ATTACHMENTS

13 - 26

Schierloh, Michael (CONTR)

Nonresponsive

----- Original Message -----
From: Roy, Robin [mailto:rroy@nrdc.org]
Sent: Wednesday, May 21, 2014 01:49 PM
To: Cymbalsky, John
Subject: Re: Sending a letter of support to ASRAC on MH?

Short. 2 meetings would be great. But we won't be specific in the letter.

On 21/05/14, 10:48 AM, "Cymbalsky, John" <John.Cymbalsky@EE.Doe.Gov> wrote:

>How much time do you anticipate asking for in terms of negotiating a NOPR?
>
>----- Original Message -----
>From: Roy, Robin [mailto:rroy@nrdc.org]
>Sent: Wednesday, May 21, 2014 01:11 PM
>To: Cymbalsky, John
>Subject: Re: Sending a letter of support to ASRAC on MH?
>
>Super. I've asked my group to sign on by COB Tuesday, so aim to send on
>Wednesday May 28.
>
>On 21/05/14, 10:09 AM, "Cymbalsky, John" <John.Cymbalsky@EE.Doe.Gov>
>wrote:
>
>>That would be great to have sooner than later.
>>
>>----- Original Message -----
>>From: Roy, Robin [mailto:rroy@nrdc.org]
>>Sent: Wednesday, May 21, 2014 11:27 AM
>>To: Cymbalsky, John
>>Subject: Sending a letter of support to ASRAC on MH?
>>
>>Hi John,
>>
>>In your role as ASRAC DFO, can I send you a letter to distribute to ASRAC

>>members?
>>
>>It would be a joint letter in support of an ASRAC working group on
>>manufactured housing, with diverse signers from our regular MH discussion
>>group (including industry, consumer interests, EE advocates). I suspect
>>it might be helpful for the committee's deliberations to see that there
>>is a diverse group that works together and would welcome the effort.
>>
>>Cheers,
>>Robin
>

Natural Resources Defense Council • California Energy Commission • National Manufactured Home Owners Association • National Association of State Energy Officials • Manufactured Housing Institute • Corporation for Enterprise Development • Environmental and Energy Study Institute • Systems Building Research Alliance • National Rural Electric Cooperative Association • Washington State University Ext Energy Program • American Council for an Energy-Efficient Economy • Northwest Energy Efficiency Alliance

May 28, 2014

To: Members of the Appliance Standards and Rulemaking Federal Advisory Committee (ASRAC)
Sent via email to ASRAC Designated Federal Officer, ASRAC@ee.energy.gov

Re: Energy Efficiency Standards for Manufactured Housing

We are pleased that energy efficiency in manufactured housing is on the agenda for ASRAC's June 6 meeting, and are writing to express our support for ASRAC's efforts on this topic.

As you may know, a draft Notice of Proposed Rulemaking (NOPR) has been pending at the Office of Management and Budget since 2011, and DOE published a Request for Information (RFI) seeking additional information in June 2013. We note that the revised standards are long overdue, and have been working jointly with diverse stakeholders following the RFI with the aim of accelerating the process to a successful standard.

We believe that ASRAC is an appropriate mechanism to engage stakeholders in a discussion of energy efficiency standards for manufactured housing, and to develop recommendations for long overdue changes to the current standards. An ASRAC process would facilitate even greater communication and importantly, also provide analytic support, both of which we believe would be helpful to the timely resolution of remaining issues.

In order to ensure that an ASRAC process is as pragmatic and efficient as possible, we recommend that DOE:

- Use the process for effective communication and data gathering, and for seeking general consensus where possible for key elements of a standard and regulatory framework, e.g., including on U-value, air infiltration, window specifications and enforcement.
- Establish and hold to a tight meeting schedule with a minimum of meetings, e.g., 2 two-day meetings to be concluded by September.
- Consider using the draft NOPR and Technical Support Documents for opening discussion, i.e., distributed in advance of the first meeting.
- Commit a strong project leader and an ASRAC subcommittee that is comprised of a balanced group, who have the time and expertise to serve in a meaningful capacity;

- Appoint a strong facilitator to ensure the effective flow of information, and restrict time spent on repetitive or non-germane discussion, and;
- Provide prompt, effective analysis (e.g., running scenarios through their cost-effectiveness, national impacts and other models in advance of meetings).

Thank you in advance for your consideration, and we look forward to your further efforts.

Respectfully submitted,

Robin Roy
Natural Resources Defense Council
rroy@nrdc.org

Robert B. Weisenmiller, Chair
California Energy Commission
Catherine.Cross@energy.ca.gov

David Terry
National Association of State Energy Officials
dterry@naseo.org

Ishbel Dickens
National Manufactured Home Owners Association
ishbel@nmhoa.org

Doug Ryan
Corporation for Enterprise Development
dryan@CFED.org

Carol Werner
Environmental and Energy Study Institute
cwerner@eesi.org

Lois Starkey
Manufactured Housing Institute
Lois.Starkey@mfghome.org

Emmanuel Levy
Systems Building Research Alliance
elevy@research-alliance.org

Keith Dennis
National Rural Electric Cooperative Association
Keith.dennis@nreca.coop

Michael Lubliner
Washington State University Ext. Energy Program
LublinerM@energy.wsu.edu

Lowell Ungar
American Council for an Energy-Efficient Economy
lungar@aceee.org

Christopher Dymond
Northwest Energy Efficiency Alliance
CDymond@neea.org

Manufactured Housing Institute

Transmitted via email and U.S. Mail

March 14, 2014

Ms. Kathleen B. Hogan
Deputy Assistant Secretary for Energy Efficiency
U.S. Department of Energy
Room 6A-067, Mail Stop EE-1
1000 Independence Avenue, S.W.
Washington, D.C. 20585

Dear Ms. Hogan:

On behalf of the Manufactured Housing Institute (MHI), the national trade association representing all sectors of the manufactured housing industry, including manufacturers representing almost eighty percent of the production, retailers, suppliers, lenders and community owners, I am writing to respectfully request that Department of Energy (DOE) consider negotiated rulemaking for the establishment of energy efficiency standards for manufactured housing. As you know, a draft Notice of Proposed Rulemaking (NOPR) has been pending at the Office of Management (OMB) since December, 2011. In June, 2013, DOE published a Request for Information (RFI) seeking additional information (Docket EERE–2009-BT-BC-0021; RIN 1904–AC11).

DOE has established the Appliance Standards and Rulemaking Federal Advisory Committee (ASRAC) to provide advice and recommendations to address, among other thing, "specific issues of concern to DOE as requested by the Secretary of Energy, the Assistant Secretary for Energy Efficiency and Renewable Energy (EERE), and the Building Technologies Program Manager." MHI believes ASRAC is an appropriate mechanism to engage all stakeholders in a discussion of energy efficiency standards for manufactured housing and to develop consensus recommendations for long overdue changes to the current energy standards for manufactured homes. It is a pragmatic approach that has the potential to achieve a timely resolution to this issue.

MHI and its members would be delighted to participate and support such an effort. We have taken first steps to achieve consensus on new energy standards by participating with other energy stakeholders in the development of joint comments to DOE in response to its June RFI. We also strongly support efforts to engage the Department of Housing and Urban Development (HUD) and the Manufactured Housing Consensus Committee (MHCC). The MHCC is the Federal Advisory Committee established to recommend and consider all changes to the Manufactured Housing Construction Standards and Regulations. (42 U.S.C.5401et seq. and 114 Stat.2997 et. seq.). As you know, HUD has regulatory authority over the development and enforcement of the Manufactured Housing Construction and Safety Standards, including energy efficiency standards.

