

VERSION 1 (REV. 02)

Indoor airPLUS



January 13, 2014



Indoor Air Quality (IAQ)

Contents



- **Indoor airPLUS Basics**
- **Importance of High QUALITY Indoor Air**
- **How to Build and Verify Indoor airPLUS Homes**
- **Selling the VALUE of Indoor airPLUS**



Indoor Air Quality (IAQ)



Indoor airPLUS Basics



Indoor Air Quality (IAQ)

ENERGY STAR + Indoor airPLUS

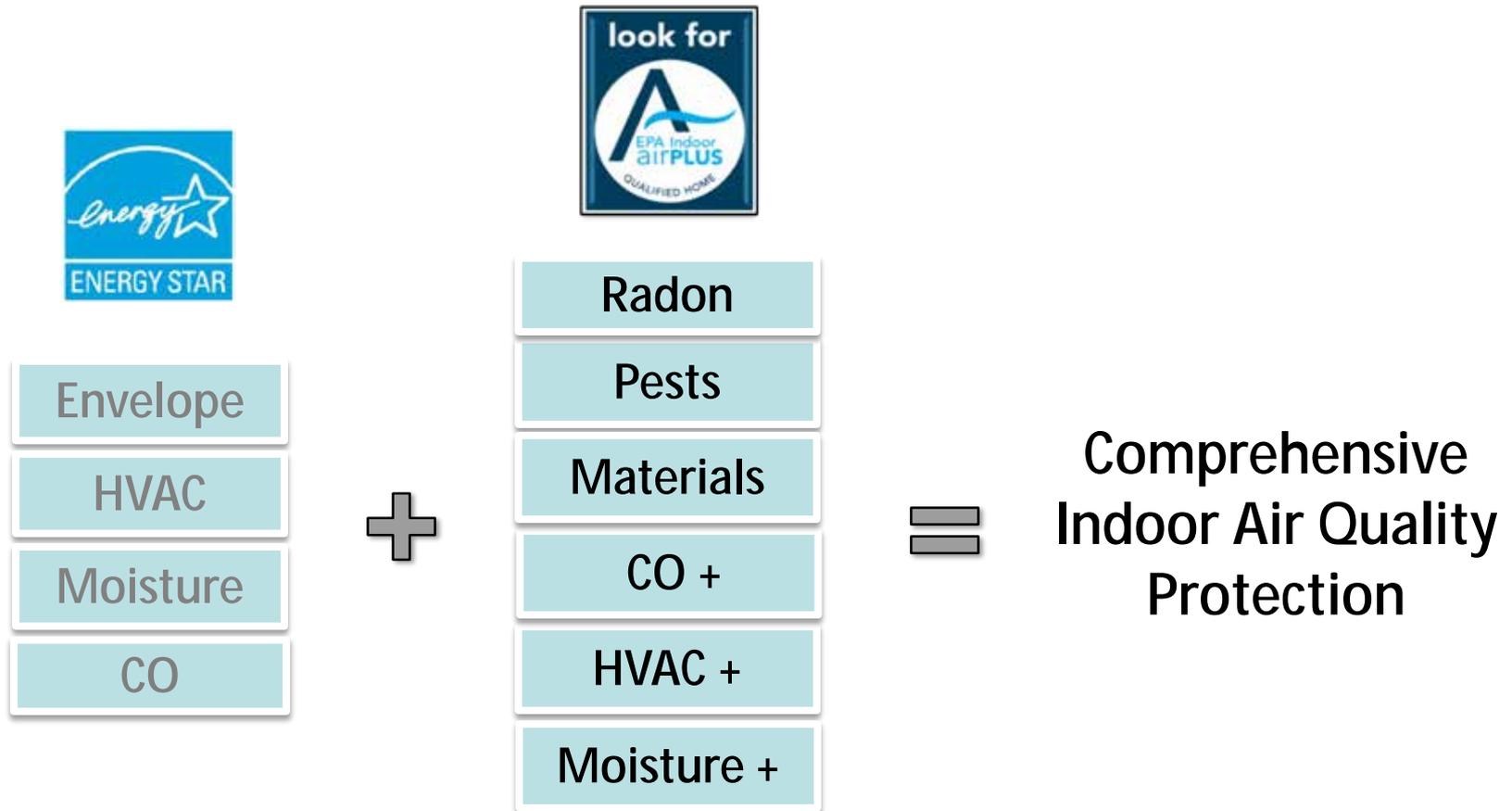


Indoor airPLUS is an EPA label that adds health protections to your **ENERGY STAR** value proposition



Indoor Air Quality (IAQ)

ENERGY STAR + Indoor airPLUS



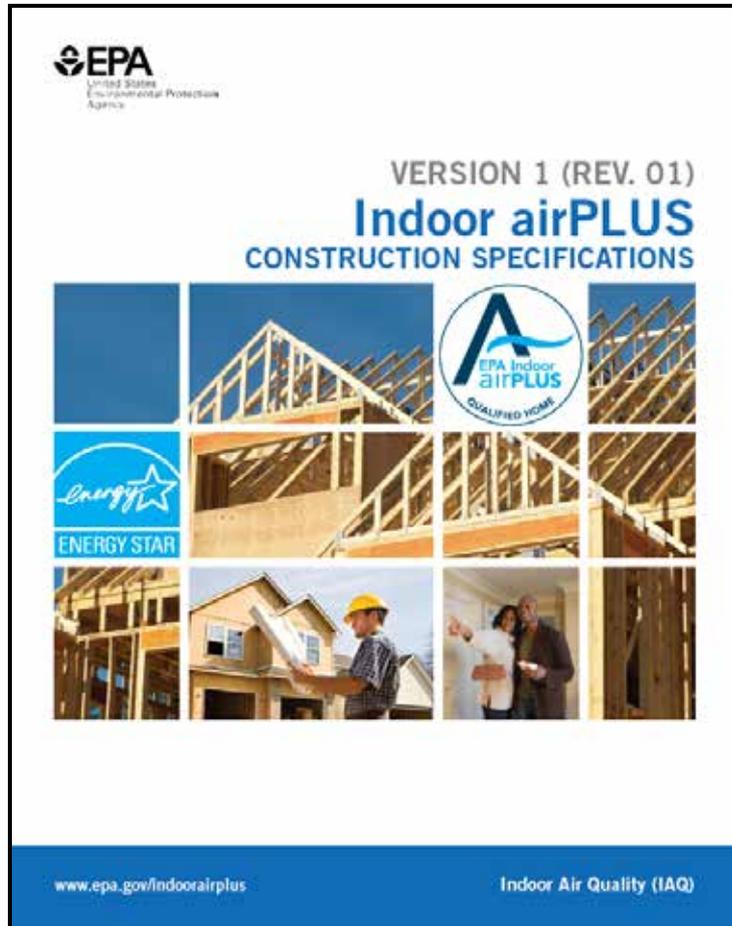
ENERGY STAR + Indoor airPLUS

- Both programs are based on building science principles that use a systems approach to improve home performance issues.
- Both programs require completion of verification checklists by a certified Home Energy Rater.
- Visual inspection items can be verified during the same on-site visits by a certified Home Energy Rater.
- Reporting to EPA follows the same schedule and is completed using the same online program.



Indoor Air Quality (IAQ)

Revision 1

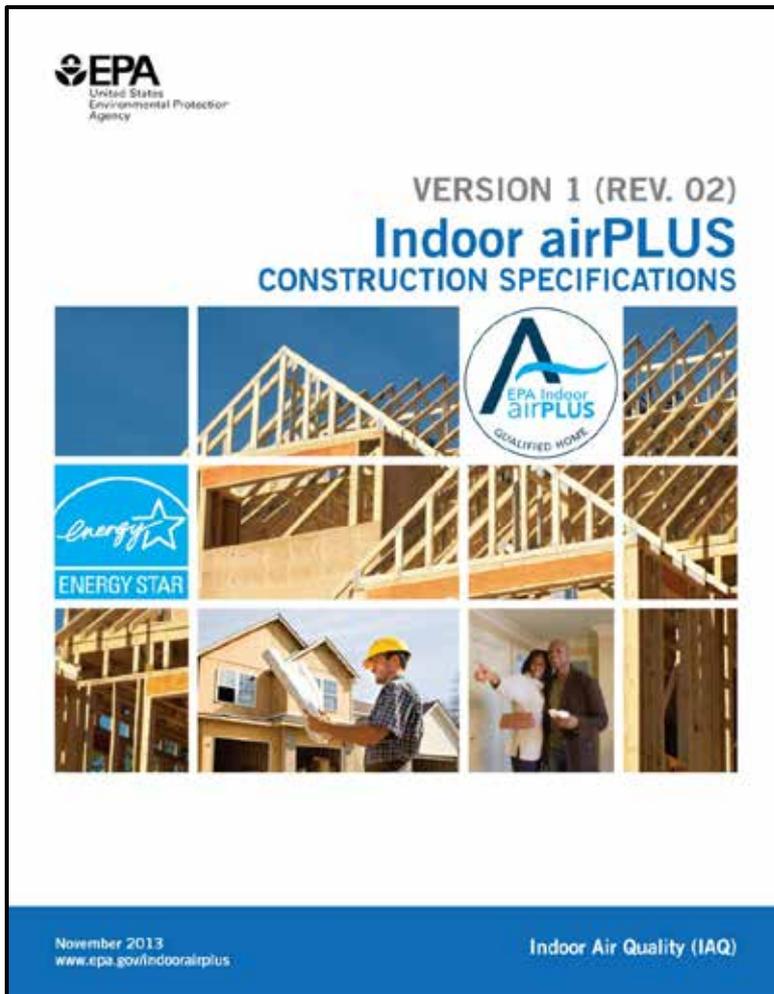


- Released February 2013.
- Greater alignment with ENERGY STAR Version 3.
- Simplified, clearer specifications.
- More flexibility and climate specific exemptions.



Indoor Air Quality (IAQ)

Revision 2



- Released November 2013
- Revised requirements for attached garages (garage fan no longer required for most homes)
- New exception from aggregate or sand requirement for slab-on-grade foundations (non-Radon Zone 1 homes only)



Indoor Air Quality (IAQ)

How to use the Construction Specifications

- **Seven sections:**
 - Moisture Control
 - Radon
 - Pests
 - HVAC Systems
 - Combustion Pollutants
 - Materials
 - Home Commissioning
- **Broken down into specific measures to address each IAQ concern.**

1. Moisture Control

1.1 Site and Foundation Drainage

NOTE: Completion of the [ENERGY STAR checklists](#) now satisfies the following Indoor airPLUS requirements:

- Slope patio slabs, walks and driveway; tamp back-fill to prevent settling; AND slope the final grade away from the foundation (WMS 1.1 and 1.2).
- Swales or drains designed to carry water away from the foundation are permitted to be provided as an alternative to the slope requirements for any home, and shall be provided for a home where setbacks limit space to less than 10 ft. (WMS 1.1 and 1.2).
- Install protected drain tile at the footings of basement and crawlspace walls. Surround each drain tile pipe with washed or clean gravel wrapped with fabric cloth, or install an approved Composite Foundation Drainage System (CFDS) (WMS 1.8).

Additional Indoor airPLUS Requirements:

- Install a drain or sump pump in basement and crawlspace floors, discharging to daylight at least 10 ft. outside the foundation or into an approved sewer system.
- **Exceptions:**
 - Slab-on-grade foundations.
 - In areas of free-draining soils — identified as Group 1 (Table R405.1, 2009 IRC) by a certified hydrologist, soil scientist, or engineer through a site visit — installation of a drain or sump pump is not required.
- In EPA Radon Zone 1, if a drain tile discharges to daylight install a check valve at the drain tile outfall (see Specification 2.1).



Indoor Air Quality (IAQ)

How to use the Construction Specifications

- **Relevant ENERGY STAR checklist items are summarized and referenced at the beginning of each measure.**
- **Additional Indoor airPLUS requirements are listed separately. These include:**
 - Items that provide additional indoor air quality protections.
 - Requirements that exclude an ENERGY STAR exception.

1. Moisture Control

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Indoor Air Quality (IAQ)

Rev.1.13.14

How to use the Construction Specifications

- **ENERGY STAR** checklists are referenced as follows:
- **TES** = Thermal Enclosure System Rater Checklist
- **HVAC-C** = HVAC System Quality Installation Contractor Checklist
- **HVAC-R** = HVAC System Quality Installation Rater Checklist
- **WMS** = Water Management System Builder Checklist

1. Moisture Control

1.1 Site and Foundation Drainage

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Indoor Air Quality (IAQ)

How to use the Construction Specifications

- **EXCEPTIONS** to the requirements described in these construction specifications are noted as appropriate.
- **NOTES** provide additional information to clarify specification requirements.
- **ADVISORIES** provide additional guidance to be considered, but are not specification requirements.
- **PERFORMANCE TEST ALTERNATIVES** describe alternate compliance approaches where performance testing is practical and results are comparable to those of the prescriptive best practices required in the specification.

1. Moisture Control

1.1 Site and Foundation Drainage

NOTE: Completion of the [ENERGY STAR checklists](#) now satisfies the following Indoor airPLUS requirements:

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- Swales or drains designed to carry water away from the foundation are permitted to be provided as an alternative to the slope requirements for any home, and shall be provided for a home where setbacks limit space to less than 10 ft. (WMS 1.1 and 1.2).
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 - In areas of free-draining soils — identified as Group 1 (Table R405.1, 2009 IRC) by a certified hydrologist, soil scientist, or engineer through a site visit — installation of a drain or sump pump is not required.
- In EPA Radon Zone 1, if a drain tile discharges to daylight install a check valve at the drain tile outfall (see Specification 2.1).



Indoor Air Quality (IAQ)

Rev.1.13.14

How to Complete the Verification Checklist

- All ENERGY STAR for Homes Version 3 checklists must be successfully completed and reported to achieve Indoor airPLUS qualification.
- Check one box per line.
- Check “N/A” for specifications that do not apply for specific conditions (e.g., climate) according to the exceptions described.
- Check either “Builder Verified” or “Rater Verified” for all other items.

Home Address:		City:	State:	Zip:	
Section	Requirements (Refer to full Indoor airPLUS Construction Specifications for details)	Must Correct	Builder Verified	Rater Verified	N/A
	Note: The Rev. 02 checklist has been modified to reflect only the additional Indoor airPLUS requirements and their corresponding section numbers that must be met after completing the ENERGY STAR checklists. ENERGY STAR remains a prerequisite for Indoor airPLUS certification.				
ENERGY STAR V3 Checklists	Thermal Enclosure System Rater Checklist completed.	<input type="checkbox"/>		<input type="checkbox"/>	
	Water Management System Builder Checklist completed.	<input type="checkbox"/>		<input type="checkbox"/>	
	HVAC System Quality Installation Contractor Checklist completed.	<input type="checkbox"/>		<input type="checkbox"/>	
	HVAC System Quality Installation Rater Checklist completed.	<input type="checkbox"/>		<input type="checkbox"/>	



Indoor Air Quality (IAQ)

How to Complete the Verification Checklist

- **Items may be verified:**
 - visually on site during construction.
 - by reviewing photographs taken during construction.
 - by checking documentation.
 - or through equivalent methods as appropriate.

Home Address:		City:	State:	Zip:	
Section	Requirements (Refer to full Indoor airPLUS Construction Specifications for details)	Must Correct	Builder Verified	Rater Verified	N/A
	Note: The Rev. 02 checklist has been modified to reflect only the additional Indoor airPLUS requirements and their corresponding section numbers that must be met after completing the ENERGY STAR checklists. ENERGY STAR remains a prerequisite for Indoor airPLUS certification.				
ENERGY STAR V3 Checklists	Thermal Enclosure System Rater Checklist completed.	<input type="checkbox"/>		<input type="checkbox"/>	
	Water Management System Builder Checklist completed.	<input type="checkbox"/>		<input type="checkbox"/>	
	HVAC System Quality Installation Contractor Checklist completed.	<input type="checkbox"/>		<input type="checkbox"/>	
	HVAC System Quality Installation Rater Checklist completed.	<input type="checkbox"/>		<input type="checkbox"/>	



Indoor Air Quality (IAQ)

How to Complete the Verification Checklist

- Raters who operate under a Sampling Provider are permitted to use a RESNET-approved sampling protocol for Indoor airPLUS verification (for items “Rater Verified” on-site or through documentation).
- All items verified by the builder shall be verified for each qualified home.
- The builder provides one copy of the completed and signed Indoor airPLUS Verification Checklist for the buyer.
- The HERS Provider or Rater files a copy of the HERS and ENERGY STAR documentation for the home.



Indoor Air Quality (IAQ)

What About Multi-Family Dwellings?

- Multifamily dwellings that meet the ENERGY STAR Certified Homes, Version 3 National Program Requirements can pursue Indoor airPLUS.
 - Buildings that would only be eligible for the ENERGY STAR Multifamily High Rise Program are not eligible for Indoor airPLUS at this time
- Multi-family requirements are the same as single-family, PLUS:
 - Compartmentalization
 - Non-smoking policies

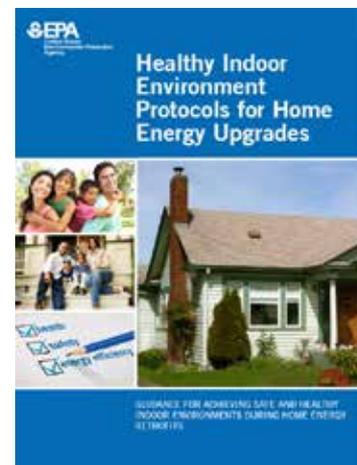


Indoor Air Quality (IAQ)

What About Existing Homes?

