

# Housing Kentucky Families:

new vision  
new strategies

2015 Kentucky Affordable Housing Conference



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# **Construction Innovations Part 1: Beyond Stick-Built Homes**

2015 Kentucky Affordable Housing Conference

# Panelists

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Megan Neff	NextStep Network
Tom Manning-Beavin	Kentucky Highlands Investment Corporation
Jill Lewis Smith	Civic Consultants Inc.
<i>Kip Lewis</i>	<i>Ohio Capital Corporation moderator</i>

2015 Kentucky Affordable Housing Conference

*Construction Innovations*

*Part 1: Beyond Stick-Built Homes*

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**Megan Neff**

**NextStep Network**

2015 Kentucky Affordable Housing Conference

**Next Step is a social enterprise with the mission to put sustainable homeownership within reach of everyone, while transforming the manufactured housing industry one home at a time.**



**Manufactured homes are an important source of affordable housing for Kentuckians.**

- 13.6% of the state's overall residential stock
- 85,000 built before 1976 (HUD Code enacted)



**For 50+ years, the industry has failed to provide higher quality, energy efficient homes installed correctly and coupled with good financing.**

**Next Step is the only place where the elements for manufactured housing “done right” come together.**



**Homebuyer  
Rights**



**Fair  
Loans**



**Pricing  
Transparency**



**Homebuyer  
Education**

**Next Step is creating a new distribution channel for quality ENERGY STAR homes through an existing value chain with our nonprofit network, while leveraging the factory-built housing industry's retailer distribution channel.**



In addition to building a nonprofit network, we are poised to **engage with the industry to instill these principles in a wider market**, thereby increasing our mission impact while we ramp up our sales volume.



## Advantages of the Next Step System

- **Speed:** Quicker cycle time = shorter carrying costs
- **Efficiency:** Predictable construction process less susceptible to weather delays, faster and requires less construction management by staff
- **Affordability:** Wholesale preferential pricing because of volume orders
- **Flexibility:** Manufactured and modular versions of most homes available
- **Eco-Friendly:** Next Step manufactured homes are 10 to 15% more energy efficient than many ENERGY STAR homes
- **Accessibility:** Next Step Homes meet many Universal Design Standards
- **Sustainability:** Homeowners gain access to education and fair financing
- **Scalability:** Product delivery tailored to markets nationwide

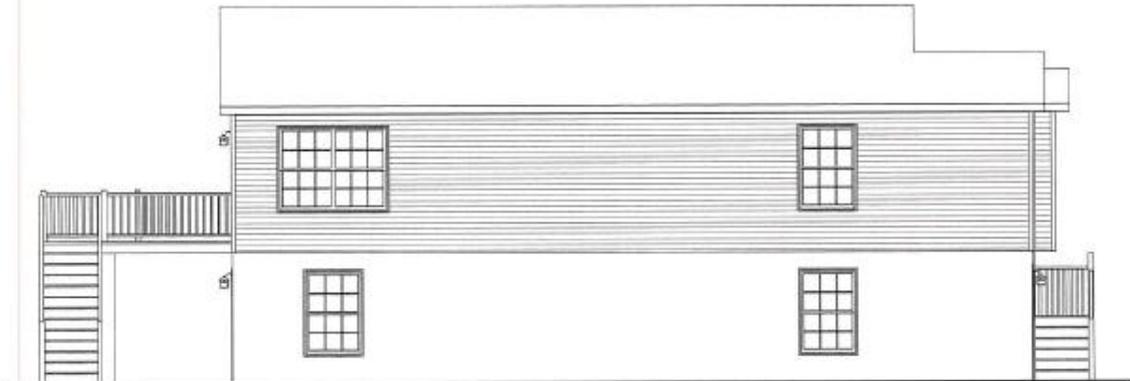
# Affordable Housing Alliance Solar at Pine Tree Community



# Affordable Housing Alliance Union Beach



**FRONT ELEVATION**



**LEFT ELEVATION**

# Community Frameworks Elder Cottage



# Community Frameworks High Performance Home



# Community Frameworks Tiny Homes for the Homeless





## Contact Information

**Thank you for your interest and participation!**

**For further information, contact:**

**Megan Neff, Communications Manager**

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**502.694.1976**

*Construction Innovations*

*Part 1: Beyond Stick-Built Homes*

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**Tom Manning-Beavin**

**Kentucky Highlands Investment Corp.**

2015 Kentucky Affordable Housing Conference

# Construction Innovations Part I: Beyond Stick-Built Homes

Houseboats to Energy  
Efficient Residences (HBEER)

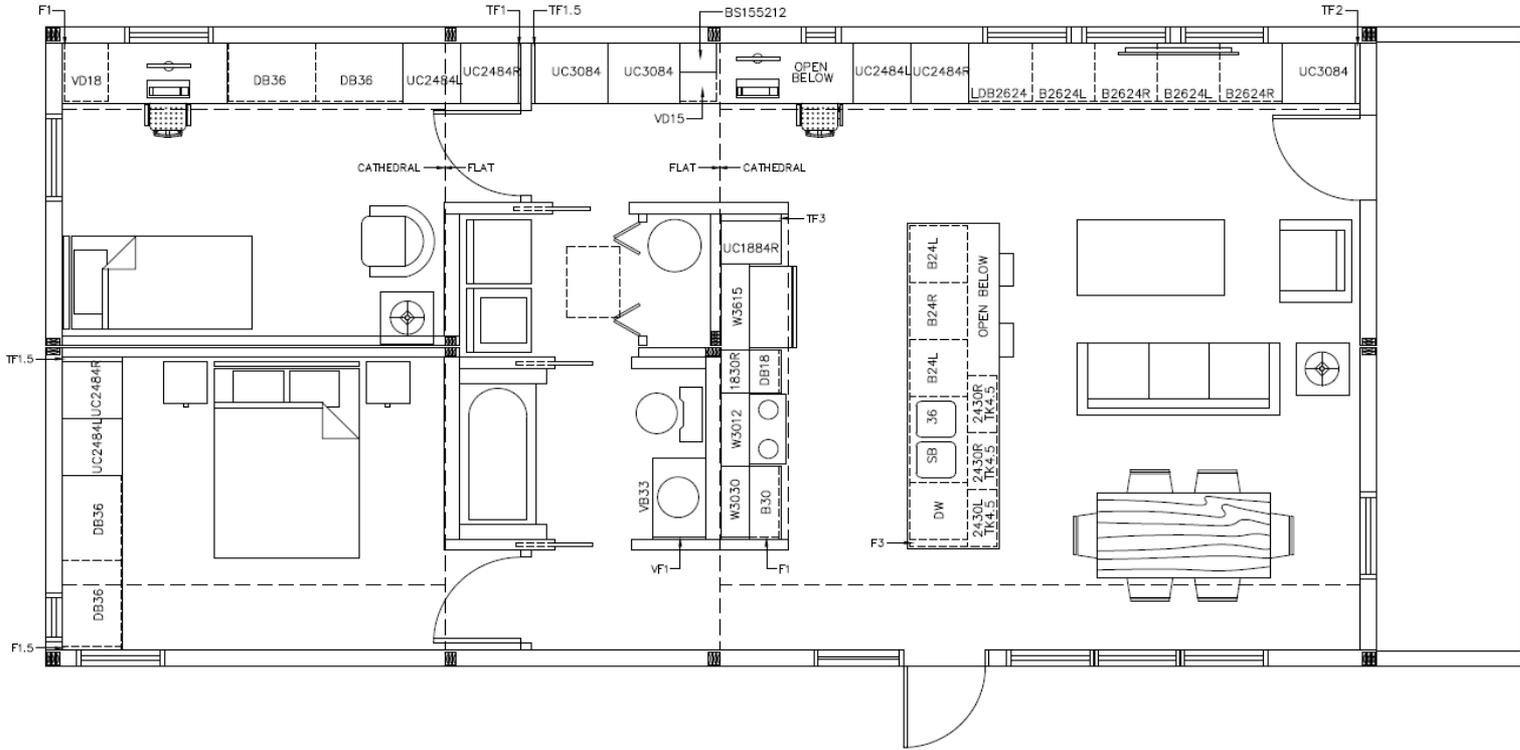
# Houseboats to Energy Efficient Residences: HBEER

