

EEBA Excellence in Building Conference & Expo

October 6 - 8, 2015

U.S. DEPARTMENT OF
ENERGY

Energy Efficiency &
Renewable Energy



Building America: Putting Research into Action

SAM RASHKIN

U.S. Department of Energy

CHRISSI ANTONOPOULOS

Pacific NW National Laboratory

World Class Guidance for High-Performance Homes...

U.S. DEPARTMENT OF
ENERGY

Energy Efficiency &
Renewable Energy

... at Your Finger Tips



Is: Guidance

Is *Not*: Design Tool

Building America
Content

Specify

Apply

Educate

Approve

Sell

Simple
Interface

Program Checklists

Access guides directly from checklists for Zero Energy Ready Home, ENERGY STAR Certified Home, and Indoor airPLUS



Building Components

Access guides for new and existing homes based on building components of interest.



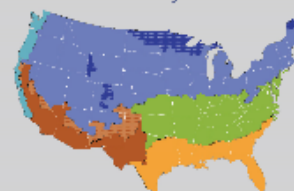
Sales Tool

Translate building science technical terms into a new language of value.



Climate Packages

Review new home energy efficiency specifications and case studies that exceed 2009 IECC by 30%.



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Train
intro

Technical terms



Climate Packages

ask about

efficiency
solutions that



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Existing Homes



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Sales Tool

Climate Packages

Double-Stud Wall

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Scope	Description	Success
Scope	Construct a double-stud wall consisting of two stud-framed walls side by side with a few inches apart. The location of the air control layer is determined by the type of insulation used.	
	- Install a continuous air control layer in the wall cavity that is filled with high-R wall assembly. - Install a vapor control layer in the wall cavity that is filled with high-R wall assembly. - Install insulation without air compressions, gaps, or voids.	
OR	Completely fill the entire wall cavity with high-R wall assembly.	

ENERGY STAR Certified Home
Thermal Enclosure Checklist, R-15 method that ensures a continuous thermal enclosure. (of the ENERGY STAR Thermal Enclosure Checklist, R-15 method that ensures a continuous thermal enclosure.)

DOE Zero Energy Ready Home
Exhibit 1: Mandatory Requirements for Thermal Enclosure. (of the ENERGY STAR Thermal Enclosure Checklist, R-15 method that ensures a continuous thermal enclosure.)

Last Updated: 07/24/2015

Double-Stud Wall

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Scope	Description	Success
Description	Double-stud wall construction consists of two stud-framed walls side by side with a few inches apart. The location of the air control layer is determined by the type of insulation used.	
	- High-R Walls Case Study: A summary of strategies, and wall types such as energy and moisture management. - Moisture Management: This report explains moisture management in six U.S. representing a range of climate zones. - Monitoring of Double-Stud Wall Construction: This report explains moisture management in six U.S. representing a range of climate zones.	

Ensuring Success
Install the air control layer in the wall cavity that is filled with high-R wall assembly.

Last Updated: 07/24/2015

Double-Stud Wall Framing

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Scope	Description	Success
Climate	The permeance and location of vapor control layer in warmer climate zones (1 through 4).	

Last Updated: 07/24/2015

Double-Stud Wall Framing

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Scope	Description	Success
Training	Right and Wrong Images	
Presentations	None Available	
Videos		

Last Updated: 07/24/2015

Double-Stud Wall Framing

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Scope	Description	Success
CAD Images		

Last Updated: 07/24/2015

Double-Stud Wall Framing

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Scope	Description	Success
Compliance	ENERGY STAR Version 3.0 (Rev. 0) Thermal Enclosure Checklist, R-15 method that ensures a continuous thermal enclosure. (of the ENERGY STAR Thermal Enclosure Checklist, R-15 method that ensures a continuous thermal enclosure.) DOE Zero Energy Ready Home Exhibit 1: Mandatory Requirements for Thermal Enclosure. (of the ENERGY STAR Thermal Enclosure Checklist, R-15 method that ensures a continuous thermal enclosure.) 2009 IECC This topic is not specifically addressed in the 2009 IECC. 2009 IRC This topic is not specifically addressed in the 2009 IRC. 2012 IECC This topic is not specifically addressed in the 2012 IECC. 2012 IRC This topic is not specifically addressed in the 2012 IRC.	

Double-Stud Wall Framing

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Scope	Description	Success
More Info.	Case Studies None Available References and Resources* All About Laminar Trusses Author(s): Holladay Organization(s): Green Building Publication Date: July, 2011 Website article interviewing the author of the book. Building America Special Report Author(s): Straube, Smeag Organization(s): BSC Publication Date: March, 2009 Report considers a number of thermal control. DOE Zero Energy Ready Home Author(s): DOE Organization(s): DOE Publication Date: April, 2014 Standard requirements for DOE. Double-Wall Thermal Blanket Author(s): CARB Organization(s): CARB Publication Date: January, 2014 Information sheet providing information on the Double-Wall Thermal Blanket. ENERGY STAR Certified Homes Requirements Author(s): EPA	

Double-Stud Wall Framing

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Scope	Description	Success
Building Science-to-Sales Translator	Double-Wall Framing = Double-Wall Thermal Blanket TECHNICAL DESCRIPTION: Although the wall cavities of a typical stud-framed home are insulated, heat loss can still occur due to the movement of heat through the wood framing. Rather than constructing a single-framed wall, some builders construct a double-wall consisting of two stud-framed walls side by side with a few inches apart. After sheathing the exterior wall, netting is attached to the inside of the interior wall and the extra-wide double-wall space is filled with insulation. Two 2x4 framed walls, spaced five inches apart will provide a wall cavity over 11 inches deep. The spacing and the insulation keep the studs in one wall from touching the studs in the other wall, which provides a continuous thermal break to keep heat from transferring through the wall. This double-wall thermal blanket creates a quiet, efficient, and comfortable home. Alternate Terms - Quiet Double-Wall Construction - Energy Saving Double-Wall - Advanced Double-Wall Technology	

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Fresh Air

- Supply Fresh Air System
- Odor and Moisture Control Fans
- High-Capture Filtration Technology

