



Building America Solution Center

SAM RASHKIN

Chief Architect,
DOE Building Technologies Office



Building America Timeline

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

Building America Building Science Education Roadmap

April 2013

>>> RACE TO ZERO
U.S. DEPARTMENT OF ENERGY
STUDENT DESIGN COMPETITION

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

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<p>Program Checklists Access guides directly from checklists for Zero Energy Ready Home, ENERGY STAR Certified Home, and Indoor AIR+.</p>	<p>Building Components Access guides for new and existing homes based on building components of interest.</p>
<p>Sales Tool Translate building science technical terms into a new language of value.</p>	<p>Climate Packages Review new home energy efficiency specifications and case studies that exceed 2009 IECC by 30%.</p>
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ZERO
ENERGY READY HOME
U.S. DEPARTMENT OF ENERGY

Guidelines for Building Science Education

November 2015

CE Metzger S Rashkin
P Huelman

U.S. DEPARTMENT OF ENERGY | Prepared for the U.S. Department of Energy under Contract DE-AC05-76

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

Building America Research-to-Market Plan

November 2015

BUILDING SCIENCE EDUCATION SOLUTION CENTER

Job Classification
Click on the image above to find content organized by job classification. Examples include mechanical engineer, appraiser, home performance contractor, code official and many more!
[READ MORE](#)

The Building Science Education Solution Center provides complete, accurate training material and curriculum for a full range of building-related professions. New to the BSE Solution Center? Visit our [webinar](#) for detailed information and a tour of the BSE Solution Center.

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World-Class Expert Guidance...



Building America Solution Center

...At Your Fingertips

Is: Guidance

Is Not: Design Tool

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Interface

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



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



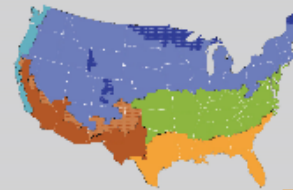
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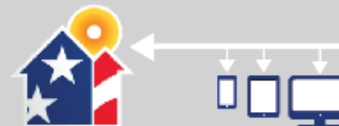
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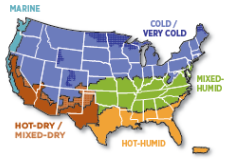
BASC ZERH Climate Packages

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



Building America's Optimized Solutions for New Homes

Cold Climate



The U.S. Department of Energy's (DOE's) Building America program has been a source of innovations in residential building energy performance, durability, and affordability for over 20 years. This world-class research program partners with many of the top U.S. home builders, contractors, and manufacturers to bring cutting-edge construction and design solutions and resources to market.

The most recent goal of the Building America program is to demonstrate how cost-effective strategies can reduce home energy use by about 30% in new homes, in all climate regions, by 2015. As part of the strategy to prove that this level of performance is achievable in the market, DOE created a labeling program called the DOE Zero Energy Ready Home program.

Working together, Building America and the DOE Zero Energy Ready Home programs have created this series of optimized solutions to demonstrate how builders can achieve these high savings goals, cost effectively, in each climate zone.

Building America's five major climate regions include: cold/very-cold, mixed-humid, hot-humid, hot-dry/mixed-dry and marine.² These climate regions are outlined in Figure 1, along with a map of the International Energy Conservation Code (IECC) climate regions as a reference for compliance information. This document outlines the Building America recommendations for achieving incremental savings in the cold climate region (approximately IECC zones 3-8).

Due to the tradeoff decisions that are made when building a home, there are hundreds of ways to meet Building America's savings target. The package listed in Table 1, shows just one way to cost effectively meet this goal. The far right column provides options for common building practices that can be used to obtain each particular performance objective. Unless otherwise noted, the performance values in the table are minimums. In depth descriptions, installation guidance and code compliance information for most of the options listed in Table 1 are available on the Building America Solution Center (basc.energy.gov).

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

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

BUILDING AMERICA
U.S. Department of Energy

BUILDING TECHNOLOGIES OFFICE

Checklists

Directly from checklists for Energy Ready Home, ENERGY STAR and Indoor airPLUS



FOR NEW HOMES: COLD CLIMATE

Checklist: Cold Climate

- Attics
 - R-49 Permeable Insulation
 - Rigid Insulation Over Sheathing
- Basements
 - R-19 Batt Insulation
- Cavities
 - Cavity Insulation with Advanced Framing
 - R-19 Permeable Insulation
 - Rigid Insulation
 - R-13 Cavity Insulation
- Exterior Walls
 - Concrete Walls
 - Rigid Foundation Insulation
 - Insulation Insulation
 - Insulation plus Batt
 - Blown-in Post-Protected Foundation
- Windows
 - ENERGY STAR Certified Window
 - Window

- Heating
 - Gas Furnace
 - Heat Pump
 - Heat Pump
 - Mini-Split Heat Pump
 - Heat Pump/Air Conditioner
 - Heat Pump
 - Mini-Split Heat Pump

- Ventilation
 - Encapsulated Ducts
 - Mechanical Ventilation
 - Balanced Ventilation

ENERGY EFFICIENT COMPONENTS

Water Heating	EF 0.8	<ul style="list-style-type: none"> • Gas Tankless • Heat Pump Water Heater • Solar
Lighting	ENERGY STAR	<ul style="list-style-type: none"> • Compact Fluorescent Light (CFL) • Light-Emitting Diode (LED)
Appliances	ENERGY STAR	
Exhaust Fans	ENERGY STAR	<ul style="list-style-type: none"> • Individual Exhaust • Central Exhaust
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).