- ▶ Recession hit the houseboat sector in Southern Kentucky hard in 2008-2009:
  - ▶ Up to 90% of jobs lost
  - ▶ By 2009, 148 jobs remained in 3 factories (down from a high of 11 factories)
  - ▶ 2 fully operational companies today, recently announced a joint venture: Trifecta
- ▶ Big Idea: use idle manufacturing capacity to build energy efficient residences
- ▶ HBEER becomes a ‘brand name’

# The HBEER Concept

- ▶ Approaching University of Kentucky, College of Design
  - ▶ Solar Decathlon House ~ \$800/ft<sup>2</sup>
  - ▶ Interested in real-world challenge
- ▶ The HBEER Challenge:
  - ▶ Total Development Cost: \$100,000
  - ▶ \$1/day for electricity
  - ▶ 70% Kentucky-sourced products
- ▶ HBEER Studio is formed

DB = DRAWER BASE  
 UC = UTILITY CABINET  
 TF = TALL FILLER  
 BS = BOOK SHELF  
 LDB = LOW DRAWER BASE  
 VB = VANITY BASE  
 VD = VANITY DRAWER BASE  
 VF = VANITY FILLER  
 F = FILLER  
 W = WALL CABINET  
 B = BASE CABINET  
 TK = TOE KICK



1 HBEER-1 FURNITURE PLAN  
 A2 SCALE: 1/4" = 1'-0"

# HBEER Prototypes

- ▶ HBEER 1 & 2
  - ▶ Boxes - less than 12 feet wide
  - ▶ HERS score: 53
  - ▶ Tight Envelope: 203 CFM @ 50 Pascal
  - ▶ ~\$150/ft<sup>2</sup> for 1,035 ft<sup>2</sup>
- ▶ Innovative technologies
  - ▶ Mini-split heat pumps & ERV
  - ▶ Structured Insulated Panels (SIPs)
  - ▶ Heat pump hot water heater
- ▶ Short HBEER video
  - ▶ <http://www.youtube.com/watch?v=9p8EWiZYgGM>
- ▶ Long HBEER video
  - ▶ <http://www.youtube.com/watch?v=Cty7TYUTAaU>











# HBEER Lessons

- ▶ Why modular?
  - ▶ Materials protected from the elements during construction
  - ▶ Speed of development: site & unit on parallel paths
- ▶ Panels vs. Boxes
- ▶ Concept of Design Liberation
  - ▶ Panels are less constrained by load limits
  - ▶ Box & Hat variations possible
  - ▶ Systems less entangled
    - Envelope/Shell: very durable (> 100 lifespan)
    - Interior walls: can be moved without impacting envelope
    - MEP: adaptable to evolving needs and technologies

# HBEER 3

- ▶ Value engineering
- ▶ Features include:
  - ▶ Panelized floor and walls in the factory
  - ▶ Flash and batt insulation
  - ▶ Conditioned crawlspace
  - ▶ Conventional HVAC
  - ▶ Heat pump hot water heater
- ▶ HERS rating: 58
- ▶ Air tightness: 550 CFM<sub>50</sub>
- ▶ Cost: ~\$104/ft<sup>2</sup> for 1,144 ft<sup>2</sup>



