

# Water Efficiency and IAQ – The Next Frontiers in Whole Home Performance

**RESNET Building Performance Conference  
February 17, 2015**





## EPA's programs in the Context of Green Building

VERSION 1 (REV. 02)

# Indoor airPLUS



Indoor Air Quality (IAQ)



# Can we address “whole house performance” without addressing Indoor Air Quality?



Indoor Air Quality (IAQ)



# Many sources of IAQ issues in homes



CO, NOx,  
Particulates, Mold  
VOCs, Formaldehyde



Pesticides

Pests...

↑ ↑ ↑  
Radon



Indoor Air Quality (IAQ)

# Health risks from poor IAQ

- ~21,000 lung cancer deaths from radon gas each year
- More than 25 million people, including 7.1 million children, have asthma
  - 20-50% increased risk of asthma in damp houses
- 400 accidental deaths from CO poisoning each year (average)
- Small particles (PM2.5) associated with asthma and premature death in people with heart or lung disease
  - Evidence emerging that indoor particle levels can often exceed outdoor air standards
- Formaldehyde and VOCs can cause a range of health effects including eye, nose and throat irritation, respiratory problems and potential long term risks



Indoor Air Quality (IAQ)

# Reducing Health Risks

## 1. Source Control

(eliminate or manage)



## 2. Ventilation

(dilution)

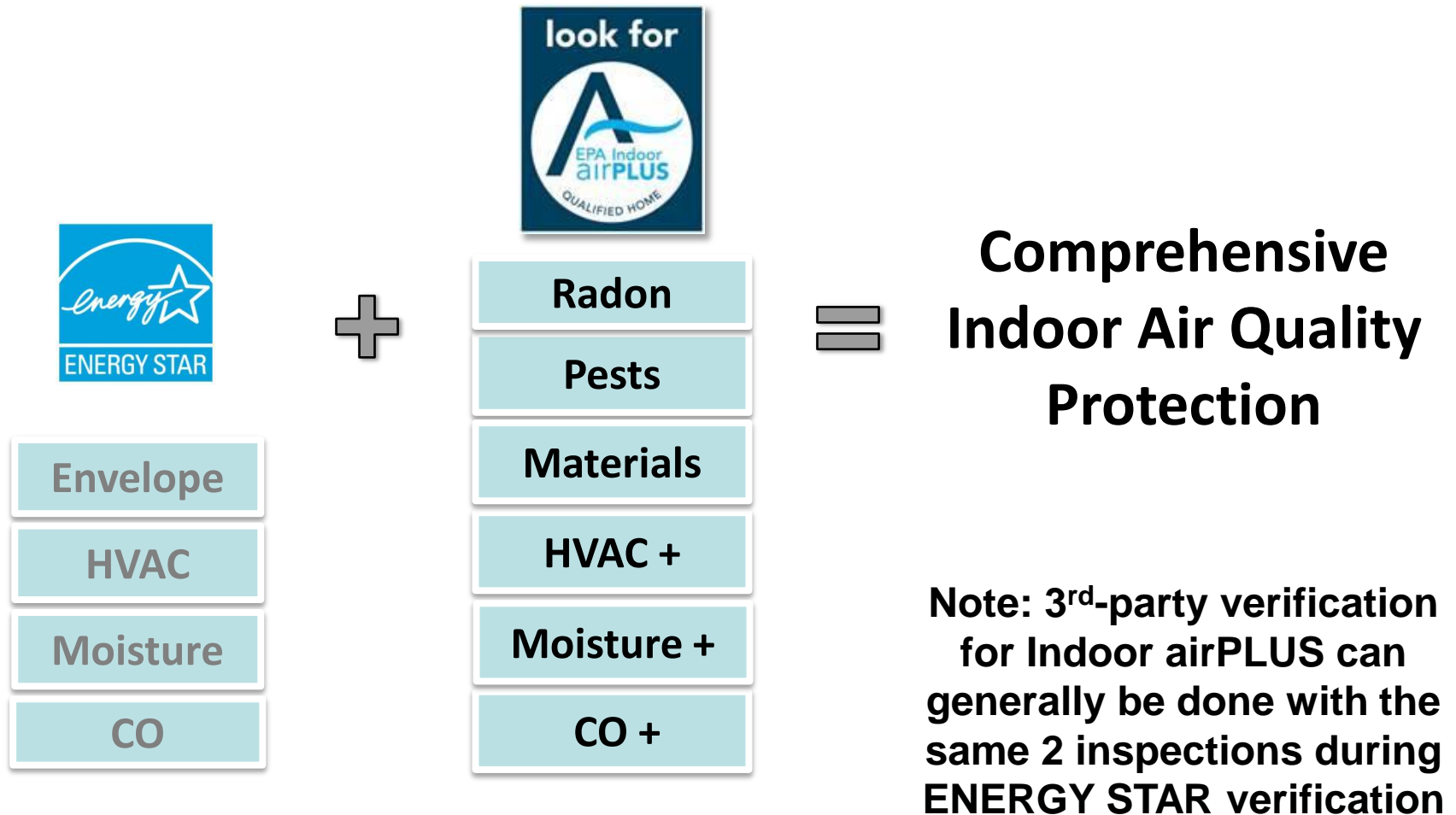


## 3. Filtration



Indoor Air Quality (IAQ)

# ENERGY STAR + Indoor airPLUS



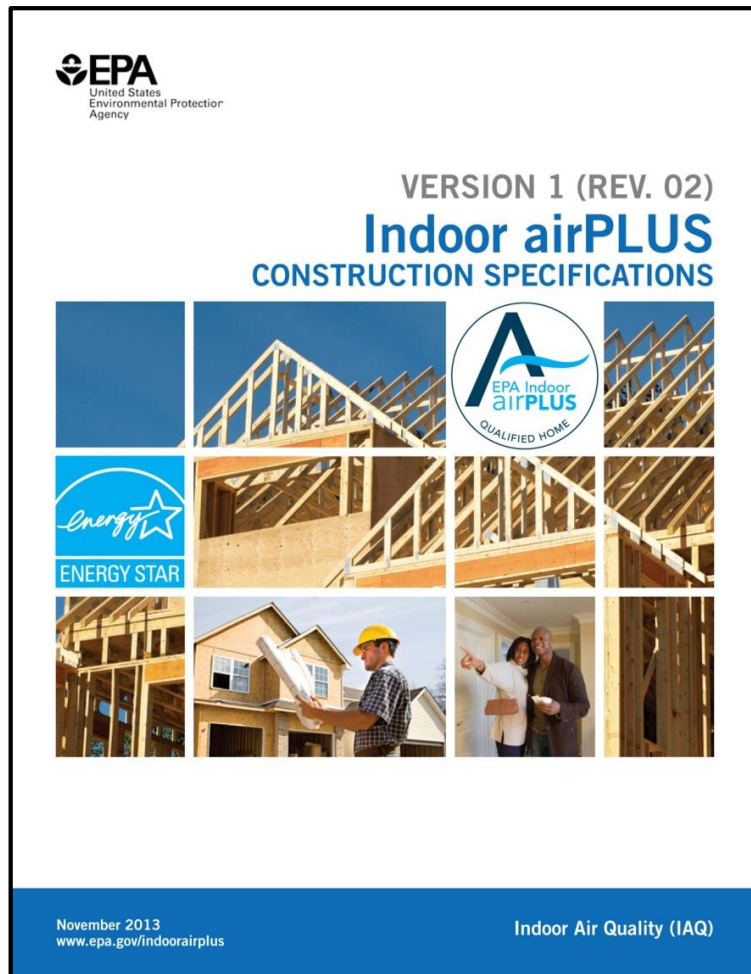
Indoor Air Quality (IAQ)

# Grow Your Market by Offering Healthier Homes



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



**Indoor airPLUS Version 1 (Rev. 02)**  
**Verification Checklist**



Home Address: \_\_\_\_\_ City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_

Section	Requirements (Refer to full Indoor airPLUS Construction Specifications for details)	Must Correct	Builder Verified	Rater Verified	N/A
<small>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 checklist. ENERGY STAR remains a prerequisite for Indoor airPLUS certification.</small>					
ENERGY STAR V3 Checklist	Thermal Enclosure System Rater Checklist completed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Water Management System Builder Checklist completed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	HVAC System Quality Installation Contractor Checklist completed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	HVAC System Quality Installation Rater Checklist completed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
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 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"/>	<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"/>	<input type="checkbox"/>	<input type="checkbox"/>
Radon	2.1 Approved radon-resistant features installed in Radon Zone 1 homes.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pests	3.2 Corrosion-proof rodent-proof screens installed at all openings that cannot be fully sealed (Exception: dryer vents).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HVAC Systems	4.1 Equipment selected to keep relative humidity < 60% in "Warm Humid" climates (Exception: see spec).	<input type="checkbox"/>	<input type="checkbox"/>	<input 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"/>	<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"/>	<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"/>	<input type="checkbox"/>
Combustion Appliances	5.1 Emissions standards met for fuel-burning and space-heating appliances (Exception: see spec).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	5.2 CO alarms installed in each sleeping zone (e.g., common hallway) according to NFPA 720.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	5.3 Multifamily buildings: Smoking restrictions implemented AND ETS transfer pathways minimized.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	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).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Materials	6.1 Certified low-formaldehyde composite wood materials AND structural plywood AND OSB PS1 or PS2 compliant.	<input type="checkbox"/>	<input type="checkbox"/>	<input 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"/>	<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"/>
Final	7.1 HVAC system and ductwork verified to be dry and clean AND new filter installed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input 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"/>

Rater Company: \_\_\_\_\_  
Rater Employee: \_\_\_\_\_  
Rater Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Builder Company: \_\_\_\_\_  
Builder Employee: \_\_\_\_\_  
Builder Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Rev. November 2013 ii

## 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

### 1.1 Site and Foundation Drainage

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

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- 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)



# 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.**

*\*Exceptions: Slab-on-grade and areas with free draining soils*



Indoor Air Quality (IAQ)

# 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.*



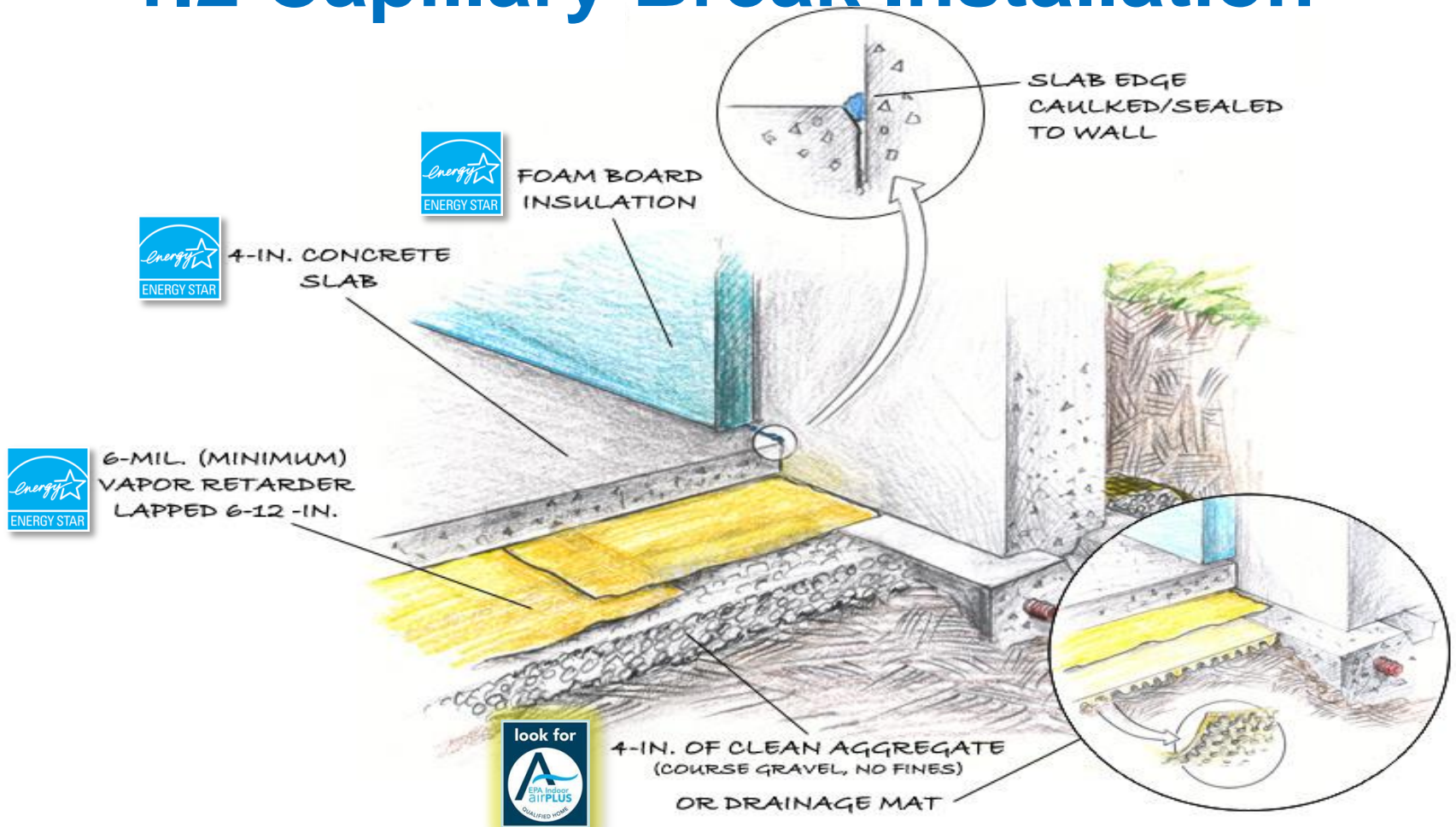
- **Under the polyethylene sheeting or extruded polystyrene (XPS) insulation:**
  - **Install a 4 in. layer of aggregate; OR**
  - **A uniform layer of sand, overlain with a layer of geotextile drainage matting.**

*Exceptions: Slab-on-grade foundations,  
certified free-draining soils and dry climates  
(only in Radon zones 2 & 3)*



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# 1.2 Capillary Break Installation



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



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# 1.4 Below-grade Foundation Walls



EPA Indoor airPLUS | MOISTURE CONTROL 1.4  
[www.epa.gov/indoorairplus](http://www.epa.gov/indoorairplus)

INSULATION  
MINIMUM OF  
3 INCHES BELOW  
SILL PLATE

IN LOW TERMITE  
RISK AREAS RAISE  
INSULATION UP TO  
TOP OF MUD SILL PLATE

FOAM BOARD  
INSULATION

AIR SUPPLY DUCT  
FROM HVAC UNIT IN  
LIVING SPACE ABOVE

1 cfm/50ft<sup>2</sup> CRAWL  
SPACE FLOOR AREA

- Seal and insulate crawlspace and basement perimeter walls.
- Provide conditioned air (1cfm/50SF).

*Exceptions: Dry climates, raised pier foundations, etc. (see spec)*



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.**



Indoor Air Quality (IAQ)

# 1. Moisture Control

## Verification

- Some items can be builder 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 the pre-drywall inspection** that all water supply lines in exterior walls are properly insulated with pipe wrap.

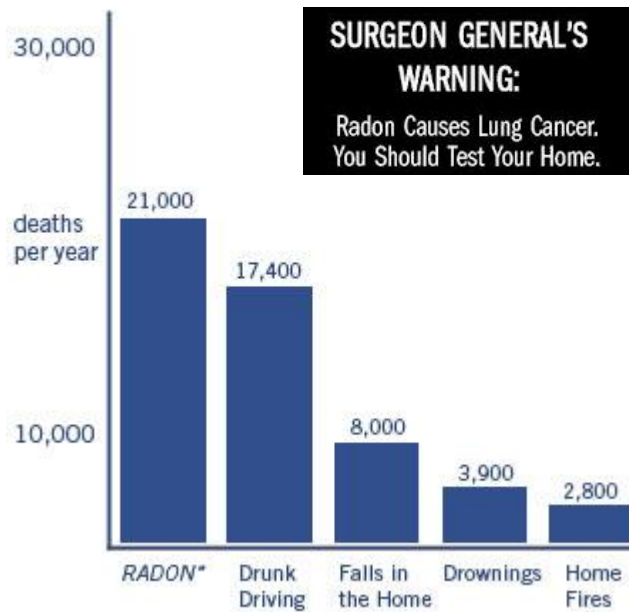
Section	Requirements (Refer to full Indoor <u>airPLUS</u> Construction Specifications for details)		Must Correct	Builder Verified	Rater Verified	N/A
Moisture Control	1.1	Drain or sump pump installed in basements and crawlspaces (Exception: free-draining soils). In EPA Radon Zone 1, check valve also installed.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