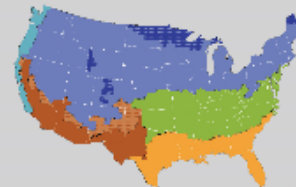
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BASC Mobile Application

The image illustrates the BASC mobile application interface. A hand is shown interacting with a tablet displaying the 'Field Kit - East Lake Project field kit' screen. The background features a larger view of the 'My Field Kits' dashboard, which includes a header with a refresh icon and a 'LOG OUT' button. Below the header are three project thumbnails: 'Project site #1', 'East Lake Project field kit', and 'Twin Peak Site'. The 'East Lake Project field kit' thumbnail is highlighted. The tablet screen shows a detailed view of the 'East Lake Project field kit' with four sub-sections: 'Compact duct design layout', 'ENERGY STAR Window...', 'Rater-measured duct leakage to...', and '2 foot plan layout with wall elevation'. A 'LOG OUT' button is visible in the top right corner of the tablet screen. To the right, a graphic shows a stylized house icon with a location pin, and below it, a 'Mobile App' section with the text 'Join our mobile community to access saved field kits wherever you need them.' and icons for a smartphone, tablet, and computer.

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- Attic Knee Walls
- Air Sealing MF Common Walls
- Air Sealing/Insulating Garage Walls
- Bathroom Fan Ratings
- Buried Ducts in Vented Attics
- Continuous Insul. Cladding/Furring
- Double Wall Framing
- Ductless Mini-Split Heat Pumps
- Dynamic Glazing
- Evaporative Cooling
- Fireplaces, Proper Ventilation
- Floors Above Unconditioned Spaces
- Gas-Fired Boilers
- Heat Pump Water Heaters
- Insulated Wall Intersections
- Insulating and Sealing Structural Headers
- Oil-Fired Boilers
- Recessed Lighting
- Rooms Containing Fuel-Burning Appliances
- Sealing/Insulating Existing Crawl Space Walls
- Sealing and Insulating Existing Exterior Walls
- Sealing and Insulating Existing Floors above Unconditioned Spaces
- Sealing & Insulating Existing Attics
- Slab-on-Grade Insulation
- Window and Frame Replacement

Buried Ducts in Vented Attics in Hot-humid and Mixed-humid Climate Zones - Code Compliance Brief

Overview:

The intent of this brief is to provide being in compliance with the code. jurisdictional officials with information increased compliance and fewer in

Ducts buried in the insulation of v Code (IECC) or International Resic recent model codes (IECC/IRC). T effective as requiring that ducts be method is endorsed by Building Ar IECC/IRC code cycle. The "measu higher level of duct insulation in h

Buried ducts in vented attics, prov particularly useful for avoiding cha with complicated framing or open ceilings, soffits, or floors.

Moving the ducting outside the bu ceiling in a vented attic, and cover minimum R-8 with common duct i insulation performed without any (

The next section (Plan Review) list and for that main reason, overall (section described below:

2015 IECC/IRC, Section R102.. intended to prevent the installatio IECC/IRC, provided that any such method of construction where the the material, method, or work offe

Plan Review:

This section lists the applicable code ducts in vented attics in hot-humid a

Per the **2015 IECC/IRC, Section R** examined, construction documents fr **2015 IECC/IRC, Section R103.2/**

- Duct design specifications and layo
 - Completed ACCA Manual J heati area, duct leakage, and duct R-value. Current software calcu the designer should calculate th typical duct layout design. Furt information, see Building Ameri
 - Section R302.1/N1101.9, Int** calculations should be a maxim of 72°F (22°C) for heating and
 - Completed ACCA Manual D fo
 - Completed ACCA Manual T fo
 - Completed ACCA Manual S fo

- Specified R-values of duct insulati (climate zone) and sealant material
- Specified R-values of ceiling insula Building America test house and te attic insulation could be higher tha
- Air sealing materials and specifica

Duct System Provisions

2015 IECC/IRC, Section R403.3/ R403.3.5/N1103.3.5.

- R403.3.1/N1103.3.1 Insulation** (76 millimeters) in diameter and greater and R-6 where less than 3 inches (76 millimeter portions of the building shall be insulated to a minimum of R-6 where 3 inches (76 millimeters) in diameter or greater and R-4.2 where less than 3 inches (76 millimeter minimum R-8 duct insulation would be required on all buried ducts.)

Exception:

Ducts or portions thereof located completely inside the *building thermal envelope*. (B envelope so this exception would not apply.)

- R403.3.2/N1103.3.2 Sealing (mandatory).** Ducts, air handlers, and filter boxes sha the International Mechanical Code or IRC, as applicable.