Pest Control

- Bug Control Barrier
- Pest Screened Home

Quiet

- Quiet Window Technology
- Quiet Wall Technology

Outdoor Contaminant Control

- Contaminant Sealed Construction
- Contaminant Sealed Comfort Delivery
- Dust and Pollen Barrier
- Radon Controlled Home

Moisture Control

- Dry-by-Design Construction
- Moisture Control System - Whole House
- Moisture Controlled Comfort System
- Moisture Controlled Windows
- Moisture Controlled Lower Level

Chemical Control

- Formaldehyde Controlled Home
- VOC Controlled Home

Fume Control

- Carbon Monoxide Controlled Equipment
- Carbon Monoxide Controlled Fireplace
- Fume Controlled Garage

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Energy Efficiency
& Renewable Energy

Building America's Optimized Solutions for New Homes

Cold Climate

IECC Climate Zones

1 = 2 = 3 = 4 = 5 = 6 = 7

Climate Zone Maps

Map of Building America climate regions (top) for program reporting and IECC climate zones (bottom) as a reference for compliance information

Photo (top left): Leif Juell, Alternative Power Enterprises, Inc.

Checklists

ectly from checklists f
y Home, ENERGY ST
nd Indoor airPLUS

OR NEW HOMES: COLD CLIMATE

ion: Cold Climate

- Attics - am Underside Roof - am • Permeable Insulation - igid Insulation Over Sheathing	- ICS - or Batt Insulation - Cavity Insulation with Advanced Framing - am • Permeable Insulation - igid Insulation - all Cavity Insulation
- concrete Walls - igid Foundation Insulation - ndation Insulation - ulation plus Batt - in Batt or Blown-in - rt-Protected Foundation	- TAR[®] Certified Window - Window
- Gas Furnace - Heat Pump - Heat Pump - in-Split Heat Pump - Heat Pump/Air Conditioner - Heat Pump - in-Split Heat Pump	- ing - elling - Encapsulated Ducts - ply Ventilation - Supply-only Ventilation - Balanced Ventilation

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Water Heating	EF 0.8
Lighting	ENERGY STAR
Appliances	ENERGY STAR
Exhaust Fans	ENERGY STAR
Ceiling Fans	ENERGY STAR

Abbreviations: Solar Heat Gain Coefficient (SHGC), Annual Fuel Utilization Efficiency (AFUE), Heating Seasonal Performance Factor (HSPF), Air Changes Per Hour (ACH), Seasonal Energy Efficiency Ratio (SEER), and Energy Factor (EF).

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BASC Simple Interface



BASC Simple Interface

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Project site #1

East Lake Project field kit

Twin Peak Site

Field Kit - East Lake Project field kit

Compact duct design layout

ENERGY STAR Window...

Rater-measured duct leakage to...

2 foot plan layout with wall elevation

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Videos



Insulation Installation (RESNET Grade 1) - Part 1

Courtesy Of: [CertainTeed](#)

Video describing how to properly install the OPTIMA insulation system.

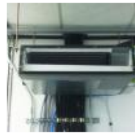


Light Tubes

Publication Date: July, 2015

Courtesy Of: [SolarLight](#)

Video describing how to install light tubes.



Mini-Split (Ductless) Heat Pumps (1)

Publication Date: July, 2015

Courtesy Of: [Risinger Homes](#)

Video describing mini split ductless heat pumps.

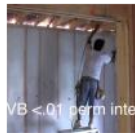


Mini-Split (Ductless) Heat Pumps (2)

Publication Date: July, 2015

Courtesy Of: [Zero Energy Homes](#)

Video describing mini split ductless heat pumps.



No Class I Vapor Retarders on Interior Side of Exterior Walls in Warm-Humid Climates

Publication Date: July, 2015

Courtesy Of: [Train2Build](#)

Video describing vapor retarders used in Warm-Humid climates.



No Excessive Coiled or Looped Flex Ducts

Publication Date: July, 2015

Courtesy Of: [Train2Build](#)

Video describing proper flex duct installation.

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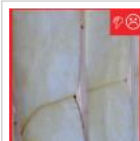
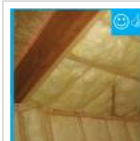
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Scope Description Success Climate **Training** CAD Compliance More Sales

Training

Right and Wrong Images



Presentations



Presentation: [Zero Energy Ready Home Training](#)  (19 MB)

Author(s): Rashkin

Organization(s): DOE

Videos



[2012 IECC Code Level Insulation – DOE Zero Energy Ready Home Requirements](#)

Publication Date: July, 2015

Courtesy Of: [Risinger Homes](#)

Video describing insulation and air sealing strategies to meet 2012 IECC code levels.