## 2. Radon

### *Quick facts if a homebuyer asks about radon*



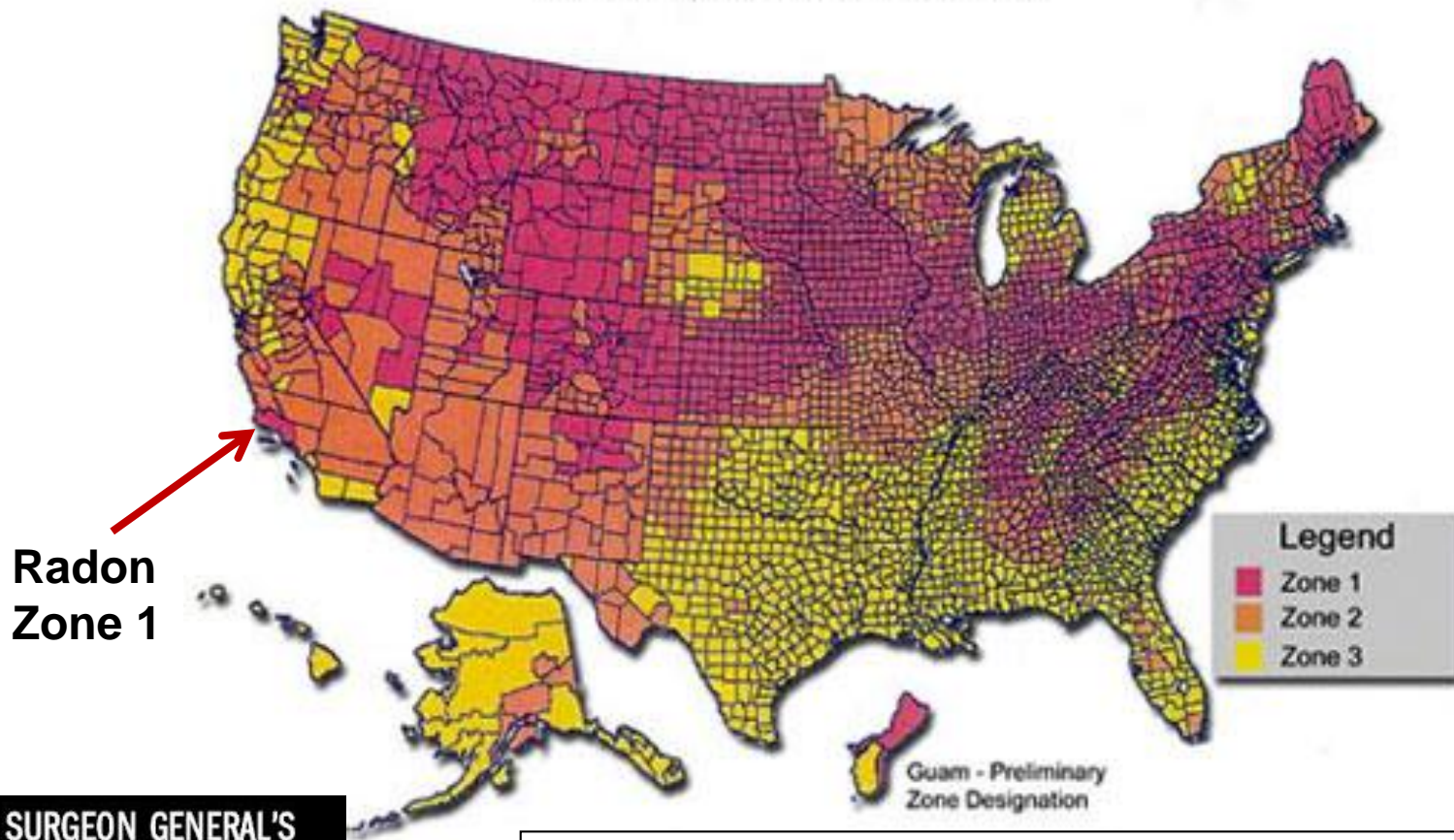
- Radon is a cancer-causing, radioactive gas created by the natural breakdown of uranium in soil.
- Radon can be found all over the US, but is more prevalent in Zone 1.
- 1 in 15 homes have radon above 4 pCi/L.
- You are most likely to get your greatest exposure to radon at home.
- Radon is the **second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



Indoor Air Quality (IAQ)

## 2. Radon Control

EPA Map of Radon Zones



**SURGEON GENERAL'S  
WARNING:**

Radon Causes Lung Cancer.  
You Should Test Your Home.

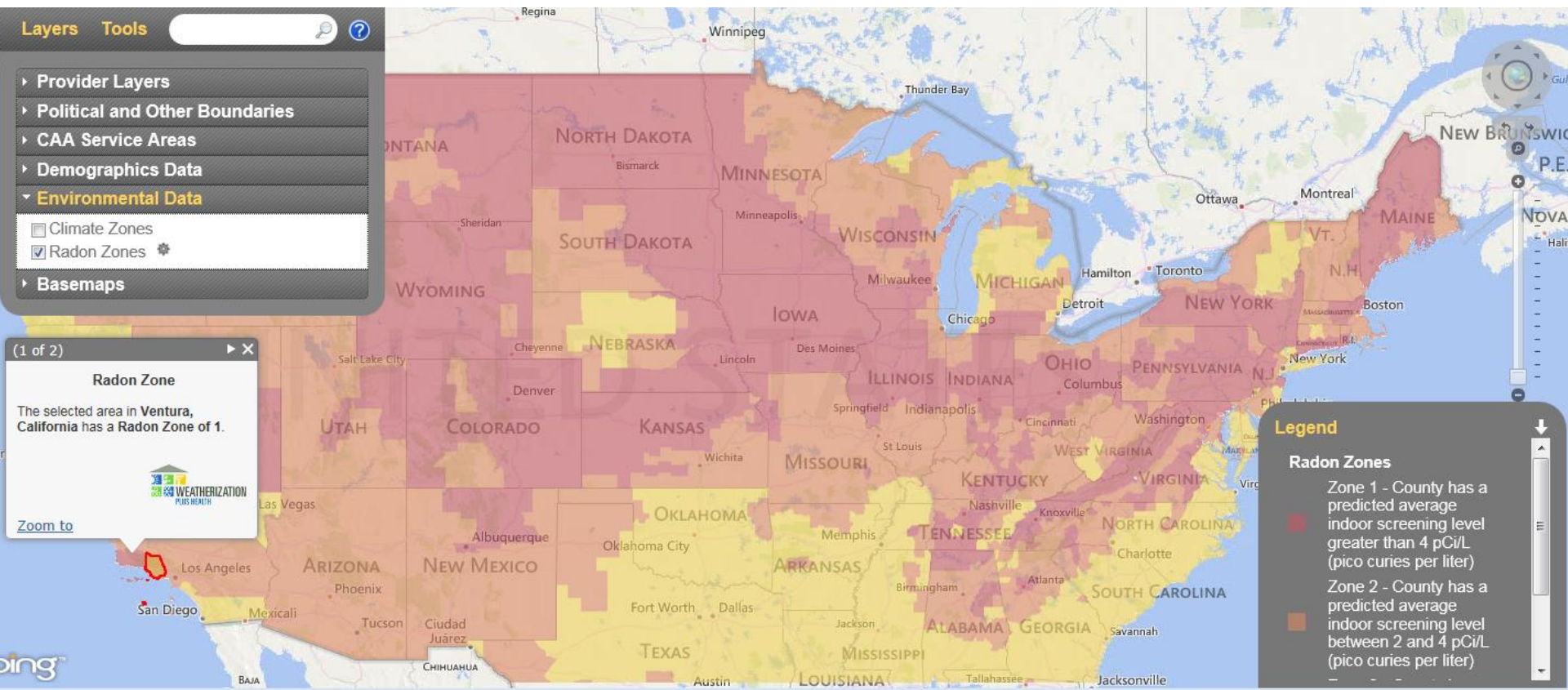
Note: These maps indicate average risk by county.  
However, high levels of radon can be found in any home.



Indoor Air Quality (IAQ)



# Radon Zones – Interactive Maps



## Weatherization Plus Health GeoExplorer

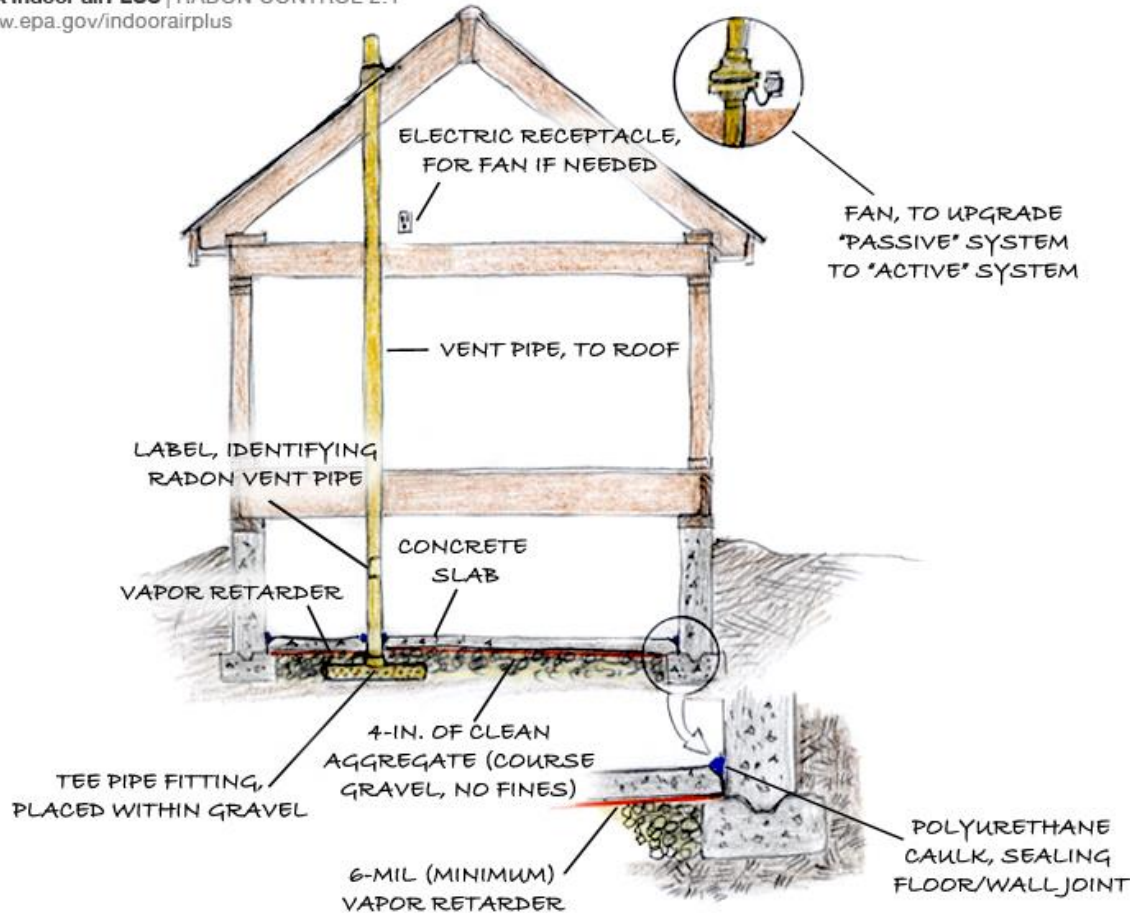
For an easy-to-use map, see:  
<http://www.wxplushealth.org/geoexplorer>



Indoor Air Quality (IAQ)

# 2. Radon Control

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

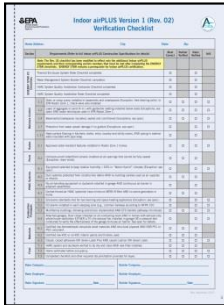
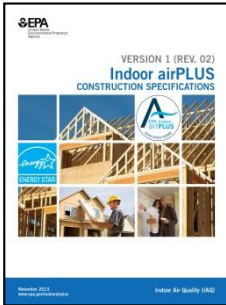


**Note:** *These techniques are only required in Radon Zone 1.*

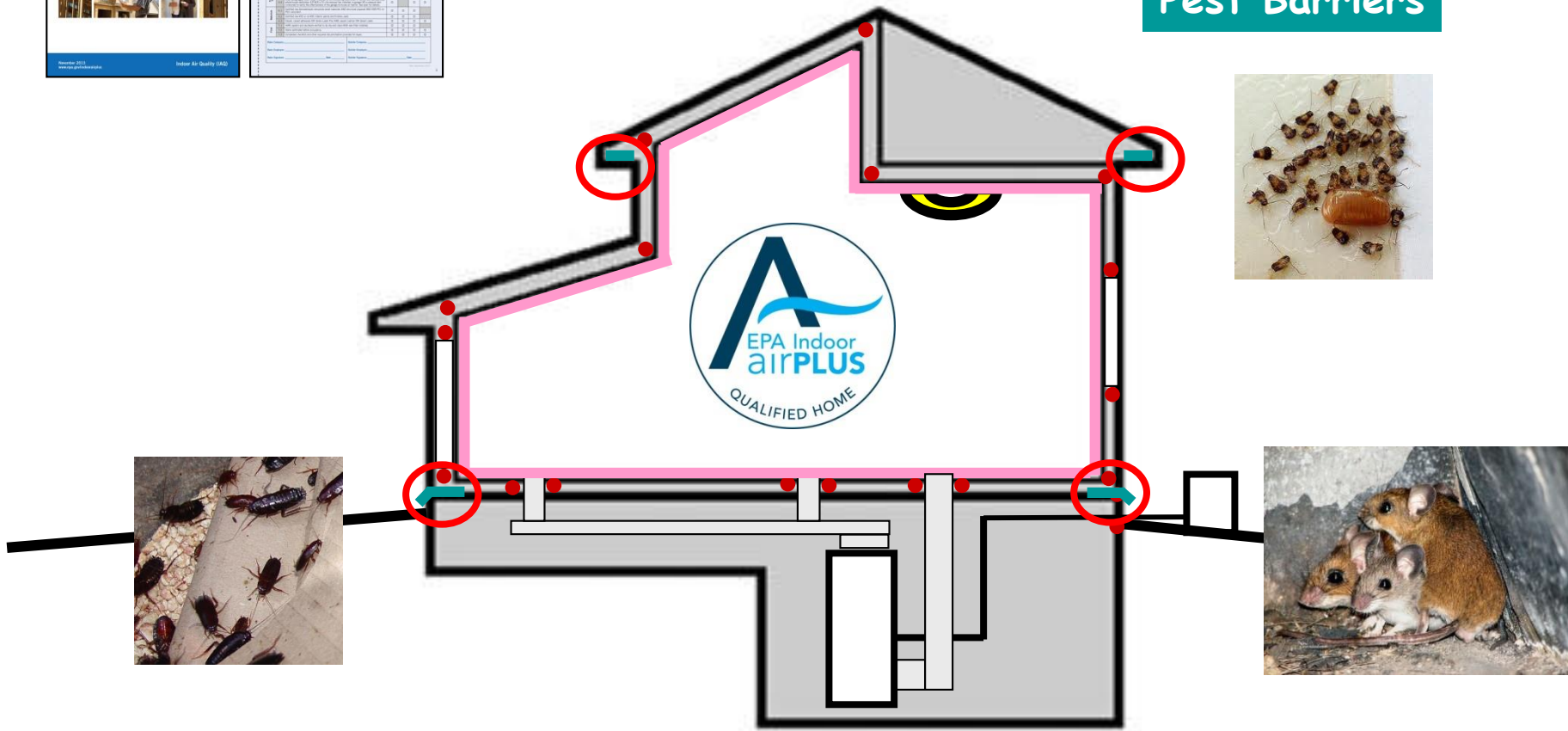


Indoor Air Quality (IAQ)

# 3. Pest Barriers



## Pest Barriers



Indoor Air Quality (IAQ)



# 3. Pest Barriers



- Seal all penetrations and joints between the foundation and walls.
- Air seal all sump covers.
- Provide corrosion-proof rodent/bird screens for all openings that cannot be sealed or caulked.

Prevention of potential damage from pests

Less vacuuming and dusting

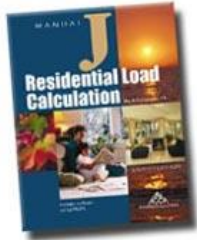
Reduced pest-related allergens, asthma triggers and diseases



Indoor Air Quality (IAQ)

# 4. HVAC Systems

## Four Primary Features



1.Design

2.Ventilation



3.Filtration

4.Inspection

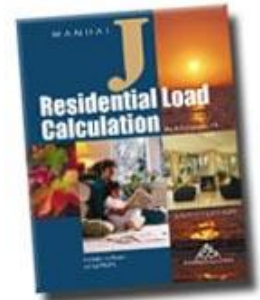


Indoor Air Quality (IAQ)

# 4.1 HVAC Sizing and Design



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

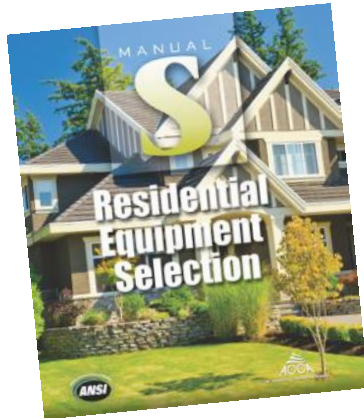


- **"Warm-Humid" climates: equipment shall be installed with sufficient latent capacity to maintain indoor relative humidity (RH) at or below 60 percent.**

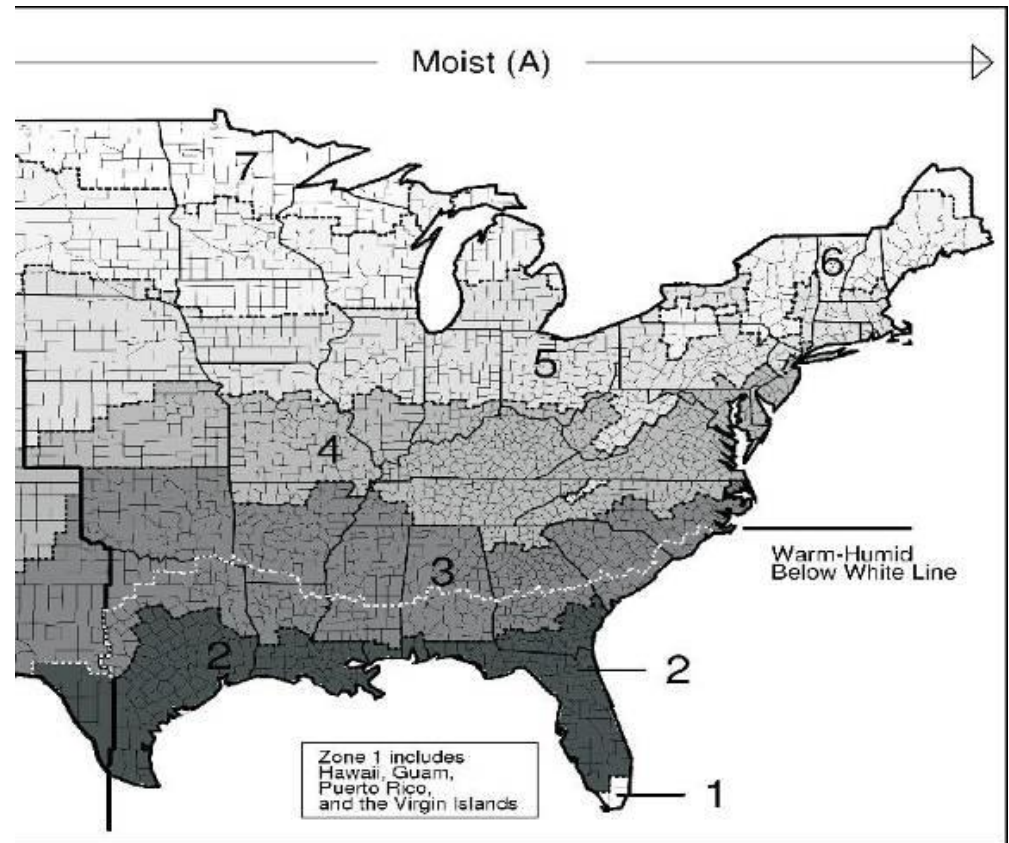


Indoor Air Quality (IAQ)

# 4.1 HVAC Sizing and Design



- Utilize Manual S for selecting HVAC systems to ensure the system can cover the latent (Moisture) load of the home.
- Separate dehumidification controls or a stand-alone dehumidifier is required in warm-humid climates.



