BetterBuiltNW

Where's WALDO?

Winning Assets Leading to Dependable Outcomes

October 5, 2017

Housekeeping

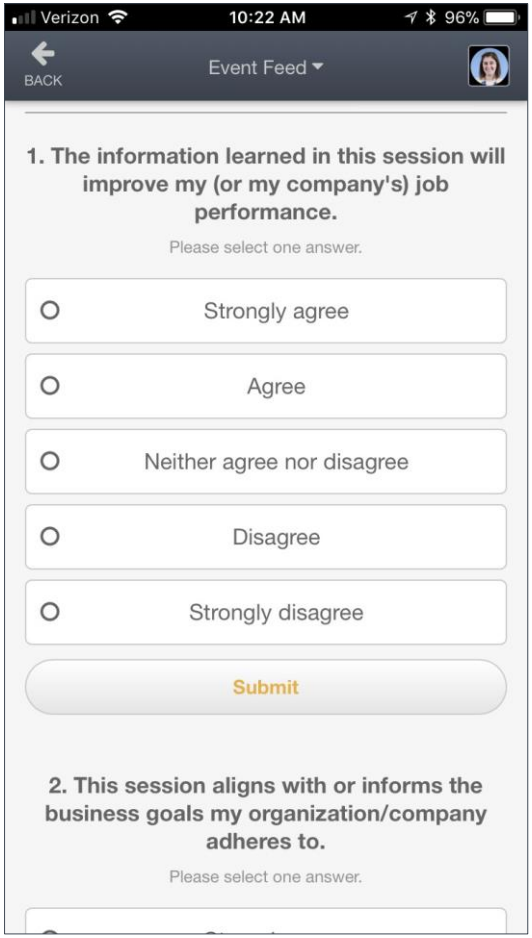
Welcome

- Safety
- Bathrooms
- Cell phones

Session Survey Instructions

At the end of each session, you will be given 5 minutes to complete the session survey.

1. Open the “HEF2017” app
2. Navigate to “Agenda” and select the session
3. Scroll down to “Session Feedback”
4. For each question, select answer and hit “Submit”
5. Show completed survey to BetterBuiltNW rep to earn points
6. Prizes awarded Friday to the top point earners
   - See “Challenge” section in the app for activities
7. Assistance available at the BetterBuiltNW table



Agenda

Tools

- IAQ tools
- Materials
- Water tools
- Energy tools
- Construction tools

Websites

- BetterBuiltNW
- NetZero Project
- BASC

Image courtesy of Creative Commons

Indoor Air Quality

Indoor airPLUS

Why does
indoor air quality matter?

People are increasingly concerned about mold, radon, carbon monoxide, and toxic chemicals in their homes. Poor indoor air quality can lead to eye irritation, headaches, allergies, respiratory problems such as asthma, and other serious health problems.

EPA studies show that levels of many indoor air pollutants can be two to five times higher than outdoor levels. And since most people spend close to 90% of their time indoors, keeping indoor pollution levels as low as possible is the right thing to do for you and your family.

How can building practices help improve
indoor air quality?

Builders can use a variety of construction practices and technologies to decrease the risk of poor indoor air quality, including careful selection and installation of building materials; heating, ventilating, and air-conditioning (HVAC) systems; combustion-venting systems; and moisture control techniques.

It's not easy for homebuyers to keep track of all the preferred construction details that lead to improved indoor air quality. That's why EPA created the Indoor airPLUS label. Ask for it in your next new home.

Only ENERGY STAR Certified Homes are eligible to earn the Indoor airPLUS label.

Office of Air and Radiation
EPA 402/F-14/001 | February 2014

www.epa.gov/indoorairplus

EPA

ask about

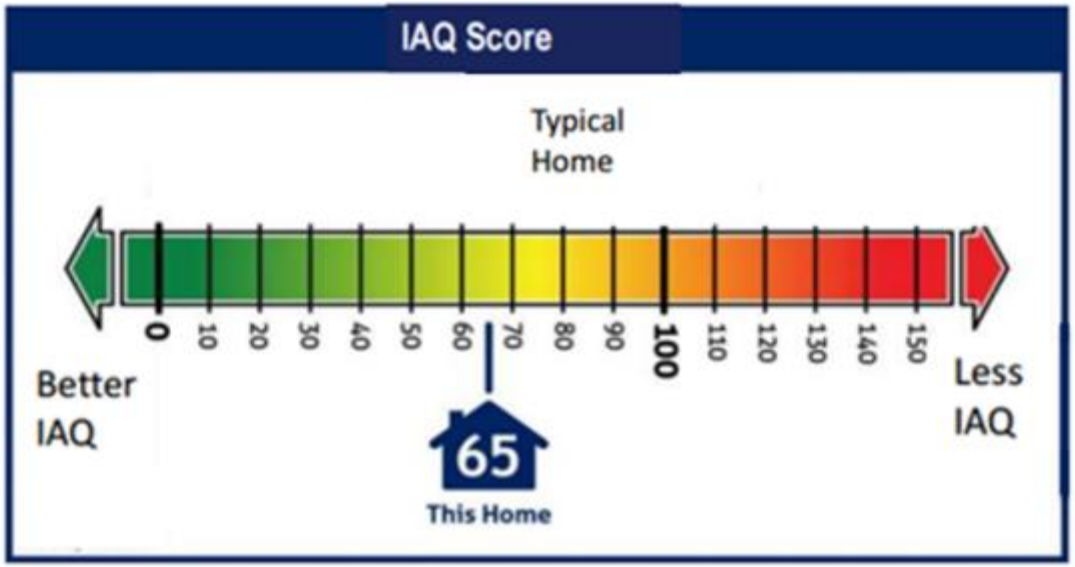
Breathe Easy
In Your NEW
Indoor airPLUS Home

Designed and built for improved indoor air quality and energy efficiency.

All Indoor airPLUS qualified homes also meet strict guidelines for energy efficiency set by ENERGY STAR, the nationally-recognized symbol for energy efficiency.

Hayward Score

The future


IAQ Score
Typical Home
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
Better IAQ
Less IAQ
65
This Home

Water Efficiency

WaterSense

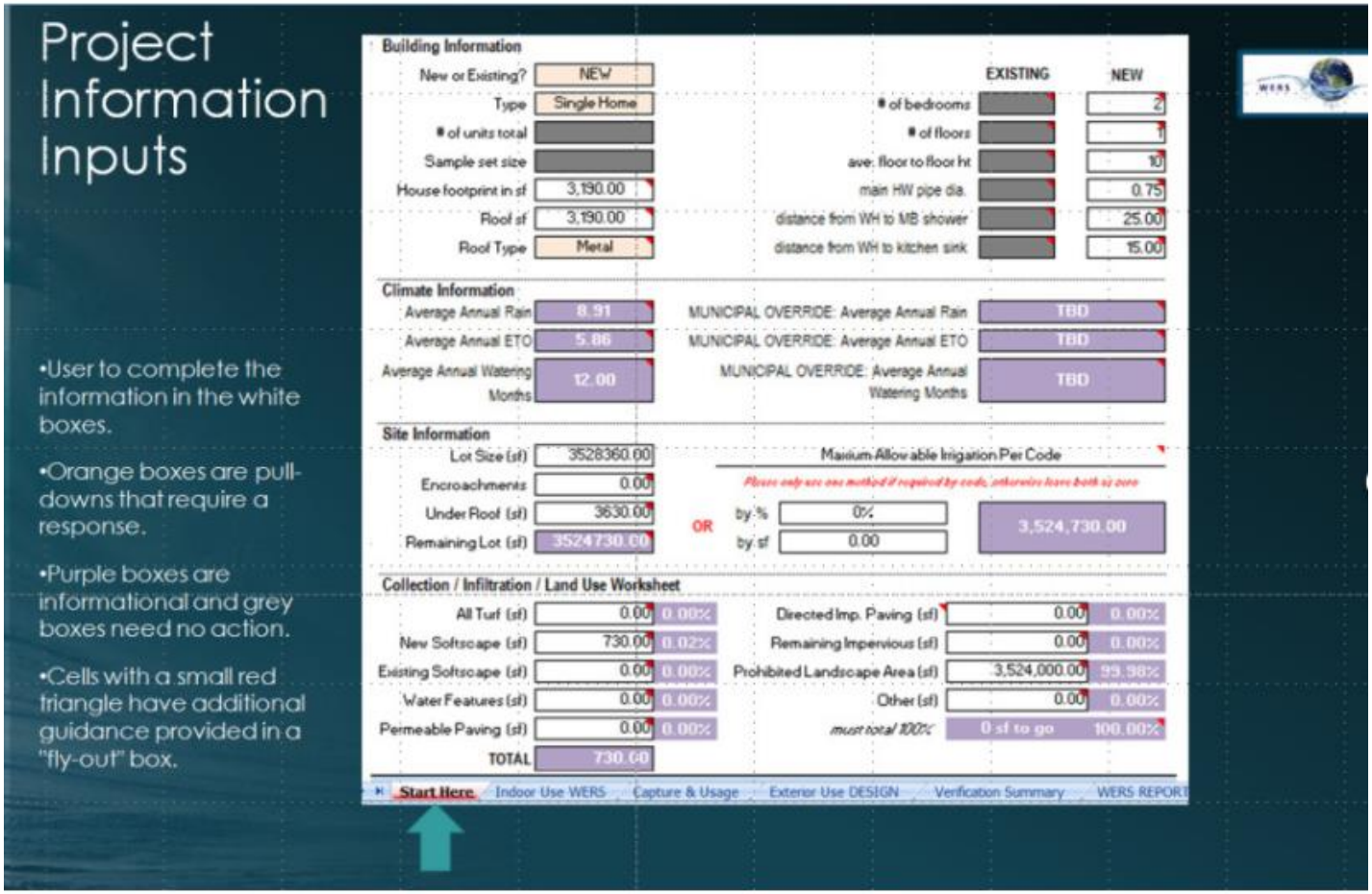
Resource Manual for Building WaterSense® Labeled New Homes

Version 1.2

July 24, 2014

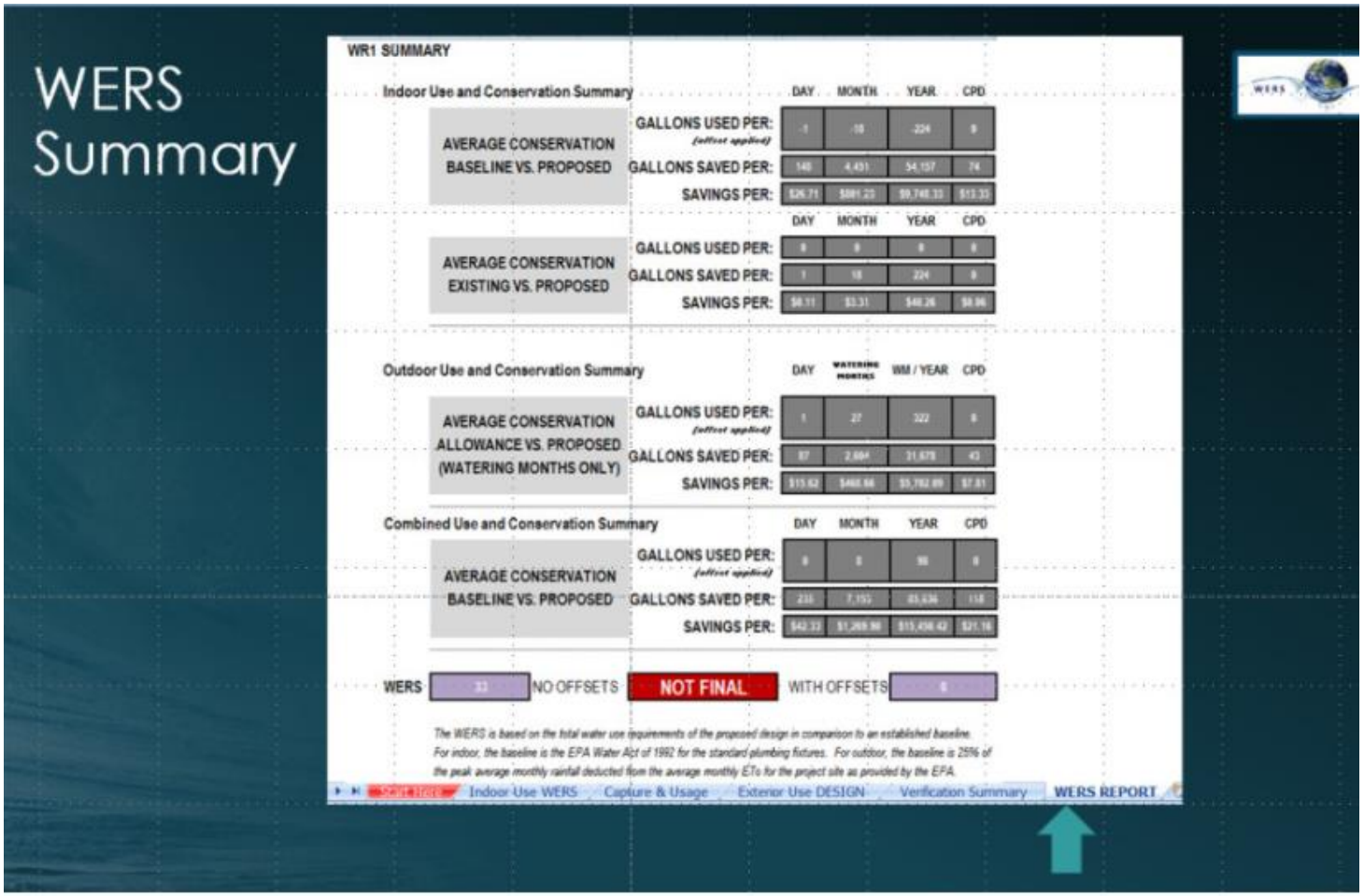
Indoor Criteria:	Outdoor Criteria:
Leaks • No visible leaks **Service Pressure** • Service pressure test ≤ 60 psi **Hot Water Delivery** • 10°F temperature change observed within ≤ 0.6 gallons **Plumbing Fixtures** • WaterSense labeled toilets, bathroom sink faucets, and showerheads **Dishwashers and Clothes Washers*** • ENERGY STAR certified dishwashers and clothes washers	**Landscape Design** • Complies with WaterSense's Water Budget Tool for water-smart design **Irrigation System*** • WaterSense labeled irrigation controllers • Designed or installed by an irrigation professional certified by a WaterSense labeled program • Audited by an irrigation professional certified by a WaterSense labeled program • Multi-family: Independently metered **Pools and Spas*** • Single-family: Cover installed • Multi-family: Independently metered, gutter or grate system used, sorptive media (pre-coat) or cartridge filtration system installed