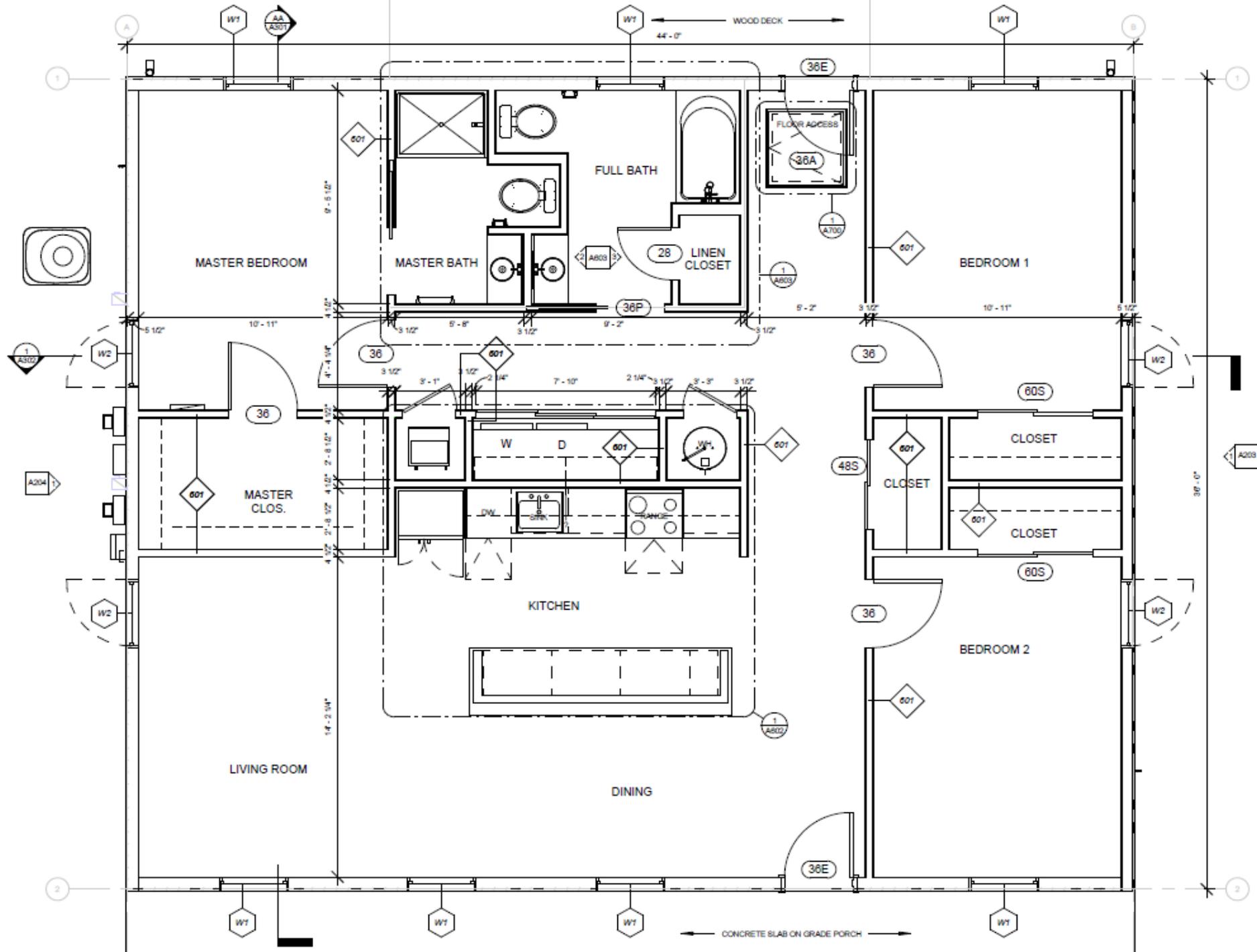


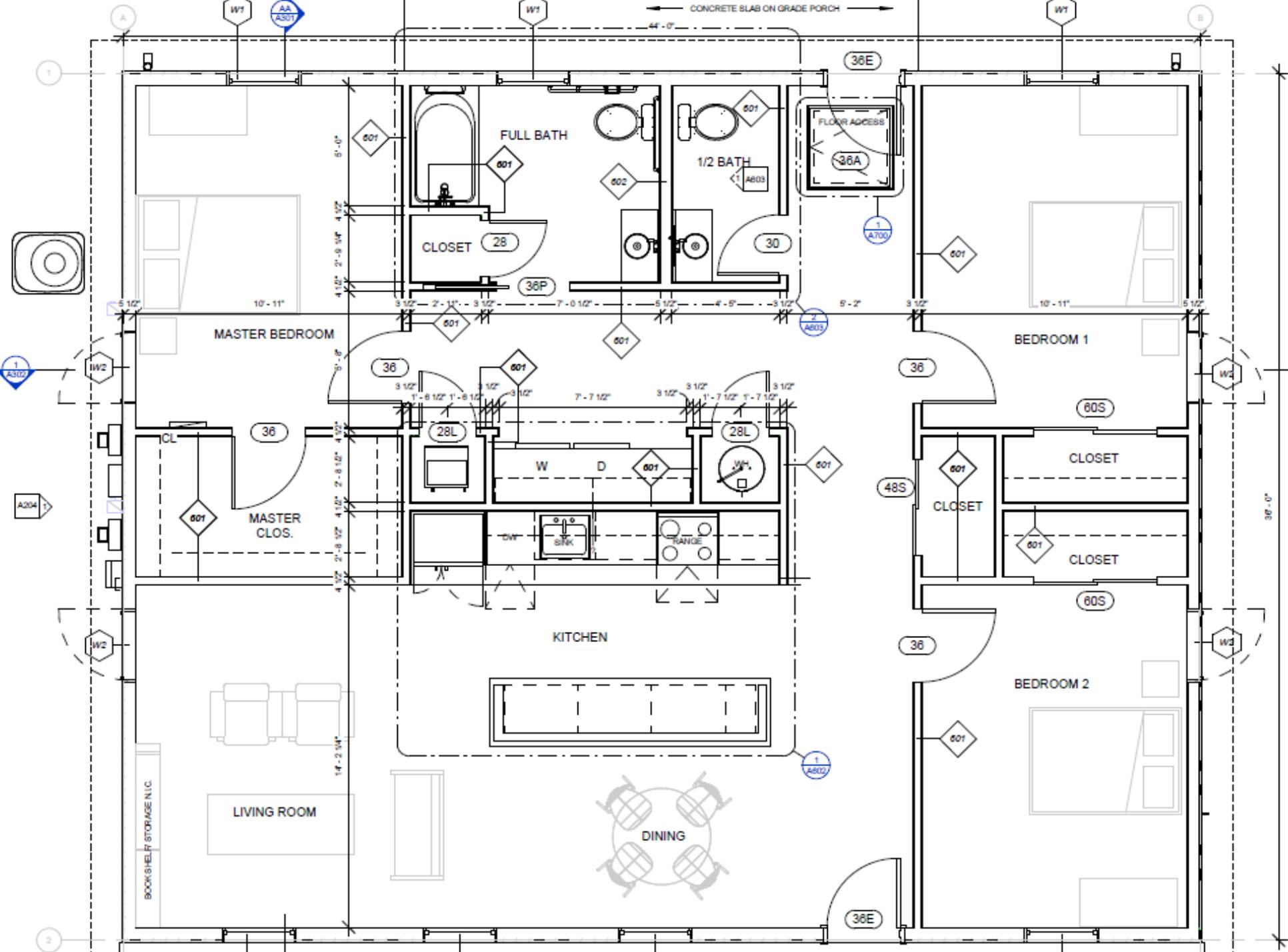


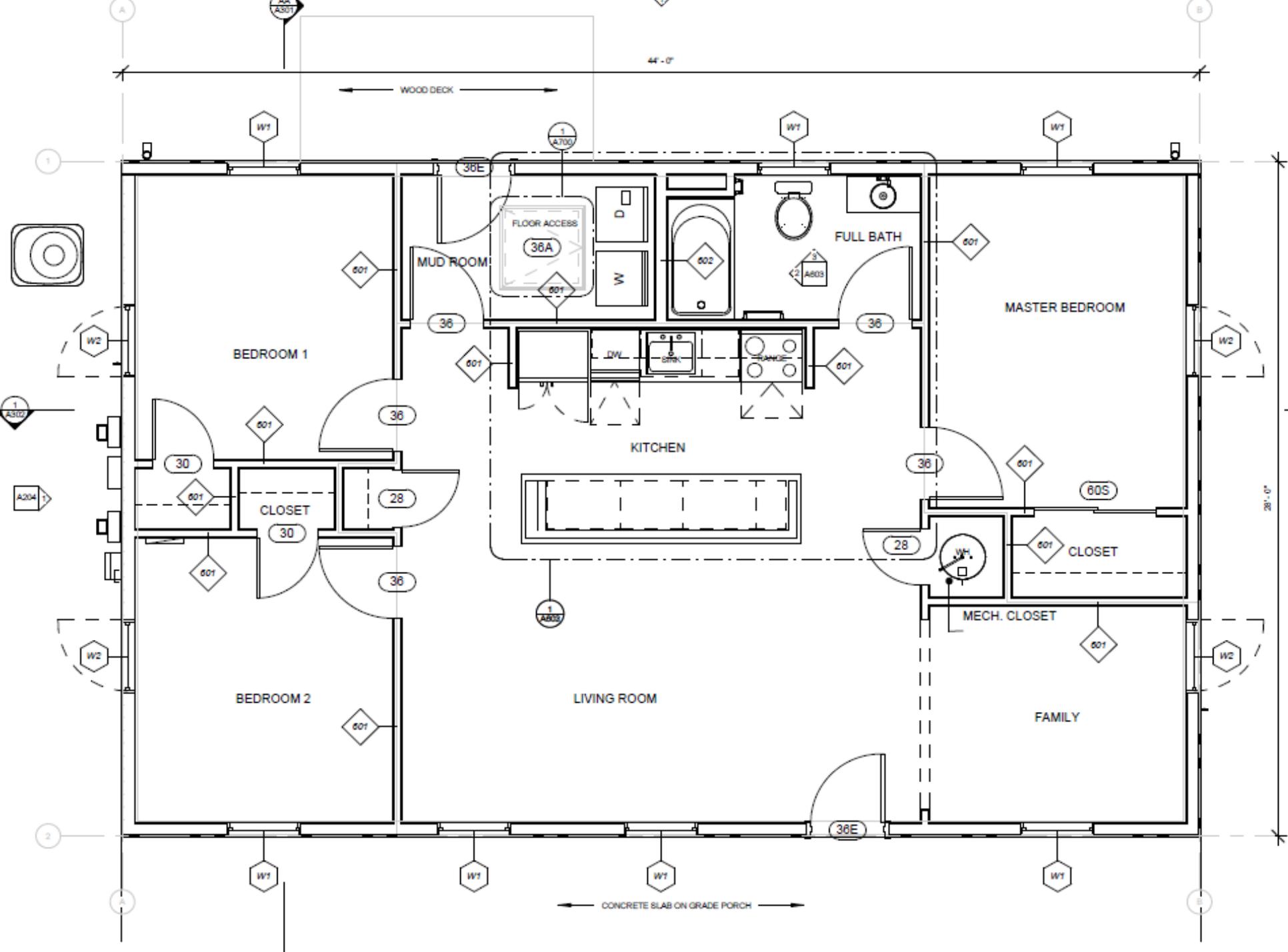


# HBEER 4, 5 & 6

- ▶ 13 units in Whitley County - funded with CDBG from DLG
- ▶ More value engineering
- ▶ Features include:
  - ▶ Pod and panel construction
  - ▶ Zip System sheeting
  - ▶ Dense-pack cellulose
  - ▶ Conventional HVAC & heat pump hot water heater
  - ▶ Conditioned crawlspace
  - ▶ PV electrical generation (~ 4 KW array)
  - ▶ 1, 1 ½ and 2 bathroom designs
- ▶ HERS ratings: 30 (with PV); 51 (without PV)
- ▶ Cost: ~\$89/ft<sup>2</sup> for 1,584 ft<sup>2</sup> (1 ½ bathroom model w/out PV)











Link-Belt

689343







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# *Construction Innovations*

## *Part 1: Beyond Stick-Built Homes*

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**Jill Lewis Smith, AIA, NCARB**  