Exceptions:

- Air-impermeable spray foam products shall be permitted to be applied without add
- For ducts having a static pressure classification of less than 2 inches of water colu required for continuously welded joints and seams, and locking-type joints and sea

- R403.3.2.1/N1103.3.2.1 Sealed Air Handler.** Air handlers shall have a manufactur of the design air flow rate when tested in accordance with ASHRAE 193.
- R403.3.3/N1103.3.3 Duct testing (mandatory).** Ducts shall be pressure tested to d

Field Inspection:

Per the **2015 IECC, Section R104 Ins** is to remain accessible and exposed for i rough-in, plumbing rough-in, mechanica

R104.2.4 Mechanical Rough-In Insp plans and specifications as to installed di duct system should be installed at the ce inspection of the attic sealing and insula

In the **IRC, Section R109 Inspections** from the permit holder or his agent, can regarding foundation, plumbing, mechan at the discretion of the building official.

This section provides details for inspecti per the IECC or IRC may be necessary to inspection.

Inspections should provide verification in

- Verify that joints and seams in ductwo jurisdictional requirements. If ducts a instructions and that the manufacture documents.
- Verify that joints, seams, holes, and p
- Ensure that the appearance of the ins
- If the R-value or U-factor approach fo R-value or maximum U-factor require
- Ensure that the continuous air barrier ceiling/soffit and sealed.

Technical Validation(s):

This section provides additional information and helpful resources.

- [Measure Guideline: Buried and/or Encapsulated Ducts](#)

Author(s): Shapiro, Zoeller, Mantha

Organization(s): CARB

Publication Date: August 2013

Document covering the technical aspects of buried and insulated ducts, as well as the advantages, disadvantages, and risks of buried and insulated ducts compared to alternative strategies.

- [Building America Top Innovations 2013 Profile: Buried and Encapsulated Ducts](#)

Author(s): PNNL

Organization(s): PNNL

Publication Date: September 2013

Case study providing information about buried and encapsulated ducts.

- [Technology Solutions Case Study: Buried and Encapsulated Ducts, Jacksonville, Florida](#)

Author(s): CARB

Organization(s): CARB

Publication Date: November, 2013

Case study exploring how using buried and/or encapsulated ducts can reduce duct thermal losses in existing homes.

- [Compact Buried Ducts in Hot-Humid Climates](#)

Author(s): D Mallay

Organization(s): Home Innovation Research Labs

Publication Date: January 2016

A system of compact, buried ducts provides a high-performance and cost-effective solution for delivering conditioned air throughout the building. This report outlines research activities that are expected to facilitate adoption of compact buried duct systems by builders. The results of this research would be scalable to many new house designs in most climates and markets, leading to wider industry acceptance and building code and energy program approval.

- ACCA Manual D – Residential Duct Systems, Air Conditioning Contractors of America, 2013. <https://www.acca.org/technical-manual/manual-d/>
- ACCA Manual J – Residential Load Calculation, Air Conditioning Contractors of America, 2011. <http://www.acca.org/technical-manual/manual-j/>
- ACCA Manual S – Residential Equipment Selection, Air Conditioning Contractors of America, 2013. <http://www.acca.org/technical-manual/manual-s/>
- ACCA Standard 5: HVAC Quality Installation Specification, Air Conditioning Contractors of America, 2010. http://www.energystar.gov/ia/home_improvement/home_contractors/aispec.pdf
- ACCA Standard 9: HVAC Quality Installation Verification Protocols, Air Conditioning Contractors of America, 2009. http://www.energystar.gov/ia/home_improvement/home_contractors/QI_Verification_Protocols.pdf

BASC Related Guides:

- Compact Air Distribution, <https://basc.pnnl.gov/resource-guides/compact-air-distribution>
- Ducts Buried in Attic Insulation, <https://basc.pnnl.gov/resource-guides/ducts-buried-attic-insulation>
- Ducts Buried in Attic Insulation and Encapsulated, <https://basc.pnnl.gov/resource-guides/ducts-buried-attic-insulation-and-encapsulated>
- Duct Leakage to the Outdoors, <https://basc.pnnl.gov/resource-guides/duct-leakage-outdoors>

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- 520+ peer-reviewed references
- 25 code compliance briefs

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Building America BASC Content