Find videos in the training tab of BASC guides

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- 90+ videos
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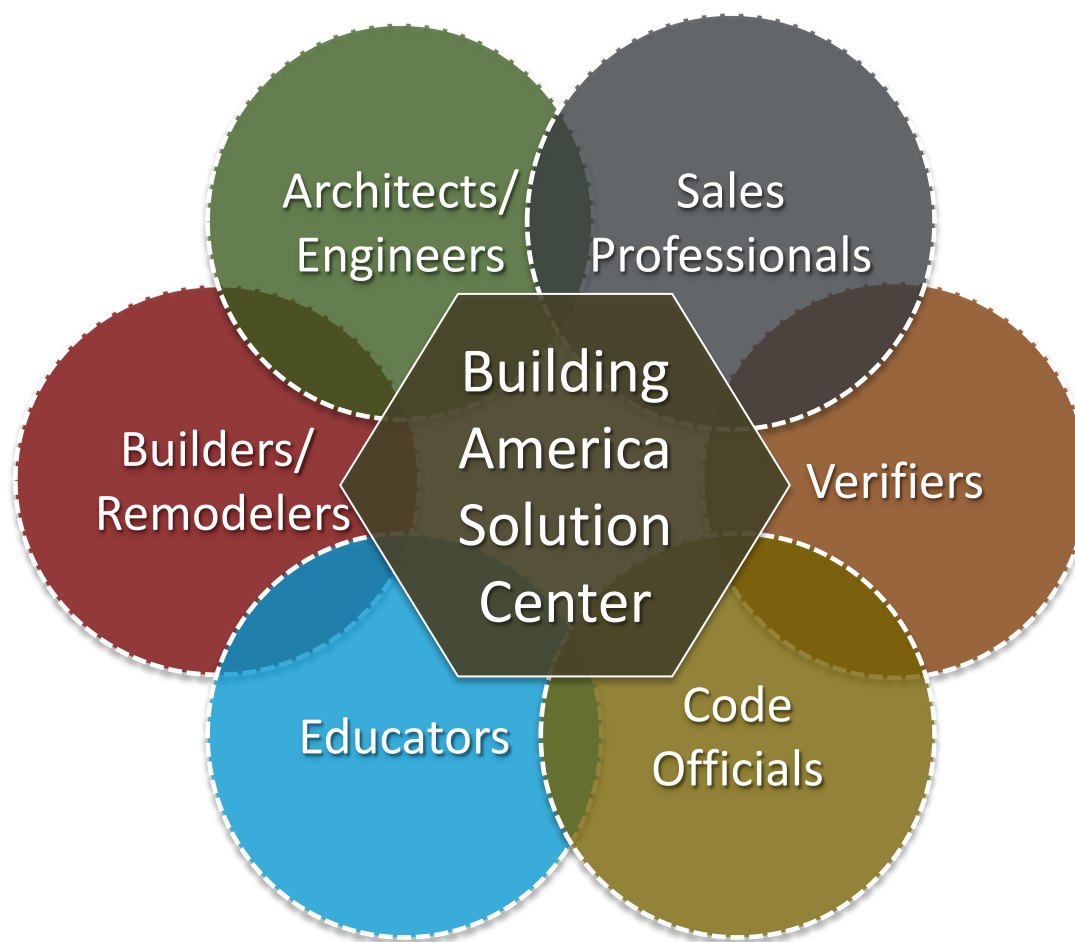
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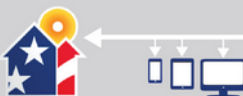
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Profession *

- Select a value -



Construction Type *

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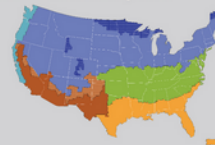
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Sales Tool

Housing industry leaders today are successfully building and selling high-performance new and existing homes. However, many stakeholders are frustrated that the transaction process fails to recognize the value associated with lower cost of ownership, greater comfort, improved health, ensured combustion safety, and more durability. Communicating the value of high-performance homes begins by using terminology for measures that consistently convey the improved consumer experience, rather than the engineering function. This is an important and powerful first step which is fully under our control, particularly if we facilitate a collective impact process engaging all stakeholders to develop and embrace this new language of 'value'.

The goal of this Building Science-to-Sales Translator is to begin this process by providing 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.



Browse by 10
different building
topics.

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12 items

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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.

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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.

Sale Tab in BASC Guides

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BUILDING SCIENCE-TO-SALES TRANSLATOR

High-R Floor Insulation = High-Efficiency or Ultra-Efficient Floor Insulation



TECHNICAL DESCRIPTION:

A poorly insulated floor can cause heat loss and uncomfortably cold floors. High-efficiency and ultra-efficient floor insulation combats heat loss through the floor by using generous amounts of properly installed insulation that stays in place in full contact with the underside of the subfloor long after the home is built. High-efficiency insulation meets or exceeds the insulation levels required by the 2012 International Energy Conservation Code (IECC); ultra-efficient insulation provides 50% more insulation than the IECC 2009 standard.

Alternate Terms

- High-Efficiency or Ultra-Efficient Floor Insulation
- Enhanced Comfort Floor Insulation
- Enhanced Quiet Floor Insulation
- Advanced Floor Insulation

High-Efficiency or Ultra-Efficient Floor Insulation Sales Message

High-efficiency floor insulation helps provide added thermal protection. What this means to you is less wasted energy along with enhanced comfort and quiet. Knowing there is one opportunity to optimize performance during construction, wouldn't you agree it's a great opportunity to meet or exceed future codes?

Find Sales Themes throughout BASC on the “Sales” tab without navigating through the Sales Tool

How to Customize your Sales Tool

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My Sales Tools mirrors Field Kits, and allows you to create customized, point-of-sale worksheets for homeowners

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Portland

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97204

Phone

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Sales Agent Reference Guide

Related Sales Themes: *

Available Options:

- High-Performance Thermal Enclosure
- High-Performance Window System
- Professionally-Installed Window
- High-Performance Insulation System
- High-Efficiency or Ultra-Efficient Insulation
- High-Efficiency or Ultra-Efficient Wall Insulation
- High-Efficiency or Ultra-Efficient Floor Insulation
- High-Efficiency or Ultra-Efficient Foundation Insulation
- Premium-Installed Insulation
- Whole-House Draft Barrier

Selected Options:

Related Sales Themes: *

Available Options:

- High-Performance Thermal Enclosure
- High-Performance Window System
- Professionally-Installed Window
- High-Performance Insulation System
- High-Efficiency or Ultra-Efficient Insulation
- High-Efficiency or Ultra-Efficient Wall Insulation
- High-Efficiency or Ultra-Efficient Floor Insulation
- High-Efficiency or Ultra-Efficient Foundation Insulation
- Premium-Installed Insulation
- Whole-House Draft Barrier

Selected Options:

Related Sales Themes: *

Available Options:

- High-Efficiency or Ultra-Efficient Attic Insulation
- ICF Thermal Blanket
- Right-Sized Comfort Equipment
- High-Efficiency Gas Furnace
- Comfort Vent
- High-Efficiency Clothes Dryer
- Advanced Lighting Technology
- High-Efficiency Fans
- Tornado/Hail Resistant Home
- On-Demand Hot Water

Selected Options:

- High-Performance Window System
- Professionally-Installed Window
- High-Performance Insulation System
- High-Efficiency or Ultra-Efficient Floor Insulation
- Whole-House Draft Barrier
- Continuous Thermal Blanket Construction
- Ventilated Fireplace
- Fresh Air System
- Disaster Resistant Home
- Pest Resistant Home

Add your custom sales themes:

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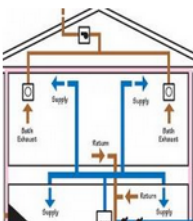
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Continuous Thermal Blanket Construction

Continuous thermal blanket construction blocks excessive heat loss and gain through structural framing. What this means to you is less wasted energy along with enhanced comfort and quiet. Knowing there is one opportunity during construction to lock in quality construction, wouldn't you agree advanced thermal protection is a great investment?



