BUILDING INNOVATION Conference

Heat, Humidity, & High Winds

Details for the Intersection of Resilience and Energy Efficiency

INTERNATIONAL CODE COUNCIL®

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ICC INTERNATIONAL CODE COUNCIL®

Learning Objectives:

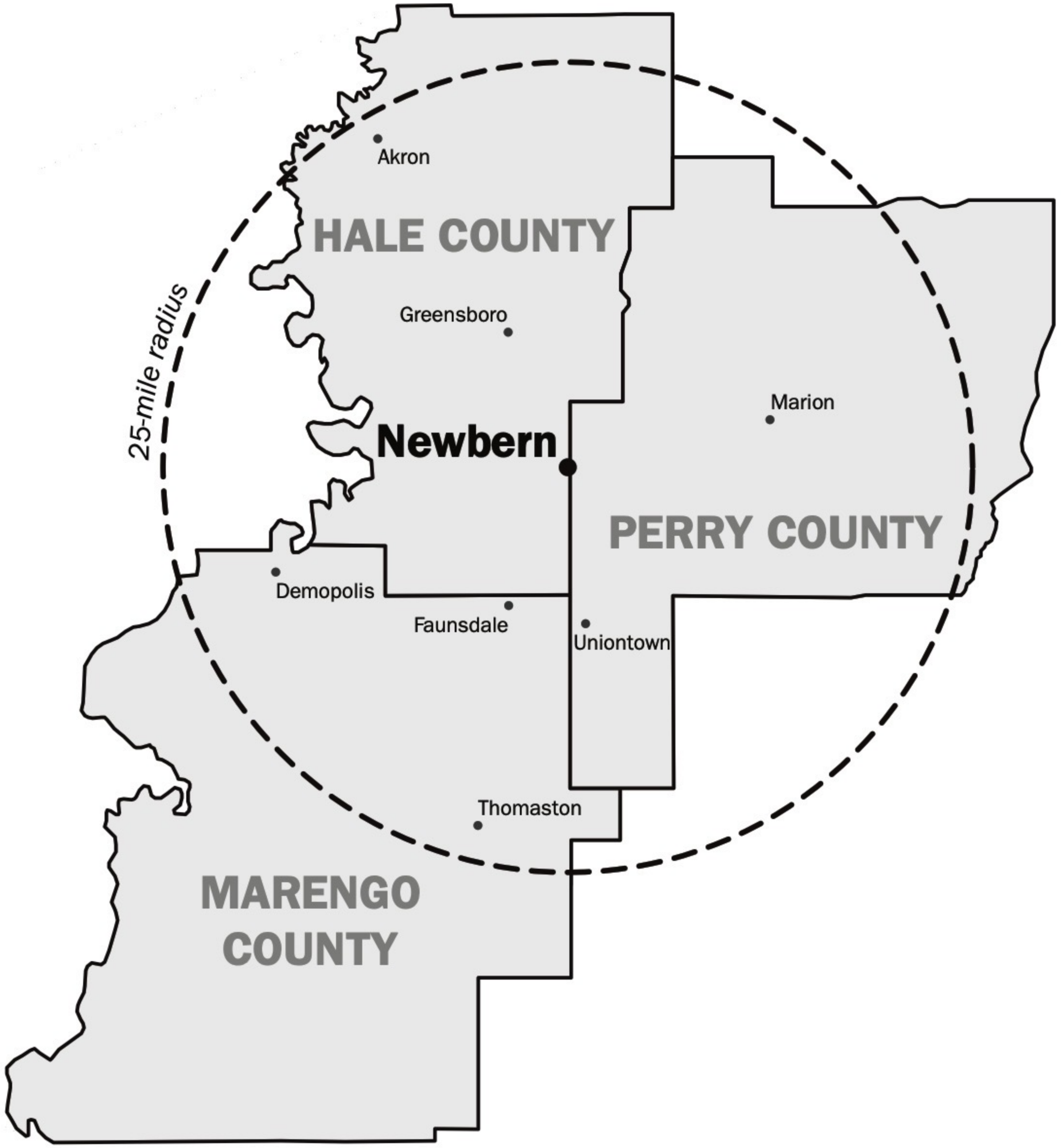
Participants will be able to

1) evaluate and differentiate between resilience objectives for protection of the occupant versus protection of the asset and define criteria for selecting between various resilience strategies
2) understand the primary methods for implementing resilient construction
3) identify potential challenges and opportunities in incorporating multiple third-party certifications into a single home and strategies to mitigate conflicts during the planning process
4) evaluate successes and lessons learned from case studies built across the southeast.

Rural Studio Students, Staff & Faculty

Fall 2023


Newbern
Auburn


Akron
HALE COUNTY
Greensboro
25-mile radius
Newbern
Marion
PERRY COUNTY
Demopolis
Faunsdale
Uniontown
Thomaston
MARENGO
COUNTY

Bryant Haybale House

photo © Timothy Hursley

Newbern Firehouse

photo © Timothy Hursley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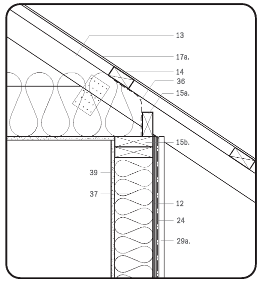
BOYS & GIRLS CLUB
WEST ALABAMA GREENSBORO
heritage
center
NEWBERN

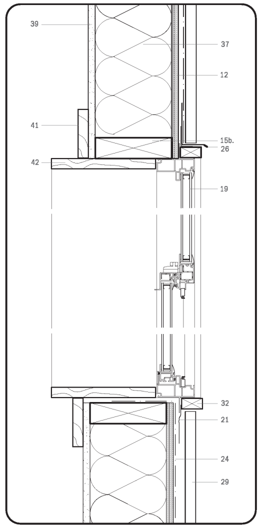
20K House

The 20K House is an ongoing research project to develop small, well-designed, affordable houses that support an industry of home building across the rural south.

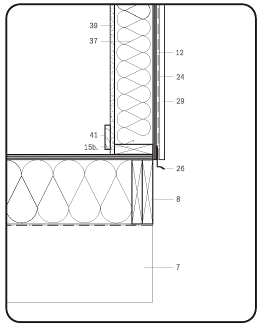
The project seeks to create dignified houses that make responsible homeownership a possibility for everyone.



Roof to wall detail scale 1 1/2" = 1'



Window section detail scale 3" = 1'



Floor to wall detail scale 1 1/2" = 1'

Foundation
1 Concrete Piers
1a. Concrete Slab
2 Simpsons Connectors
3 #4 Rebar
4 6"x6" Welded Wire Mesh
5 2" Rigid Insulation
6 Gravel

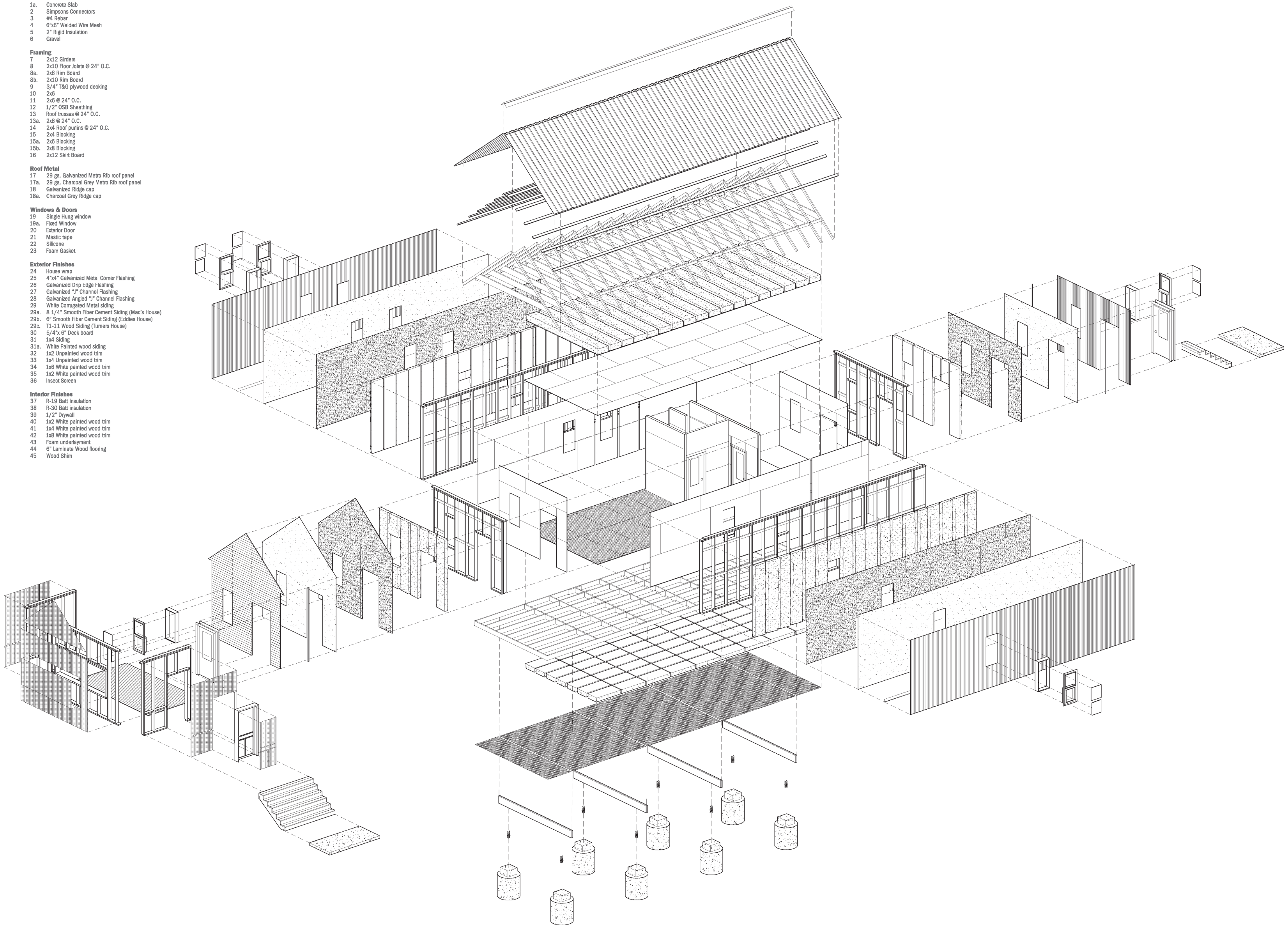
Framing
7 2x12 Girders
8 2x10 Floor Joists @ 24" O.C.
8a. 2x8 Rim Board
8b. 2x10 Rim Board
9 3/4" T&G plywood decking
10 2x6
11 2x6 @ 24" O.C.
12 1/2" OSB Sheathing
13 Roof trusses @ 24" O.C.
13a. 2x8 @ 24" O.C.
14 2x4 Roof purlins @ 24" O.C.
15 2x4 Blocking
15a. 2x6 Blocking
15b. 2x8 Blocking
16 2x12 Skirt Board

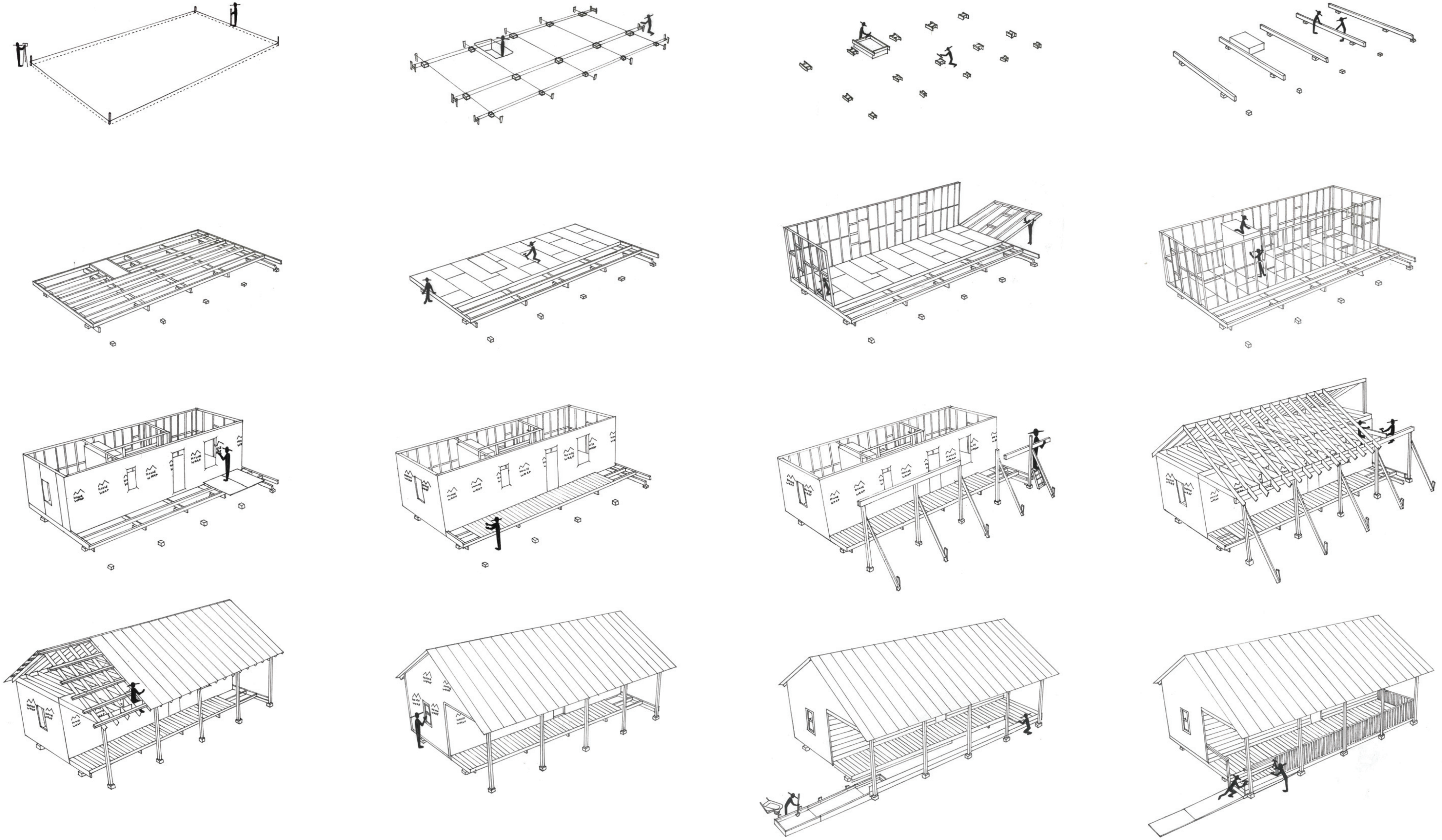
Roof Metal
17 29 ga. Galvanized Metro Rib roof panel
17a. 29 ga. Charcoal Grey Metro Rib roof panel
18 Galvanized Ridge cap
18a. Charcoal Grey Ridge cap

Windows & Doors
19 Single Hung window
19a. Fixed Window
20 Exterior Door
21 Mastic tape
22 Silicone
23 Foam Gasket

Exterior Finishes
24 House wrap
25 4"x4" Galvanized Metal Corner Flashing
26 Galvanized Drip Edge Flashing
27 Galvanized "J" Channel Flashing
28 Galvanized Angled "J" Channel Flashing
29 White Corrugated Metal siding
29a. 8 1/4" Smooth Fiber Cement Siding (Mac's House)
29b. 6" Smooth Fiber Cement Siding (Eddies House)
29c. T1-11 Wood Siding (Turners House)
30 5/4"x 6" Deck board
31 1x4 Siding
31a. White Painted wood siding
32 1x2 Unpainted wood trim
33 1x4 Unpainted wood trim
34 1x6 White painted wood trim
35 1x2 White painted wood trim
36 Insect Screen

Interior Finishes
37 R-19 Batt insulation
38 R-30 Batt insulation
39 1/2" Drywall
40 1x2 White painted wood trim
41 1x4 White painted wood trim
42 1x8 White painted wood trim
43 Foam underlayment
44 6" Laminate Wood flooring
45 Wood Shim



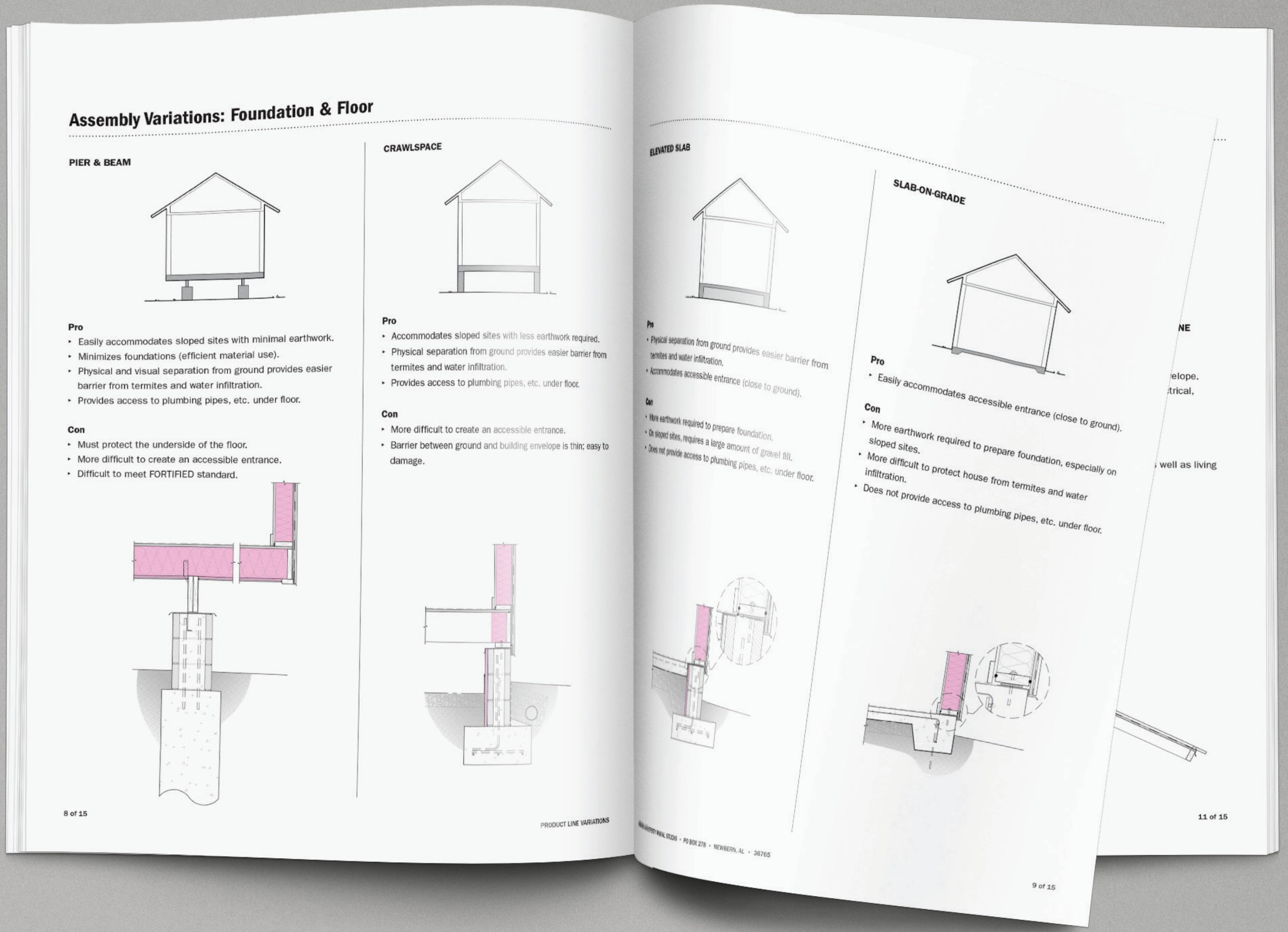


Front Porch Initiative

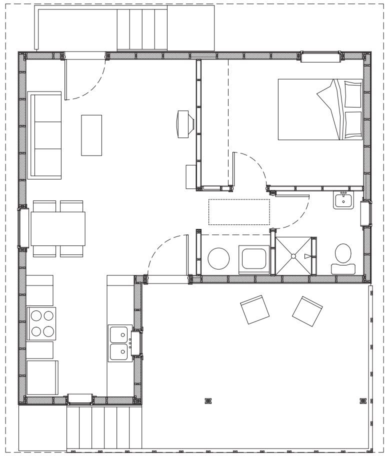
The Front Porch Initiative seeks to extend the impact of Rural Studio's applied research in housing affordability by developing a scalable, sustainable, and resilient process for delivering homes in under-resourced rural communities.

photos © Ford Photographs, Timothy Hursley, Matt Hall

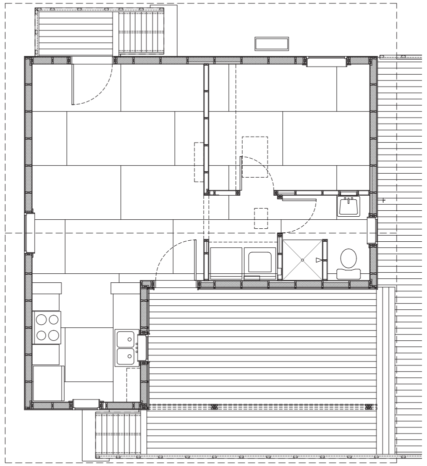

Envelopes, Assemblies and Components
ENVELOPE
The envelope is the total enclosure of the house, separating inside and outside. The envelope considers how the assemblies transition across plans to create space.
ASSEMBLY
The assembly is how all of the components of a system, such as a wall, are arranged. The placement and order of each component affects the assembly's performance.
COMPONENT
A component is one element of an assembly. For example, sheathing is a component of a wall. Some components fulfill one purpose in an assembly, while others combine multiple functions.
Buildings are made up of components. When those components are put together — or assembled — they create assemblies. Collectively, those assemblies — floor, walls, and roof — create the building envelope. While individual components can be assessed based on performance, cost, and other such factors, it is critical to understand how the components form the assemblies and, therefore, the envelope. For example, systems like insulation and air barriers must be continuous across the planes of the home. In this guide, we will work from large to small scales: starting with the building envelope, then assemblies, and finishing with components.
2 of 15
PRODUCT LINE VARIATIONS
Envelope
At its most basic level, the building envelope is what separates inside from outside. Design decisions made at the level of the building envelope can have a large effect on a building's performance. For example, the design of the envelope determines how much volume you are conditioning – or heating and cooling – in a building. Making informed decisions at the scale of the building envelope puts us on the right track as we drill down further into the systems, assemblies, and components that make up a building.
For the purpose of this document, we will primarily discuss the building envelope in terms of its thermal properties. The building thermal envelope is bounded by the location of the insulation. This is what separates conditioned (heated and cooled) space from unconditioned space. For example, if insulation is placed along the ceiling plane of the house, then the attic, or space between the ceiling and the roof, would be outside of the thermal envelope. However, if the insulation is placed along the underside of the roof, the attic space would be inside. Similarly, in a house that features a crawlspace, the design and detailing of the crawlspace will dictate whether or not the crawlspace is within the thermal envelope. If the crawlspace is unvented, meaning that there are no vents to the exterior along the crawlspace walls, then the crawlspace is within the thermal envelope, or inside. Conversely, if we insulate along the underside of the first floor and install vents in the crawlspace walls, then the crawlspace is outside of the thermal envelope.
The diagrams on the following page illustrate the
outside
inside
outside
inside
inside
inside
Insulated Box
Only the living space (the 'box') of the house is inside the thermal envelope, while the roof and foundation serve to protect the box from the elements.
Insulated Form
The roof and foundation are inside the thermal envelope. They perform 2 functions: providing insulation and protect house from the elements.
four basic variations in the thermal envelope:
• Insulated at floor and ceiling
• Insulated at ground and ceiling
• Insulated at floor and roof
• Insulated at ground and roof
We can think of the two ends of this spectrum as being the "insulated box" and the "insulated form." In the Insulated box scenario, only the living spaces are inside the thermal envelope. In the Insulated form scenario, the thermal envelope matches the extents of the built form, meaning that space under the floor and above the ceiling are inside the thermal envelope. Of the four variations shown in this document, there is not one that is "better" than the others. Each offers opportunities and challenges that should be weighed within the context of a specific project, location, and building method.
3 of 15
5 of 15


Assembly Variations: Foundation & Floor
PIER & BEAM
Pro
Easily accommodates sloped sites with minimal earthwork.
Minimizes foundations (efficient material use).
Physical and visual separation from ground provides easier barrier from termites and water infiltration.
Provides access to plumbing pipes, etc. under floor.
Con
Must protect the underside of the floor.
More difficult to create an accessible entrance.
Difficult to meet FORTIFIED standard.
CRAWLSPACE
Pro
Accommodates sloped sites with less earthwork required.
Physical separation from ground provides easier barrier from termites and water infiltration.
Provides access to plumbing pipes, etc. under floor.
Con
More difficult to create an accessible entrance.
Barrier between ground and building envelope is thin; easy to damage.
8 of 15
PRODUCT LINE VARIATIONS
ELEVATED SLAB
SLAB-ON-GRADE
Pro
Easily accommodates accessible entrance (close to ground).
Con
More earthwork required to prepare foundation, especially on sloped sites.
More difficult to protect house from termites and water infiltration.
Does not provide access to plumbing pipes, etc. under floor.
9 of 15
11 of 15