The ASRAC process would be the pragmatic and efficient approach to establishing recommendations for new energy efficiency standards for manufactured housing provided that DOE:

- Uses the process for effective communication and data gathering, and for seeking general consensus for key elements of a standard and regulatory framework.
- Establishes a tight meeting schedule with a minimum of meetings.
- Considers using the draft NOPR and Technical Support Documents for opening discussion.

- Commits a strong project leader and an ASRAC subcommittee that is comprised of a balanced group, who have the time and expertise to serve in a meaningful capacity;
- Appoints a strong facilitator to ensure the effective flow of information, and restrict time spent on repetitive or non-germane discussion, and;
- Provides prompt, effective lab analysis (e.g., running scenarios through their cost-effectiveness, national impacts and other models in advance of meetings).

Thank you in advance for your consideration of this request, and we look forward to hearing from you at your earliest convenience.

Sincerely,

Lois Starkey, Vice President
Regulatory Affairs

CC: Roland J. Risser, Office of Building Technologies Program

1655 N Fort Myer Dr. Suite 104 Arlington, VA 22209 Tel: 703.558.0400 Fax: 703.558.0401
http://www.manufacturedhousing.org info@mfghome.org

draft proposed rule on the information developed as part of that process to see where they were at that point.

MR. CYMBALSKY: I'm sorry, why is that relevant necessarily here?

MR. WEISS: I'm sorry?

MR. CYMBALSKY: I'm trying to figure out the relevance of the old rule that kind of we've moved past that and we're doing new stuff now, so I guess --

UNIDENTIFIED SPEAKER: (Inaudible).

MR. CYMBALSKY: Yeah, you know, we'll have - - we're going to hand out analysis as quickly as possible and there will be a bunch of numbers for you to look at, but, you know, what was done for the (inaudible) that was then withdrawn from (inaudible) is kind of, that's history in my opinion, I think.

MR. WEISS: Well, our legal opinion --

MR. RAMIREZ: All right. So let me chime in here so -- just to make sure that I'm clear. What you're talking about is a 2012 piece,

is that what you're talking about?

MR. WEISS: I've never seen it. I assume it's 2012.

MR. RAMIREZ: But is that what you're talking about?

MR. WEISS: I believe so.

MR. RAMIREZ: Okay.

MR. CYMBALSKY: He means the 2012. You want an analysis with the 2012 code or do you want to look at the old Noper (ph) analysis? I'm sorry, I may have misheard you.

MR. WEISS: No, what I'm referring to is what I think we discussed yesterday which was the draft proposed rule developed by DOE and --

MR. CYMBALSKY: Yeah, we're not going to hand that out anything.

MR. WEISS: And any -- well, let me just finish -- any related analysis.

MR. CYMBALSKY: Right, we're not going to -- we're not -- we've moved past that, right, so we're going to have all new data, all new numbers and we will provide that as a basis to

talk about.

MR. LUTER: It was suggested yesterday (inaudible).

MR. CYMBALSKY: Not at this point. I mean, I think we're hoping in a few days to a week's time we'll have a bunch of numbers to hand out.

MR. WEISS: Well, if I may just respond. You say it's history and that's fine, but I don't know if it's history or not, okay, I don't know -- I don't know what it was and how it might relate to where we start from here. So I understand you're saying it's history but I don't know one way or the other. And I think to have a clear record in this proceeding, given the fact that DOE spent quite some time working on this prior to this proceeding and then we're only talking about two months here potentially, I think we need to see where you were before and where we're going in relation to that.

MR. RAMIREZ: Let me -- let me chip in real quick cause I don't think --

UNIDENTIFIED SPEAKER: (Inaudible).

MR. JENSEN: I just have -- this is Mike Jensen from DOE GC. I just have two comments in that regard. As far as we're concerned, the document that was sent to OIRA in October 2011 is still a pre- decisional document. I understand that it was impermissibly distributed to many people in this room. But as far as we're concerned, that that's history. We're starting -- we're hitting the reset button and we are beginning negotiations again today.

That information, the proposed rule and the accompanying documents are still pre-decisional at this point, will not be distributed outside of DOE.

On a slightly, just to move slightly to a separate issue that I think I'd just like to address and then I'll put it out there for everyone's consideration is that there was a discussion about two or three minutes ago about the need for DOE to set forth the relevant provisions of the IECC for all of the committee to

understand what provisions we're actually working with.

There are certain provisions of the IECC that may or may not be energy efficiency related, depending on what this committee deems those to be. For example, mechanical ventilation or light in. You know, these are issues that I think that the -- the committee needs to address to determine exactly which provisions of the IECC DOE needs to come back and give data to all of you about.

MR. RAMIREZ: Yeah.

MR. WEISS: Two questions. First of all, can you specify OIRA, what that refers to?

MR. JENSEN: Excuse me. In October of 2011, DOE transmitted our pre-decisional draft of the rule making at that time to the Office of Management and Budget. There's a section in OMB, the Office of Information and Regulatory Affairs, which is OIRA. That document was never intended to be released to the public and was for OMB's review. That document has since been kicked back to DOE to -- with the instructions to begin the

process anew, so that's why we're here today.

MR. ~~LUTER~~ WEISS: And your position, OGC's position is that regardless of the disclosure to others outside of DOE, that that's still pre-decisional and still exempt from disclosure?

MR. JENSEN: That's correct.

MR. RAMIREZ: So there was -- what exactly is the status of PNL?

MR. CYMBALSKY: That's the national laboratory.

MR. RAMIREZ: Okay.

MR. CYMBALSKY: Pacific Northwest National Laboratory.

MR. RAMIREZ: Okay. So another piece then would be the PNL study.

MODERATOR HOFFMAN: And is Eric -- is that up there for -- you want to speak?

MR. LACEY: Yeah.

MODERATOR HOFFMAN: Okay.

MR. LACEY: Eric Lacey. Just two issues. Don Surrena back here with NAHB reminded me that there are some free resources available if

you've not seen the IECC. The ICC (sic) website has, and it's kind of hard to find on the ICC website so if you want this, let me know and I'll show you how to get there.

Also, on our organization's website, RECA_codes.com, you can get a copy of state by state what the requirements are for various additions of the IECC. We don't yet have the 2015 up, but it will be the same for 2012.

Anyway, if you don't have a copy of the code and want to see one of these resources, come grab me and I'll point you to one of those.

MR. RAMIREZ: Let me pause you right there -

-

MR. LACEY: Okay.

MR. RAMIREZ: -- because can you just send that link out, do a reply all to one of the group emails and just send that out to everybody?

MODERATOR HOFFMAN: And also I believe you should have a copy of the ground rules, they're been sent out to everyone as well.

Emanuel Levy

2nd

President, The Levy Partnership, Inc.

Greater New York City Area Architecture & Planning

Current Systems Building Research Alliance, The Levy Partnership, Inc.

Education Carnegie Mellon University

Connect | Send Emanuel InMail

110 connections

https://www.linkedin.com/in/emanuel-levy-20a61b12

Contact Info

Background

Summary

Emanuel is President of The Levy Partnership, a consulting firm providing engineering, architectural, management, and marketing services in building-related areas. Through The Levy Partnership, he works with companies in the US and abroad and is a pioneer in building research, development, and product marketing. The Levy Partnership has served the home building industry for 32 years, generally providing technical support and advice to companies involved in home building, sales and marketing and providing services to public agencies interested in developing new technologies for housing and accelerating their adoption by industry. The firm specializes in a wide range of areas, including new product development, economic assessment, regulatory analysis and standards development, strategies for incenting efficiency, diagnostics and field evaluations, energy modeling analysis and feasibility studies. Included among the firm's clientele are utilities, leading homebuilders and home manufacturers, state and federal government agencies, major product suppliers, and trade organizations.

