Access" means a door, permanent stairs, pull-down stairs or ladder, OR if you're not entering the attic, arms-length access through a ceiling hatch or wall access panel that is no more than 9' from the floor.



Image Source: www.stairwayshop.com



Indoor Air Quality (IAQ)

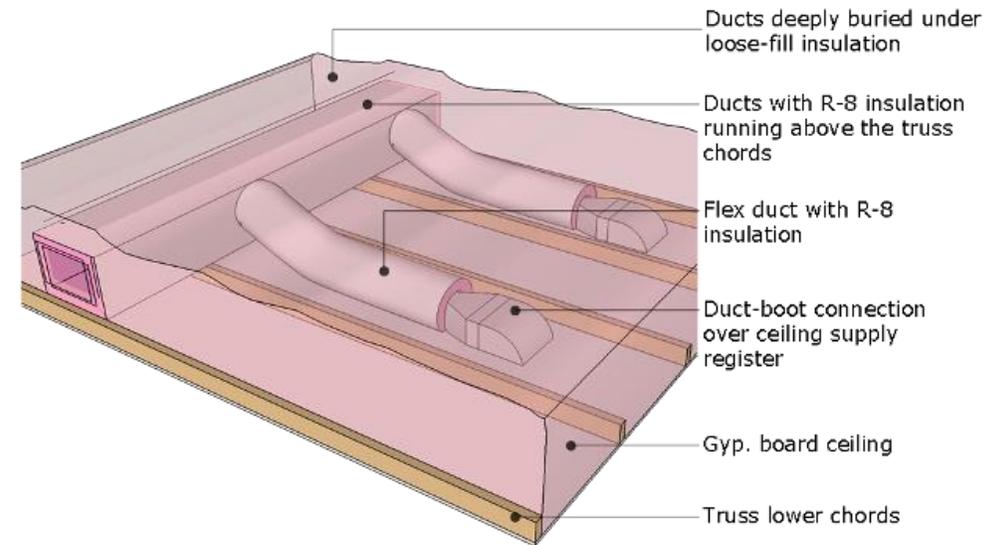
4.3 Location of Air Handling Equipment & Ductwork

All HAC air handling equipment and ductwork serving individual dwelling units, **must be installed within the thermal and air barrier boundary of the dwelling unit**

Exceptions:

- Essentially, exceptions outlined by DOE Zero Energy Ready Homes apply, (e.g. buried ducts)
- Ducted systems serving multiple units in multifamily buildings

Key takeaway: Ducts and AHU are inside the dwelling unit and the equipment is readily accessible for cleaning & filter replacement.



4.5 Dwelling-Unit Mechanical Ventilation

✓ *Comply with ENERGY STAR*

Additional IAP Requirements proposed in V2:

Must provide a **BALANCED** ventilation system; exhaust-only or supply-only not allowed, but ERV/HRV not required; can be in-unit or central

Considered 'balanced' if the supply and exhaust flows measure within **10% or 10 cfm**

Balanced system can include an intake connected to the HAC air handler if it meets ENERGY STAR requirements & measured airflow



Image Source: Heyoka Solutions



Indoor Air Quality (IAQ)

4.5 Dwelling-Unit Mechanical Ventilation (cont'd)

Outdoor air passes through a MERV 13 filter.

Like HAC, **ventilation** system components are in an accessible location for maintenance & replacement

Design and measure to ASHRAE 62.2-**2013** or later.
If a rater is **unable to measure supply airflow & measured supply airflow is not required for ENERGY STAR**, TAB reports can be used

New Advisories on HRV, ERV, and powered supply ventilation installation

Key takeaway: Balanced ventilation, higher rates, and with filtration!



4.6 Dwelling Unit Bathroom & Kitchen Exhaust

✓ *Comply with ENERGY STAR*

Additional IAP Requirements proposed in V2:

Controls:

Require controls such that bath exhaust fan runs for minimum 30 minutes after use or humidity drops below 60%

Advisory on smart range hood controls that activate/deactivate the hood automatically by sensing operation or other variable

Maximum sound levels:

- Intermittent bath exhaust, **max 2 sones at 50cfm**
- Intermittent kitchen exhaust, **max 2 sones at 100cfm**
- Continuous kitchen exhaust, **max 1 sone at 5 ACH**



Image Source: Ranco



Indoor Air Quality (IAQ)

4.6 Dwelling Unit Bathroom & Kitchen Exhaust (cont'd)

Detached one- and two-family homes & townhouses:

Intermittent kitchen exhaust is required, using a range hood or appliance range hood combo, **vented to outdoors**, min 100cfm or downdraft min 300cfm

Multifamily may still use **continuous exhaust**, but that fan must be in the kitchen “area” & **must have a MERV 3 or washable filter AND a recirculating range hood with charcoal filter over the stove is also required**

New Advisories recommend induction cooktops, range hoods, and microwave-range hoods that are HVI or AHAM certified

Key takeaway: Local exhaust fans that run quietly, while pollutants & moisture are being generated.