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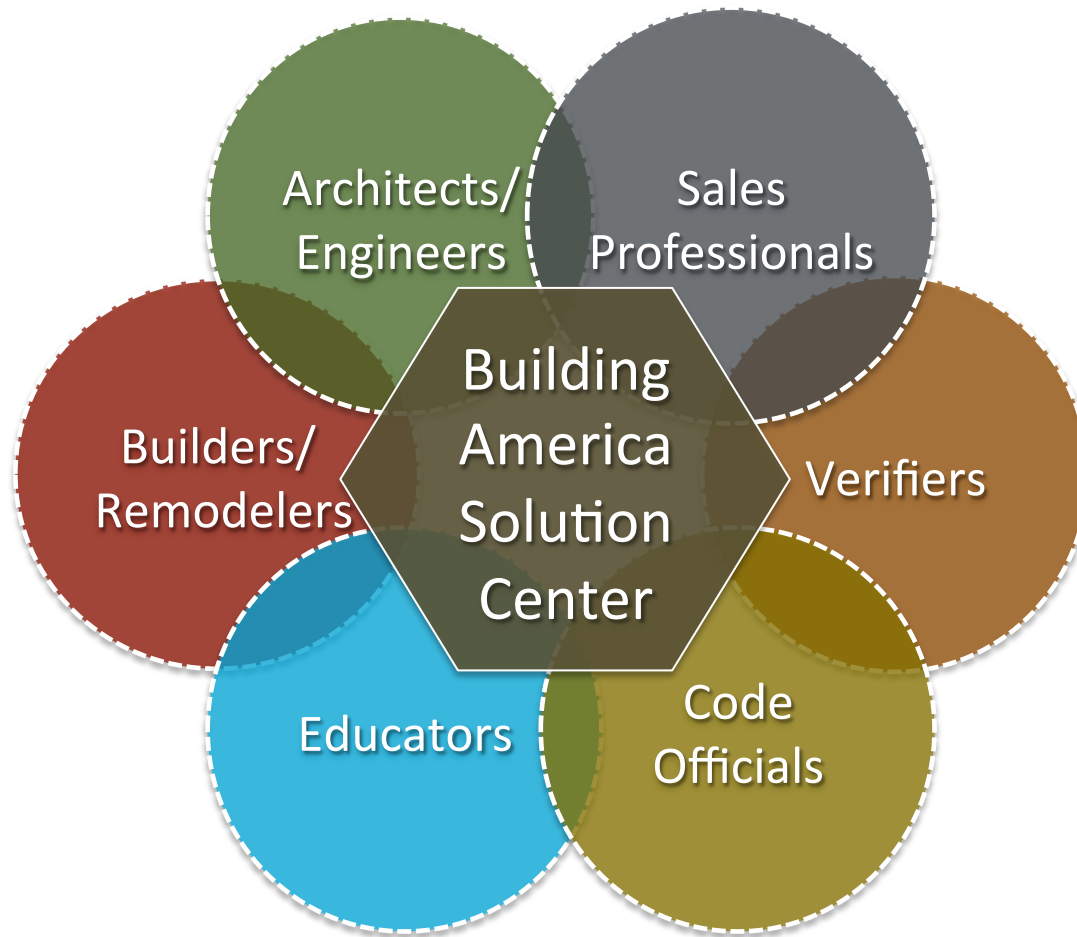
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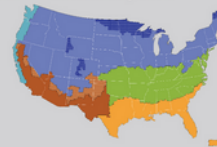
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<https://basc.energy.gov>

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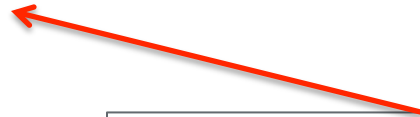
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Air Sealing Attached Garage

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Scope

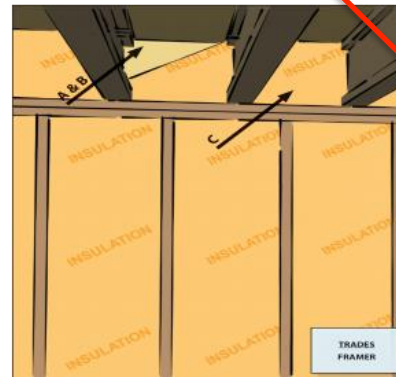
Ensure that the garage is separated from the conditioned space by a continuous rigid air barrier. Seal all seams, gaps, and holes in the air barrier with caulk or foam before installing the insulation.

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. It specifically identifies several areas requiring a



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- Happy Valley homes subdivision Portland Oregon
12 Items
- Zero Energy Ready Home project #5
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[Staircase Walls](#)

Guide describing how to create a fully aligned air barrier behind a staircase. -



[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](#)