- Indoor airPLUS not designed for existing homes.
- Under certain conditions, (e.g., gut rehabs) if ENERGY STAR requirements and Indoor airPLUS requirements are met.
- For most renovation and energy upgrade work, see EPA's Healthy Indoor Environment Protocols for Home Energy Upgrades.

<http://www.epa.gov/iaq/homes/retrofits.html>



Indoor Air Quality (IAQ)

What does Indoor airPLUS cost?

- No fee to participate in the EPA program.
- Raters may charge a verification fee.
- Cost of additional Indoor airPLUS features will vary based on:
 - Local code requirements and typical building practices
 - Climate Zone (e.g., moist versus dry)
 - Radon Zone
 - Availability of suppliers and cost of materials
 - Type of construction (e.g., below grade foundation or slab on grade)
- Cost of additional features could be a few hundred dollars in dry, non-Radon Zone 1 areas or up to a few thousand dollars in moist climates in Radon Zone 1.





High Quality Indoor Air

Radon



Indoor Air Quality (IAQ)

What Causes Poor Indoor Air Quality?



- Pollution sources that release gases or particles into the air are the primary cause.
- Inadequate ventilation can increase indoor pollutant levels.



Indoor Air Quality (IAQ)

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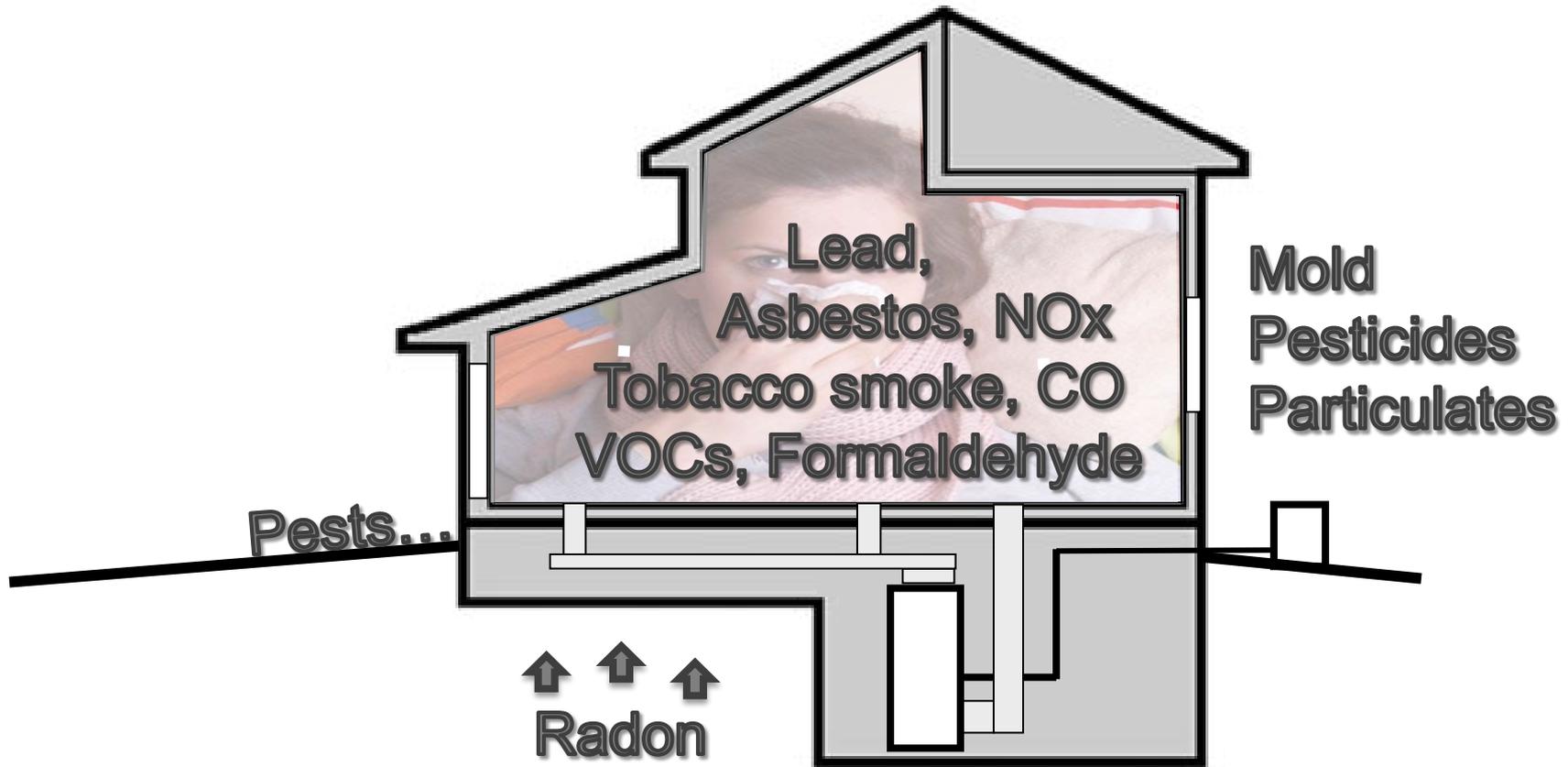
Health Risks

May appear after a single exposure, years after exposure, or only after long or repeated periods of exposure.



Indoor Air Quality (IAQ)

Health Risks



Reducing Health Risks

1. Source Control

(eliminate or manage)



2. Ventilation

(dilution)



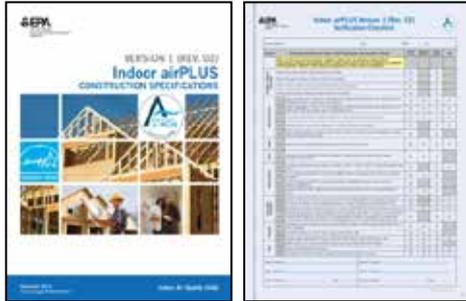
3. Filtration



Indoor Air Quality (IAQ)

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Indoor airPLUS



Moisture Control

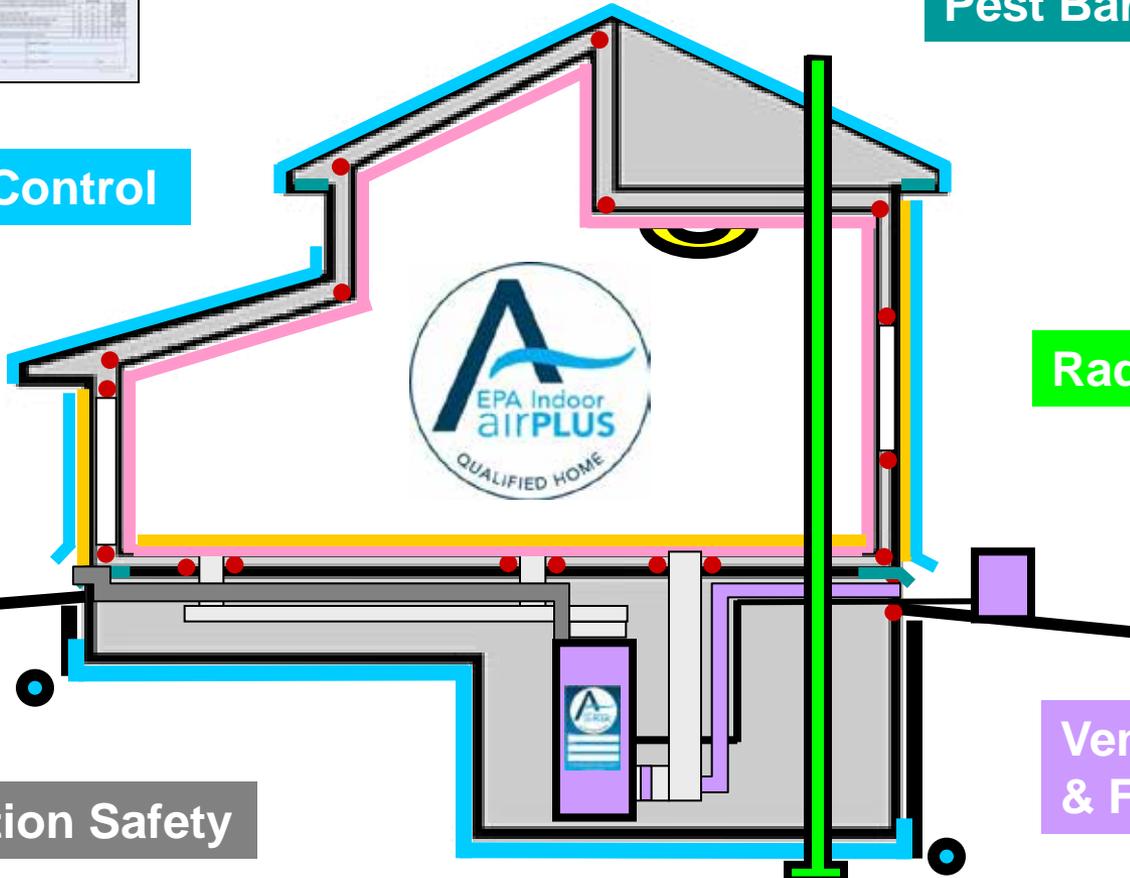
Pest Barriers

Radon Control

Materials

Ventilation & Filtration

Combustion Safety



Indoor Air Quality (IAQ)



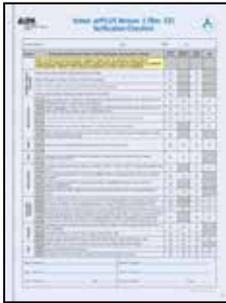
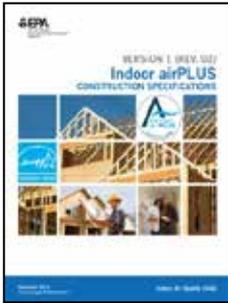
How to Build and Verify Indoor airPLUS Homes



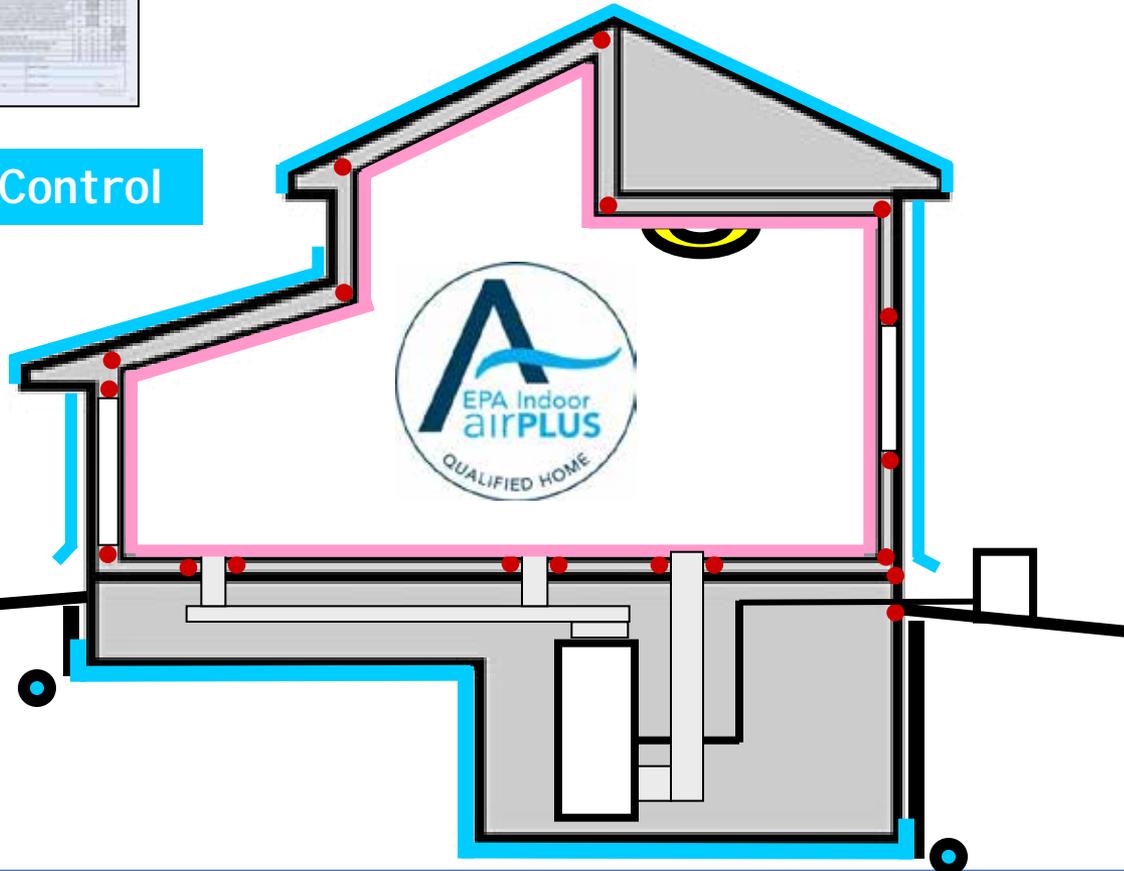
Indoor Air Quality (IAQ)

Rev.1.13.14

1. Moisture Control



Moisture Control



Indoor Air Quality (IAQ)

1. Moisture Control



- Moisture is a leading cause of health, comfort and durability concerns in homes.
- 19% of U.S. households have at least one person with Asthma.
- There is a 20-50% increased risk of asthma in damp houses.
- The economic cost of asthma amounts to more than \$56 billion annually.
- Mold grows where there is moisture.
- Molds produce allergens, irritants, and in some cases, potentially toxic substances.



Indoor Air Quality (IAQ)

1.1 Site and Foundation Drainage



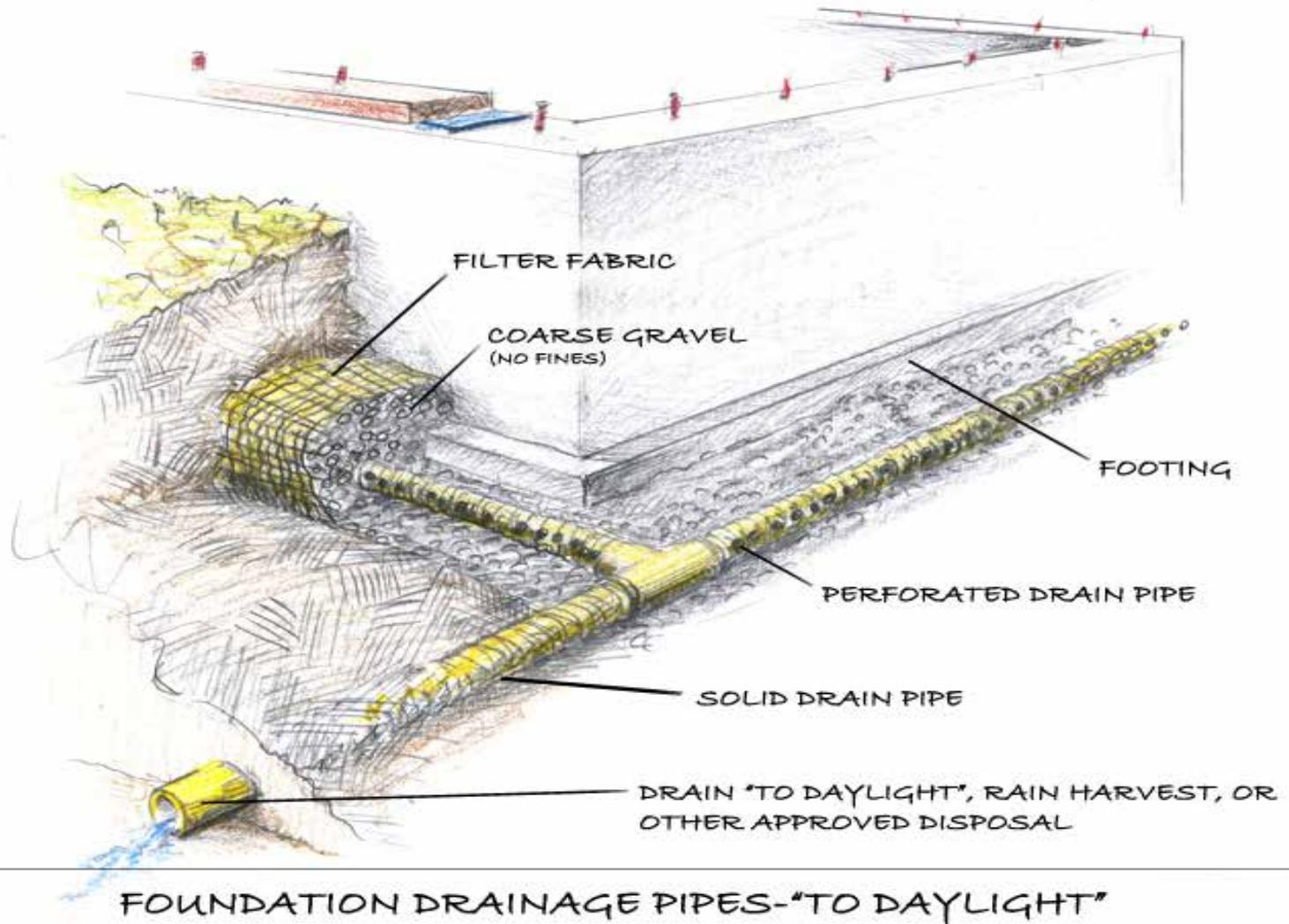
- *Slope hard surfaces and final grade away from the foundation.*
- *Install drain tile at the footings of basement and crawlspace walls.*



- **Install a drain or sump in basement and crawlspace floors.**



1.1 Site and Foundation Drainage



1.1 Site and Foundation Drainage Verification

- Can be builder or Rater verified.
- **Visually verify during pre-slab** inspection the drain or sump pump's discharge to daylight (including distance from the foundation) or connection to the sewer.
- In Radon Zone 1, visually verify check-valve installed.
- Review documentation of free-draining soils when the exception is used.