4.7 Common Spaces and Other Ventilation

✓ *Comply with ENERGY STAR*

✓ *Ventilation & exhaust in common spaces per ASHRAE 62.1-2010*

Additional IAP requirements proposed in V2:

- **Outdoor air passes through a MERV 13 filter**
- Still require vented dryers to exhaust outside;
moved condensing dryer draining requirements to 1.16
- **Added a requirement for central vacuum exhaust to be at least 10' from ventilation air inlets**
- Added advisories for dryer make-up air and booster fan if dryer duct exceeds manufacturer lengths



4.8 Filtration for Ducted HAC Systems

Increasing filter rating from MERV 8 to MERV 13 for all ducted HAC systems, serving dwelling units & common spaces

- Still can use temporary non-MERV 13 filter through construction

Maintaining the prohibition on ozone-generators that intentionally produce ozone, but specifying that **electronic air cleaners** (i.e., electrostatic, air ionizers, and UV lamps) that **do not exceed ozone emission limits of 0.050 ppm** are permitted



Key takeaway: Design all ducted HAC systems with MERV 13 filters. EACs are permitted if they meet ozone emission limits.



4.9 Filtration for Non-Ducted HAC

No new requirement, due to current industry constraints (e.g. limited filtration in ductless mini-splits)

Advisory to provide stand-alone portable air cleaners OR provide circulation/transfer fans with MERV 13 for air exchange



Key takeaway: Filtration of recirculated air is important for all dwelling units. Given the lack of readily available options for non-ducted systems, EPA recommends stand-alone air cleaners or other types of circulation fans with filtration.



4.10 Humidity Control

Used to be in Section 4.1 for HAC Sizing & Design, in some form

Provide **humidity monitor** with digital display of indoor temp, relative humidity (RH) and ability to record data OR for MF, monitor remotely through building management system (BMS)

In Moist (A) Climates **1 through 4**, dwelling units **must have equipment installed to maintain indoor RH at or below 60%** (i.e. whole-home dehumidification or HAC with **variable capacity & humidity sensor**)



Image Source: Honeywell

Key takeaway: Added the monitoring requirement & expanded dehumidification requirement to CZ4.



4.11 & 4.12 Gas Phase Air Cleaning & Microbial Disinfection

New advisories, but no new requirements to include gas phase air cleaning devices.

- Ozone generators are prohibited

Advisory: when installed with HAC system, generally locate gas-phase filters that contain sorbents downstream of particle filters.

See EPA guidance on:

- [Air Cleaners and Air Filters in the Home](#)
- [Indoor Air and Coronavirus \(COVID-19\)](#)