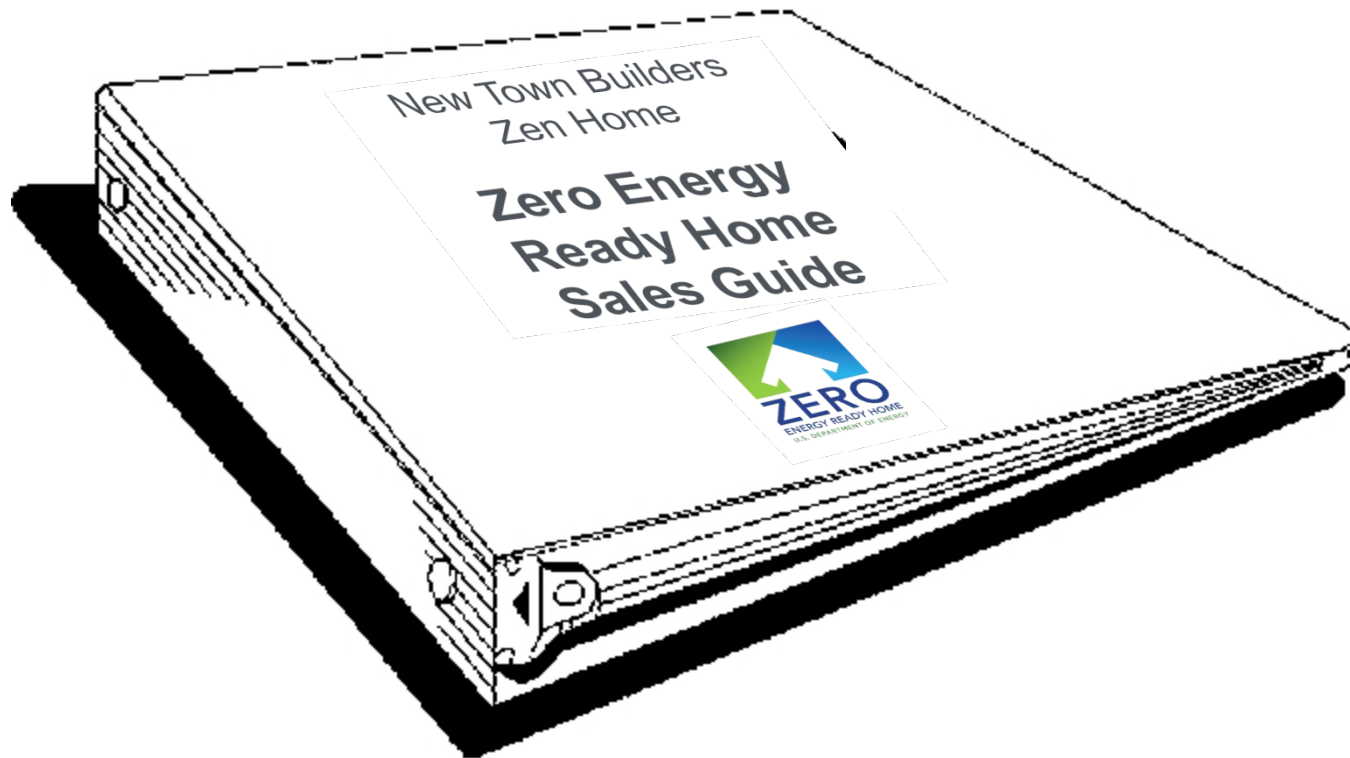
Poorly installed insulation and inadequate amounts of insulation can result in rooms that are too hot in the summer, too cold in the winter, temperatures that vary from room to room, and homes with unnecessarily high utility bills. High-performance insulation systems include generous amounts of properly 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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The Building America Solution Center provides access to expert information on hundreds of high-performance construction topics, including air sealing and insulation, HVAC components, windows, indoor air quality, and much more. Click on the links below to explore the Solution Center.

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.



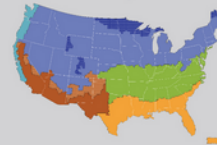
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Review new home energy efficiency specifications and case studies that exceed 2009 IECC by 30%.



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[Step and Kick-Out Flashing at Roof-Wall Intersections](#)

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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'.

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MY FIELD KITS

[Zero Energy Ready Home Project #1](#)
15 items

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6 items

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4 items

[Indoor airPLUS](#)
2 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?

Translation

Simplified Description


Alternate Terms

Sales Script

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

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

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MY SALES TOOLS

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


Create Sales Tool 

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Sales Tool Version *

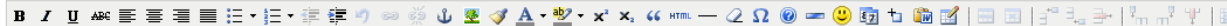
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▼ COMPANY INFO

Click Create Sales Tool to go to the sales tool form. We'll walk through filling out the form to create your customized sales tools

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 Insula
- High-Efficiency or Ultra-Efficient Wall I
- High-Efficiency or Ultra-Efficient Floor
- High-Efficiency or Ultra-Efficient Found
- 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 Insula
- High-Efficiency or Ultra-Efficient Wall I
- High-Efficiency or Ultra-Efficient Floor
- High-Efficiency or Ultra-Efficient Found
- Premium-Installed Insulation
- Whole-House Draft Barrier



Selected Options:

-

Related Sales Themes: *

Available Options:

- High-Efficiency or Ultra-Efficient Attic
- 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
- Whole-House Draft Barrier
- Continuous Thermal Blanket Construct
- Ventilated Fireplace
- Fresh Air System
- Disaster Resistant Home
- Pest Resistant Home

Add your custom sales themes:

- Hold “Ctrl” scroll and click measures in the list.
- Once you are done, click the green “+” icon to move them to your selected options box.
- Click Save at the bottom of the form to save your selections and generate your Sales Tool.

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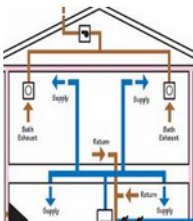
Happy Valley reference material for sales teams outlining all the technologies used in our homes.

Sales Agent Reference Guide for Happy Valley Homes



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?