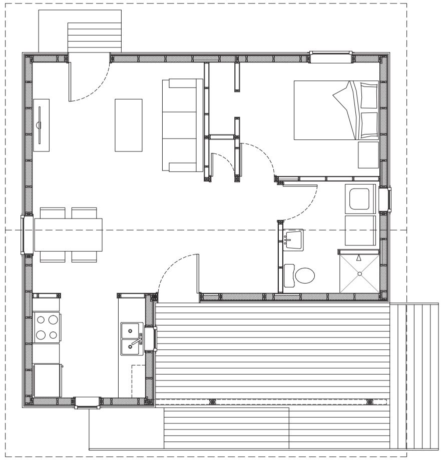
Joanne's Home
Faunsdale, AL



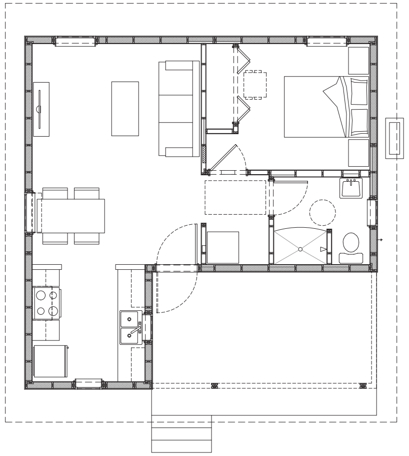
AIR Serenbe
Chattahoochee Hills, GA



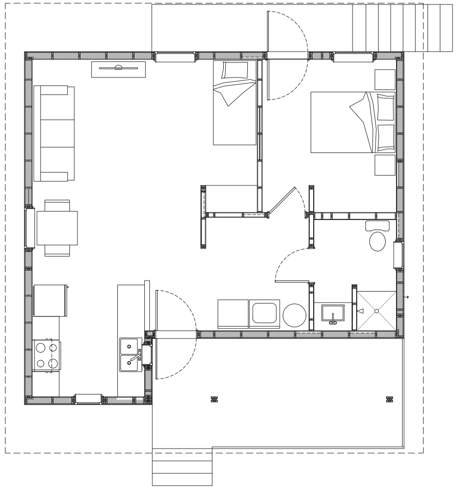
Ree's Home
Newbern, AL

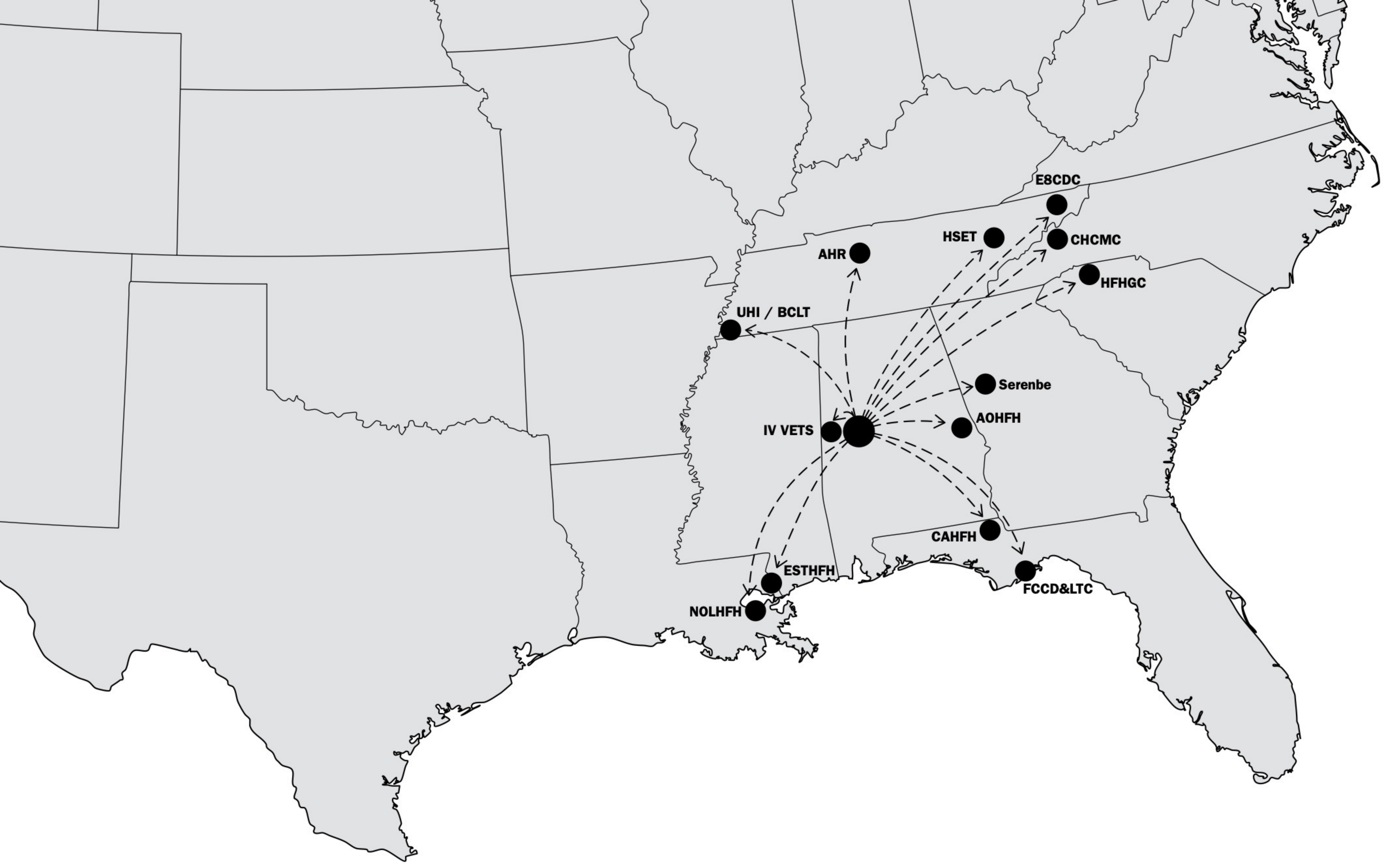


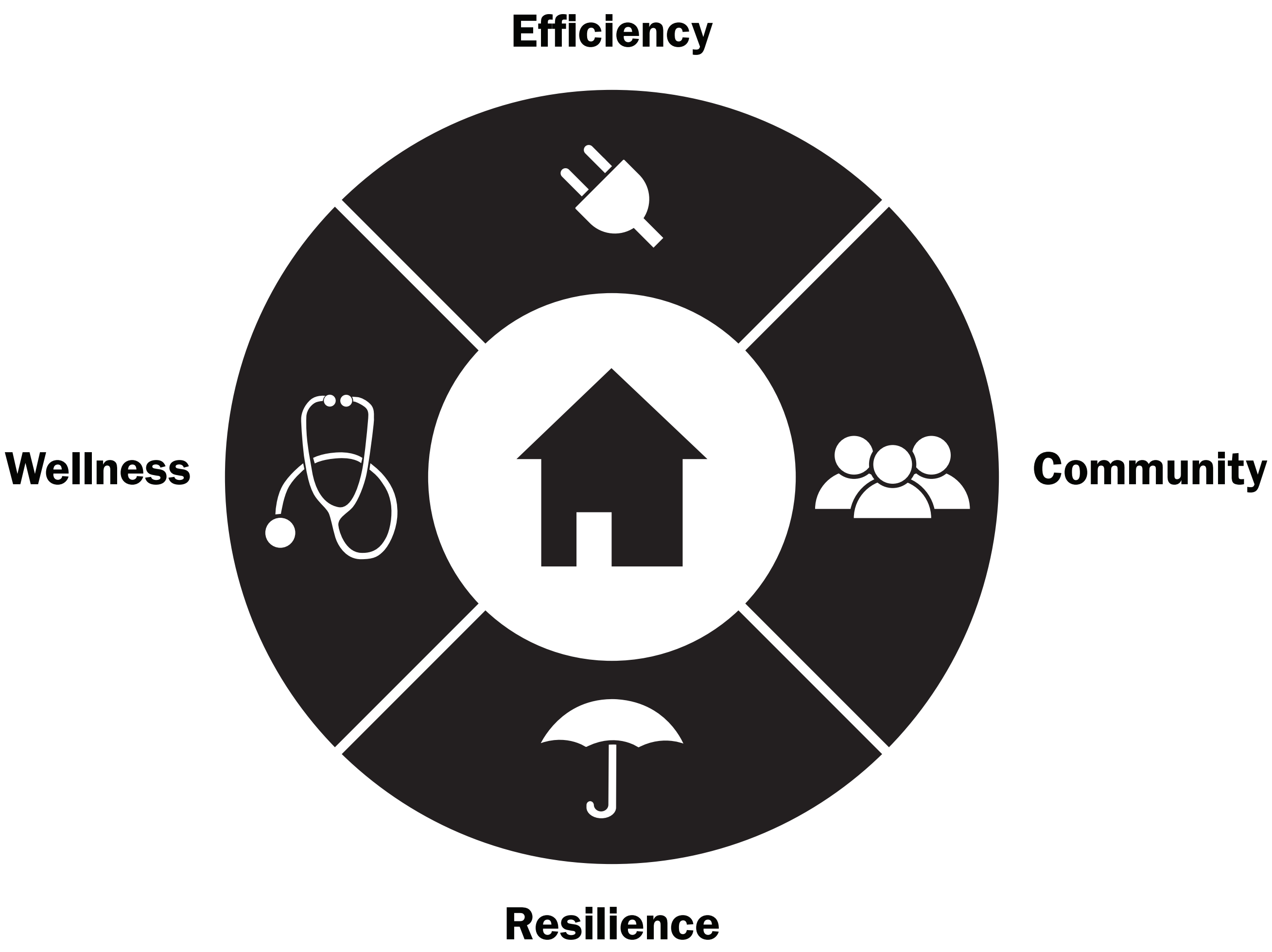
AHR Wharf Avenue
Nashville, TN



Ophelia's Home
Newbern, AL



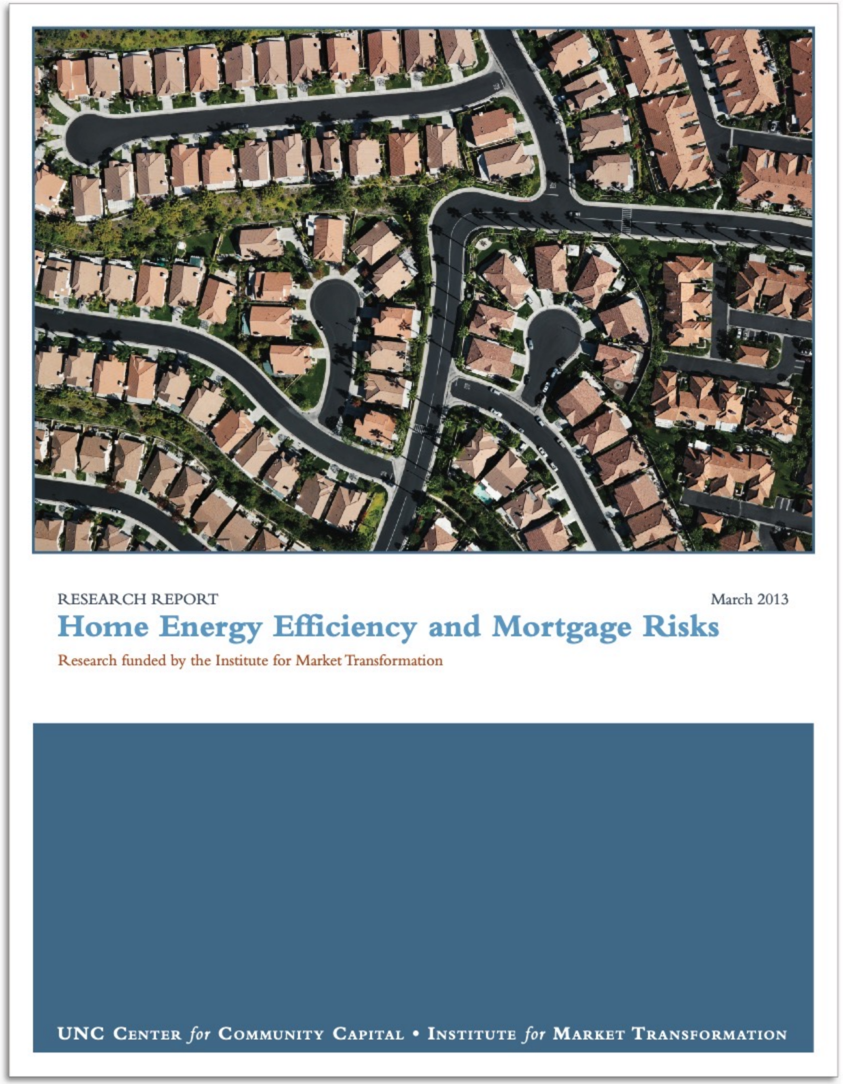

E8CDC
HSET
CHCMC
AHR
HFHGC
UHI / BCLT
Serenbe
AOHFH
IV VETS
CAHFH
ESTHFH
FCCD&LTC
NOLHFH


Efficiency
Wellness
Community
Resilience

Efficiency

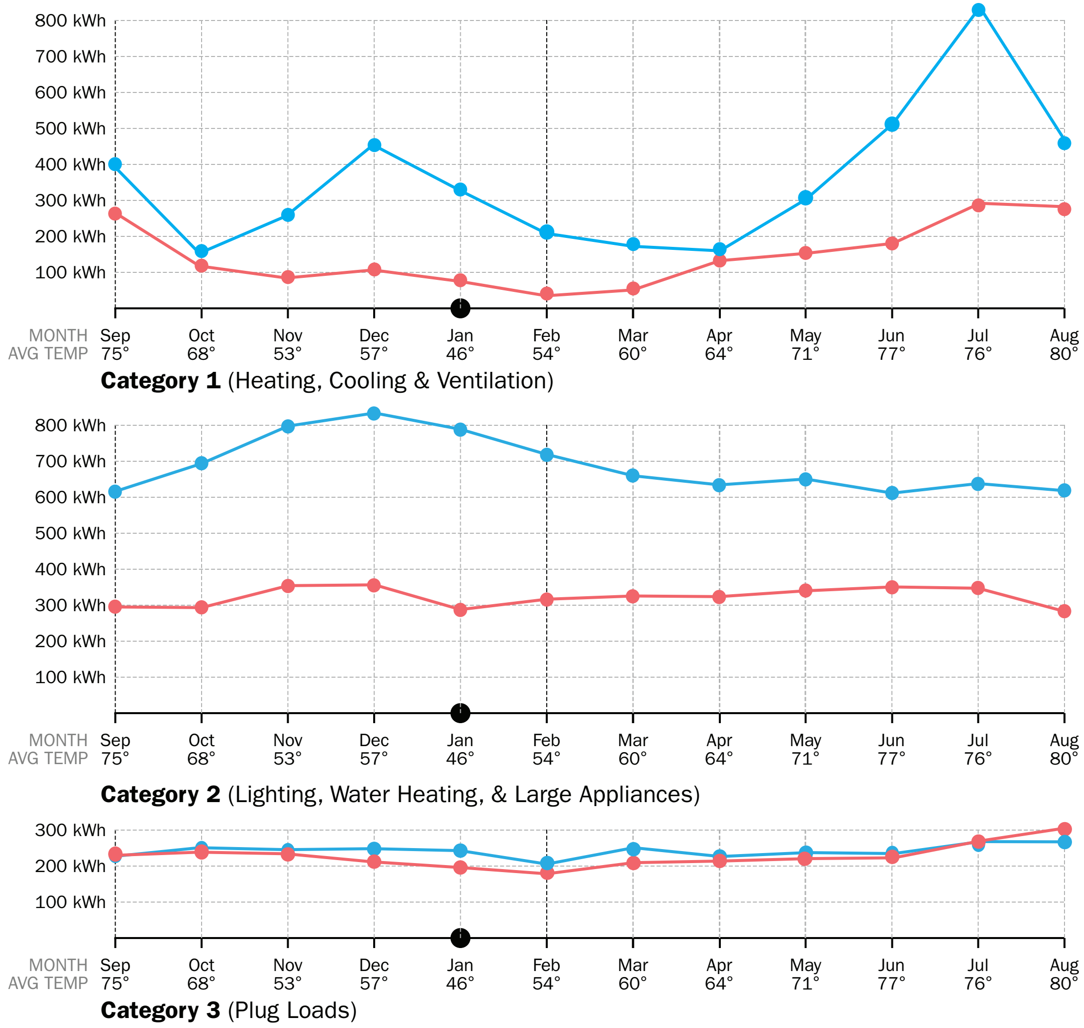
Default risks are on average 32% lower in energy-efficient homes, controlling for other loan determinates.

Institute for Market Transformation

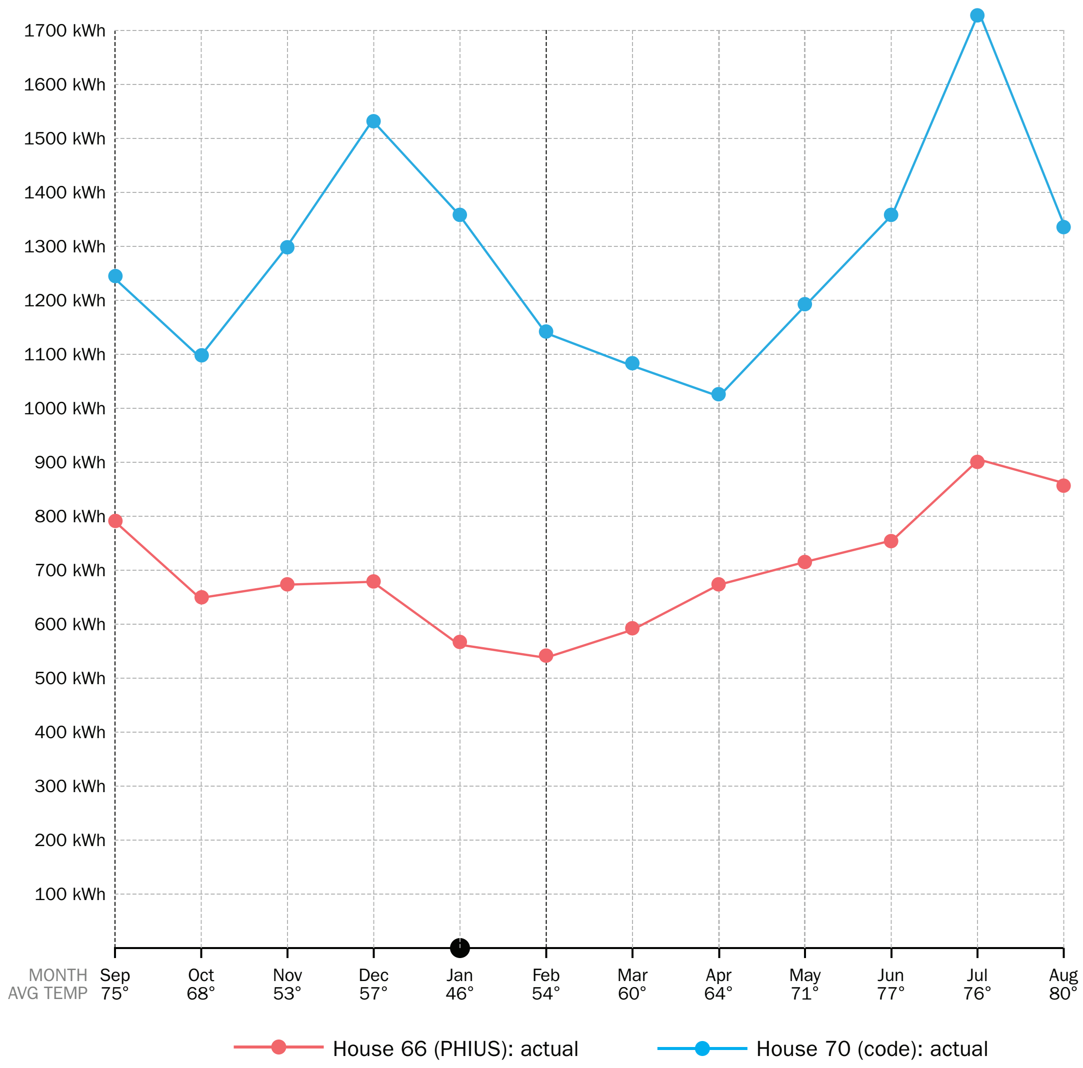


source: Institute for Market Transformation, "Home Energy Efficiency and Mortgage Risks"

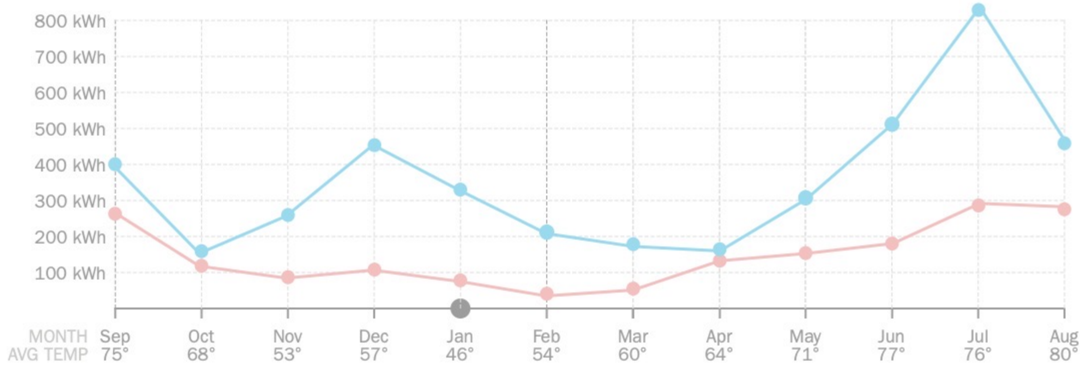
ENERGY CONSUMPTION BY CATEGORY (kWh)



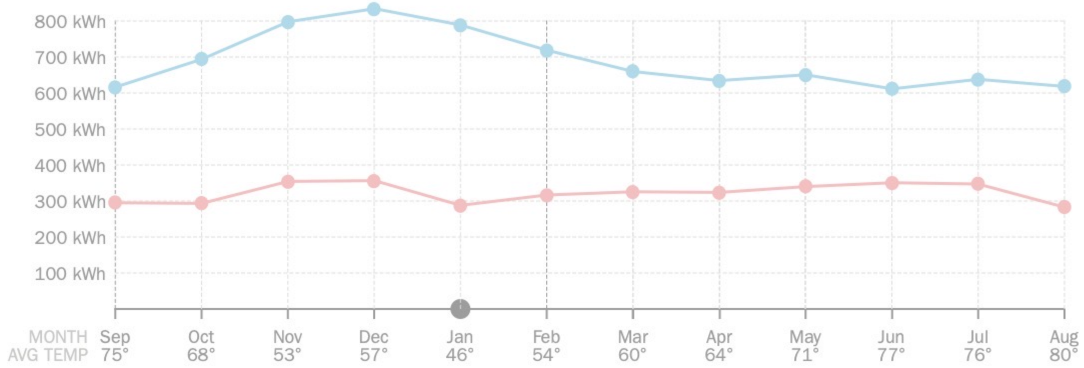
TOTAL ENERGY CONSUMPTION (kWh)



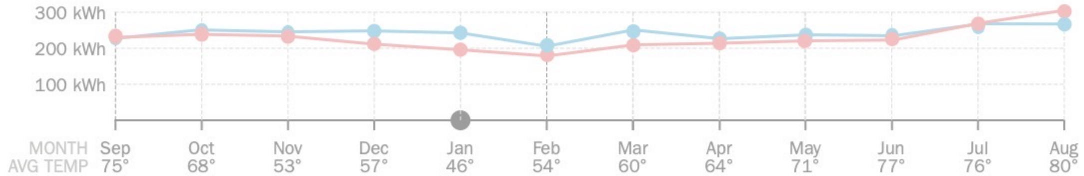
ENERGY CONSUMPTION BY CATEGORY (kWh)



Category 1 (Heating, Cooling & Ventilation)

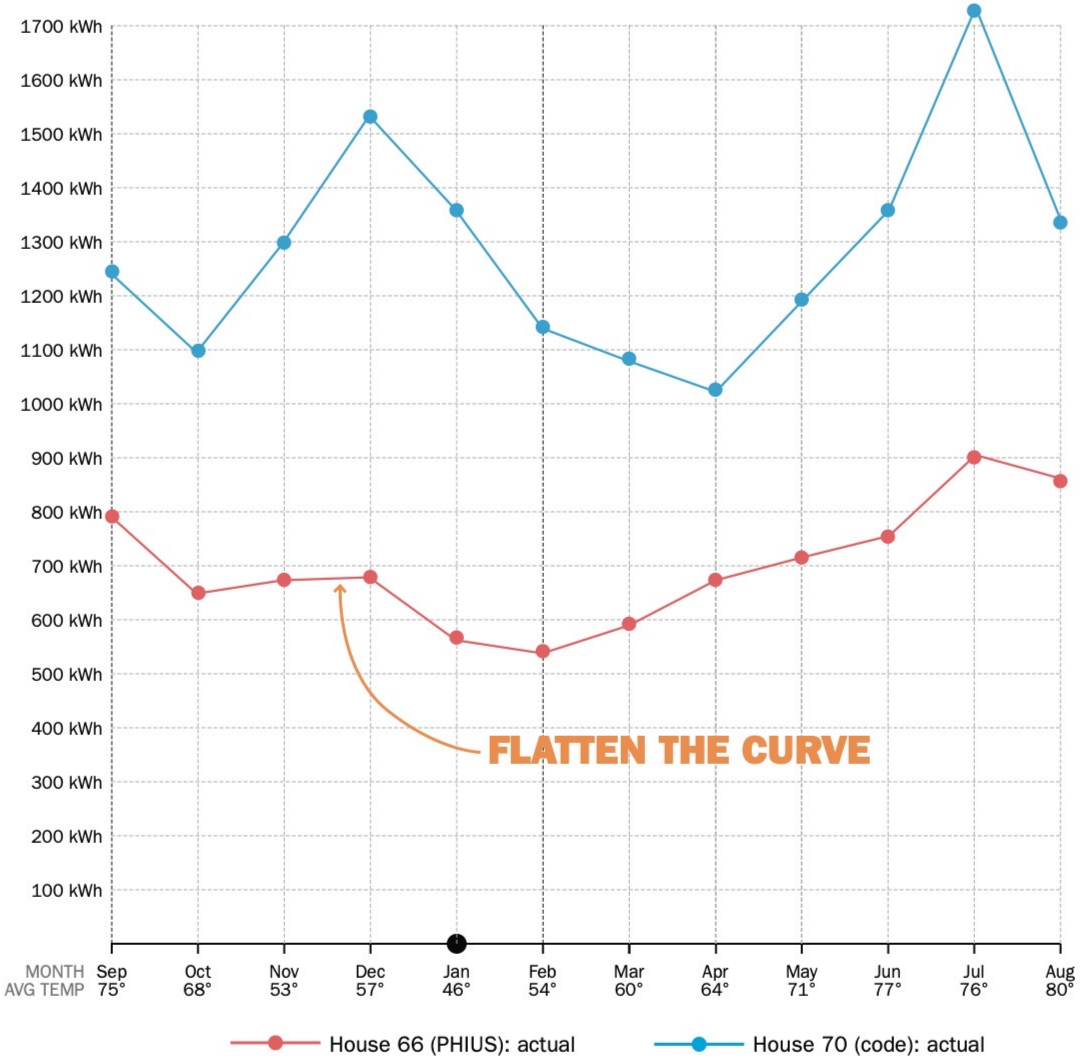


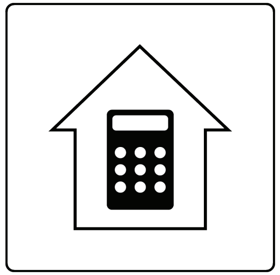
Category 2 (Lighting, Water Heating, & Large Appliances)



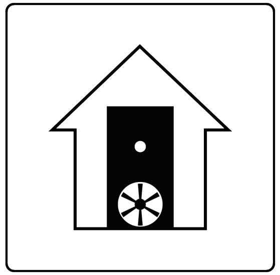
Category 3 (Plug Loads)

TOTAL ENERGY CONSUMPTION (kWh)

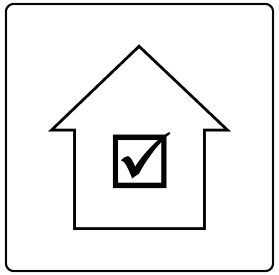




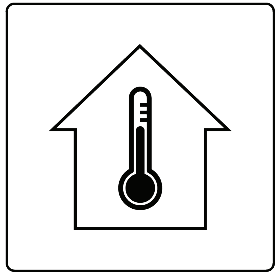
MODEL



TEST



VERIFY

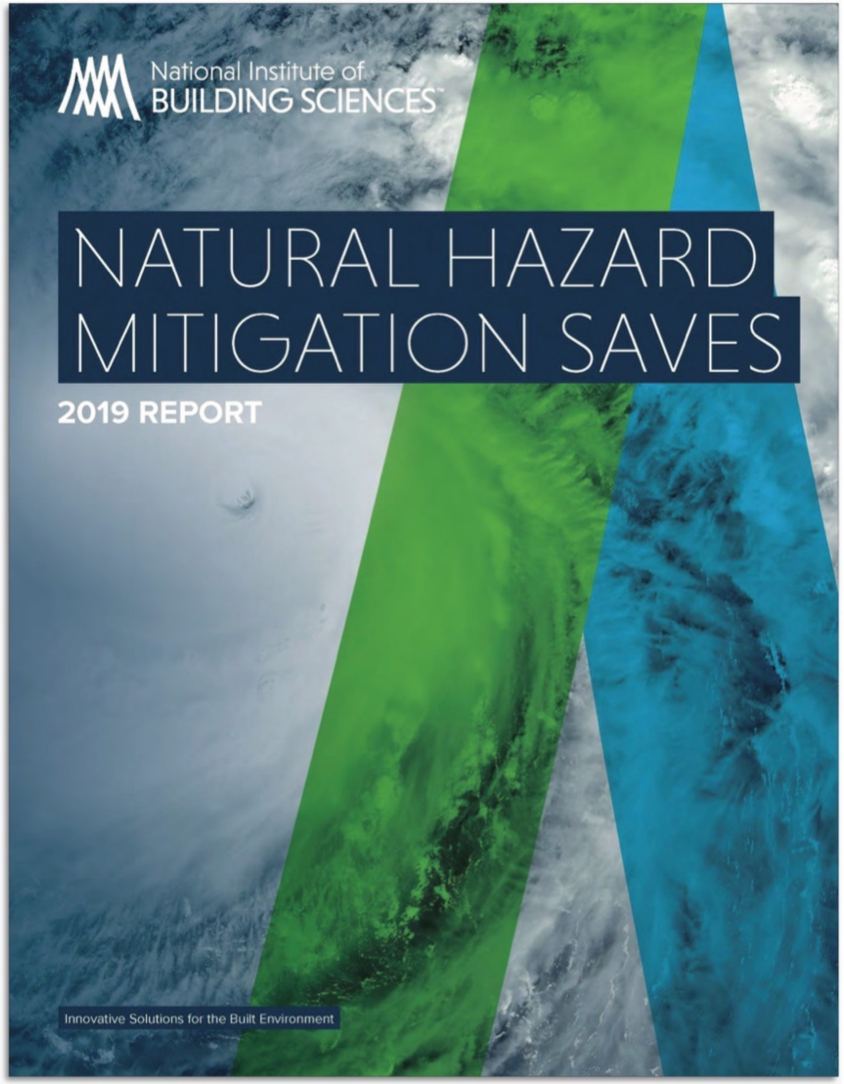


MONITOR

Resilience

Mitigation can result in significant savings in terms of safety, preventing property loss, and preventing distruption of day-to-day life. For example, exceeding buiding codes on average saves $4 per $1 spent.

National Institute of Building Sciences



source: National Institute of Building Sciences, "Natural Hazard Mitigations Saves: 2019 Report"

Resilience is the ability of a system, entity, community, or person to withstand shocks while still maintaining its essential functions. Resilience also refers to the ability to recover quickly and effectively from catastrophe and the capability to endure greater stress.