**Civic Consultants, Inc.**

2015 Kentucky Affordable Housing Conference

# **Affordable CONCRETE** **HOMES**

JILL LEWIS SMITH, AIA, NCARB

PRESENTATION PREPARED BY CIVIC CONSULTANTS INC

# PRESENTATION OBJECTIVES

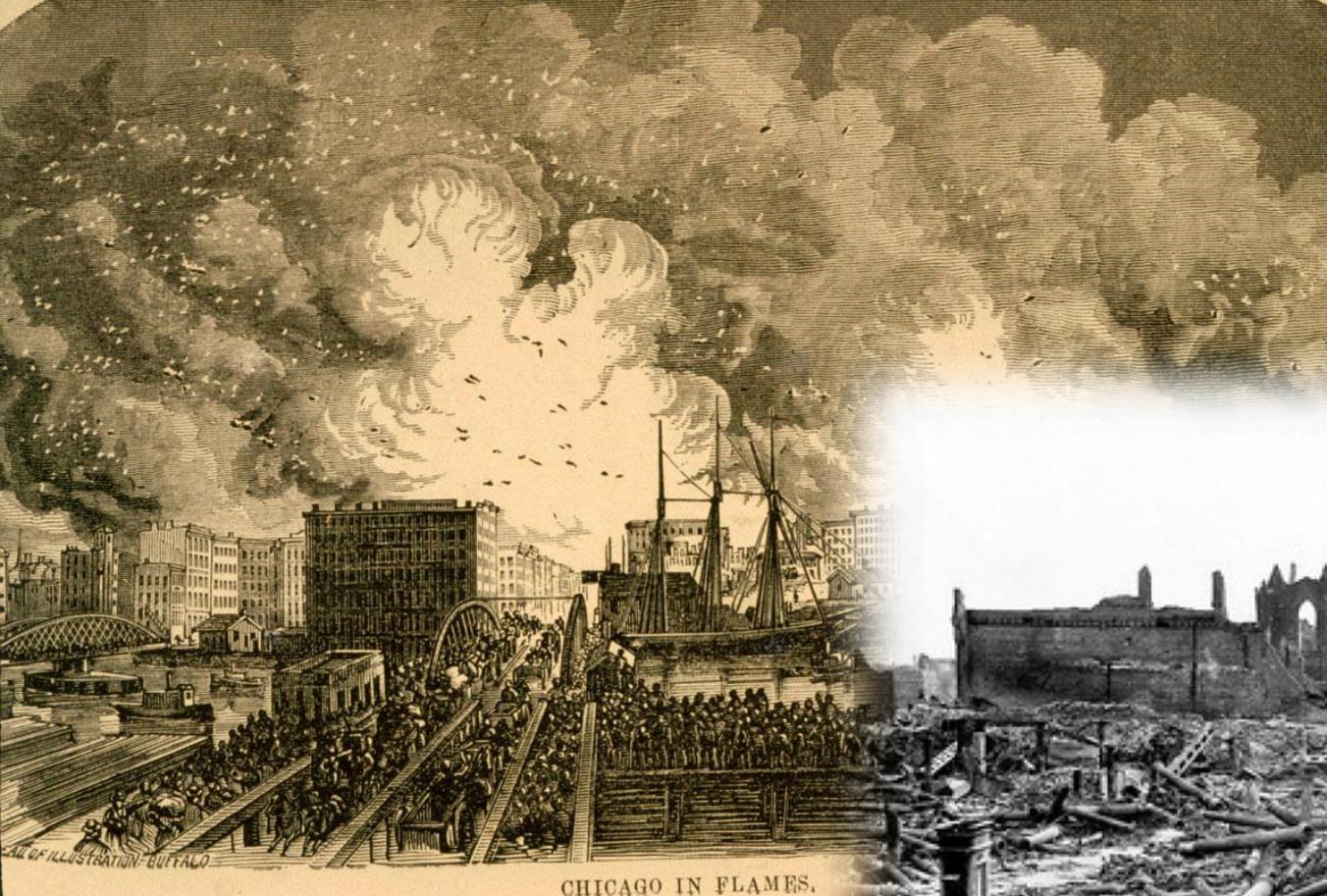
- REVIEW THE LONGEVITY OF CONCRETE AS A CONSTRUCTION MATERIAL FOR BUILDINGS.
- UNDERSTAND HOW AN ICF HOME CAN COST THE SAME AS A WOOD HOME.
- MAXIMIZE ENERGY EFFICIENCY OF THE EXTERIOR SHELL OF A HOME.
- UNDERSTAND WHY LOW OPERATIONS COSTS AND STRUCTURAL STABILITY ARE IMPORTANT TO OUR ECONOMY.

NERO PLAYING HIS FIDDLE WHILE WATCHING ROME BURN – JULY 19, 64 A.D.



BUILT BY EMPEROR HADRIAN  
117-138 A.D. TO REPLACE  
MARCUS AGRIPPA'S PANTHEON  
BUILT IN 27 B.C. AND REBUILT  
WITH CONCRETE IN 80 A.D.  
REBUILT WITH WOOD 3 TIMES  
BEFORE CONSTRUCTED WITH  
CONCRETE.





CHICAGO IN FLAMES.