MY FIELD KITS

Default Field Kit
8 items

+ New Field Kit

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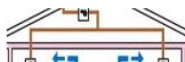
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Fresh Air System

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10 items

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[Oregon](#)

12 items

[Zero Energy Ready Home project #5](#)

4 items

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[Quality Built list](#)

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[Enhanced Durability List](#)

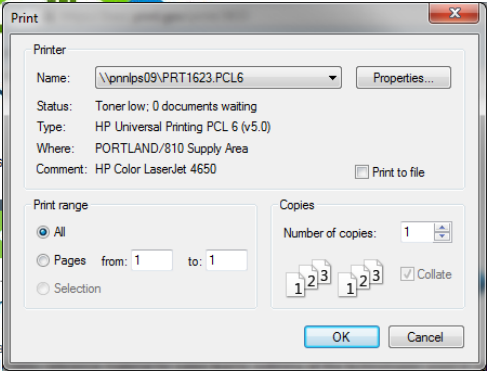
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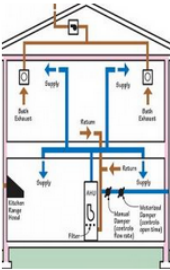
Happy Valley reference material for sales teams

Sales Agent Reference Guide for Happy Valley Homes




Continuous Thermal Blanket Construction

Continuous structural framing, enhanced thermal protection, and enhanced comfort and quiet. Knowing there is one opportunity during 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?



High-Efficiency or Ultra-Efficient Floor Insulation

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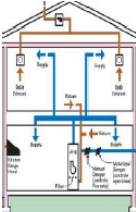
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- DOE's Zero Energy Ready Home program has created six value propositions to use for selling high efficient homes.
- The Sales Tool will create lists of innovations based on any one of these value propositions:
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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

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Sales Tool Version *

Sales Theme Groups

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Engineered Comfort
Enhanced Durability
Healthful Environment
Quality Built
Ultra-Efficient

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- In the Sales Tool form, select the Predetermined Sales Tool Version.
- At the bottom of the form, choose your value proposition theme grouping.
- Enter all the other information the same as the custom lists.
- Click save.

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Happy Valley Homes

A global leader in sustainability, Lend Lease is committing to a 20% energy reduction goal within the next three to five years throughout its Military Housing Privatization Initiative portfolio.

Ultra Efficient List: Ultra-Efficient

ZERO ENERGY READY HOME U.S. DEPARTMENT OF ENERGY

Ultra Efficient List.pdf - Adobe Acrobat Pro

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Happy Valley Homes

A global leader in sustainability, Lend Lease is committing to a 20% energy reduction goal within the next three to five years throughout its Military Housing Privatization Initiative portfolio.

Ultra Efficient List: Ultra-Efficient

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

ZERO ENERGY READY HOME U.S. DEPARTMENT OF ENERGY

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

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Scope	Description	Success	Climate	Training	CAD	Compliance	Marketing	Sales
<h3>Scope</h3> <h4>Planning and Design</h4> <p>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.</p> <h4>Duct and Equipment Layout and Grille Selection</h4> <ul style="list-style-type: none">• 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. <h4>Duct and Equipment Sizing</h4> <ul style="list-style-type: none">• 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. <h4>Duct Installation</h4> <ul style="list-style-type: none">• 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

Last Updated: 06/16/2015

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.

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 are numerous, but they are reduced in importance relative to home construction or building HVAC contractor and

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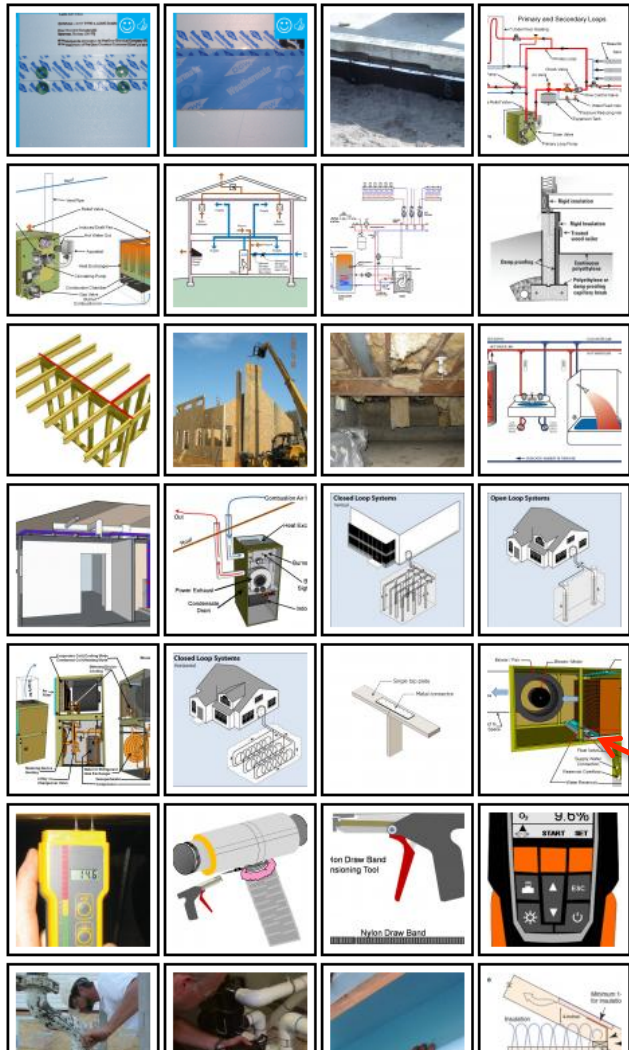
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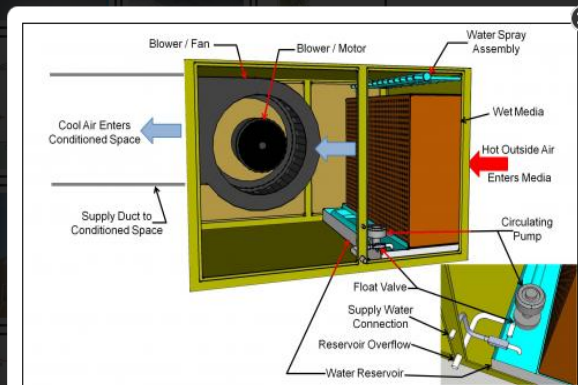
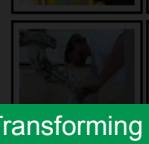
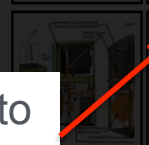
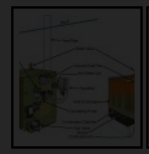
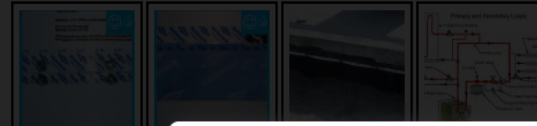
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A modern single-inlet direct evaporative cooler draws outside air through an 8- to 12-inch media filter