Image Source: enVerid



Image Source: freshaireuv.com

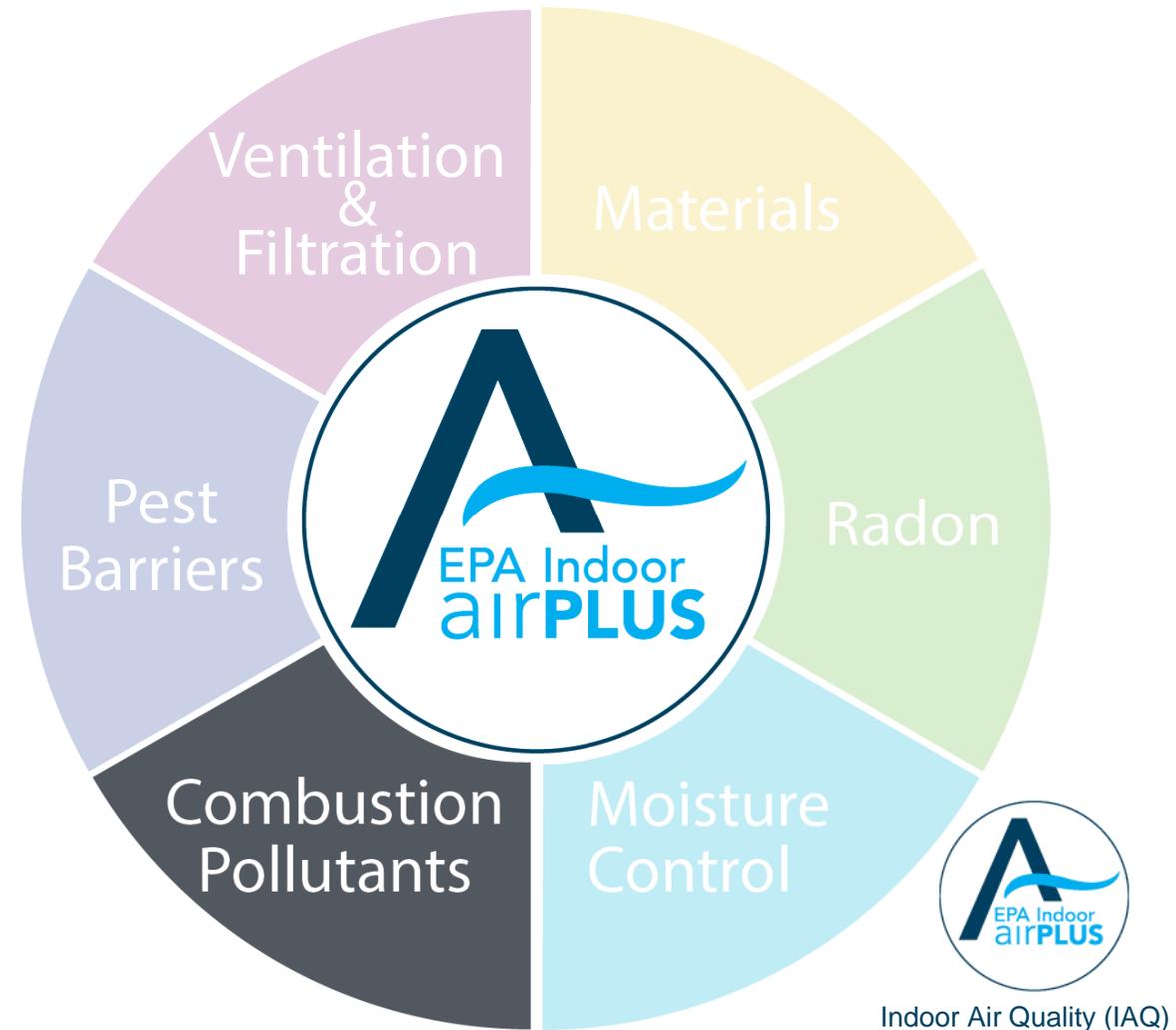


Image Source: hvactraining101.com

5. Combustion Pollutant Control

The phrase "conditioned space" has been clarified to "within the building's pressure boundary"

For multifamily, this includes dwelling units and all common spaces



5.1 Combustion Appliances

No unvented combustion appliances (except cooking)

All Climate Zones only mechanically drafted or direct-vent equipment allowed within the building's pressure boundary

For solid fuel burning appliances, provide a monitoring device capable of monitoring PM2.5 (< 35 µg/m³) & CO₂ (< 800 ppm)



Image Source: iAeris



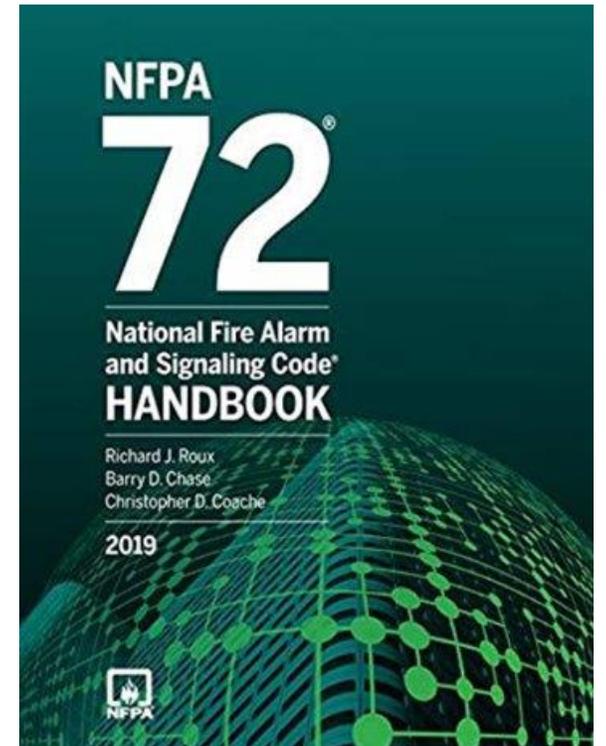
Key Takeaways:

If you install a solid fuel burning appliance (wood, pellet, etc.) you must also install an air-quality monitoring device. Non-vented, decorative appliances NOT ALLOWED.