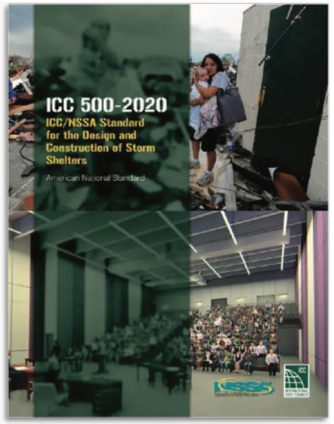
Definition from Rockefeller Foundation 100 Resilient Cities

PROTECTION OF OCCUPANT

↓

Federal, State & Municipality

FEMA P-320



ICC 500

PROTECTION OF ASSET

↓

Private Entities (Insurance Companies)

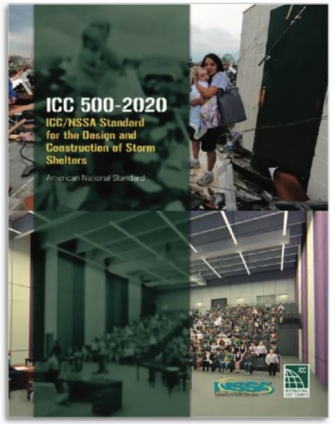
IBHS FORTIFIED

PROTECTION OF OCCUPANT

↓

Federal, State & Municipality

FEMA P-320



ICC 500

PROTECTION OF ASSET

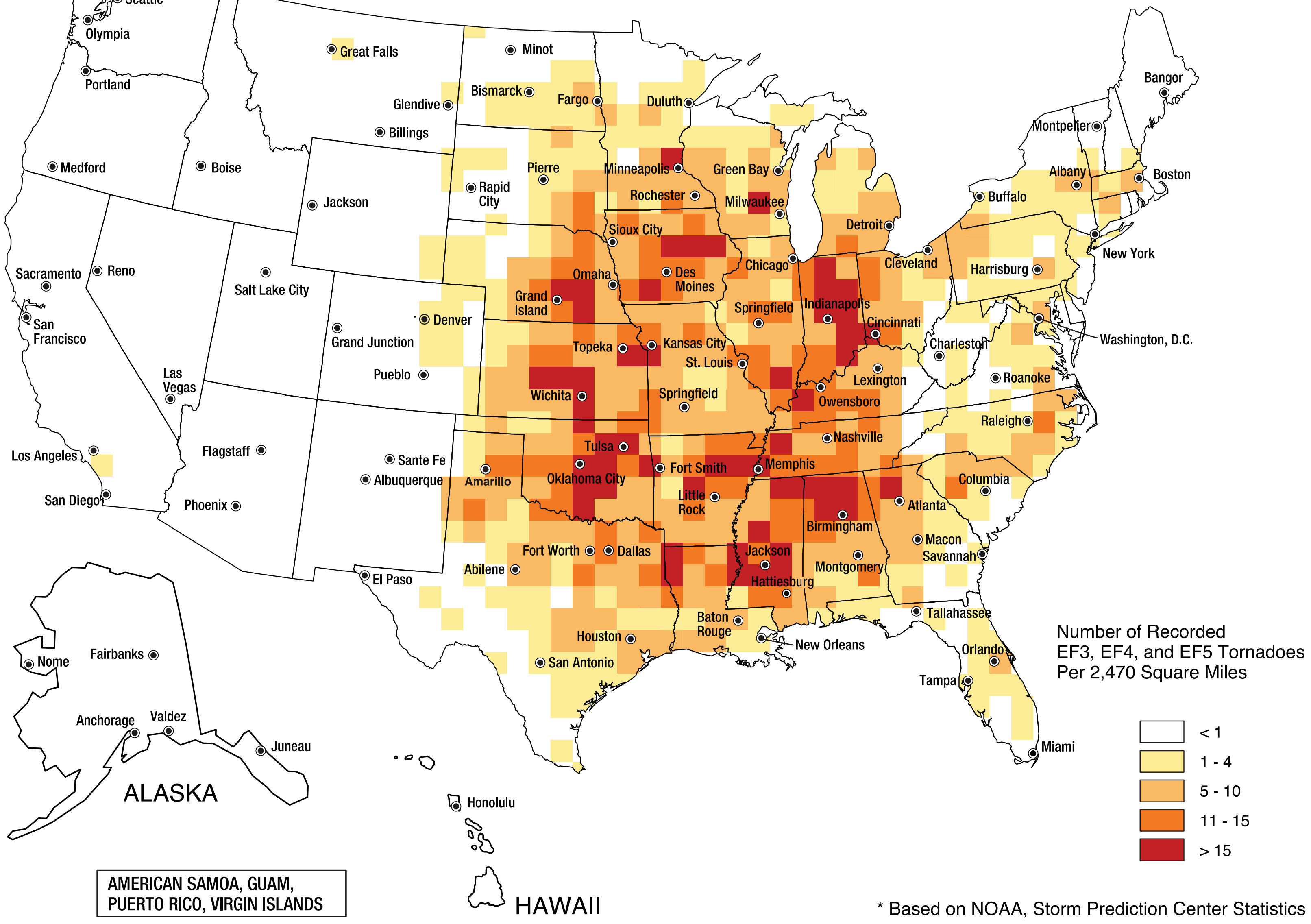
↓

Private Entities (Insurance Companies)

IBHS FORTIFIED

TORNADO ACTIVITY IN THE UNITED STATES*

Summary of Recorded EF3, EF4, and EF5 Tornadoes
Per 2,470 Square Miles (1950-2006)

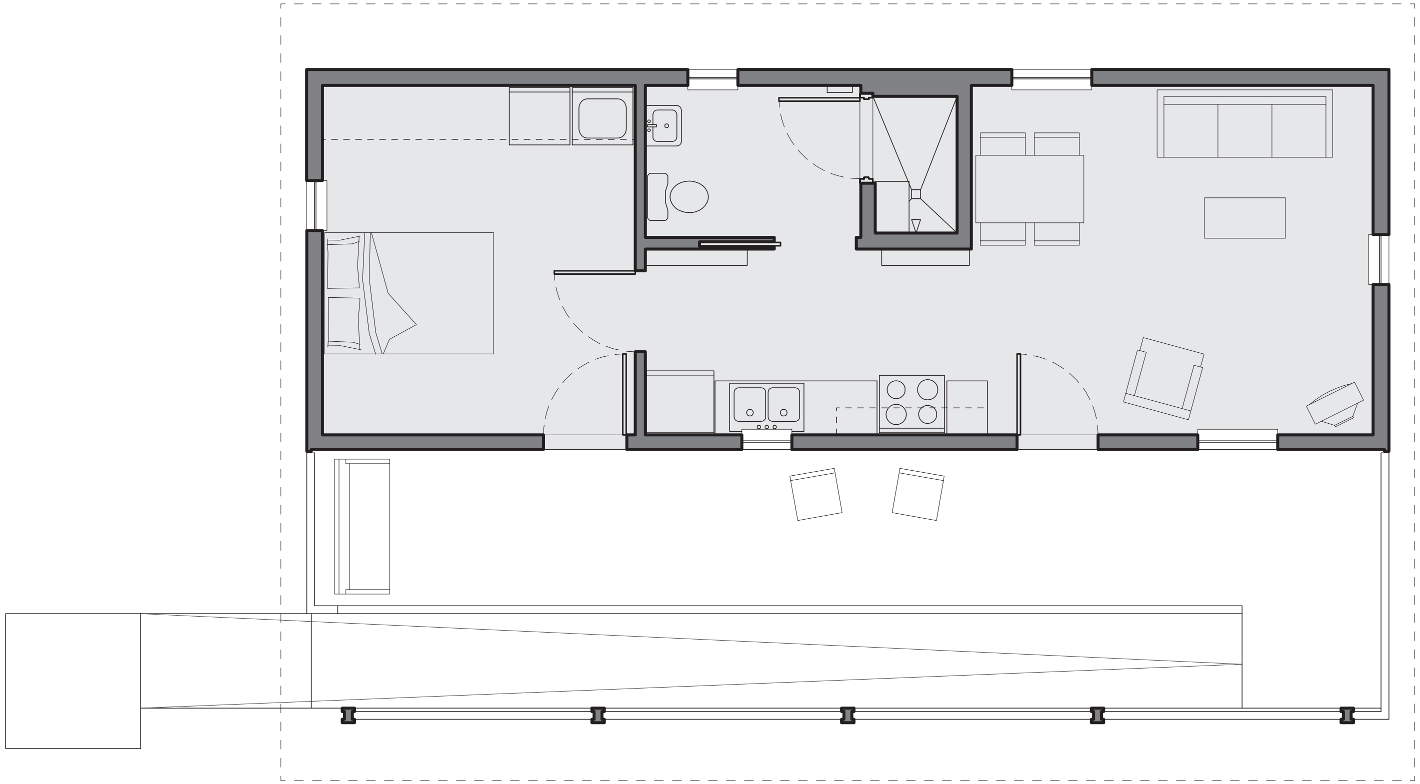


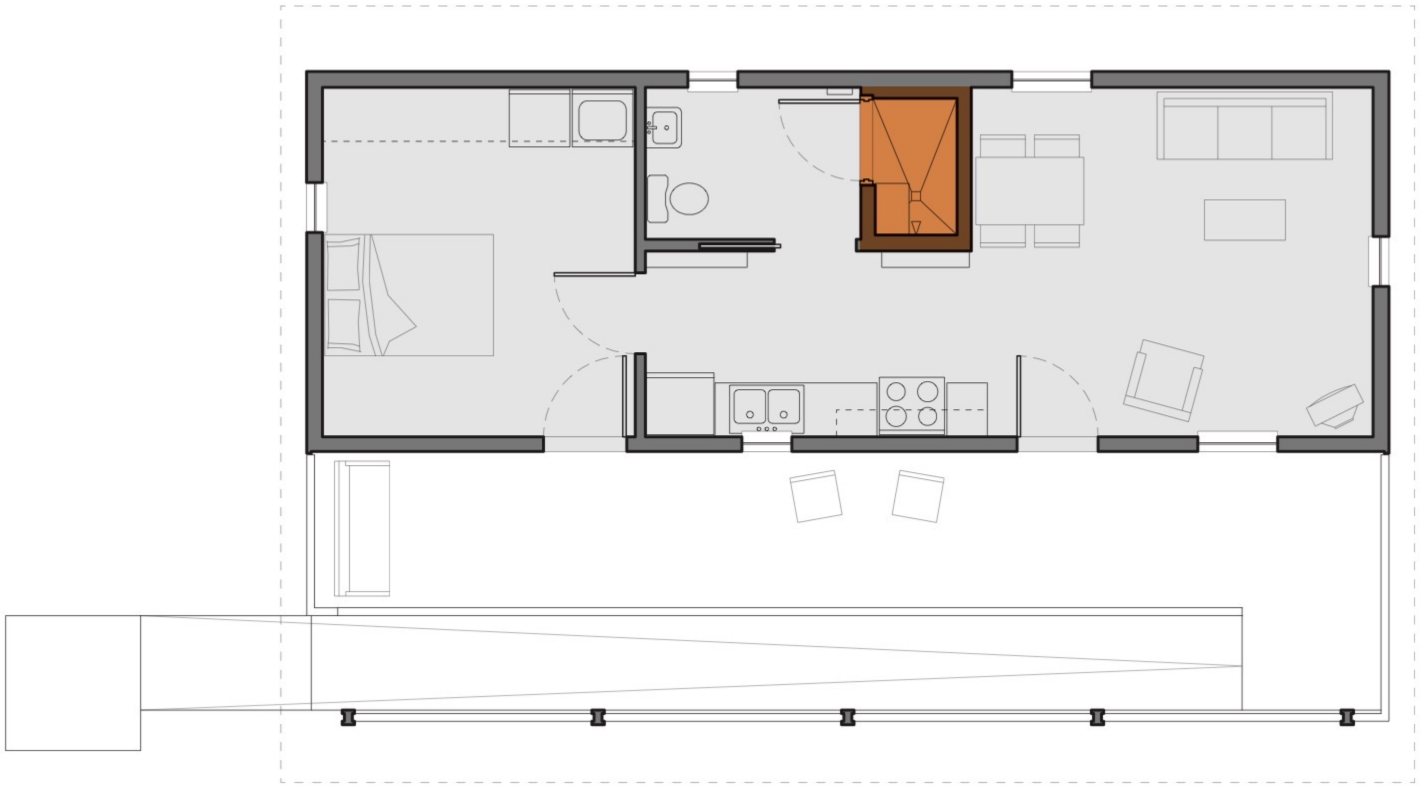
* Based on NOAA, Storm Prediction Center Statistics

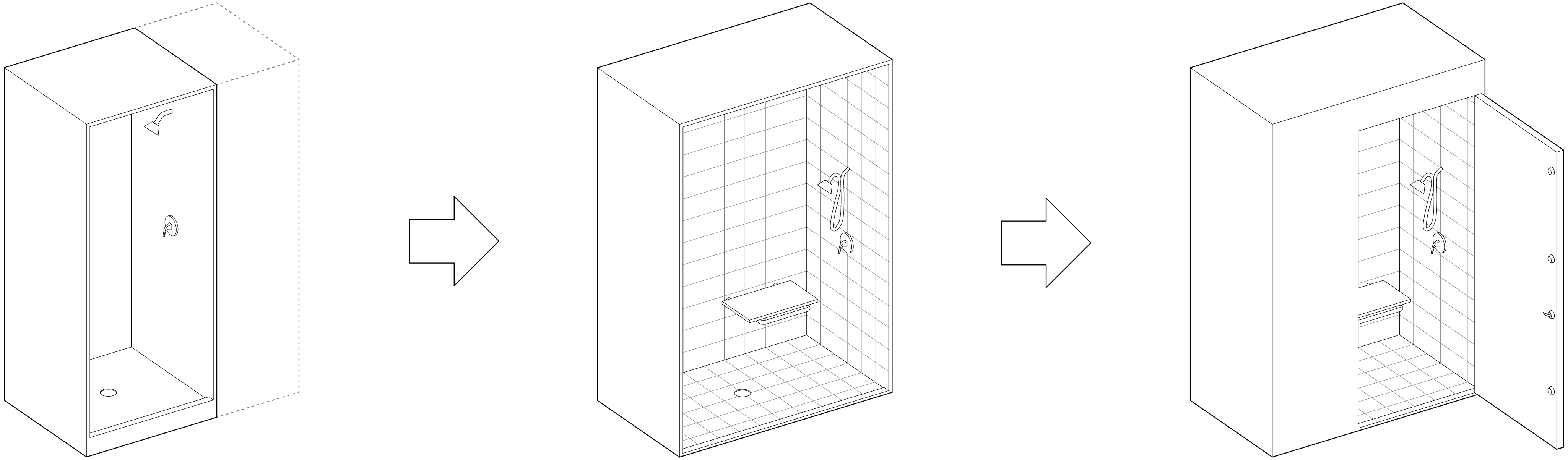
Source: FEMA "Taking Shelter from the Storm: Building a Safe Room Inside Your Home"

Turner's House

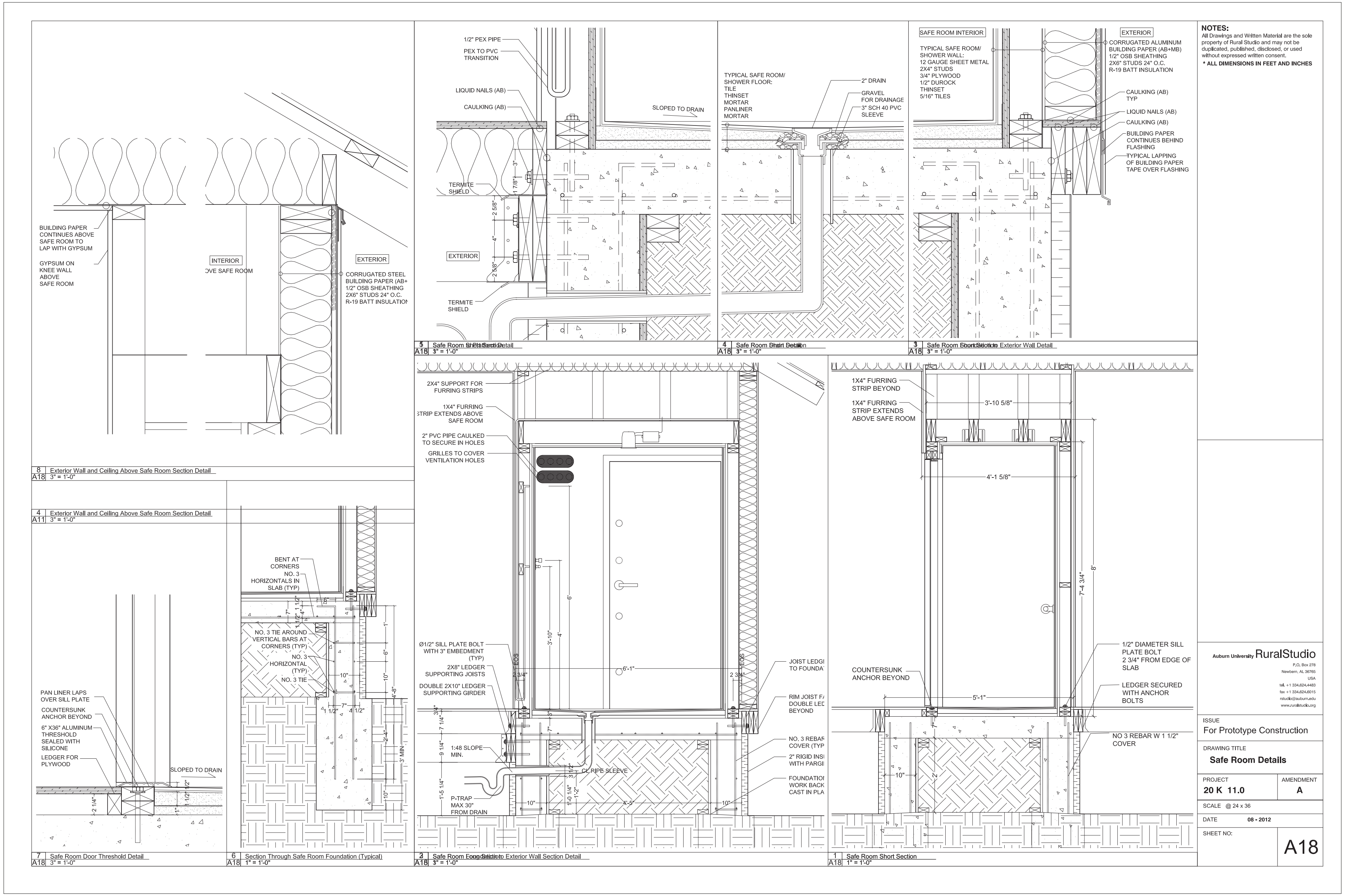
Faundsale, AL







STANDARD SHOWER **ACCESSIBLE SHOWER** **ACCESSIBLE SHOWER SAFE ROOM**


NOTES:
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* ALL DIMENSIONS IN FEET AND INCHES
8 Exterior Wall and Ceiling Above Safe Room Section Detail
A18 3" = 1'-0"
4 Exterior Wall and Ceiling Above Safe Room Section Detail
A11 3" = 1'-0"
BUILDING PAPER CONTINUES ABOVE SAFE ROOM TO LAP WITH GYPSUM
GYPSUM ON KNEE WALL ABOVE SAFE ROOM
INTERIOR
EXTERIOR
CORRUGATED STEEL
1/2" OSB SHEATHING
2X6" STUDS 24" O.C.
R-19 BATT INSULATION
1/2" PEX PIPE
PEX TO PVC TRANSITION
LIQUID NAILS (AB)
CAULKING (AB)
SLOPED TO DRAIN
TERMITE SHIELD
5 Safe Room Shower Detail
A18 3" = 1'-0"
TYPICAL SAFE ROOM/ SHOWER FLOOR:
TILE
THINSET
MORTAR
PANLINER
MORTAR
2" DRAIN
GRAVEL FOR DRAINAGE
3" SCH 40 PVC SLEEVE
4 Safe Room Drain Detail
A18 3" = 1'-0"
SAFE ROOM INTERIOR
TYPICAL SAFE ROOM/ SHOWER WALL:
12 GAUGE SHEET METAL
2X4" STUDS
3/4" PLYWOOD
1/2" DUROCK
THINSET
5/16" TILES
CORRUGATED ALUMINUM
BUILDING PAPER (AB+MB)
1/2" OSB SHEATHING
2X6" STUDS 24" O.C.
R-19 BATT INSULATION
CAULKING (AB) TYP
LIQUID NAILS (AB)
CAULKING (AB)
BUILDING PAPER CONTINUES BEHIND FLASHING
TYPICAL LAPPING OF BUILDING PAPER TAPE OVER FLASHING
3 Safe Room Foundation to Exterior Wall Detail
A18 3" = 1'-0"
2X4" SUPPORT FOR FURRING STRIPS
1X4" FURRING STRIP EXTENDS ABOVE SAFE ROOM
2" PVC PIPE CAULKED TO SECURE IN HOLES
GRILLES TO COVER VENTILATION HOLES
Ø1/2" SILL PLATE BOLT WITH 3" EMBEDMENT (TYP)
2X8" LEDGER SUPPORTING JOISTS
DOUBLE 2X10" LEDGER SUPPORTING GIRDER
1:48 SLOPE MIN.
P-TRAP MAX 30" FROM DRAIN
CI PIPE SLEEVE
JOIST LEDGER TO FOUNDATION
RIM JOIST DOUBLE LEDGER BEYOND
NO. 3 REBAR COVER (TYP)
2" RIGID INSULATION WITH PARGING
FOUNDATION WORK BACK CAST IN PLACE
2 Safe Room Long Section
A18 3" = 1'-0"
1X4" FURRING STRIP BEYOND
1X4" FURRING STRIP EXTENDS ABOVE SAFE ROOM
3'-10 5/8"
4'-1 5/8"
5'-1"
COUNTERSUNK ANCHOR BEYOND
1/2" DIAMETER SILL PLATE BOLT 2 3/4" FROM EDGE OF SLAB
LEDGER SECURED WITH ANCHOR BOLTS
NO 3 REBAR W 1 1/2" COVER
1 Safe Room Short Section
A18 1" = 1'-0"
PAN LINER LAPS OVER SILL PLATE
COUNTERSUNK ANCHOR BEYOND
6" X36" ALUMINUM THRESHOLD SEALED WITH SILICONE
LEDGER FOR PLYWOOD
SLOPED TO DRAIN
7 Safe Room Door Threshold Detail
A18 3" = 1'-0"
BENT AT CORNERS
NO. 3 HORIZONTALS IN SLAB (TYP)
NO. 3 TIE AROUND VERTICAL BARS AT CORNERS (TYP)
NO. 3 HORIZONTAL (TYP)
NO. 3 TIE
6 Section Through Safe Room Foundation (Typical)
A18 1" = 1'-0"
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Newbern, AL 36765
USA
tel. +1 334.624.4483
fax +1 334.624.6015
rstudio@auburn.edu
www.ruralstudio.org
ISSUE
For Prototype Construction
DRAWING TITLE
Safe Room Details
PROJECT
20 K 11.0
AMENDMENT
A
SCALE @ 24 x 36
DATE 08 - 2012
SHEET NO:
A18





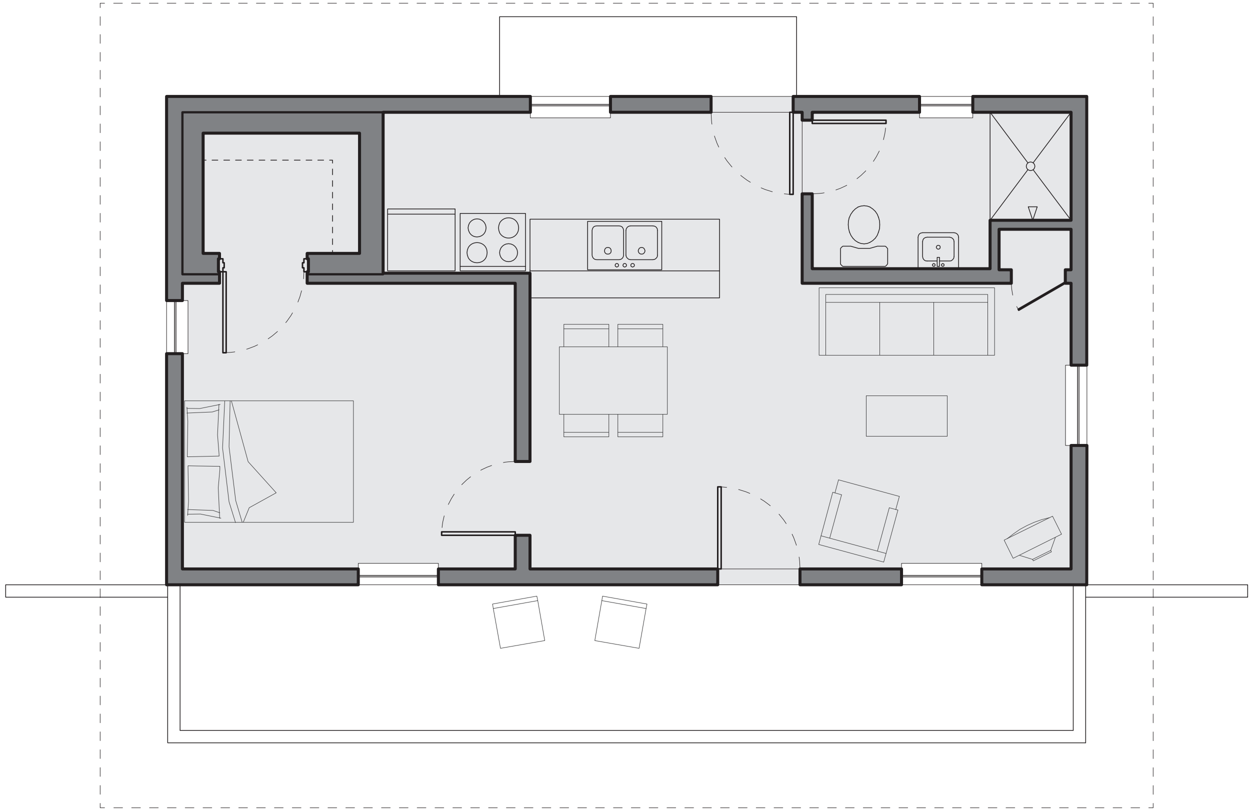


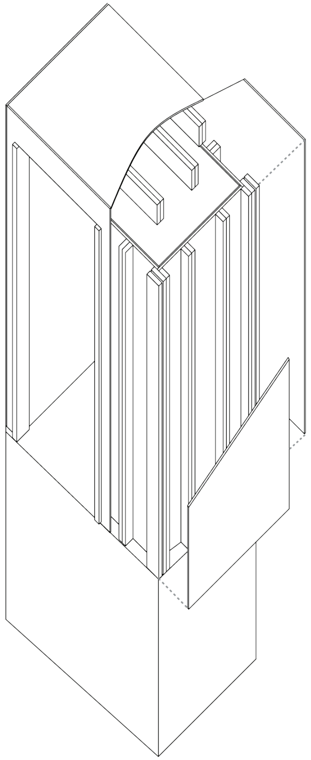
Turner's House

Eddie's House

Faundsale, AL

photo © Timothy Hursley



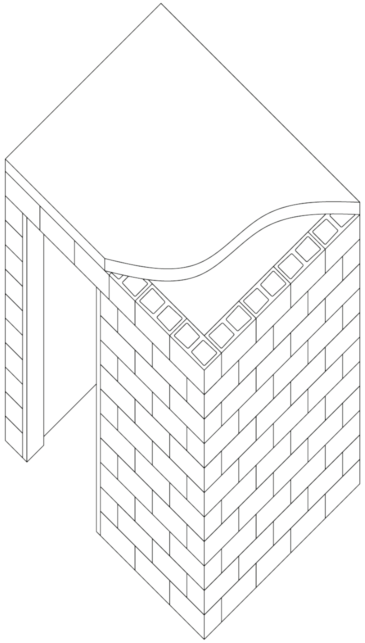


TURNER'S HOUSE

Foundation
Elevated slab (w/in pier & beam)

Walls
Doubled wood studs w/
plywood & steel sheathing

Ceiling
Doubled wood joists w/
plywood & steel sheathing



EDDIE'S HOUSE

Foundation
Slab-on-grade

Walls
CMU (grouted solid)

Ceiling
Concrete slab

A **Rebar Foundation:** The turn down and reinforcing for the safe room was placed before the concrete slab was poured. A guide for the rebar floated above the slab, holding the #5 rebar in place and spaced it in every other concrete block cell. In the turndown, a 90-degree bend inside the rebar provided uplift resistance. The #5 rebar continued up the CMU walls.

B **Door Frame:** The safe room door was manufactured and purchased from Building Specialties Company. It is very important that the safe room door frame is placed before the safe room walls are built. This tied the door frame to the concrete block and ensured that the door would fit and that the walls were plumb.

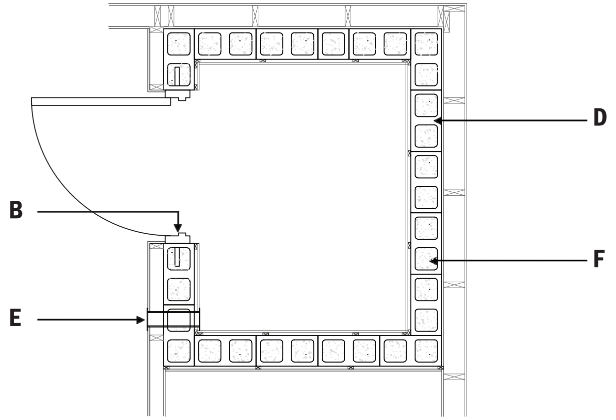
C **Mortar:** Mortar was placed in between the blocks. The mortar is a mixture of portland cement, all purpose sand and water.

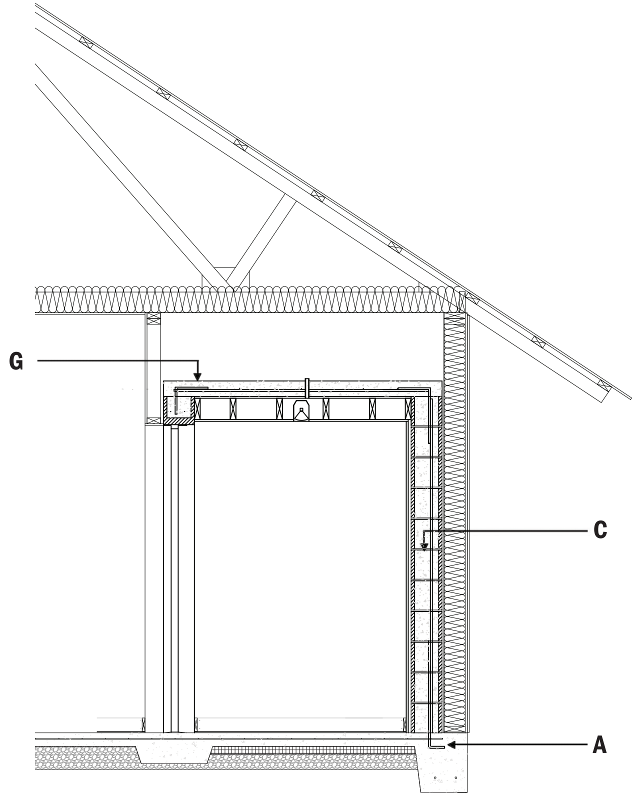
D **Block:** We used standard grade CMU blocks that were nominally 8”x8”x16”. Thankfully, Jonathan Brooks (a brick mason) helped up lay the CMU walls. This trade requires skill and practice to get right. And it has to be right.

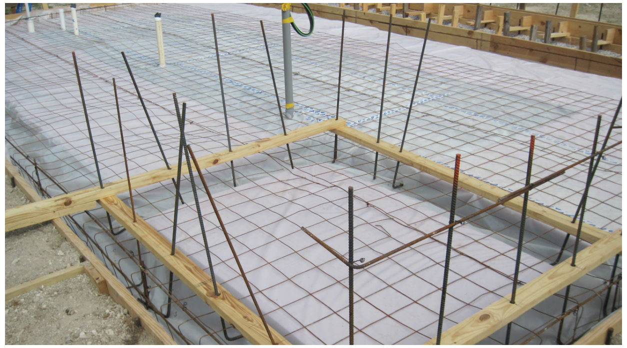
E **Ventilation:** In order to properly ventilate the safe room, we cut an opening in the concrete block approximately 2 feet from the bottom of the wall and placed a 4” diameter PVC pipe inside. The space around the pipe was sealed with grout. Later, we cut off the extra pipe and covered the opening with a vent plate.

F **Grout:** The CMU walls had to be filled solid with precision grout. To ensure the grout fully filled the wall, we poured grout after laying five courses of block. We repeated this process until the walls had reached the right height.