Section	Requirements (Refer to full <u>Indoor airPLUS</u> Construction Specifications for details)	Must Correct	Builder Verified	Rater Verified	N/A
Moisture Control	1.1 Drain or sump pump installed in basements and crawlspaces (Exception: free-draining soils). In EPA Radon Zone 1, check valve also installed.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.2 Layer of aggregate or sand (4 in.) with geotextile matting installed below slabs (Exceptions: see spec) AND radon techniques used in EPA Radon Zone 1.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.4 Basements/crawlspaces insulated, sealed and conditioned (Exceptions: see spec).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.7 Protection from water splash damage if no gutters (Exceptions: see spec).	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
	1.11 Hard-surface flooring in kitchens, baths, entry, laundry and utility rooms, AND piping in exterior walls insulated with pipe wrap.	<input type="checkbox"/>		<input type="checkbox"/>	



1.2 Capillary Break Installation



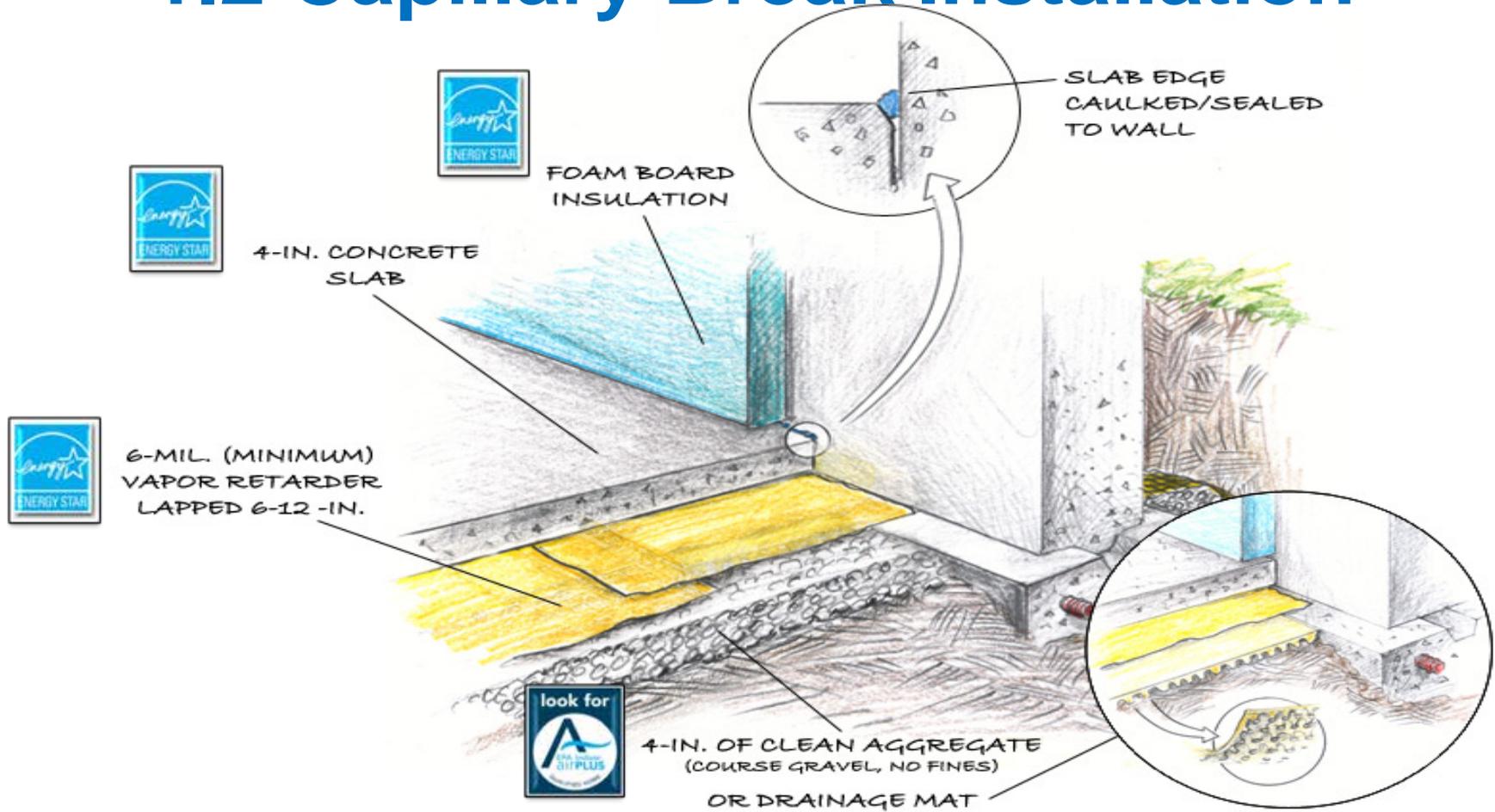
- *Install polyethylene sheeting or extruded polystyrene beneath concrete slabs.*
- *Install a capillary break at all crawlspace floors using polyethylene sheeting.*



- **Under the polyethylene sheeting or extruded polystyrene (XPS) insulation:**
 - **Install a 4 in. layer of aggregate; OR**
 - **A uniform layer of sand, overlain with a layer of geotextile drainage matting.**



1.2 Capillary Break Installation



BASEMENT SLAB W/ CAPILLARY BREAK - GRAVEL AND GEOTEXTILE MAT (INSET)

1.2 Capillary Break Installation Verification

- Can be builder or Rater verified.
- **Visually verify during pre-slab inspection** the capillary break is properly installed.
- In Radon Zone 1: Visually verify polyethylene sheeting has been overlapped 6 – 12 in. and the ENERGY STAR staking method for crawlspaces has not been used.

Section	Requirements (Refer to full <u>Indoor airPLUS</u> Construction Specifications for details)	Must Correct	Builder Verified	Rater Verified	N/A
Moisture Control	1.1 Drain or sump pump installed in basements and crawlspaces (Exception: free-draining soils). In EPA Radon Zone 1, check valve also installed.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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	1.7 Protection from water splash damage if no gutters (Exceptions: see spec).	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
	1.11 Hard-surface flooring in kitchens, baths, entry, laundry and utility rooms, AND piping in exterior walls insulated with pipe wrap.	<input type="checkbox"/>		<input type="checkbox"/>	



1.3+1.4 Below-grade Foundation Walls



- *Waterproof crawlspace and basement perimeter walls.*
- *All floors above unconditioned spaces shall be insulated.*



- **Insulate crawlspace and basement perimeter walls.**
- **Seal crawlspace and basement perimeter walls.**
- **Provide conditioned air.**



1.4 Basement and Crawlspace Verification

- Can be builder or Rater verified.
- **Visually verify during pre-drywall** inspection the proper sealing and insulation (IECC 2009) of the crawlspace/basement.
- Review **documented calculations before the start of construction** for the required rate of conditioned air.

Section	Requirements (Refer to full <u>Indoor airPLUS</u> Construction Specifications for details)	Must Correct	Builder Verified	Rater Verified	N/A
Moisture Control	1.1 Drain or sump pump installed in basements and crawlspaces (Exception: free-draining soils). In EPA Radon Zone 1, check valve also installed.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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	1.4 Basements/crawlspaces insulated, sealed and conditioned (Exceptions: see spec).	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
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Indoor Air Quality (IAQ)

1.4 Basement and Crawlspace Verification

2009 International Energy Conservation Code (IECC)

TABLE 402.1.1
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT^a

CLIMATE ZONE	FENESTRATION U-FACTOR ^b	SKYLIGHT ^b U-FACTOR	GLAZED FENESTRATION SHGC ^{b, e}	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE ⁱ	FLOOR R-VALUE	BASEMENT ^c WALL R-VALUE	SLAB ^d R-VALUE & DEPTH	CRAWL SPACE ^c WALL R-VALUE
1	1.2	0.75	0.30	30	13	3/4	13	0	0	0
2	0.65 ^j	0.75	0.30	30	13	4/6	13	0	0	0
3	0.50 ^j	0.65	0.30	30	13	5/8	19	5/13 ^f	0	5/13
4 except Marine	0.35	0.60	NR	38	13	5/10	19	10 /13	10, 2 ft	10/13
5 and Marine 4	0.35	0.60	NR	38	20 or 13+5 ^h	13/17	30 ^g	10/13	10, 2 ft	10/13
6	0.35	0.60	NR	49	20 or 13+5 ^h	15/19	30 ^g	15/19	10, 4 ft	10/13
7 and 8	0.35	0.60	NR	49	21	19/21	38 ^g	15/19	10, 4 ft	10/13



Indoor Air Quality (IAQ)

1.5 – 1.7 Wall Drainage System



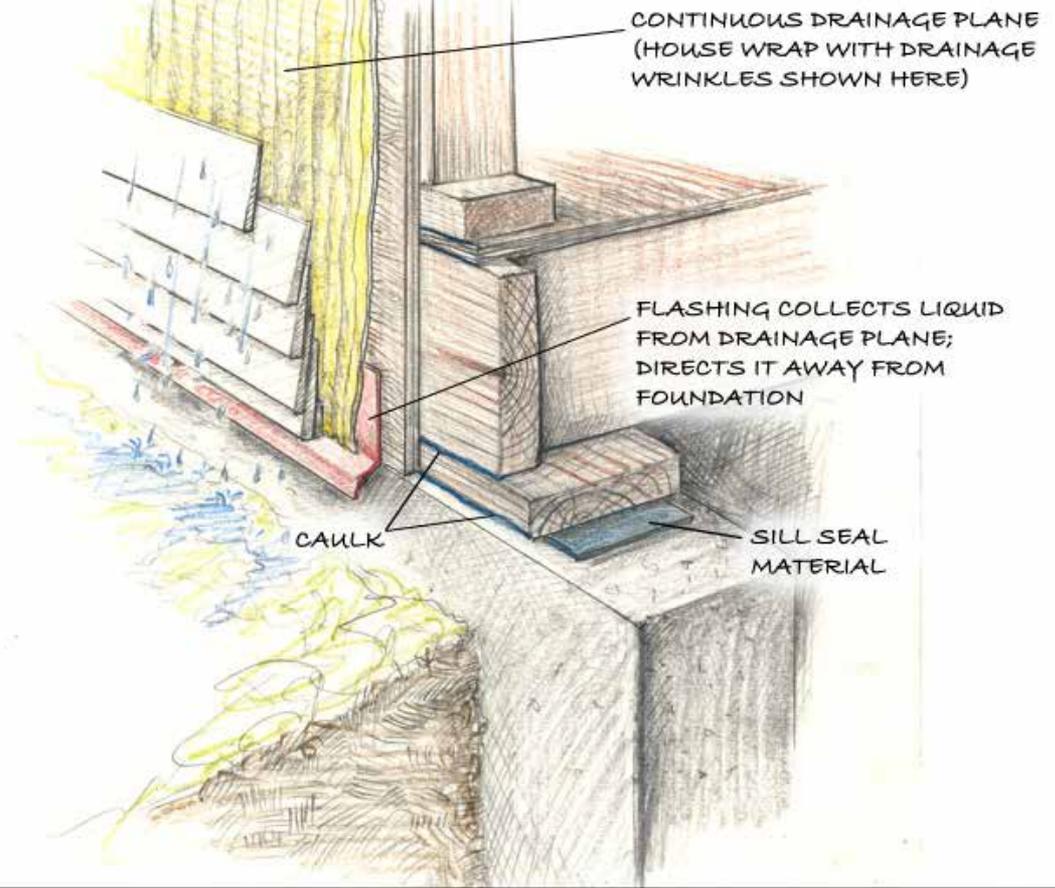
- *Install a drainage plane behind exterior wall cladding.*
- *Install flashing at the bottom of exterior walls.*
- *Fully flash all window and door openings.*
- *Direct roof water away from the house using gutters or an underground catchment system.*



- **For homes that meet ENERGY STAR exceptions for gutters and downspouts, provide protection for water splash damage by one of the following**
 - **Extend the foundation walls 16 in. above grade.**
 - **Provide a drip line that is 16 in. from the foundation.**
 - **Install cladding that can tolerate wetting and a drainage plane that extends 16 in. above grade.**



1.5 – 1.7 Wall Drainage System



SIDING WITH DRAINAGE PLANE AND FLASHING



1.7 Gutters, Downspouts, and Site Drainage Verification

- Must be Rater verified.
- The Rater should **coordinate with the builder before construction to verify** what ENERGY STAR or Indoor airPLUS compliance option is being pursued.
- The Rater should **visually verify at final inspection** that the selected compliance option is properly installed (for example, that the foundation wall is extended *at least 16in.* above final grade).

Section	Requirements (Refer to full <u>Indoor airPLUS</u> Construction Specifications for details)	Must Correct	Builder Verified	Rater Verified	N/A
Moisture Control	1.1 Drain or sump pump installed in basements and crawlspaces (Exception: free-draining soils). In EPA Radon Zone 1, check valve also installed.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.2 Layer of aggregate or sand (4 in.) with geotextile matting installed below slabs (Exceptions: see spec) AND radon techniques used in EPA Radon Zone 1.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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	1.11 Hard-surface flooring in kitchens, baths, entry, laundry and utility rooms, AND piping in exterior walls insulated with pipe wrap.	<input type="checkbox"/>		<input type="checkbox"/>	

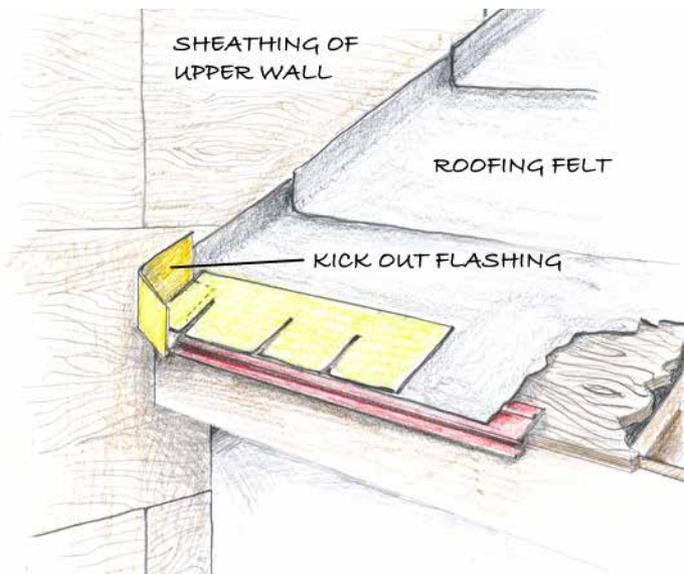


Indoor Air Quality (IAQ)

1.8 – 1.10 Water Managed Roof



- *Fully flash all roof-to-wall intersections and all roof penetrations.*
- *Install a bituminous membrane or the equivalent at all valleys and roof decking penetrations.*
- *Install ice flashing over the sheathing at eaves.*



Indoor Air Quality (IAQ)

1.11 Moisture-Resistant Materials



- *Install moisture-resistant backing material behind tub and shower enclosures.*
- *Install a corrosion-resistant drain pan.*



- **Install only water-resistant hard-surface flooring in kitchens, bathrooms, entryways, laundry areas, and utility rooms.**
- **Insulate water supply pipes in exterior walls with pipe wrap.**



1.11 Moisture Resistant-Materials Verification

- Must be Rater verified.
- The Rater should **visually verify at the pre-drywall inspection** that all water supply lines in exterior walls are properly insulated with pipe wrap.
- The Rater should **visually verify at final inspection** that only water-resistant hard-surface flooring is installed in the required rooms.

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Moisture Control	1.1 Drain or sump pump installed in basements and crawlspaces (Exception: free-draining soils). In EPA Radon Zone 1, check valve also installed.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.2 Layer of aggregate or sand (4 in.) with geotextile matting installed below slabs (Exceptions: see spec) AND radon techniques used in EPA Radon Zone 1.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.4 Basements/crawlspaces insulated, sealed and conditioned (Exceptions: see spec).	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	1.7 Protection from water splash damage if no gutters (Exceptions: see spec).	<input type="checkbox"/>		<input checked="" type="checkbox"/>	<input type="checkbox"/>
	1.11 Hard-surface flooring in kitchens, baths, entry, laundry and utility rooms, AND piping in exterior walls insulated with pipe wrap.	<input type="checkbox"/>		<input checked="" type="checkbox"/>	



Indoor Air Quality (IAQ)

1.12 Class 1 Vapor Retarders



- *Do not install Class 1 vapor retarders on the interior side of below-grade exterior walls or in any exterior walls in Warm-Humid climates.*



Indoor Air Quality (IAQ)

1.13 Materials with Water Damage / Mold



- *Do not install building materials that have visible signs of water damage or mold.*
- *Do not enclose framing members and insulation products having high moisture content.*
- *For wet-applied insulation, follow the manufacturer's drying recommendations.*
- *Lumber with water and/or mold damage may be used only if visible mold has been physically removed.*
- *Note: Lumber with "sap stain fungi" may be used as long as the lumber is structurally intact.*



Indoor Air Quality (IAQ)

1.13 Materials with Water Damage / Mold



Bad

Good



Indoor Air Quality (IAQ)

1. Moisture Control / Water Management



Benefits

Structural durability.

Flood mitigation.

Fewer maintenance issues from peeling paint and moldy grout.

Moisture and water damage reduction.

Reduces potential for mold growth – even in places you can't see.