5.2 Carbon Monoxide Alarms

CO Alarms listed in accordance with UL 2034 or CSA 6.19-01 & placed according to [NFPA 72](#)

Have minimum [4-Year](#) warranty & contain sealed, [non-replaceable batteries](#)



Key Takeaway:

Verify CO alarm compliance during Design Phase as well as at final verification.



Indoor Air Quality (IAQ)

5.3 Pollutant Control from Smoking

Required for three or more attached dwelling units

Prohibit smoking tobacco in indoor common areas

Communicate prohibition in building rental/lease agreements



Advisories:

- Include information on dangers of harmful products such as smoking tobacco and other substances, vaping, burning candles and incense
- Prohibit smoking throughout the building, not just in common areas

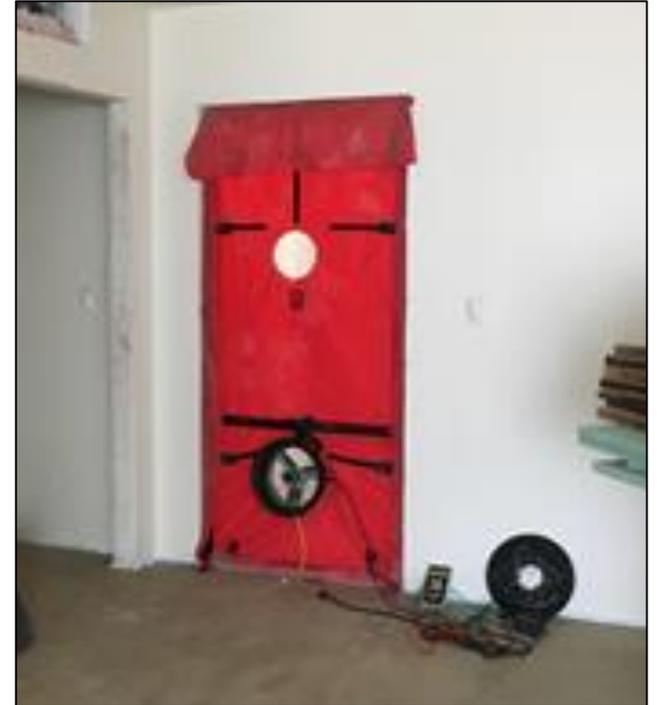


5.4 Pollutant Control through Minimized Infiltration

All attached dwelling units, including apartments, townhouses, and duplexes: measured air leakage no greater than 0.23 CFM50/ft² of enclosure area

Note: For ENERGY STAR MFNC projects, current threshold is 0.30 CFM50/ft² of enclosure area