Since its inception, Emanuel has served as Executive Director for the Systems Building Research Alliance (formerly the Manufactured Housing Research Alliance), a membership-based organization that serves as the R&D arm of the factory building industry. Emanuel manages SBRA's multimillion-dollar annual research budget. Under his direction, SBRA has become a major force in the housing industry, spearheading developments in new technologies and manufacturing methods.

Specialties: Registered Architect, New York State (Registration No. 419870)

Experience

Executive Director
Systems Building Research Alliance
January 1995 – Present (21 years 7 months)

President
The Levy Partnership, Inc.
1983 – Present (33 years)

Education

Carnegie Mellon University
M. Architecture, Systems Building and Multidisciplinary Design
1977 – 1978

People Also Viewed


Jordan Dentz
Vice President at The Levy Partnership


Gwynne Koch Frankel
Business Manager at The Levy Partnership, Inc.


Pournamasi Rath, LEED AP
Energy Efficiency & Sustainability Consultant at The Levy Partnership, Inc.

Tyler Davis
Energy Analyst at The Levy Partnership, Inc.

Eric Ansanelli
Building Systems Engineer

Zoe Kaufman
Building Energy Consultant and Analyst at The Levy Partnership


Devanshi Dadia
LEED AP, Environmental Designer at Atelier Ten

Diana Hun
Student at The University of Texas at Austin


Galen Plourde, AIA, CSI, CCS, SCIP
Architect/Specifier at Specwright Strategies


Angel Maldonado
CSR

How You're Connected

You


Richard Rand

Jordan Dentz

3rd

Vice President at The Levy Partnership

Greater New York City Area | Construction

Education Massachusetts Institute of Technology

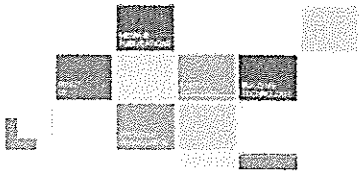
193 connections

https://www.linkedin.com/in/jordan-dentz-5b85893

Posts

Published by Jordan

The Levy Partnership is hiring - energy modeling...
May 23, 2016



Job Opportunity: Building Energy Consultant and...
October 30, 2015

Background

Summary

I have been a consultant and technical advisor to the building industry, including architects, developers, contractors, builders, and building materials manufacturers and suppliers since the 1990s. My focus has been on building energy efficiency, electric demand response, and residential systems building including panelized, modular, HUD-code, and stressed skin panel systems. Starting in about 2008 I became involved with Passive House design and have since provided technical expertise to about a dozen project. As a researcher I have authored publications and presented research results at conferences and seminars nationwide. I holds a M.S. in Building Technology and a B.S. in Architecture from the Massachusetts Institute of Technology.

Experience

Vice President
The Levy Partnership
2002 – Present (14 years)

Mr. Dentz is Vice President of The Levy Partnership, Inc. (TLP), having been with the firm since 2002. TLP provides architectural, engineering, management, and research services to the building industry and has worked with over 300 organizations (including large and small builders, developers, product suppliers, public agencies, lenders, other researchers, and consumer groups) conducting efforts that cover a wide range of technology areas including value engineering, product analysis, energy efficiency, and industrialization methods. Mr. Dentz's role at TLP includes management of builder/developer services and directing building energy efficiency research. Some of Mr. Dentz's specific responsibilities are outlined below:

People Also Viewed

Emanuel Levy
President, The Levy Partnership, Inc.

Gwynne Koch Frankel
Business Manager at The Levy Partnership, Inc.

Zoe Kaufman
Building Energy Consultant and Analyst at The Levy Partnership

Tyler Davis
Energy Analyst at The Levy Partnership, Inc.

Eric Ansanelli
Building Systems Engineer

Pournamasi Rath, LEED AP
Energy Efficiency & Sustainability Consultant at The Levy Partnership, Inc.

Devanshi Dadia
LEED AP, Environmental Designer at Atelier Ten

Denise Averbukh
Program Manager and Administrative Professional

Galen Plourde, AIA, CSI, CCS, SCIP
Architect/Specifier at Specwright Strategies

Philippe (Campus)
Responsable Equipe Informatique chez Decathlon Internacional

How You're Connected

You

Doug Gorman

- Provide energy efficiency consulting services to builders and developers
- Manage a team of TLP staff to assist building projects earn various certifications
- Develop research project concepts into detailed research plans
- Manage all phases of research projects, including budgeting and scheduling
- Coordinate and synthesize the input of numerous contributors to research efforts
- Serve as primary client contact for sponsoring organizations
- Perform technical analysis on a wide range of subjects
- Oversees all Passive House design, analysis, inspections and testing
- Write reports and research proposals
- Oversee subcontractors including engineers, scientists, technical writers and editors

Sr. Project Coordinator

Systems Building Research Alliance

2002 – Present (14 years)

Research Coordinator and Building Scientist

Skills

Top Skills

- Green Building
- Energy Efficiency
- Sustainability
- LEED
- Architecture
- Construction
- Contractors
- LEED AP
- Architectures
- Construction Management

Jordan also knows about...

Residential Homes · Value Engineering · Energy efficiency of... · Passive House design... · Moisture issues in... · Certified HERS Home... · Certified Building... · Industrialization of... · Design and construction...

Education

Massachusetts Institute of Technology

Bachelor of Science (B.S.) and Master of Science (M.S.), Architecture and Building Technology

1984 – 1991

Massachusetts Institute of Technology

Bachelor's degree in Architecture and Master's degree of Building Technology, Architecture and Building Technology

1984 – 1991

Certifications

Certified Passive House Consultant
Passive House Institute

Volunteer Experience & Causes

Causes Jordan cares about:

- Environment
- Science and Technology

Organizations

New York Passive House, Inc.

Recommendations

Given (1)

Sandra Ho
Marketing and Communications Coordinator

"I worked closely with Sandra for a number of years and it was always a pleasure. She was responsible for putting together our publications including graphics, layout, etc. Her work was superb, she was very diligent and careful and creative. I highly recommend her.

August 7, 2015, Jordan managed Sandra indirectly at The Levy Partnership

Groups

NJ Pay for Performa...
169 members
Join

Green Building Advisor
1,623 members
Join

Building Science Co...
10,061 members
Join

Following

Schools

Massachusetts Instit...
Greater Boston Area
Follow

3rd

Jordan Dentz

Vice President at The Levy Partnership

Greater New York City Area

Construction

Current: The Levy Partnership,
Systems Building Research Alliance

Education: Massachusetts Institute of Technology

193 connections

Connect

Send Jordan InMail

IECC EFFECT

	DW 28X56 1568 sq. ft.	SW 14X66 924 sq. ft.
Insulation R38-21-22 vs. R28-11-11	641.12	499.82
Exterior Doors	322.40	322.40
Exterior Walls 2x6 vs. 2x4	295.00	264.00
Windows	641.90	449.33
Rafters Energy Heel with Flat Ceiling	180.00	108.00
Bill of Material Increases	2080.42	1643.55
Selling Price Increase Wholesale 50% BOM	4160.84	3287.10
Retail Markup 1.4 x	5825.17	4601.94

DEPARTMENT OF ENERGY FORMULA FOR YEARS TO PAY BACK

Years to Pay Back = $(C(i) \times R(1) \times R(2) \times E) \div (C(e) \times [R(2)-R(1)] \times HDD \times 24)$