Fresh Air System

Fresh air systems help ensure adequate dilution of any indoor contaminants. What this means to you is your home is supplied with enough fresh air every day so your family can breathe better. Wouldn't you agree protecting health is too important to ignore in new homes?

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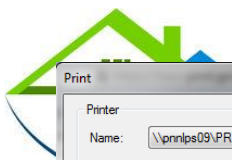
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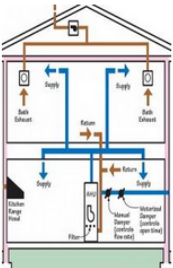
Continuous Thermal Blanket Construction

Continuous structural framing, comfort and energy efficiency. During construction, wouldn't you agree advanced thermal protection is a great investment?



Fresh Air System

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High-Efficiency or Ultra-Efficient Floor Insulation



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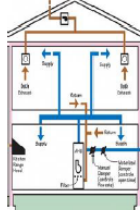
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Access guides directly from checklists for Zero Energy Ready Home, ENERGY STAR Certified Home, and Indoor airPLUS



Building Components

Access guides for new and existing homes based on building components of interest.



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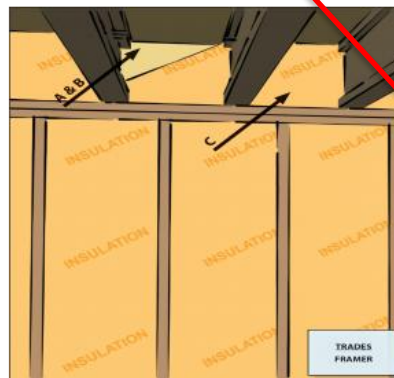
Ensure that the garage is separated from the conditioned space by a continuous rigid air barrier. Seal all seams, gaps, and holes in the air barrier with caulk or foam before installing the insulation.

DOE Zero Energy Ready Home Notes

The U.S. Department of Energy (DOE) [Zero Energy Ready Home](#) program requires that builders comply with the U.S. Environmental Protection Agency (EPA) [Indoor airPLUS program criteria](#). The Indoor airPLUS checklist (Item 4.3) requires that builders not locate air handling equipment or ductwork in garages but notes that ducts and equipment may be located in building cavities adjacent to garage walls or ceilings if the cavities are separated from the garage space with a continuous air barrier. The Indoor airPLUS Construction Specifications (Item 5.4) requires that homes with exhaust-only whole-house ventilation either are equipped with an exhaust fan or that the builder verify that the garage-to-house air barrier can maintain a pressure difference of greater than 45 Pascals while the home maintains a 50 Pascal pressure difference with respect to the outdoors, with all doors and windows closed during the blower door test.

ENERGY STAR Certified Homes Notes

The [ENERGY STAR Certified Homes Thermal Enclosure Checklist](#) requires (in Item 3 Fully Aligned Air Barriers) that a complete air barrier that is fully aligned with insulation be installed at each insulated location of the home including at the interior or exterior surface of ceilings in Climate Zones 1 through 3 and at the interior surface of ceilings in Climate Zones 4 through 8; at the exterior surface of walls in all climate zones and at the interior surface of walls in Climate Zones 4 through 8; and at the interior surface of floors in all climate zones.



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[Concrete Slab over Polyethylene](#)

Guide describing how to install a capillary break to help manage moisture in foundations. -



[Demand Plumbing](#)

This measure guide describes effective ways to distribute hot water using demand plumbing techniques. -



[Air Sealing Attached Garage](#)

Guide describing ways to air seal an attached garage. -

Videos



[Duct Leakage to Outdoors \(2\)](#)



[Garage Rim/Band Joist Adjoining Conditioned Space](#)

Sales Messages



[High-Performance Insulation System](#)

Poorly installed insulation and inadequate amounts of insulation can result in rooms that are too hot in the summer, too cold in the winter, temperatures that vary from room to room, and homes with unnecessarily high utility bills. High-performance insulation systems include generous amounts of properly installed insulation that provide comfort throughout the home by retaining heat in the winter and keeping out unwanted heat in the summer. High-performance insulation systems include insulation in amounts that exceed the minimum amount required by code. For example high-efficiency insulation 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. -

[Pest Resistant Home](#)

Insects, rodents, and other pests are more than just a nuisance; they can carry diseases, aggravate allergies, and spread germs. These pests can cause considerable property and structural damage if their activities go undetected for any length of time. There are several steps that builders can take to reduce opportunities for pest intrusion and damage. Wet wood attracts carpenter ants and is easier for animals

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- DOE's Zero Energy Ready Home program has created six value propositions to use for selling high efficient homes.
- The Sales Tool will create lists of innovations based on any one of these value propositions:
 - Advanced Technology
 - Engineered Comfort
 - Enhanced Durability
 - Healthful Environment
 - Quality Built
 - Ultra Efficient

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Sales Tool

Housing industry leaders today are successfully building and selling high-performance new and existing homes. However, many stakeholders are frustrated that the transaction process fails to recognize the value associated with lower cost of ownership, greater comfort, improved health, ensured combustion safety, and more durability. Communicating the value of high-performance homes begins by using terminology for measures that consistently convey the improved consumer experience, rather than the engineering function. This is an important and powerful first step which is fully under our control, particularly if we facilitate a collective impact process engaging all stakeholders to develop and embrace this new language of 'value'.

The goal of this Building Science-to-Sales Translator is to begin this process by providing 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.