ALL OF ILLUSTRATION - BUFFALO



THE GREAT CHICAGO FIRE –  
OCTOBER 8<sup>TH</sup> – 10<sup>TH</sup>, 1871



**ARCHITECTS AND ENGINEERS ARE DESIGNING BUILDINGS AND STRUCTURES TO WITHSTAND MOTHER NATURE. THE ONLY THING WE KNOW ABSOLUTELY IS MOTHER NATURE WILL WIN! IT IS OUR RESPONSIBILITY TO TRY AND HOLD OFF HER VICTORY FOR AS LONG AS POSSIBLE, AT LEAST PAST OUR LIFE TIME!**



**BREEZY POINT, QUEENS, NEW YORK – HURRICANE SANDY – OCTOBER 29, 2012**

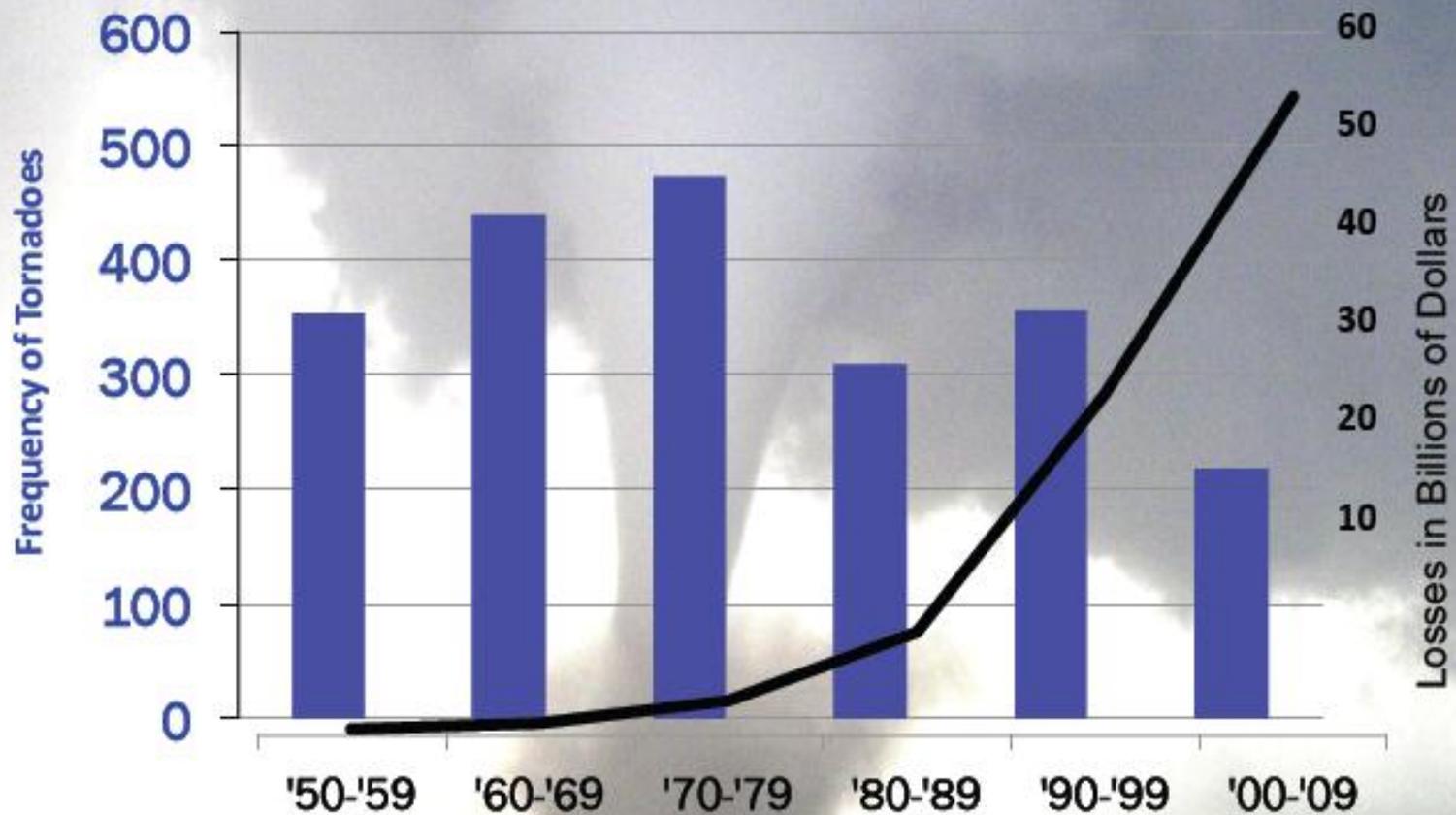
[go to video]



Hurricane Katrina August 2005 - \$108 billion in damages, 1,833 lives taken.



# Tornado Losses vs. Number of EF3- EF5\*



\*National Weather Service

[go to video]



ELLISVILLE, ALABAMA – APRIL 27, 2011

## Crittenden Co. Fire Station



Pre-fab Metal Building

Built: 2012

Cost: \$692,520

6,418 sq. ft. - \$107.90/sq. ft.

## Lewisburg Fire Station



ICF and Masonry Structure

Built: 2011

Cost: \$617,792

7,206 sq. ft. - \$85.73/sq. ft.

**ICF FIRE STATION = COST LESS, DISASTER RESILIENT, LOWER ENERGY COSTS, MORE ATTRACTIVE**



*To be able to provide a storm-safe, energy-efficient and high quality construction alternative to the typical modular home buyer.*



This is a HUDURA home

Hurricane Ivan August 2004 - \$81 billion in damages, 91 lives taken.



Hurricane Andrew August 1992 - \$26 billion in damages, 43 lives taken.

**FACT: The majority of deaths in tornados and hurricanes are people taking shelter in modular homes.** While modular homes provide a low cost place for people to live, they are not built to withstand extreme weather conditions.

# MODULAR HOME

# CONCRETE HOUSE

BOTH CAN BE CONSTRUCTED AT YOUR SITE FOR SIMILAR COSTS. WHICH WOULD YOU RATHER LIVE IN?