G **Celing:** One of the most important requirements for the FEMA tornado safe room is that it be structurally separate from the house. The exterior walls of the house wrap the safe room and a lower ceiling in the safe room does not interfere with the house’s roof structure. The safe room ceiling assembly is reinforced concrete. First, we built the formwork for the concrete ceiling by notching the top CMU block and setting joists (treated #2 2x8s). Then, we covered the joists with 3/4” treated plywood. We cut a hole in the plywood in order to place a 3” PVC pipe that would serve as a chase for electrical wire. A grid of #4 rebar was placed at 16” on center and turned down 24” into the walls. Then, we built the bounding box formwork. Lastly, we poured the concrete ceiling. After the concrete was set, we removed the bounding box formwork but left the ceiling joists to provide a cavity for the safe room light and as a surface to attach the drywall.









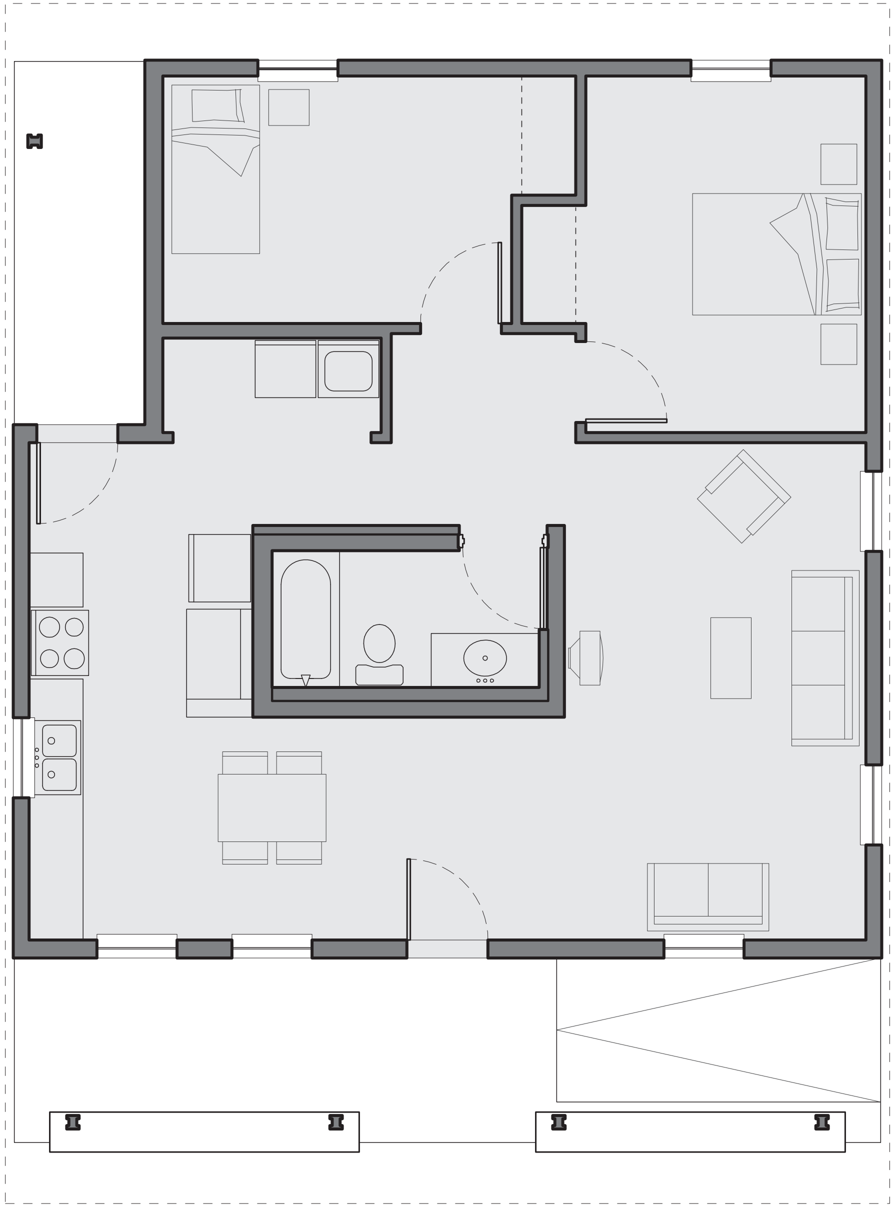


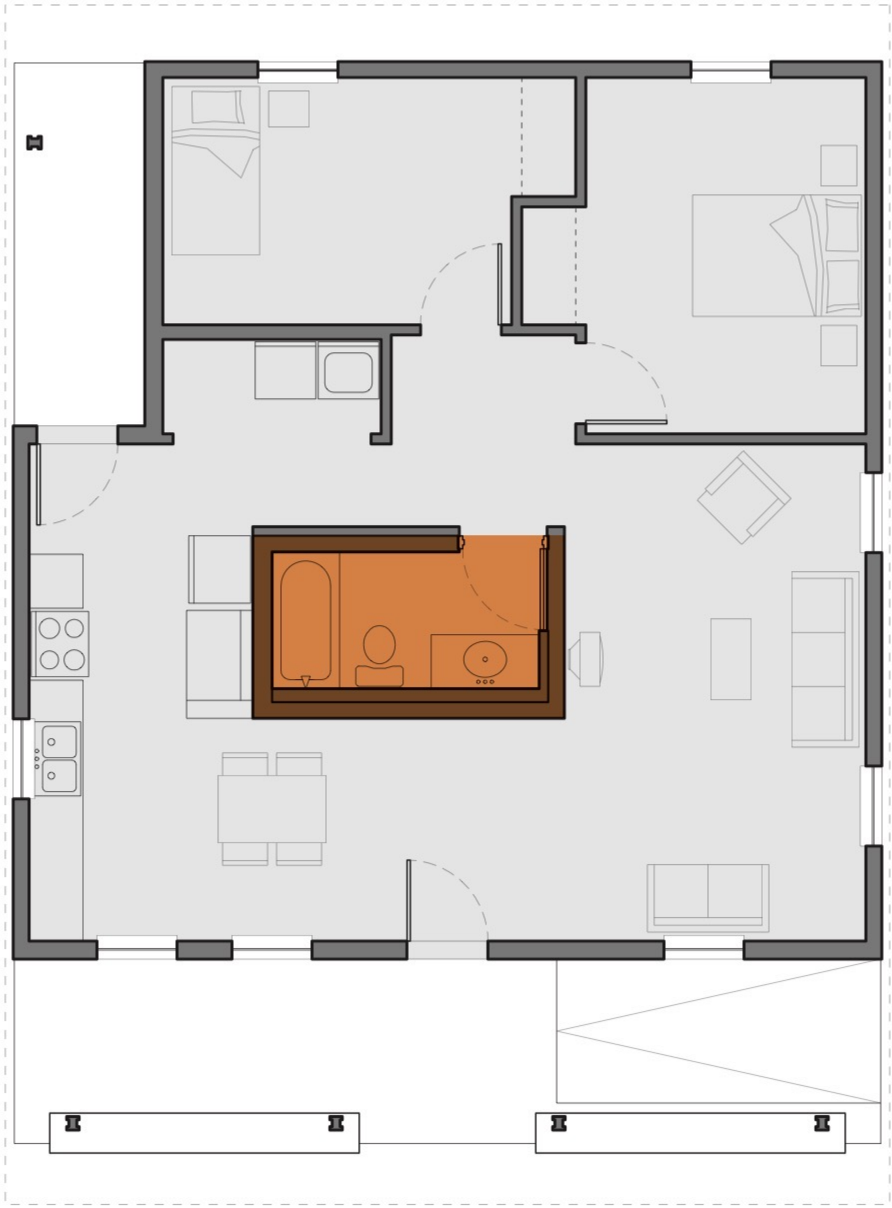


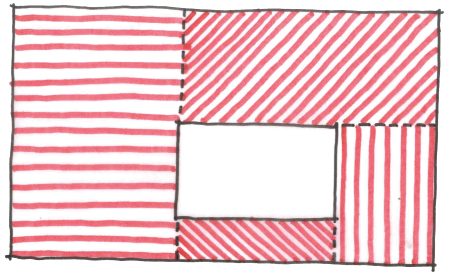



Idella's House

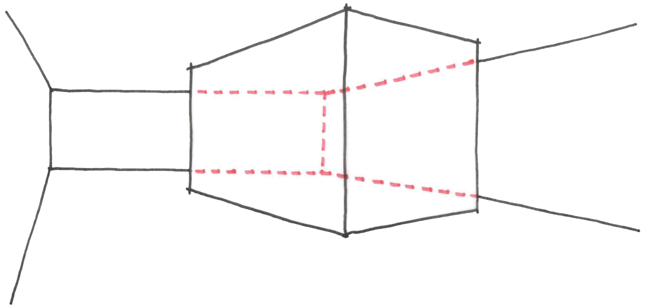
Newbern, AL



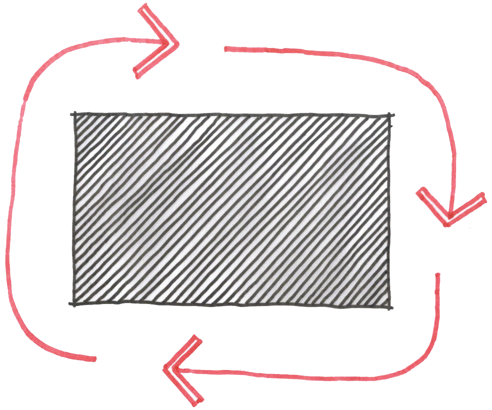




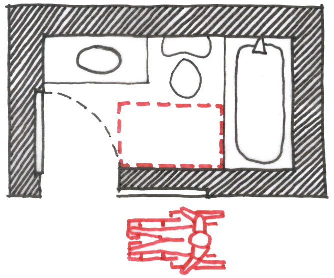
An Object that Defines
Surrounding Spaces



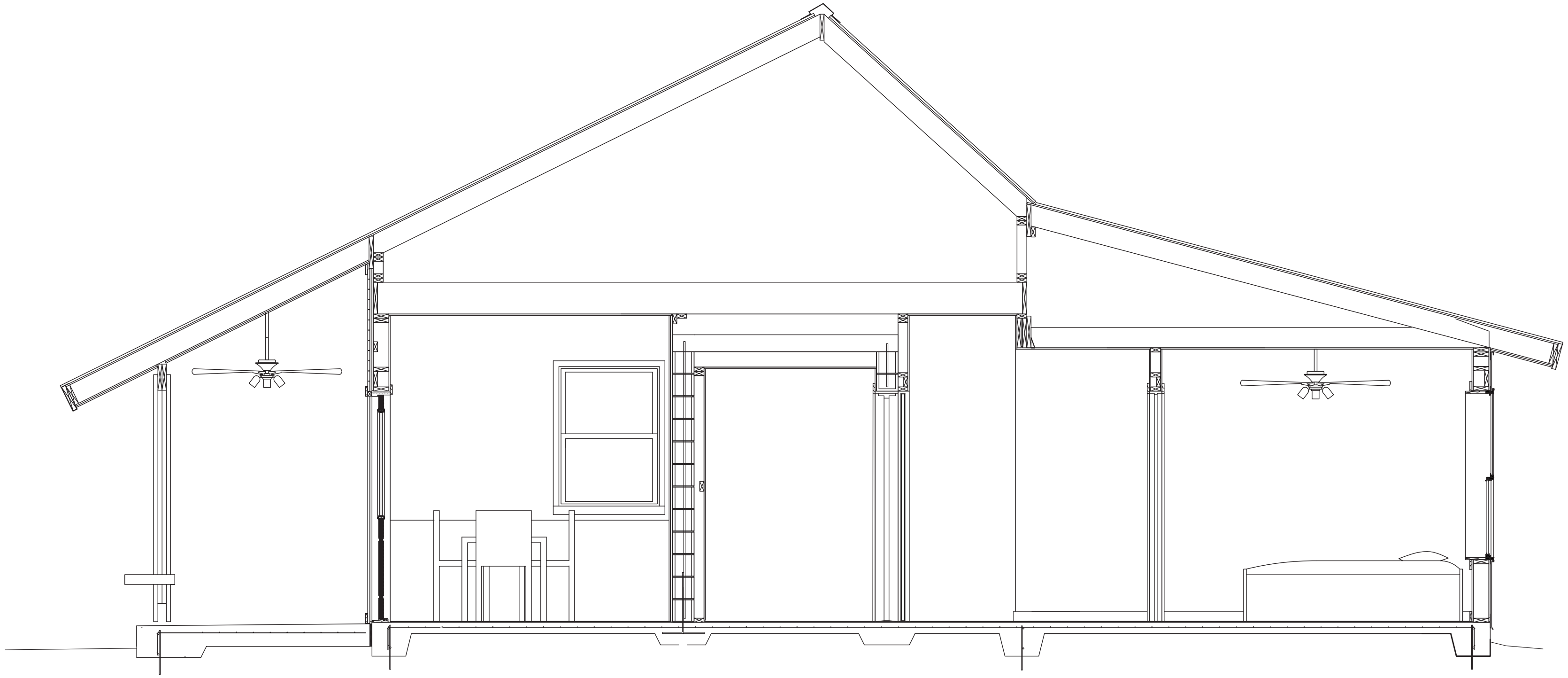
Views of Implied Expansion

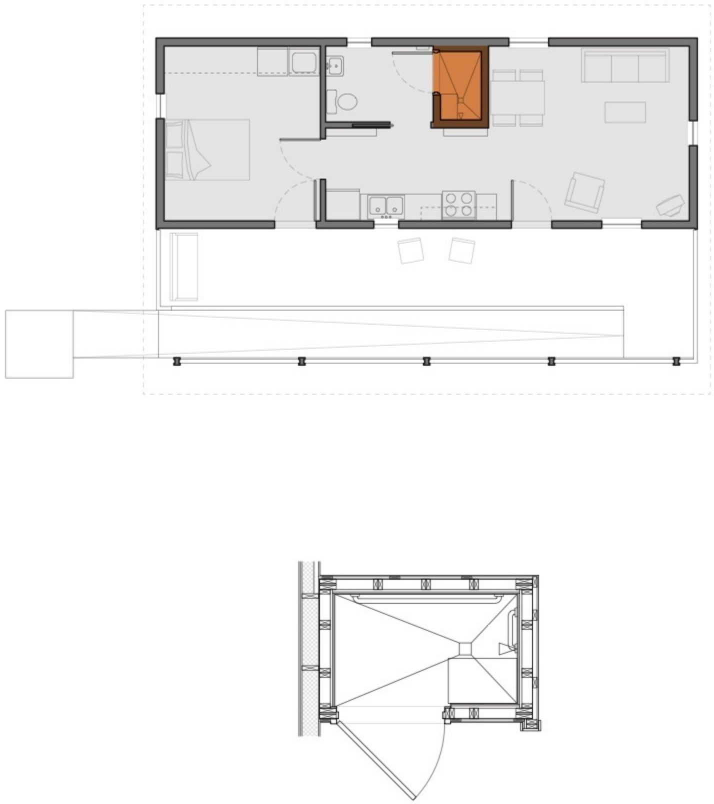


Race Track Circulation
(Adaptability)

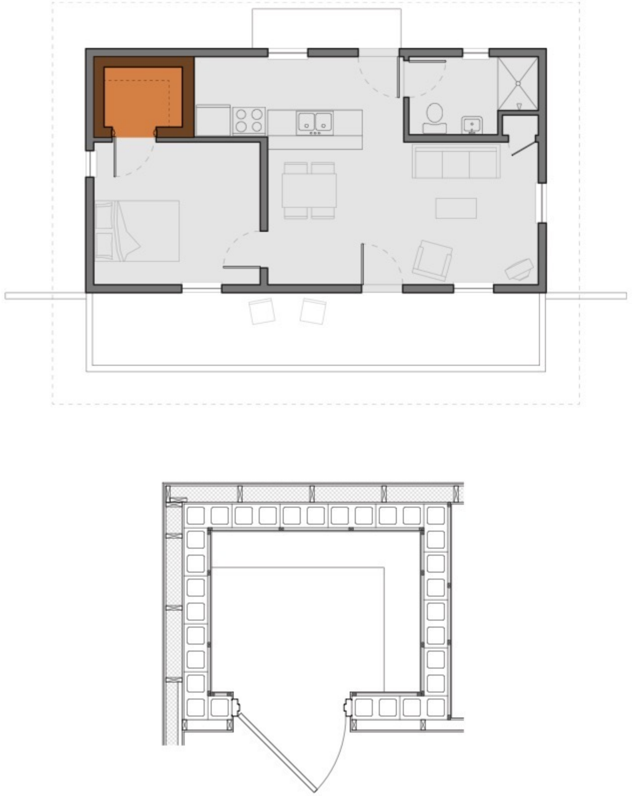


Storm Shelter
(Adaptability)

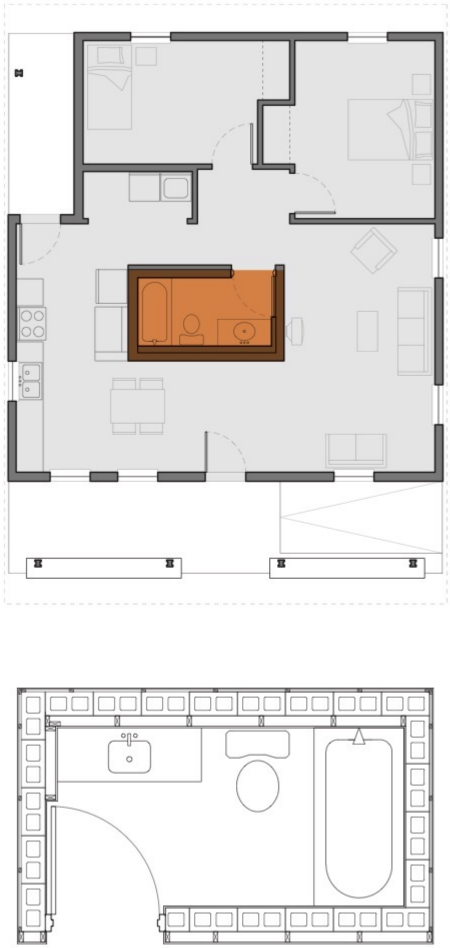




TURNER'S HOUSE



EDDIE'S HOUSE



IDELLA'S HOUSE

PROTECTION OF OCCUPANT

↓

Federal, State & Municipality

FEMA P-320

ICC 500

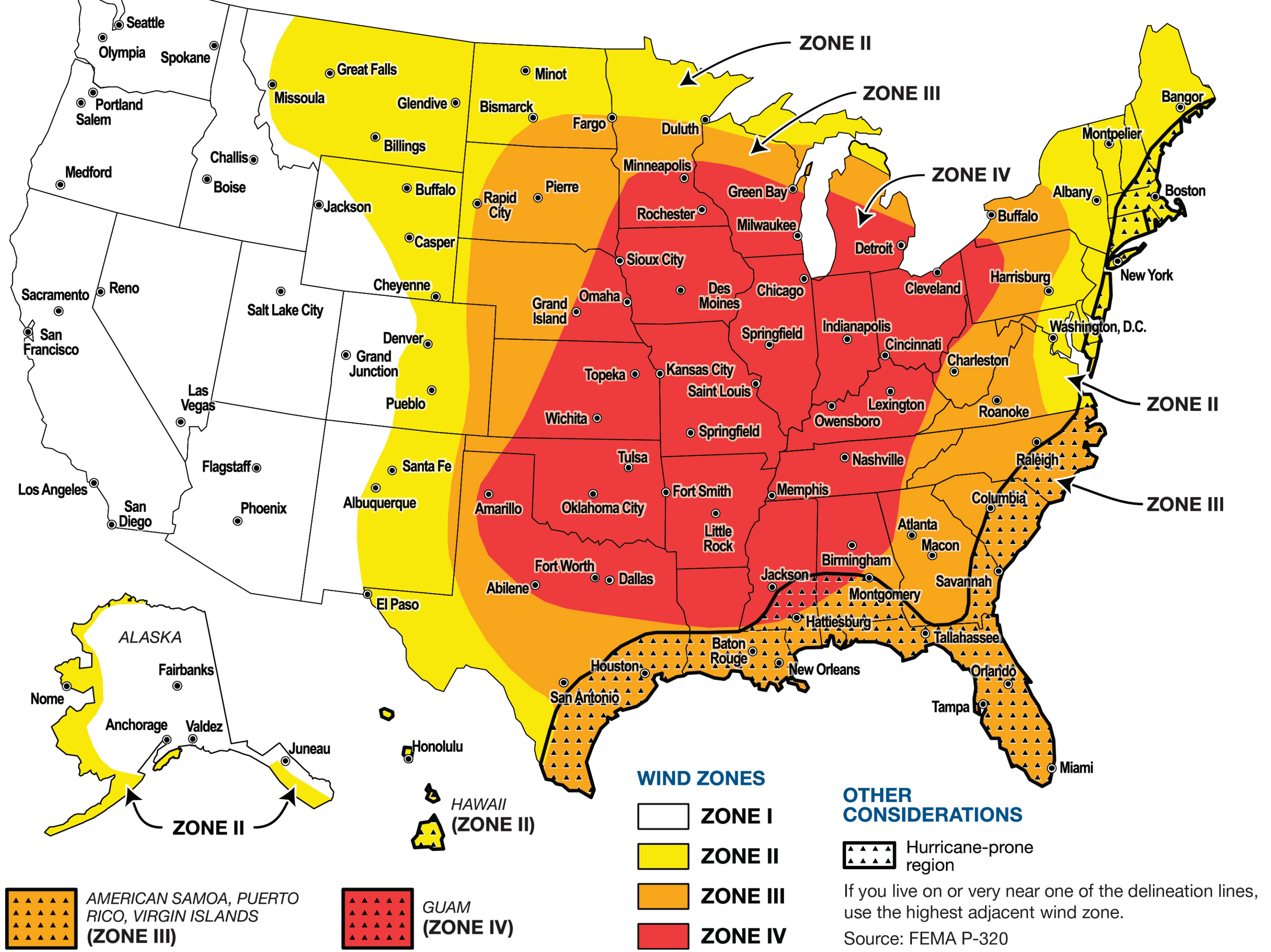
PROTECTION OF ASSET

↓

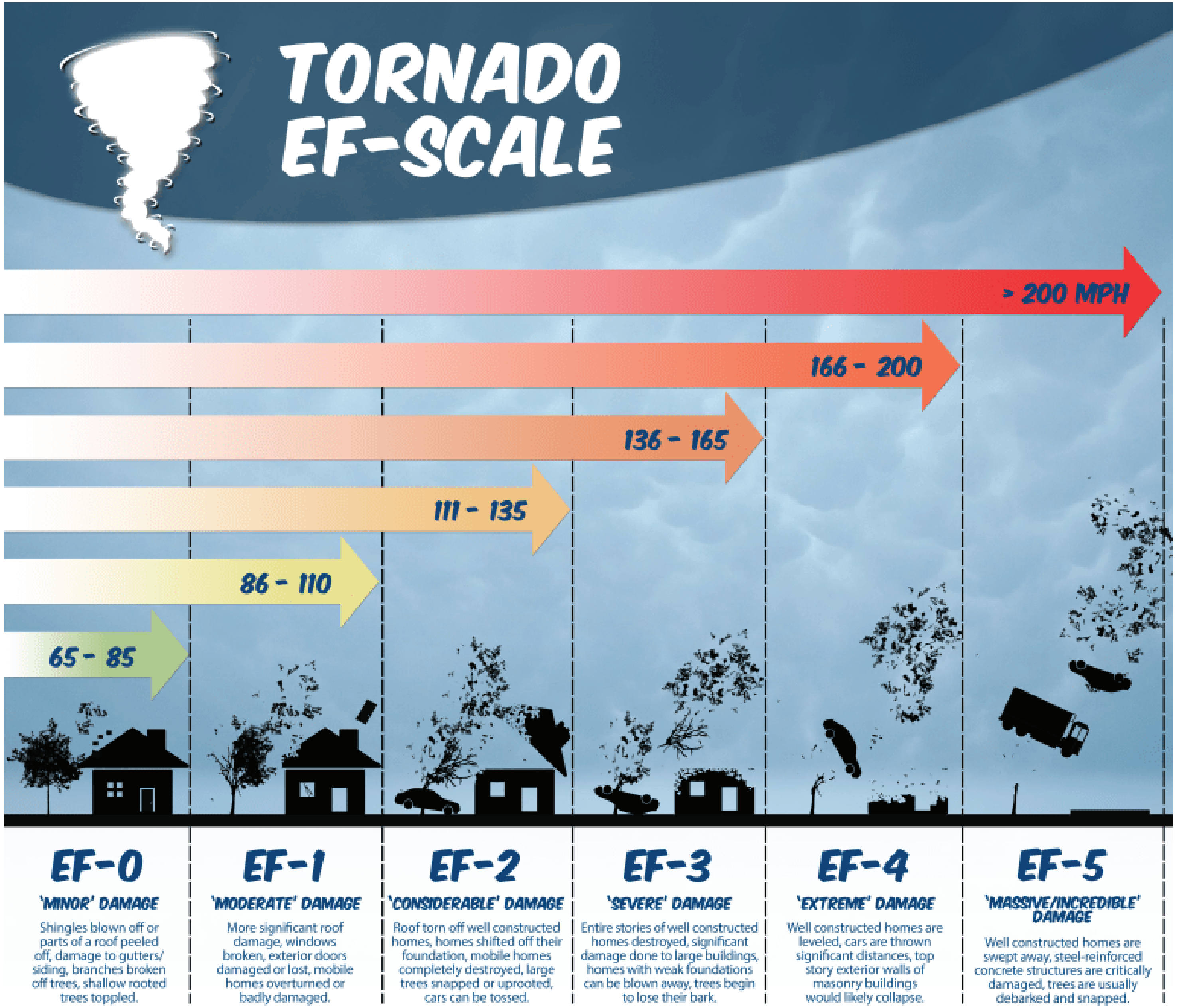
Private Entities (Insurance Companies)

IBHS FORTIFIED

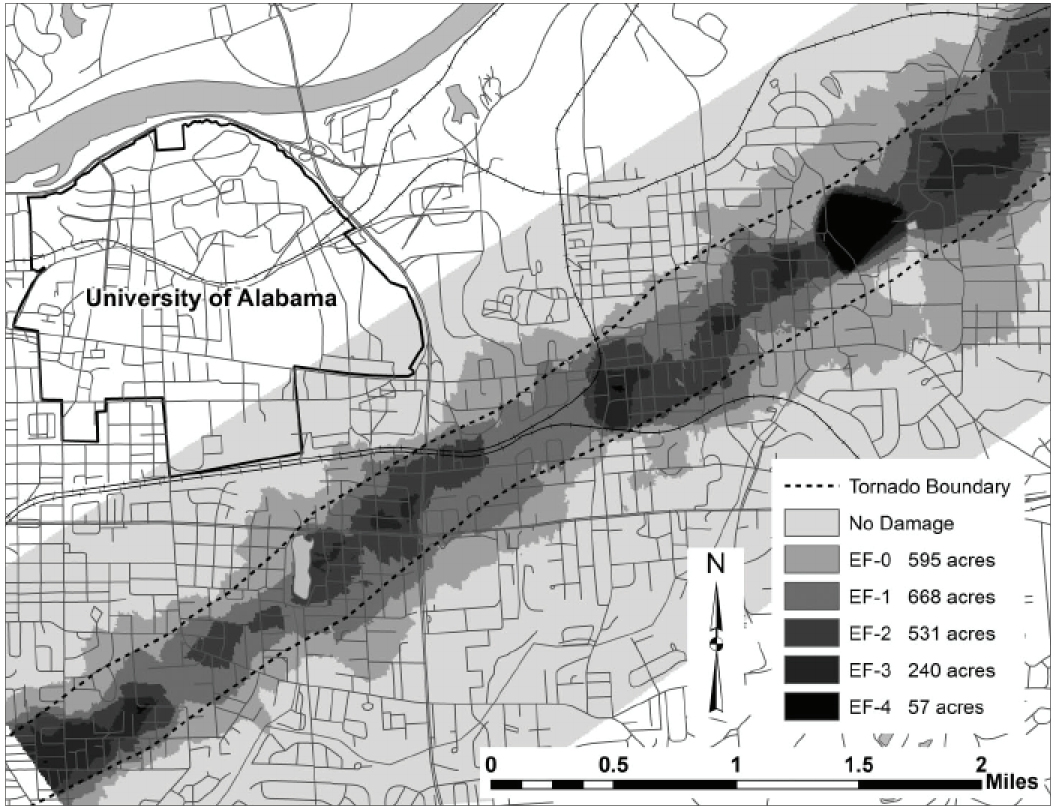
WIND ZONES IN THE UNITED STATES*

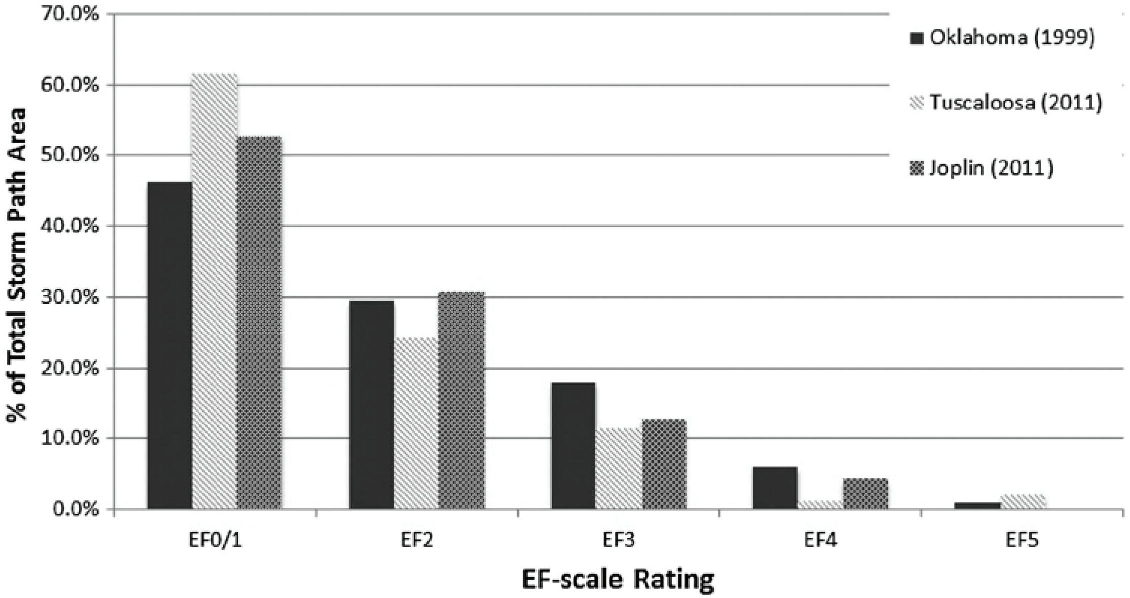


Source: FEMA "Overview of FEMA P-804 (2023), Wind Retrofit Guide for Residential Buildings in Hurricane-Prone Regions"