Detached homes, air leakage not to exceed 3 ACH50



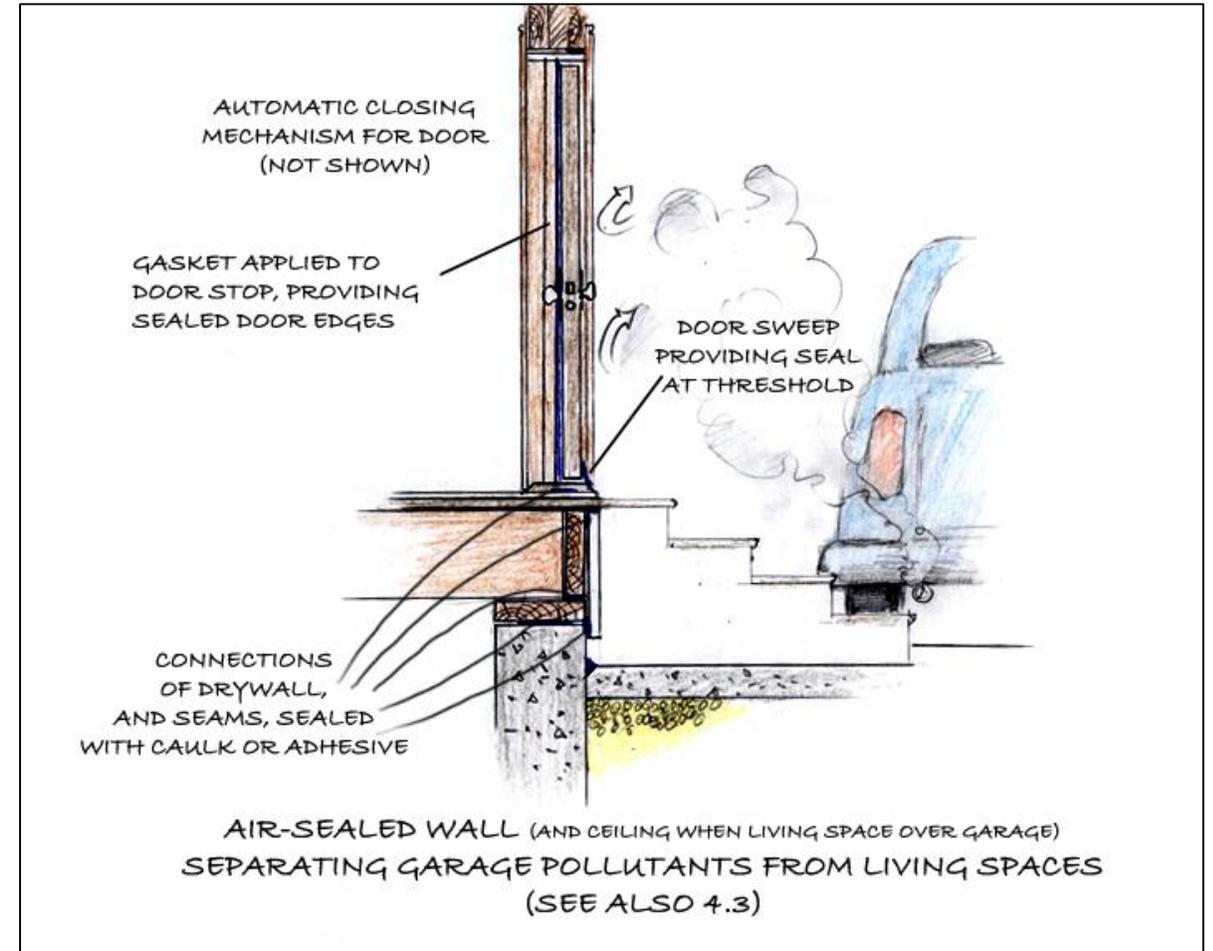
Key Takeaway:

There is now a maximum allowable threshold for air infiltration.



5.5 Attached Garages

- In detached homes, duplexes and townhouses
 - Exhaust fan min increased to 100 cfm
Rater Verified
- OR
- test house/garage pressure difference



5.5 Attached Garages & Enclosed Parking Structures

- ✓ Comply with ENERGY STAR MFNC
 - ✓ Compartmentalization sampling - test min. 20% of units adjacent to the garage
 - ✓ Where exhaust is installed, equip with CO & NO₂ sensors & provide min. continuous rate of 0.05cfm/ft² in standby mode; otherwise, 0.75 cfm/ft²