C(i)	=	Cost of Insulation in $/square feet (includes cost of all materials required)
C(e)	=	Cost of Energy, expressed in $/BTU
E	=	Efficiency of Heating System (0.7 to 0.95 for Natural Gas Furnaces)
R(1)	=	Initial R-Value of Section
R(2)	=	Final R-Value of Section
R(2) - R(1)	=	R-Value of Additional Insulation
HDD	=	Heating Degree Days/Year for Home Location
24	=	Multiplier used to convert heating degree days to heating hours (24 hours/day)

ROOF

14 x 66 Single Section

C(i)	=	Insulation	81.76
		Energy Heel Rafters	108.00
			189.76
		Material Markup (.50 BOM)	379.52
		Retail Markup x 1.4 ÷ 924 sqft = .575	$ 531.33
C(e)	=	.5449 per Therm ÷ 100,000 btu/Therm = .0000054 NIPSCO Cost February 2015	
E	=	0.80 Gas Furnace Efficiency (Coleman DGAA070)	
R(1)	=	28	
R(2)	=	38	
HDD	=	7253 Valparaiso, IN	

.575 x 28 x 38 x .8 = 489.44
.0000054 x 10 x 7253 x 24 = 9.39

489.44 ÷ 9.39 = 52.12 Years

Just Use the Insulation

81.76 ÷ .5 = 163.52 x 1.4 = 228.93 ÷ 924 sq. ft =.2478

.2478 x 28 x 38 x .8 = 210.93 ÷ 9.39 = 22.46 Years

WALLS

14 x 66 Single Section

Insulation	R21 HD		$426.15
	R11		171.68
			$254.47
Studs	1635 bf 2x6	x $463	$757.00
	1096 bf 2x4	x $450	493.00
	(Lumber Pricing, Feb. 2015)		$264.00

Material Cost:	Insulation	$254.47
	Lumber	264.00
	Total	$518.47
50% Bill of Materials		÷ .50
		$1,036.94
		x 1.4
Retail Markup x 1.4		$1,452.00
1116 sq. ft. wall space		$1.30/sq ft

DOE Formula:

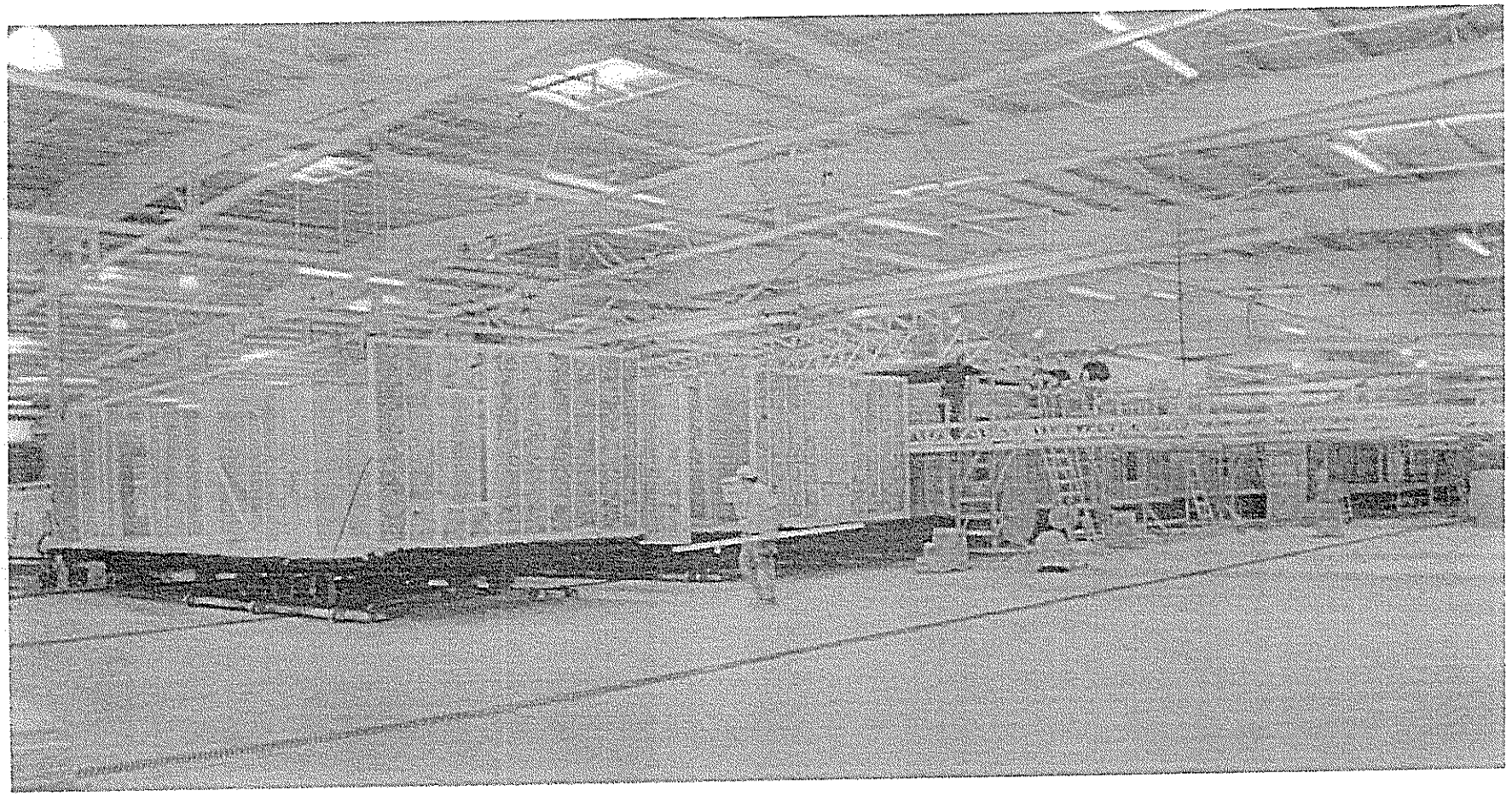
1.30 x 21 x 11 x .8 = 240.24

.0000054 x 10 x 7253 x 24 = 9.39

240.24 ÷ 9.39 = 25.58 Years

High Performance Factory Built Housing

2015 Building Technologies Office Peer Review



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

Jordan Dentz, jdentz@levypartnership.com
ARIES / The Levy Partnership, Inc.

Project Summary

Timeline:

Start date: **November 2010**

Planned end date: **October 2015**

Key Milestones:

1. TO2 Detailed Test & Work Plan, Phase 1: Planning; May 2011
2. TO2 Technical Report, Phase 2: Prelim Design–Development; Feb 2012
3. TO3 Technical Report, Phases 2 & 3: Advanced Design–Development; May 2013
4. TO4 Technical Report, Phase 3: Prototyping; Mar 2014
5. TO5 Technical Report, Phase 4: Prototyping and Testing; Oct 2015

Budget:

Total DOE $ to date: **$810,426**

Total future DOE $: **$1,090,113 proposed**

Key Partners:

Accuvent	AFM
Bayer Material Science	BASF
CertainTeed	Dow
Factory Home Builders	Hunter Panels
Johns Manville	Louisiana Pacific
Mitsubishi	MHI
Owens Corning	SBRA
Senco	Tjernlund

Target Market/Audience:

Manufactured housing industry

Project Goal:

Provide factory homebuilders with high performance, cost effective alternative envelope designs as a comprehensive solution for reaching net zero energy use

Relevance to BTO Needs and Objectives

BTO Objective: Develop and deploy technologies and systems that reduce building energy consumption by 50%

BTO' Strategies	How this Project Fulfills BTO's Needs and Objectives
Research and develop advanced technologies	Develop and test technologies to reduce new MH energy use by half
Stimulate the market for innovations	Partner with those responsible for 80%+ of all new MH through a process referred to as "Collective Impact"
Develop and implement codes and standards	Participate in the ongoing MH standards development process – informed by the R&D work

Purpose and Objectives: Problem Statement

How to move a highly price-sensitive industry to exemplary levels of energy efficiency.