Indoor Air Quality (IAQ)

Rev.1.13.14

Revision 1 Moisture Control Changes

Section	Changes
1. Moisture Control	Majority of Indoor airPLUS requirements now incorporated into ENERGY STAR.
1.1 Water Managed Site and Foundation	<u>Exception Added:</u> Drain or sump pump not required in areas of free draining soils.
1.7 Gutters, Downspouts and Site Drainage	<u>Compliance Option Added:</u> Homes that meet the ENERGY STAR exceptions for gutter and downspouts must also provide protection for water splash damage (exemption for dry climates).
1.13 Materials with Signs of Water Damage or Mold	<p><u>Compliance Option Added:</u> Lumber with signs of superficial water and/or mold damage may be used only if visible mold has been physically removed.</p> <p><u>Exception Added:</u> Wood with sap stains may be used as long as wood is structurally intact.</p>



Revision 2 Moisture Control Changes

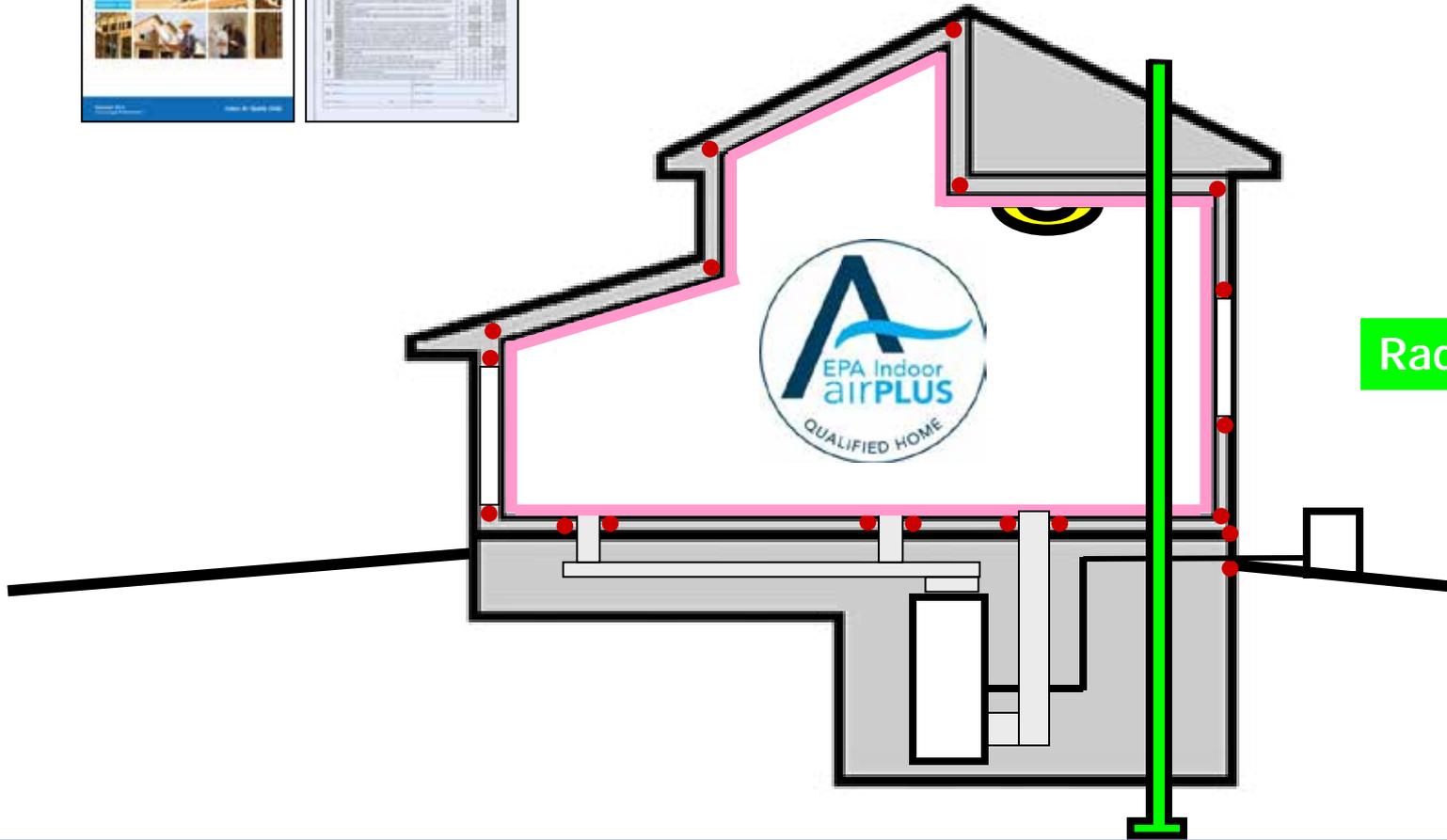
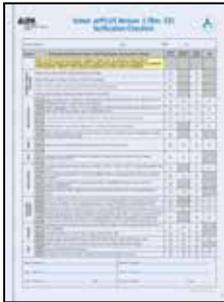
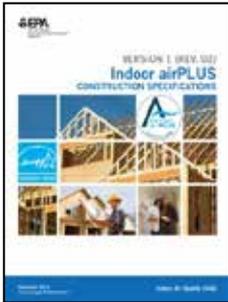
Section	Changes
1.2 Capillary Break	<p><u>Clarification added:</u> XPS may be used under slabs provided it is used in addition to the required 6 mil polyethylene sheeting.</p> <p><u>Exceptions added (non-EPA Radon Zone 1):</u> Sand or aggregate under slab not required in areas with free-draining soils or homes with slab-on-grade foundations.</p>



2. Radon

**SURGEON GENERAL'S
WARNING:**

Radon Causes Lung Cancer.
You Should Test Your Home.



Radon Control

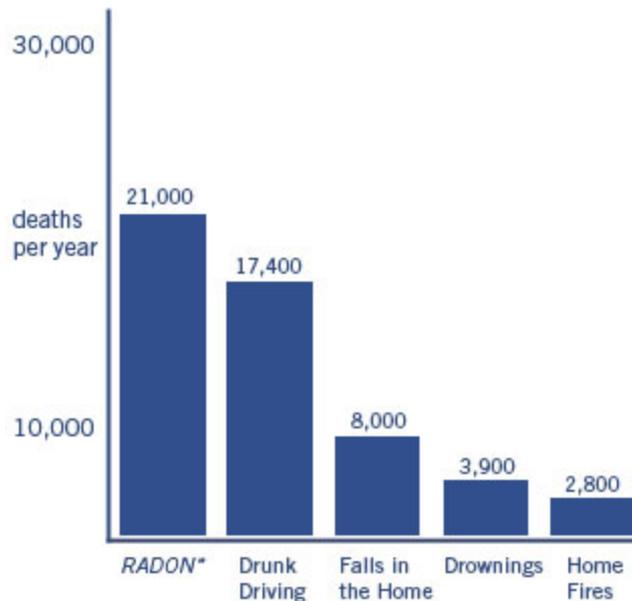


Indoor Air Quality (IAQ)

2. Radon

**SURGEON GENERAL'S
WARNING:**

Radon Causes Lung Cancer.
You Should Test Your Home.



- Radon is a cancer-causing, radioactive gas created by the natural breakdown of uranium in soil.
- Radon can be found all over the US.
- 1 in 15 homes have radon above 4 pCi/L.
- You are most likely to get your greatest exposure to radon at home.
- Radon is the second leading cause of lung cancer after smoking.



Indoor Air Quality (IAQ)

2.1 Radon Control



- *Air seal all sump covers.*

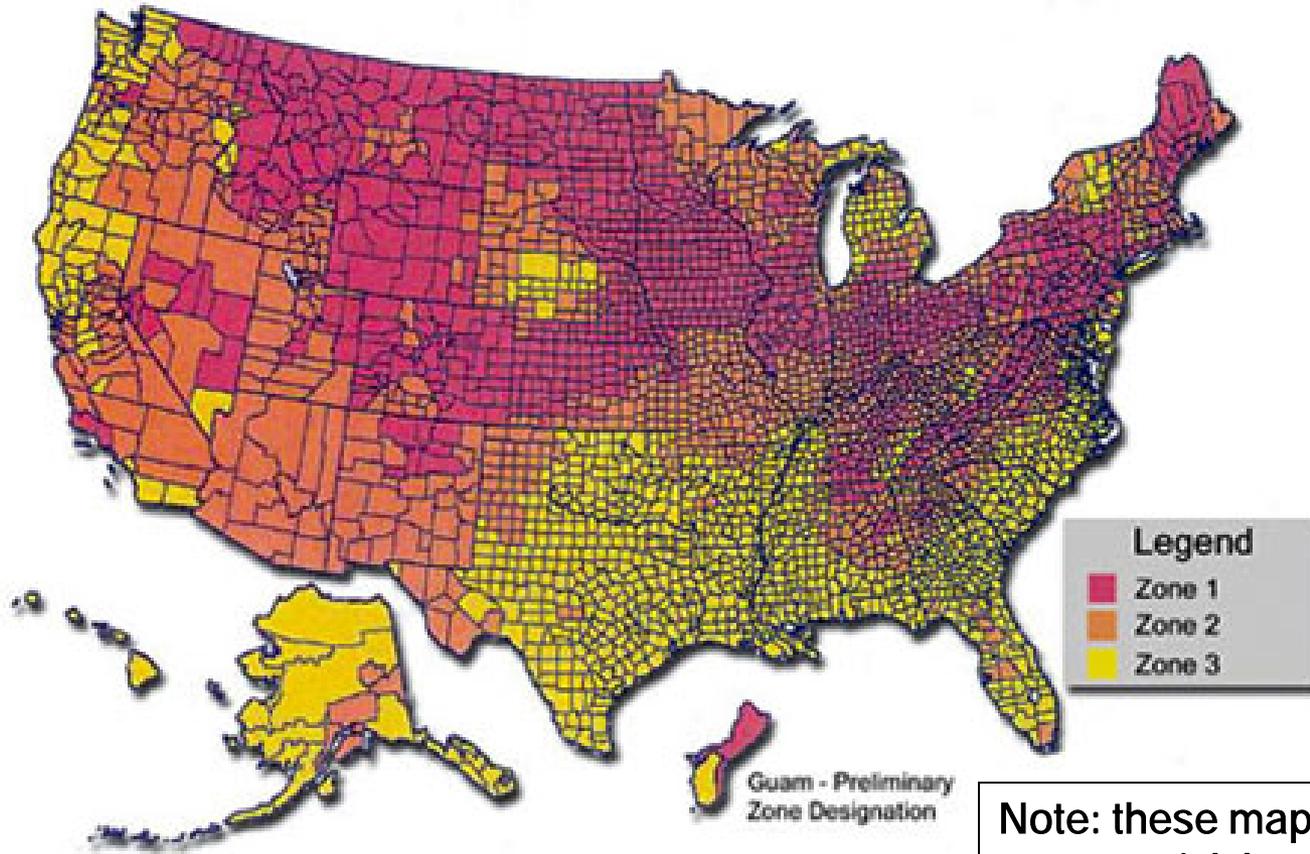


- **Construct homes built in EPA Radon Zone 1 with radon-resistant features.**
- **Advisory:**
 - **Passive Systems in Zones 2 & 3.**
 - **Educate homeowners.**



2.1 Radon Control

EPA Map of Radon Zones



**Surgeon General's Warning:
Radon Causes Lung Cancer**

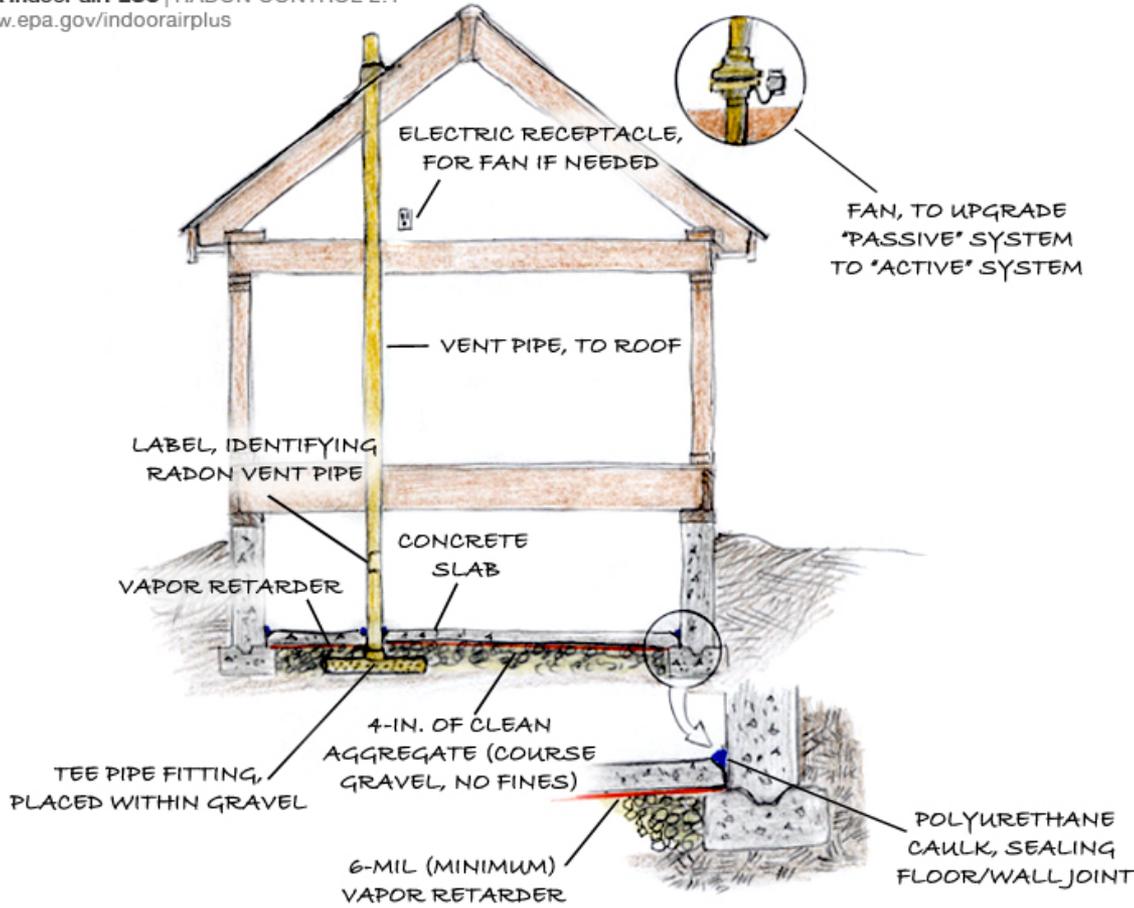
**Note: these maps indicate
average risk by county.
However, high levels of radon
can be found in any home.**



Indoor Air Quality (IAQ)

2.1 Radon Control

EPA Indoor airPLUS | RADON CONTROL 2.1
www.epa.gov/indoorairplus



Indoor Air Quality (IAQ)

Rev.1.13.14

2.1 Radon Resistant Construction Verification

- Can be builder or Rater verified.
- **Verify documentation before the start of construction** of an approved radon mitigation system.
- The aggregate layer, connected to a vent pipe under overlapped polyethylene sheeting, should be **visually verified before pouring the slab.**
- The fully connected vent pipe, fan/electrical receptacle, and foundation air sealing should be **visually verified at pre-drywall inspection.**

Section	Requirements (Refer to full Indoor <u>airPLUS</u> Construction Specifications for details)	Must Correct	Builder Verified	Rater Verified	N/A
Radon	2.1 Approved radon-resistant features installed in Radon Zone 1 homes.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>



Indoor Air Quality (IAQ)

2.1 Radon Control

Homeowner Benefits



Protection against radon, the second leading cause of lung cancer in the U.S.