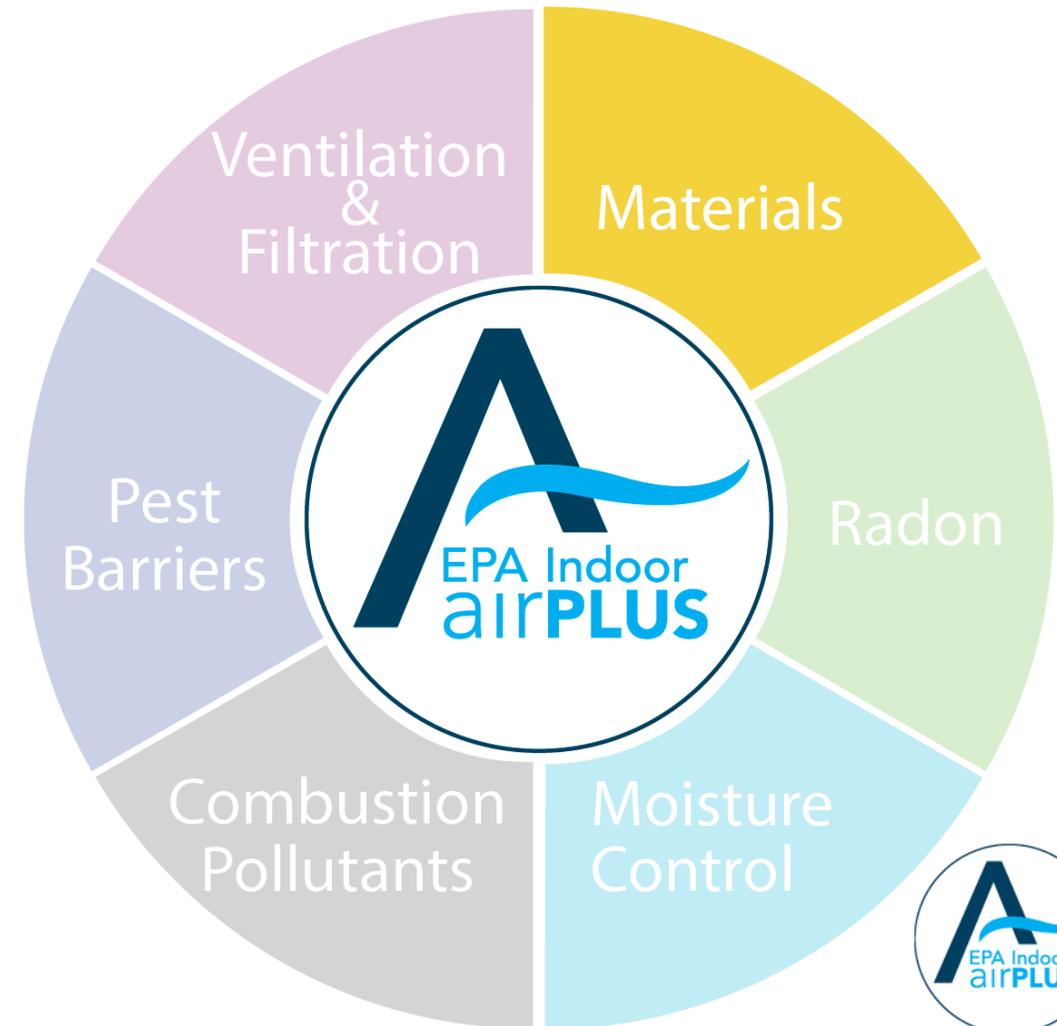


6. Low-Emission Materials

Source Control:

VOCs and Formaldehyde

- Content-based approach based on weight or volume in product (g/L VOC)
- Emissions-based approach based on product emission testing



6.1 Composite Wood

[EPA's Formaldehyde Standards For Composite Wood Products](#) (TSCA Title VI) is now “the law of the land”

As of June 1, 2018 all composite wood panels must be labeled as TSCA Title VI compliant

Removed references to other standards



Key Takeaway:

Builders should have no trouble complying, since all of these listed composite wood products are now required to meet EPA's formaldehyde rule to be sold in the U.S.



6.2 Interior Paints, Finishes, Coatings

EPA is proposing to shift from numerous optional certifications to just underlying standards.

Meet emissions limits under California Department of Public Health (CDPH) Standard Method V1.2 – 2017

Meet VOC content limits as identified in South Coast Air Quality Management (SCAQMD) OR CARB

STANDARD METHOD FOR THE TESTING AND EVALUATION OF
VOLATILE ORGANIC CHEMICAL EMISSIONS FROM INDOOR SOURCES USING
ENVIRONMENTAL CHAMBERS
VERSION 1.2

*(Emission testing method for California Specification 01350.
Supersedes the previous version of
STANDARD PRACTICE FOR THE TESTING OF VOLATILE ORGANIC EMISSIONS FROM VARIOUS SOURCES
USING SMALL-SCALE ENVIRONMENTAL CHAMBERS)*

PREPARED BY:
Indoor Air Quality Section
Environmental Health Laboratory Branch
Division of Environmental and Occupational Disease Control
California Department of Public Health

JANUARY 2017

California Department of Public Health
DR. KAREN SMITH, Director

California Health and Human Services Agency
DIANA DOOLEY, Secretary

State of California
EDMUND G. BROWN JR., Governor



6.3 Carpets and Cushions

CDPH V1.2 Standard for compliance

- Green Label PLUS meets this criteria



Indoor Air Quality (IAQ)

6.4 Adhesives and Sealants

Previously an advisory, now required to meet:

- CDPH Standard Method V1.2-2017; AND
- VOC limits in SCAQMD



6.5 Hard Surface Flooring

Previously an advisory, now required to meet:

- **CDPH Standard Method V1.2-2017**
 - Removed reference to other standards.
- Exception for inherently non-emitting (stone, ceramic, glass, concrete, clay brick)