Barriers

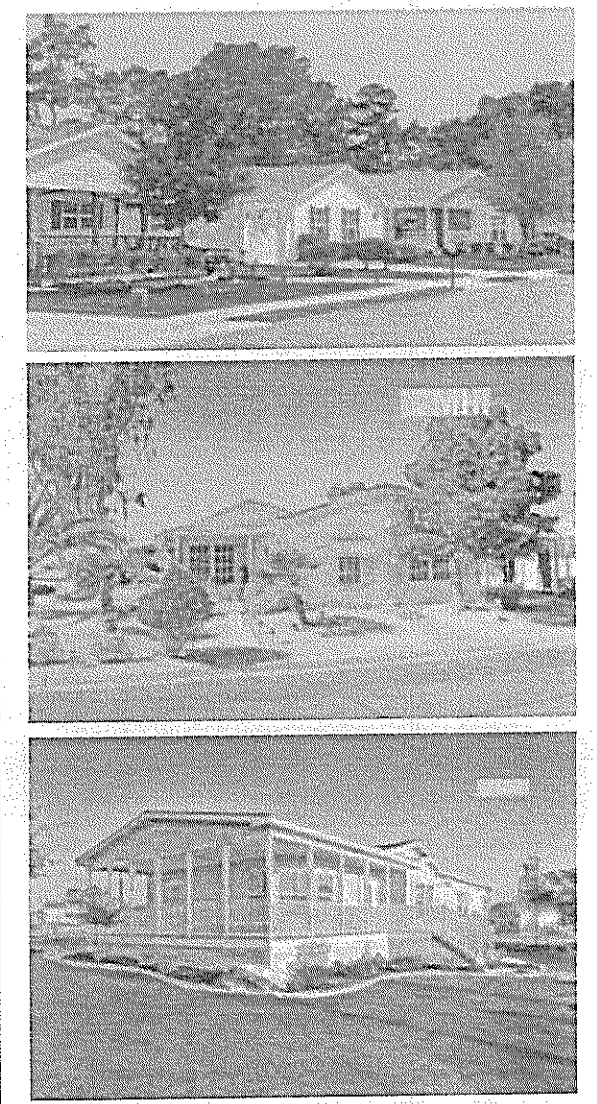
- 1st cost is king
- Communicating energy benefits faces major hurdles

Challenges

- Technologies must be production friendly
- New building methods must be HUD approved
- Sold by dealers like autos

Knowledge Gaps

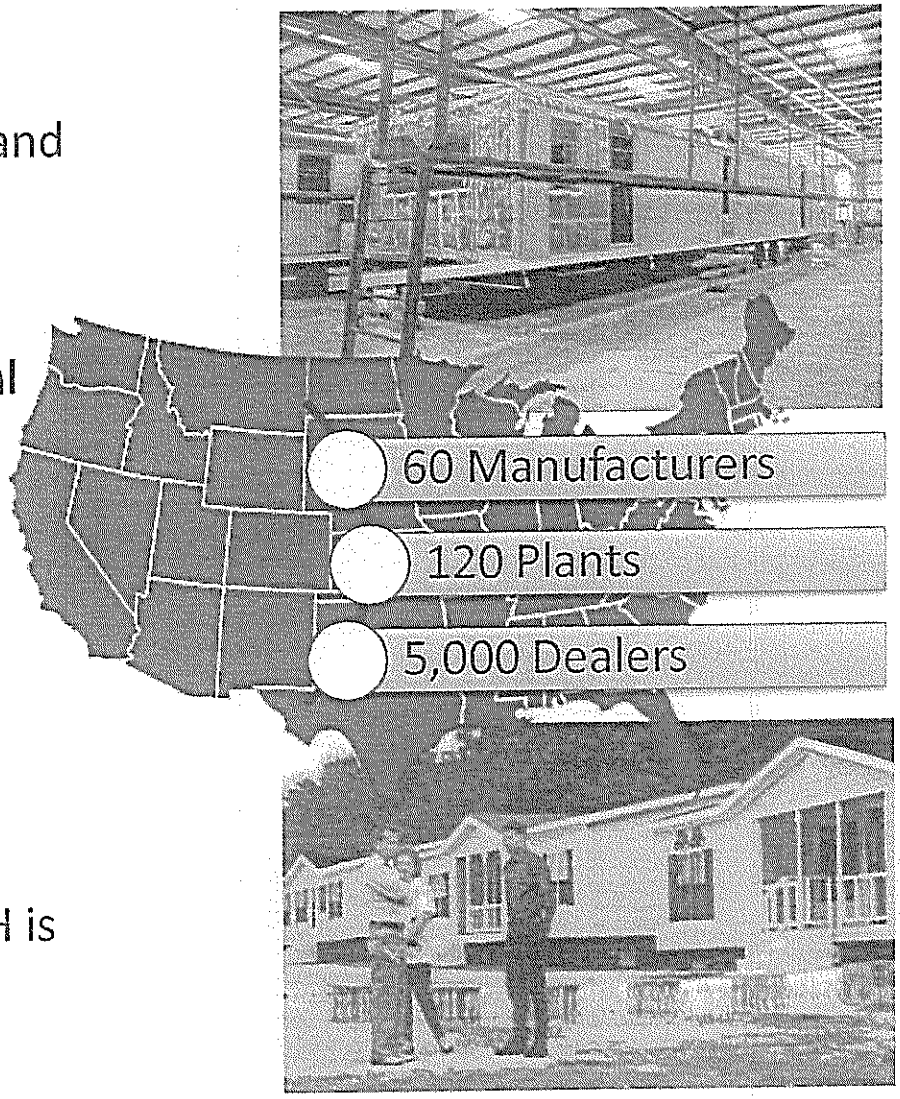
- Industry mindset focused on 1st cost; must shift to total ownership costs
- Few examples of high performance homes
- HUD energy standards last updated in 1994, many iterations behind the IECC



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

Purpose and Objectives: Target Market and Audience

- Manufactured Homes (MH) are built in plants across the nation and shipped to sites nearly ~95% complete.
- ~70% of unsubsidized affordable housing nationally (Congressional study)
- Preemption of HUD standards enables home standardization, key to achieving efficient production
- 10-12% of all new homes on average
- Financial crisis hurt affordable housing hardest and earliest. MH is likely to bounce back fast due to pent up demand and attractive pricing.