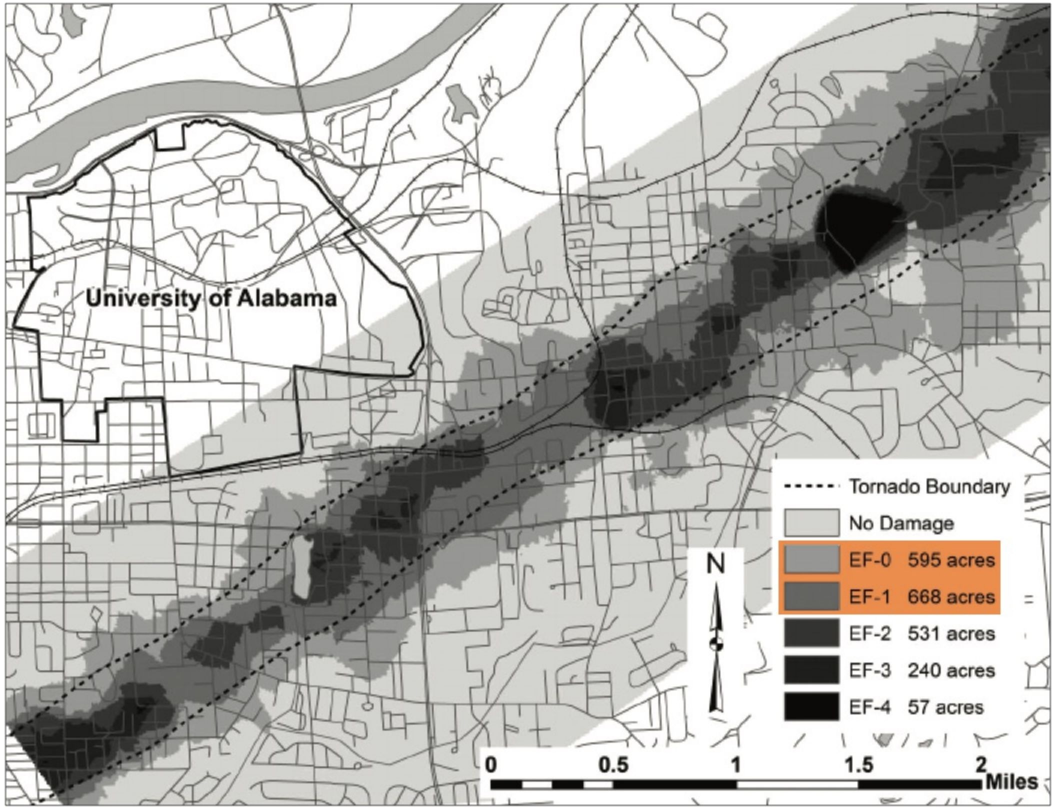


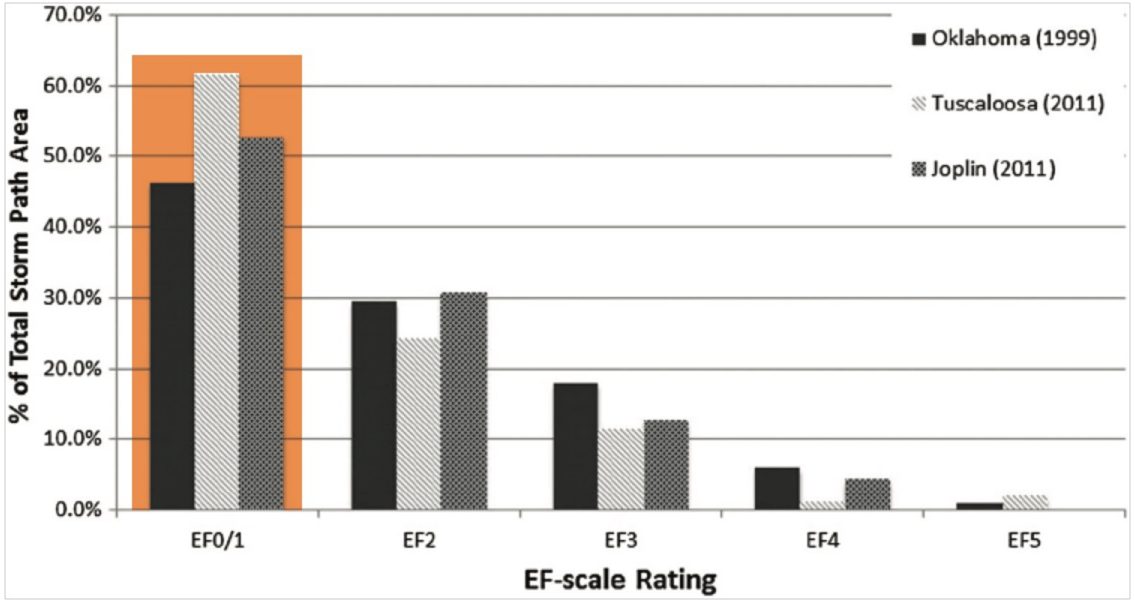
Source: Insurance Institute for Business and Home Safety (IBHS)





Source: "Making the Case for Improved Structural Design: Tornado Outbreaks of 2011," Leadership and Management in Engineering, October 2012

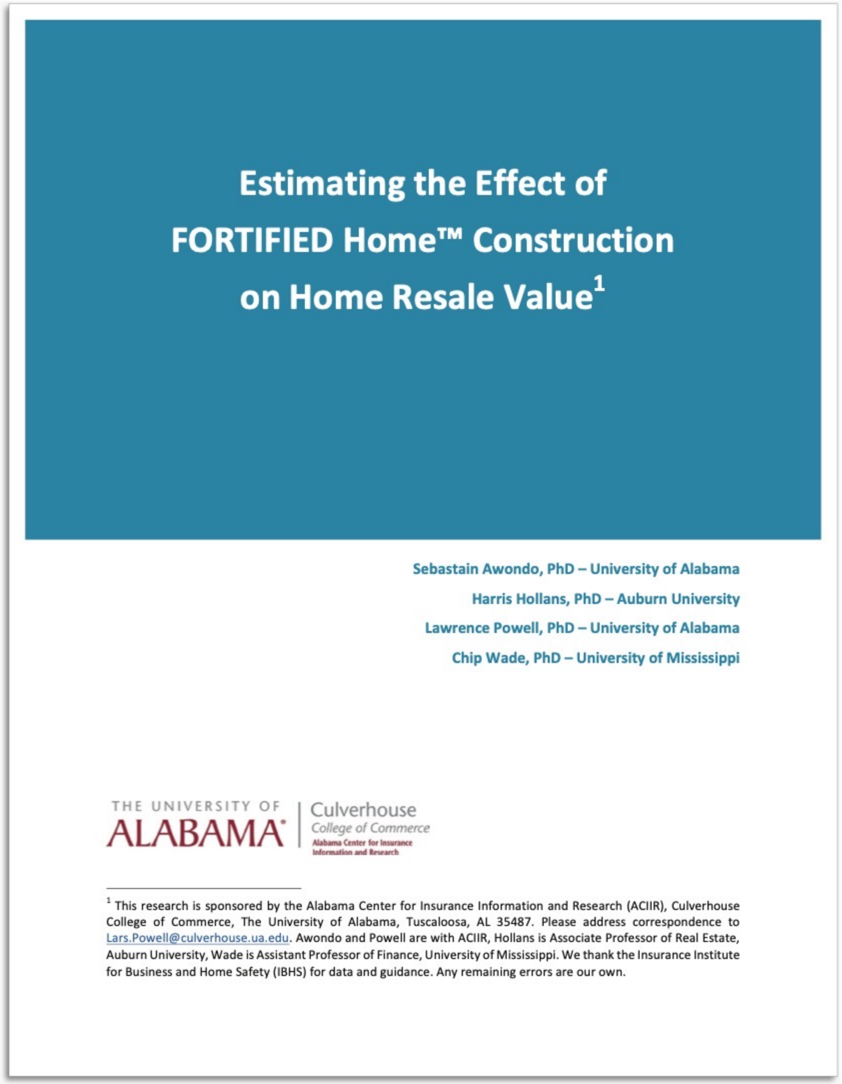




Source: "Making the Case for Improved Structural Design: Tornado Outbreaks of 2011," Leadership and Management in Engineering, October 2012

A survey of homes in Alabama saw a 6.8% increase in resale value when the home was designated as FORTIFIED.

Alabama Center for Insurance Information & Research



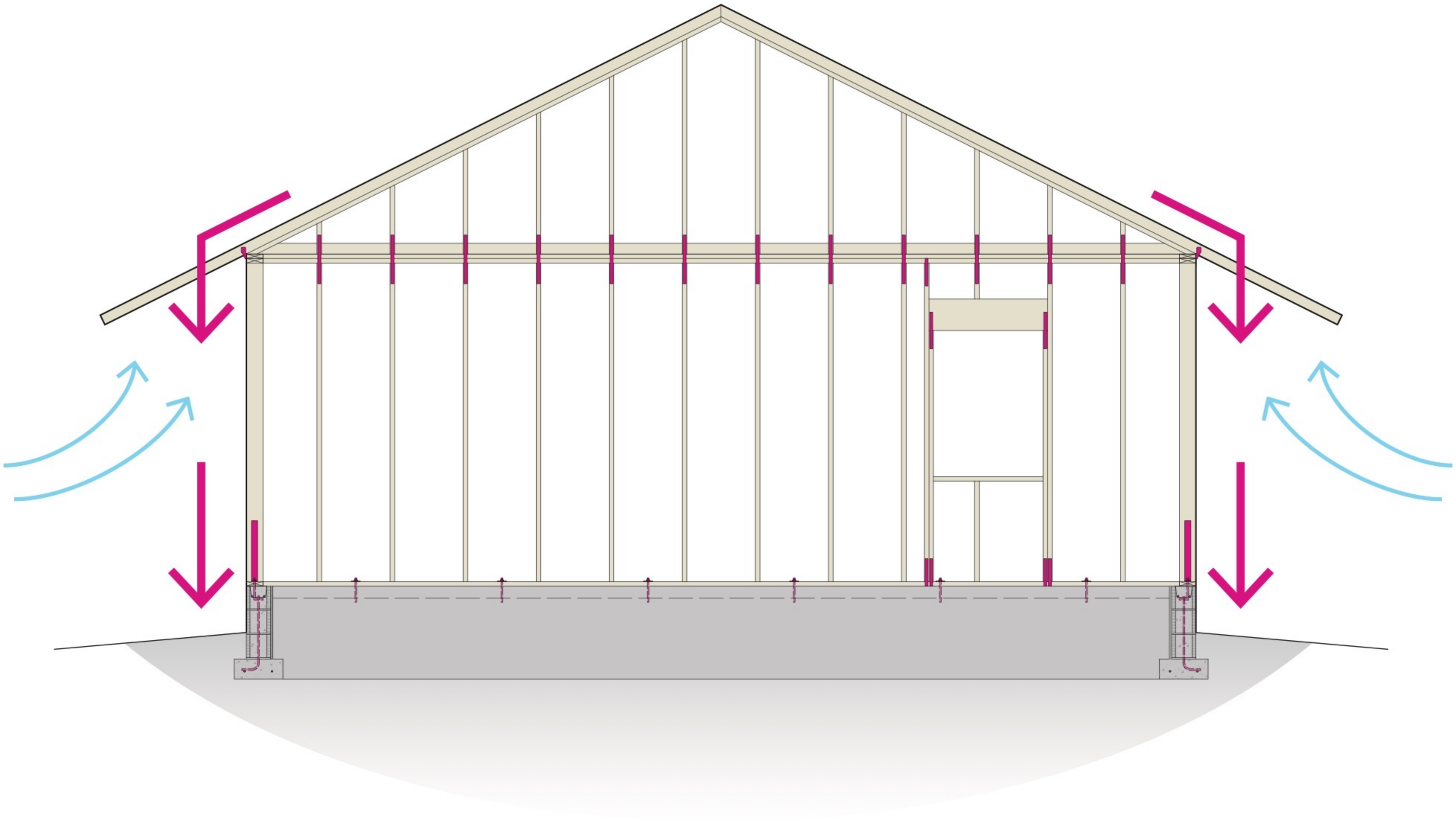
Estimating the Effect of FORTIFIED Home™ Construction on Home Resale Value[1]

Sebastain Awondo, PhD – University of Alabama
Harris Hollans, PhD – Auburn University
Lawrence Powell, PhD – University of Alabama
Chip Wade, PhD – University of Mississippi

THE UNIVERSITY OF ALABAMA | Culverhouse College of Commerce
Alabama Center for Insurance Information and Research

[1] This research is sponsored by the Alabama Center for Insurance Information and Research (ACIIR), Culverhouse College of Commerce, The University of Alabama, Tuscaloosa, AL 35487. Please address correspondence to Lars.Powell@culverhouse.ua.edu. Awondo and Powell are with ACIIR, Hollans is Associate Professor of Real Estate, Auburn University, Wade is Assistant Professor of Finance, University of Mississippi. We thank the Insurance Institute for Business and Home Safety (IBHS) for data and guidance. Any remaining errors are our own.

source: Alabama Center for Insurance Information and Research, "Estimating the Effect of FORTIFIED Home Construction on Home Resale Value"




1/2" ROOF AND
STRUCTU
YEAR SYSTEM
LIMITED WARRAN


Russell
Building Supply
tamko.com
TAMKO Building Products, Inc.
- JOPLIN, MO -
SYNTHETIC
GUARD
UNDERLAYMENT


ZIPsystem

Overhang and Gable Reinforcement

Continuous Load Path

CAHFH Chipola Street

Chipola Area Habitat for Humanity

Marianna, FL

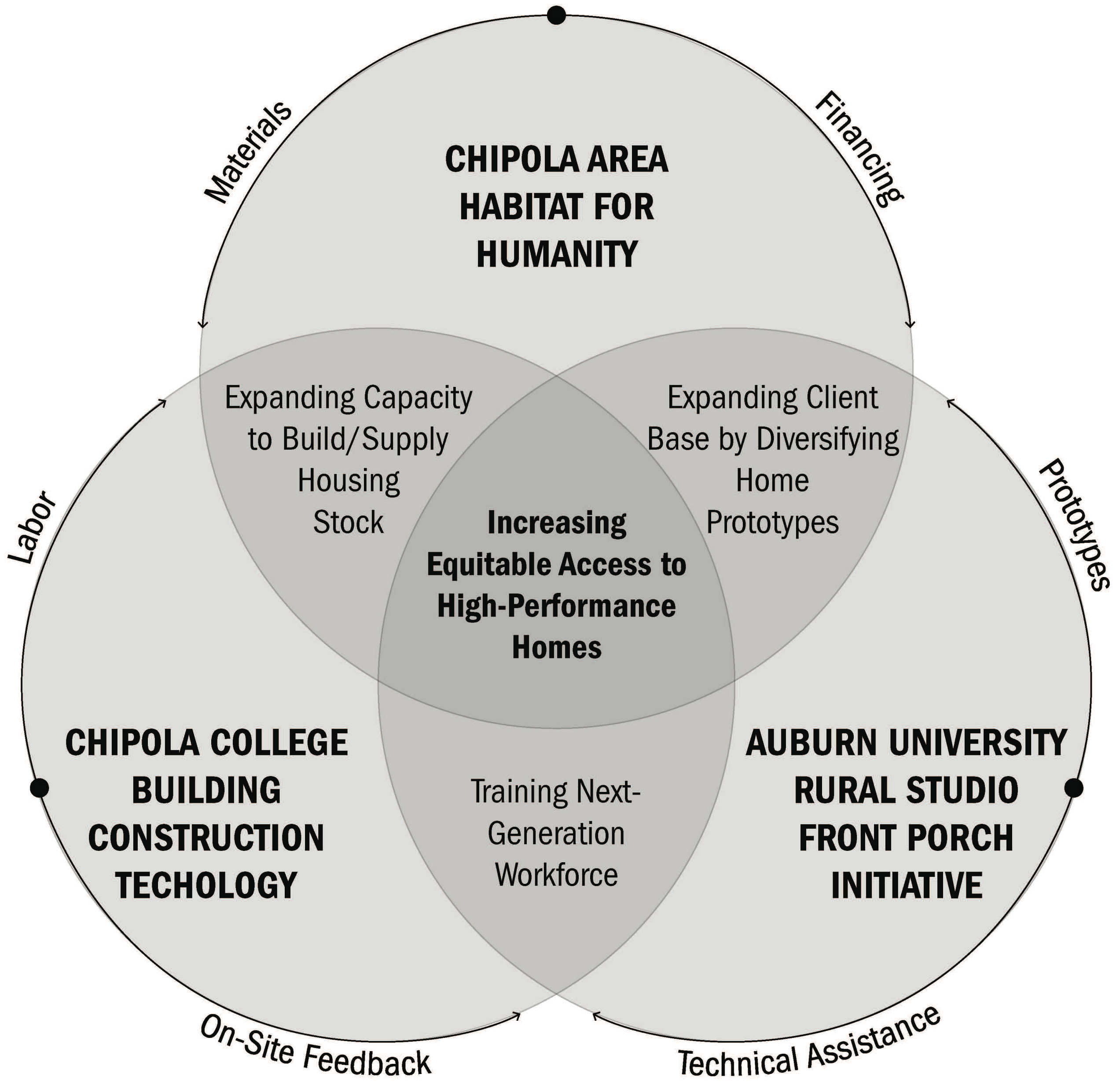
4 houses (Buster, Dave, Joanne, Sylvia 2/1)

2017 FRC (2015 IRC) [Climate Zone 2]

HERS 36–40

FORTIFIED Hurricane Gold + ENERGY STAR + FGBC Green Home

photo © Keith Isaacs


Materials
Financing
CHIPOLA AREA HABITAT FOR HUMANITY
Expanding Capacity to Build/Supply Housing Stock
Expanding Client Base by Diversifying Home Prototypes
Labor
Prototypes
Increasing Equitable Access to High-Performance Homes
CHIPOLA COLLEGE BUILDING CONSTRUCTION TECHOLOGY
Training Next-Generation Workforce
AUBURN UNIVERSITY RURAL STUDIO FRONT PORCH INITIATIVE
On-Site Feedback
Technical Assistance

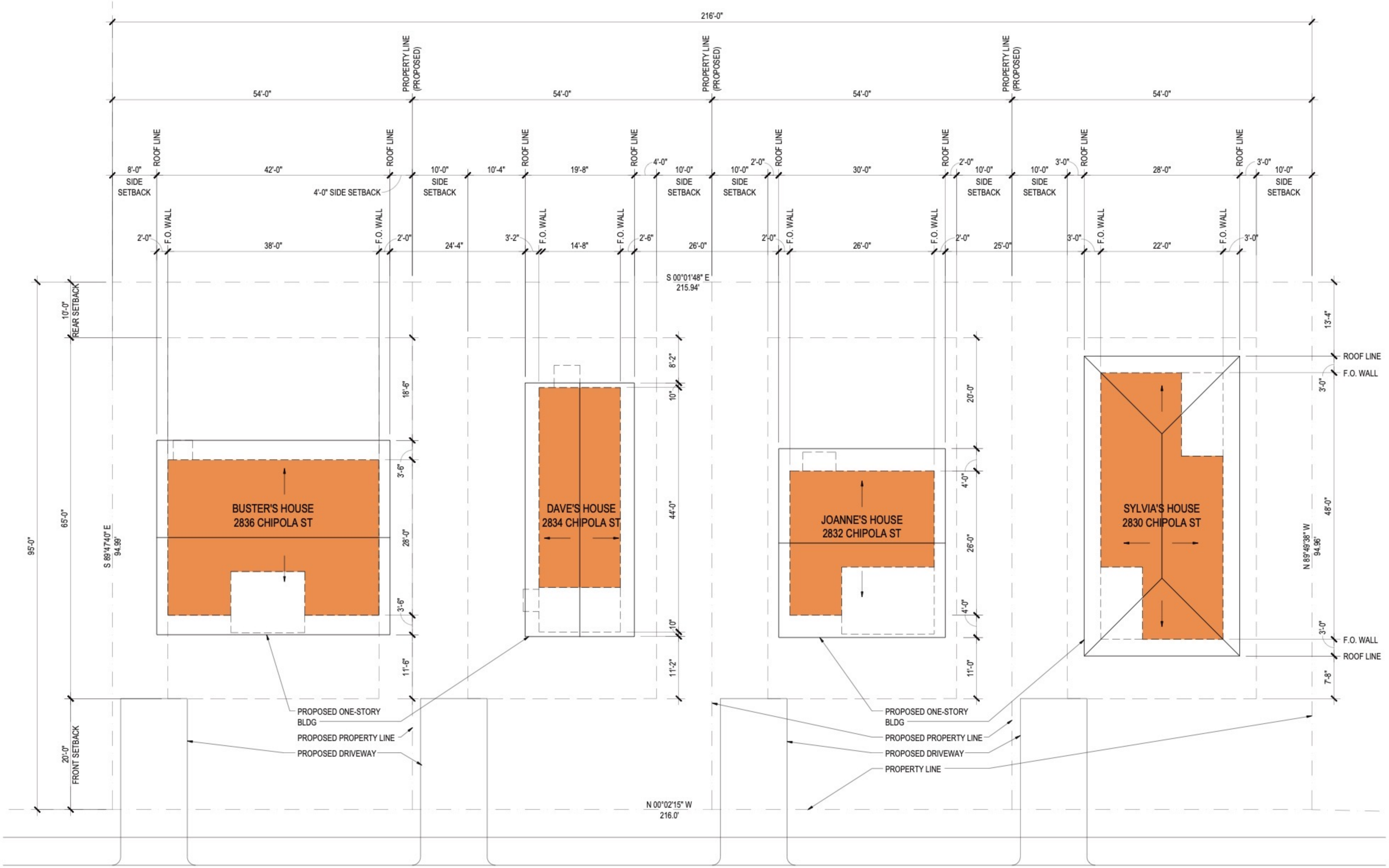
CAHFH Chipola Street

photos © Chipola College

CAHFH Chipola Street

photo © Keith Isaacs


STOP



216'-0"
PROPERTY LINE (PROPOSED)
54'-0"
ROOF LINE
SIDE SETBACK
4'-0" SIDE SETBACK
F.O. WALL
S 00°01'48" E 215.94'
10'-0" REAR SETBACK
BUSTER'S HOUSE
2836 CHIPOLA ST
DAVE'S HOUSE
2834 CHIPOLA ST
JOANNE'S HOUSE
2832 CHIPOLA ST
SYLVIA'S HOUSE
2830 CHIPOLA ST
S 89°47'40" E 94.99'
N 89°49'38" W 94.96'
PROPOSED ONE-STORY BLDG
PROPOSED PROPERTY LINE
PROPOSED DRIVEWAY
PROPERTY LINE
20'-0" FRONT SETBACK
N 00°02'15" W 216.0'

CAHFH Chipola Street

photo ©Keith Isaacs

ENERGY STAR

Improve energy efficiency to lower energy bills and increase thermal comfort.

1. High-performance windows, doors, & insulation
2. Fully-aligned air barriers
3. Reduce thermal bridging
4. Air sealing
5. Heating & cooling equipment
6. Quality duct installation
7. Ventilation
8. Filtration

FORTIFIED FOR HURRICANE

Strengthen home to improve resistance to damage from high winds and rain.

1. Roof
2. Impact protection @ windows & doors
3. Overhang & gable end bracing
4. Continuous load path

FGBC GREEN HOME

Address Florida-specific climactic conditions for improved efficiency, health, and resilience performance.

1. Energy performance
2. Water conservation
3. Site conditions (minimize disturbance)
4. Healthy materials
5. Local, efficient, recycled materials
6. Disaster mitigation

ENERGY STAR

Improve energy efficiency to lower energy bills and increase thermal comfort.

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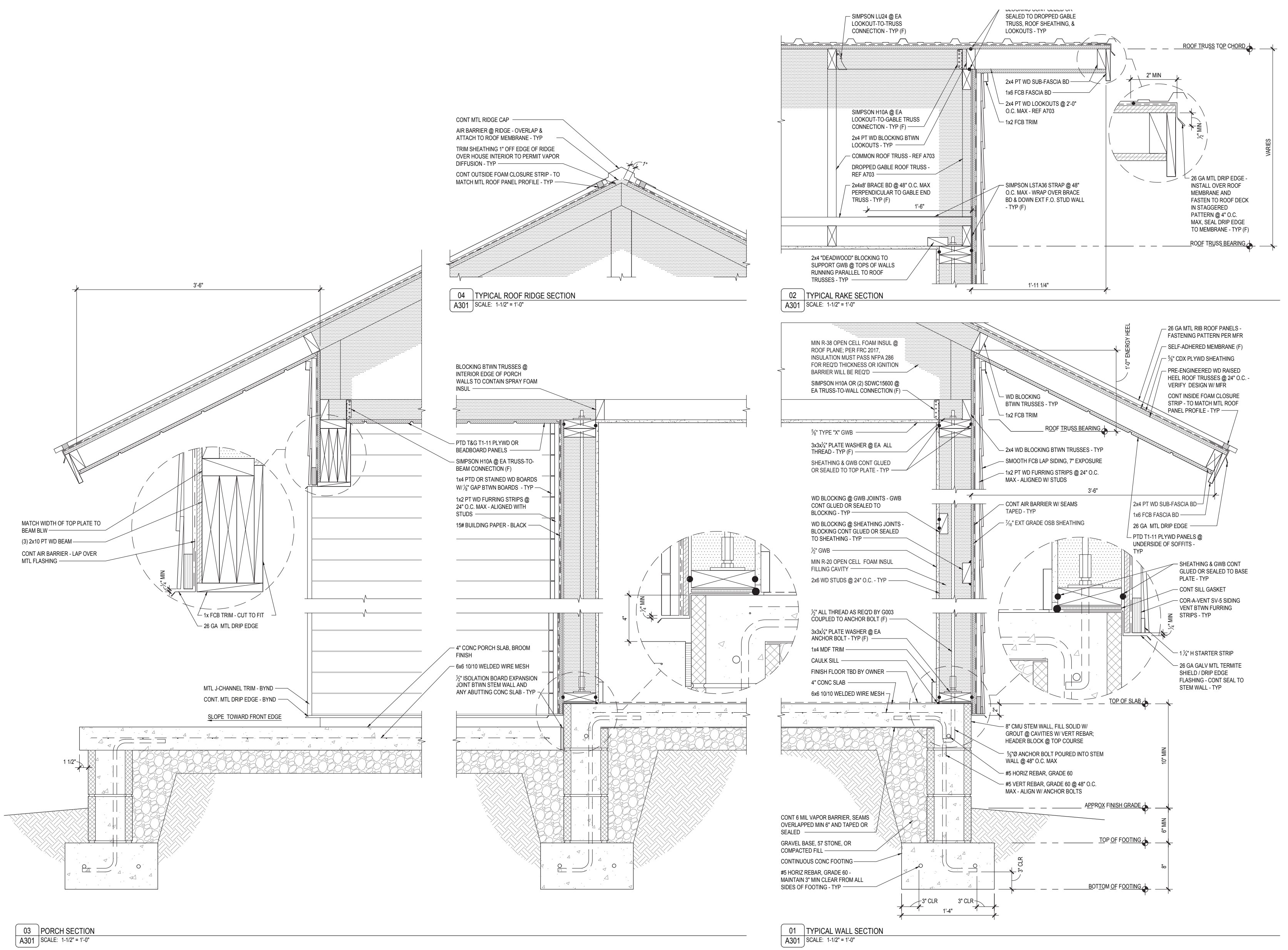
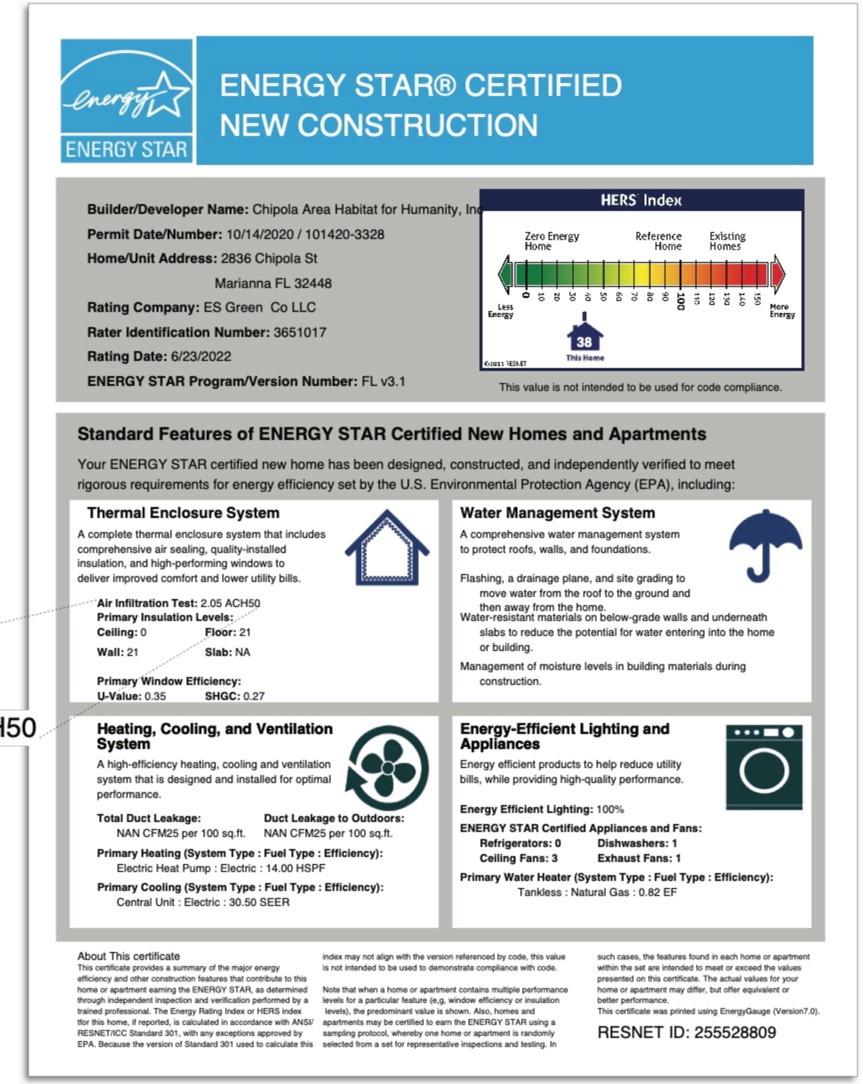




ENERGY STAR® CERTIFIED NEW CONSTRUCTION

Builder/Developer Name: Chipola Area Habitat for Humanity, Inc
Permit Date/Number: 10/14/2020 / 101420-3328
Home/Unit Address: 2836 Chipola St
Marianna FL 32448
Rating Company: ES Green Co LLC
Rater Identification Number: 3651017
Rating Date: 6/23/2022
ENERGY STAR Program/Version Number: FL v3.1

HERS Index
Zero Energy Home | Reference Home | Existing Homes
Less Energy | More Energy
38 This Home

This value is not intended to be used for code compliance.