**SURGEON GENERAL'S
WARNING:
Radon Causes Lung Cancer.**

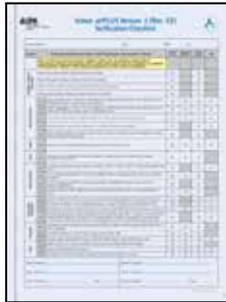
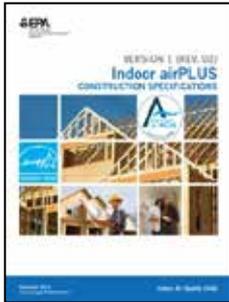


Revision 1 Radon Changes

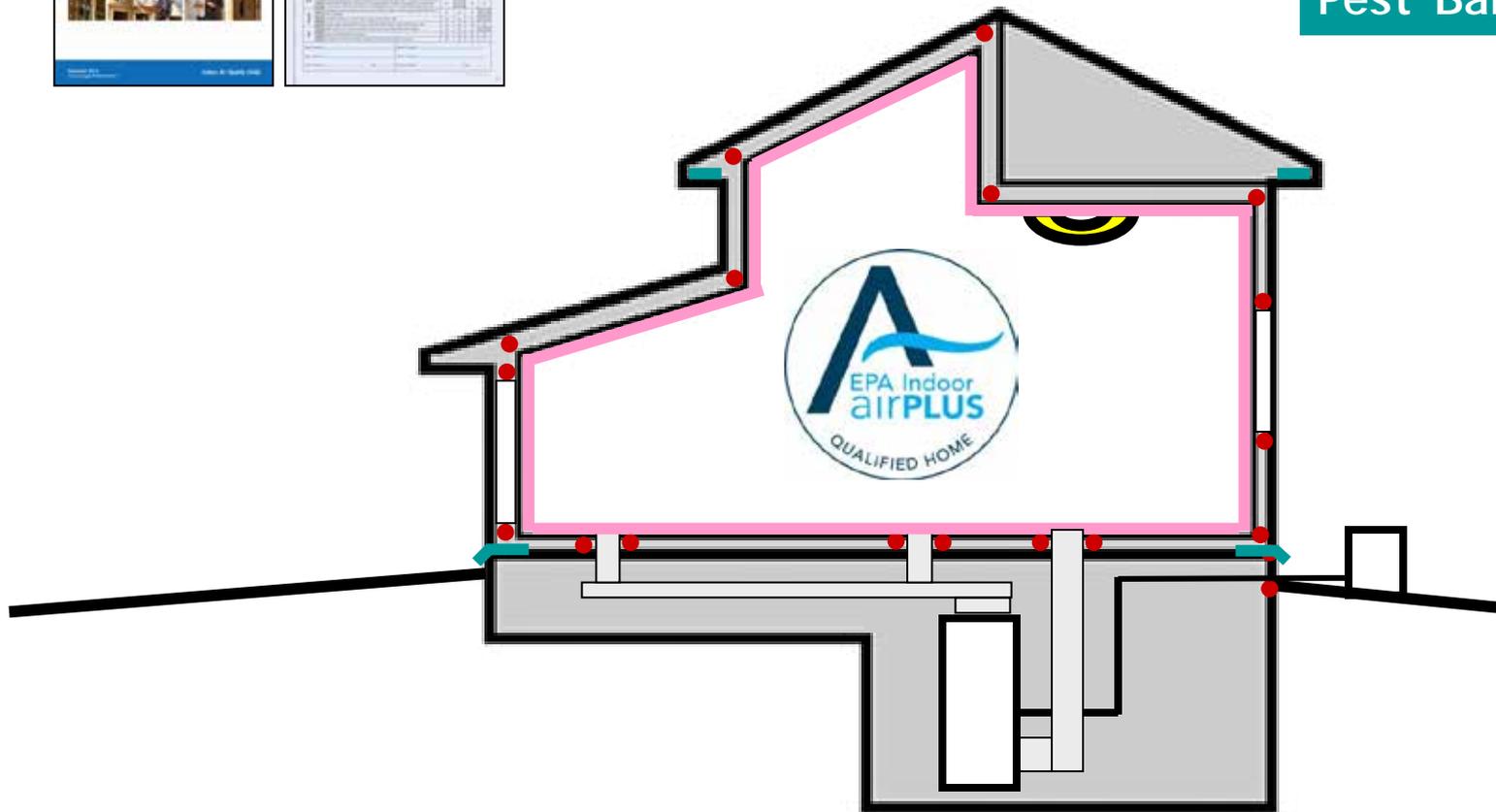
Section	Changes
2. Radon	
2.1 Radon-Resistant Construction	<p><u>References Removed:</u> Appendix F; CABO.</p> <p><u>Advisories Added:</u> Including a radon vent fan and installing radon resistant features in EPA Radon Zones 2 and 3 are recommended.</p> <p><u>Advisories Added:</u> Radon testing recommended.</p>
2.2 Radon Test Kits	<p><u>Requirement Removed:</u> Radon test kits are no longer required to be provided to homebuyers.</p>



3. Pest Barriers



Pest Barriers



Indoor Air Quality (IAQ)

3. Pest Barriers



3.1 Minimize Pathways for Pest Entry



- Seal all penetrations and joints between the foundation and exterior wall assemblies.
- Air seal all sump covers.



No additional Indoor airPLUS Requirements.

Advisories:

- **When sealing large gaps use copper or stainless steel wool.**
- **Additional precautions should be taken in areas classified as “Moderate to Heavy” termite infestation.**



Indoor Air Quality (IAQ)

3.2 Rodent/Bird Screens



- Provide corrosion-proof rodent/bird screens for all building openings that cannot be fully sealed and caulked.



3.2 Rodent/Bird Screens Verification

- Can be builder or Rater verified.
- **Visually verify at final inspection** that all openings are either sealed or covered by a corrosion-proof screen.

Section	Requirements (Refer to full Indoor <u>airPLUS</u> Construction Specifications for details)	Must Correct	Builder Verified	Rater Verified	N/A
Pests	3.2 Corrosion-proof rodent/bird screens installed at all openings that cannot be fully sealed (Exception: dryer vents).	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	



3.2 Rodent/Bird Screens

Homeowner Benefits



Prevention of potential damage from pests to the home.



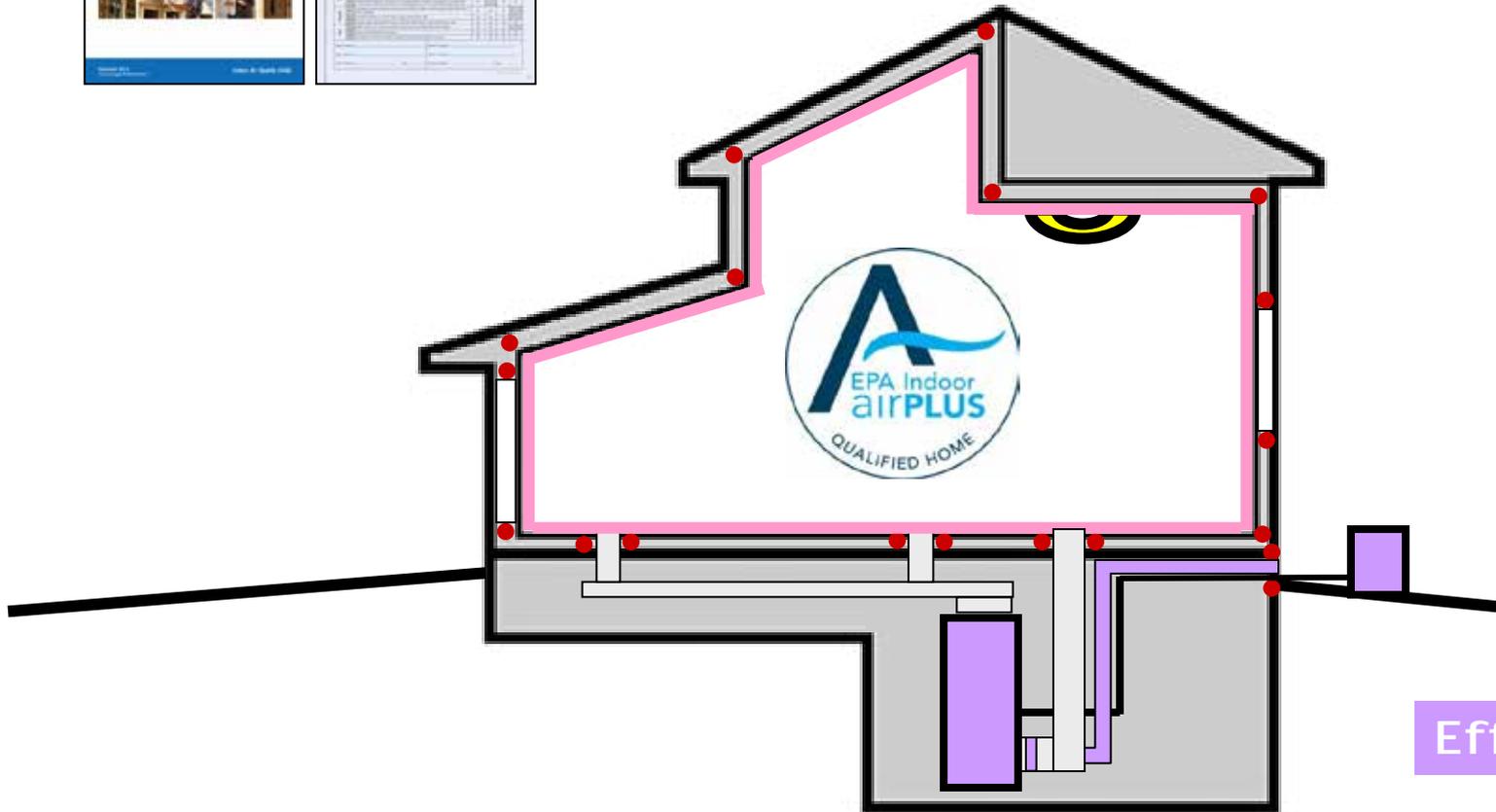
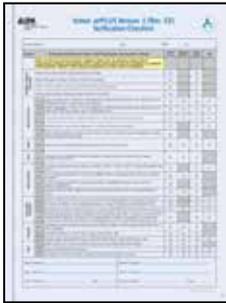
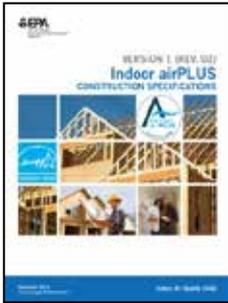
Less vacuuming and dusting.



Reduced pest-related allergens, asthma triggers and diseases.



4. HVAC Systems

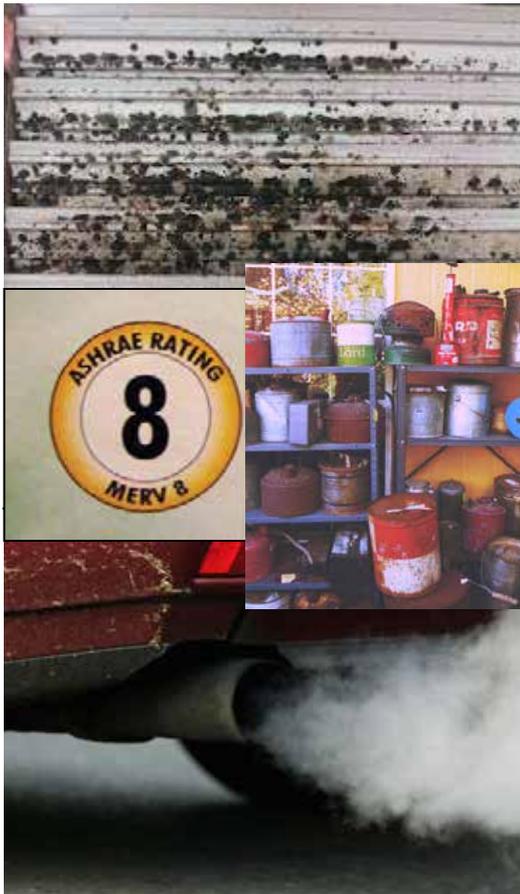


Effective HVAC



Indoor Air Quality (IAQ)

4. HVAC Systems



- Indoor relative humidity greater than 60% can encourage mold growth and attract organisms such as dust mites or other pests.
- HVAC components in wall cavities and garages can expose occupants to mold, carbon monoxide, hydrocarbons, nitrogen oxides, radon, pesticides and other contaminants.
- Ordinary residential panel filters collect less than 20 percent of the particles between 3 and 10 microns. A MERV 8 filter collects more than 70% of the particles in this range.



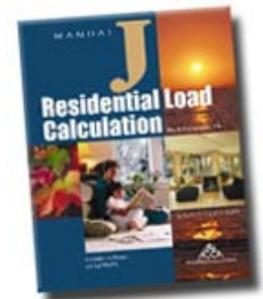
4.1 HVAC Sizing and Design



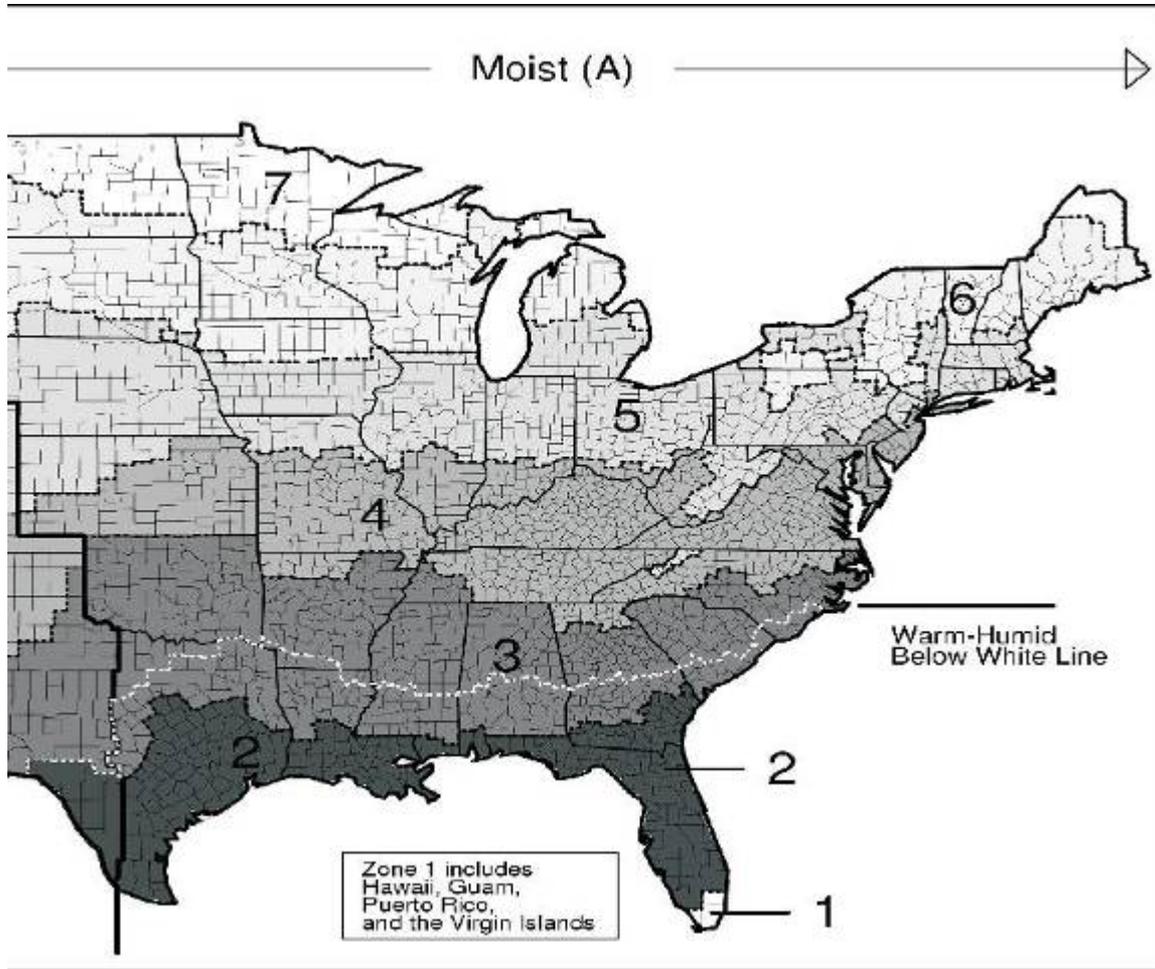
- *Properly size all heating and cooling equipment using ACCA Manual J, ASHRAE Handbooks, or equivalent software.*



- **"Warm-Humid" climates: equipment shall be installed with sufficient latent capacity to maintain indoor relative humidity (RH) at or below 60 percent.**



4.1 HVAC Sizing and Design



Controlled to $\leq 60\%$ RH



Indoor Air Quality (IAQ)

4.1 HVAC Sizing and Design Verification

- Must be Rater verified.
- Rater should **verify documentation before the start of construction** showing the method and calculations for retaining an indoor relative humidity below 60 percent.
- Rater should **visually verify at final inspection** that the designed system has been properly installed.

Section	Requirements (Refer to full Indoor <u>airPLUS</u> Construction Specifications for details)	Must Correct	Builder Verified	Rater Verified	N/A
HVAC Systems	4.1 Equipment selected to keep relative humidity < 60% in “Warm-Humid” climates (Exception: see spec).	<input type="checkbox"/>		<input checked="" type="checkbox"/>	<input type="checkbox"/>
	4.2 Duct systems protected from construction debris AND no building cavities used as air supplies or returns.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	4.3 No air-handling equipment or ductwork installed in garage AND continuous air barrier in adjacent assemblies.	<input type="checkbox"/>		<input type="checkbox"/>	
	4.7 Central forced-air HVAC system(s) have minimum MERV 8 filter AND no ozone generators in home.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	



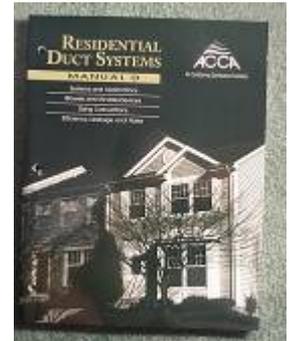
4.2 Duct System Design and Installation



- *Design all duct systems according to ACCA Manual D, ASHRAE Handbooks, or equivalent software.*
- *Ensure that all duct systems are airtight and properly balanced.*



- **Do not use building cavities as part of the forced air supply or return systems.**
- **Cover duct openings throughout construction or vacuum out ducts prior to installing registers.**



4.2 Duct System Design and Installation



SEALING WITH MASTIC



4.2 Duct System Design and Installation Verification

- Can be builder or Rater verified.
- **Visually verify at pre-drywall inspection** that no cavities are used as part of the forced air system.
- Verify that all duct openings were covered during construction or have been thoroughly vacuumed upon completion.