Controlled to  $\leq 60\%$  RH below warm/humid line

For IECC climate zone map, visit [www.iccsafe.org](http://www.iccsafe.org)



Indoor Air Quality (IAQ)



## 4.2 Duct System Design and Installation



**COVERING DUCT  
OPENINGS DURING  
CONSTRUCTION**

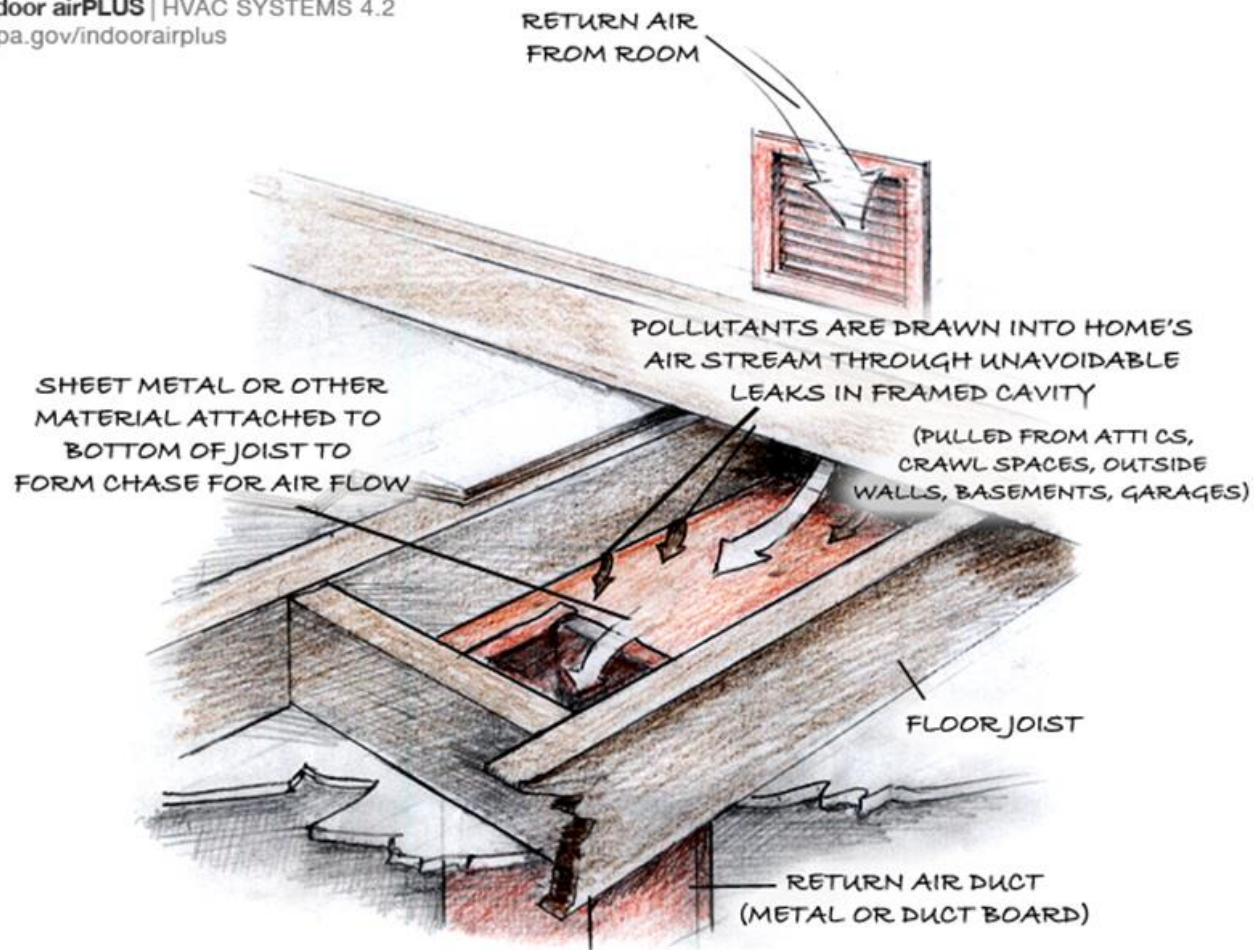


**SEALING WITH MASTIC**



**Indoor Air Quality (IAQ)**





BUILDING CAVITIES (E.G., PANNED JOISTS) SHALL NOT BE USED AS  
FORCED-AIR SUPPLIES OR RETURNS (1 OF 2)

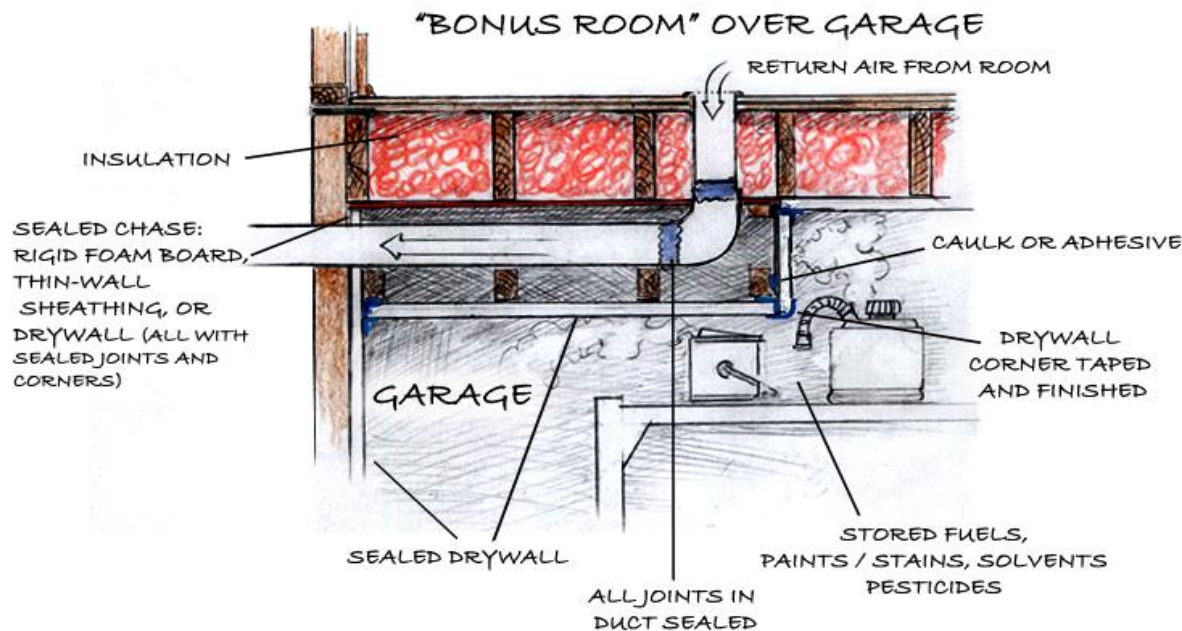


Indoor Air Quality (IAQ)

## 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.



Indoor Air Quality (IAQ)

## 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.**



Indoor Air Quality (IAQ)

# 4.7 Filtration for Central Forced-Air HVAC Systems

- Filters come multiple sizes.
- Filters are typically 1", 2" or 4" in depth.
- In years past the primary purpose for filtration was to protect the HVAC system, not IAQ.
- Beware of static pressure drop with standard filters



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# 5. Combustion Pollutants



Combustion Safety

Accidental carbon monoxide (CO) poisoning kills an average of 439 persons annually



Indoor Air Quality (IAQ)

# 5. Combustion Equipment



- All space-heating appliances are **vented**, and any naturally drafted appliances are **tested**.
- All fuel-burning appliances located in conditioned spaces **meet strict emissions standards**.



CO ALARM

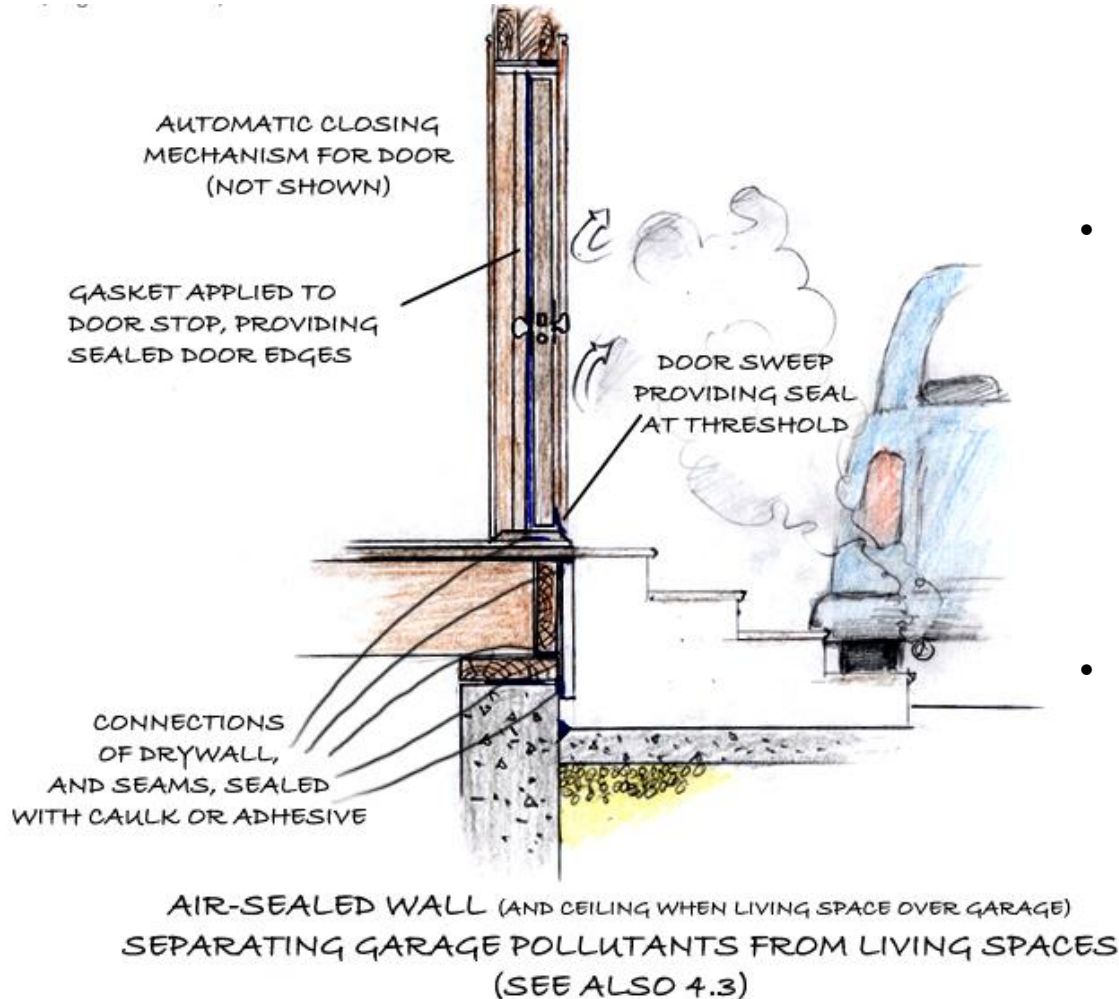


DIRECT VENTED FURNACE



Indoor Air Quality (IAQ)

# 5. Attached Garages



- **Isolated** from conditioned spaces:
  - Common walls and ceilings are **air-sealed**.
  - **Weather stripping** and an **automatic door closer** is installed on connecting doors between living space and garage.
- **Appropriate ventilation strategy or pressure testing** ensures separation from living space.



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:
  - Verify at final inspection that an **appropriate garage fan** has been installed.

**OR**

  - Conduct 45 Pascal pressure test** with all garage openings closed to verify the garage-to-house air barrier.



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 type="checkbox"/>		<input checked="" type="checkbox"/>	<input type="checkbox"/>
	5.2	CO alarms installed in each sleeping zone (e.g., common hallway) according to NFPA 720.	<input type="checkbox"/>		<input checked="" type="checkbox"/>	
	5.3	Multifamily buildings: Smoking restrictions implemented AND ETS transfer pathways minimized.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	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.	<input type="checkbox"/>		<input checked="" type="checkbox"/>	<input type="checkbox"/>



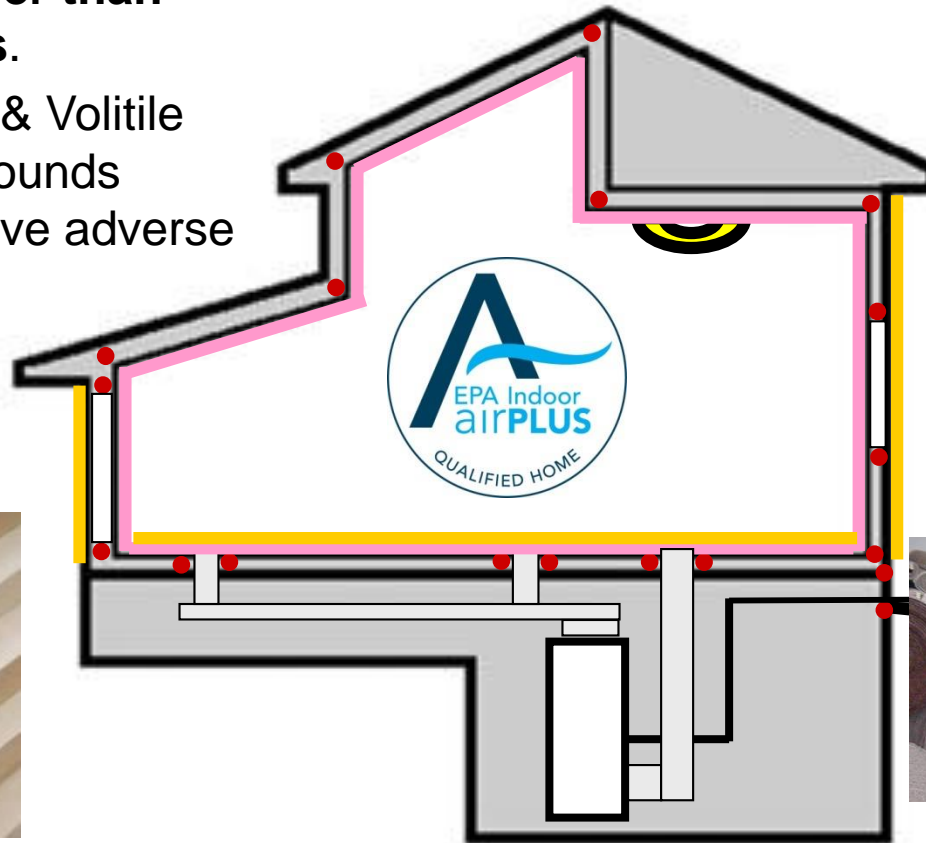
Indoor Air Quality (IAQ)



# 6. Low Emission Materials

- Indoor levels of many chemical pollutants can be **2-5 times higher than outdoor levels.**
- Formaldehyde & Volatile Organic Compounds (**VOCs**) can have adverse health effects

## Materials

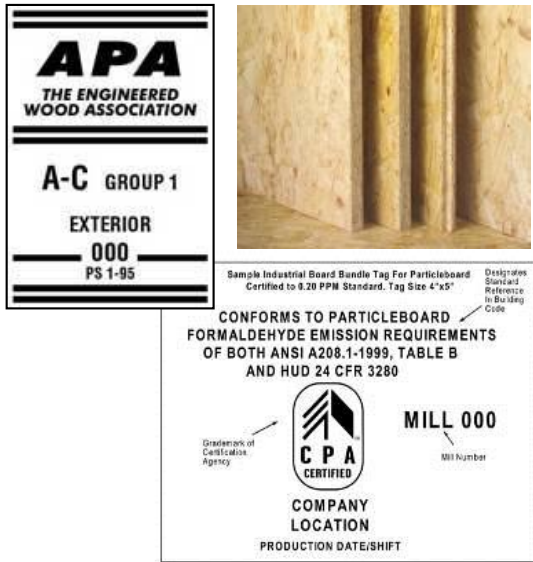


Indoor Air Quality (IAQ)

# 6. Materials

## 1. Composite Woods

- Low-formaldehyde
- Rated for durability  
PS1 or PS2



## 2. Paints

- Low or No-VOC



## 3. Carpets, Pads, Adhesives

- Green Label or  
Green Label  
PLUS Certified



Indoor Air Quality (IAQ)

# 6. Low Emission Materials



**Homeowner Benefits**



**Less “chemical” smell**



**Lowered exposure to VOCs**



**Reduced potential for occupant health complaints**



**Indoor Air Quality (IAQ)**

# Quiz - Last Item on the Checklist: What else should the Builder provide to the Homebuyer?

Hint: They may need the Rater's help.