Standard Features of ENERGY STAR Certified New Homes and Apartments

Your ENERGY STAR certified new home has been designed, constructed, and independently verified to meet rigorous requirements for energy efficiency set by the U.S. Environmental Protection Agency (EPA), including:

Thermal Enclosure System

A complete thermal enclosure system that includes comprehensive air sealing, quality-installed insulation, and high-performing windows to deliver improved comfort and lower utility bills.

Air Infiltration Test: 2.05 ACH50
Primary Insulation Levels:
Ceiling: 0 **Floor:** 21
Wall: 21 **Slab:** NA

Primary Window Efficiency:
U-Value: 0.35 **SHGC:** 0.27

Water Management System

A comprehensive water management system to protect roofs, walls, and foundations.

Flashing, a drainage plane, and site grading to move water from the roof to the ground and then away from the home.
Water-resistant materials on below-grade walls and underneath slabs to reduce the potential for water entering into the home or building.
Management of moisture levels in building materials during construction.

Heating, Cooling, and Ventilation System

A high-efficiency heating, cooling and ventilation system that is designed and installed for optimal performance.

Total Duct Leakage: NAN CFM25 per 100 sq.ft.
Duct Leakage to Outdoors: NAN CFM25 per 100 sq.ft.
Primary Heating (System Type : Fuel Type : Efficiency):
Electric Heat Pump : Electric : 14.00 HSPF
Primary Cooling (System Type : Fuel Type : Efficiency):
Central Unit : Electric : 30.50 SEER

Energy-Efficient Lighting and Appliances

Energy efficient products to help reduce utility bills, while providing high-quality performance.

Energy Efficient Lighting: 100%
ENERGY STAR Certified Appliances and Fans:
Refrigerators: 0 **Dishwashers:** 1
Ceiling Fans: 3 **Exhaust Fans:** 1
Primary Water Heater (System Type : Fuel Type : Efficiency):
Tankless : Natural Gas : 0.82 EF

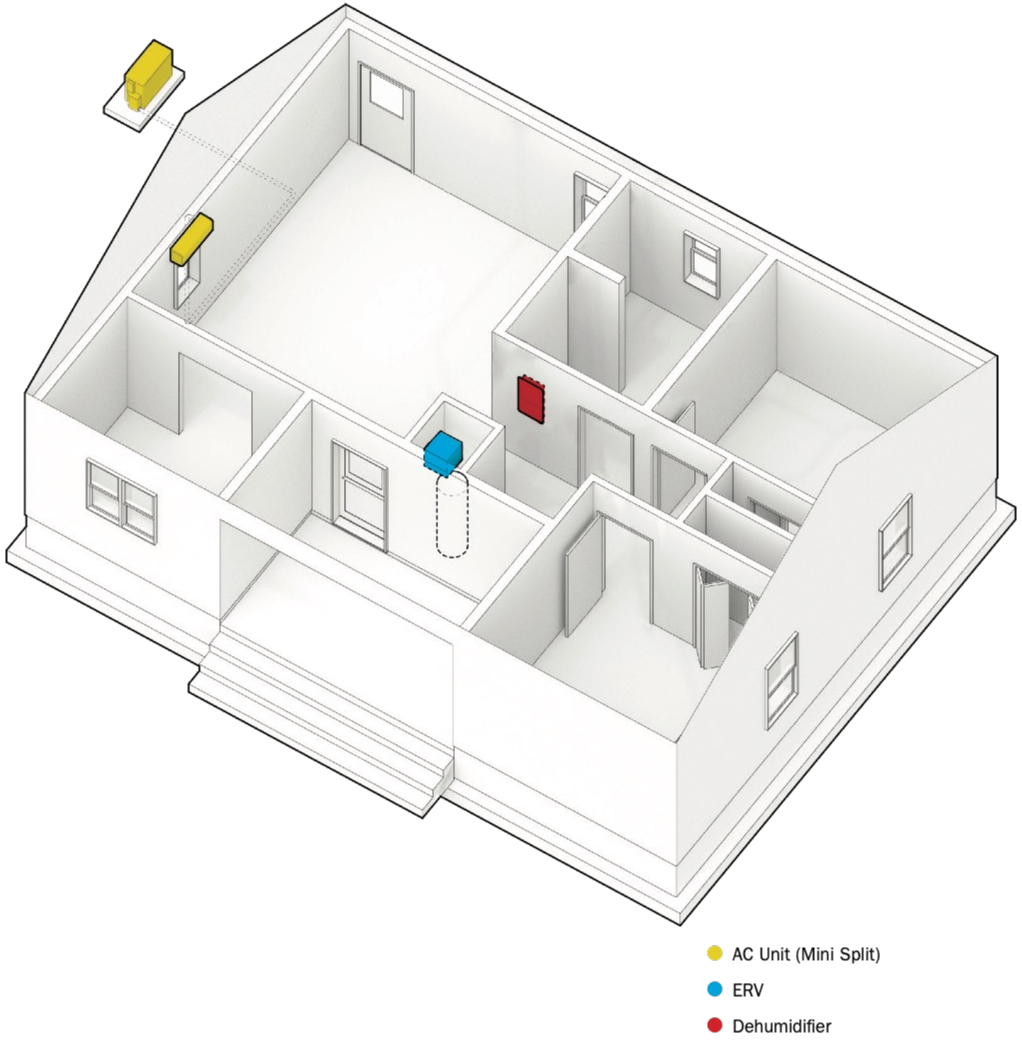
About This certificate
This certificate provides a summary of the major energy efficiency and other construction features that contribute to this home or apartment earning the ENERGY STAR, as determined through independent inspection and verification performed by a trained professional. The Energy Rating Index or HERS index tfor this home, if reported, is calculated in accordance with ANSI/RESNET/ICC Standard 301, with any exceptions approved by EPA. Because the version of Standard 301 used to calculate this index may not align with the version referenced by code, this value is not intended to be used to demonstrate compliance with code.

Note that when a home or apartment contains multiple performance levels for a particular feature (e,g, window efficiency or insulation levels), the predominant value is shown. Also, homes and apartments may be certified to earn the ENERGY STAR using a sampling protocol, whereby one home or apartment is randomly selected from a set for representative inspections and testing. In such cases, the features found in each home or apartment within the set are intended to meet or exceed the values presented on this certificate. The actual values for your home or apartment may differ, but offer equivalent or better performance.
This certificate was printed using EnergyGauge (Version7.0).

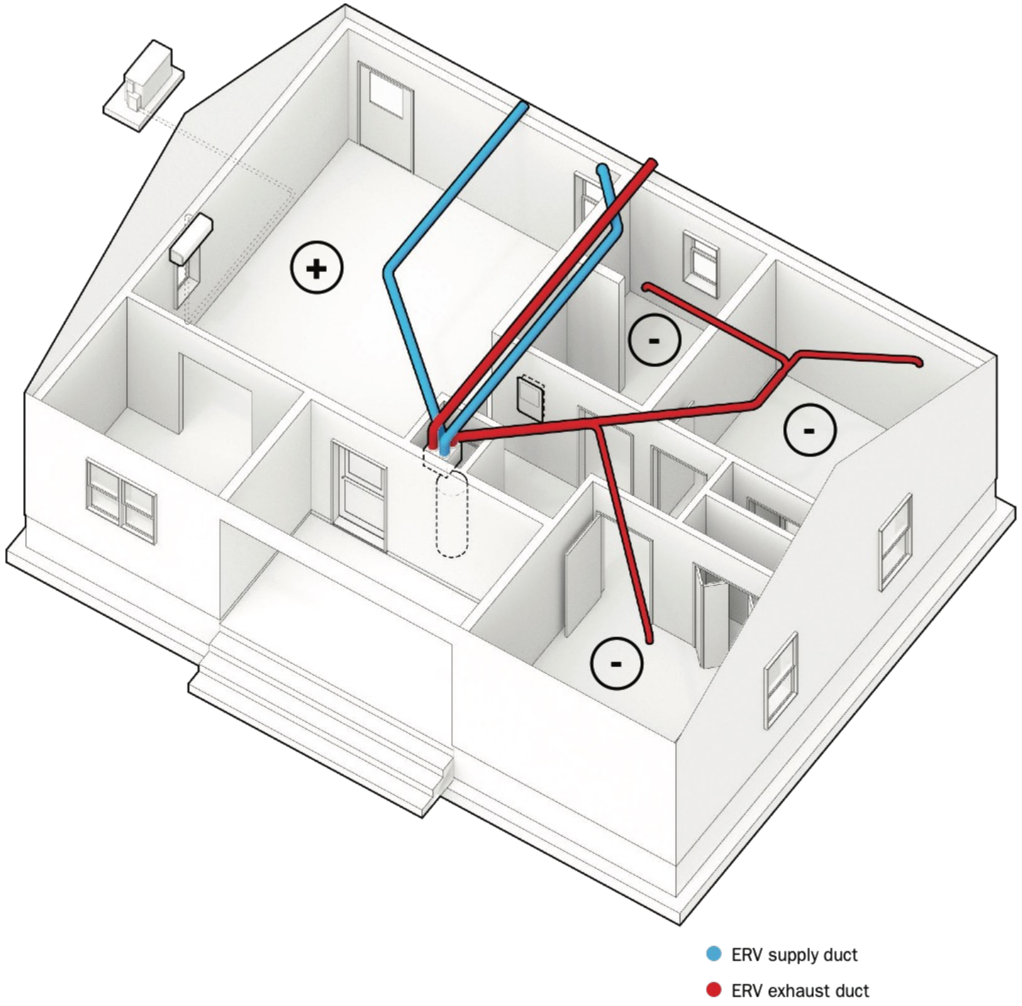
RESNET ID: 255528809

Air Infiltration Test: 2.05 ACH50

THERMAL COMFORT SYSTEM



DUCTED ERV SYSTEM

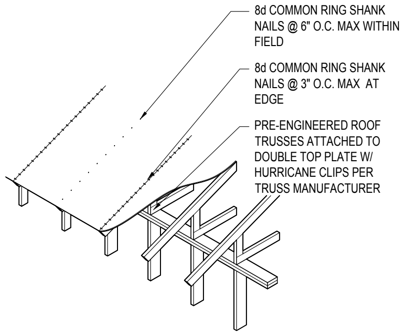


A PROGRAM OF IBHS
FORTIFIED
HOME

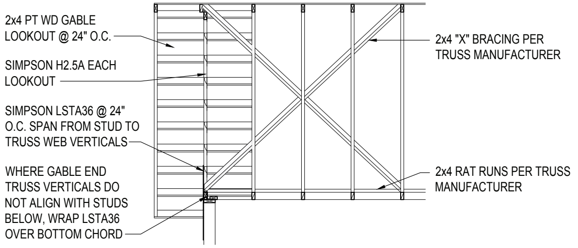
FORTIFIED FOR HURRICANE

Strengthen home to improve resistance to damage from high winds and rain.

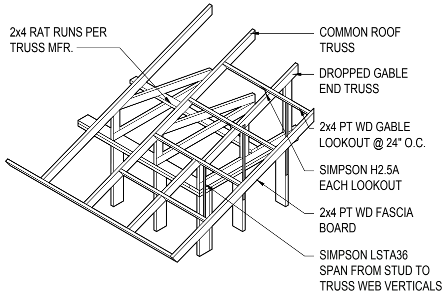
1. Roof
2. Impact protection @ windows & doors
3. Overhang & gable end bracing
4. Continuous load path



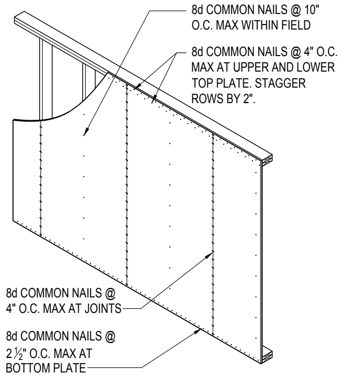
13 G003 WIND RESISTANCE: ROOF SHEATHING & TRUSS ATTACHMENT
SCALE: NOT TO SCALE



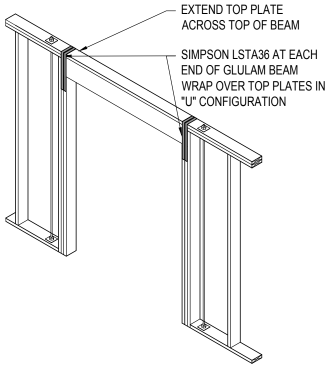
12 G003 WIND RESISTANCE: TRUSS X-BRACING
SCALE: NOT TO SCALE



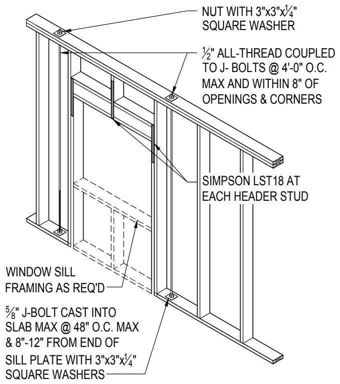
11 G003 WIND RESISTANCE: GABLE END WALL
SCALE: NOT TO SCALE



10 G003 WIND RESISTANCE: WALL SHEATHING PANEL
SCALE: NOT TO SCALE



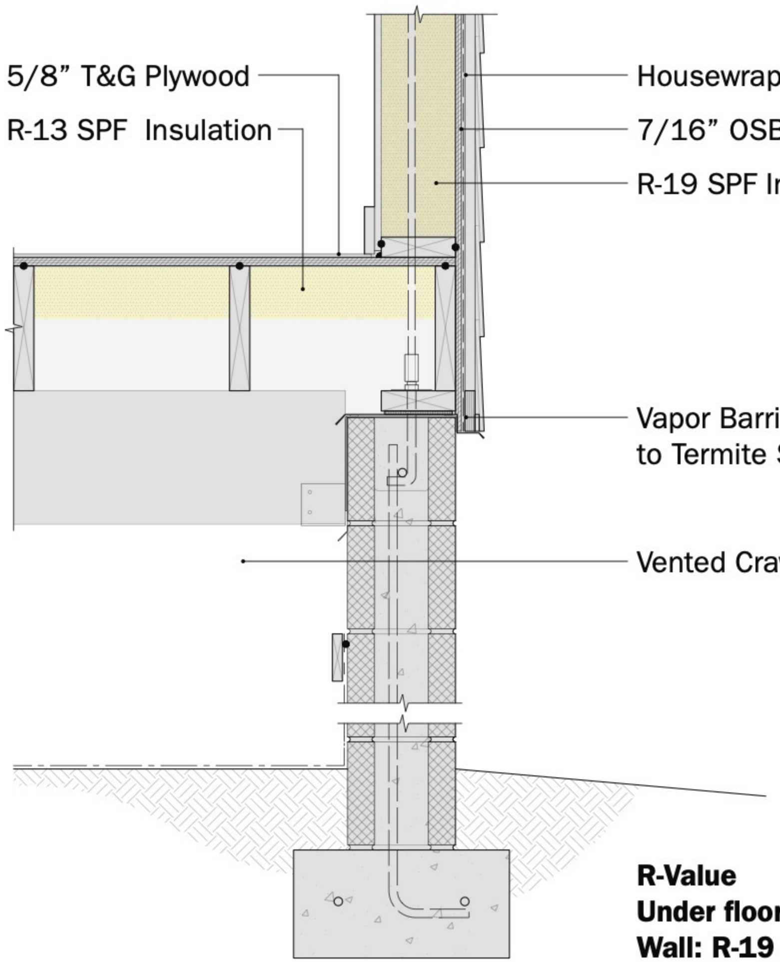
09 G003 WIND RESISTANCE: BEAM TIE-DOWN
SCALE: NOT TO SCALE



08 G003 WIND RESISTANCE: STUD WALL LOAD PATH
SCALE: NOT TO SCALE

ASSEMBLY ANALYSIS: FOUNDATION & FLOOR

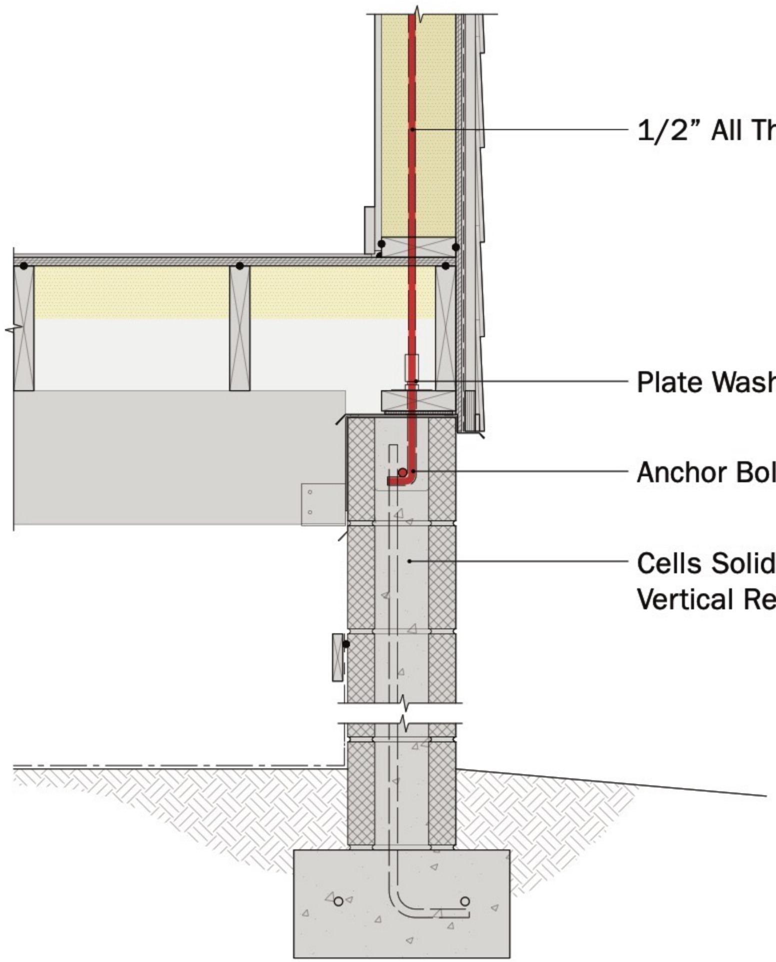
ENERGY STAR



R-Value
Under floor: R-13
Wall: R-19

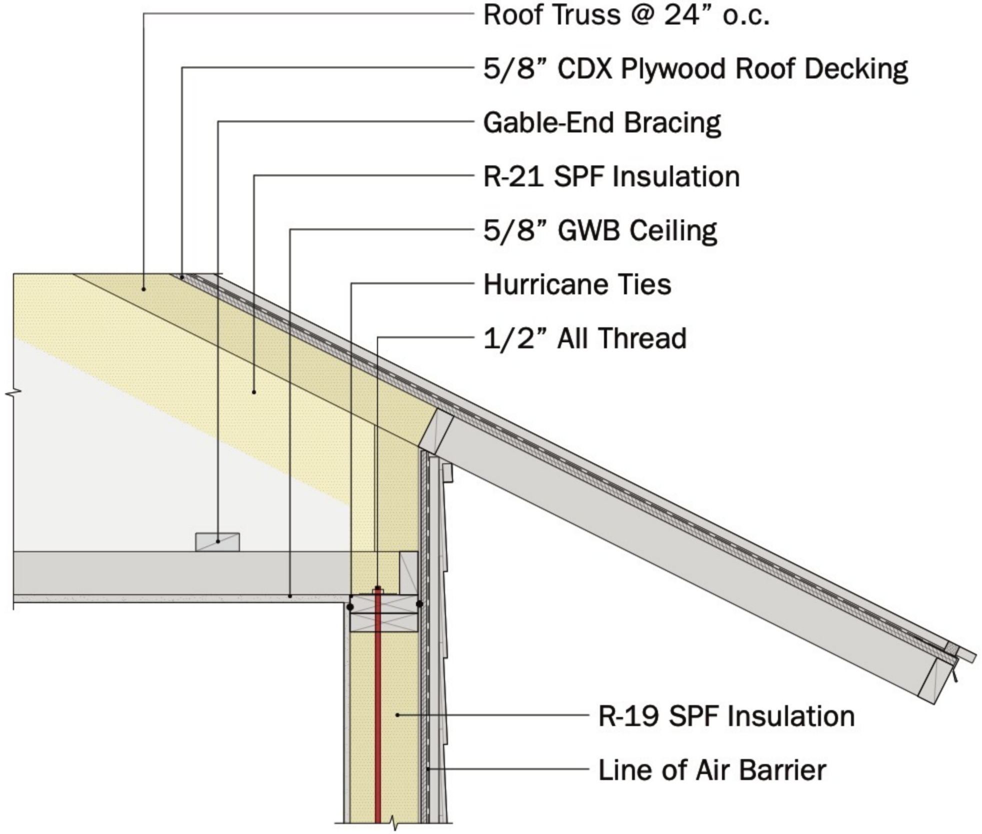
ASSEMBLY ANALYSIS: FOUNDATION & FLOOR

FORTIFIED



ASSEMBLY ANALYSIS: CEILING & ROOF

ENERGY STAR + FORTIFIED



Air Infiltration: 2.05 ACH50

CAHFH Chipola Street

CAHFH Chipola Street

photo © Keith Isaacs

NOLAHFH Jean Lafitte

New Orleans Area Habitat for Humanity

Jean Lafitte, LA

1 house (Sylvia 2/2)

2015 IRC w/ LA amendments [Climate Zone 2]

HERS 40

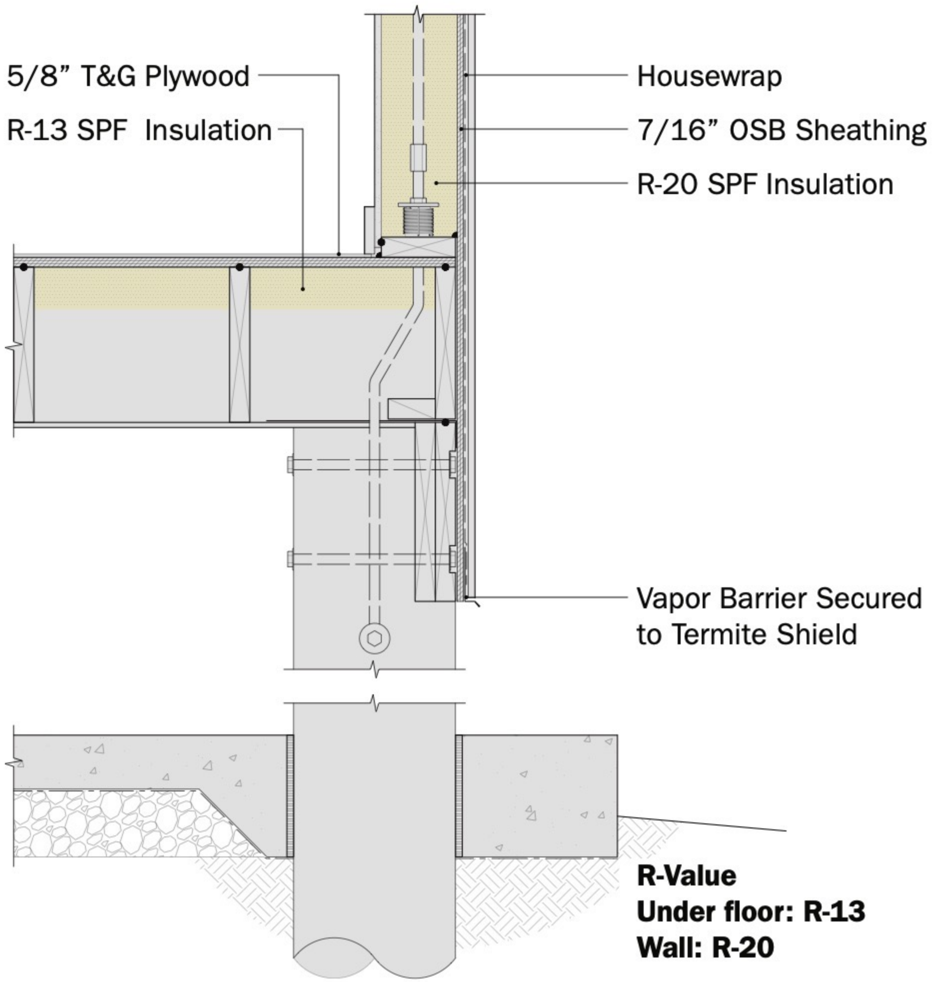
FORTIFIED Hurricane Gold + ENERGY STAR

LOUISIANA
McComb
Bogalusa
Amite
Zachary
Central
Opelousas
Baton Rouge
Hammond
Covington
Picayune
Mandeville
Prairieville
Gonzales
Slidell
Crowley
Lafayette
Saint Martinville
LaPlace
Abbeville
New Orleans
Waggaman
Thibodaux
Morgan City
Houma