Section	Requirements (Refer to full Indoor <u>airPLUS</u> Construction Specifications for details)	Must Correct	Builder Verified	Rater Verified	N/A
HVAC Systems	4.1 Equipment selected to keep relative humidity < 60% in “Warm-Humid” climates (Exception: see spec).	<input type="checkbox"/>		<input checked="" type="checkbox"/>	<input type="checkbox"/>
	4.2 Duct systems protected from construction debris AND no building cavities used as air supplies or returns.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	4.3 No air-handling equipment or ductwork installed in garage AND continuous air barrier in adjacent assemblies.	<input type="checkbox"/>		<input type="checkbox"/>	
	4.7 Central forced-air HVAC system(s) have minimum MERV 8 filter AND no ozone generators in home.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

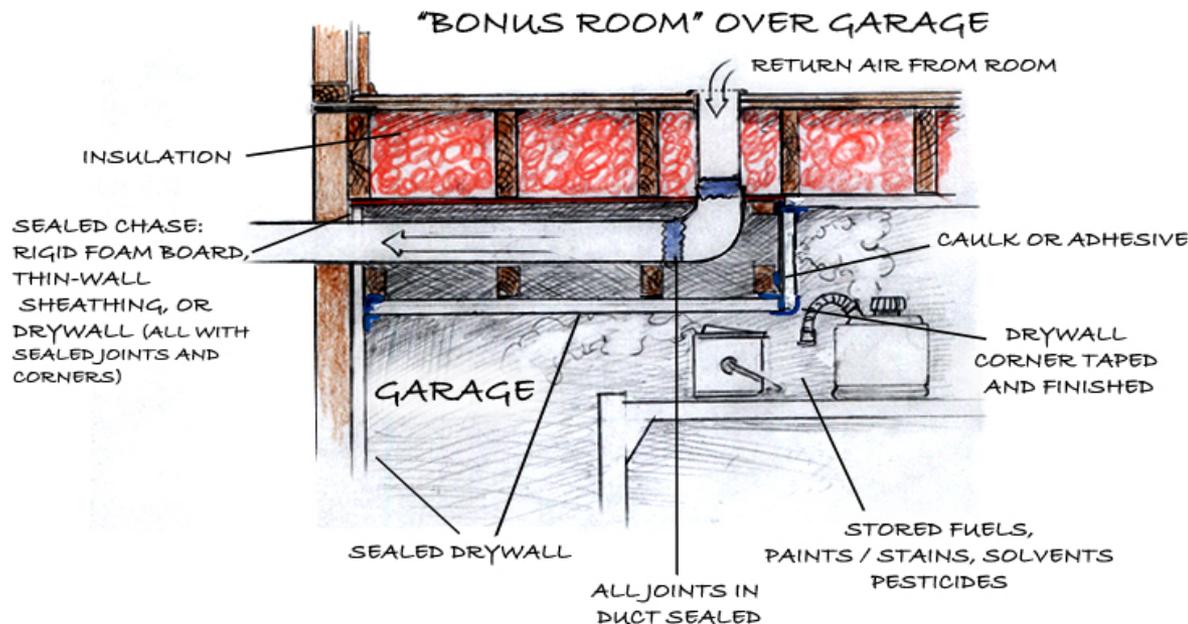


Indoor Air Quality (IAQ)

4.3 Location of Air Handler and Ducts



- Do not locate air-handling equipment or ductwork in garages.
- Note: Ducts may be located in building cavities adjacent to the garage if they are separated with a continuous air barrier.



4.3 Location of Air-Handling Equipment and Ductwork Verification

- Must be Rater verified.
- Rater should **visually verify at pre-drywall inspection** that no air-handling equipment or ductwork has been installed in the garage and any ducts or equipment located in adjacent framing spaces has been separated from the garage space by a continuous air barrier.

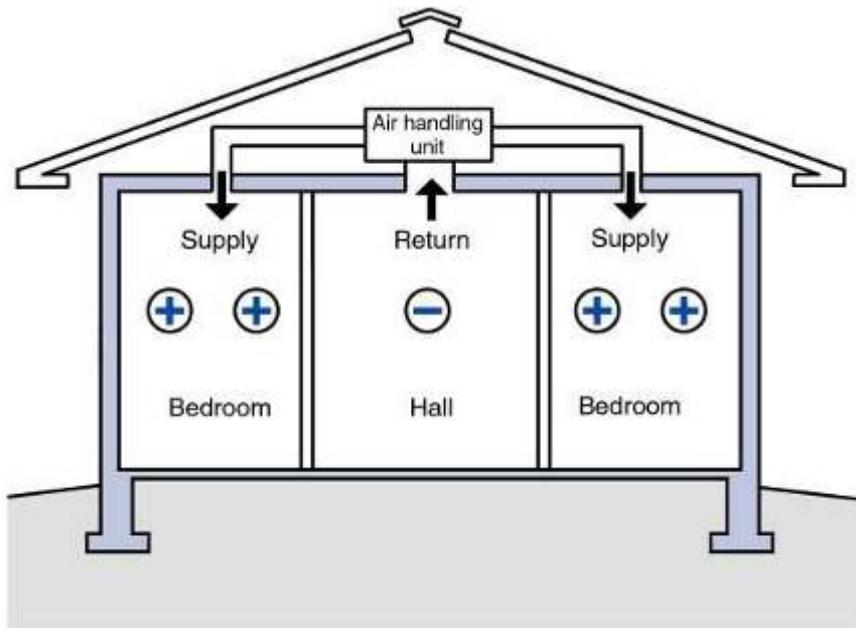
Section	Requirements (Refer to full Indoor <u>airPLUS</u> Construction Specifications for details)	Must Correct	Builder Verified	Rater Verified	N/A
HVAC Systems	4.1 Equipment selected to keep relative humidity < 60% in “Warm-Humid” climates (Exception: see spec).	<input type="checkbox"/>		<input checked="" type="checkbox"/>	<input type="checkbox"/>
	4.2 Duct systems protected from construction debris AND no building cavities used as air supplies or returns.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	4.3 No air-handling equipment or ductwork installed in garage AND continuous air barrier in adjacent assemblies.	<input type="checkbox"/>		<input checked="" type="checkbox"/>	
	4.7 Central forced-air HVAC system(s) have minimum MERV 8 filter AND no ozone generators in home.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	



4.4 Room Pressure Differentials



- *Minimize room pressure differentials for any bedroom that does not have a dedicated return.*



JUMP DUCT



4.5 Mechanical Whole-House Ventilation



- *Provide mechanical whole-house ventilation meeting ASHRAE 62.2-2010.*
- *Test airflows to ensure they meet ASHRAE 62.2-2010.*



- **Advisory: Outdoor air ducts connected to the return side of an air handler should be used as supply ventilation only if the manufacturers' requirements for return air temperature are met.**



4.5 Mechanical Whole-House Ventilation



**FRESH AIR
DAMPER**



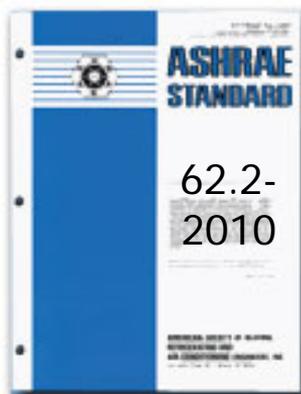
DUCTED FRESH AIR SUPPLY



4.6 Local Exhaust



- *Provide local mechanical exhaust ventilation in each bathroom and kitchen, meeting ASHRAE 62.2-2010.*
- *Vent all conventional clothes dryers directly to the outdoors.*



LOCAL EXHAUST



4.7 Filtration



- *Equip all filter access panels with gasket material or comparable sealing mechanism to prevent bypass air.*



- **Install only HVAC filters that are rated MERV 8 or higher.**
- **Do not install any air-cleaning equipment designed to produce ozone.**



4.7 Filtration for Central Forced-Air HVAC Systems

Verification

- Can be builder or Rater verified.
- Coordinate with the builder and/or HVAC contractor **before the start of construction** to ensure that:
 - no ozone-producing air-cleaning equipment will be installed AND
 - a MERV 8 filter is accommodated in the HVAC design.
- **Visually verify at final inspection** that the filter has been installed.

Section	Requirements (Refer to full Indoor <u>airPLUS</u> Construction Specifications for details)	Must Correct	Builder Verified	Rater Verified	N/A
HVAC Systems	4.1 Equipment selected to keep relative humidity < 60% in "Warm-Humid" climates (Exception: see spec).	<input type="checkbox"/>		<input checked="" type="checkbox"/>	<input type="checkbox"/>
	4.2 Duct systems protected from construction debris AND no building cavities used as air supplies or returns.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	4.3 No air-handling equipment or ductwork installed in garage AND continuous air barrier in adjacent assemblies.	<input type="checkbox"/>		<input checked="" type="checkbox"/>	
	4.7 Central forced-air HVAC system(s) have minimum MERV 8 filter AND no ozone generators in home.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	



Indoor Air Quality (IAQ)

4.1 HVAC Systems



Homeowner Benefits

Reduced exposure to the harmful effects of mold and mildew growth.

A more comfortable humidity level in the home, year round.

Improved lifespan of building materials and a more durable home.

Helps remove allergens, toxins, irritants and asthma triggers from the home.

House stays cleaner.



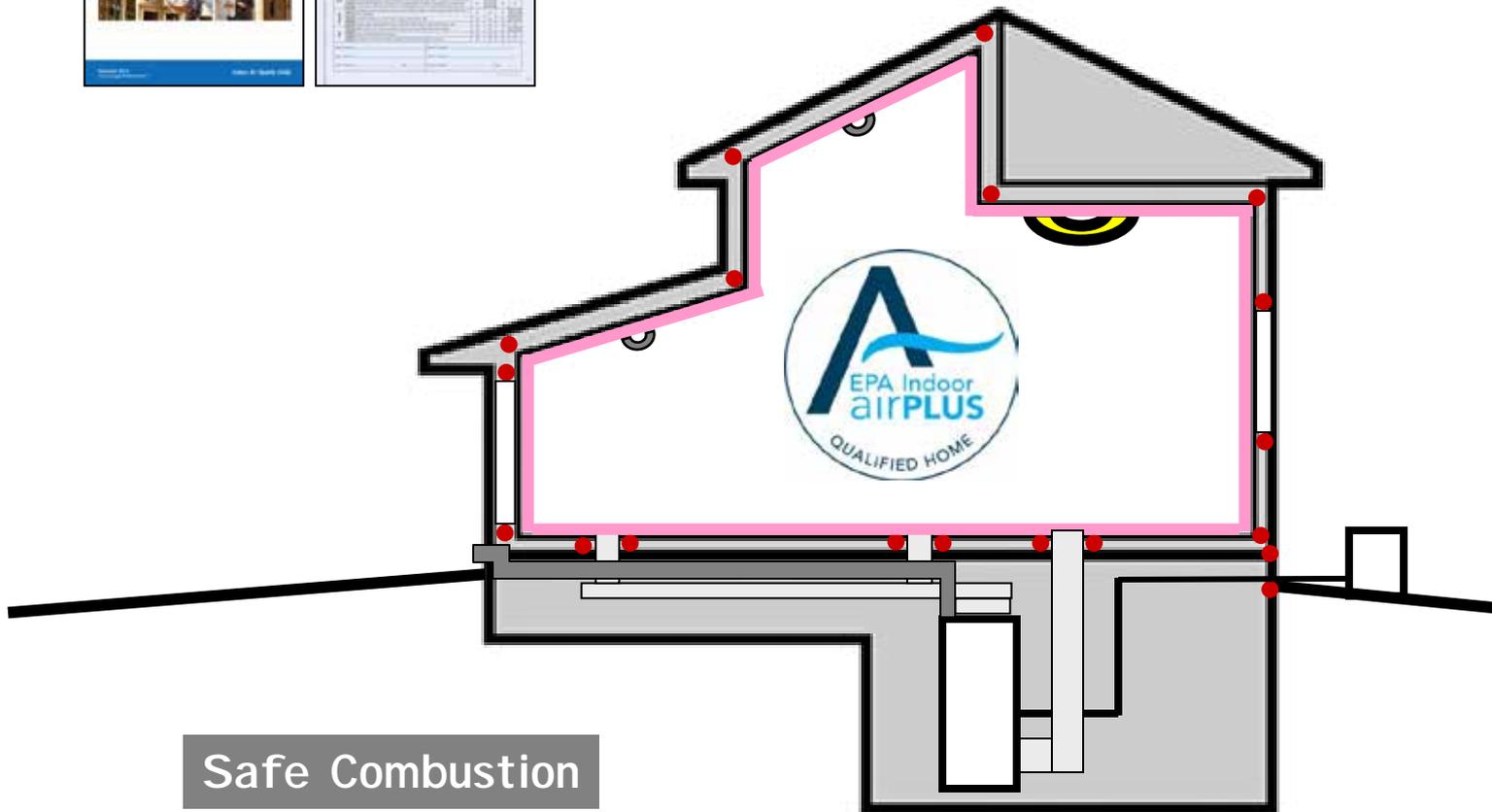
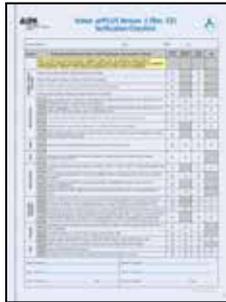
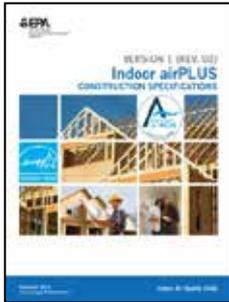
Indoor Air Quality (IAQ)

Revision 1 HVAC Changes

Section	Changes
4. HVAC	
4.1 HVAC Sizing and Design	Original Indoor airPLUS Specification numbers 4.1 and 4.8 now combined under the new 4.1.
4.2 Duct System Design and Installation	Formatting revised to clarify that building cavities cannot be used as part of the forced air supply or return systems.



5. Combustion Pollutants



Indoor Air Quality (IAQ)

5. Combustion Pollutants



- Accidental carbon monoxide (CO) poisoning kills an average of 439 persons annually (CDC; MMWR; 12/21/2007).
- Carbon monoxide, an odorless, colorless gas, which can cause sudden illness and death, is produced any time a fossil fuel is burned.



5.1 Combustion Equipment



- *Mechanically draft or direct vent all gas- and oil-fired furnaces, boilers and water heaters.*
- *Fireplaces that are not mechanically drafted must meet exhaust flow or pressure differential.*



- **Do not install any unvented combustion space-heating appliances.**
- **Ensure naturally drafted fuel-burning appliances comply with ASHRAE 62.2 or conduct a Worst Case Depressurization Combustion Air Zone (CAZ) Test.**
- **Ensure that all fireplaces and other fuel-burning appliances are vented to the outdoors and supplied with ventilation air.**
- **Meet emissions standards and restrictions for all fuel-burning appliances located in conditioned spaces.**



5.1 Combustion Equipment



POWER VENTED WATER HEATER

DIRECT VENTED FURNACE



5.1 Combustion Equipment Verification

- Must be Rater verified.
- Rater should **verify documentation before the start of construction** that all combustion appliances meet the required emissions standards and **visually verify at final inspection** that the specified equipment has been installed or conduct a combustion air zone test if applicable.

Section	Requirements (Refer to full Indoor airPLUS Construction Specifications for details)	Must Correct	Builder Verified	Rater Verified	N/A
Combustion Pollutants	5.1 Emissions standards met for fuel-burning and space-heating appliances (Exception: see spec).	..		<input checked="" type="checkbox"/>	..
	5.2 CO alarms installed in each sleeping zone (e.g., common hallway) according to NFPA 720.	..		..
	5.3 Multifamily buildings: Smoking restrictions implemented AND ETS transfer pathways minimized.	..	..	..	..
	5.4 Attached garages: Door closer installed on all connecting doors AND in homes with exhaust-only whole-house ventilation, EITHER a 70 cfm exhaust fan installed in garage OR a pressure test conducted to verify the effectiveness of the garage-to-house air barrier. See spec for details.	..		..	..



5.2 Carbon Monoxide Alarms



- All homes with combustion appliance(s) or an attached garage shall have a carbon monoxide (CO) alarm installed in a central location in the immediate vicinity of each separate sleeping zone.



CO ALARM



COMBINED CO & SMOKE ALARM



5.2 Carbon Monoxide Alarms

Verification

- Must be Rater verified.
- Rater should **visually verify at final inspection** that a carbon monoxide alarm has been installed in a central location in the immediate vicinity of each sleeping zone.

Section	Requirements (Refer to full Indoor airPLUS Construction Specifications for details)	Must Correct	Builder Verified	Rater Verified	N/A
Combustion Pollutants	5.1 Emissions standards met for fuel-burning and space-heating appliances (Exception: see spec).	..		■	..
	5.2 CO alarms installed in each sleeping zone (e.g., common hallway) according to NFPA 720.	..		■	
	5.3 Multifamily buildings: Smoking restrictions implemented AND ETS transfer pathways minimized.	..	..	..	..
	5.4 Attached garages: Door closer installed on all connecting doors AND in homes with exhaust-only whole-house ventilation, EITHER a 70 cfm exhaust fan installed in garage OR a pressure test conducted to verify the effectiveness of the garage-to-house air barrier. See spec for details.	..		..	..



5.3 Multi-family ETS Protections



- **Reduce exposure to environmental tobacco smoke (ETS) in multi-family buildings by:**
 - **Prohibiting smoking in indoor common areas.**
 - **Locating designated outdoor smoking areas.**
 - **Minimizing uncontrolled pathways for ETS transfer between individual dwelling units by sealing walls, ceilings, and floors of dwelling units.**



5.3 Multi-Family Environmental Tobacco Smoke Protections

Verification

- Can be builder or Rater verified.
- **Verify documentation** of prohibited smoking in common areas.
- **Visually verify at pre-drywall inspection** that units have been properly sealed to limit transfer of environmental tobacco smoke.
- **Visually verify at final inspection** the distance of designated smoking areas.

Section	Requirements (Refer to full Indoor airPLUS Construction Specifications for details)	Must Correct	Builder Verified	Rater Verified	N/A
Combustion Pollutants	5.1 Emissions standards met for fuel-burning and space-heating appliances (Exception: see spec).	..		■	..
	5.2 CO alarms installed in each sleeping zone (e.g., common hallway) according to NFPA 720.	..		■	
	5.3 Multifamily buildings: Smoking restrictions implemented AND ETS transfer pathways minimized.	..	■	..	..
	5.4 Attached garages: Door closer installed on all connecting doors AND in homes with exhaust-only whole-house ventilation, EITHER a 70 cfm exhaust fan installed in garage OR a pressure test conducted to verify the effectiveness of the garage-to-house air barrier. See spec for details.	..		..	..