WERS



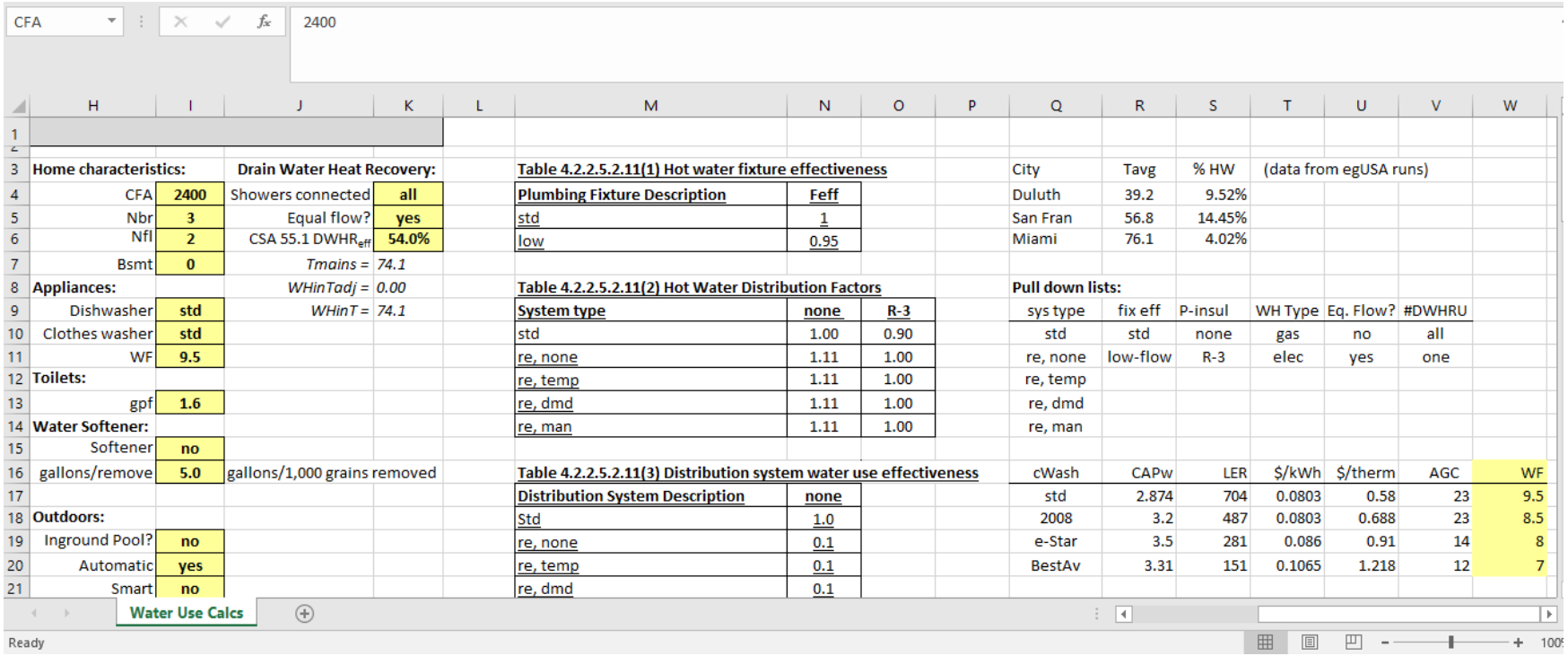
Starting Tab: Project information and data collection

WERS



WERS Report indicating complete indoor & outdoor WERS, with or without offsets

Same logic and mostly same inputs, but…



CFA | 2400

	Home characteristics:		Drain Water Heat Recovery:	
	CFA	2400	Showers connected	all
	Nbr	3	Equal flow?	yes
	Nfl	2	CSA 55.1 $DWHR_{eff}$	54.0%
	Bsmt	0	*Tmains =*	*74.1*
	Appliances:		*WHinTadj =*	*0.00*
	Dishwasher	std	*WHinT =*	*74.1*
	Clothes washer	std		
	WF	9.5		
	Toilets:			
	gpf	1.6		
	Water Softener:			
	Softener	no		
	gallons/remove	5.0	gallons/1,000 grains removed	
	Outdoors:			
	Inground Pool?	no		
	Automatic	yes		
	Smart	no		

Table 4.2.2.5.2.11(1) Hot water fixture effectiveness

Plumbing Fixture Description	Feff
std	1
low	0.95

Table 4.2.2.5.2.11(2) Hot Water Distribution Factors

System type	none	R-3
std	1.00	0.90
re, none	1.11	1.00
re, temp	1.11	1.00
re, dmd	1.11	1.00
re, man	1.11	1.00

Table 4.2.2.5.2.11(3) Distribution system water use effectiveness

Distribution System Description	none
Std	1.0
re, none	0.1
re, temp	0.1
re, dmd	0.1

City	Tavg	% HW	(data from egUSA runs)
Duluth	39.2	9.52%	
San Fran	56.8	14.45%	
Miami	76.1	4.02%	

Pull down lists:

sys type	fix eff	P-insul	WH Type	Eq. Flow?	#DWHRU
std	std	none	gas	no	all
re, none	low-flow	R-3	elec	yes	one
re, temp					
re, dmd					
re, man					

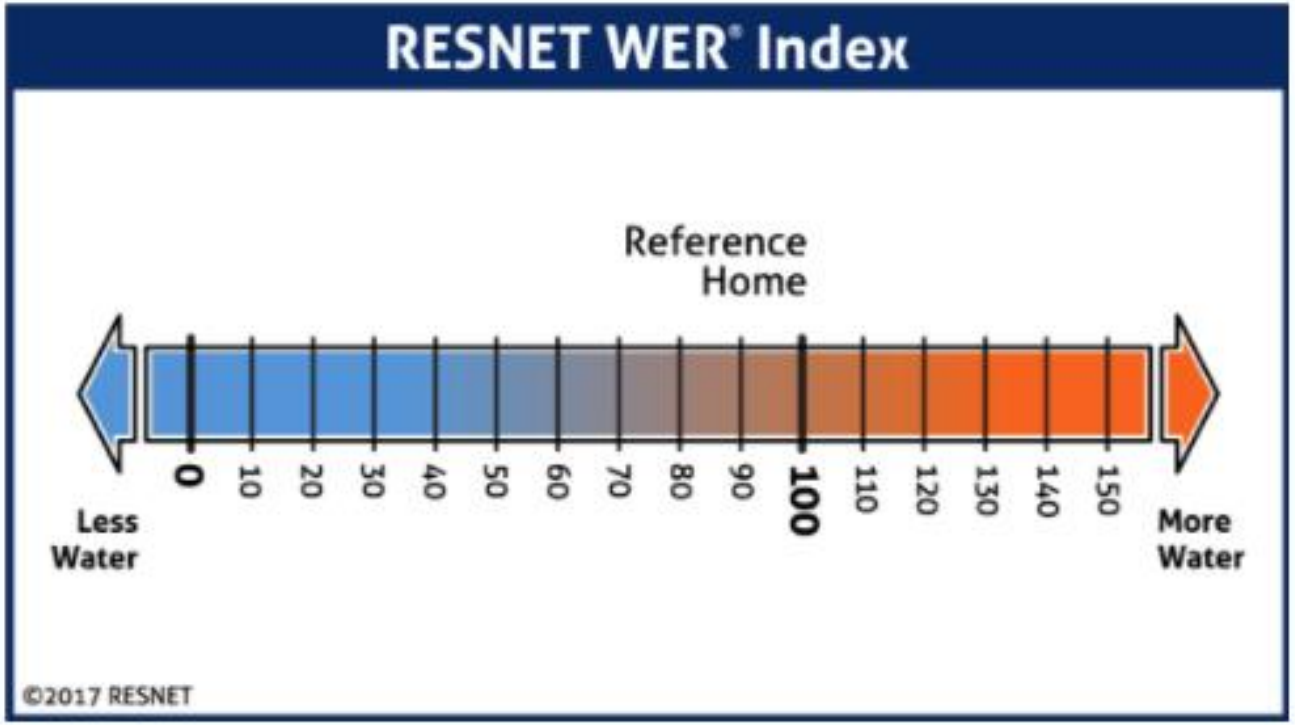
cWash	CAPw	LER	$/kWh	$/therm	AGC	WF
std	2.874	704	0.0803	0.58	23	9.5
2008	3.2	487	0.0803	0.688	23	8.5
e-Star	3.5	281	0.086	0.91	14	8
BestAv	3.31	151	0.1065	1.218	12	7

Water Use Calcs

Ready

RESNET WER Index

DRAFT RESNET WATER EFFICIENCY RATING INDEX TECHNICAL GUIDELINES OPEN FOR PUBLIC REVIEW AND COMMENT



Energy Efficiency

ENERGY STAR

Features & Benefits of an ENERGY STAR Certified Home

BENEFITS FOR HOMEOWNERS

- **Peace of Mind**: Tried-and-true best building practices followed by independent inspections and testing from certified professionals mean that you can be confident that things were done right.
- **Enduring Quality**: Value-adding energy efficiency features and a combination of materials and equipment deliver better performance and an overall superior level of quality.
- **Wall-to-Wall Comfort**: You'll see, feel, and hear the difference of a heating and cooling system that has been engineered and installed to efficiently deliver comfort. Enjoy consistent temperatures across every room and a constant supply of fresh, filtered air reducing indoor pollutants, dust, pollen, and other allergens.
- **Proven Value**: Better energy efficiency and performance means lower utility and maintenance costs. Homes earning the ENERGY STAR label use 15-30 percent less energy than typical new homes, and even more when compared to most resale homes on the market today.

DOE ZERH

ZERO
ENERGY READY HOME
U.S. DEPARTMENT OF ENERGY

Exhibit 1: DOE Zero Energy Ready Home Mandatory Requirements for All Labeled Homes

Area of Improvement	Mandatory Requirements
1. ENERGY STAR for Homes Baseline	☐ Certified under ENERGY STAR Qualified Homes Program Version 3 or 3.1 [10, 11]
2. Envelope[12]	☐ Fenestration shall meet or exceed ENERGY STAR requirements. See End Note for specific U, SHGC values, and exceptions. [13] ☐ Ceiling, wall, floor, and slab insulation shall meet or exceed 2012 or 2015 IECC levels[14, 15]
3. Duct System	☐ Duct distribution systems located within the home's thermal and air barrier boundary or an optimized location to achieve comparable performance[16]
4. Water Efficiency	☐ Hot water delivery systems (distributed and central) shall meet efficient design requirements[17]
5. Lighting & Appliances[18]	☐ All installed refrigerators, dishwashers, and clothes washers are ENERGY STAR qualified. ☐ 80% of lighting fixtures are ENERGY STAR qualified or ENERGY STAR lamps (bulbs) in minimum 80% of sockets ☐ All installed bathroom ventilation and ceiling fans are ENERGY STAR qualified
6. Indoor Air Quality	☐ Certified under EPA Indoor airPLUS [11]
7. Renewable Ready	☐ Provisions of the DOE Zero Energy Ready Home PV-Ready Checklist are Completed [19]