NOLAHFH Jean Lafitte

ASSEMBLY ANALYSIS: FOUNDATION & FLOOR

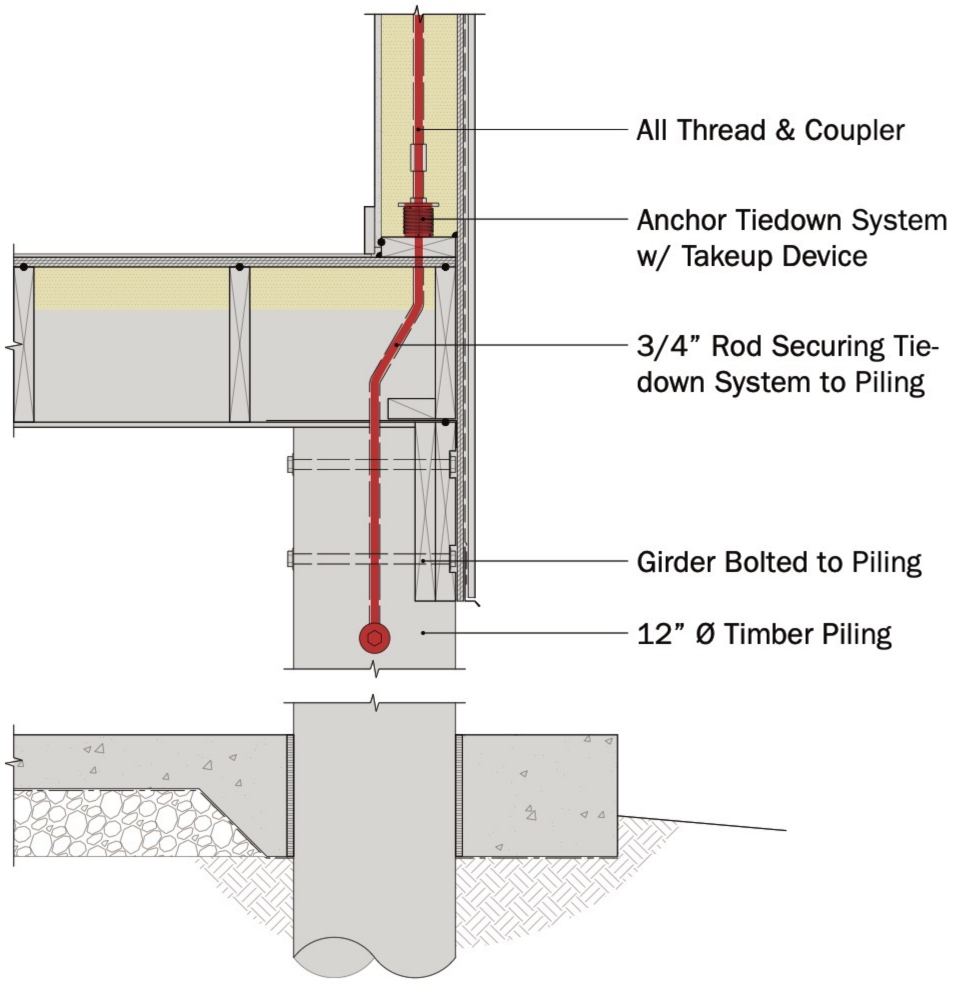
ENERGY STAR



R-Value
Under floor: R-13
Wall: R-20

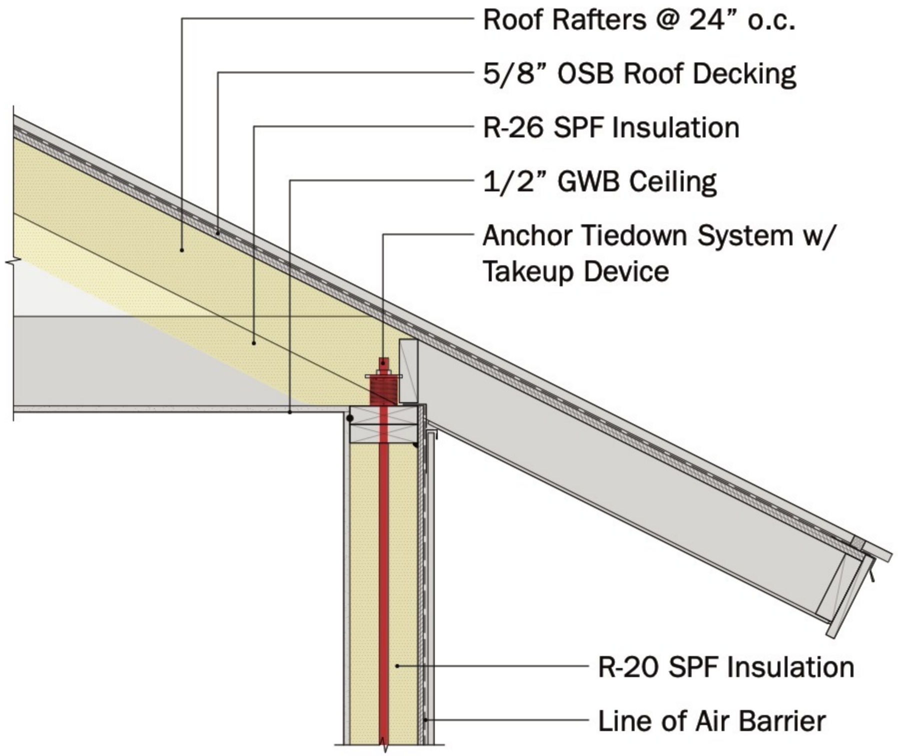
ASSEMBLY ANALYSIS: FOUNDATION & FLOOR

FORTIFIED

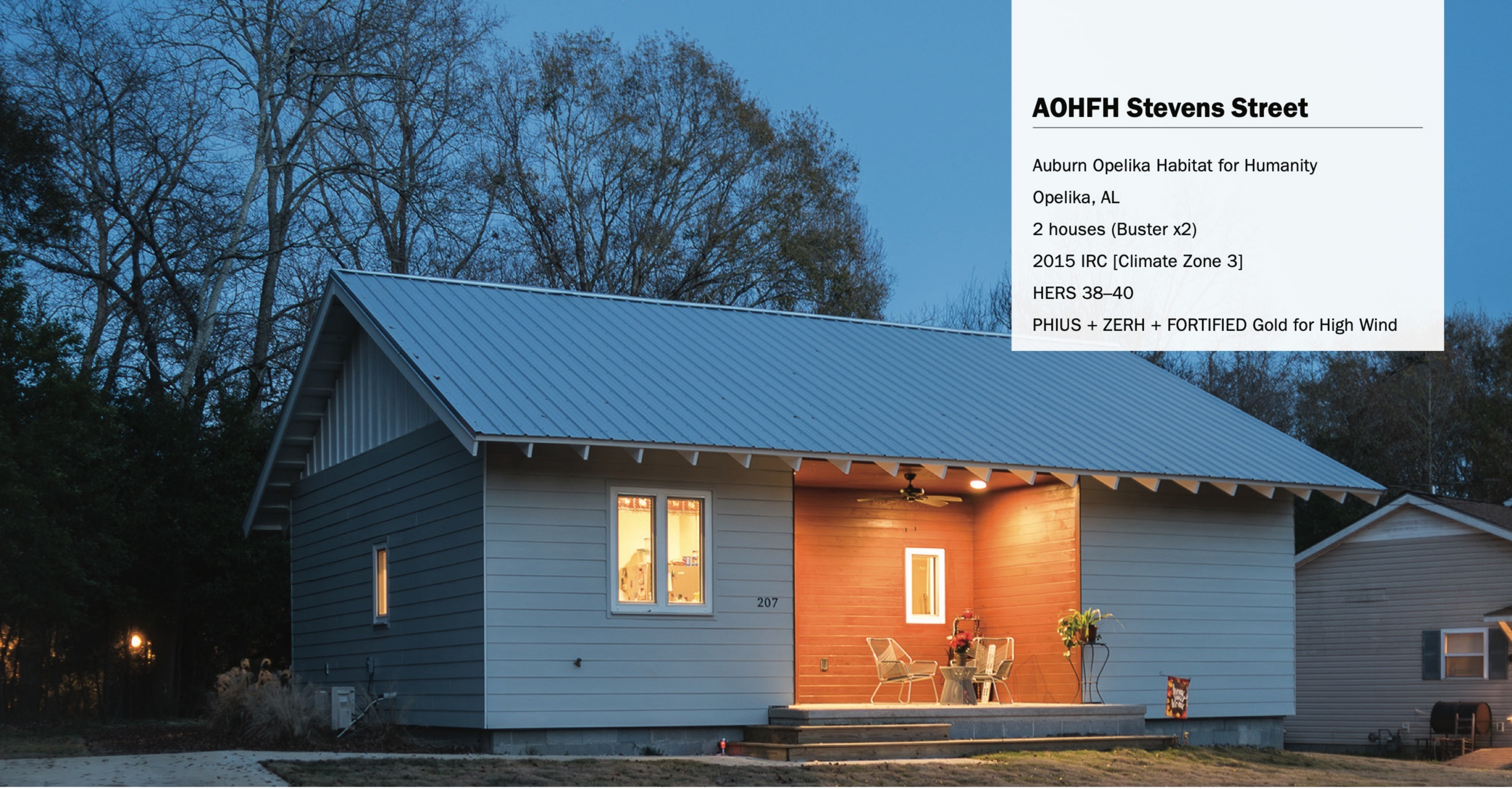


ASSEMBLY ANALYSIS: CEILING & ROOF

ENERGY STAR + FORTIFIED



Air Infiltration: 2.89 ACH50



AOHFH Stevens Street

Auburn Opelika Habitat for Humanity

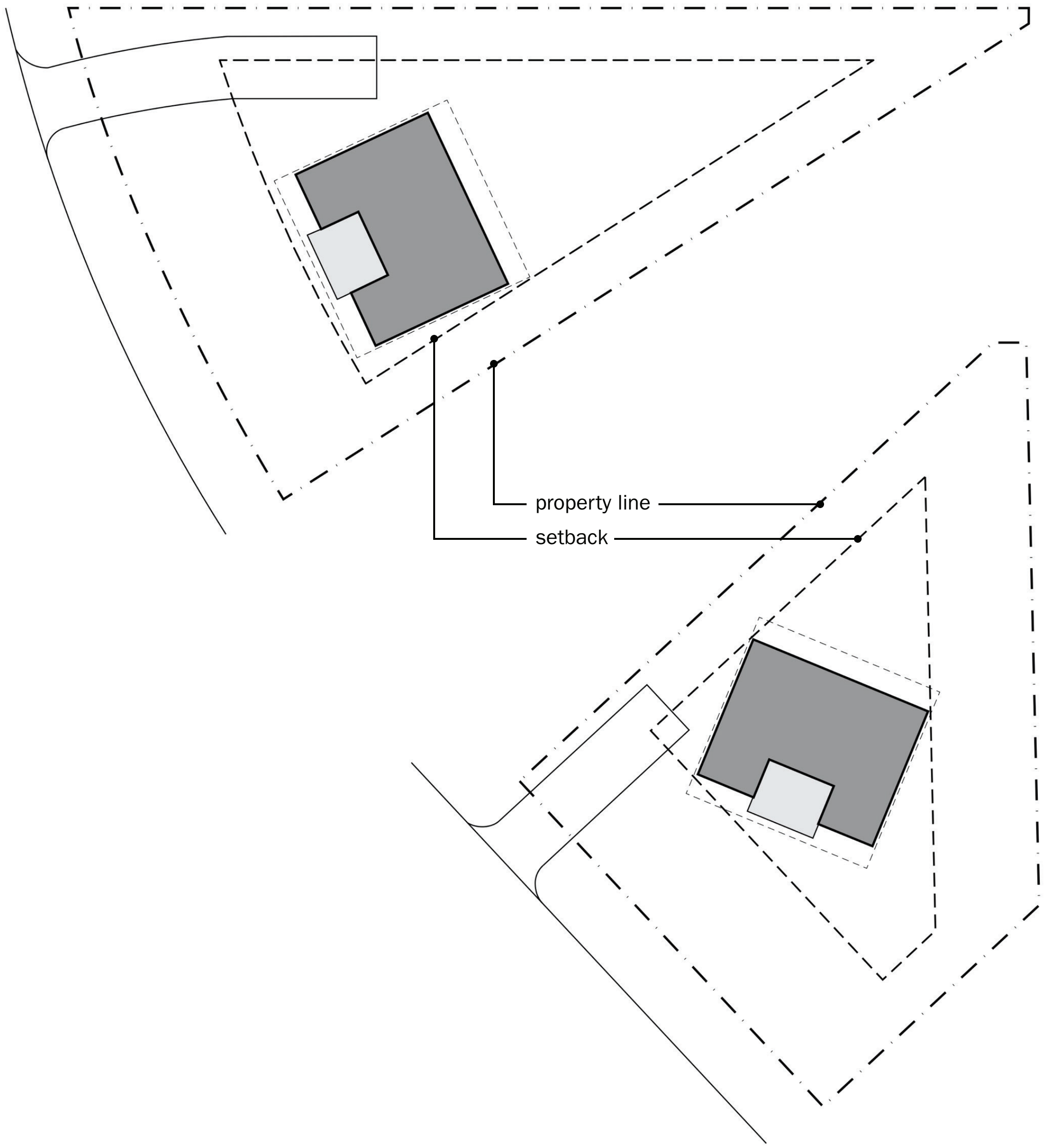
Opelika, AL

2 houses (Buster x2)

2015 IRC [Climate Zone 3]

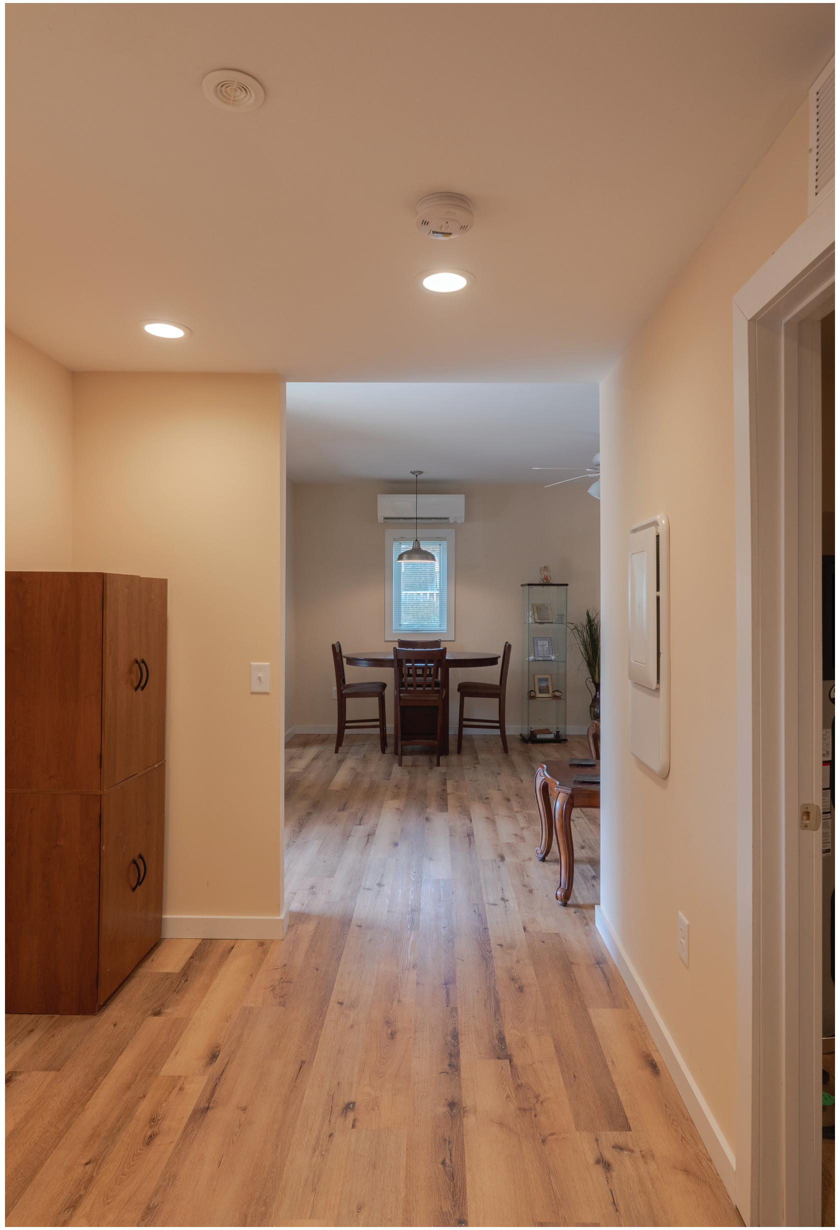
HERS 38–40

PHIUS + ZERH + FORTIFIED Gold for High Wind


property line
setback

House 66
PHIUS + FORTIFIED

House 68
ZERH + FORTIFIED




211

Passive House Institute US

PASSIVE HOUSE

Making high-performance passive building the mainstream market standard.

1. Continuous insulation
   (no thermal bridging)
2. Attention to air sealing
3. Window & door performance
4. Active ventilation
5. Energy efficient equipment
6. Active ventilation

A PROGRAM OF IBHS FORTIFIED HOME™

FORTIFIED FOR HIGH WINDS

Strengthen home to improve resistance to damage from high winds.

1. Roof
2. Gable end bracing
3. Continuous load path

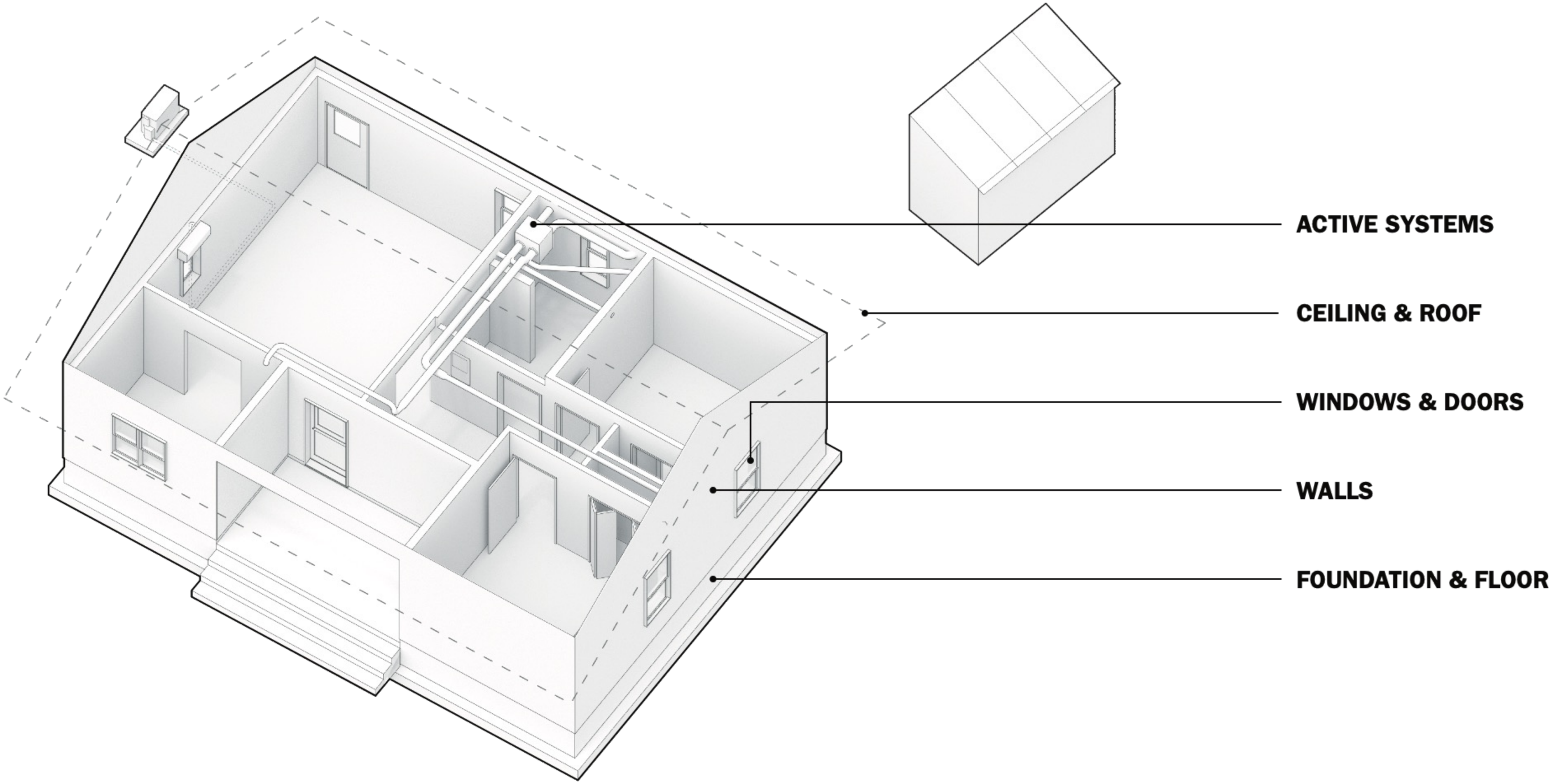
ZERO ENERGY READY HOME

ZERO ENERGY READY HOMES

Optimize efficiency, manage related risks, and help ensure future readiness.

1. Optimize efficiency
   - Enclosure
   - Equipment
   - Appliances / lighting
2. Do no harm
   - Water protection
   - Ensured comfort
   - Indoor air quality
3. Ensure future ready
   - Solar ready
   - Forthcoming codes