Additional Product Categories

6.6 – Gypsum Board

- At least 90% of applied gypsum board must meet **CDPH V1.2**

6.7 – Insulation

- At least 90 percent of the insulation materials installed in wall, floor, or ceiling cavities, as well as on the interior surface of foundation walls must meet **CDPH V1.2**
 - Exceptions: pipe insulation and installed at exterior of sheathing



7. Occupant Education

Section formerly called “Home Commissioning”

Previous “commissioning” items moved

- Filter verification moved to Section 4
- Ventilation after Material Installation moved to Section 6

Reduced to 1 requirement: Owner and Resident Information Kit

- Provide operations and maintenance recommendations, including suggested schedules and sources for the replacement of filters in all ventilation and air handling equipment



High-Performance Residential Building Programs

- Indoor airPLUS is a benchmark for IAQ to protect occupant health in residences
- Required by other labeling programs (Zero Energy Ready Homes, PHIUS) as a pre-requisite
- Referenced by LEED for Homes and the National Green Building Standard



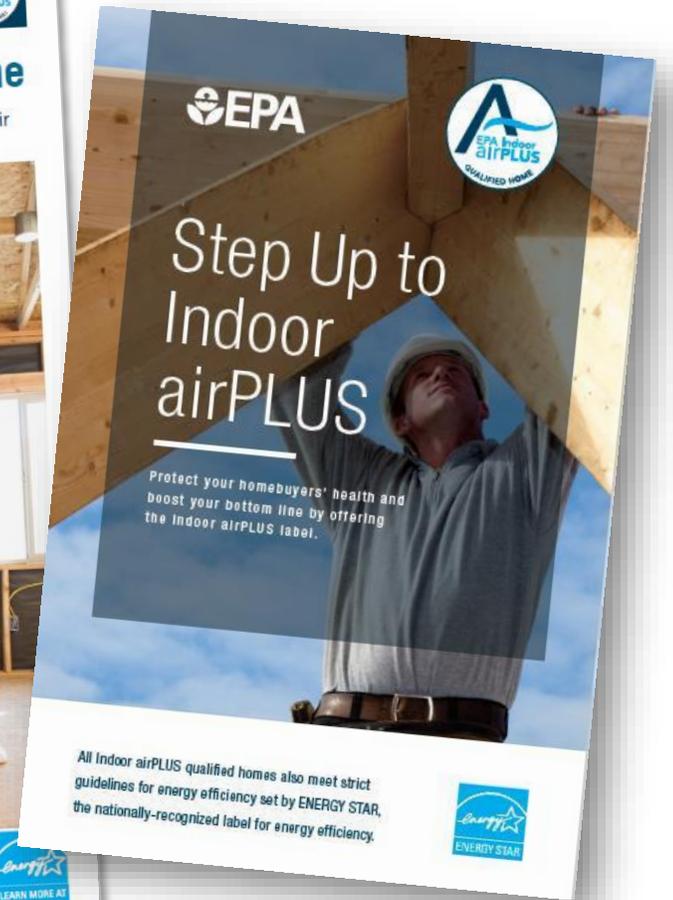
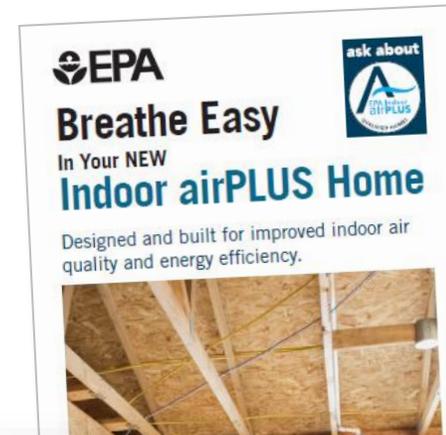
Resources and Tools

- Partner logos
- Co-brandable brochures
- Partner locator
- Website widgets
- 100% Commitment

**Committed to Building
100% Indoor airPLUS**



**ASK ABOUT
Indoor airPLUS
QUALIFIED HOMES**



Sales and Marketing Resources: <https://www.epa.gov/indoorairplus/indoor-airplus-sales-and-marketing-resources>.
Partner logos and co-brandable resources in your [My ENERGY STAR Account \(MESA\)](#).