## 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.



Indoor Air Quality (IAQ)

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

One additional checklist verified by the Rater

**EPA** Indoor airPLUS Version 1 (Rev. 02) Verification Checklist

Home Address: \_\_\_\_\_ City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_

Section	Requirements (Refer to full Indoor airPLUS Construction Specifications for details)	Must Correct	Builder Verified	Rater Verified	N/A
<b>ENERGY STAR V3</b>					
Thermal Enclosure System Rater Checklist completed.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Water Management System Builder Checklist completed.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
HVAC System Quality Installation Contractor Checklist completed.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
HVAC System Quality Installation Rater Checklist completed.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>Moisture Control</b>					
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 type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.2 Layer of vapor-retard or seal in or with product to meeting 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"/>	<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"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Radon</b>					
2.1 Approved radon-resistant features installed in Radon Zone 1 homes.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Paints</b>					
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 type="checkbox"/>	<input type="checkbox"/>
<b>HVAC Systems</b>					
4.1 Equipment selected to keep relative humidity < 60% in "Warm Humid" climates (Exception: see spec).		<input type="checkbox"/>	<input type="checkbox"/>	<input 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"/>	<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"/>	<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"/>	<input type="checkbox"/>
<b>Combustion Appliances</b>					
5.1 Emissions standards met for fuel-burning and space-heating appliances (Exception: see spec).		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.2 CO alarms installed in each sleeping zone (e.g., common hallway) according to NFPA 720.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.3 Multifamily buildings: Smoking restrictions implemented AND ETS transfer pathways minimized.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.4 Attached garages: Door closer installed on all connecting doors AND in homes with exhaust only whole-house ventilation (TYPE 4 or 7) the 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.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Materials</b>					
6.1 Certified low-formaldehyde composite wood materials AND structural plywood AND OSB PS1 or PS2 compliant.		<input type="checkbox"/>	<input type="checkbox"/>	<input 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"/>	<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"/>
7.1 HVAC system and ductwork verified to be dry and clean AND new filter installed.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input 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"/>

Rater Company: \_\_\_\_\_ Builder Company: \_\_\_\_\_  
 Rater Employee: \_\_\_\_\_ Builder Employee: \_\_\_\_\_  
 Rater Signature: \_\_\_\_\_ Date: \_\_\_\_\_ Builder Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Rev. November 2013



Place the Indoor airPLUS label adjacent to the ENERGY STAR label



Indoor Air Quality (IAQ)



# Resources and Tools

## Marketing and Technical Support for Partners



- Construction requirements
- Technical guidance
- Recorded webinars
- YouTube videos
- Builder and consumer resources
- Partner locator
- Website widgets
- Free brochures



[www.epa.gov/indoorairplus](http://www.epa.gov/indoorairplus)



Indoor Air Quality (IAQ)

### Mold and Moisture Control

*Paying close attention to moisture details:*

- ▶ Increases structural durability
- ▶ Reduces the potential for mold-related health issues
- ▶ Prevents recurring maintenance issues

### Homeowner Education

*Indoor airPLUS homebuyers receive:*

- ▶ An Indoor airPLUS label and certificate
- ▶ A list of features included in their home
- ▶ Instructions for regular equipment maintenance

### Radon Control

*Planning for the possibility of radon helps reduce risks posed by the second leading cause of lung cancer in the United States.*

### Efficient HVAC Systems

*A well-designed heating, ventilation, and air conditioning system provides:*

- ▶ Improved comfort
- ▶ Humidity control
- ▶ Enhanced filtration
- ▶ Clean, well-sealed ductwork

*Indoor airPLUS construction specifications are designed to help improve indoor air quality (IAQ) in new homes compared with homes built to minimum code. However, these features alone cannot prevent all IAQ problems. Occupant behavior is also important for IAQ. For example, products used in the home after occupancy and smoking inside may both negatively impact the home's IAQ and the performance of the specified Indoor airPLUS features.*

*See: <http://www.epa.gov/indoorairplus/> for more information.*

### Building Materials

*Choosing low-emission building materials:*

- ▶ Lowers exposure to Volatile Organic Compounds (VOCs)
- ▶ Reduces the potential for health problems
- ▶ Minimizes "chemical smell" in the home

### Combustion Pollutant Control

*Careful attention to venting and combustion sources:*

- ▶ Reduces pollutants in living spaces
- ▶ Minimizes CO exposure
- ▶ Provides peace-of-mind for everyone in the home

### Pest Barriers

*Blocking pest entry:*

- ▶ Keeps the home cleaner
- ▶ Limits allergens, germs, and asthma triggers
- ▶ Prevents potential pest damage

**Benefits of an Indoor airPLUS Qualified Home**





# Indoor airPLUS Leader Awards



- 2014 -- 1<sup>st</sup> annual Builder Award Winners
- *2015 applications now available – due March 25<sup>th</sup>!*

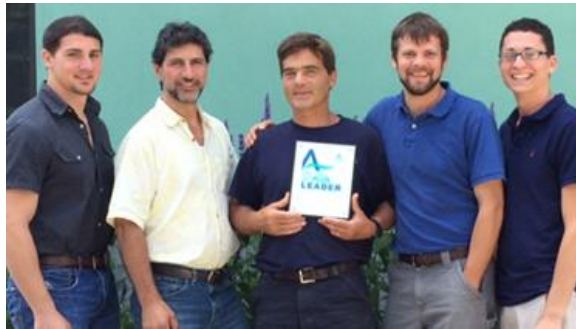
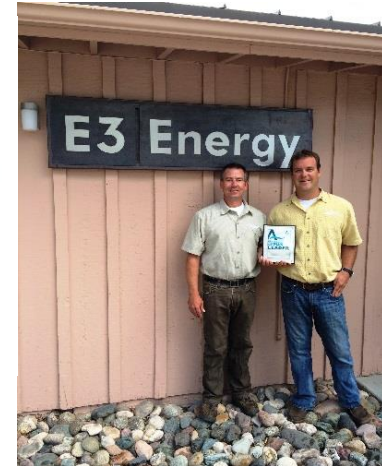
**To see company profiles, visit the INDOOR airPLUS website:**  
**[www.epa.gov/indoorairplus/leader\\_awards.html](http://www.epa.gov/indoorairplus/leader_awards.html)**

## 2014 Builder Leaders



Indoor Air Quality (IAQ)

# Indoor airPLUS Leader Awards



**2015 Applications:**

**[www.epa.gov/indoorairplus/leader\\_awards.html](http://www.epa.gov/indoorairplus/leader_awards.html)**



## 2014 Verifier Leaders

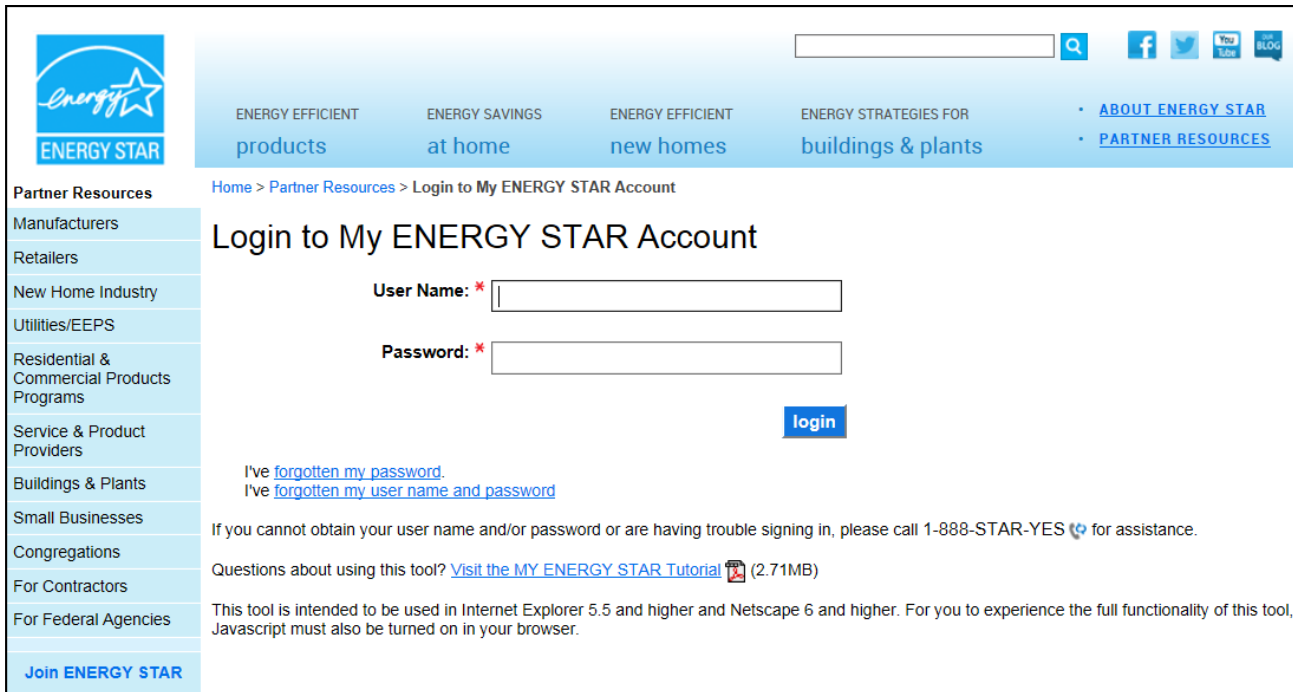


**Indoor Air Quality (IAQ)**

# What's Next?

## Become an Indoor airPLUS Partner

- For current ENERGY STAR Partners:
  - Log into your My ENERGY STAR Account (MESA)  
[www.energystar.gov/mesa](http://www.energystar.gov/mesa)



The screenshot shows the ENERGY STAR website's Partner Resources section. On the left is a navigation menu with links like Manufacturers, Retailers, New Home Industry, etc. The main content area is titled 'Login to My ENERGY STAR Account'. It features input fields for 'User Name' and 'Password', each with a red asterisk indicating a required field. Below these fields is a blue 'login' button. There are also links for 'I've forgotten my password' and 'I've forgotten my user name and password'. A note at the bottom states: '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.'

If you don't know your user name and password, click the link or email [energystarhomes@energystar.gov](mailto:energystarhomes@energystar.gov) for assistance.



Indoor Air Quality (IAQ)

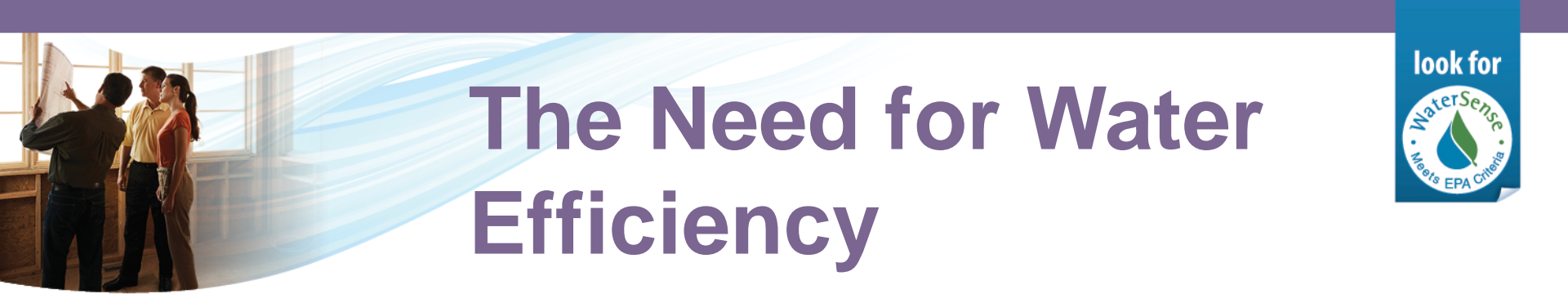


look for



# WaterSense® New Homes

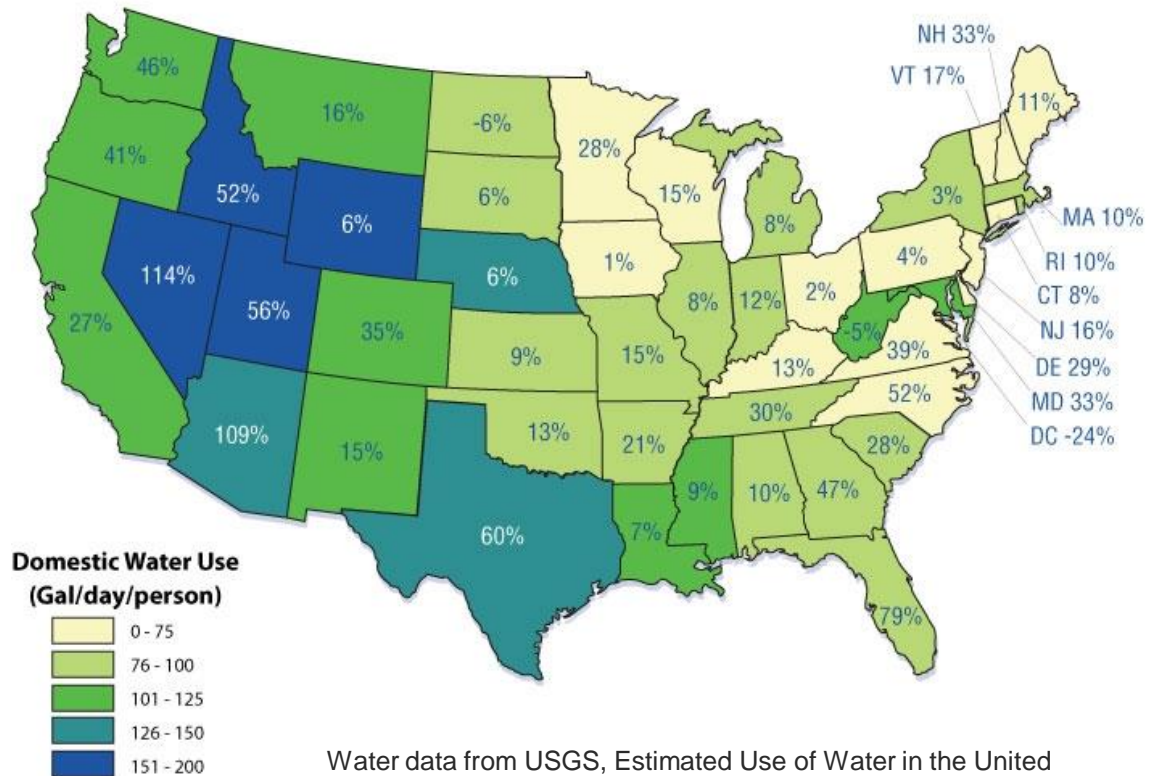




# The Need for Water Efficiency

- Our national thirst for water is increasing
- Demand coupled with climate change will increase stresses on water supplies
- Non-drought water shortages are expected in 40 states
- Water utilities may need to invest more than \$700 billion to update aging infrastructure in the next 20 years

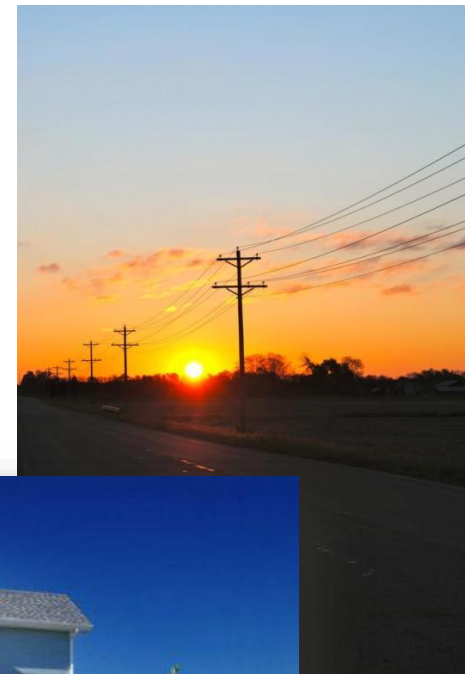
**Domestic Water Use in Gallons per Day per Person and Projected Percent population Change by 2030**



Water data from USGS, Estimated Use of Water in the United States in 2005. Table 6, Page 20; population data from U.S. Census Bureau, State Interim Population Projections by Age and Sex: 2004-2030.