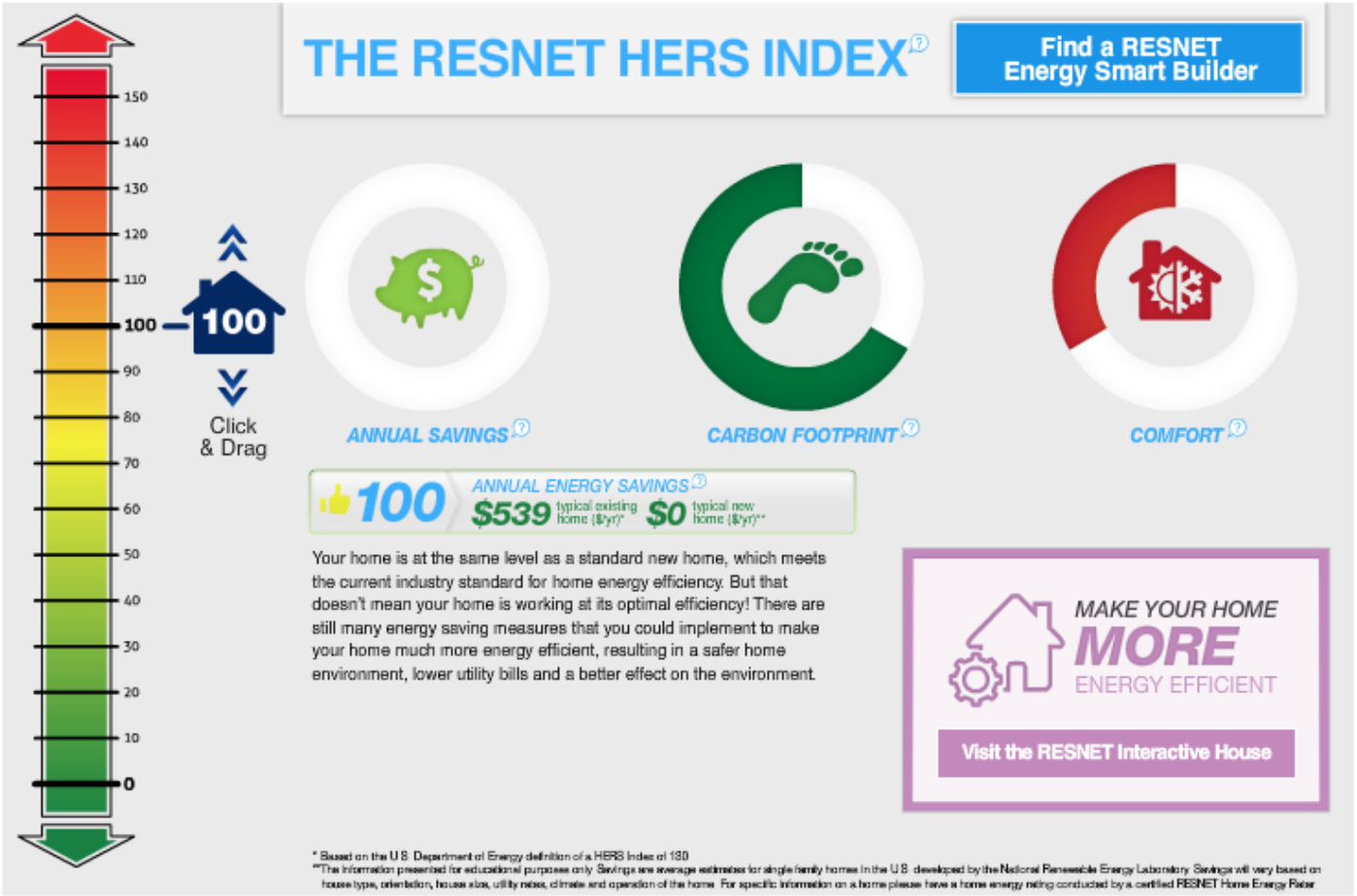
DOE Zero Energy Ready Home Builders are encouraged to:

	100% Commitment	Commit to constructing 100% of your homes to the U.S. DOE's Zero Energy Ready Home Requirements.
	PHIUS+	Take the next step on the continuous path to Zero Energy Ready Home by meeting the additional requirements of the Passive House Institute US.
	WaterSense	Minimize water use by participating in the EPA WaterSense for New Single-Family Homes program.
	Fortified for Safer Living	Embrace disaster resistance by following the Institute for Business and Home Safety (IBHS) FORTIFIED for Safer Living or FORTIFIED Home provisions for regionally specific natural hazards.
	Quality Management Program	Implement comprehensive quality management practices.
	Solar Hot Water	Accomplish additional savings by using the solar hot water-ready checklist and EPA's solar thermal systems guide. These requirements are no longer mandatory but encouraged.
		Ask buyers to sign a waiver allowing DOE Zero Energy Ready Home access to one year of utility bill data.

PHIUS

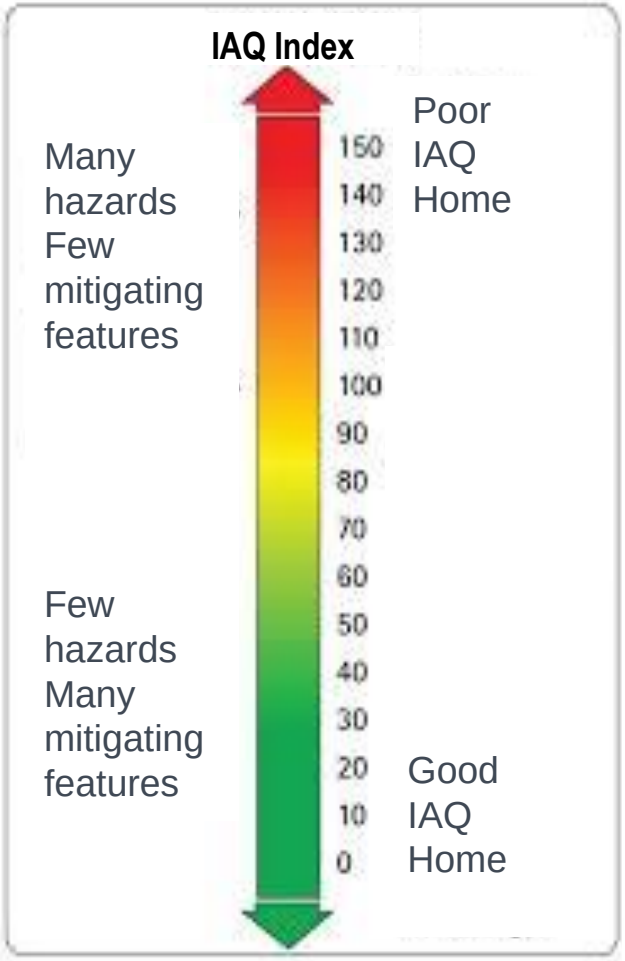
						Source Zero Renew-able Energy System
					Balanced Ventilation HRV/ERV	Balanced Ventilation HRV/ERV
				SOLAR READY Depends on climate	SOLAR READY **ALWAYS**	SOLAR READY **ALWAYS**
				Eff. Comps. & H2O Distrib	Eff. Comps. & H_2O Distrib	Eff. Comps. & H_2O Distrib
				EPA Indoor airPLUS	EPA Indoor airPLUS	EPA Indoor airPLUS
				Ducts in Condit. Space	Ducts in Condit. Space	Ducts in Condit. Space
		HVAC QI w/WHV	HVAC QI w/WHV	HVAC QI w/WHV	Micro-load HVAC QI	Micro-load HVAC QI
		Water Management	Water Management	Water Management	Water Management	Water Management
		Independent Verification	Independent Verification	Independent Verification	Independent Verification	Independent Verification
IECC 2009 Enclosure	IECC 2012 Enclosure	IECC 2009 Enclosure	IECC 2012 Enclosure	IECC 2012/15 Encl./ES Win.	Ultra-Efficient Enclosure	Ultra-Efficient Enclosure
HERS **85-90**	HERS **70-80**	HERS **65-75**	HERS **55-65**	HERS **48-55**	HERS **35-45**	HERS **< 0**
IECC 2009	**IECC 2012**	**ENERGY STAR v3**	**ENERGY STAR v3.1**	**ZERH**	**PHIUS+**	**PHIUS+ SourceZero**