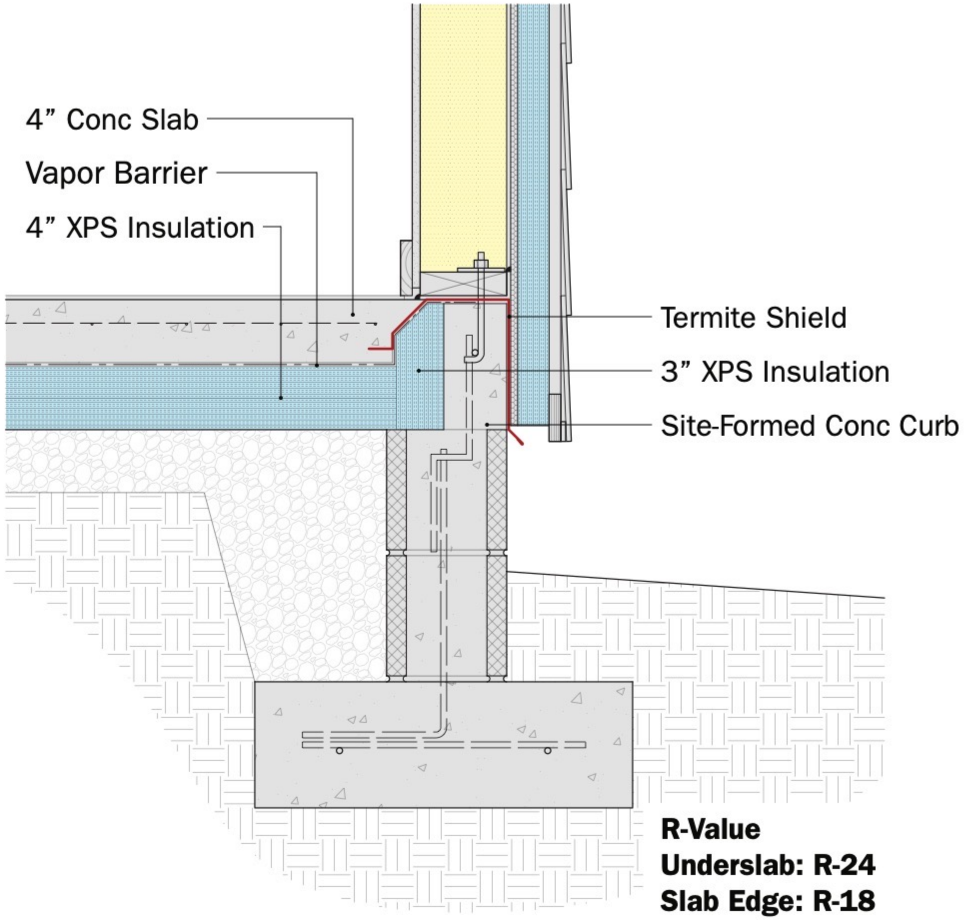
KEY ASSEMBLIES



ASSEMBLY COMPARISON: FOUNDATION & FLOOR

House 66

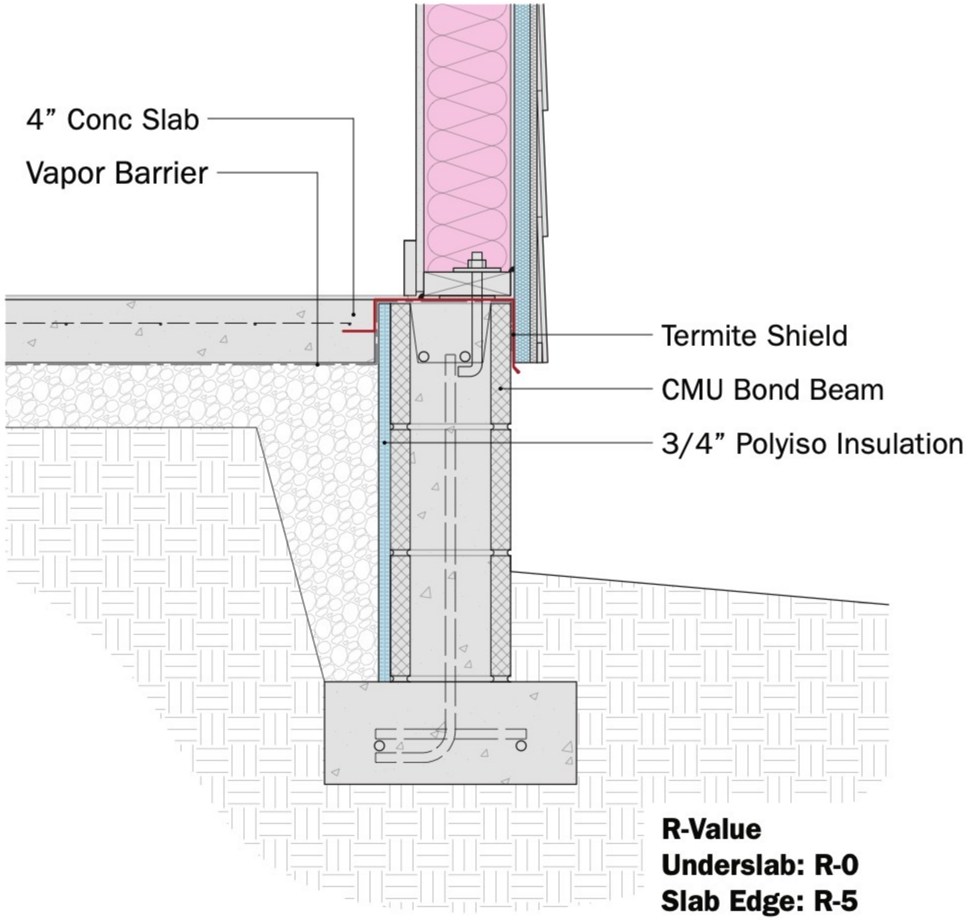
PHIUS



R-Value
Underslab: R-24
Slab Edge: R-18

House 68

ZERH

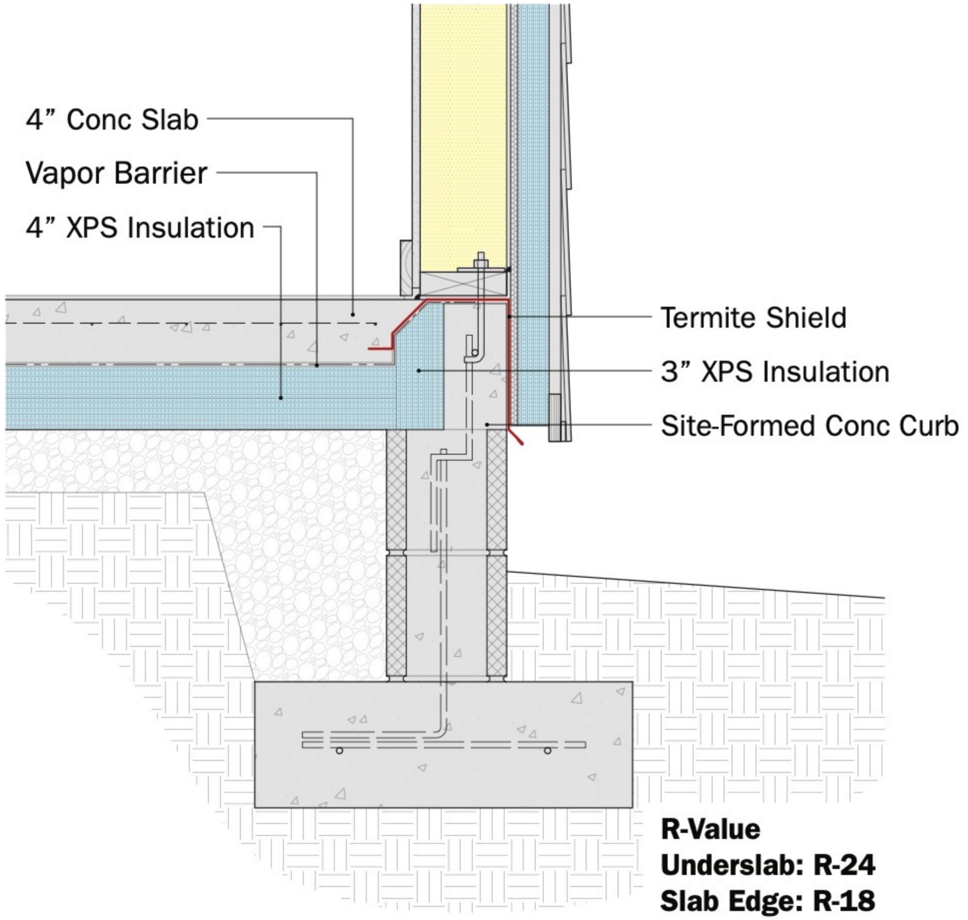


R-Value
Underslab: R-0
Slab Edge: R-5

ASSEMBLY COMPARISON: FOUNDATION & FLOOR

House 66

PHIUS

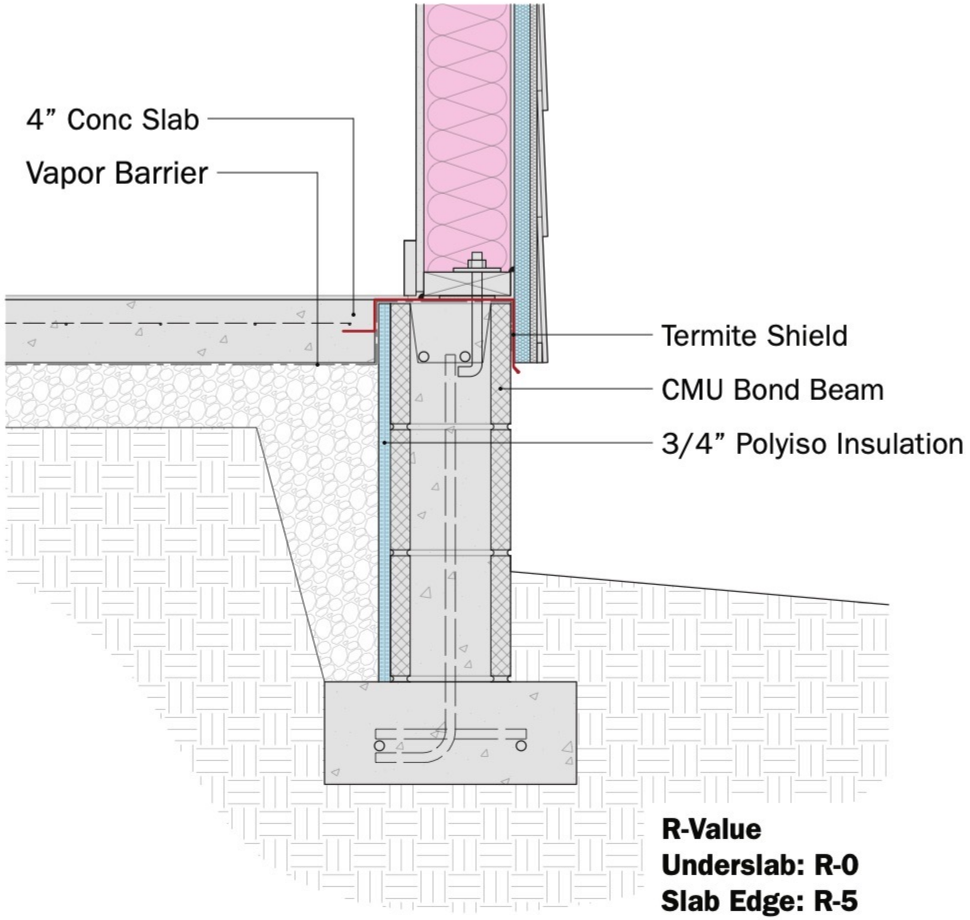


R-Value
Underslab: R-24
Slab Edge: R-18

ASSEMBLY COMPARISON: FOUNDATION & FLOOR

House 68

ZERH

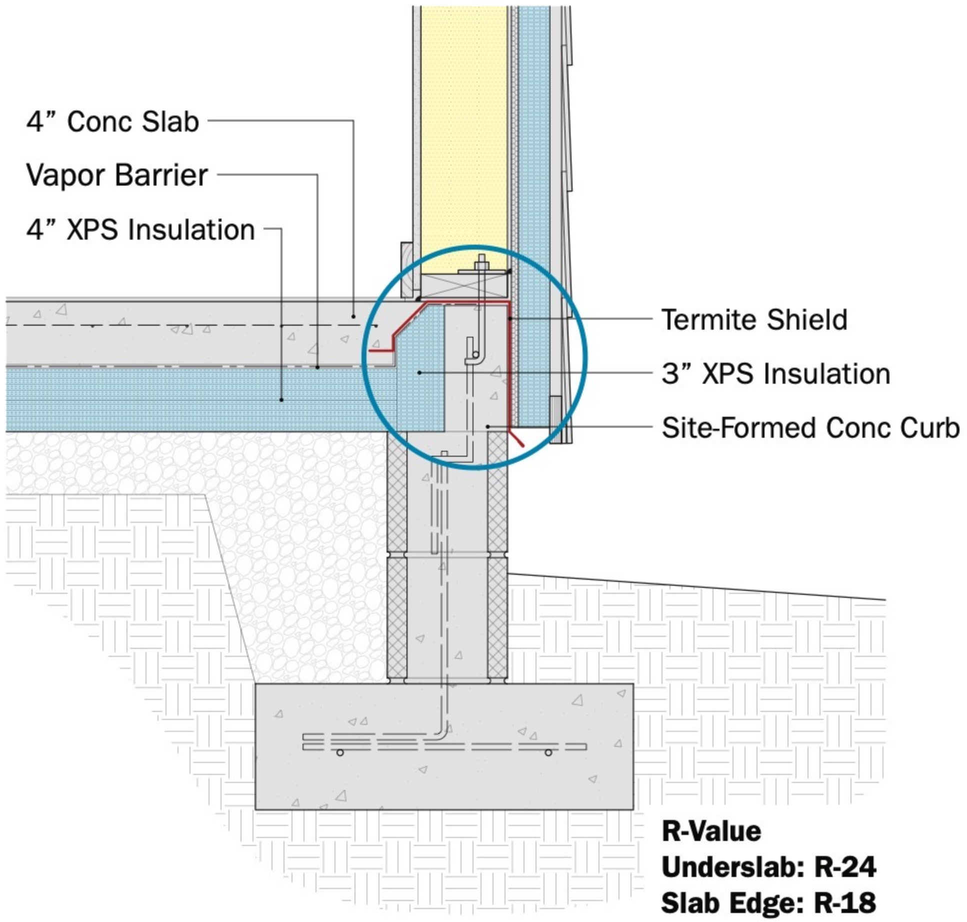


R-Value
Underslab: R-0
Slab Edge: R-5

ASSEMBLY COMPARISON: FOUNDATION & FLOOR

House 66

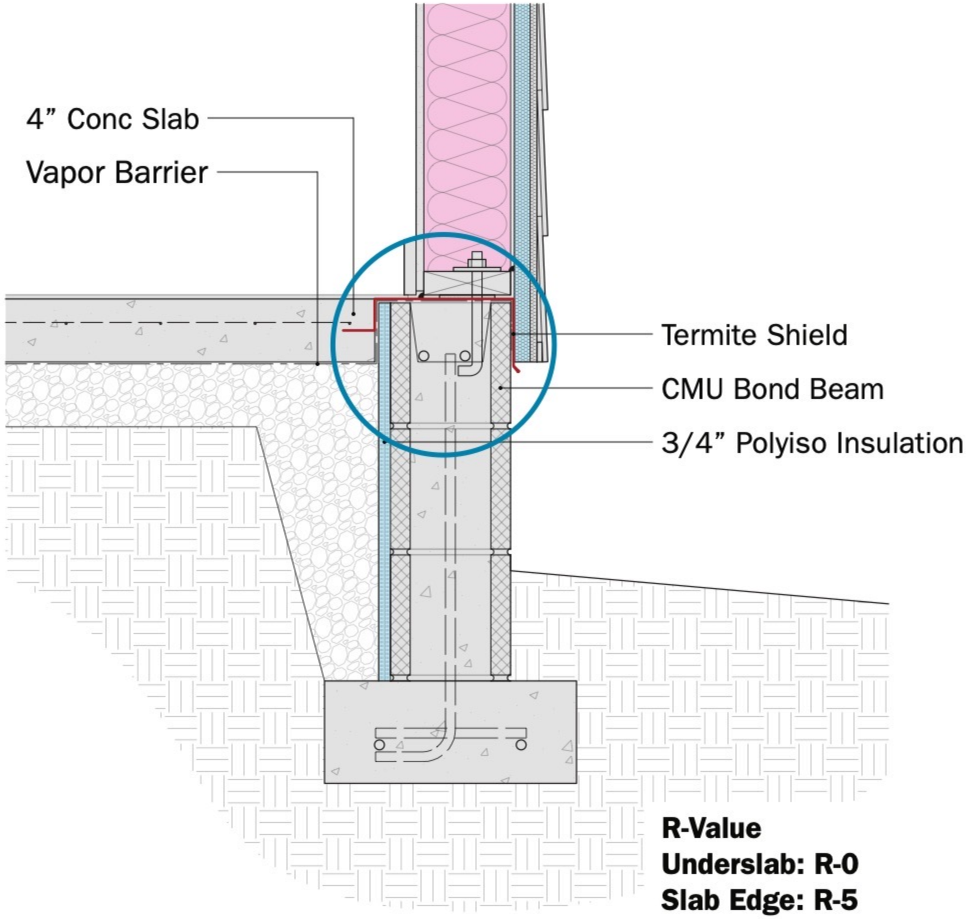
PHIUS



ASSEMBLY COMPARISON: FOUNDATION & FLOOR

House 68

ZERH

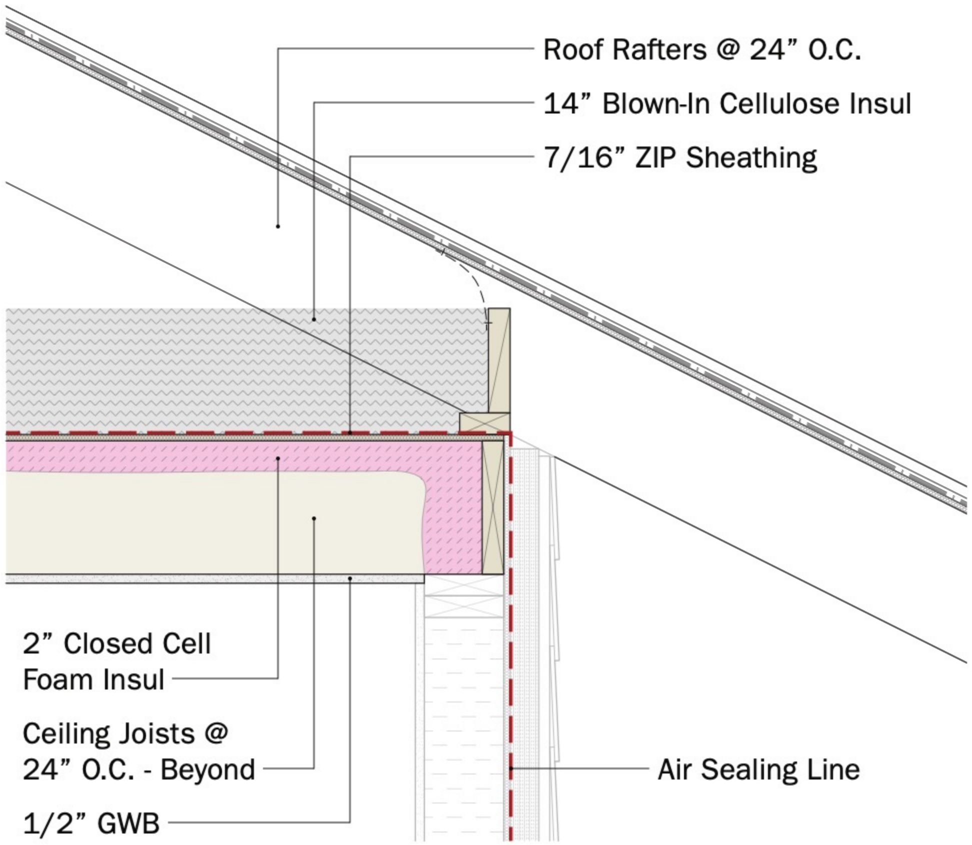


R-Value
Underslab: R-0
Slab Edge: R-5

ASSEMBLY COMPARISON: CEILING & ROOF

House 66

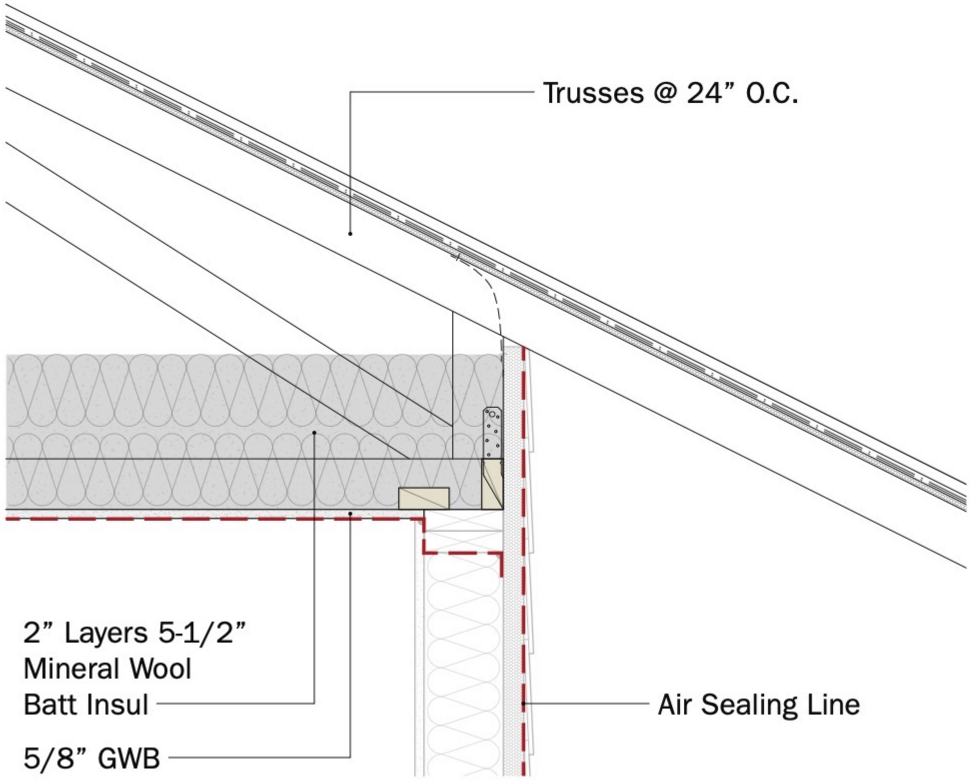
PHIUS



Total R-Value: R-62

House 68

ZERH

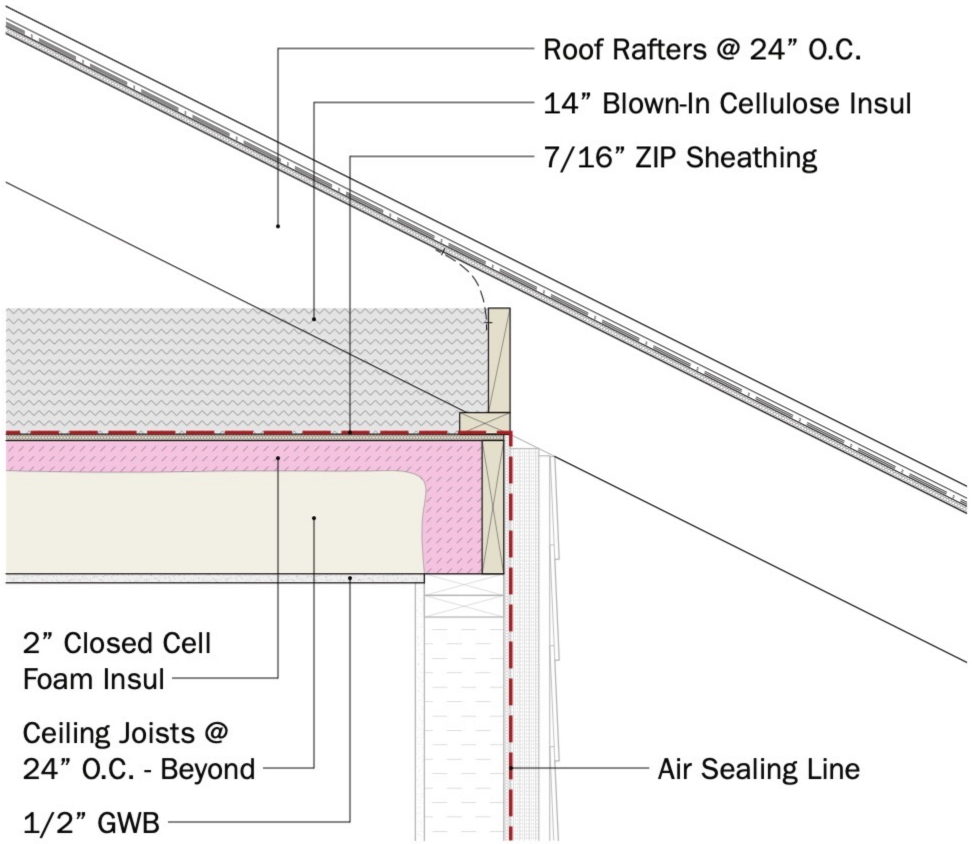


Total R-Value: R-46

ASSEMBLY COMPARISON: CEILING & ROOF

House 66

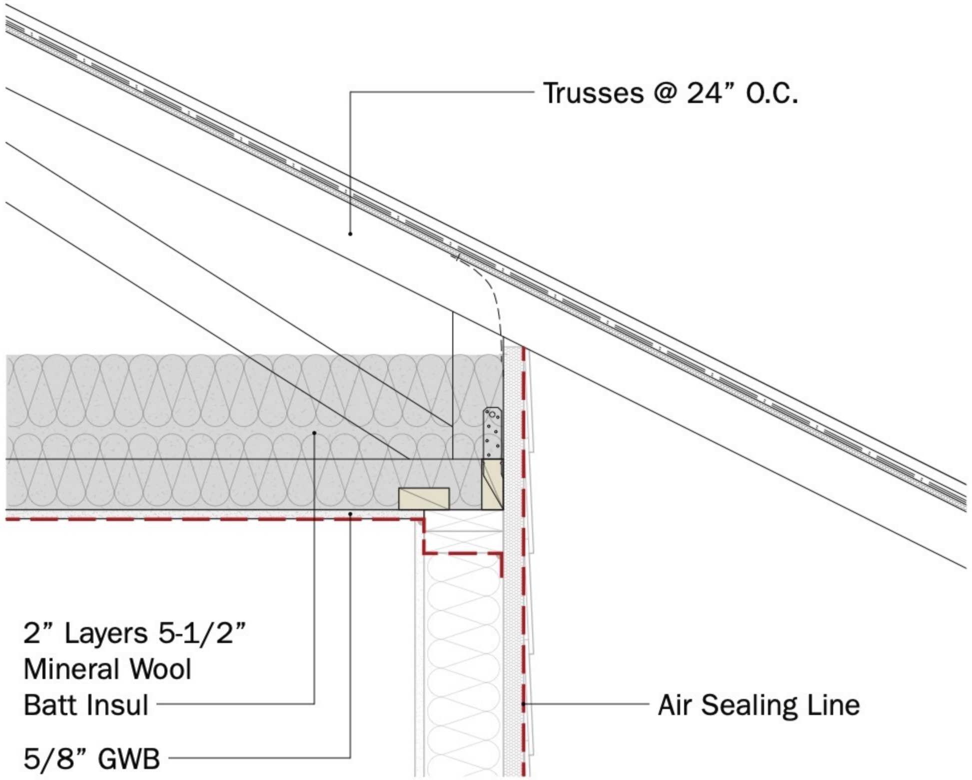
PHIUS



Total R-Value: R-62

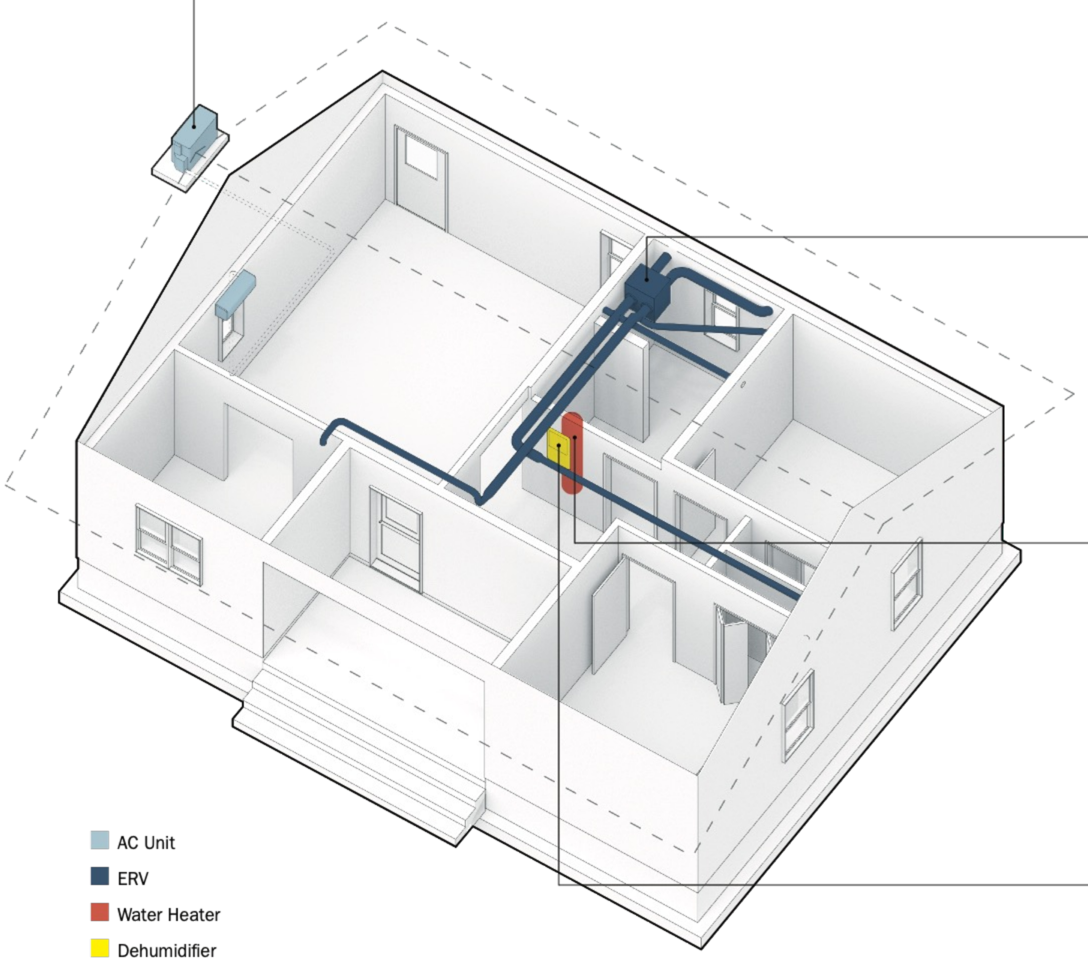
House 68

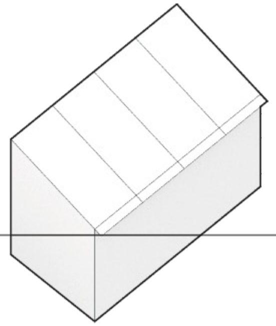
ZERH



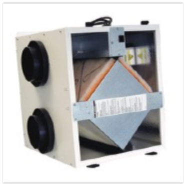
Total R-Value: R-46

ACTIVE SYSTEMS - CONSUMPTION





Ductless Mini Split
Mitsubishi



ERV
Renew-aire

Heat Pump Water Heater
AO Smith

Dehumidifier
Ultra-Aire

COST-BENEFIT ANALYSIS: Water Heater

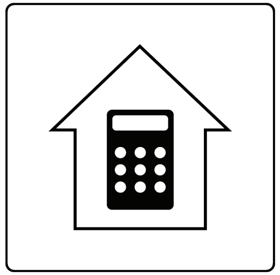
	House 68 *ZERH* | *House 70* *code*
Average monthly savings	$40.50
Average annual savings	$486
Initial cost difference of two models	$1100
Payback	**2.26 years**

COST-BENEFIT ANALYSIS: Homeowner’s Insurance

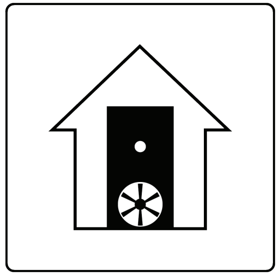
Annual homeowners insurance premium: House 68*	$472
Average annual premium: AOHFH	$1,150
Cost difference between two premiums	**$678**

** Generally, a FORTIFIED certification yields, on average, a 20% discount on wind premiums.*

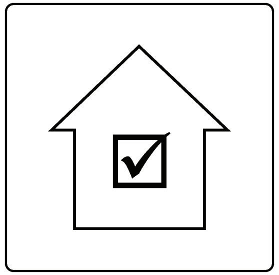
Installing an effective FORTIFIED sealed roof deck system—as well as an improved roof deck attachment and improved edge detailing on shingle roofs—can reduce damage by reducing potential water intrusion by as much as 95%. - **IBHS**



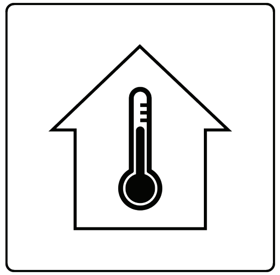
MODEL



TEST



VERIFY



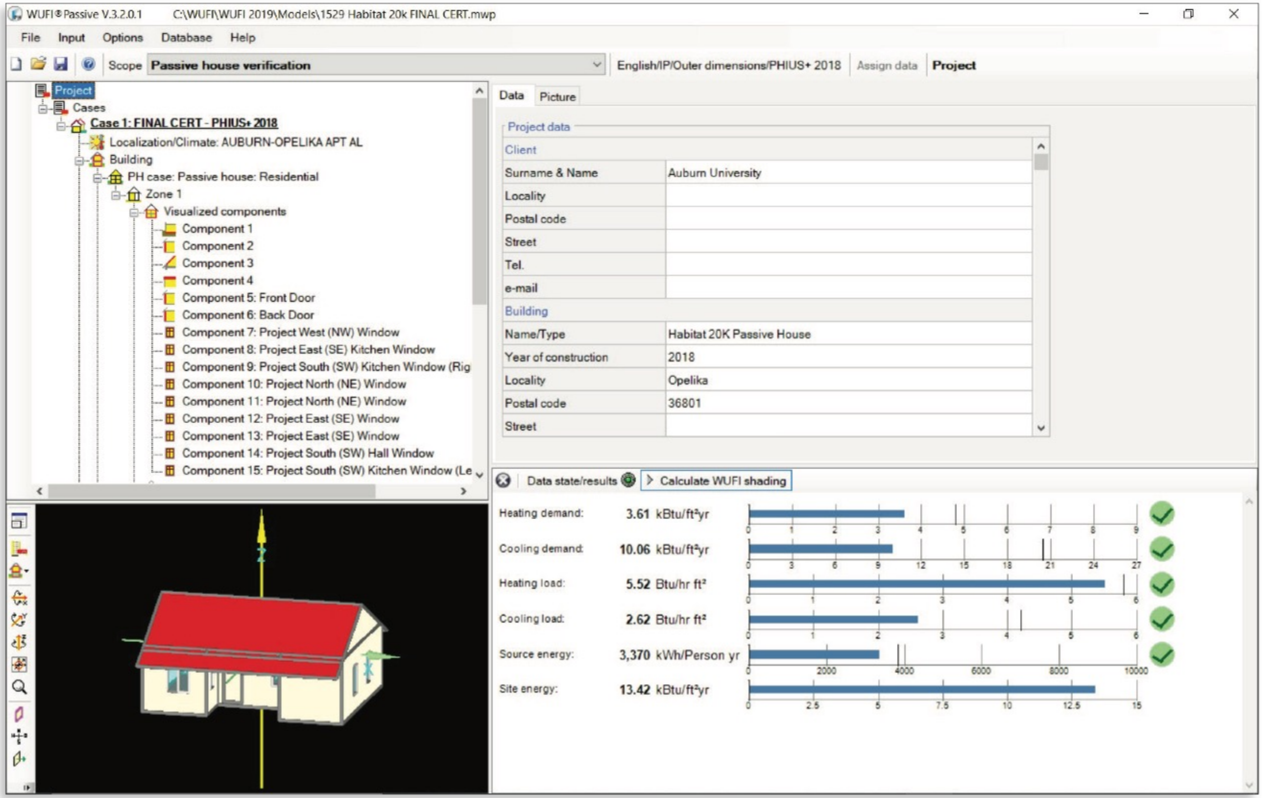
MONITOR

MODEL

TEST

VERIFY

MONITOR



MODEL

TEST

VERIFY

MONITOR

MODEL

TEST

VERIFY

MONITOR

Home Energy Rating Certificate
Final Report

Rating Date: 2018-09-10
Registry ID: 318060912
Ekotrope ID: j2rp3yGd

HERS® Index Score:

38

Your home's HERS score is a relative performance score. The lower the number, the more energy efficient the home. To learn more, visit www.hersindex.com

Annual Savings

$855

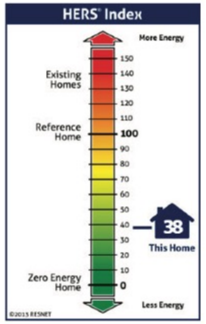
*Relative to an average U.S. home

Home:

Builder:
Real Life Homes

Your Home's Estimated Energy Use:

	Use [MBtu]	Annual Cost
Heating	3.7	$99
Cooling	0.4	$12
Hot Water	1.3	$34
Lights/Appliances	11.7	$309
Service Charges		$0
Generation (e.g. Solar)	0.0	-$0
Total:	**17.2**	**$454**



Home Feature Summary:

Home Type:	Single family detached
Conditioned Floor Area:	915 sq. ft.
Number of Bedrooms:	2
Primary Heating System:	Air Source Heat Pump • Electric • 12.8 HSPF
Primary Cooling System:	Air Source Heat Pump • Electric • 24.6 SEER
Primary Water Heating:	Water Heater • Electric • 3.42 Energy Factor
House Tightness:	40 CFM50 (0.35 ACH50)
Ventilation:	72.0 CFM • 40.0 Watts
Duct Leakage to Outside:	Untested
Above Grade Walls:	R-31
Ceiling:	Attic, R-61 + Radiant Barrier
Window Type:	U-Value: 0.18, SHGC: 0.25
Foundation Walls:	N/A

This home meets or exceeds the criteria of the following:

Energy Star v3
Energy Star v3.1
2018 International Energy Conservation Code
2015 International Energy Conservation Code
2012 International Energy Conservation Code
2009 International Energy Conservation Code
2006 International Energy Conservation Code

Rating Completed by:

Energy Rater: Bruce Kitchell
RESNET ID:7668731

Rating Company: Airedale Energy Consultants
1464 Shadowrock Heights, Marietta, GA 30062
404-218-0905

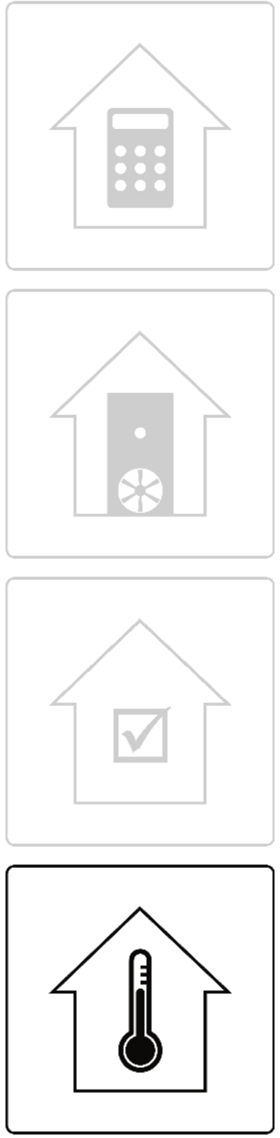
Rating Provider: Energy Vanguard
533 W Howard, Suite E, Decatur, GA 30030
678-662-4332

B. Kitchell

Bruce Kitchell, Certified Energy Rater
Digitally signed: 10/10/18 at 2:56 PM

ekotrope™

Ekotrope RATER - Version:3.1.0.2024
The Home Energy Rating Standard Disclosure for this house is available from the rating provider.
This report does not constitute any warranty or guarantee.



MODEL

TEST

VERIFY

MONITOR

AIR SEALING

2012 IRC: 7 ACH50

2018 IRC: 3 ACH50

	(pre-intervention) *First Blower Door Test*	*(post-intervention)* *2nd Blower Door Test*	*Final Blower Door Test*	*HERS*
Joanne (41A)	6.3	3.7	2.9	52
Mac (41B)	7.6	3.7	3.5	51
Dave (43A)	6.3	3.9	3.3	54
Joanne (43B)	5.2	2.9	2.7	52
Average	**6.35**	**3.55**	**3.1**	**52**

KEY TAKEAWAYS

Assess the needs, risks, and opportunities of each specific project.

What hazards are you trying to address (wind, rain, flood, fire, etc.)? How easy or difficult is it for home occupants to access and utilize existing shared resources versus what needs to be provided in the home (eg. is there a local community shelter resident can access during a storm event, or will residents need to shelter in place)? What infrastructure is or is not in place for the features you plan on integrating into the home (eg. does the local energy company offer bidirectional metering or will batteries need to store any energy produced on-site)? What policy or financial incentives can be leveraged to increase building performance (tax credits, insurance discounts, etc.)?

Plan ahead.

Setting expectation at the outset of the project and planning accordingly is key for incorporation of multiple—occasionally conflicting—standards in a cost- and time-efficient manner. Think through construction sequencing. How are you going to adequately air seal around all of those FORTIFIED anchors? How do you insulate the perimeter wall running directly behind your concrete safe room? How do you provide continuous insulation in a way that satisfies both your PHIUS evaluator and your termite company?

Check your work along the way...and make sure the evaluator does too.

Don't wait until closing out construction to ensure you're on track to meet performance expectations. Take advantage of third-party inspections throughout the construction process. Is your HERS rater coming out to do an insulation inspection? Ask them to run a blower door test while they're out so you can identify and correct any deficiencies before the walls are closed up. Get those inspections on your schedule; missing them can mean missing out on certification and potential incentives that come with achieving beyond-code performance.

RURAL
STUDIO


Thank You