# Water-Energy Nexus

- Every gallon of water has an energy “footprint”
- Moving, treating, and heating water uses energy
- In some areas close to 20% of energy used is embedded in water
- Reducing hot water use can significantly lower water and energy costs

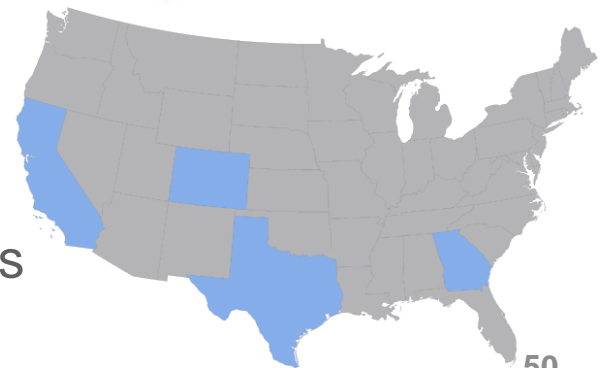


**WaterSense labeled new home by HiPointe Homes  
Colorado Springs, CO**



# What Will This Mean?

- Rising costs for water and sewer
  - Higher utility bills
  - Larger connection fees
- Increased use of outdoor water restriction
  - Designated watering days
  - No new planting
  - Water budget based billing
  - No outdoor water use
- More stringent code
  - More efficient plumbing products
  - Strict permitting & development policies







# Why Build WaterSense Labeled Homes?

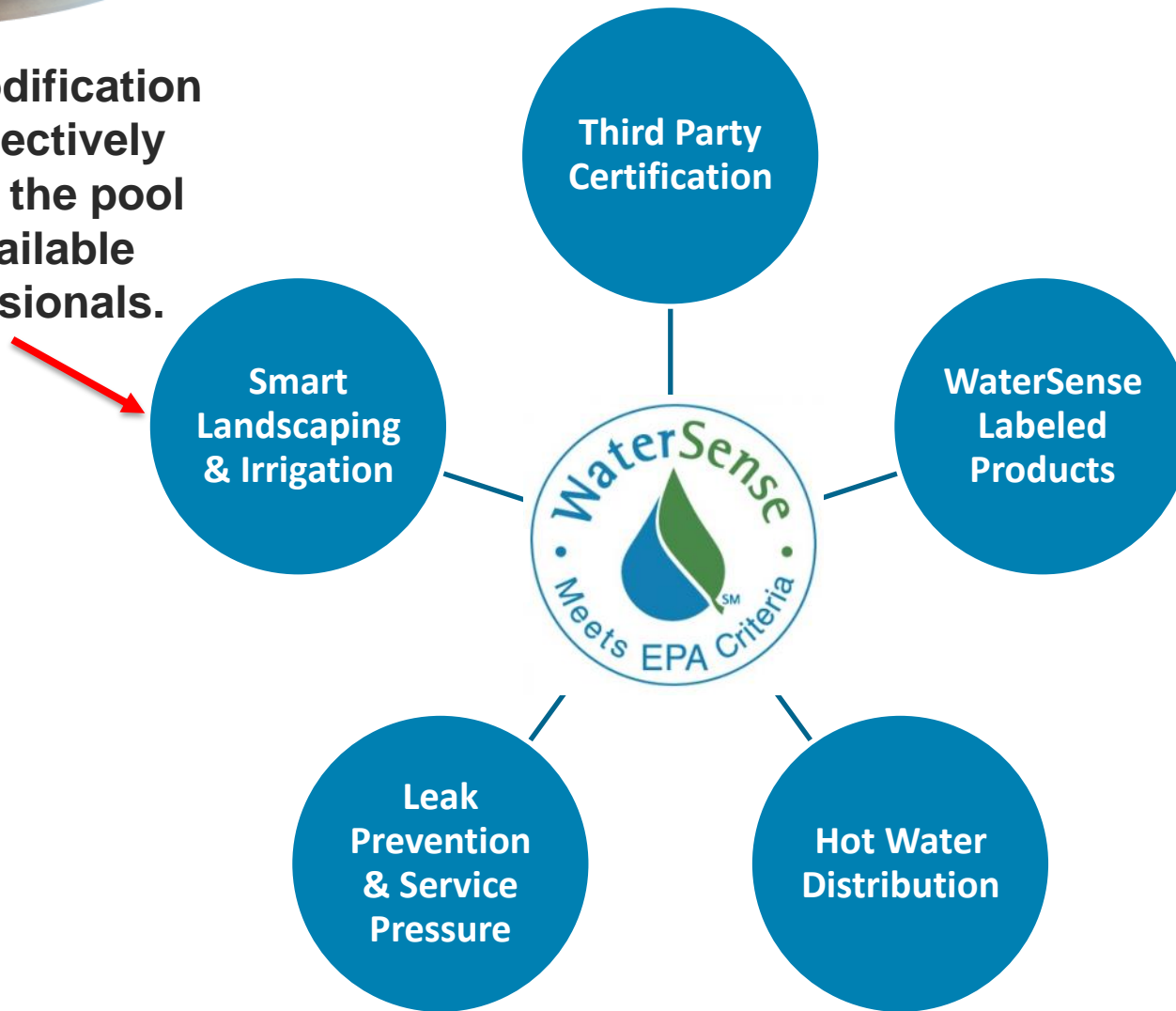
- **Part of the “whole-house” building science approach**
  - Provides a key market differentiation
  - Allows builders to stay a step ahead of codes and utility rates
- **Convenience, efficiency, & confidence**
  - Hot water will be delivered to users faster and use less energy
  - Regionally appropriate landscaping
  - WaterSense labeled products provide efficiency *and* performance
  - Improved quality and reduced call backs
- **Ability to co-brand with WaterSense**
  - Access to WaterSense partner resources
  - Meet the growing demand for green products
  - Eligibility for awards



# What Makes a WaterSense Labeled Home?



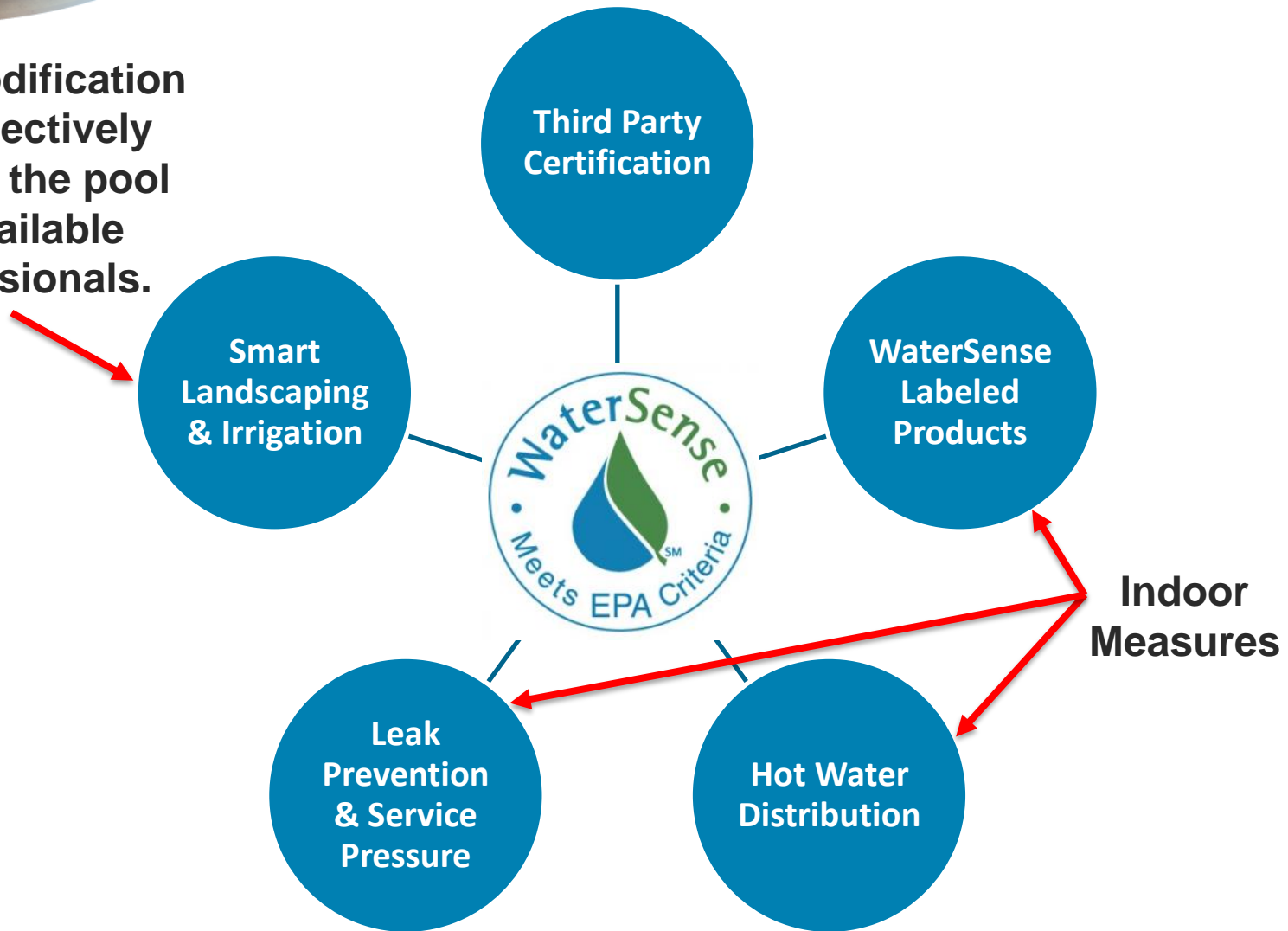
2014 modification  
will effectively  
expand the pool  
of available  
professionals.



# What Makes a WaterSense Labeled Home?



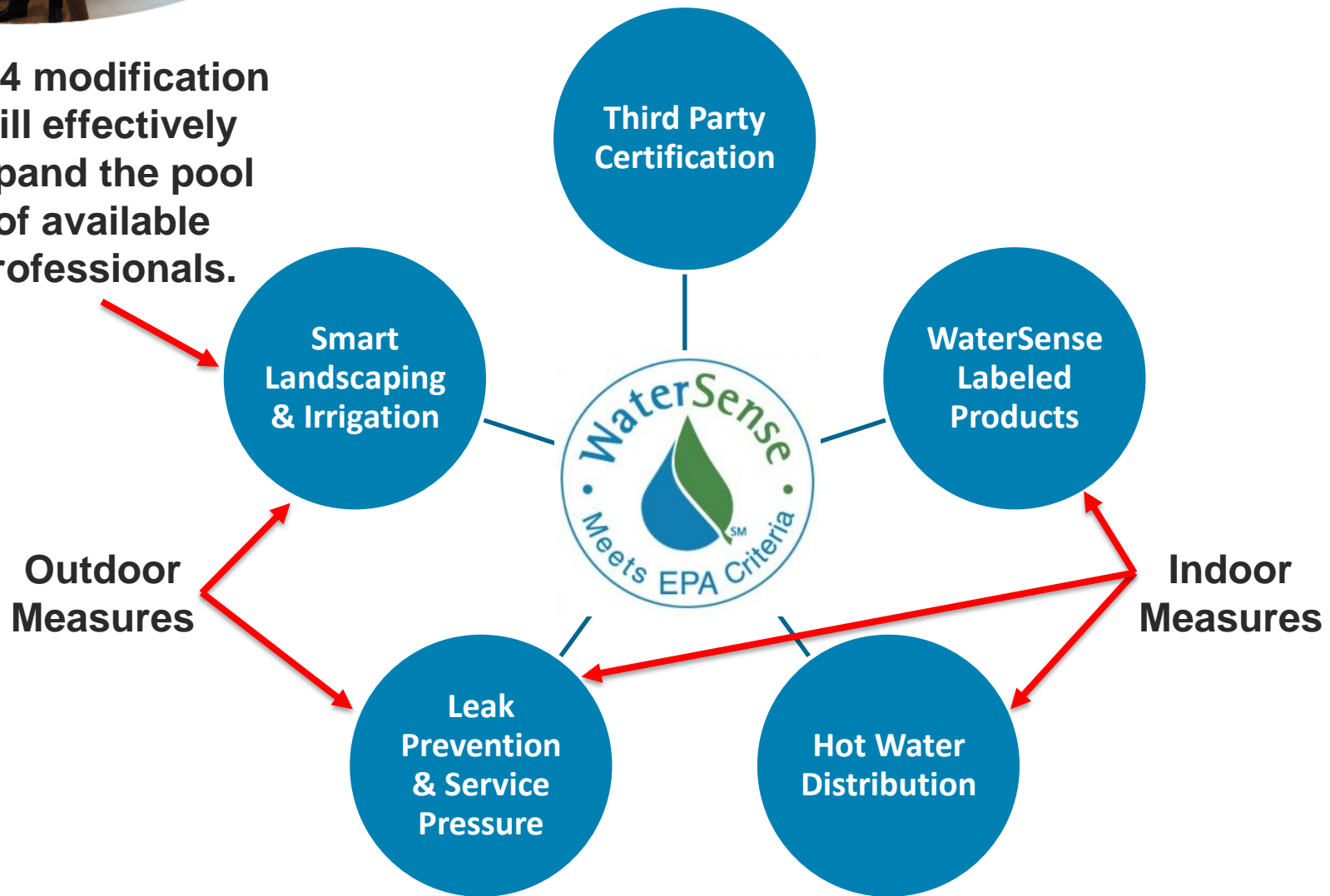
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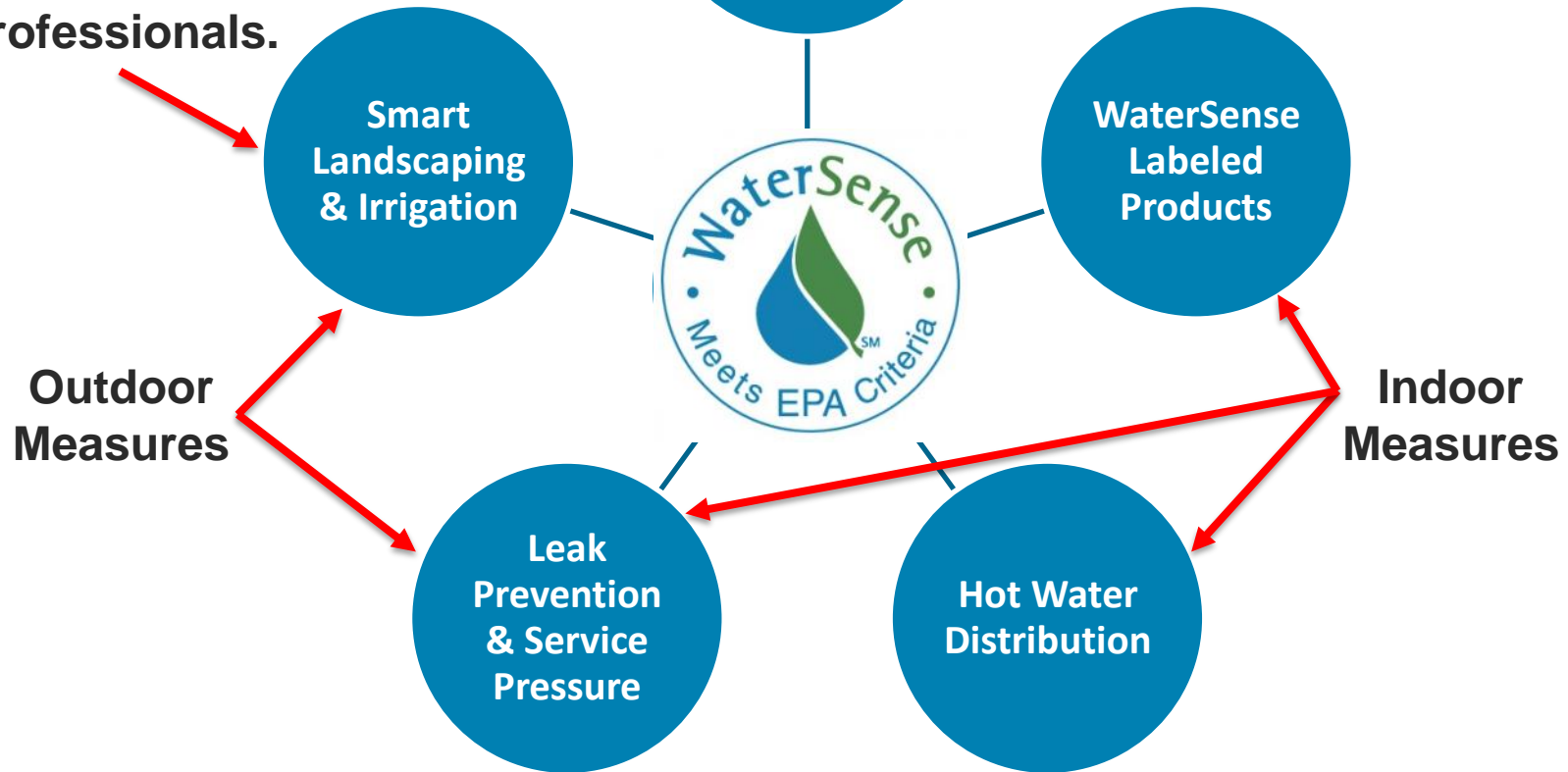
# What Makes a WaterSense Labeled Home?



2014 modification  
will effectively  
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of available  
professionals.



Third Party  
Certification



look for



# WaterSense Labeled Products



**Flushing  
Urinals**



**Lavatory  
Faucets**



**Tank-Type  
Toilets**



**Showerheads**



**Irrigation  
Controllers**



**Pre-Rinse  
Spray  
Valves**

**More than  
10,000  
Labeled  
Product  
Models**



**Water factors are also  
included in many  
ENERGY STAR certified  
products**

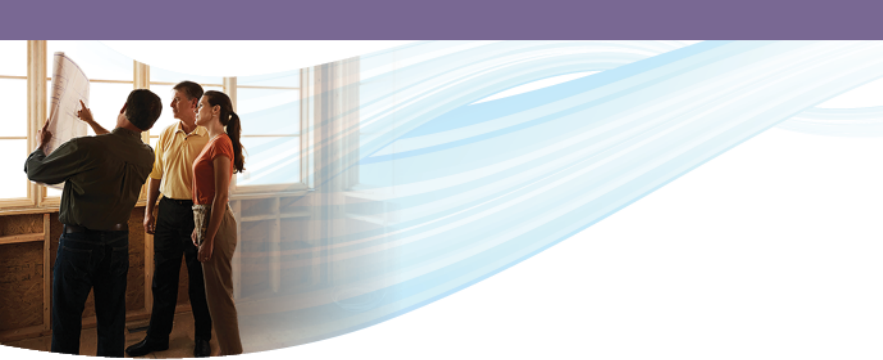




# Indoor Criteria

- Low-hanging fruit: simple to implement and document
- Items that require basic on-site verification by WS Inspector
- Items that require coordination and planning w/ builder

Item	Section	Home or Unit Criteria	Yes	No	NI*	Doc†
<b>Indoor Water Efficiency Criteria</b>						
Leaks	3.1	Pressure-loss test on all water supplies detected no leaks				
		No visible leaks from hot water delivery system				
		No visible leaks from toilets/urinals				
		No visible leaks from bathroom faucets				
		No visible leaks from kitchen faucets				
		No visible leaks from showerheads				
		No visible leaks from other fixtures or appliances				
Service pressure	3.2	Single-family: Pressure tank installed and set ≤ 60 psi OR				
		Single-family: PRV installed upstream of fixtures and pressure test ≤ 60 psi OR				
		Single-family: Pressure test ≤ 60 psi and written documentation from water supplier that pressure ≤ 60 psi				Req.
		Multi-family: Pressure test ≤ 60 psi				
Hot water delivery	3.3	Acceptable system type				
		10°F temp. change within ≤ 0.6 gallons				
Toilets	3.4.1	WaterSense labeled				Req.
Flushing urinals	3.4.2	WaterSense labeled				Req.
Bathroom sink faucets	3.5.1	WaterSense labeled				Req.
		Measured flow rate—maximum 1.5 gpm (Flow test maximum: 0.25 gallons)				
Kitchen sink faucets	3.5.2	Measured flow rate—maximum 2.2 gpm (Flow test maximum: 0.4 gallons)				
		WaterSense labeled				Req.
Showerheads	3.6	Measured flow rate—maximum: 2.0 gpm water per shower compartment ≤ 2,160 in <sup>2</sup> (Flow test maximum: 0.35 gallons/compartment) Separate controls for showerheads if > 2160 in <sup>2</sup>				
Dishwashers	3.7.1	ENERGY STAR qualified				Req.
Clothes washers	3.7.2	ENERGY STAR qualified				Req.
		Water factor ≤ 6.0				Req.
Evaporative cooling system	3.8.1	Acceptable system type				Req.
		Maximum 3.5 gal/water/ton hour cooling, maximum 3 blowdowns in 24 hours				Req.
		Controls blowdown through conductivity or a basin temperature-based controller				Req.
Water softeners	3.8.2	Certified to NSF/ANSI Standard 44, including voluntary efficiency rating standards in Section 7				Req.
Drinking water	3.8.3					Req.