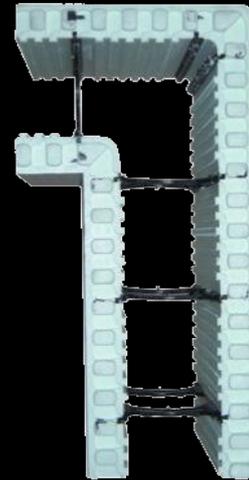




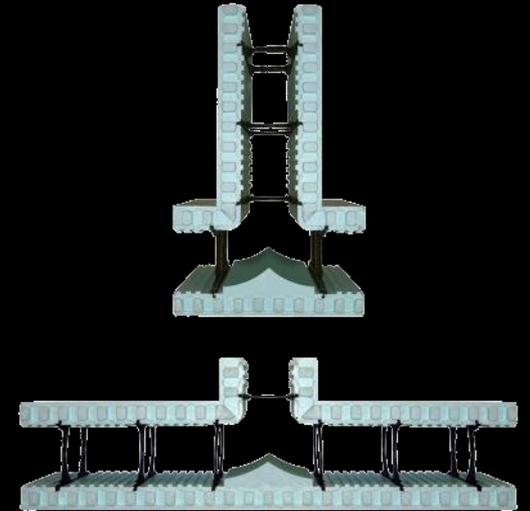
Radius Walls



45° Degree  
Corners



90° Degree  
Corners

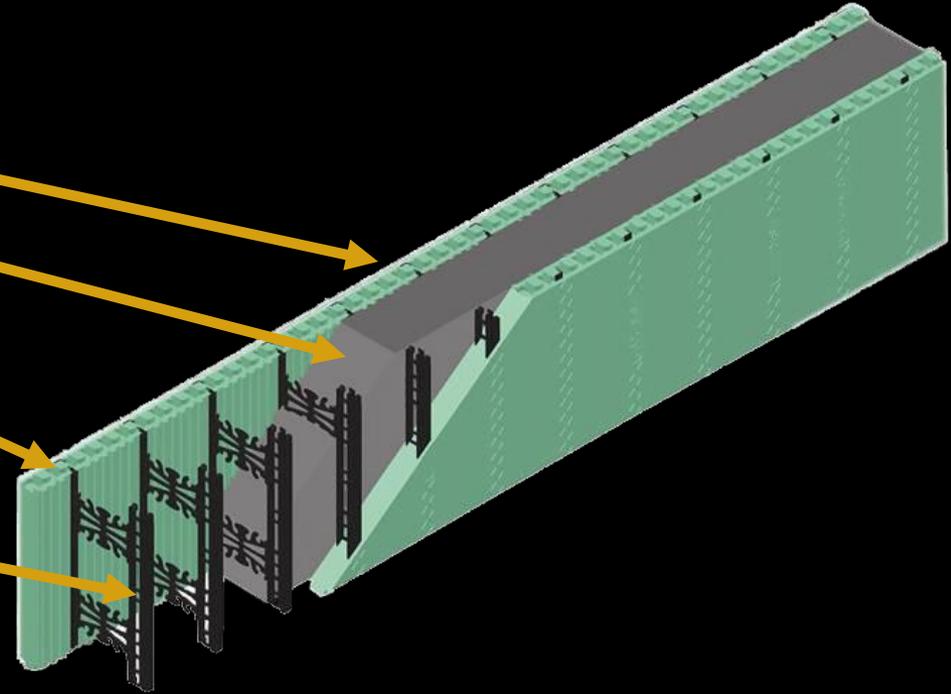


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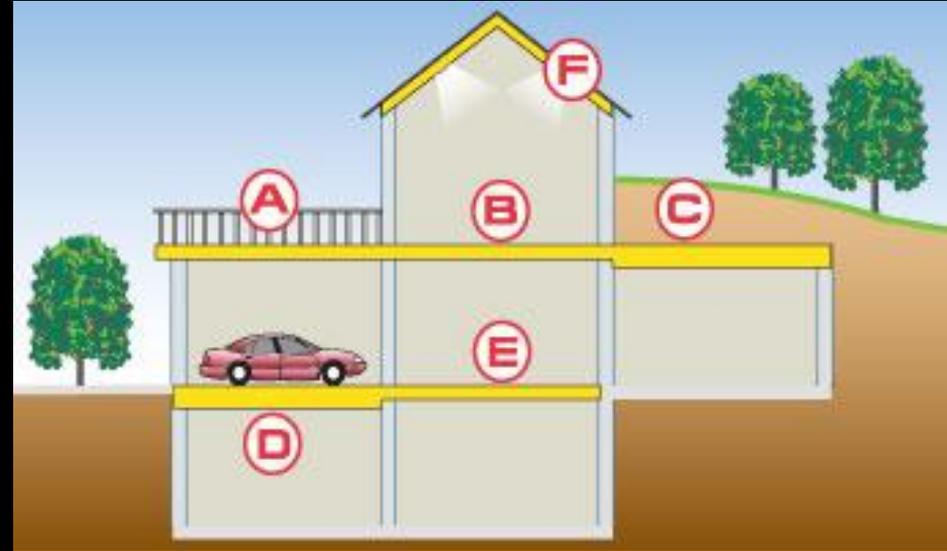
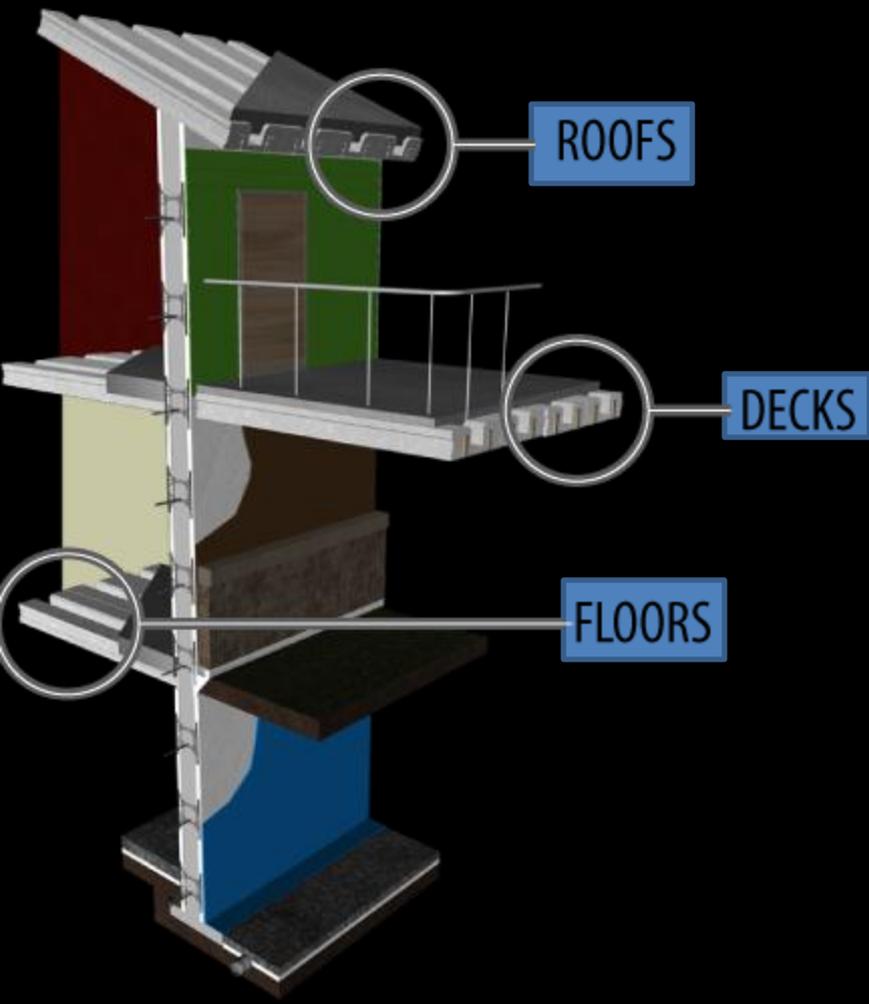
# ICF Basics

- Six wall elements

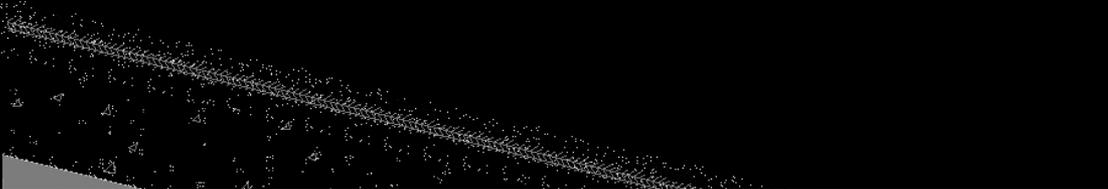
1. Form system
2. Wall structure
3. Insulation
4. Air barrier
5. Vapor barrier
6. Interior and exterior finish anchorage



Having six wall elements in one product eliminates costly building steps and allows your structure to be constructed faster and more efficiently.



- |          |                    |          |                        |
|----------|--------------------|----------|------------------------|
| <b>A</b> | Decks and Patios   | <b>D</b> | Elevated Garage Floors |
| <b>B</b> | Multi-Story Floors | <b>E</b> | Floors                 |
| <b>C</b> | Flat Roofs         | <b>F</b> | Pitched Roofs          |



## Breckinridge Co. Public Library



Built: 2012

Cost: \$2,445,000

10,500 sq. ft. - \$232/sq. ft.

**THIS WAS BID AS A METAL STUD AND STEEL FRAME OR ICF BUILDING.  
THE COST TO BUILD WITH ICF WAS \$77,000 LESS THAN  
CONVENTIONAL METAL STUDS AND STEEL FRAME.  
ICF LIBRARY = COST LESS, LOWER ENERGY COSTS.**

# MAXIMIZE ENERGY EFFICIENCY OF THE EXTERIOR SHELL OF A BUILDING



CAN YOU GUESS WHICH ONE HAS THE MOST ENERGY LOSS?