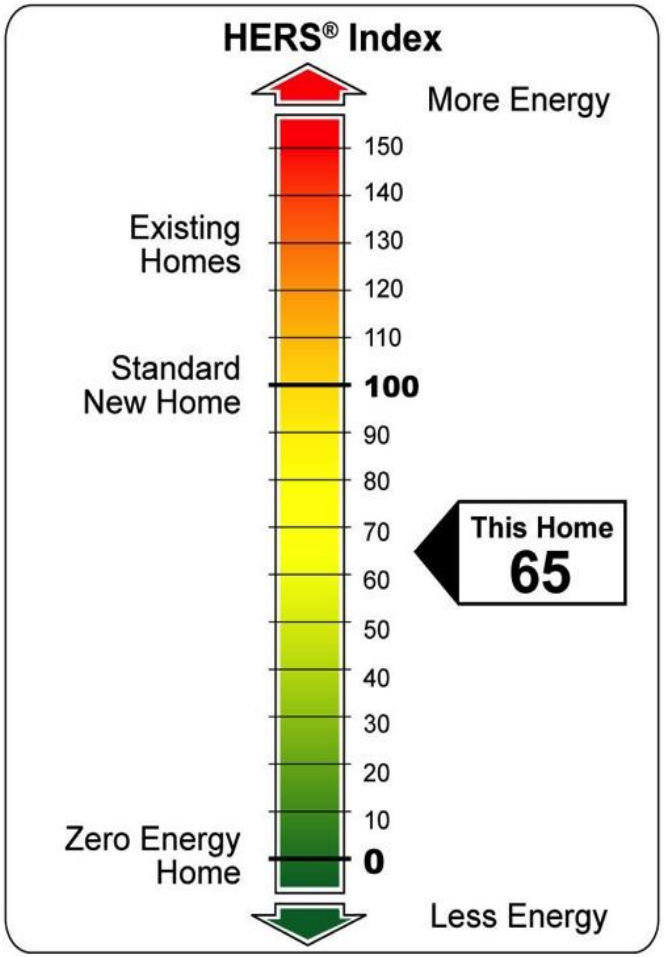
HERS Index

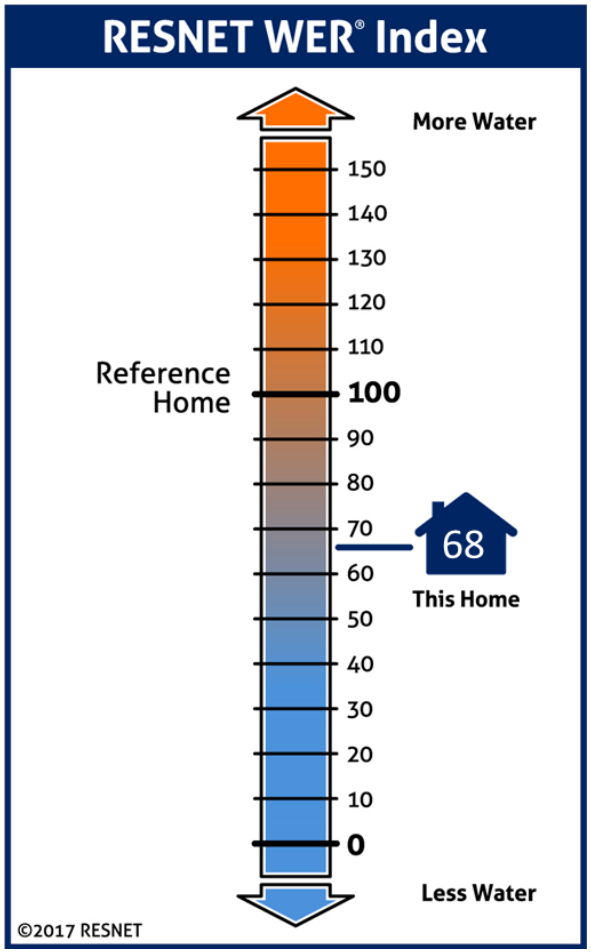


A Lower HERS Index Score Means a More Energy Efficient Home

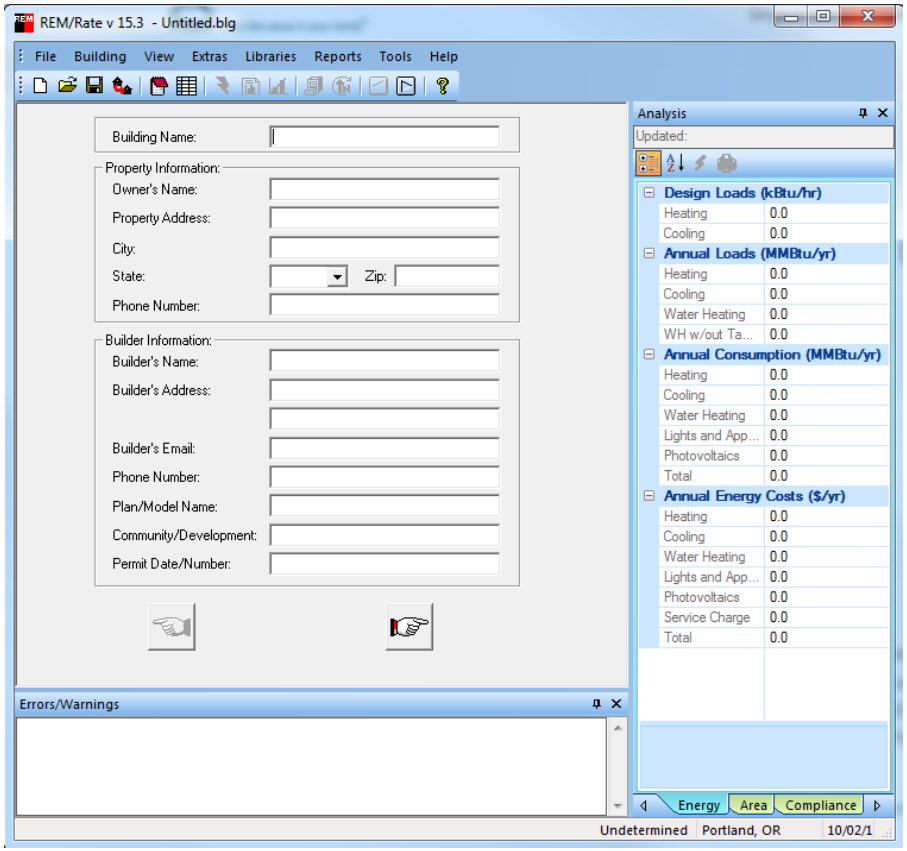
Where RESNET is headed…

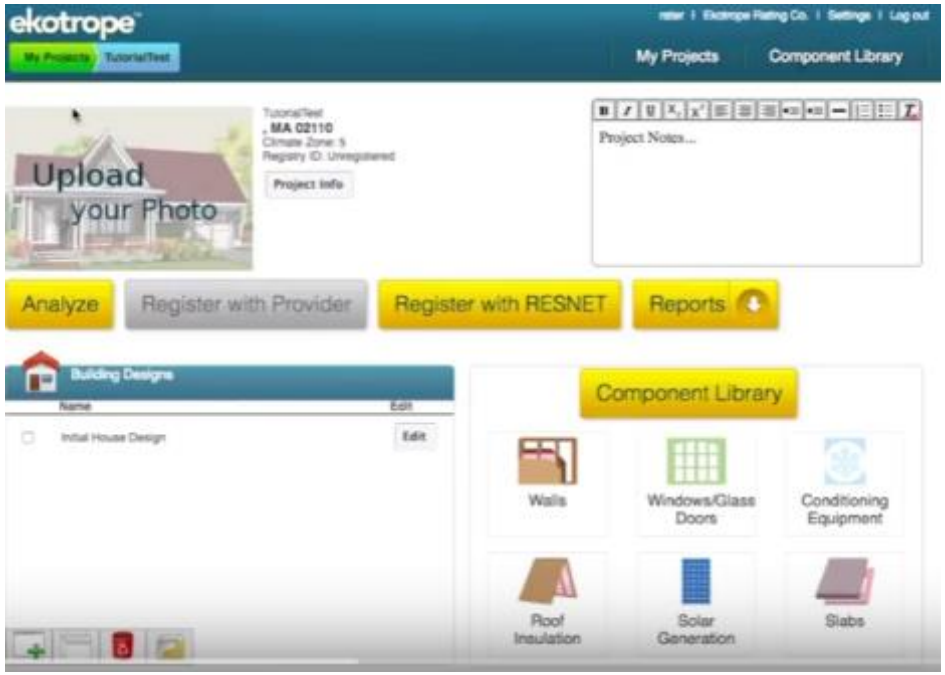




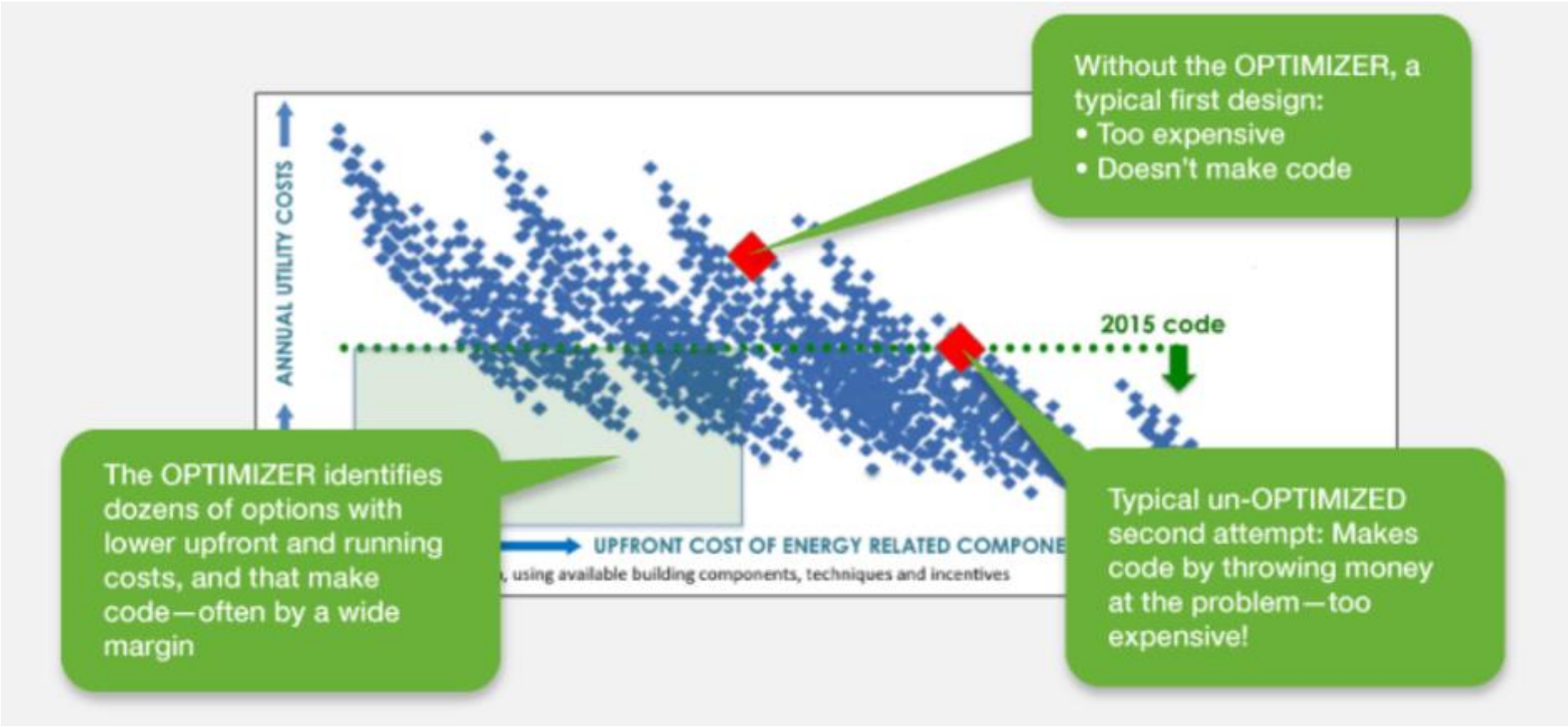


Getting a HERS Index



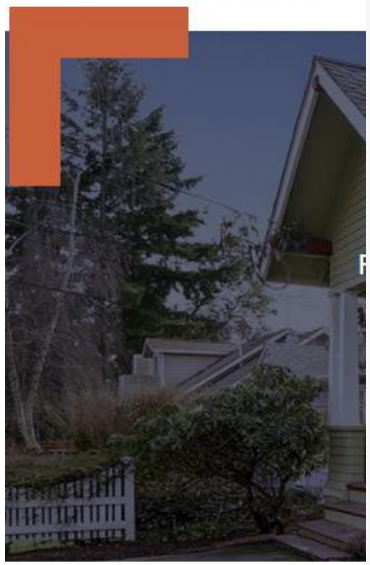


Ekotrope for builders



Websites!

https://betterbuiltnw.com/



BetterBuilt^NW

PROGRAMS FIND A PROFESSIONAL RESOURCES CASE STUDIES

AXIS Overview for Utilities

Performance Path

269.58 KB pdf

This resource provides utilities a step-by-step review of the AXIS database workflows associated with home entry, QA, and reporting under the Performance Path. This resource also highlights future workflow and new feature/functionality options.

Download Share

Utility Performance Path Overview Webinar

Performance Path

This webinar will provide utilities an overview of RTF approved modeling protocols, the BPA reporting requirements, and home entry and reporting with AXIS.

Link Share

Rater Performance Path Overview Webinar

Performance Path

This webinar will provide Raters an overview of Northwest approved modeling protocols and, home entry and reporting with AXIS.

Link Share

Utility Performance Path Overview for AXIS Presentation

Performance Path

1.81 MB pdf

This presentation will provide utilities an overview of home entry and reporting with AXIS.

Download Share

Rater Performance Path Overview for AXIS Presentation

Performance Path

1.48 MB pdf

This presentation will provide Raters an overview of home entry and reporting with AXIS.

Download Share

Rater Performance Path Overview and Modeling Presentation

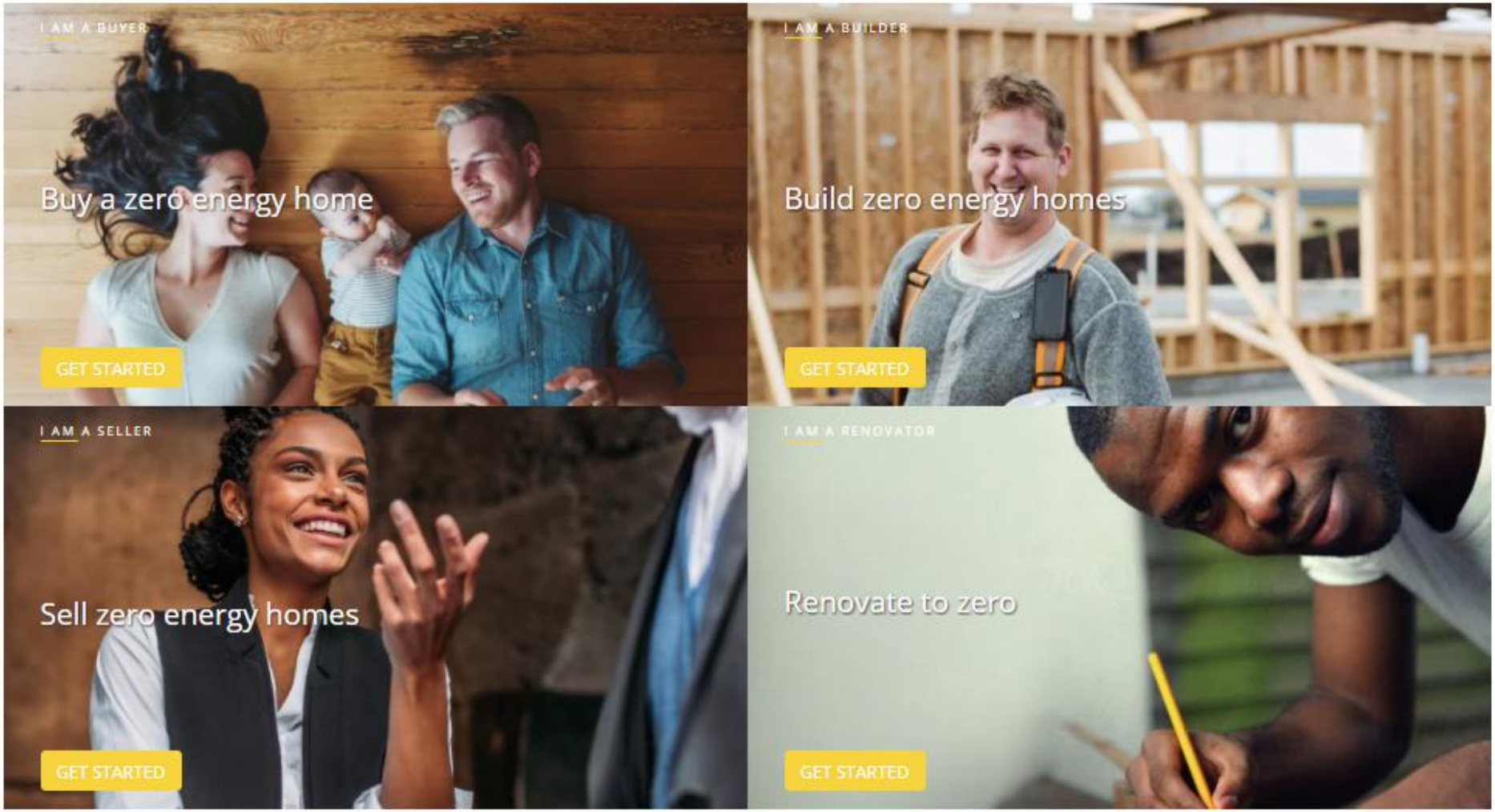
Performance Path

1.72 MB pdf

This presentation will provide Raters an overview of Northwest approved modeling protocols.

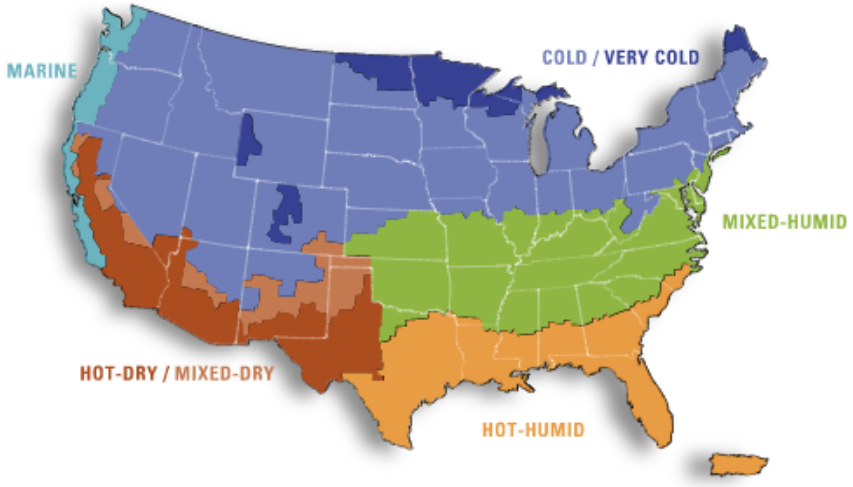
Download Share

http://zeroenergyproject.org/



https://energy.gov/eere/buildings/doe-tour-zero

Are you ready for a home that lives, works, and lasts better? The home of the future - a better home - is available today. Take a virtual tour of homes that are so energy efficient a renewable energy system can offset all or most of their annual energy consumption. These award-winning homes are independently certified to meet DOE Zero Energy Ready Home guidelines and constructed by a select group of top builders. Zero Energy Ready Home is part of the U.S. Department of Energy's Better Buildings initiative. Better Buildings aims to make commercial, industrial, public, and residential buildings 20 percent more energy efficient over the next decade.



https://energy.gov/eere/efficiency/homes

Building America Solution Center and Building Science Advisor

Home Efficiency Forum 2017

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Where's WALDO? (Winning Assets that Lead to Dependable Outcomes)

October 5, 2017

Chrissi Antonopoulos

DOE Zero Energy Ready Home Program,
Pacific NW National Laboratory

What is the BUILDING AMERICA SOLUTION CENTER?