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Engineered Comfort

Enhanced Durability

Healthful Environment

Quality Built

Ultra-Efficient

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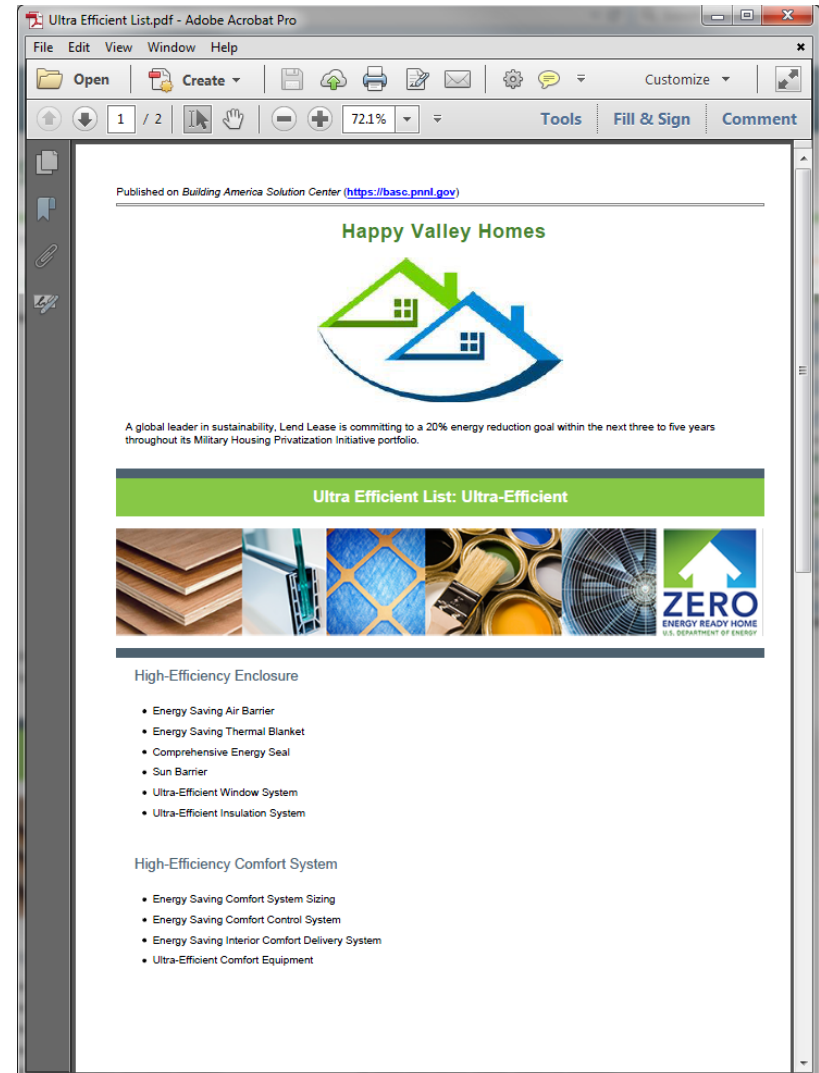
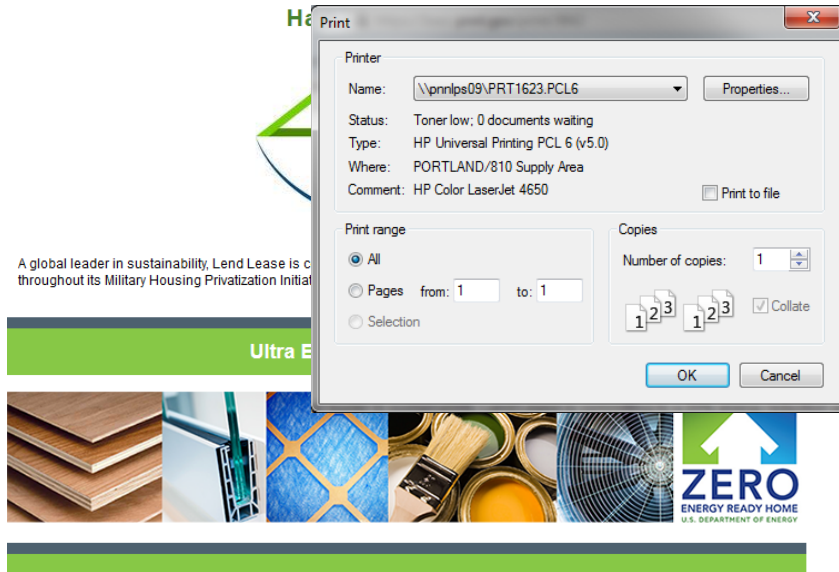
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- In the Sales Tool form, select the Predetermined Sales Tool Version.
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- Enter all the other information the same as the custom lists.
- Click save.

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High-Efficiency Enclosure

- Energy Saving Air Barrier
- Energy Saving Thermal Blanket
- Comprehensive Energy Seal
- Sun Barrier
- Ultra-Efficient Window System
- Ultra-Efficient Insulation System

High-Efficiency Comfort System

- Energy Saving Comfort System Sizing
- Energy Saving Comfort Control System
- Energy Saving Interior Comfort Delivery System
- Ultra-Efficient Comfort Equipment

Water Saving System

- On Demand Hot Water

High-Efficiency Enclosure

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- Energy Saving Thermal Blanket
- Comprehensive Energy Seal
- Sun Barrier
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- Ultra-Efficient Insulation System

High-Efficiency Comfort System

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Scope

Planning and Design

The builder, architect or designer, and HVAC contractor shall coordinate the location of equipment and ducting prior to finalizing construction drawings with the goal of minimizing the length of duct runs and providing adequate space to allow for quality installation.

Duct and Equipment Layout and Grille Selection

- Locate furnace or heat pump air handler as close to the center of the house as possible.
- Locate supply grilles close to interior walls of rooms where possible. Side wall registers are preferred.
- Select supply grilles that provide sufficient throw to reach exterior walls.
- Avoid supplying air to low-load interior spaces such as closets and powder rooms.

Duct and Equipment Sizing

- Use [ACCA Manual J](#) to calculate loads using the 0.06/0.06 cfm/sq.ft. supply/return leakage assumption (Leakage Class CL-3), the appropriate insulation (R-8 for attic ducts), and the 7C-AE duct location option.
- Size equipment in accordance with Manual J and the ENERGY STAR HVAC System Quality Installation Checklist.
- Use [ACCA Manual D](#) to size ducts based on Manual J loads.

Duct Installation

- Tightly seal all duct connections and joints with mastic and test to confirm leakage rate of not more than 5% of total system airflow.
- Stretch flex ducts out to full length and avoid kinks and compression.
- Bury ducts in ceiling insulation, install in non-vented attic, or route through chases that are within the house's thermal barrier.