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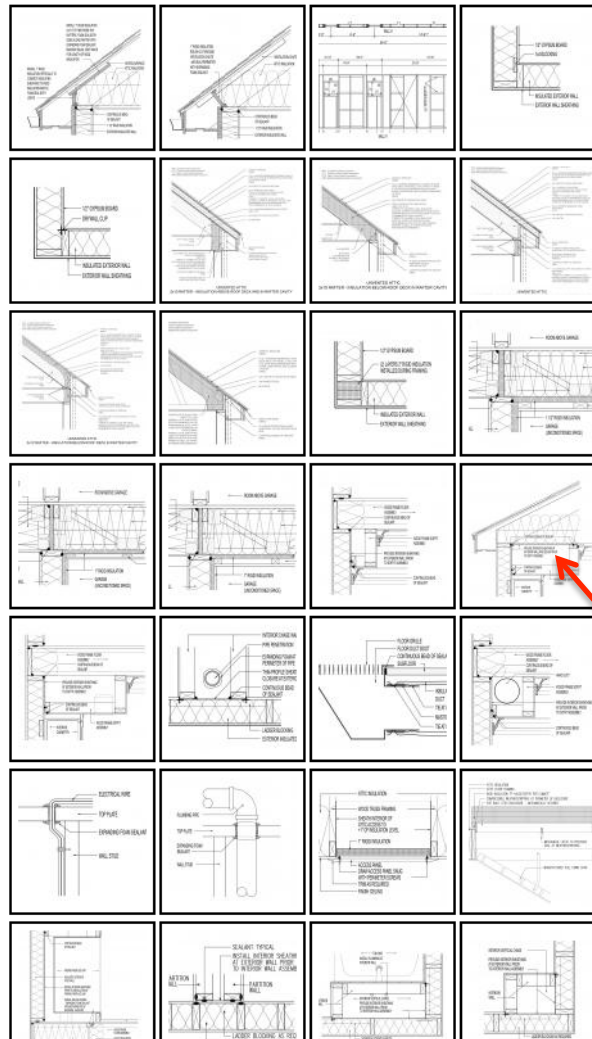
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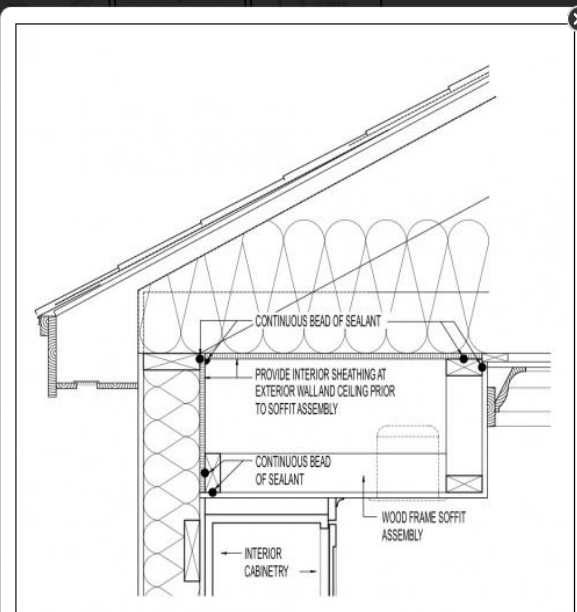
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Air seal at cabinet soffit - single-story