Indoor Air Quality (IAQ)

5.4 Attached Garages

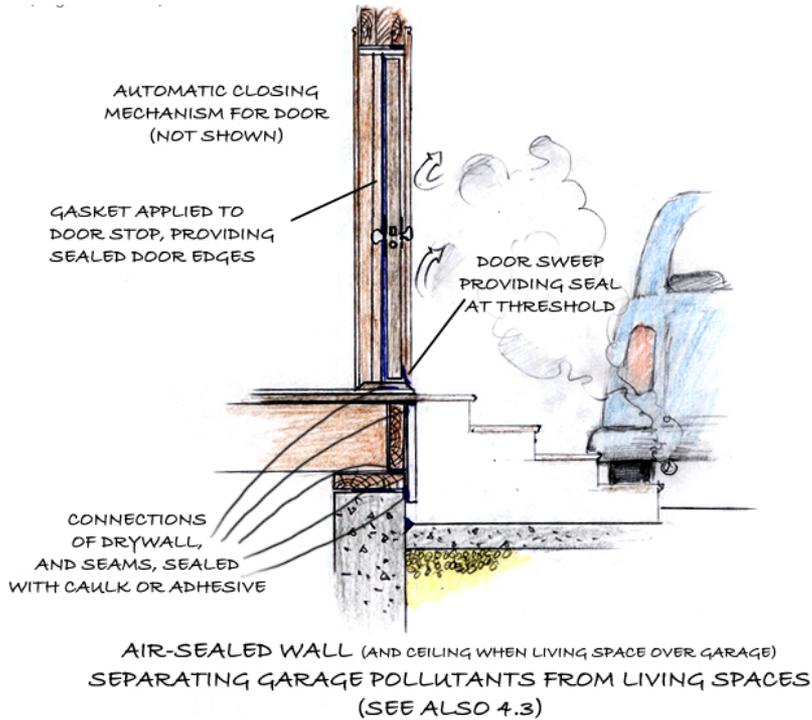


- *Isolate attached garages from conditioned spaces:*
 - *Air-seal common walls and ceilings.*
 - *Use weather stripping on all doors between living spaces and attached garages.*
 - Install an automatic door closer on all connecting doors between living spaces and attached garages.
 - In homes with exhaust-only whole-house ventilation either:
 - Equip the attached garage with an exhaust fan with a minimum installed capacity of 70 cfm that is vented directly outdoors;
- OR
- Conduct a pressure test to verify the effectiveness of the garage-to-house air barrier.

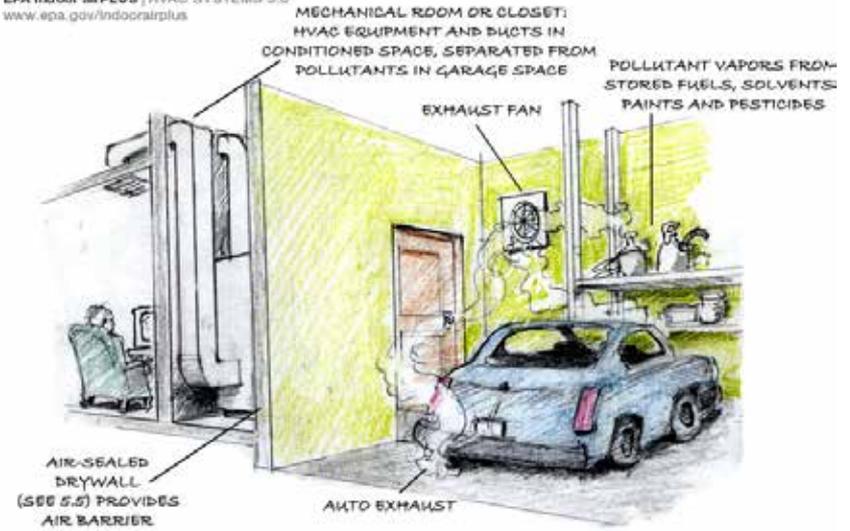
Note: Requirements for attached garages revised. See [November 13, 2013 Policy Record update](#).



5.4 Attached Garages



EPA Indoor airPLUS | HVAC SYSTEMS 5.6
www.epa.gov/indoorairplus



ADVISORY:
 PROVIDE EXHAUST FAN TO REMOVE GARAGE POLLUTANTS
 (SEE ALSO 4.3 AND 5.5)



Indoor Air Quality (IAQ)

5.4 Attached Garages

Verification

- Rater should **verify proper functioning of the automatic door closer** at final inspection.
- In homes with **exhaust only ventilation system**, at final inspection Rater should:
 - **Visually verify at final inspection** that an appropriate garage fan has been installed. If the garage is ventilated by a ducted fan, a Rater should perform a flow test to confirm the required CFM is being met.

OR

 - **Conduct 45 Pascal pressure test** with all garage openings closed to verify the garage-to-house air barrier.
 - Test can be performed during required ENERGY STAR blower door test
 - If garage-to-house air barrier does not pass pressure test, additional air sealing or a garage fan required.

Section	Requirements (Refer to full Indoor airPLUS Construction Specifications for details)		Must Correct	Builder Verified	Rater Verified	N/A
Combustion Pollutants	5.1	Emissions standards met for fuel-burning and space-heating appliances (Exception: see spec).	..		■	..
	5.2	CO alarms installed in each sleeping zone (e.g., common hallway) according to NFPA 720.	..		■	
	5.3	Multifamily buildings: Smoking restrictions implemented AND ETS transfer pathways minimized.	..	■	..	..
	5.4	Attached garages: Door closer installed on all connecting doors AND in homes with exhaust-only whole-house ventilation, EITHER a 70 cfm exhaust fan installed in garage OR a pressure test conducted to verify the effectiveness of the garage-to-house air barrier. See spec for details.	..		■	..



Indoor Air Quality (IAQ)

Combustion Pollutants



Benefits

Reduced exposure to carbon monoxide.

Pollutants in attached garages isolated from living space.

Round-the-clock peace of mind.



Indoor Air Quality (IAQ)

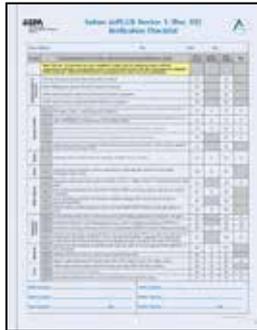
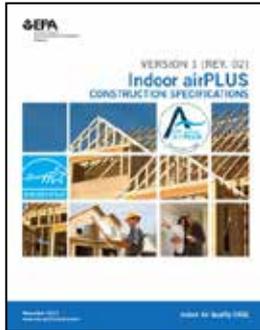
Rev.1.13.14

Revision 2 Combustion Pollutant Changes

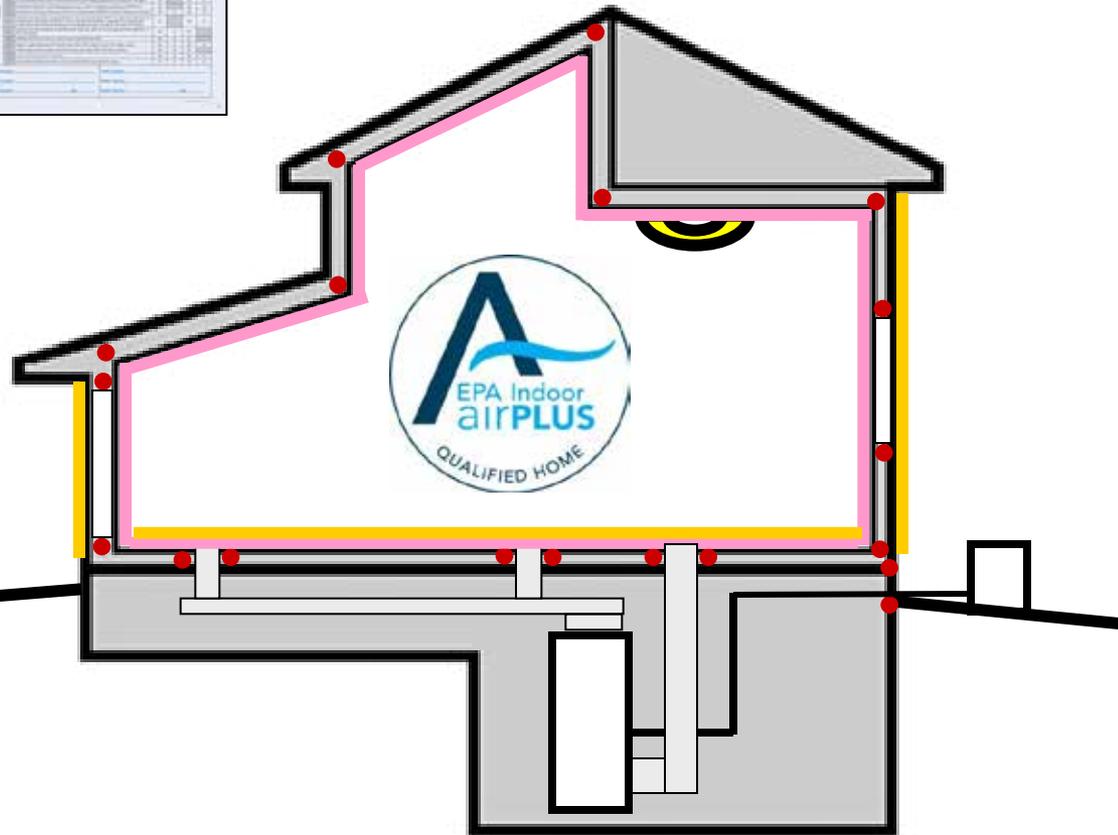
Section	Changes
5. Combustion Pollutant Control	
5.4 Attached Garages	<p><u>Change:</u> Homes with a supply-only or balanced whole-house ventilation system designed to maintain the living space under a positive or neutral pressure relative to the garage are no longer required to install a garage exhaust fan.</p> <p>Homes with exhaust-only whole house ventilation must meet one of the following two requirements:</p> <ul style="list-style-type: none">-Equip the attached garage with an exhaust fan with a minimum installed capacity of 70 cfm that is vented directly outdoors. <p>OR</p> <ul style="list-style-type: none">-Verify that the garage-to-house air barrier can maintain a pressure difference of greater than 45 Pascals while the home maintains a 50 Pascal pressure difference with respect to the outdoors. All operable garage openings shall be closed during this test. <p><u>Advisories Added:</u> See Revision 2 construction specifications.</p>



6. Low Emission Materials



Materials



Indoor Air Quality (IAQ)

6. Low Emission Materials



- Indoor levels of many chemical pollutants can be 2-5 times higher than outdoor levels.
- VOCs include a variety of chemicals, some of which may have short- and long-term adverse health effects, including eye, nose, and throat irritation, headaches, loss of coordination, nausea, damage to liver, kidney, and central nervous system.



Indoor Air Quality (IAQ)

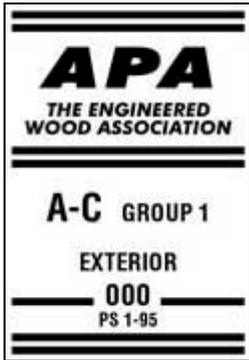
6.1 Composite Wood



- *Use plywood and OSB compliant with PS1 or PS2, and made with moisture-resistant adhesives as indicated by the American Plywood Association (APA) trademark.*
- *Use hardwood plywood products compliant with ANSI/HPVA and U.S. HUD Title 24, OR CA Title 17.*
- *Use particleboard and MDF products compliant with ANSI A208.1 and A208.2, and U.S. HUD Title 24, OR CPA Grademark certification program, OR CA Title 17.*
- *Install only cabinetry made with component materials that met all the standards above OR registered products produced in plants certified under KCMA's Environmental Stewardship Certification Program (ESP 05-12).*



6.1 Composite Wood



HARDWOOD PLYWOOD & VENEER ASSOCIATION		
FORMALDEHYDE EMISSION 0.30 PPM CONFORMS TO HUD REQUIREMENTS	INDUSTRIAL PLYWOOD  MILL 000	GLUE BOND TYPE II ANSI/HPVA HP-1-2004



Indoor Air Quality (IAQ)

6.1 Composite Wood Verification

- Can be builder or Rater verified.
- **Verify documentation before the start of construction** that the composite wood materials supplied will meet the required emissions standards.

Section	Requirements (Refer to full Indoor <u>airPLUS</u> Construction Specifications for details)	Must Correct	Builder Verified	Rater Verified	N/A
Materials	6.1 Certified low-formaldehyde composite wood materials AND structural plywood AND OSB PS1 or PS2 compliant.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	6.2 Certified low-VOC or no-VOC interior paints and finishes used.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	6.3 Carpet, carpet adhesives CRI Green Label Plus AND carpet cushion CRI Green Label.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Indoor Air Quality (IAQ)

6.2 Interior Paints and Finishes



- *Use interior paints and finishes certified as low-VOC or no-VOC*
 - *Greenseal GS11*
 - *Greenguard*
 - *Scientific Certification Systems*
 - *Master Painters Institute*
 - *Verified using CA 01350(CDPH Standard Method V1.1-2010).*



6.2 Interior Paints and Finishes

Verification

- Can be builder or Rater verified.
- **Verify documentation before the start of construction** that the paints and finishes supplied will meet the required emissions standards.

Section	Requirements (Refer to full <u>Indoor airPLUS</u> Construction Specifications for details)	Must Correct	Builder Verified	Rater Verified	N/A
Materials	6.1 Certified low-formaldehyde composite wood materials AND structural plywood AND OSB PS1 or PS2 compliant.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	6.2 Certified low-VOC or no-VOC interior paints and finishes used.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	6.3 Carpet, carpet adhesives CRI Green Label Plus AND carpet cushion CRI Green Label.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Indoor Air Quality (IAQ)

6.3 Carpets and Carpet Adhesives



- Use carpets and carpet adhesives labeled with the Carpet and Rug Institute (CRI) Green Label Plus testing program criteria.
- For carpet cushion (i.e., padding), use only products certified to meet the CRI Green Label testing program criteria.



6.3 Carpets and Carpet Adhesives Verification

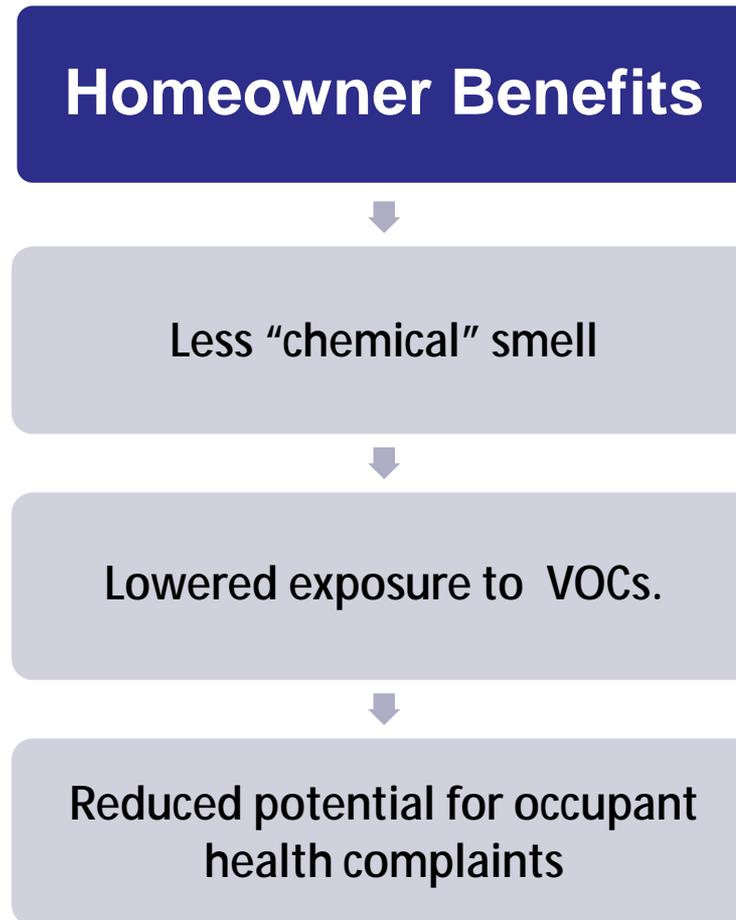
- Can be builder or Rater verified.
- **Verify documentation before the start of construction** that the carpet and carpet adhesives supplied will meet the required emissions standards.

Section	Requirements (Refer to full Indoor <u>airPLUS</u> Construction Specifications for details)	Must Correct	Builder Verified	Rater Verified	N/A
Materials	6.1 Certified low-formaldehyde composite wood materials AND structural plywood AND OSB PS1 or PS2 compliant.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	6.2 Certified low-VOC or no-VOC interior paints and finishes used.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	6.3 Carpet, carpet adhesives CRI Green Label Plus AND carpet cushion CRI Green Label.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Indoor Air Quality (IAQ)

6.3 Carpets and Carpet Adhesives



Indoor Air Quality (IAQ)

Rev.1.13.14

Revisions 1&2 Low Emission Materials Changes

Section	Changes
6. Low Emission Materials	
6.2 Interior Paints and Finishes	<p><u>Compliance Option Added:</u> Master Painters Institute (MPI) X-Green.</p>
6.3 Carpets and Carpet Adhesives	<p><u>Exception Added:</u> 90% or more of finished surface area covered by carpet and carpet adhesives must comply with requirements.</p> <p><u>Clarification Added:</u> At least 90 percent of the surface area covered by carpet and carpet adhesives must use products labeled with, or otherwise documented as meeting, the Carpet and Rug Institute's (CRI) Green Label PLUS testing program criteria.</p>





7. Home Commissioning



Indoor Air Quality (IAQ)

7.1 HVAC and Duct Verification



- *Verify that HVAC systems and ductwork are installed according to their design.*



- **Inspect ductwork to verify it is dry and substantially free of dust or debris. If duct openings were not covered during construction, thoroughly vacuum out each opening.**
- **Inspect air-handling equipment and verify that heat exchangers/coils are free of dust AND the filter is new, clean and meets specified MERV rating.**



7.1 HVAC and Duct Verification

Verification

- Can be builder or Rater verified.
- **Visually verify at final inspection** that the ductwork and air-handling equipment is substantially free of dust and debris.