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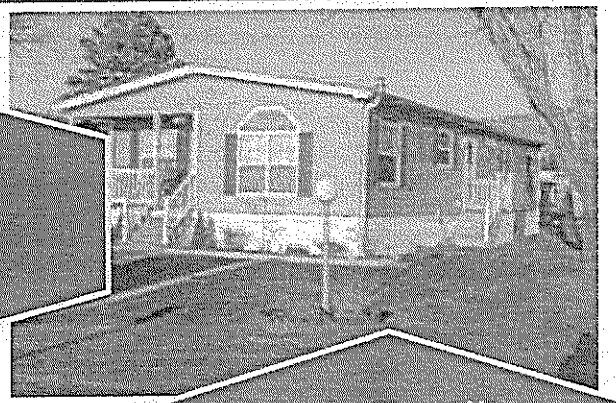
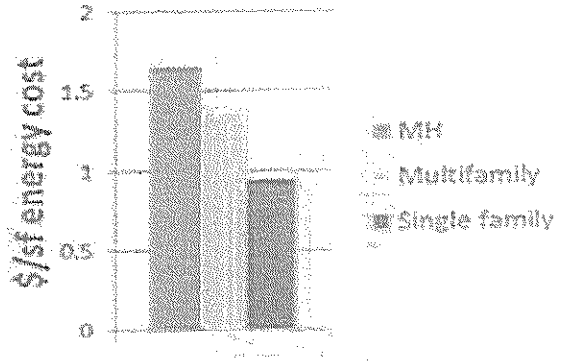
Purpose and Objectives: Target Market and Audience

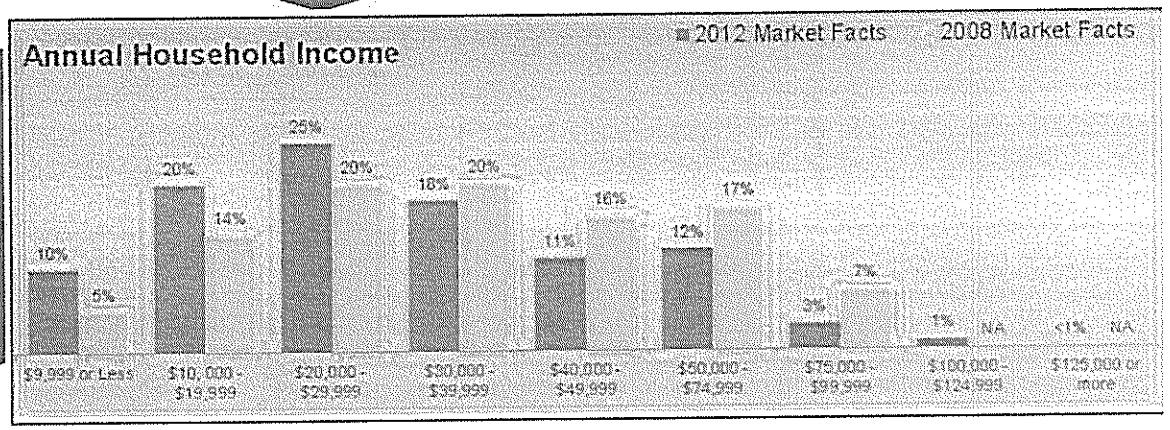
75% of MH are owner-occupied (Foremost)



Nearly 7 million MH use 0.47 quad Btu/yr (site) (RECS)



Homeowners quality of life greatly impacted by efficiency. Energy costs can be as high as home payments.



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Purpose and Objectives: Impact

Project Output

- Demonstrated solutions for building affordable, high performance MH; clear guidelines for plants and installers.

Measuring Achievement

- Interim—testing and prototype evaluation.
- Ultimate—number of homes built using high performance measures.

Impact Path

- Working with manufacturers to develop and demonstrate solutions
- Mfgs will drive the adoption: "affecting the operation of a few companies will change the industry."
- If successful, can be wildly successful
- Industry needs cost-effective strategies for complying with the new energy code

Goals

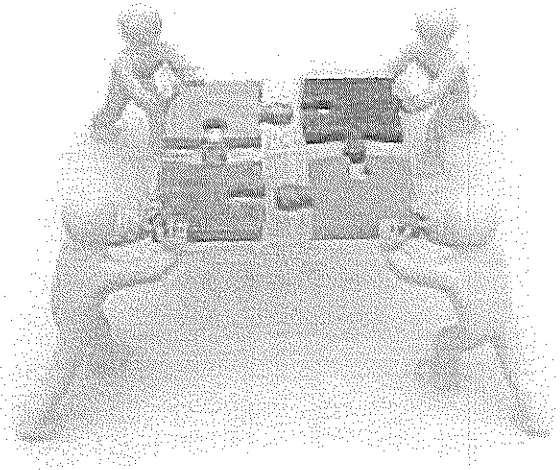
- Near-term (through 2016): Pilot projects; limited adoption by progressive plants.
- Intermediate-term (2017-2019): New HUD standards drives adoption.
- Long-term (2020+): Reach critical mass; adoption starts in north then spreads south. SBRA helps facilitate adoption.

Approach: Collective Impact

Collective Impact is the commitment of a group of actors from different sectors to a common agenda for solving a specific problem, using a structured form of collaboration.

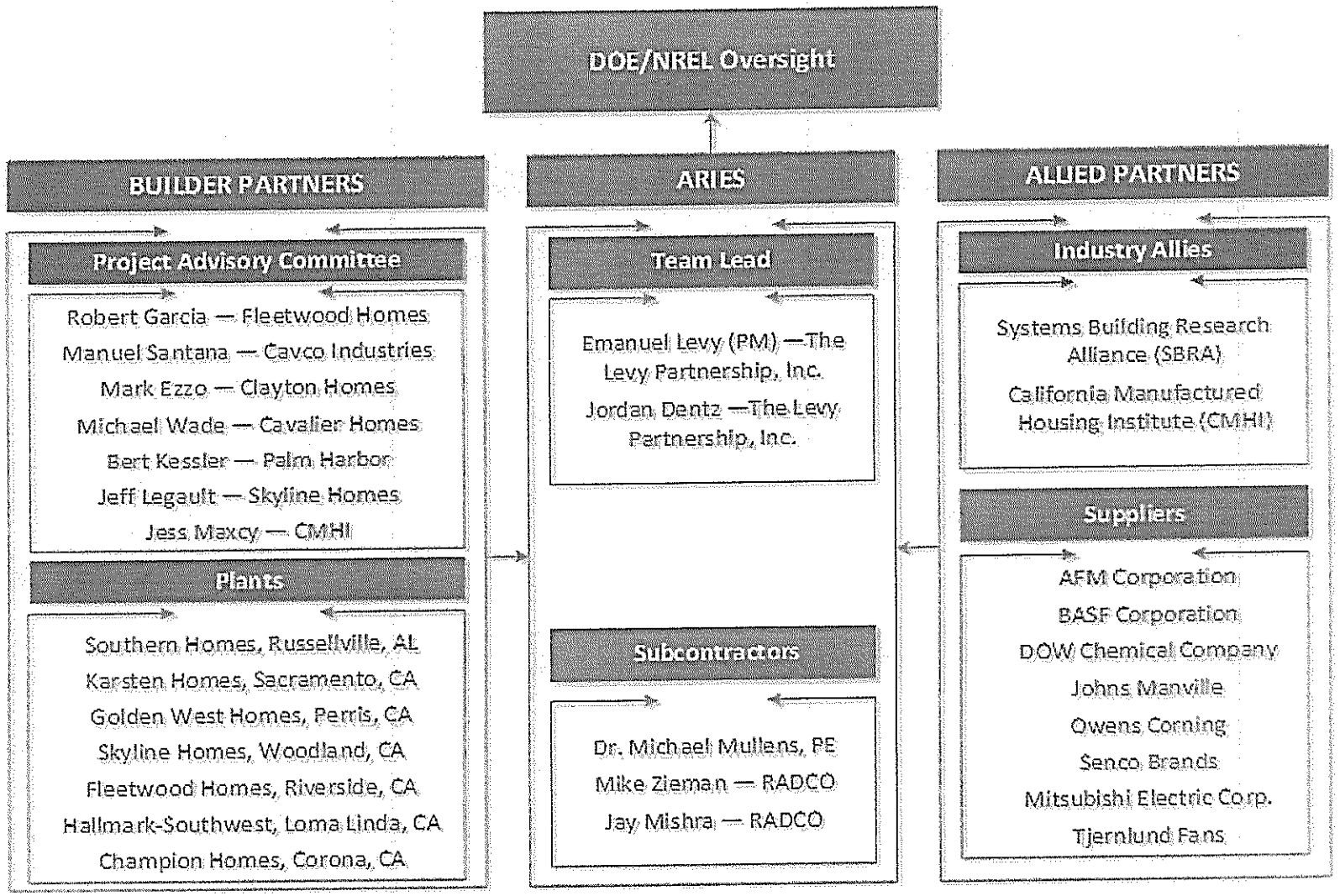
The Five Conditions of Collective Impact