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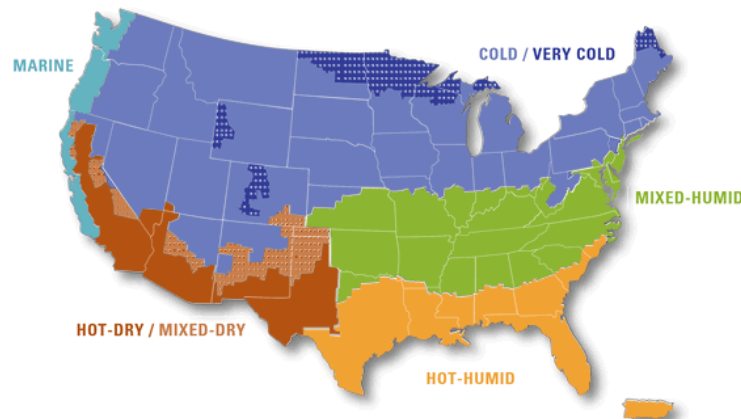
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Optimized Climate Solutions

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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[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.



A Department of Energy (DOE) [ZERH](#) represents a whole new level of energy performance, with rigorous requirements that ensure outstanding levels of energy savings, comfort, health and durability.

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

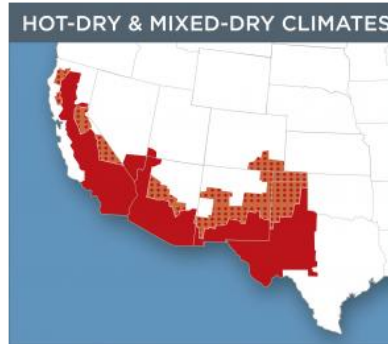
Find Case Studies by Climate Zone

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](#).

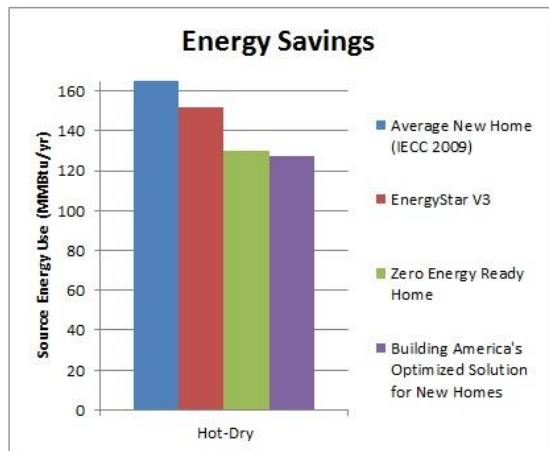


Energy Savings

Thermal Enclosure

HVAC System


Efficient Components



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

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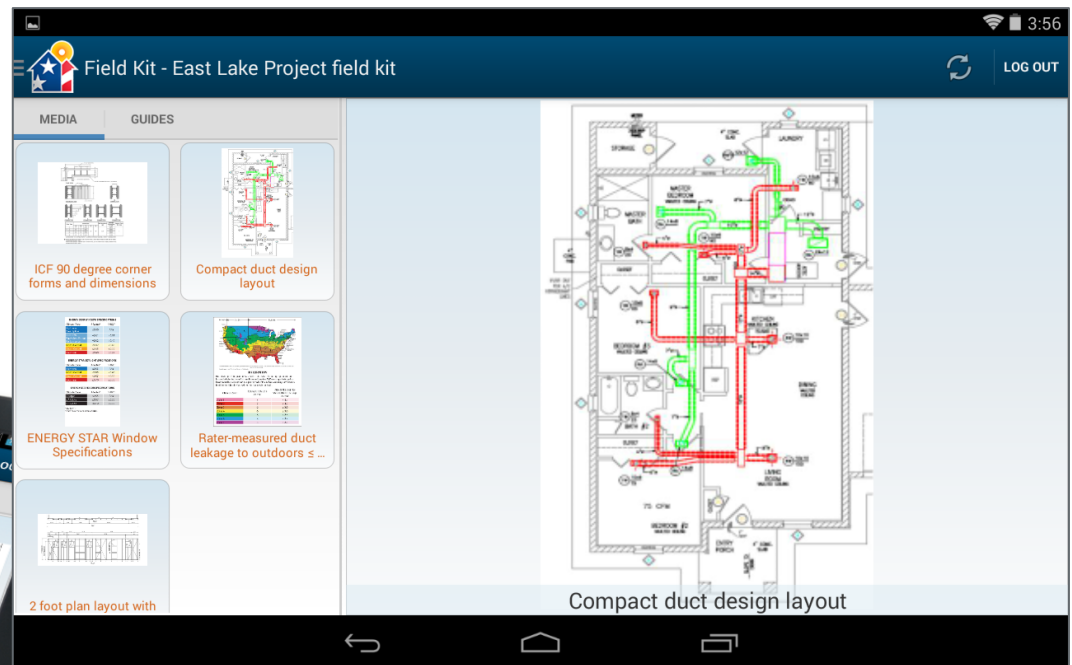
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Access your Building America Field Kits remotely using the new “Solutions” mobile application for Android and iOS. Access the iOS app through the Apple store, and use link on web site for Android app.

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



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<http://energy.gov/eere/buildings/building-america-bringing-building-innovations-market>

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