## DEFINITIONS

**R-VALUE: A MEASURE OF RESISTANCE TO THE FLOW OF HEAT THROUGH A GIVEN THICKNESS OF A MATERIAL (AS INSULATION) WITH HIGHER NUMBERS INDICATING BETTER INSULATING PROPERTIES**

**U-VALUE: A MEASURE OF THE HEAT TRANSMISSION THROUGH A BUILDING PART (AS A WALL OR WINDOW) OR A GIVEN THICKNESS OF A MATERIAL (AS INSULATION) WITH LOWER NUMBERS INDICATING BETTER INSULATING PROPERTIES.**

# R-VALUES ARE DECEPTIVE!!!

20% x .025 THE U-VALUE OF WOOD + 80% x .01 THE U-VALUE  
FOR R-100 INSULATION = .05 + .008 = .058

R-VALUE WALL ASSEMBLY = 1/U-VALUE WALL ASSEMBLY

R-VALUE = 1 / .058

R-VALUE = 17.24

SAME EQUATION WITH R-19 INSULATION = R-5

$20\% \times .025$  THE U-VALUE OF WOOD +  $80\% \times .01$  THE U-VALUE FOR R-19 INSULATION =  $.05 + .15 = .2$

R-VALUE WALL ASSEMBLY =  $1/\text{U-VALUE WALL ASSEMBLY}$

R-VALUE =  $1 / .2$

R-VALUE = 5

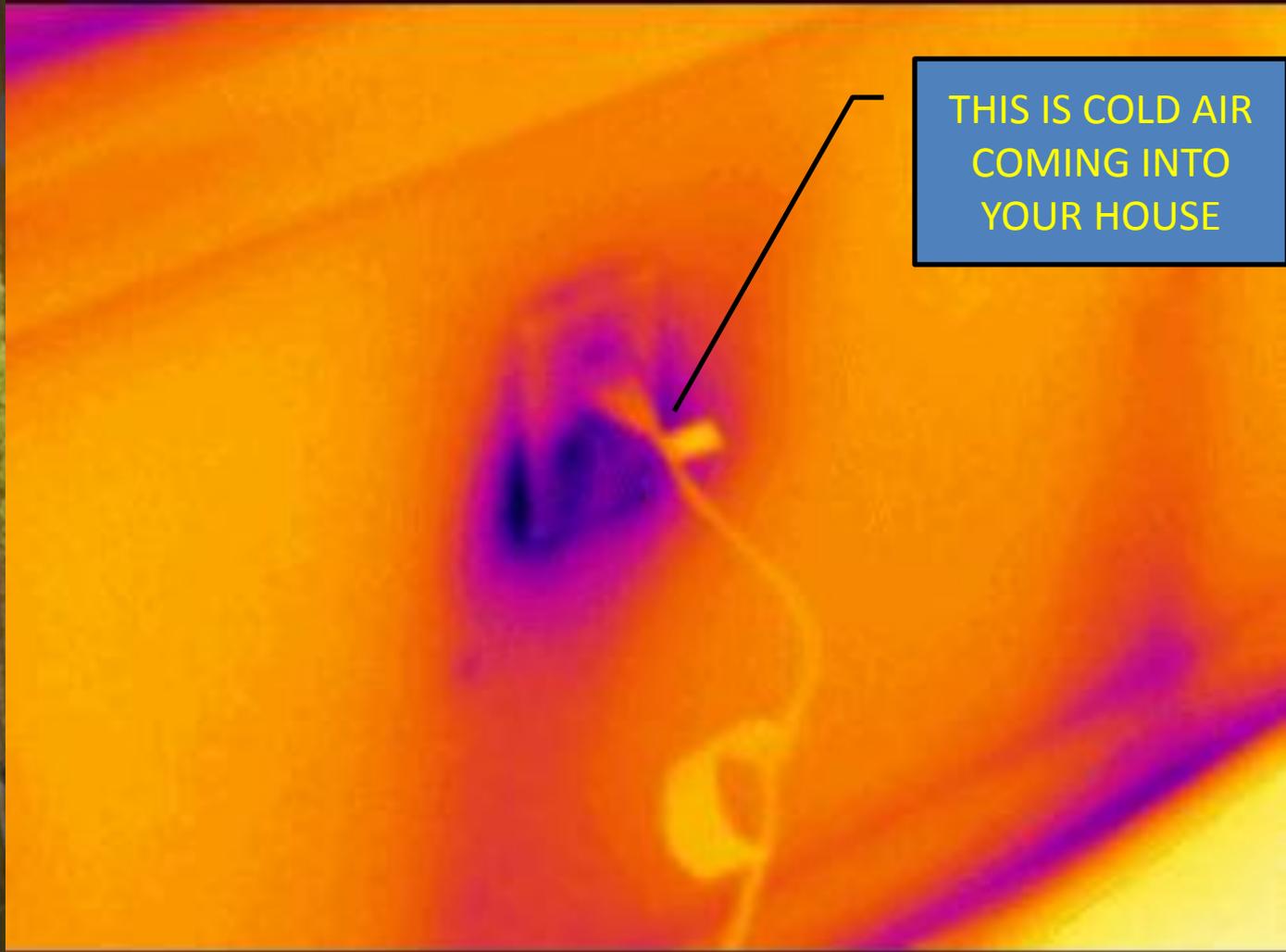
CURRENT CODES REQUIRE R-13 TO R-19

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THIS IS COLD AIR  
COMING INTO  
YOUR HOUSE



**WITH THESE AREAS FOR LEAKAGE AS WELL AS OTHERS, IT'S LIKE LEAVING A WINDOW OPEN ON YOUR HOUSE AT ALL TIMES.**

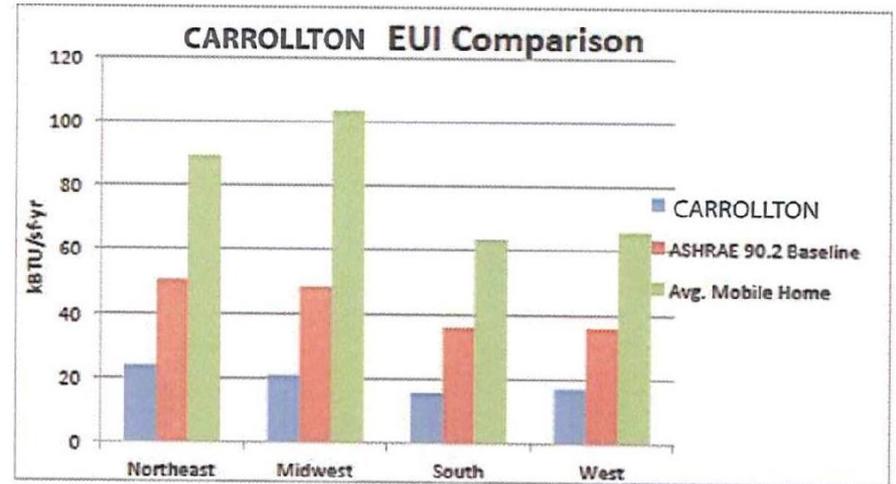
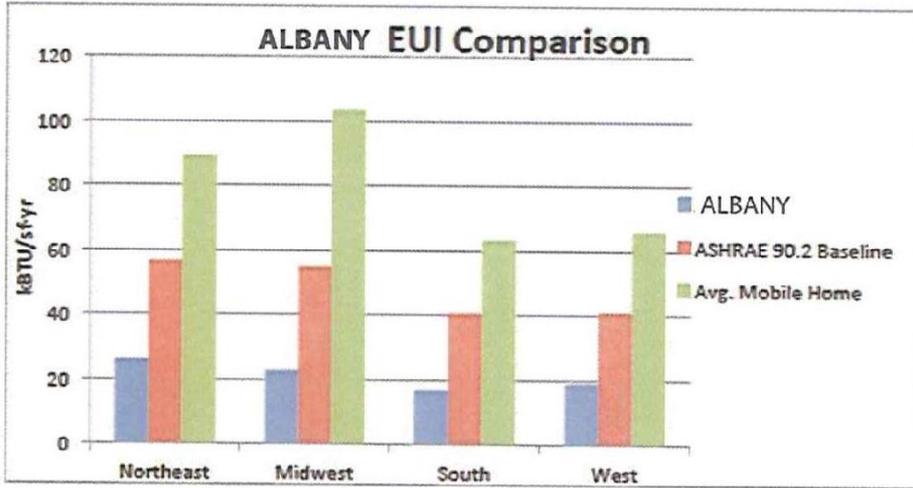