# Indoor Criteria

- Low-hanging fruit: simple to implement and document
  - WaterSense labeled bath fixtures
  - ENERGY STAR clothes and dishwashers
  - Document if installed:
    - Evaporative cooling systems
    - Water softeners
    - Drinking water treatment systems

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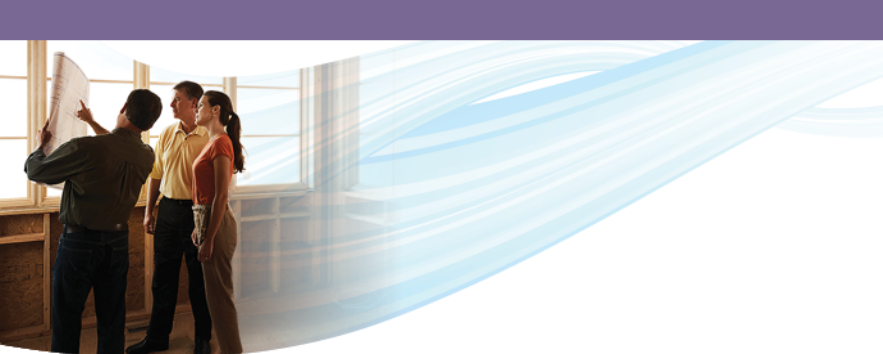


# What is “Water Factor”?

- **Water Factor** is the number of gallons per cycle per cubic foot that the clothes washer uses. The lower the water factor, the more efficient the washer is.
- **Example:** If a clothes washer uses 30 gallons per cycle and has a tub volume of 3.0 cubic feet, then the water factor is 10.0.

**Look for:**





# Indoor Criteria

## • Items that require basic on-site verification

- Leak check (pressure loss test)
- Service pressure 60psi
- Toilet dye test
- Measure flow rates:
  - Faucets
  - Showerheads

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		No visible leaks from kitchen faucets				
		No visible leaks from showerheads				
		No visible leaks from other fixtures or appliances				
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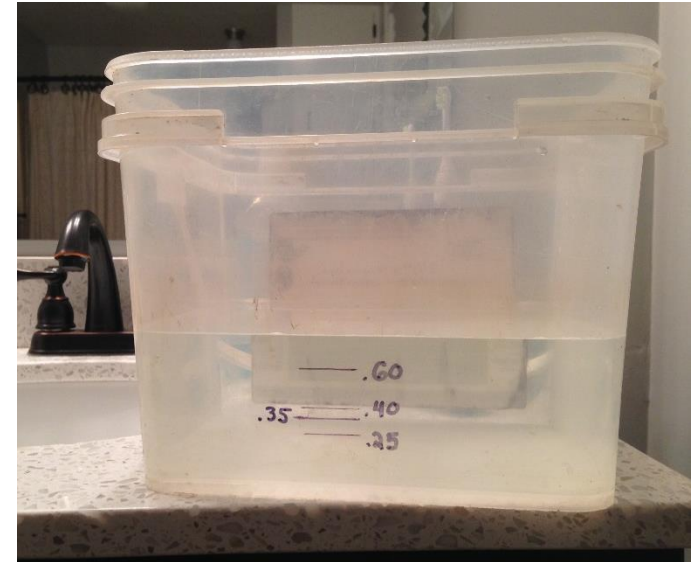


# How Do I Measure Flow Rates?

1. Use a flow-measuring bag or clear bucket.
2. Turn water on completely (both handles) for 10 seconds
3. Verify total volume collected does not exceed limit for each fixture

## Planning Note: Multiple Showerheads

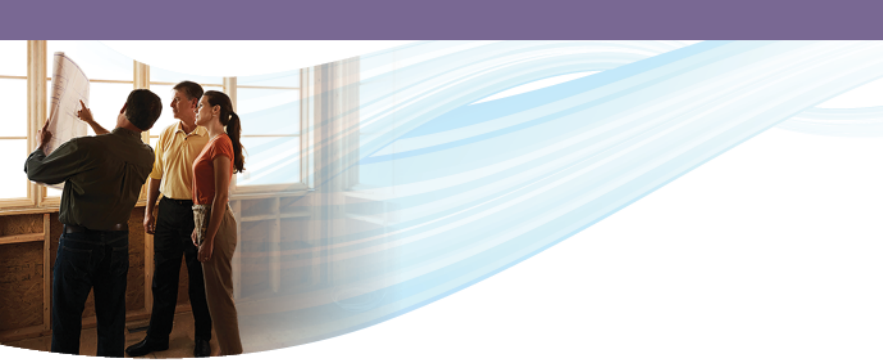
- Allowable flow is 2gpm total for all heads in compartment
- Note exception if shower compartment is larger than 15 square feet and there are separate controls



## Why? –

- Ensure the aerators are intact and operating as designed.
- .1 gallons over the life of the fixture is a lot of waste!





# Indoor Criteria

- Items that require coordination and planning w/ builder

- Hot Water Delivery: various options to consider

- Benefits

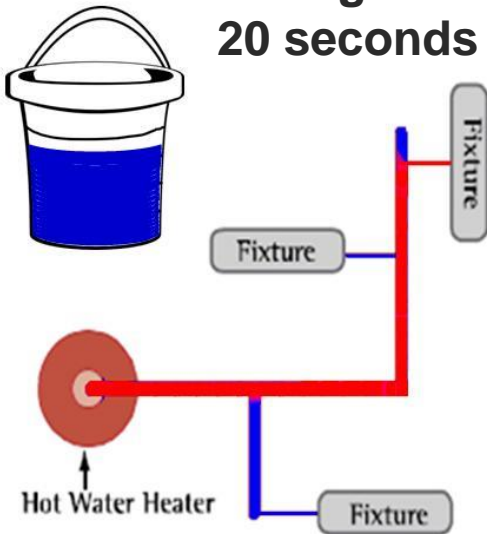
- Water AND Energy Savings
  - Convenience for the Homeowner

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# Hot Water Distribution Systems

## The Problem

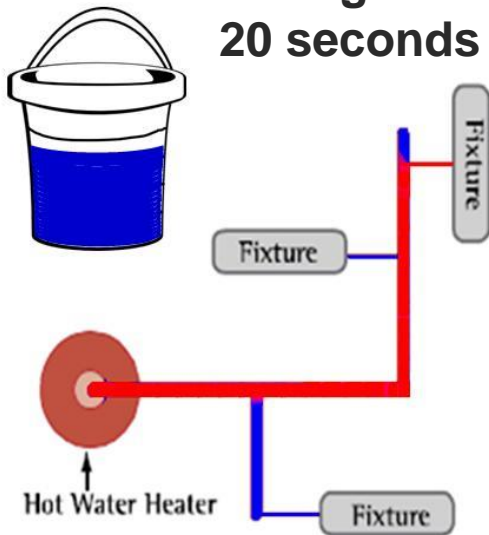
1.67 gallons wasted  
20 seconds wait time



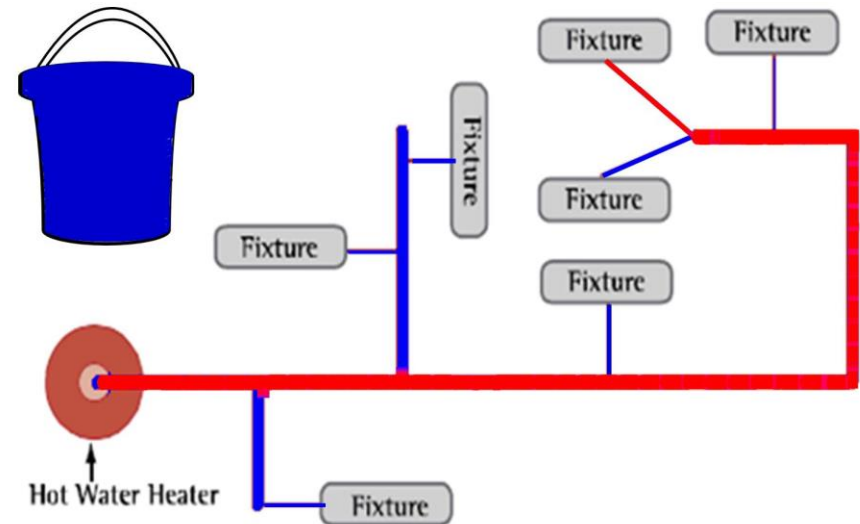
# Hot Water Distribution Systems

## The Problem

1.67 gallons wasted  
20 seconds wait time



•3 gallons wasted  
•1 minute 30 seconds wait time





# Hot Water Distribution Systems Performance Requirement

- *The system shall store no more than 0.5 gallons in any piping/manifold between the hot water source and any hot water fixture.*
- *No more than 0.6 gallons of water shall be collected from the fixture before hot water is delivered (accounts for water that must be removed from the system before hot water can be delivered).*





# How to Design?

## How is the Volume Calculated?

The table below summarizes the volume of water stored in different sized piping:

**Table 1. Internal Volume of Various Water Distribution Piping**

Ounces of Water Per Foot of Hot Water Tubing								
Nominal Diameter in inches (in)	Copper M	Copper L	Copper K	CPVC CTS SDR 11	CPVC SCH 40	PEX-AI-PEX ASTM F 1281	PE-AL-PE	PEX CTS SDR 9
3/8	1.06	0.97	0.84	N/A	1.17	0.63	0.63	0.64
1/2	1.69	1.55	1.45	1.25	1.89	1.31	1.31	1.18
3/4	3.43	3.22	2.90	2.67	3.38	3.39	3.39	2.35
1	5.81	5.49	5.17	4.43	5.53	5.56	5.56	3.91
1 1/4	8.70	8.36	8.09	6.61	9.66	8.49	8.49	5.81
1 1/2	12.18	11.83	11.45	9.22	13.20	13.88	13.88	8.09
2	21.08	20.58	20.04	15.79	21.88	21.48	21.48	13.86

Source: Modified from 2009 International Plumbing Code Table E202.1. International Code Council. January.

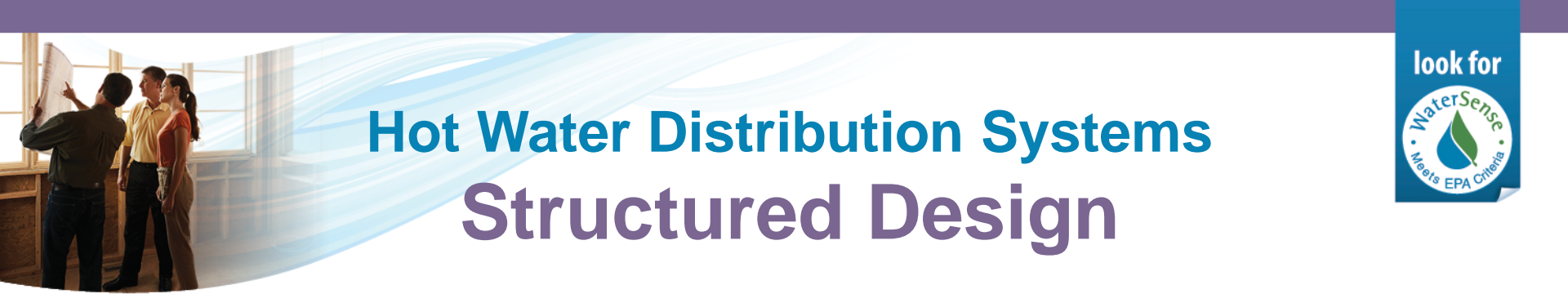
The volume of water stored in manifolds is estimated at 0.013 gallons per manifold port. This estimate is based on information provided by the Plastic Pipe and Fittings Association (PPFA).

# How to Design?

<b>Trunk:</b>		
piping:	<input type="text" value="Copper L"/>	diameter: <input type="text" value="1"/>
length (feet)	<input type="text" value="10"/>	<div>ounces/ft: 5.43</div> <div>volume (oz): 54.3</div>
<b>Branch:</b>		
piping:	<input type="text" value="Copper L"/>	diameter: <input type="text" value="3/4"/>
length (feet)	<input type="text" value="5"/>	<div>ounces/ft: 3.22</div> <div>volume (oz): 16.1</div>
<b>Twig:</b>		
piping:	<input type="text" value="Copper L"/>	diameter: <input type="text" value="1/2"/>
length (feet)	<input type="text" value="2"/>	<div>ounces/ft: 1.55</div> <div>volume (oz): 3.1</div>
<b>total</b>		
length (feet)	17	volume (oz): 73.5

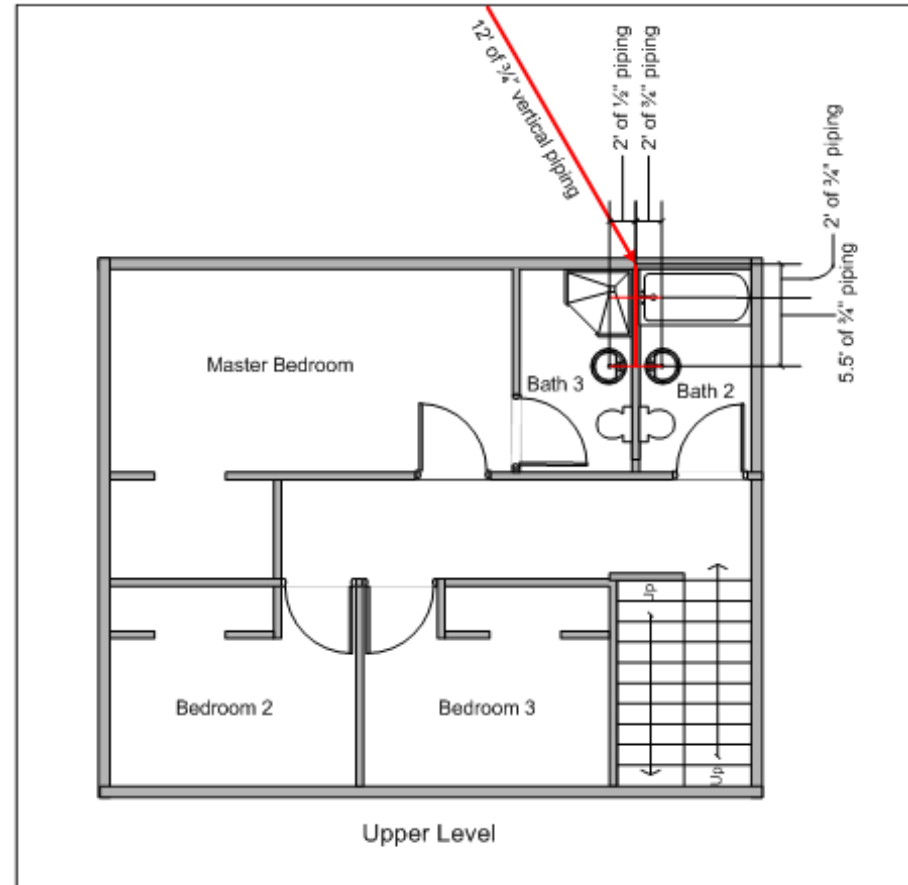
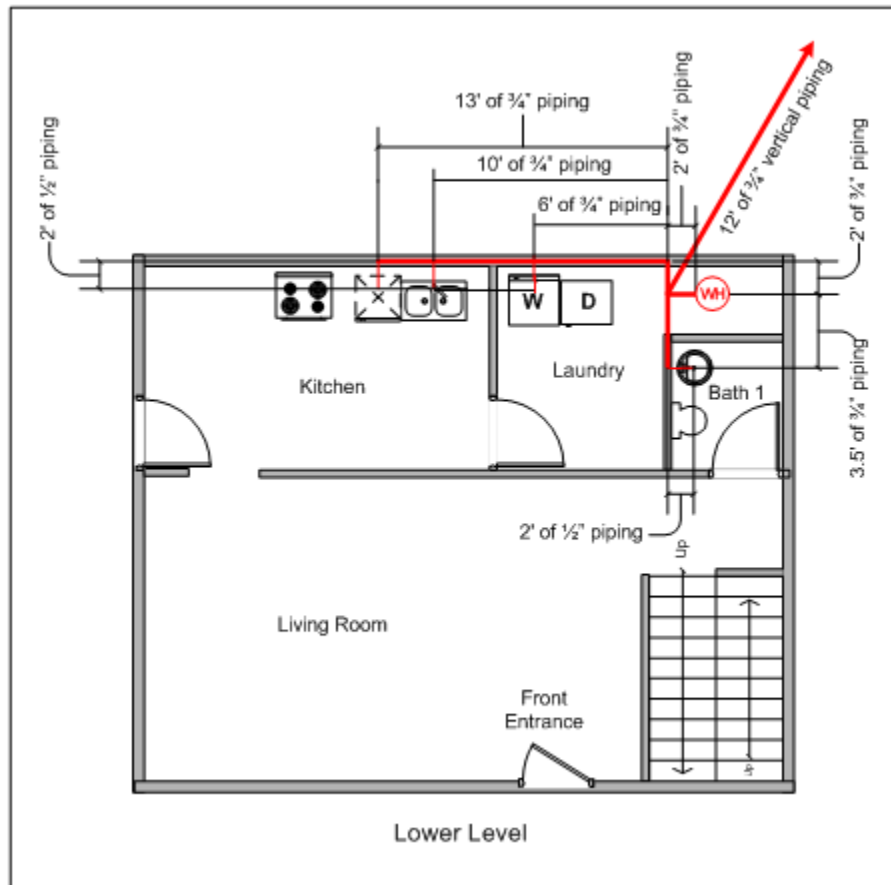
## Resources