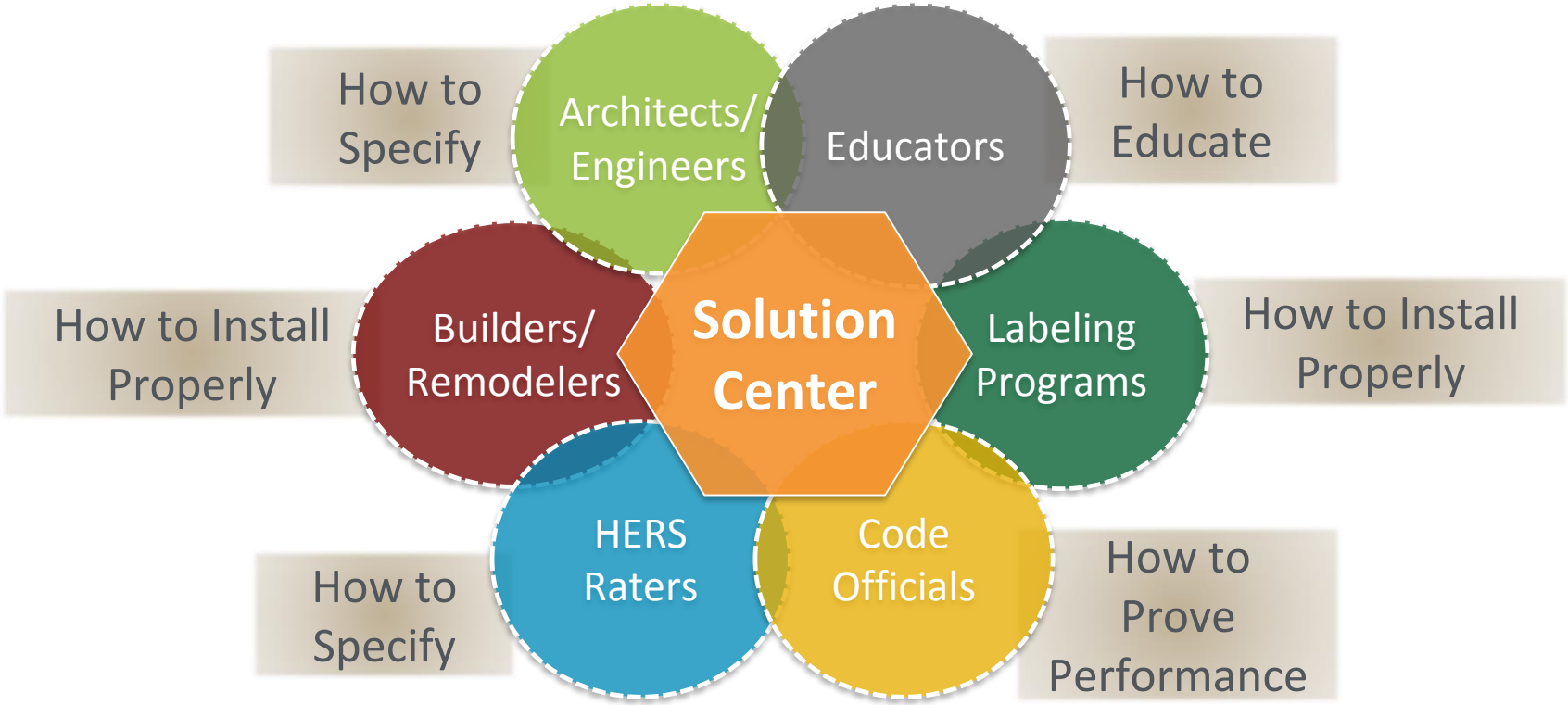
- An online tool designed to provide building professionals with fast, free and reliable best practices based on leading building science.

- At the heart of the Building America Solution Center are guides – each covering eight critical topics for more than 230 individual best practices (and growing).

- Users can browse to view galleries of content -- such as images, CAD files, case studies, or the reference library – search and filter by keyword.

Content and Audiences

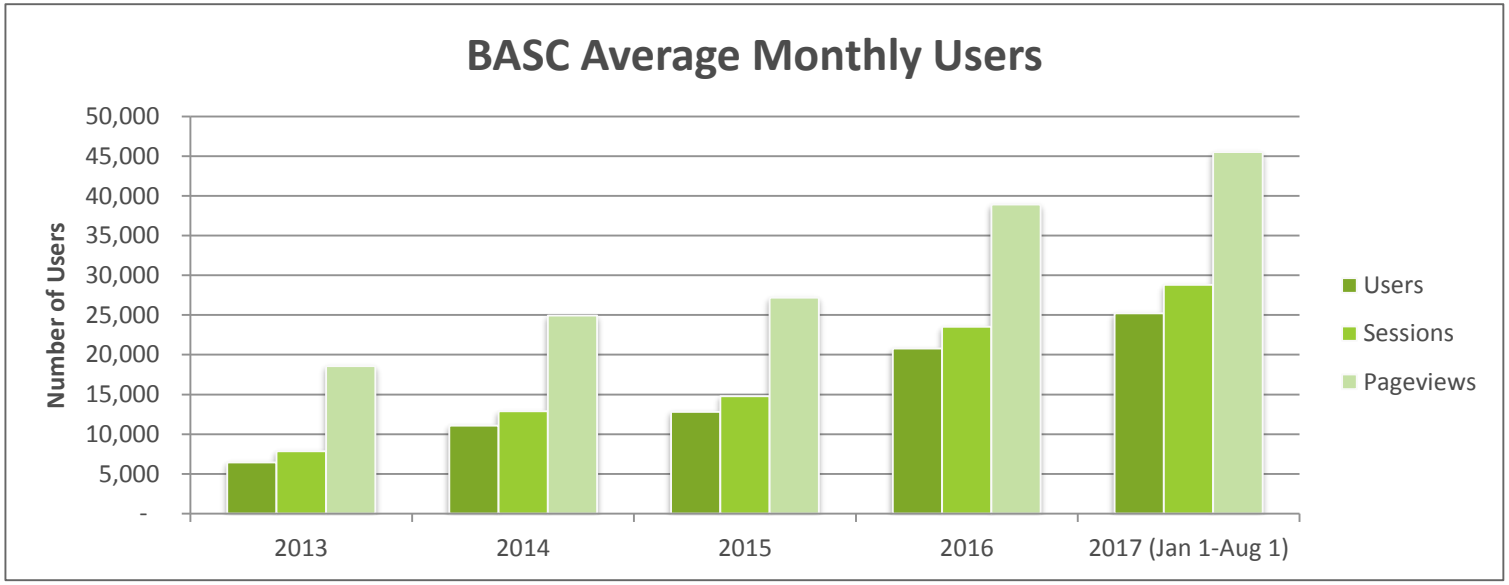
- 230+ Guides
- 1,600+ Images
- 330+ Proven performance case studies
- 115+ CAD drawings
- 900+ Building Science references & resources
- 30+ Code compliance briefs
- 90+ Videos
- 40+ Sales briefs



User Data Over Time

User Stats Since 2013

- 292% increase in users
- 316% increase in direct users
- Over 52,000 page views in August 2017; over 1.6 million since 2013



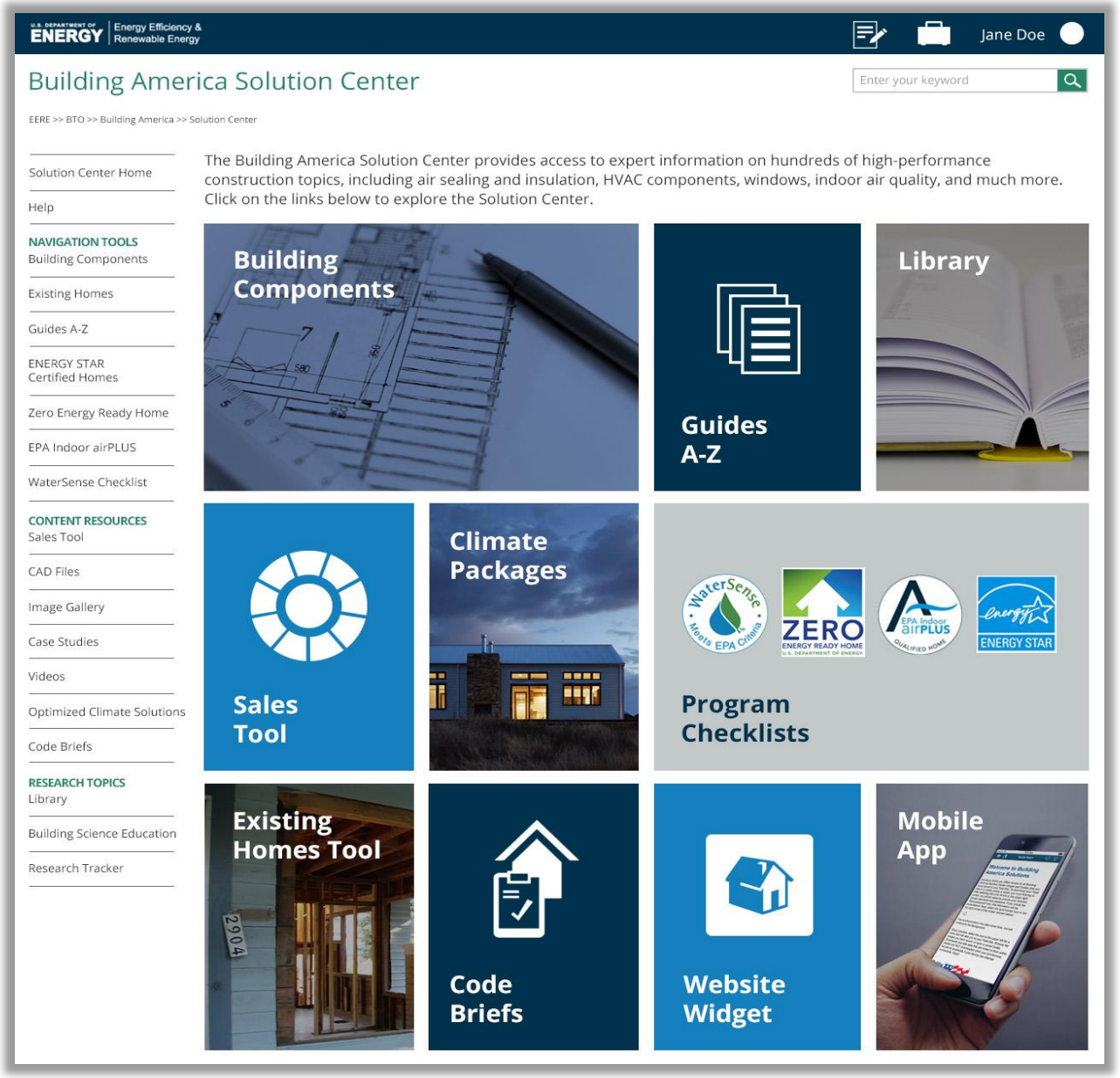
Average monthly data allows comparisons of partial years

Homepage – BASC.ENERGY.GOV

BASC Simple Interface:

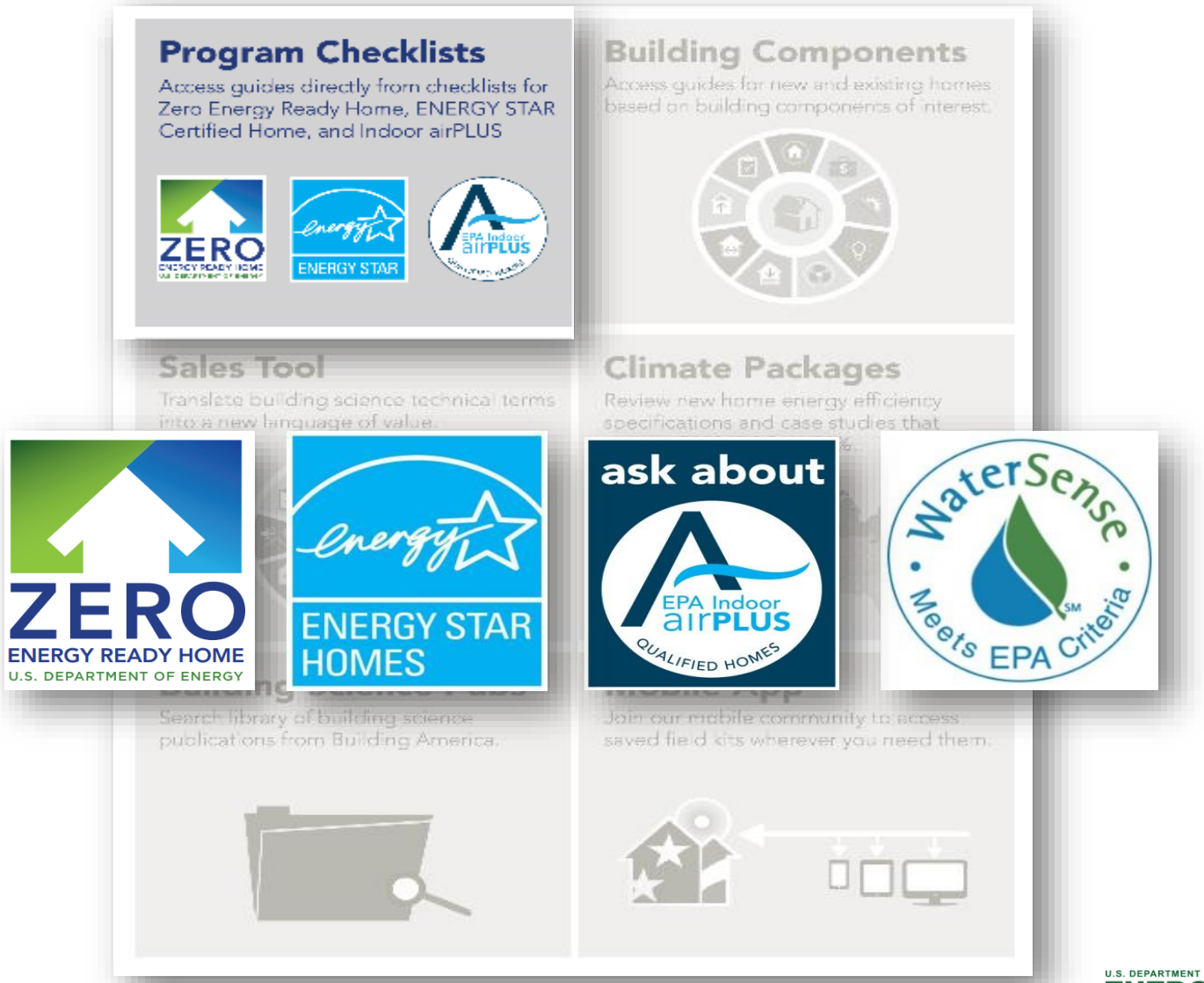
- Access DOE/EPA Program information
- Browse guides
- Access sales guidance
- Access climate resources
- Browse library
- Download the mobile app

New BASC Homepage – COMING SOON!