- Common agenda
- Shared measurement
- Mutually reinforcing activities
- Continuous communication
- Backbone support



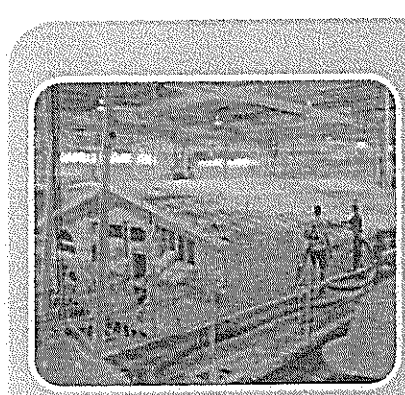
The concept of collective impact is clearly articulated in the 2011 Social Innovation Review article *Collective Impact*, by John Kania and Mark Kramer.

Approach: Partners

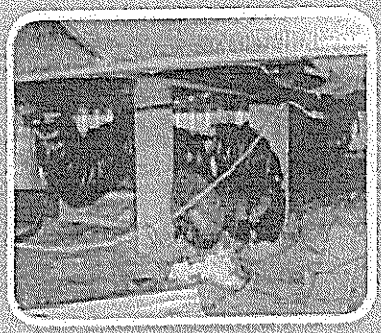


Approach: Key Issues

For a defined market segment, a holistic solution, including:



Thermal envelope: wall, roof, airtightness, windows



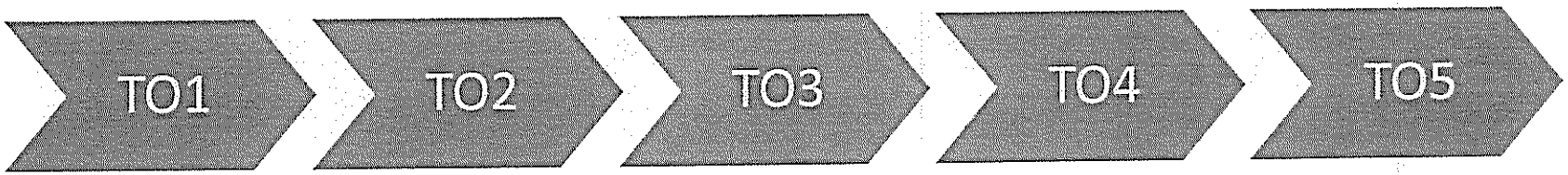
Space conditioning and ventilation

Integrating into the building process (production environment requires speed)

Cost and installation: quality key considerations

Ultimate goal is market transformation

Approach: Planning



Planning
Screen design options
Select three options to move forward

Design Development
Code compliance
Thermal performance
Moisture analysis

Advanced Design Development
Detailing
Wall component prototyping and testing

Component Prototyping
Constructability assessment
Transportation test
Cost-benefit analysis

Whole House Prototyping
Monitoring of moisture and thermal performance

Approach: Heat Maps

Process for structuring committee input and focusing down on those solutions most likely to succeed in the long run

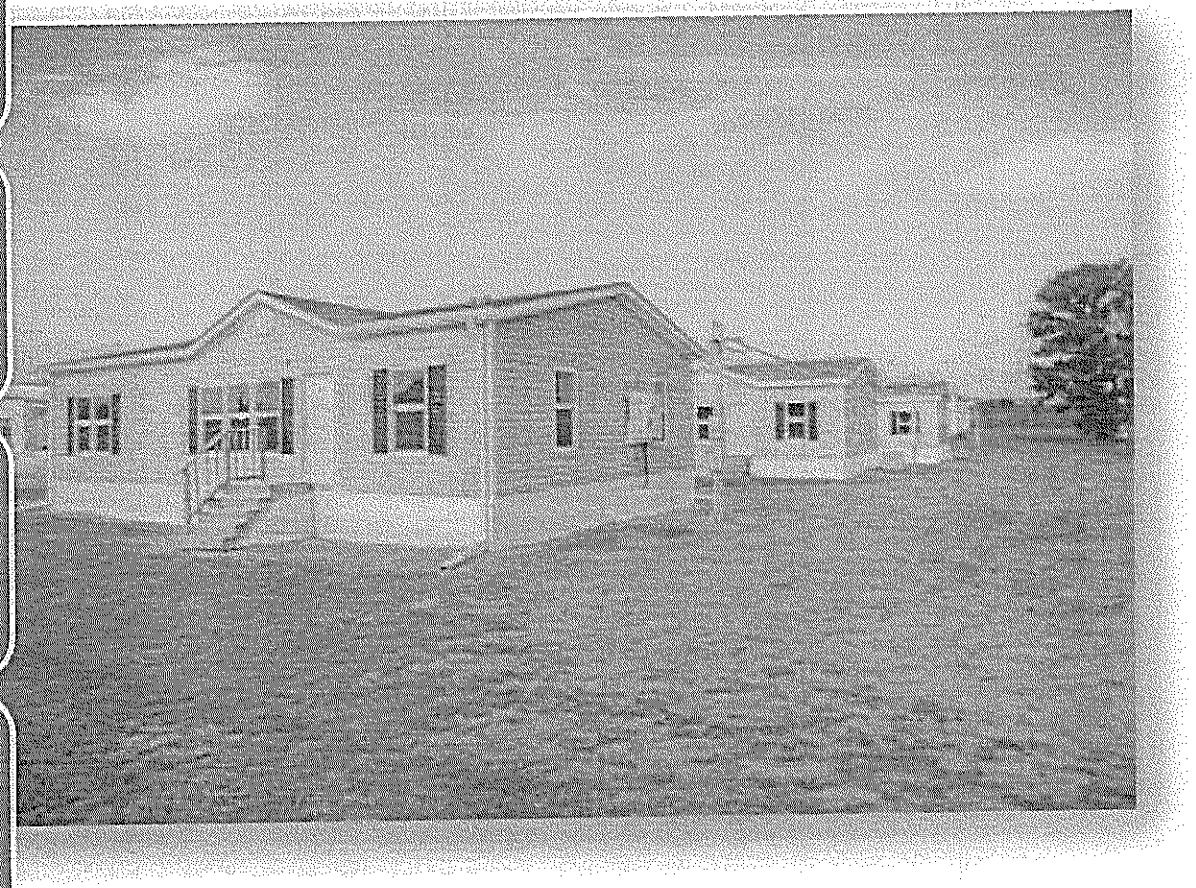
Option	DK	ME	BK	MW	BS	MS	KF	LS	Man.	Code	Thermal
1. Structural insulated panels or SIPs for ceilings	33 (7)	26 (3)	31 (5)	24 (4)	(6)	23 (5)	(4)	32 (6)	5	5	5
2. Structural insulated panels or SIPs for walls	23 (2)	25 (2)	34 (6)	20 (1)	(5)	23 (5)	(3)	23 (4)	2	4	4
3. Stud wall with insulating sheathing board	23 (2)	24 (1)	20 (1)	20 (1)	(2)	10 (1)	(2)	17 (1)	1	2	1
4. Un-vented attic with insulating sheathing board	24 (4)	31 (7)	26 (4)	25 (5)	(3)	11 (2)		27 (5)	2	6	3
5. Flash and batt wall construction	11 (1)	29 (5)	25 (3)	23 (3)	(1)	20 (4)	(1)	20 (3)	1	1	6
6. Poured closed cell foam	25 (5)	29 (5)	22 (2)	27 (6)	(4)	19 (3)		19 (2)	4	3	2
7. Innovative new floor	28 (6)	28 (4)	31 (5)	---	---	---			---	---	---

Scores indicate the simple sum of the qualitative ratings. Figure in parenthesis is the rank for that rater.