- [Hot Water Distribution Volume Calculator](#)
- [Guide for Efficient Hot Water Delivery Systems](#)



# Hot Water Distribution Systems

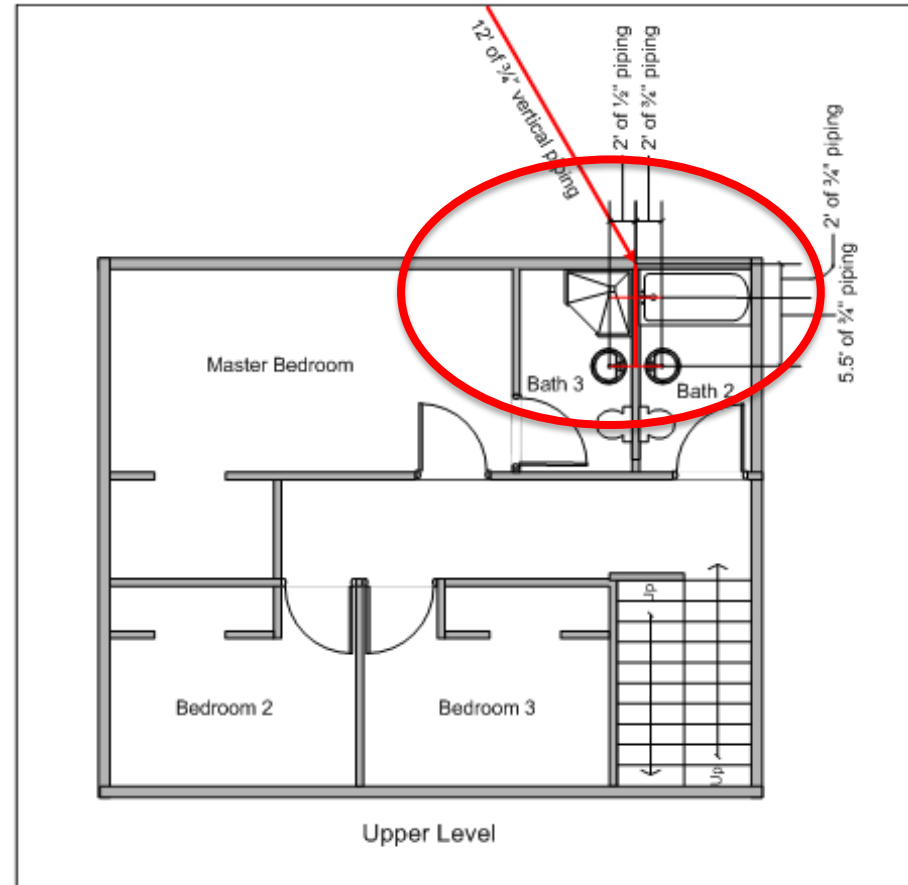
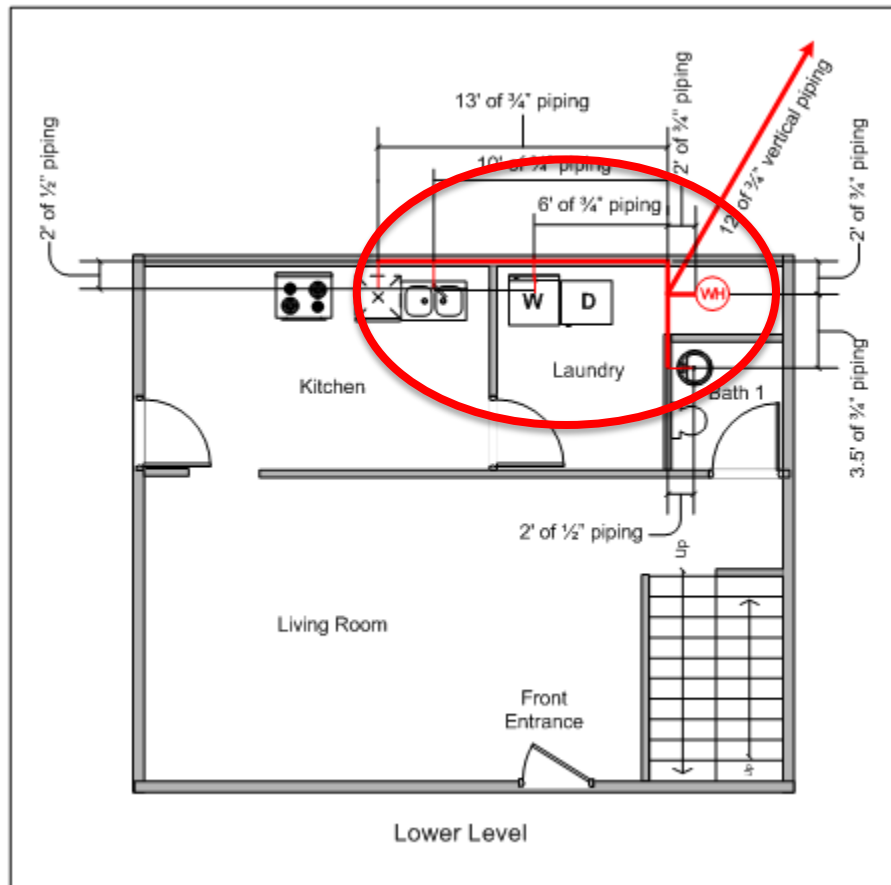
## Structured Design





# Hot Water Distribution Systems

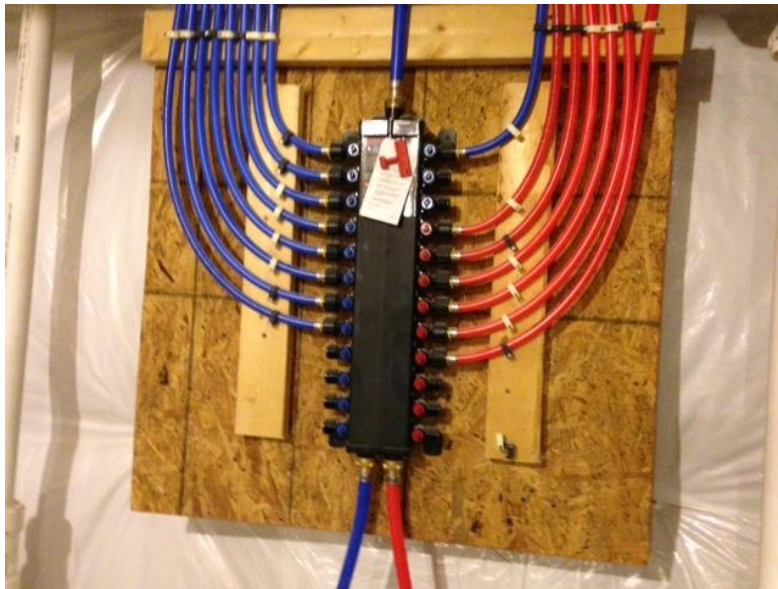
## Design #1



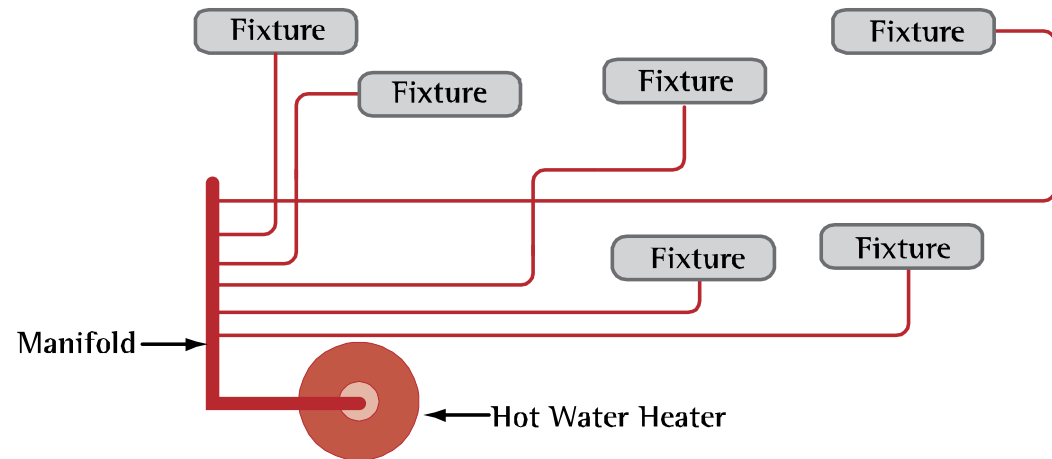


# Hot Water Distribution Systems

## Whole House Manifold System



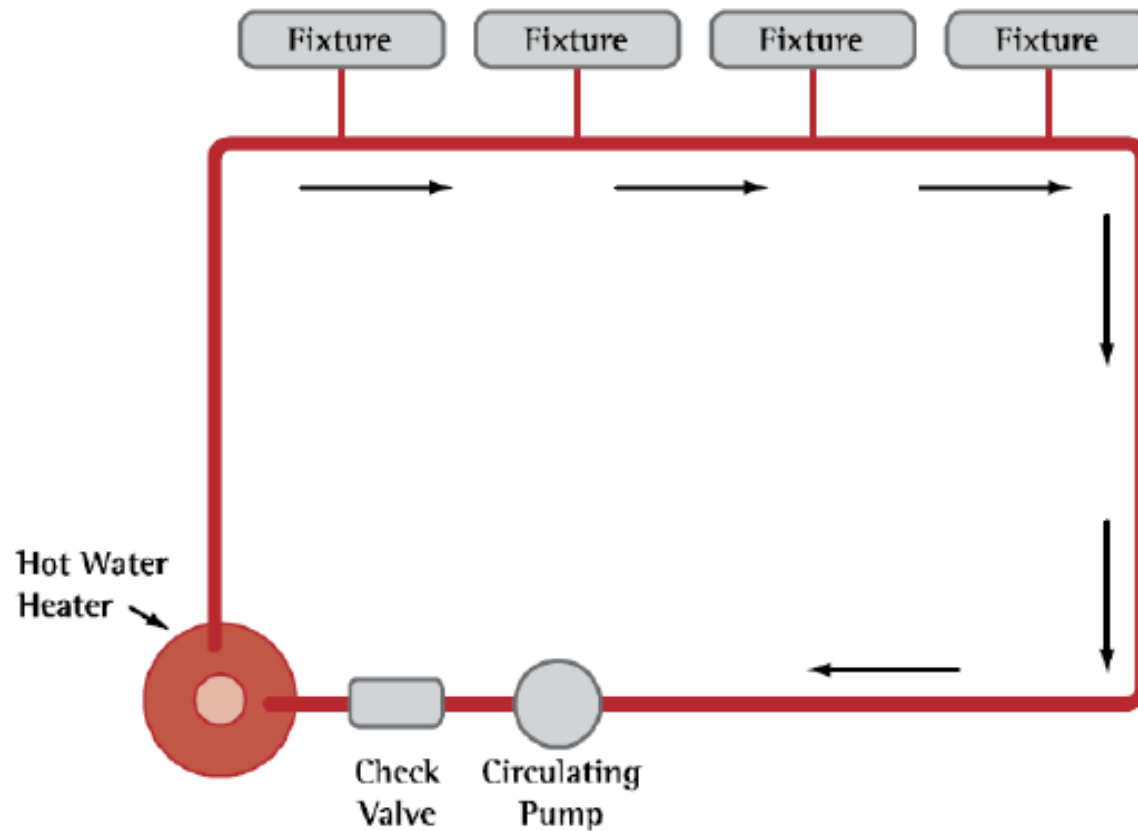
**Manifold**



**Plumbing Design w/ Manifold**

# Hot Water Distribution Systems

## Demand Initiated Recirculation



Triggered by Motion Sensor or Push Button



# Hot Water Distribution Systems Design & Layout Choices



*Remember: The system shall store no more than 0.5 gallons in any piping/manifold between the hot water source and any hot water fixture.*

	Option 1	
	Structured Design	
Lower Level		
Dishwasher	.48 gal	NA
Kitchen Sink	.40 gal	16 sec
Washer	.29 gal	NA
Bath 1 sink	.17 gal	10 sec
Upper Level		
Bath 2 tub	.43 gal	26 sec
Bath 2 sink	.50 gal	45 sec
Bath 3 shower	.40 gal	24 sec
Bath 3 sink	.50 gal	45 sec



# Hot Water Distribution Systems Design & Layout Choices



*Remember: The system shall store no more than 0.5 gallons in any piping/manifold between the hot water source and any hot water fixture.*

	Option 1		Option 2	
	Structured Design		Un-Structured Design	
Lower Level				
Dishwasher	.48 gal	NA	.48 gal	NA
Kitchen Sink	.40 gal	16 sec	.40 gal	16 sec
Washer	.29 gal	NA	.29 gal	NA
Bath 1 sink	.17 gal	10 sec	.17 gal	10 sec
Upper Level				
Bath 2 tub	.43 gal	26 sec	1.02 gal	61 sec
Bath 2 sink	.50 gal	45 sec	1.09 gal	65 sec
Bath 3 shower	.40 gal	24 sec	.99 gal	59 sec
Bath 3 sink	.50 gal	45 sec	1.09 gal	65 sec





# Hot Water Distribution Systems Design & Layout Choices



*Remember: The system shall store no more than 0.5 gallons in any piping/manifold between the hot water source and any hot water fixture.*

	Option 1		Option 2		Option 3	
	Structured Design		Un-Structured Design		Structured Design W/Parallel Pipe (Manifold)	
Lower Level						
Dishwasher	.48 gal	NA	.48 gal	NA	.25 gal	NA
Kitchen Sink	.40 gal	16 sec	.40 gal	16 sec	.24 gal	10 sec
Washer	.29 gal	NA	.29 gal	NA	.22 gal	NA
Bath 1 sink	.17 gal	10 sec	.17 gal	10 sec	.21 gal	12 sec
Upper Level						
Bath 2 tub	.43 gal	26 sec	1.02 gal	61 sec	.25 gal	11 sec
Bath 2 sink	.50 gal	45 sec	1.09 gal	65 sec	.27 gal	16 sec
Bath 3 shower	.40 gal	24 sec	.99 gal	59 sec	.25 gal	11 sec
Bath 3 sink	.50 gal	45 sec	1.09 gal	65 sec	.27 gal	16 sec



# Hot Water Distribution Systems Design & Layout Choices



***Remember: The system shall store no more than 0.5 gallons in any piping/manifold between the hot water source and any hot water fixture.***

	Option 1		Option 2		Option 3		Option 4	
	Structured Design		Un-Structured Design		Structured Design W/Parallel Pipe (Manifold)		On Demand Recirculation*	
Lower Level								
Dishwasher	.48 gal	NA	.48 gal	NA	.25 gal	NA	.13 gal	NA
Kitchen Sink	.40 gal	16 sec	.40 gal	16 sec	.24 gal	10 sec	.13 gal	5 sec
Washer	.29 gal	NA	.29 gal	NA	.22 gal	NA	.13 gal	NA
Bath 1 sink	.17 gal	10 sec	.17 gal	10 sec	.21 gal	12 sec	.13 gal	7 sec
Upper Level								
Bath 2 tub	.43 gal	26 sec	1.02 gal	61 sec	.25 gal	11 sec	.13 gal	6 sec
Bath 2 sink	.50 gal	45 sec	1.09 gal	65 sec	.27 gal	16 sec	.13 gal	7 sec
Bath 3 shower	.40 gal	24 sec	.99 gal	59 sec	.25 gal	11 sec	.13 gal	6 sec
Bath 3 sink	.50 gal	45 sec	1.09 gal	65 sec	.27 gal	16 sec	.13 gal	7 sec

***\*NOTE: Recirculation systems must be demand initiated (push button or motion sensor).***  
***-Timer and temperature activated recirculation systems do not meet this requirement.***

# Outdoor & Irrigation Requirements Overview & Benefits

- Allow for beautiful and functional landscapes
- Provide for regionally appropriate landscapes that are easy to maintain
  - Can cut down on maintenance (time and expense)
  - May survive periods of drought or watering restrictions more readily than conventional landscapes
- Offer efficient irrigation technology with weather based control
  - Only where irrigation is installed (not required)



# Outdoor & Irrigation Requirements

## Outdoor Criteria

- Low-hanging fruit: simple to implement and verify
- Items that require basic documentation or coordination w/ irrigation professional
- Items that require coordination and planning w/ builder

Item	Section	Home or Unit Criteria	Yes	No	NI <sup>†</sup>	Doc <sup>†</sup>
<b>Outdoor Water Efficiency Criteria</b>						
Landscape design	4.1	Single-family: Front yard landscaped				
		All improved upon areas landscaped				
		Temporary landscape installed				
	4.1.1	Landscapable area of lot $\leq 1,000$ ft <sup>2</sup> and exempt from landscape design criteria				
	4.1.1.1	Water budget tool calculations verified				Req.
		Landscape complies with water budget design				Req.
Slopes	4.1.2	Slopes $\geq 4:1$ are vegetated				
Mulching	4.1.3	No exposed soil				
		All mulch is 2 to 3 inches deep				
Pools/spas	4.1.4	Single-family: Cover installed				
		Multi-family: Independently metered				
		Multi-family: Gutter or grate system				
		Multi-family: Sorptive media or cartridge filtration system				
Ornamental water feature	4.1.5	Recirculates water and serves beneficial use				
Irrigation system	4.2	WaterSense labeled weather-based irrigation controllers or approved soil moisture sensor-based controller				Req.
		Multi-family: Independently metered				
		Designed or installed by an irrigation professional certified by a WaterSense labeled program				Req.
		Provided waiver for design/installation				Req.
		System audited by certified irrigation professional				Req.
		Irrigation System Audit Checklist completed by certified irrigation professional				Req.
		Provided waiver for audit				Req.