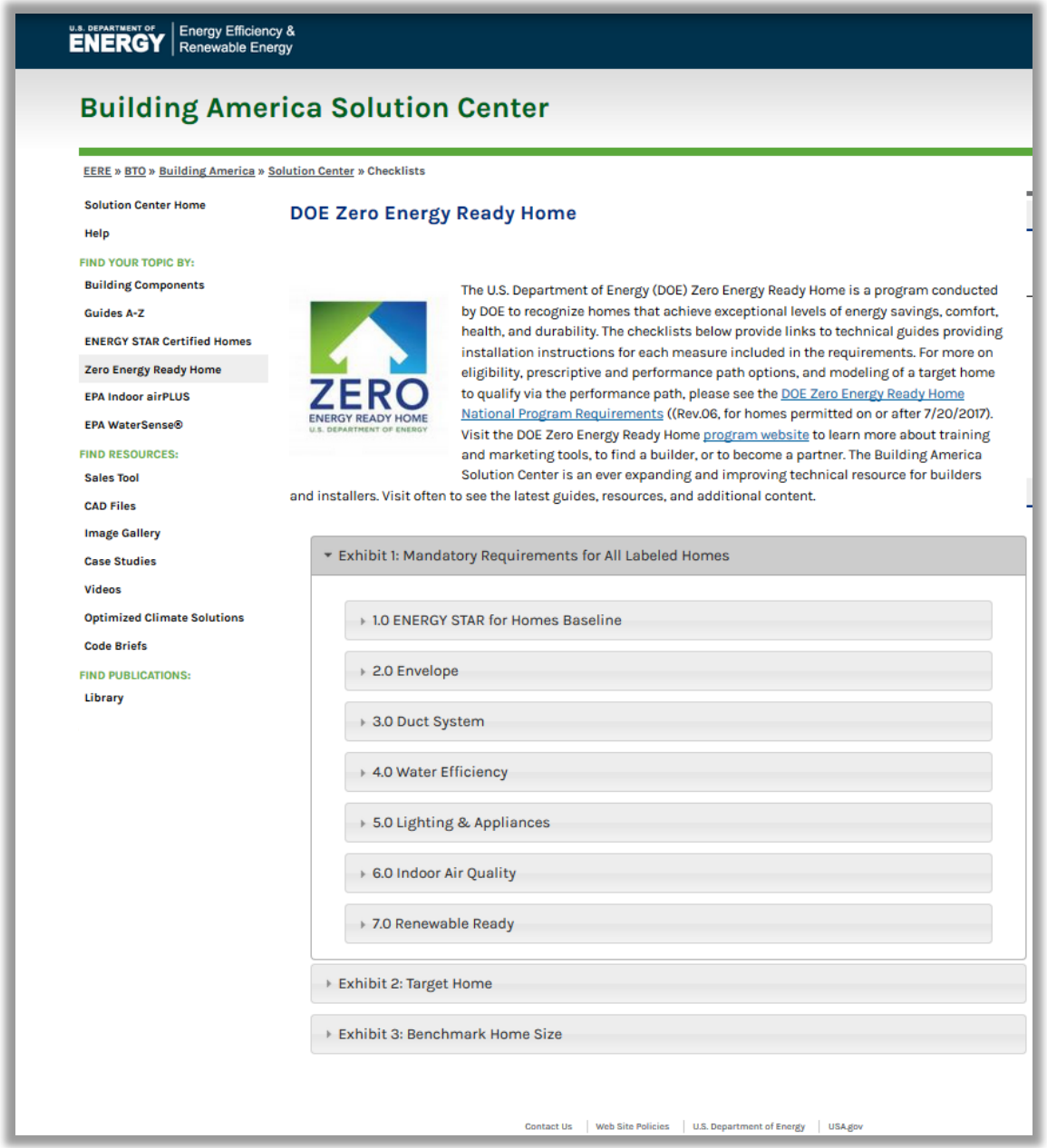


- New homepage design highlights BASC navigation options.
- Incorporates new WaterSense checklist and Existing Homes tool.
- Re-organizes topics in the left navigation column.

Access to DOE/EPA Program Specifications



DOE Zero Energy Ready Home Program

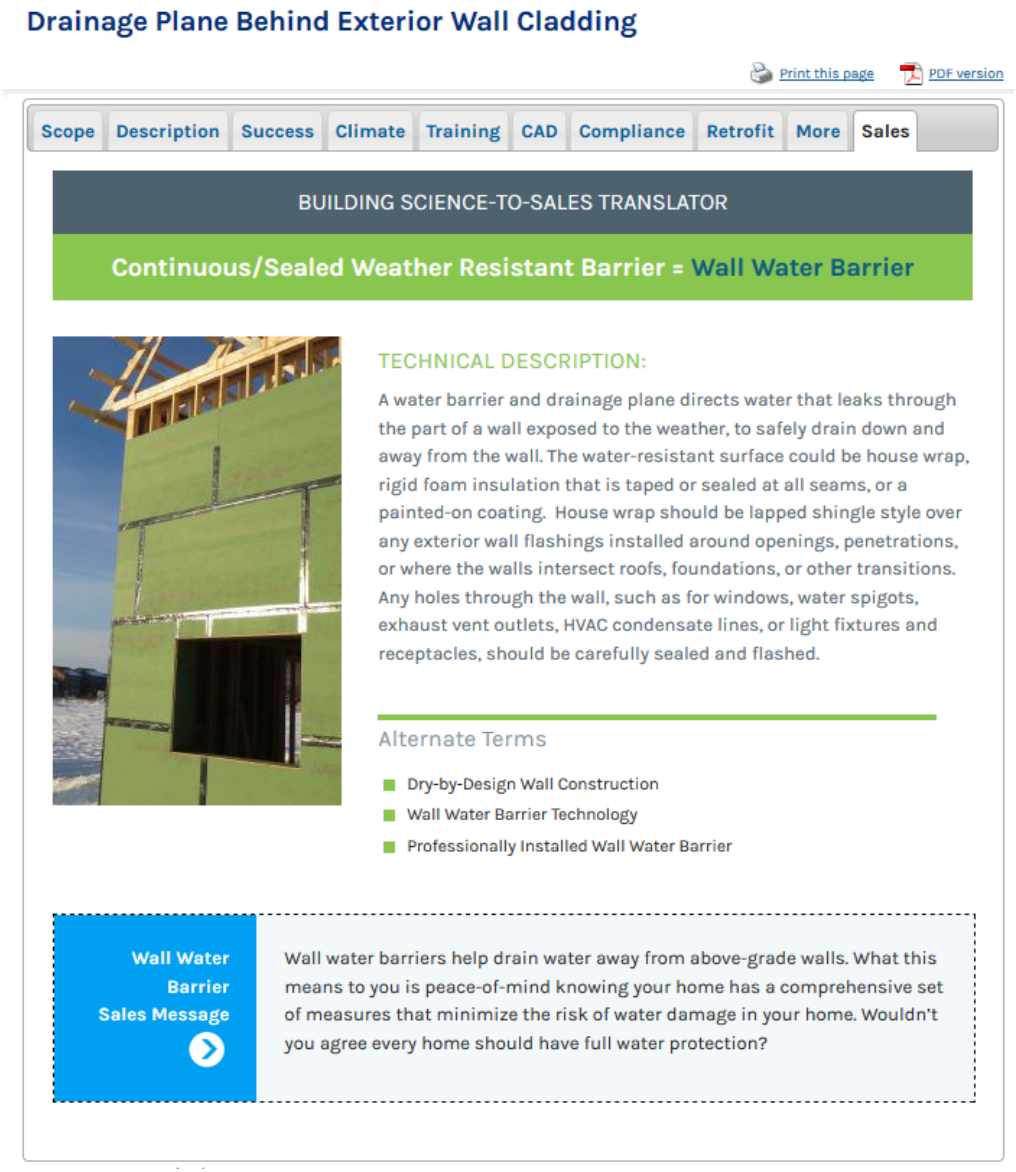


- BASC includes an automated version of the program checklist
- Use the checklist to find specifications for each requirement
- Each specification is included in a BASC guide
- If you're running a program, BASC is your technical support.

Use Program Navigation to Find BASC Guides

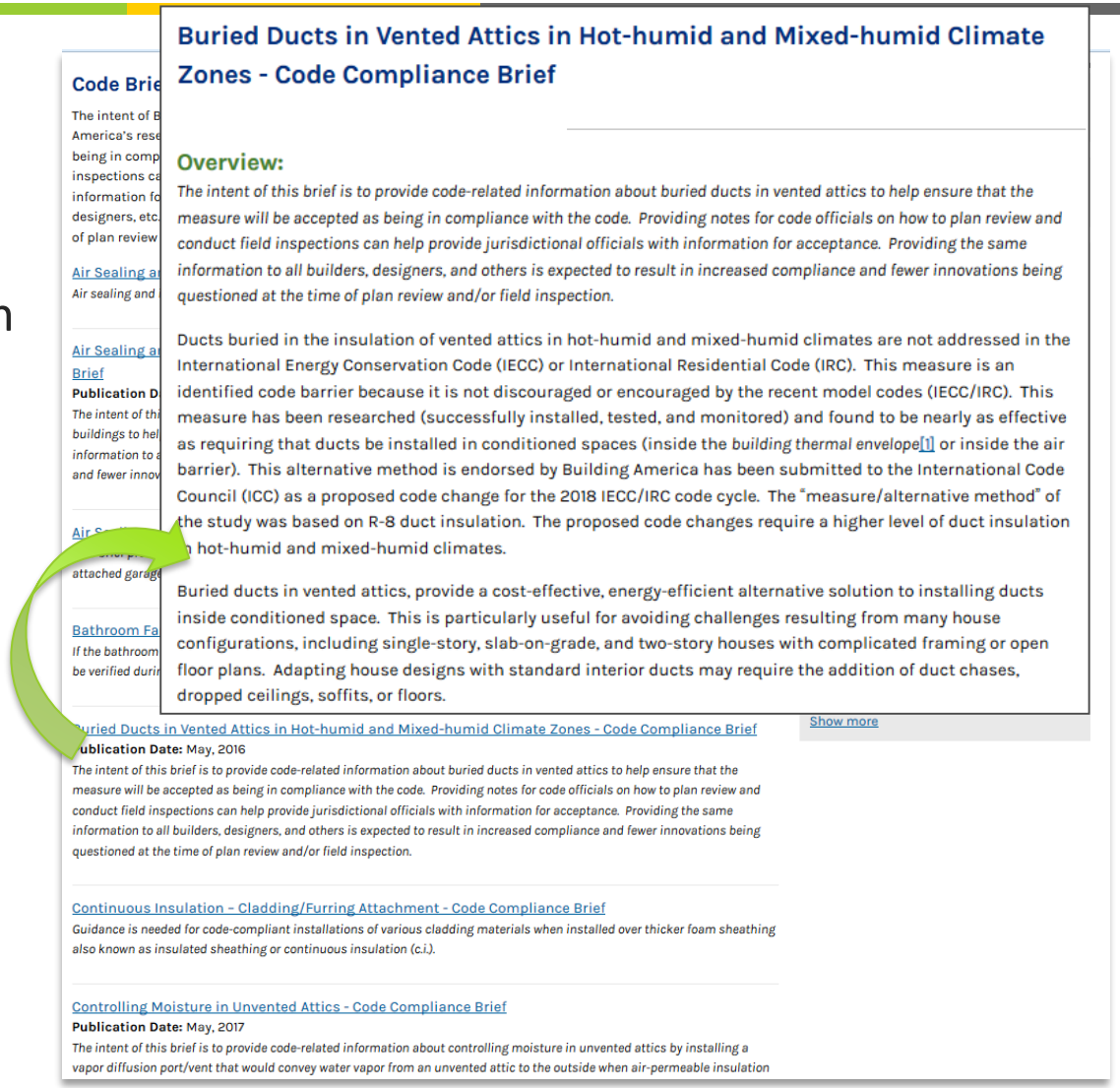
Each Guide contains:

- Scope of work
- Description (how to install)
- Ensuring Success (safety, planning)
- Climate specific info
- Training (images, presentations, videos)
- CAD drawings
- Compliance info (codes/standards/programs)
- Retrofit info for existing homes
- External resources and case studies
- Sales info



BASC Code Compliance Briefs

- Designed to address code barriers, such as installation of advanced technologies.
- Detailed references to research findings and codes and tips for plan review and field inspections.
- Consistent expectations resulting in increased compliance and fewer innovations being questioned.
- A shortcut to technical validation, which is critical for code officials to accept innovations.