Compact Air Distribution

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Scope



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DOE Zero Energy Ready Home Notes

The U.S. Department of Energy's DOE Zero Energy Ready Home program (ZERH) includes in its Mandatory Requirements the requirement that all labeled homes are certified to the U.S. Environmental Protection Agency's [Indoor airPLUS criteria](#). Indoor airPLUS requires that homes meet ENERGY STAR Certified Homes criteria including the requirement that all duct systems are installed to be substantially airtight and properly balanced. Another mandatory requirement of DOE's Zero Energy Ready Home program is that duct systems be located within the home's thermal and air barrier boundary. There are no requirements for compact duct design, but compact ducts are highly compatible with and facilitate meeting ZERH requirements.

ENERGY STAR Version 3, (Rev. 07)

HVAC System Quality Installation Rater Checklist,

2. Duct Quality Installation - Applies to All Heating, Cooling, Ventilation, Exhaust, and Pressure Balancing Ducts, 2.1 Connections and routing of ductwork completed without kinks or sharp bends. . 2.2 No excessive coiled or looped flexible ductwork.

Description

A compact duct system locates the heating/cooling equipment and supply plenum near the center of the home, and locates each room supply grille as close as possible to the supply plenum (see Figure 1). The advantages of a compact duct system

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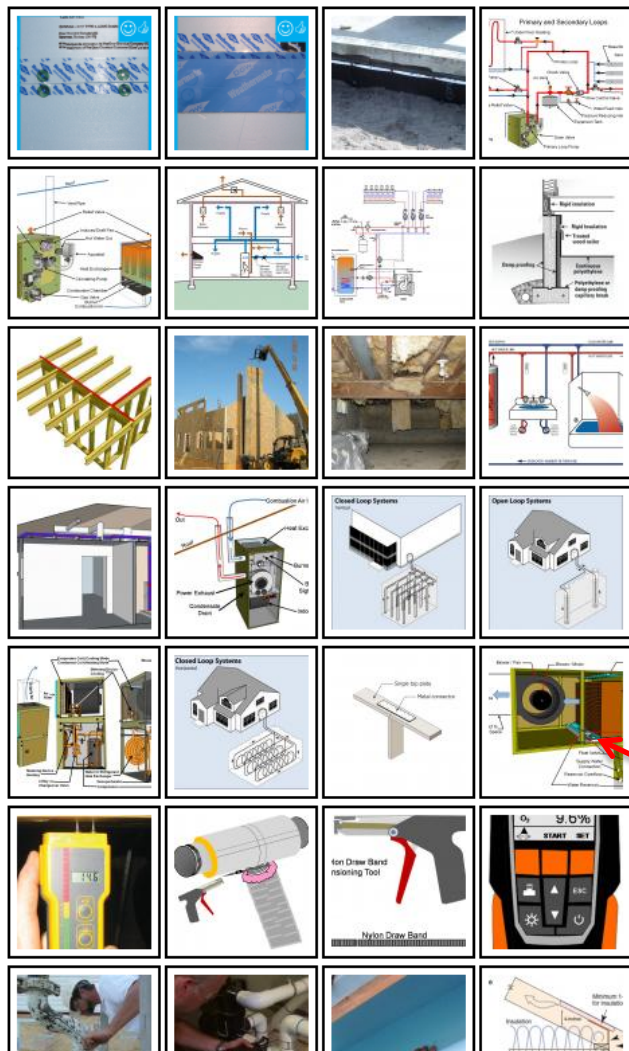
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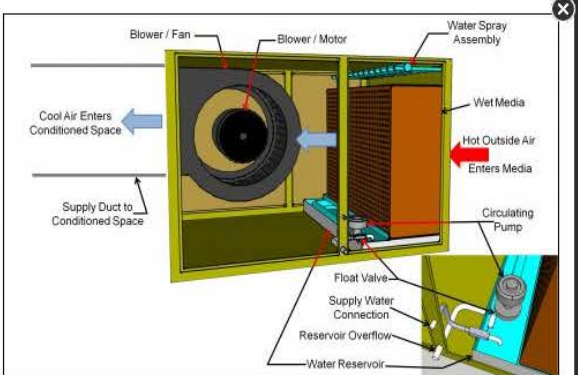
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A modern single-inlet direct evaporative cooler draws outside air through an 8- to 12-inch media filter

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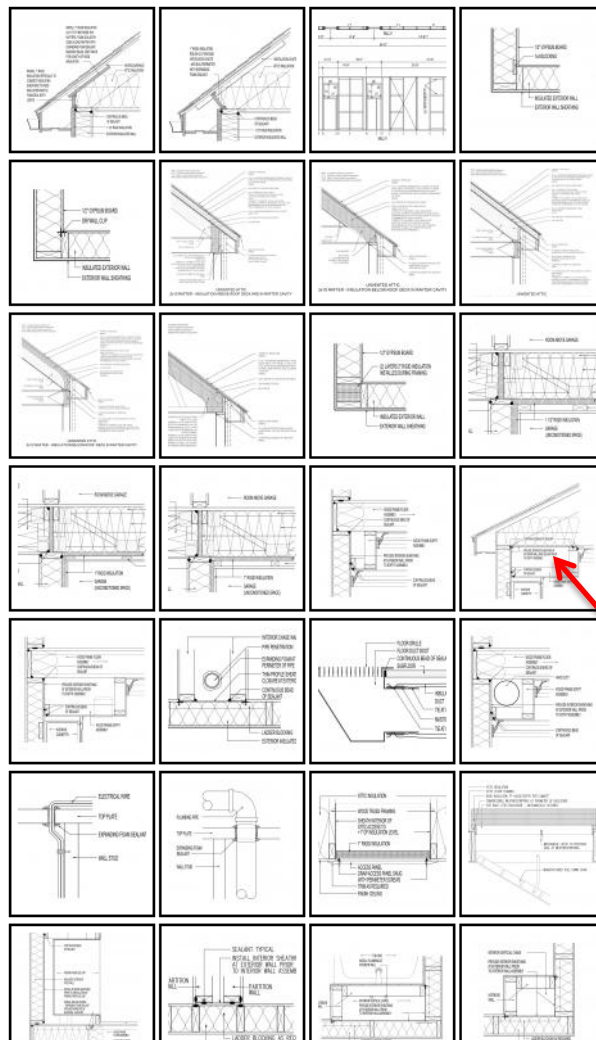
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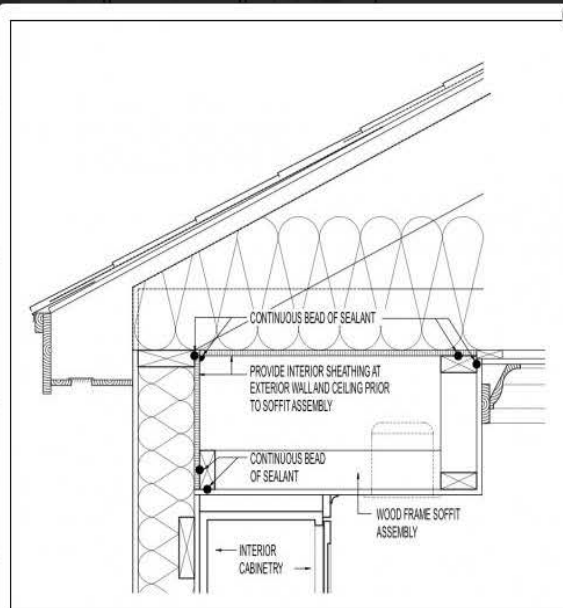
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Air seal at cabinet soffit - single-story