Section	Requirements (Refer to full Indoor <u>airPLUS</u> Construction Specifications for details)	Must Correct	Builder Verified	Rater Verified	N/A
Final	7.1 HVAC system and ductwork verified to be dry and clean AND new filter installed.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	7.2 Home ventilated before occupancy.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	7.3 Completed checklist and other required documentation provided for buyer.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Indoor Air Quality (IAQ)

7.2 Ventilation after Material Installation



- **Verify that the home has been ventilated with outside air:**
 - **During and shortly after installing products that are known sources of contaminants, AND**
 - **During the period between finishing and occupancy.**



7.2 Ventilation after Material Installation Verification

- Can be builder or Rater verified.
- The builder should **maintain a record** of the times ventilation of the home is completed.

Section	Requirements (Refer to full Indoor <u>airPLUS</u> Construction Specifications for details)		Must Correct	Builder Verified	Rater Verified	N/A
Final	7.1	HVAC system and ductwork verified to be dry and clean AND new filter installed.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	7.2	Home ventilated before occupancy.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	7.3	Completed checklist and other required documentation provided for buyer.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Indoor Air Quality (IAQ)

7.3 Buyer Information Kit



- Provide buyers with information and documentation of the home's IAQ protections, including:
 - A copy of the Indoor airPLUS Verification Checklist.
 - HVAC, duct, and ventilation system design documentation.
 - Operations and maintenance instruction manuals for all installed equipment and systems addressed by Indoor airPLUS and ENERGY STAR requirements.



7.3 Buyer Information Kit Verification

- Can be builder or Rater verified.
- The builder should **retain a copy** of the buyer information kit provided to the homebuyer.

Section	Requirements (Refer to full Indoor <u>airPLUS</u> Construction Specifications for details)		Must Correct	Builder Verified	Rater Verified	N/A
Final	7.1	HVAC system and ductwork verified to be dry and clean AND new filter installed.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	7.2	Home ventilated before occupancy.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	7.3	Completed checklist and other required documentation provided for buyer.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Indoor Air Quality (IAQ)

Sign and Date

The Rater who conducted the verification, or a responsible party from the Rater's company, must sign the completed Verification Checklist. The builder must sign the checklist if any items in the "Builder Verified" column are checked, and by so doing accepts full responsibility for verifying that those items meet Indoor airPLUS requirements.

Rater Company: _____	Builder Company: _____
Rater Employee: _____	Builder Employee: _____
Rater Signature: _____ Date: _____	Builder Signature: _____ Date: _____





Selling Indoor airPLUS



Indoor Air Quality (IAQ)



ADD VALUE



Indoor Air Quality (IAQ)

Homes with green labels can sell for an average of

9% MORE¹

Tell homebuyers to ask for a Residential Green Appraiser.

1. Nils Kok and Matthew Kahn, The Value of Green Labels in the California Housing Market, July 2012.



Indoor Air Quality (IAQ)

Rev.1.13.14

Grow Your Market



More than 25 million people, including 7.1 million children, have asthma and there is a 20-50% increased risk of asthma in damp houses.



Indoor Air Quality (IAQ)

Differentiate Your Company



Build a Reputation for Quality

"We decided to build a new house after restoring and residing in two 100-year-old homes in a row. We didn't even know the health problems attributed to those old drafty houses until we had our son. After running some low-level allergy symptoms for about a year, we moved into our new home which is Indoor airPLUS certified. The health issues cleared up immediately - for all of us. It's amazing what a little clean air can do!"

-Homeowner in Oklahoma City



Indoor Air Quality (IAQ)

Lead the Industry

One third of builders expect to be dedicated to green building by 2016 and in 2011, 60% of builders placed a greater emphasis on indoor air quality as a green home feature.



Indoor Air Quality (IAQ)

Reduce Risk



Resources and Tools

www.epa.gov/indoorairplus

Marketing and Technical Support for Partners



- Builder and consumer resources.
- Partner locator.
- Website widgets.
- Construction requirements.
- Technical guidance.



Indoor Air Quality (IAQ)

Resources and Tools



Get the latest information:

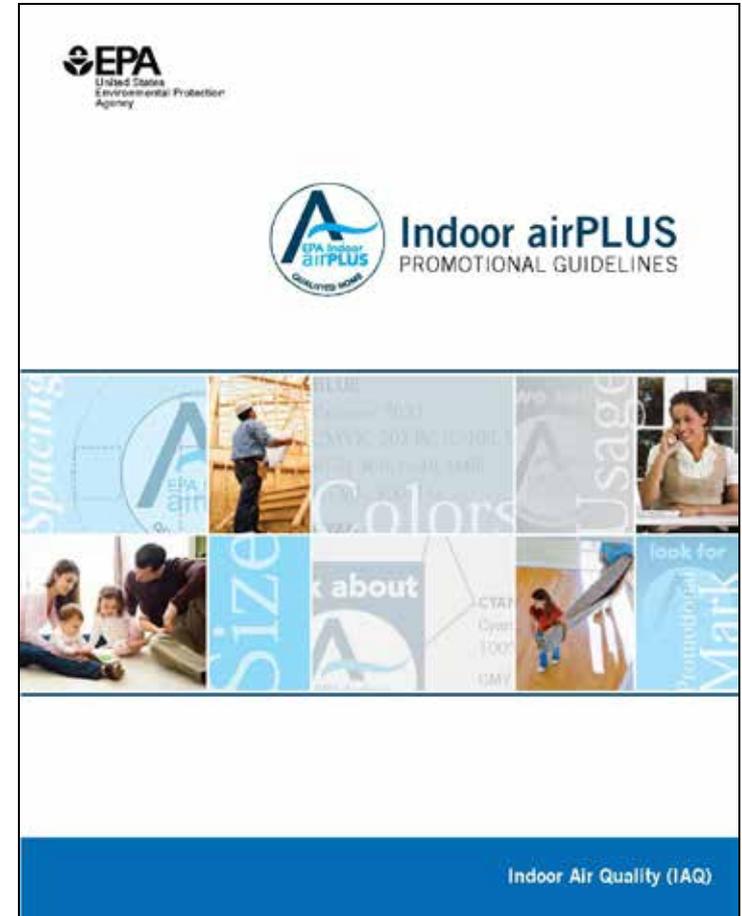
- Facebook
- Twitter
- YouTube Videos
- Mobile App
- Podcasts



Indoor Air Quality (IAQ)

Promotional Guidelines

- Using Indoor airPLUS to maintain and build value.
- Using Indoor airPLUS marks.
- Using Indoor airPLUS with complementary programs.
- Indoor airPLUS general guidelines.
- Indoor airPLUS graphic technical guidelines.
- Incorrect usage.



Indoor Air Quality (IAQ)

Indoor airPLUS Marks and Messaging



ZURICH HOMES

where we build | available lots | homes for sale | custom homes | sub-contractors | home technology | about

CHANGE FOR THE BETTER WITH ENERGY STAR

Building an Energy Star certified home means that your home has met energy efficacy standards set by the EPA. In order to receive Energy Star certification your home is built to strict standards and its energy efficiency is inspected and verified by an independent home rater. Building an Energy Star certified home means lower monthly utility bills, adding resale value to your home, and possible eligibility for [available tax credits](#). By building Energy Star you are using smart building techniques that help conserve natural resources while saving you money on your energy bills.

To find out more about Energy Star contact us or visit: www.energystar.gov

More on Energy Star:

Plus!

we sell

EPA Indoor airPLUS QUALIFIED HOMES



Indoor Air Quality (IAQ)

That's it. You're ready to build & label Indoor airPLUS homes!

One additional checklist verified by the Rater

The image shows a screenshot of the 'Indoor airPLUS Version 1 (Rev. 02) Verification Checklist' form. The form is a table with columns for 'Item', 'Pass', 'Fail', 'Not Applicable', and 'Date'. It contains numerous rows of checklist items related to indoor air quality, such as 'Verify that the home has a mechanical ventilation system that meets the requirements of the Indoor airPLUS specification' and 'Verify that the home has a radon mitigation system that meets the requirements of the Indoor airPLUS specification'. The form is partially filled out, with some cells containing 'X' marks.



Place the Indoor airPLUS label adjacent to the ENERGY STAR label



Indoor Air Quality (IAQ)



Become a Partner



Indoor Air Quality (IAQ)

Become an Indoor airPLUS Partner

Note: Builders and Raters must also be active ENERGY STAR partners to report Indoor airPLUS homes

- For **new ENERGY STAR & Indoor airPLUS Partners, visit:**
www.energystar.gov/newhomesPA

[Home](#) > [Partner Resources](#) > [For New Home Industry Professionals](#) > [Join ENERGY STAR](#)

Join ENERGY STAR as a Residential New Construction Partner

To apply:

Becoming an ENERGY STAR partner is easy. Simply fill out an ENERGY STAR Partnership Agreement by following the appropriate link below. There is no cost to partner with ENERGY STAR or use ENERGY STAR promotional materials.

Training Requirements for Builder and Rater Partners:

Builder and Rater partners are required to complete mandatory training. For more information about the training requirements, visit [ENERGY STAR for Homes Version 2.5 and 3 Guidelines](#).

Online Partnership Agreements for:

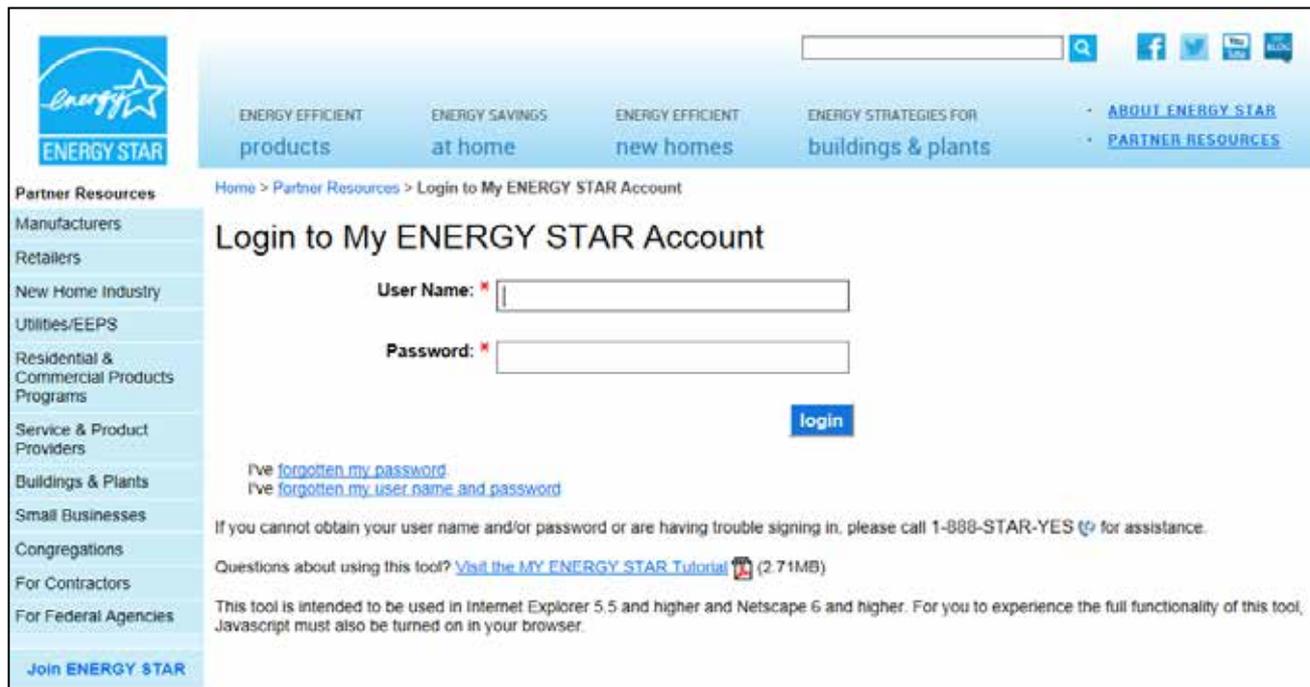
- [Builders](#)
Companies or individuals that plan to construct one or more new ENERGY STAR certified home for either sale or personal use. This category includes Modular Home Builders, Multifamily Low Rise Builders, Community Developers, Affordable Housing Builders, and Manufactured Home Plants/Retailers/Installers.
- [Multifamily High Rise Developers](#)
Companies or individuals that plan to construct new ENERGY STAR certified multifamily high rise buildings.
- [Home Energy Raters](#)
Professionals who analyze energy-efficient home plans and provide on-site verification for homes to earn the ENERGY STAR.
- [Architect/Home Plan Designers](#)



Indoor Air Quality (IAQ)

Become an Indoor airPLUS Partner

- For current ENERGY STAR Partners:
 - Log into your My ENERGY STAR Account (MESA)
www.energystar.gov/mesa
 - If you don't know your user name and password, click the link or email energystarhomes@energystar.gov for assistance.



The screenshot shows the 'Login to My ENERGY STAR Account' page. At the top left is the ENERGY STAR logo. Below it is a 'Partner Resources' sidebar with links for Manufacturers, Retailers, New Home Industry, Utilities/EEPS, Residential & Commercial Products Programs, Service & Product Providers, Buildings & Plants, Small Businesses, Congregations, For Contractors, and For Federal Agencies. The main content area has a breadcrumb trail: 'Home > Partner Resources > Login to My ENERGY STAR Account'. The title is 'Login to My ENERGY STAR Account'. There are two input fields: 'User Name: *' and 'Password: *'. A blue 'login' button is below the password field. Below the login fields are links for 'I've forgotten my password' and 'I've forgotten my user name and password'. A note states: 'If you cannot obtain your user name and/or password or are having trouble signing in, please call 1-888-STAR-YES for assistance.' Below that is a link to 'Visit the MY ENERGY STAR Tutorial (2.71MB)'. At the bottom, a disclaimer reads: 'This tool is intended to be used in Internet Explorer 5.5 and higher and Netscape 6 and higher. For you to experience the full functionality of this tool, Javascript must also be turned on in your browser.'



Indoor Air Quality (IAQ)

Become an Indoor airPLUS Partner

- After entering your account, click “Join Indoor airPLUS”.
 - For builders, be sure you’ve completed the required ENERGY STAR training.

ENERGY STAR®
My ENERGY STAR Account

ENERGY STAR

Partner Resources Contact ENERGY STAR | Help | Logout

Home > Partner Resources > My ENERGY STAR Account

My ENERGY STAR Account

Welcome, *FIRST TESTER!*

You are invited to navigate directly to other ENERGY STAR tools and sites, change your password for your password-protected ENERGY STAR tools, or update contact information for you, your organization, and your colleagues.

To-Do List:

New Homes Builder Training
You were required to complete training by 06/09/2013. Please complete the training to reactivate your partnership.

(Internet Explorer or Firefox are the preferred browsers for this training. Please turn off your browser pop-up blocker.)

My ENERGY STAR Tools:

- [Linking Opportunities](#)
- [Certified Homes Co-brandable Consumer Brochure](#)
- [Certified Homes Co-brandable Banners](#)
- [Join Indoor airPLUS](#)



Indoor Air Quality (IAQ)

Become an Indoor airPLUS Partner

- When your partnership is activated, you'll have access to Indoor airPLUS logos.

ENERGY STAR®
My ENERGY STAR Account

ENERGY STAR

Partner Resources Contact ENERGY STAR | Help | Logout

Home > Partner Resources > My ENERGY STAR Account

My ENERGY STAR Account

Welcome, Kevin Reza!

You are invited to navigate directly to other ENERGY STAR tools and sites, change your password for your password-protected ENERGY STAR tools, or update contact information for you, your organization, and your colleagues.

To-Do List:

New Homes Builder Training
Kevin Reza completed the training on 12/06/2013.

(Internet Explorer or Firefox are the preferred browsers for this training. Please turn off your browser pop-up blocker.)

My ENERGY STAR Tools:

- **Logo Downloads**
- Linking Opportunities
- Certified Homes Consumer Videos
- Certified Homes Co-brandable Consumer Brochure
- Certified Homes Co-brandable Banners



Indoor Air Quality (IAQ)

Become an Indoor airPLUS Partner

- Use the logos to promote your partnership and commitment to offering healthier, more durable homes.

Indoor airPLUS Certification Mark



Indoor airPLUS Certification Mark (vertical)
[EPS](#) | [JPG](#)



Indoor airPLUS Certification Mark (vertical)
[EPS](#) | [JPG](#)

[Back to Top](#)

Indoor airPLUS Promotional Marks



Indoor airPLUS Promotional Marks (vertical)
[EPS](#) | [JPG](#)



Indoor airPLUS Promotional Marks (vertical)
[EPS](#) | [JPG](#)



Indoor airPLUS Promotional Marks (vertical)
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Indoor airPLUS Promotional Marks (vertical)
[EPS](#) | [JPG](#)



Indoor airPLUS Promotional Marks (vertical)
[EPS](#) | [JPG](#)



Indoor airPLUS Promotional Marks (vertical)
[EPS](#) | [JPG](#)



Indoor Air Quality (IAQ)



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