# Outdoor & Irrigation Requirements

## WaterSense Water Budget Tool



Evergreens for  
protection from north winds

Permeable paving



Deciduous trees for  
shade on southside



# Outdoor & Irrigation Requirements

## WaterSense Water Budget Tool

### STEP 1 Location and Area

### STEP 2 Plants and Irrigation

### STEP 3 The Results

Congratulations on choosing to design a locally appropriate water-efficient landscape! The WaterSense water budget tool will help you determine if your landscape meets EPA's criteria for efficient outdoor water use in your area.

In order to use the water budget tool, you will need to know some basic information about your landscape:

- The location and zip code
- The total area of applicable landscape
- Types of plants and the total coverage
- Methods of irrigation (if any)

Your landscape will receive a pass/fail based on local climate, plant selection, irrigation methods, and size of the landscape. Follow the instructions on screen to find out if your landscape meets the WaterSense criteria.

For what purpose is the tool being used?  
What are you landscaping?

WaterSense Labeled Home(s) ▼

How many sites?

☐ Development of Multiple Landscapes

☒ Single Site

Is there an irrigation system?

☒ Yes ☐ No

Enter Zip Code

75751

Enter Landscaped Area  
for a Single Home or Site<sup>i</sup>

5000

Sq. Ft.

Enter Multi-Home/Development Landscaped Area Range<sup>i</sup>

to

Sq. Ft.

NEXT STEP >

**\*Required for all homes except for lots with total landscapable areas equal to or less than 1,000 square feet.**

# Outdoor & Irrigation Requirements

## WaterSense Water Budget Tool

### STEP 1 Location and Area

### STEP 2 Plants and Irrigation

### STEP 3 The Results

Fill out the chart below with all the appropriate information to calculate your landscape's water needs.

Zone	Area (sq. ft.)	Plant Type / Landscape Feature	Water Demand	Irrigation Type	Impact on Water Use	Required Water (gal/month)
× 1	2000	Turfgrass	Medium	Fixed Spray	10	9807
× 2	1000	Groundcover	Low	Drip (Press Comp)	2	778
× 3				Drip (Standard)		
× 4				Drip (Press Comp)		
× 5				Micro Spray		
× 6				No Irrigation		

Total: 3000

+ add zone

**2,000**

Remaining Area (sq. ft.)

**17,409**

Water Allowance (gal/month)

**10,585**

Total Water Requirement for the Site (gal/month)

**6,824**

Below Allowance (gal/month)

NEXT STEP >

# Outdoor & Irrigation Requirements

## WaterSense Water Budget Tool



**STEP 1** Location and Area

**STEP 2** Plants and Irrigation

**STEP 3** The Results

Fill out the chart below with all the appropriate information to calculate your landscape's water needs.

Zone	Area (sq. ft.) <sup>i</sup>	Plant Type / Landscape Feature <sup>i</sup>	Water Demand <sup>i</sup>	Irrigation Type <sup>i</sup>	Impact on Water Use <sup>i</sup>	Required Water (gal/month)
× 1	2000	Turfgrass	Medium	Fixed Spray	10 drops	9807
× 2	1000	Groundcover	Low	Drip (Press Comp)	2 drops	778
× 3	1500	Shrubs	Medium	Drip (Press Comp)	5 drops	3654
× 4	500	Trees	Medium	Drip (Press Comp)	4 drops	1218
× 5						
× 6						

Total: **5000**

+ add zone

**0**

Remaining Area (sq. ft.)

**17,409**

Water Allowance (gal/month)

**15,457**

Total Water Requirement for the Site (gal/month)

**1,952**

Below Allowance (gal/month)

**NEXT STEP >**

# Outdoor & Irrigation Requirements WaterSense Water Budget Tool



STEP 1 Location and Area

STEP 2 Plants and Irrigation

STEP 3 The Results



## Congratulations!

Your designed landscape meets the water budget!

Landscape Water Allowance: 17,409 Gallons/Month

Landscape Water Requirements: 15,457 Gallons/Month

Your landscape is 38% below the baseline for this site

To create a report (PDF), please fill out the form below:

Your Name

Builder Name

Street Address

City

State

Zip Code

Email Address

☐ Share my contact information with WaterSense

[Legal Notice](#)

CREATE REPORT

# Summary & Questions

- Lots of “low-hanging fruit” and simple verification items
- Inspector and builder should coordinate early in key areas:
  - Hot water delivery design
  - Landscape design and Water Budget Tool
  - Unique fixtures or applications (custom showers, water softeners and treatment systems, etc.)
- Ensure builder coordination with an Irrigation System Partner

Item	Section	Home or Unit Criteria	Yes	No	NI <sup>†</sup>	Doc <sup>†</sup>
<b>Outdoor Water Efficiency Criteria</b>						
Landscape design	4.1	Single-family: Front yard landscaped				
		All improved upon areas landscaped				
		Temporary landscape installed				
	4.1.1	Landscapable area of lot ≤ 1,000 ft <sup>2</sup> and exempt from landscape design criteria				
	4.1.1.1	Water budget tool calculations verified				Req.
		Landscape complies with water budget design				Req.
Slopes	4.1.2	Slopes ≥ 4:1 are vegetated				
Mulching	4.1.3	No exposed soil				
		All mulch is 2 to 3 inches deep				
Pools/spas	4.1.4	Single-family: Cover installed				
		Multi-family: Independently metered				
		Multi-family: Gutter or grate system				
		Multi-family: Sorptive media or cartridge filtration system				
Ornamental water feature	4.1.5	Recirculates water and serves beneficial use				
Irrigation system	4.2	WaterSense labeled weather-based irrigation controllers or approved soil moisture sensor-based controller				Req.
		Multi-family: Independently metered				
		Designed or installed by an irrigation professional certified by a WaterSense labeled program				Req.
		Provided waiver for design/installation				Req.
		System audited by certified irrigation professional				Req.
		Irrigation System Audit Checklist completed by certified irrigation professional				Req.
		Provided waiver for audit				Req.





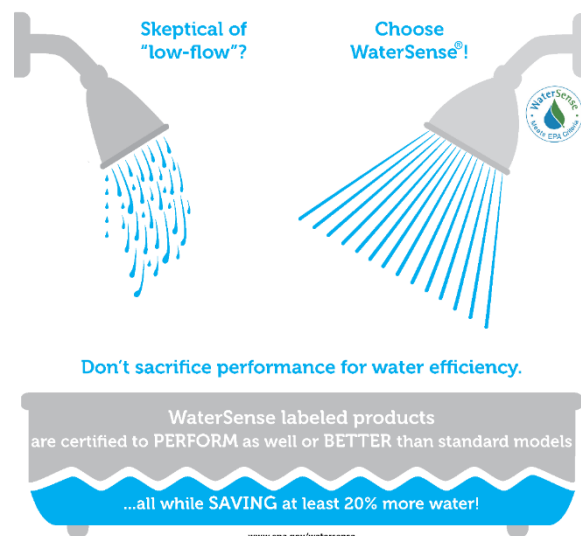
# What's Left?

Item	Section	Home or Unit Criteria	Yes	No	NI <sup>*</sup>	Doc <sup>†</sup>
<b>Homeowner or Resident and Building Management Education Criteria</b>						
Single-family/ occupant operating manual	5.2	Written operating and maintenance manual (or chapter) for all water-using equipment/controls installed in house, unit, yard, or common use outdoor area				
		General information on water-efficient dishwashers and clothes washers if they are not installed				
Building operating manual	5.3	Multi-family: Manual for all water-using equipment and controls outside of individual dwellings or inside of individual dwellings that are maintained by building management				
Irrigation system	5.2	Schematic, itemized list of irrigation components, copies of irrigation schedules, and information on reprogramming schedules included in operating manual for homeowners of single-family homes and for building managers for multi-family buildings				
Pools/spas	4.1.4	Multi-family: Detailed information on filtration equipment and manufacturer's recommended maintenance schedule to building management				



# Marketing Tools

- Consumer Brochures
- Marketing toolkit
  - Press release templates
  - Web site language
  - Artwork templates
- Online materials
  - Text and ideas for builder Web sites
  - Programmed “widget” updated regularly with water-efficiency tips from WaterSense





# Marketing Tools



**Save Water & Energy**

**Don't Waste Time!** **Get Hot Water Fast!**

**WaterSense® labeled homes**  
have efficient plumbing systems that get you  
hot water right when you need it!

[www.epa.gov/newhomes](http://www.epa.gov/newhomes)

**A Healthy Yard Isn't Hard!**

**we build**  
WaterSense  
Meets EPA Criteria

WaterSense® labeled homes have low-maintenance,  
beautiful landscapes that save water.

# Next Steps for Builders

1. Partner with WaterSense
2. Find an Irrigation Professional and work with a WaterSense Inspector
3. Market your Commitment

WaterSense® An EPA Partnership Program

Product Search | Meet Our Partners | Contact Us | FAQ | Partner Login

WaterSense / Partners / Become A Partner / Join Now / WaterSense Partnership Agreement

WaterSense Partnership Agreement

Thank you for your interest in joining WaterSense! Please take a moment to:

1. Check the [eligibility requirements](#).
2. Complete the contact information and other fields below.
3. Read and agree to the terms and conditions of WaterSense partnership. Print a copy for your records.
4. Click the "Submit Partnership Agreement" button.

If you have any questions about WaterSense or need assistance with this form, please contact the WaterSense Helpline at (866) WTR-SENS (987-7367) or [watersense@epa.gov](mailto:watersense@epa.gov).

Partner Type \*

Organization or Company Name \*

Address \*

City \*

State/Territory

ZIP/Postal Code \*  (Enter "International" if not applicable.)

Country

Website \*  (Enter "N/A" if not applicable.)

we build

WaterSense®  
Meets EPA Criteria

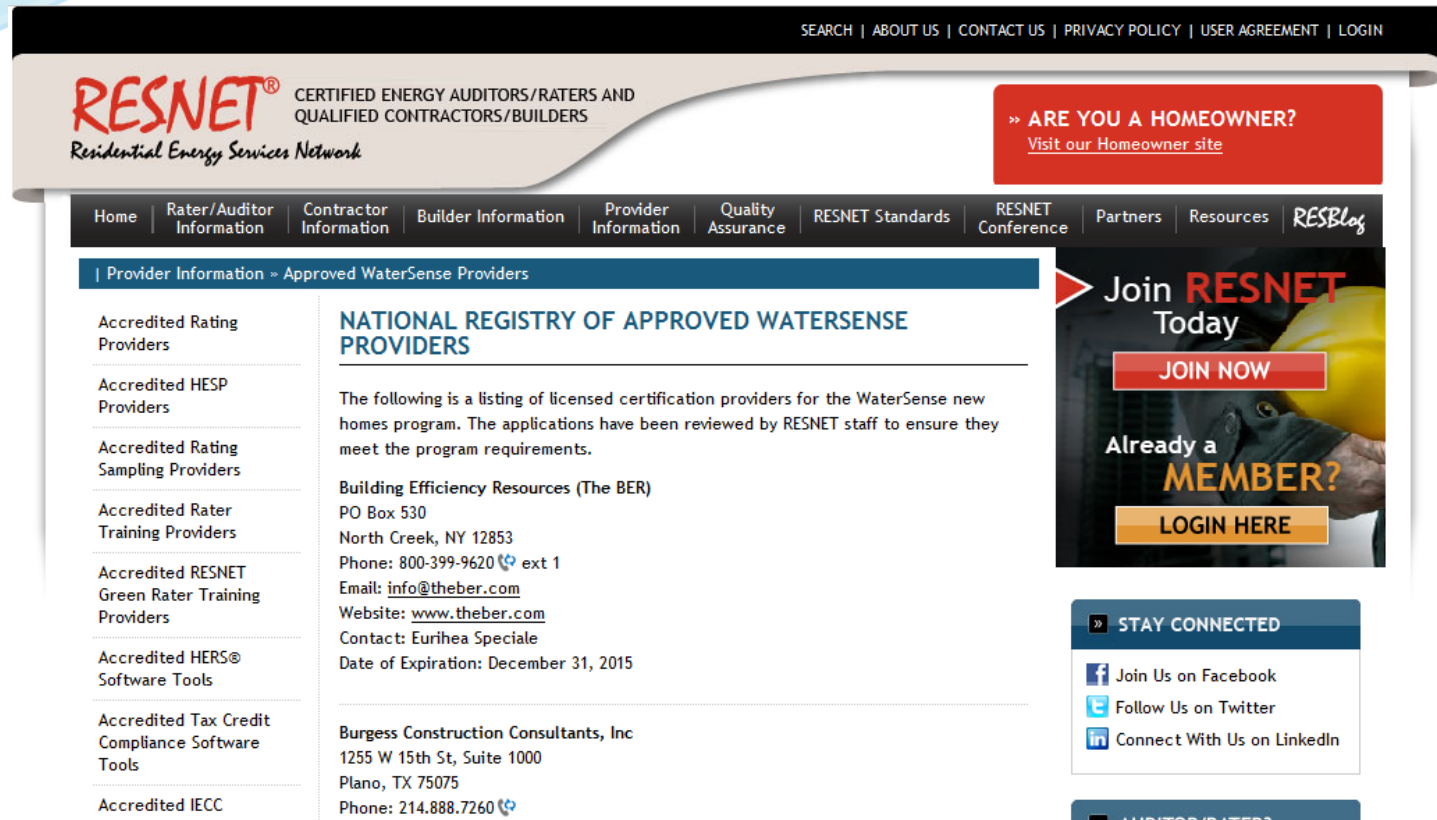
To become a WaterSense partner, visit:

[www.epa.gov/WaterSense/partners/become\\_a\\_watersense\\_partner.html](http://www.epa.gov/WaterSense/partners/become_a_watersense_partner.html)



# Next Steps for Raters

1. Become a WaterSense Inspector
2. Work with a Liscensed Certification Provider
3. Market your services



The screenshot shows the RESNET website interface. At the top, there is a navigation bar with links: SEARCH | ABOUT US | CONTACT US | PRIVACY POLICY | USER AGREEMENT | LOGIN. Below this is the RESNET logo and tagline: RESNET® CERTIFIED ENERGY AUDITORS/RATERS AND QUALIFIED CONTRACTORS/BUILDERS Residential Energy Services Network. A red banner on the right asks: » ARE YOU A HOMEOWNER? Visit our Homeowner site. The main navigation menu includes: Home, Rater/Auditor Information, Contractor Information, Builder Information, Provider Information, Quality Assurance, RESNET Standards, RESNET Conference, Partners, Resources, and RESBlog. The current page is 'Provider Information - Approved WaterSense Providers'. It features a sidebar with a list of accreditation types: Accredited Rating Providers, Accredited HESP Providers, Accredited Rating Sampling Providers, Accredited Rater Training Providers, Accredited RESNET Green Rater Training Providers, Accredited HERS® Software Tools, Accredited Tax Credit Compliance Software Tools, and Accredited IECC. The main content area is titled 'NATIONAL REGISTRY OF APPROVED WATERSENSE PROVIDERS' and contains a paragraph: 'The following is a listing of licensed certification providers for the WaterSense new homes program. The applications have been reviewed by RESNET staff to ensure they meet the program requirements.' Below this is a section for 'Building Efficiency Resources (The BER)' with contact information: PO Box 530, North Creek, NY 12853, Phone: 800-399-9620 ext 1, Email: info@theber.com, Website: www.theber.com, Contact: Eurihea Speciale, Date of Expiration: December 31, 2015. Another entry for 'Burgess Construction Consultants, Inc' is partially visible. On the right side of the page, there is a 'Join RESNET Today' section with 'JOIN NOW' and 'LOGIN HERE' buttons, and a 'STAY CONNECTED' section with social media links for Facebook, Twitter, and LinkedIn.

To find approved WaterSense Providers, visit:

[http://www.resnet.us/professional/programs/watersense\\_providers](http://www.resnet.us/professional/programs/watersense_providers)





# WaterSense Labeled New Homes

## More Information

- **Inspection and Verification Guidance and Inspection Checklist**
  - Lists the specification requirements
  - Provides step by step inspection instructions for each element
  - Provides a template for documenting whether each requirement is met
  - Indicates which elements require documentation
- **Guidelines for Irrigation Audits and Irrigation Audit Checklist**
  - Provides guidance and documentation criteria that the WaterSense irrigation partner uses when inspecting an irrigation system
- **Sampling protocol information for single and multi-family homes**
  - Provides an inspection checklists for documenting homes covered by a sampling protocol



# WaterSense Labeled New Homes

## More Information

WaterSense New Homes (Main Page):

[www.epa.gov/watersense/new\\_homes](http://www.epa.gov/watersense/new_homes)

WaterSense New Homes Certification System:

[http://www.epa.gov/watersense/new\\_homes/cert\\_new\\_homes.html](http://www.epa.gov/watersense/new_homes/cert_new_homes.html)

WaterSense New Homes Technical Materials:

[http://www.epa.gov/watersense/new\\_homes/homes\\_final.html](http://www.epa.gov/watersense/new_homes/homes_final.html)



# More Information



Web site: [www.epa.gov/watersense](http://www.epa.gov/watersense)

E-mail: [watersense@epa.gov](mailto:watersense@epa.gov)

Helpline: (866) WTR-SENS (987-7367)