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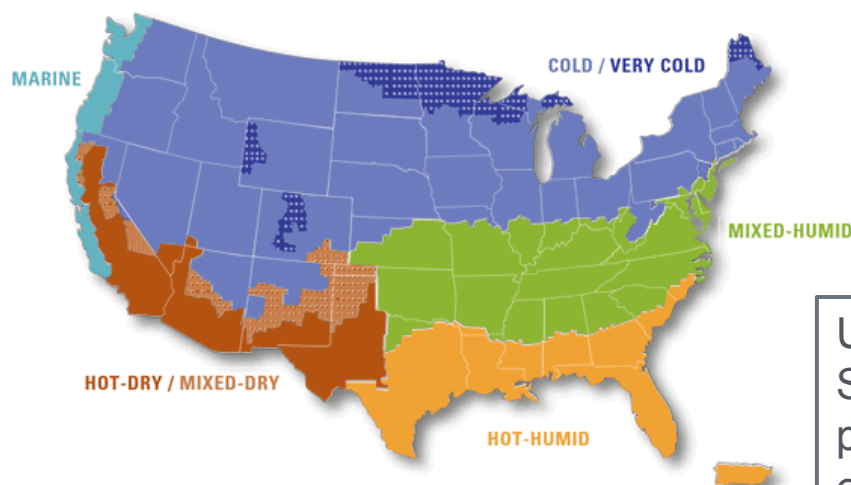
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Optimized Climate Solutions

The Building America Program, funded by the Department of Energy (DOE), has worked for the last five years to reach the next level of cost effective energy performance in homes (approximately 30% above the [B10 Benchmark](#) – roughly consistent with the 2009 International Energy Conservation Code). To prove to industry that this level of performance is achievable and market viable, DOE created a labeling program called the [DOE Zero Energy Ready Home \(ZERH\)](#). The climate-specific guidance in this section of the Building America Solution Center provides detailed information on optimized solutions that meet or exceed the ZERH program requirements, cost effectively.

Use the interactive map below to find climate-specific guidance on Building America's Optimized Solutions for New Homes. For more information about climate designations, see the Building America [Guide to Determining Climate Regions by County](#).



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[Portland Oregon Renovation](#)

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[Indoor airPLUS](#)

2 items



New Field Kit

Building America's Optimized Solutions for New Homes can help you meet or exceed the requirements of the [Zero Energy Ready Home \(ZERH\)](#) program.



Use the new Optimized Climate Solutions tool to access building packages designed to achieve 30% energy savings better than the 2009 IECC, by climate zone

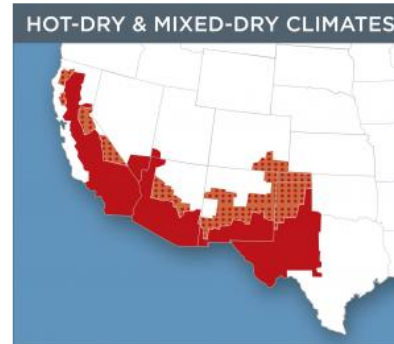
Find Case Studies by Climate Zone

Hot-Dry/Mixed-Dry

This Building America Optimized Solution describes a set of building practices necessary to achieve the next step in energy performance for new homes (approximately 30% energy savings above the [B10 Benchmark](#) - roughly consistent with the 2009 International Energy Conservation Code). This package of measures meets and exceeds DOE's [Zero Energy Ready Home \(ZERH\)](#) program requirements and was selected for its performance in the following areas:

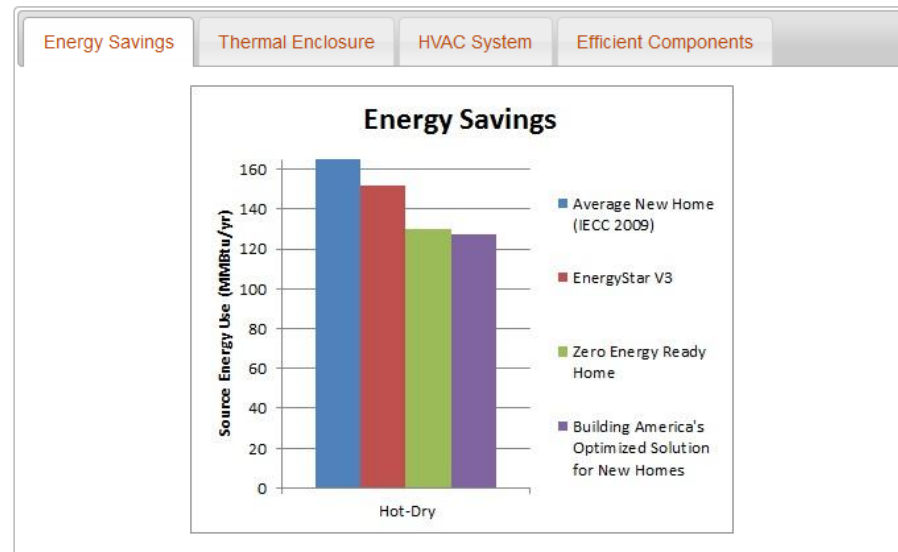
- Energy Savings
- Affordability
- Buildability
- Durability
- Healthy Indoor Environment

The high performance builders profiled in the **case studies found below** the interactive box show just a few examples of the hundreds of ways a builder can meet the premium levels of energy savings Building America strives for, while qualifying for the ZERH. Print the [Optimized Solution for the Hot-Dry/Mixed-Dry Climate](#).