2020 Indoor airPLUS Leader Award Winners

Indoor airPLUS Leader Award Profiles: <https://www.epa.gov/indoorairplus/indoor-airplus-leader-award-winners>

2020 Leader Awards Ceremony: <https://www.youtube.com/watch?v=EdB0xklfeg&feature=youtu.be>





Indoor airPLUS

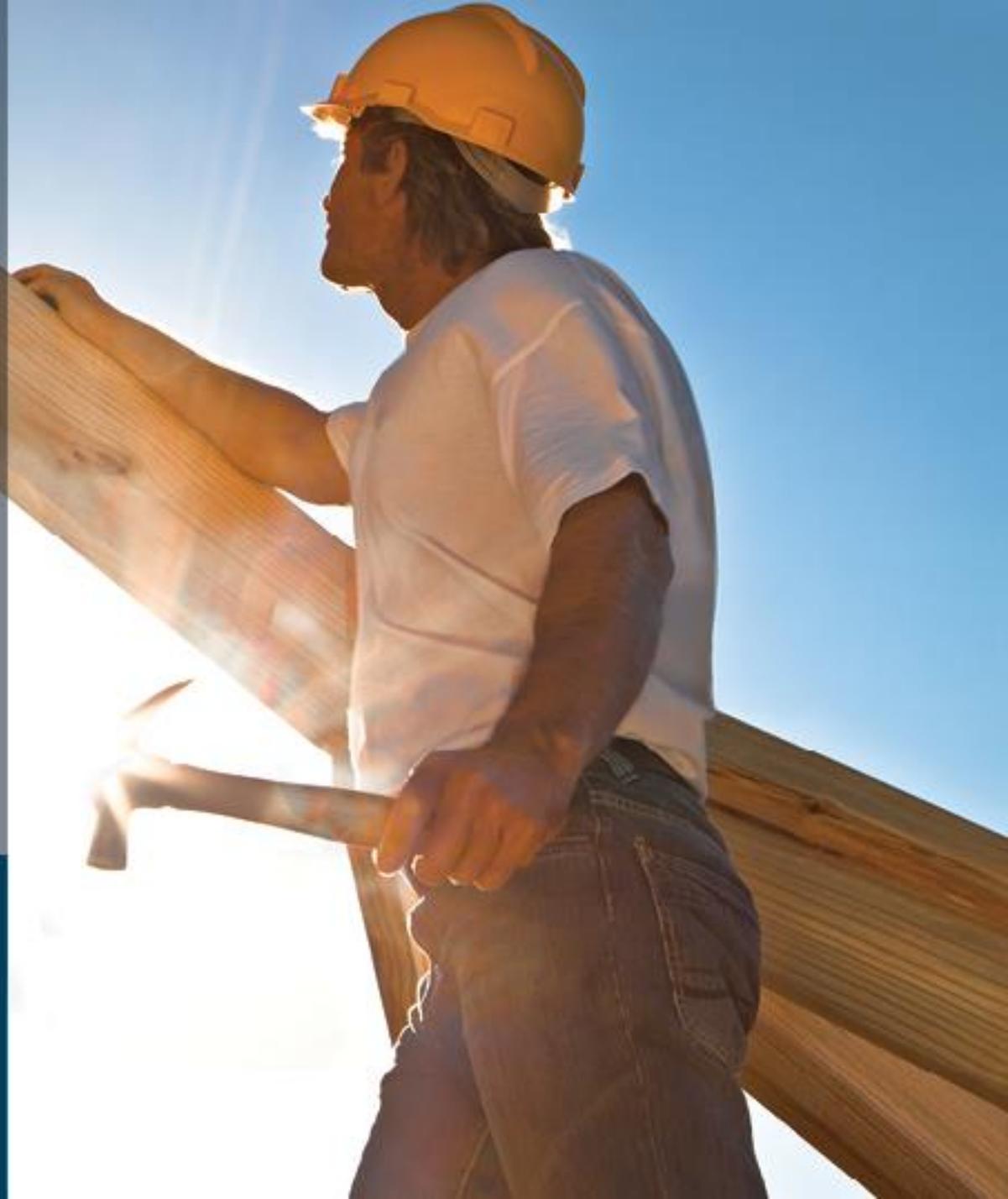
A new opportunity for leading builders to create better environments inside and out.

Learn more at:

www.epa.gov/indoorairplus

OR contact the Indoor airPLUS Team at

indoor_airPLUS@epa.gov



ENERGY STAR Residential New Construction Partner Meeting Webinar Series

- [ES Certified Homes Revision 11](#), Dean Gamble and Elliot Seibert, EPA
Thursday, November 12, 2020 at 1:00pm ET
- [ES Marketing Materials & Communications](#), Marta Montoro, EPA
Tuesday, November 17, 2020 at 1:00pm ET
- [WaterSense Labeled Homes Version 2.0](#), Jonah Schein, EPA
Thursday, November 19, 2020 at 1:00pm ET