Sales Tool

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Building America Solution Center

Log In | Register

Enter your keywor SEARCH

EERE » BTO » Building America » Solution Center

- Solution Center Home
- Help

FIND YOUR TOPIC BY:

- Building Components
- Guides A-Z
- ENERGY STAR Certified Homes
- Zero Energy Ready Home
- EPA Indoor airPLUS

FIND RESOURCES:

- Sales Tool
- CAD Files
- Image Gallery
- Case Studies
- Videos
- Optimized Climate Solutions
- References and Resources

Sales Tool

The goal of this Building Science-to-Sales Translator is to provide a new glossary of sales themes that can be used across the industry to consistently reinforce the value of high-performance homes. This includes applying this new language consistently to all consumer-facing materials used by government programs and industry alike. Use the tool below to explore sales themes that relate to each primary area of a high-performance home.

Use the tool below to navigate through sales themes. When logged into your BASC account, you can create customized Sales Worksheets. You will see the MY SALES WORKSHEETS block on the upper right of your screen. Click Create Sales Worksheet to make a new customized sales list, or View All Sales Worksheets to see all saved Sales Tools. For in-depth instructions for creating sales worksheets, see this presentation.

Browse by 10 different building topics.

The Sales Tool provides a new glossary of sales themes that can be used across the industry to consistently reinforce the value of high-performance homes.

Sales Tool

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Building America Solution Center

Log In | Register

Enter your keyword SEARCH

EERE » BTO » Building America » Solution Center

FIND YOUR TOPIC BY:

- Building Components
- Guides A-Z
- ENERGY STAR Certified Homes
- Zero Energy Ready Home
- EPA Indoor airPLUS

FIND RESOURCES:

- Sales Tool
- CAD Files
- Image Gallery
- Case Studies
- Videos
- Optimized Climate Solutions
- References and Resources
- Code Briefs

BUILDING SCIENCE-TO-SALES TRANSLATOR

HVAC Ducts In Conditioned Space = Interior Comfort Delivery System

TECHNICAL DESCRIPTION:

Heating and cooling equipment and ducts are often located in uninsulated attics and crawlspaces where humidity and temperature extremes can prematurely age the equipment and encourage unwanted heat loss or heat gain to the conditioned air traveling through the ducts. If the ducts are not tightly air sealed, conditioned air can escape from the ducts, resulting in energy loss and potential moisture damage, or unfiltered attic or crawlspace air can be drawn into the ducts and distributed throughout the home. Interior comfort delivery systems with the air handler and ducts located inside the conditioned environment of the home minimize the effects of duct leakage. Any conditioned air that does leak from the ducts leaks into the conditioned areas of the home. This saves money by ensuring conditioned air produced by the comfort equipment is not wasted in places like the attic or crawlspace.

Alternate Terms

- Advanced Interior Comfort Delivery System
- Energy Saving Interior Comfort Delivery System

Interior Comfort Delivery System Sales Message

Interior comfort delivery systems are installed inside the conditioned space rather than in unconditioned spaces. What this means to you is full comfort with much less wasted energy. Wouldn't you rather have your heating and cooling delivered from inside your home rather than effectively outdoors?

Each term has a translation, alternate terms, technical description and consumer sales message.

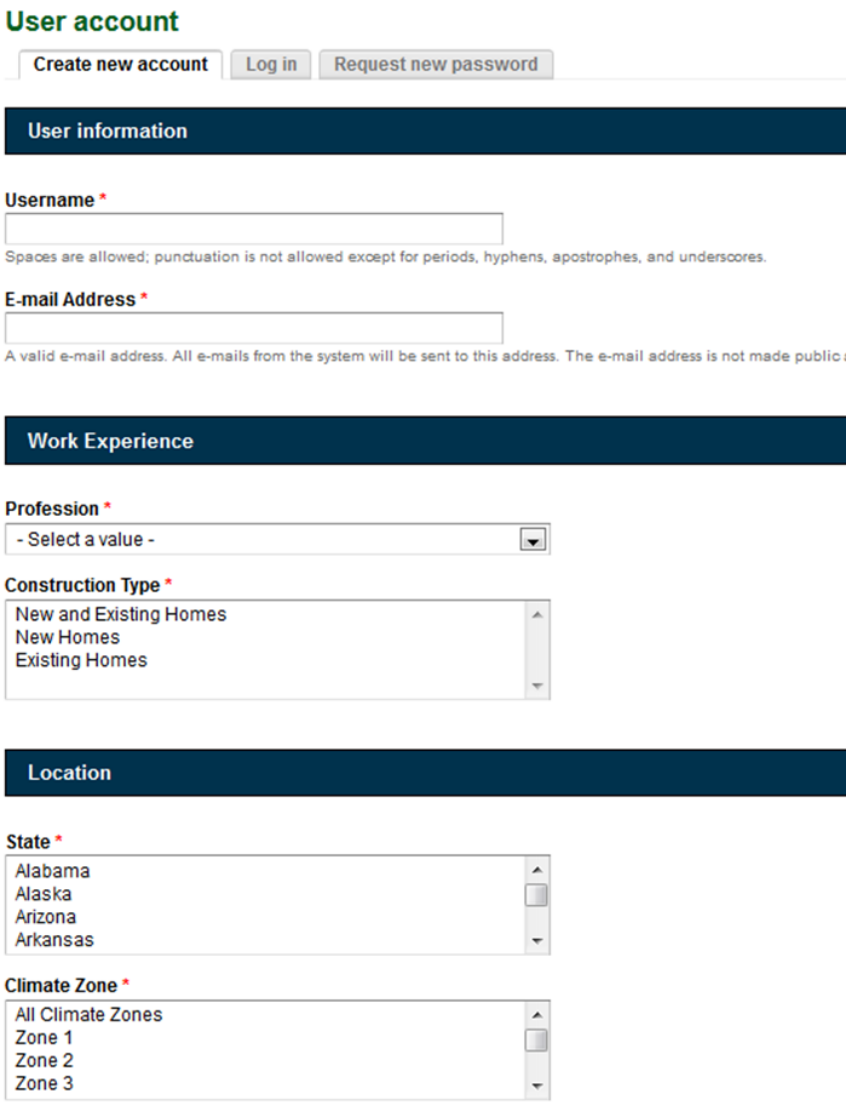
Become Part of the Solution Center

Join the Solution Center community!

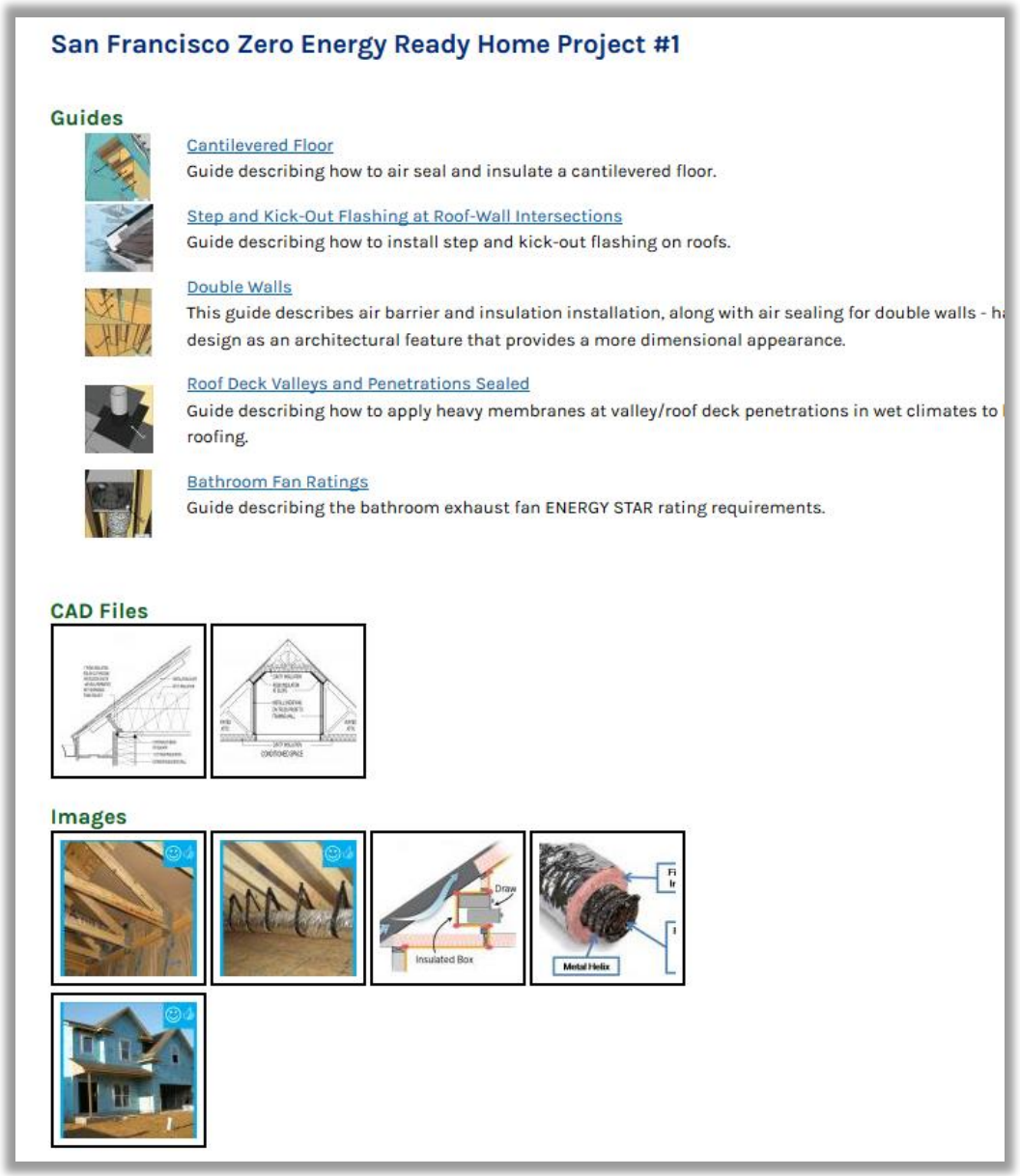
www.basc.energy.gov

Register for free to customize content

- Create Field Kits
- Create Point-of-Sale Fact Sheets and Training Materials
- Access saved and created content from your mobile device
- Provide feedback on content



Field Kits



Easily access all your saved content:

- CAD files
- Images
- Guides
- Information Guides
- Videos
- Case Studies
- Sales Messages

Sales Binder in Field Kits

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Building America Solution Center

My Account | Log Out

Enter your keywor SEARCH

EERE » BTO » Building America » Solution Center

- Solution Center Home
- Help

FIND YOUR TOPIC BY:

- Building Components
- Guides A-Z
- ENERGY STAR Certified Homes
- Zero Energy Ready Home
- EPA Indoor airPLUS

FIND RESOURCES:

- Sales Tool
- CAD Files
- Image Gallery
- Case Studies
- Videos
- Optimized Climate Solutions
- Code Briefs

FIND PUBLICATIONS:

- Library

Sales Binder: Zero Energy Ready Home Project Specs

Sales Messages

High-R Window

High-efficiency ENERGY STAR-rated windows perform at least 15% better than a standard window. Ultra-efficient windows perform at least 50% better. On average, high-efficiency windows save homeowners 7% to 15% on utility bills. These windows use a combination of insulating frames and other features to reduce heat loss. They consist of two or three glass panes separated by insulating spacers. The space between the glass layers is filled with a nontoxic gas like argon or krypton that insulates better than air and the glass panes are coated with a nearly invisible low-emissivity coating that reflects heat to keep warm air in during the winter and hot sun out in summer. The coatings also help to block ultraviolet rays, minimizing fading of curtains and furniture.

High-R Insulation

High-performance insulation systems include properly installed insulation in amounts that meets or exceeds the insulation levels required by the 2012 International Energy Conservation Code (IECC), which is ~15% more efficient than the 2009 IECC. Ultra-efficient insulation levels exceed the 2009 IECC levels by 50% or more. By using high-efficiency and ultra-efficient insulation, that is carefully installed to avoid gaps and compression, home builders create well-insulated conditioned spaces that require very little effort to heat and cool, provide even comfort throughout the house, and help occupants reduce costs.

Fully Aligned Air Barriers

A whole-house draft barrier is a continuously connected layer of solid or air-tight materials that block air leaks. This barrier can also function as part of a water barrier, thermal barrier, and vapor barrier, if the location and materials are compatible. For example, rigid foam insulation can provide a combined function. Rigid foam sheets can be used to block air flow when seams are sealed with tape, caulks or adhesives, or liquid applied sealants. An example of an interior air barrier may be the drywall on the home's walls and ceilings, when the seams are taped and mudded, and caulk, spray foam, or gaskets are used to seal around wiring, plumbing, and other penetrations. Insulation should be in full contact with the air barrier layer.

Exterior Insulation Sheathing

A continuous thermal blanket of rigid foam can be installed on the exterior of the walls, either over the plywood or OSB sheathing or in place of the wood sheathing. Adding sheets of rigid foam insulation to the outside of wall framing has many advantages. The rigid foam covers the entire surface of the wall or roof, which blocks the transfer of heat through the studs. When only cavity insulation is used, the studs form a bridge that heat can follow between inside the house and the exterior. As a form of insulation, rigid foam is a great addition to the thermal barrier, but it can also help block air leaks, water leaks, and vapor leaks.