For each climate zone, find:

- Energy savings data
- Guidance for thermal enclosure, HVAC and efficient components
- Detailed case studies



Case Studies

[DOE Zero Energy Ready Home Case Study: KB Homes, San Marcos, California](#) 

Author(s): PNNL

Organization(s): PNNL

Publication Date: September, 2013

Case study about a DOE 2014 Housing Innovation Award winner.

[DOE Zero Energy Ready Home Case Study: Palo Duro Homes, Albuquerque, New Mexico](#) 

Author(s): PNNL

Organization(s): PNNL

Publication Date: September, 2013

Case study about a DOE 2014 Housing Innovation Award winner.

[DOE Zero Energy Ready Home Case Study: Mandalay Homes, Prescott Valley, AZ](#) 

Author(s): PNNL

Organization(s): PNNL

Publication Date: October, 2014

Case study about zero energy ready home construction project in the hot-dry climate.

- Each climate zone will include a list of case studies
- Use the case studies to show precedence for targeted building science measures that might be used to secure approval by a code official or builder executive
- Technology specific case studies also available

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Case Studies

Building America Top Innovations 2014 Profile: HVAC Cabinet Air Leakage Test Method 

Author(s): PNNL, LBNL

Organization(s): PNNL, LBNL

Publication Date: December, 2014

Case study describing research results that helped develop a standardized testing method for testing the air leakage of HVAC air handlers and furnace cabinets.

Building America Top Innovations 2014 Profile: Valuing Green in the Appraisal Process 

Author(s): PNNL, BARA

Organization(s): PNNL, BARA

Publication Date: December, 2014

Case study describing research leading to using the Home Energy Rating System (HERS) software to auto-generate a fact-filled Green and Energy Efficiency Addendum intended for real estate appraisers for every home rated by a RESNET-certified HERS rater.

Building America's Optimized Solutions for New Homes: Cold Climate  (2 MB)

Author(s): PNNL

Organization(s): PNNL

Publication Date: March, 2015

Building America Optimized Solution in the cold and very cold climates.

Building America's Optimized Solutions for New Homes: Hot-Dry Climate  (2 MB)

Author(s): PNNL

Organization(s): PNNL

Publication Date: March, 2015

Building America Optimized Solution in the hot-dry and mixed-dry climate.

Building America's Optimized Solutions for New Homes: Hot-Humid Climate  (2 MB)

Author(s): PNNL

Organization(s): PNNL

Publication Date: March, 2015

Building America Optimized Solution in the hot-humid climate.

Building America's Optimized Solutions for New Homes: Marine Climate  (2 MB)

Author(s): PNNL

Organization(s): PNNL

Publication Date: March, 2015

Building America Optimized Solution in the marine climate.

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[Very Cold \(3\)](#)

[Marine \(2\)](#)

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[PNNL \(13\)](#)

[BSC \(10\)](#)

[Steven Winter Associates \(7\)](#)

[NREL \(2\)](#)

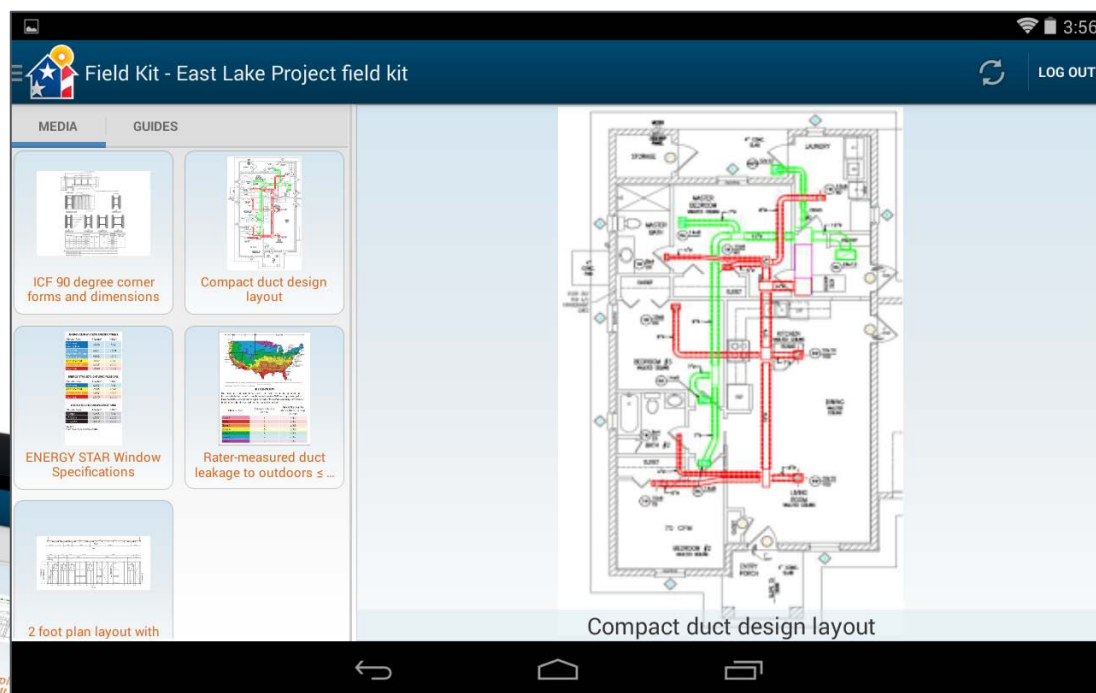
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Solutions Mobile Application



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

Access the Building America Solution Center at:

<http://basc.energy.gov>

Also accessible through the Building America Website at:

<http://www.buildingamerica.gov>