## ENERGY DATA FOR THE ALBANY & THE CARROLLTON

	Northeast	Midwest	South	West
ALBANY	25.9	22.6	16.8	18.7
ASHRAE 90.2 Baseline	56.7	54.9	40.5	40.9
Avg. Mobile Home	89.3	103.3	63.3	65.8
% better than Average	71%	78%	73%	72%

	Northeast	Midwest	South	West
CARROLLTON	23.8	20.7	15.4	17.1
ASHRAE 90.2 Baseline	50.3	48.3	35.8	35.9
Avg. Mobile Home	89.3	103.3	63.3	65.8
% better than average	73%	80%	76%	74%





# Compliance Certificate

Project Title: The Bellvue

Energy Code: **2009 IECC**  
 Location: **Louisville, Kentucky**  
 Construction Type: **Single Family**  
 Project Type: **New Construction**  
 Conditioned Floor Area: **1,182 ft<sup>2</sup>**  
 Glazing Area Percentage: **5%**  
 Heating Degree Days: **4514**  
 Climate Zone: **4**  
 Permit Date:

Construction Site:  
Louisville, KY

Owner/Agent:

Designer/Contractor:  
 Civic consultants, Inc.  
 11605 Hazelwood Road  
 Louisville, KY 40223  
 502-244-1160  
 jill @ jlsarch.com

### Compliance: Passes using UA trade-off

Compliance: **34.1% Better Than Code** Maximum UA: **378** Your UA: **249**

The % Better or Worse Than Code Index reflects how close to compliance the house is based on code trade-off rules. It DOES NOT provide an estimate of energy use or cost relative to a minimum-code home.

## Envelope Assemblies

Assembly	Gross Area or Perimeter	Cavity R-Value	Cont. R-Value	Glazing or Door U-Factor	UA
Wall 1: Insulated Concrete Forms	1,503		24.0		61
Window 1: Vinyl Frame:Double Pane with Low-E SHGC: 0.00	75			0.400	30
Door 1: Solid	42			0.500	21
Ceiling 1: Flat Ceiling or Scissor Truss	1,182	0.0	38.0		30
Floor 1: Slab-On-Grade:Unheated Insulation depth: 2.0'	140		24.0		107

*Compliance Statement:* The proposed building design described here is consistent with the building plans, specifications, and other calculations submitted with the permit application. The proposed building has been designed to meet the 2009 IECC requirements in REScheck Version 4.4.4 and to comply with the mandatory requirements listed in the REScheck Inspection Checklist.

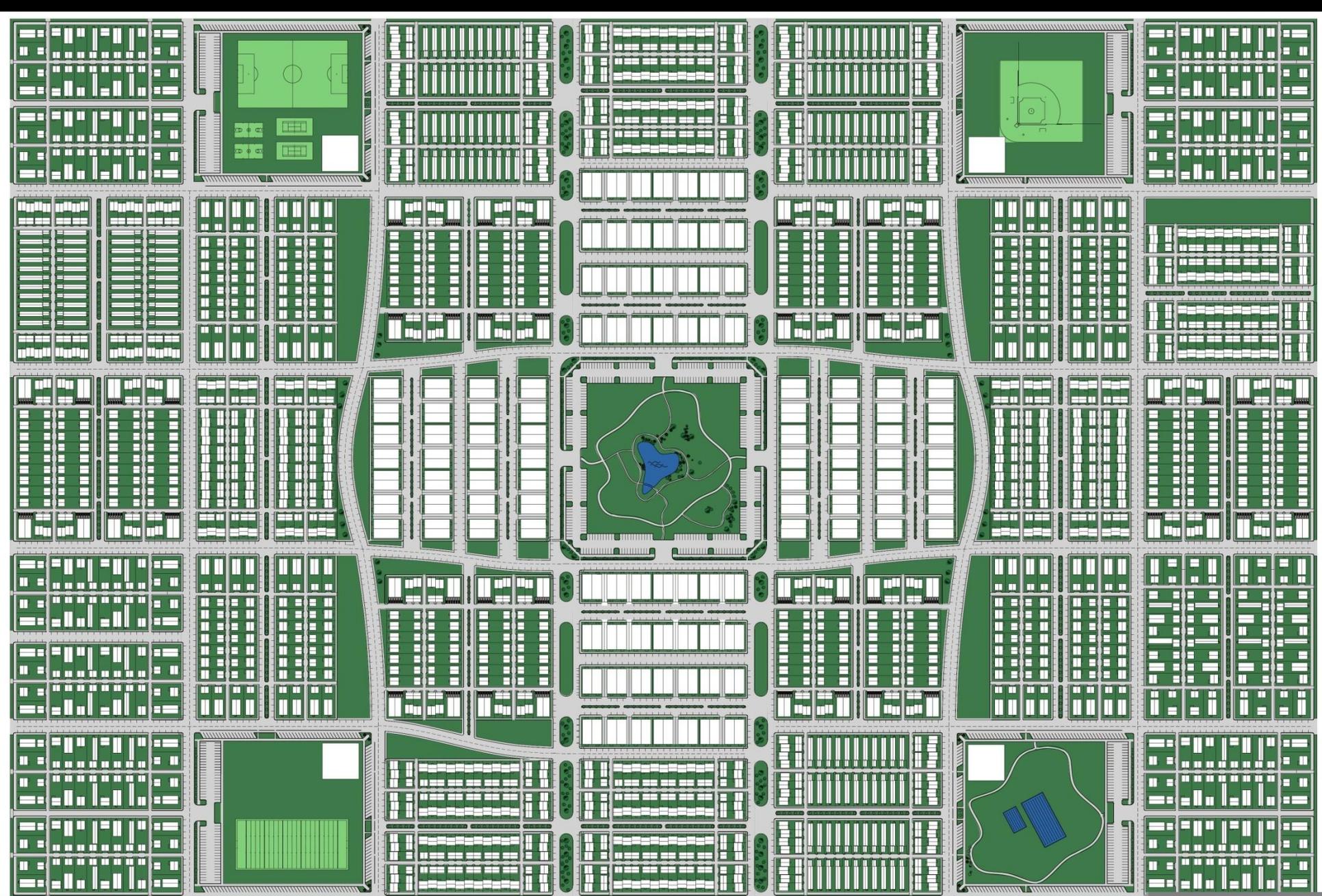
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Name - Title

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Signature

\_\_\_\_\_  
Date

Project Notes:

Prototype 2 bedroom single family home



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