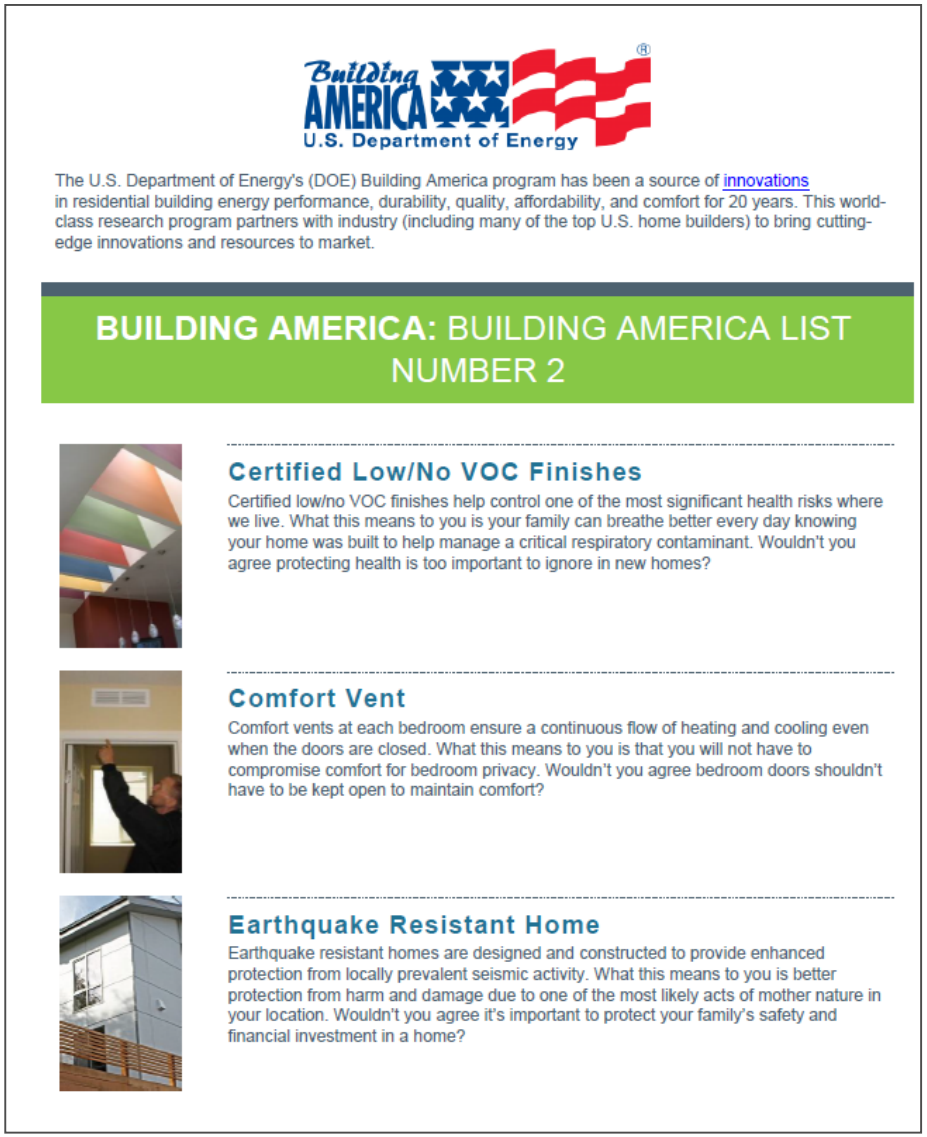
U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Sales Tool Customized Worksheet: ZERH Value Propositions

Download one of six worksheets based on ZERH value propositions:

- Advanced Technology
- Engineered Comfort
- Enhanced Durability
- Healthful Environment
- Quality Built
- Ultra Efficient

Customized Sales Tool Worksheets



- Access all Sales Tool messages and build your own customized worksheets
- Add builder logo, contact info and descriptions
- Save worksheets to your Field Kits, or download PDF files.

Add Content to Field Kits

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Building America Solution Center

Add or remove this item in your Field Kits.
- Zero Energy Ready Home Project #1 — 22 items
- New Construction Specs — 6 items
- Portland Oregon Rennovation — 4 items
- Indoor airPLUS — 3 items
- Sales Binder: Zero Energy Ready Home Project Specs — 20 items

EERE » BTO » Building America » Solution Center » Guides

Solution Center Home
Help

FIND YOUR TOPIC BY:
Building Components
Guides A-Z
ENERGY STAR Certified Homes
Zero Energy Ready Home
EPA Indoor airPLUS
EPA WaterSense®

FIND RESOURCES:
Sales Tool
CAD Files
Image Gallery
Case Studies
Videos
Optimized Climate Solutions
Code Briefs

FIND PUBLICATIONS:
Library
Research Tracker

Ducts Buried in Attic Insulation and Encapsul

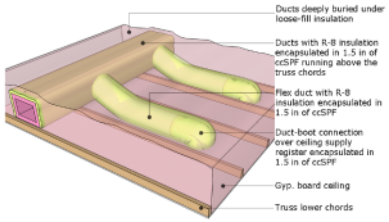
Feedback

Belongs to 0 Field Kits | Print this page | PDF version

Scope | Description | Success | Climate | Training | CAD | Compliance | More | Sales

Scope

Buried and encapsulated ducts are installed in unconditioned attics. Ducts are installed in contact with the ceiling and/or truss lower cords. Ducts are then encapsulated with 1.5 in of closed-cell spray polyurethane foam (ccSPF), which increases the R-value of the duct insulation, mitigates condensation issues, and reduces air leakage. Finally, loose-fill insulation is installed at the ceiling plane, covering the ductwork. This insulation serves as ceiling insulation and additional insulation for the ductwork. Figure 1 provides a diagram of a finished buried & encapsulated duct installation. Buried & encapsulated ducts can be installed in all climate zones, including moist and marine climate zones.



A. Install ductwork in direct contact with the ceiling and/or truss lower cords.
B. Mastic-seal all duct connections.
C. Test total duct leakage.
D. Apply at least 1.5 in of ccSPF to all ducts.
E. Install loose-fill ceiling insulation.

To view these approaches as seperate measures, see: Ducts Buried in Attic Insulation, and Encapsulated Ducts.

Last Updated: 05/12/2014

Create Sales Worksheet
View All Sales Worksheets

Building America Solution Center
Last Updated: February 22, 2017
Building America List number 2
Last Updated: February 22, 2017
Building America Sales Tool
Last Updated: February 22, 2017
Ultra Efficient List
Last Updated: September 23, 2015

MY FIELD KITS

Zero Energy Ready Home Project #1 — 22 items
New Construction Specs — 6 items
Portland Oregon Rennovation — 4 items
Indoor airPLUS — 3 items
Sales Binder: Zero Energy Ready Home Project Specs — 20 items

New Field Kit

Contact Us | Web Site Policies | U.S. Department of Energy | USA.gov

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

BASC Mobile Access

Access your Building America Field Kits remotely using the new “Solutions” mobile application for Android and iOS. Access the iOS app through the Apple store, and use the link below for the Android app.

- Access media
- Access guides
- Access Field Kits for specific construction projects

https://basc.energy.gov/solutions

Field kits can also be accessed from computers

World Class Guidance for High-Performance Homes…

… at Your Finger Tips

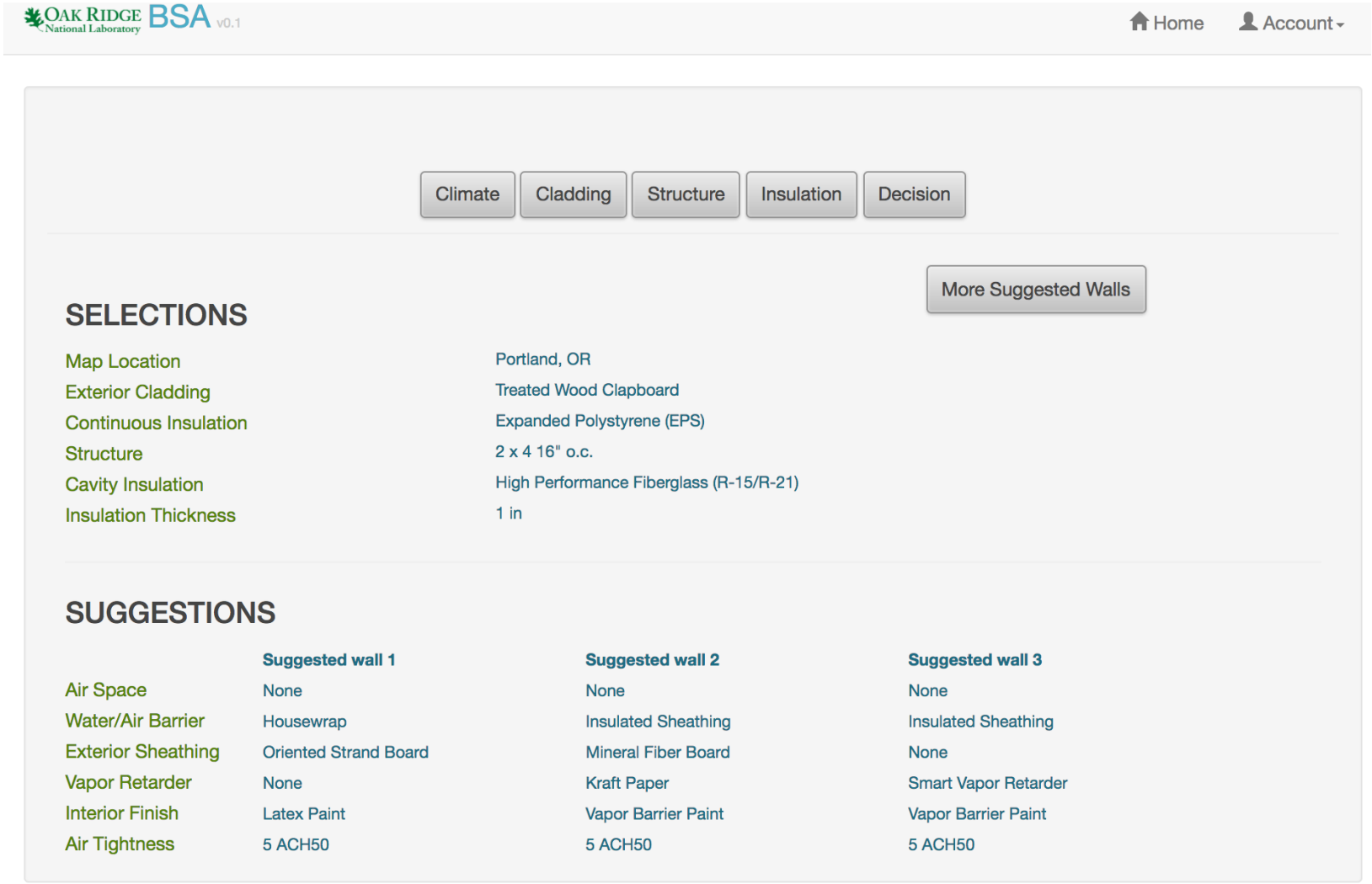
BASC.ENERGY.GOV

Contacts:
BASC@pnnl.gov
Chrissi Antonopoulos@pnnl.gov

Building Science Advisor – BSA.ORNL.GOV

- Developed by the US Department of Energy and Oak Ridge National Laboratory.
- The tool (BETA version released) is designed to help users determine moisture risks in wall structure designs.
- The tool works by gathering information about climate zone and wall components:
  - Cladding
  - Structure
  - Insulation
  - Vapor barriers
  - Air sealing
  - Sheathing
  - Other materials
- The output will inform the user about the moisture risks associated with the wall.

Building Science Advisor Wall Suggestions



Building Science Advisor Advanced Output Example

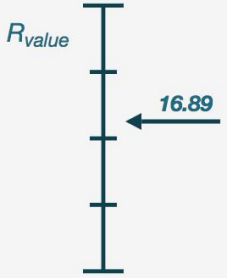
OAK RIDGE National Laboratory BSA v0.1 — Home — Account

Back/Decision | Air Gap | Water/Air Barrier | Sheathing | Vapor Retarder | Interior Finish | Air Tightness | Results

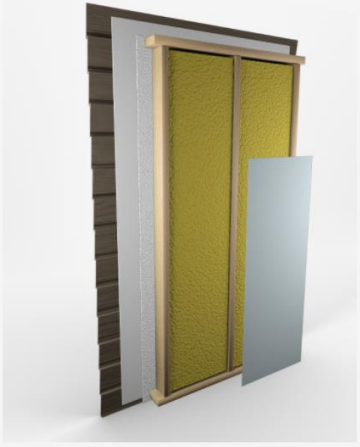
Map Location	Portland, OR
Exterior Cladding	Treated Wood Clapboard
Structure	2 x 4 16" o.c.
Cavity Insulation	High Performance Fiberglass (R-15/F
Continuous Insulation	Expanded Polystyrene (EPS)
Insulation Thickness	
Air Space	None
Water/Air Barrier	Housewrap
Exterior Sheathing	None
Vapor Retarder	None
Interior Finish	Vapor Barrier Paint
Air Tightness	3 ACH50
ID	13899

Moisture Durability Performance

Thermal Performance



Email a question about this wall.



Moisture Performance

This wall assembly has sufficient drying capacity and should perform adequately in the selected climate zone.

Thank You

Dan Wildenhaus

info@betterbuiltnw.com

Chrissi Antonopoulos

BASC@pnnl.gov