Key: red box = top pick; yellow box = second pick; green box = third pick.

Approach: Distinctive Characteristics

- Collective Impact
- Heat Maps
- Three lab homes side by side – located at the production facility
- Dovetail with code update process – hand in glove



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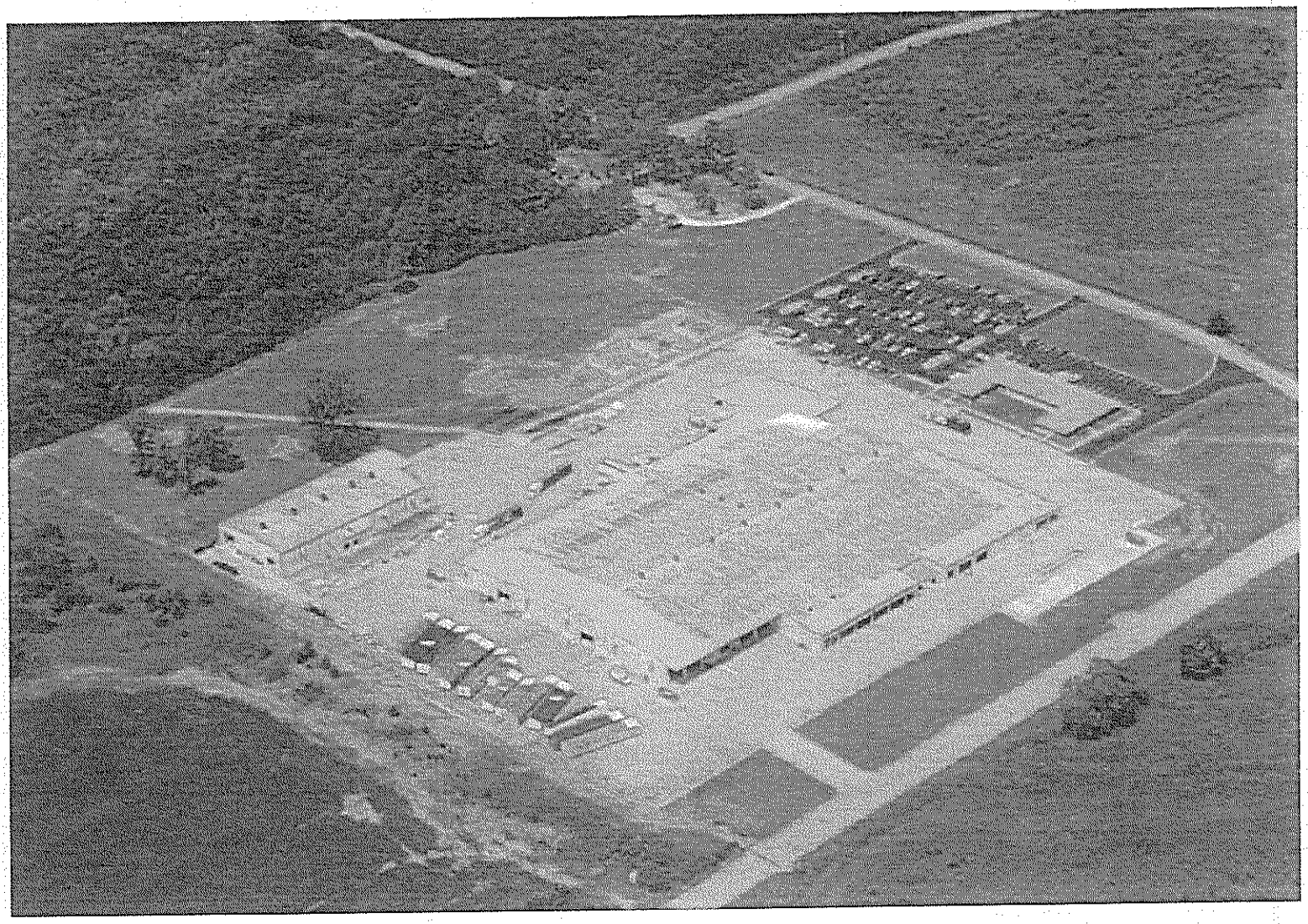
Progress and Accomplishments

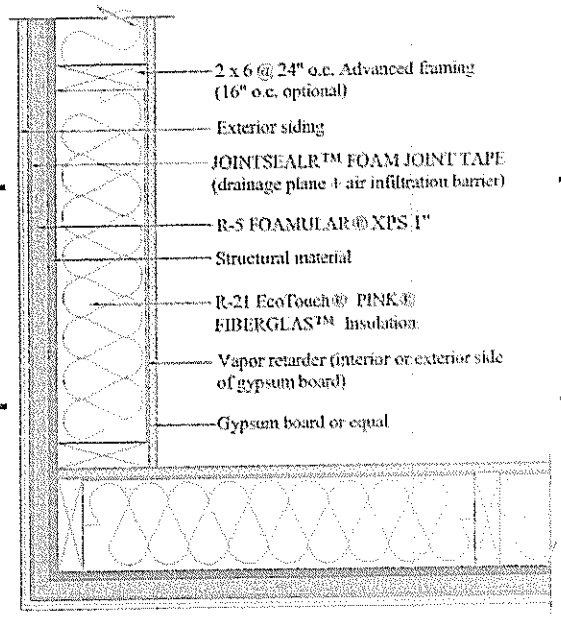


Progress and Accomplishments: TOs1-2

Developed advanced wall design that improves the thermal performance of the envelope and reduces annual energy use

Analysis of proprietary products

Suppliers	Product	Structural sheathing	WRB/ Sealant	VB	Fastener	FG Batts	Freight factor	TOTAL $/home	TOTAL $/sq. ft.
AFM	Nailbase	✓	✓	✓	✓	—	✓	6,151	2.13
DOW	Styrofoam	—	✓	—	—	—	—	2,860	0.99
Johns Manville	Vaultherm	—	—	—	✓	—	—	1,416	0.49
	AP Foil	—	✓	—	✓	—	—	2,682	0.93
	Structural Wall Sheathing	✓	✓	—	✓	—	—	2,942	1.02
Owens Corning	Foamular	—	✓	—	—	✓	—	3,252	1.13
Saint Gobain	Faced Certainteed	—	—	—	—	—	—	2,336	0.81
BASF	Neopor Unfaced	—	—	—	✓	—	—	1,966	0.68
	Neopor Poly Foil	—	—	—	✓	—	—	2,033	0.71
	Neopor/ ⅞" OSB	✓	—	—	—	—	—	3,667	1.27



TO2 – Design development and material selection

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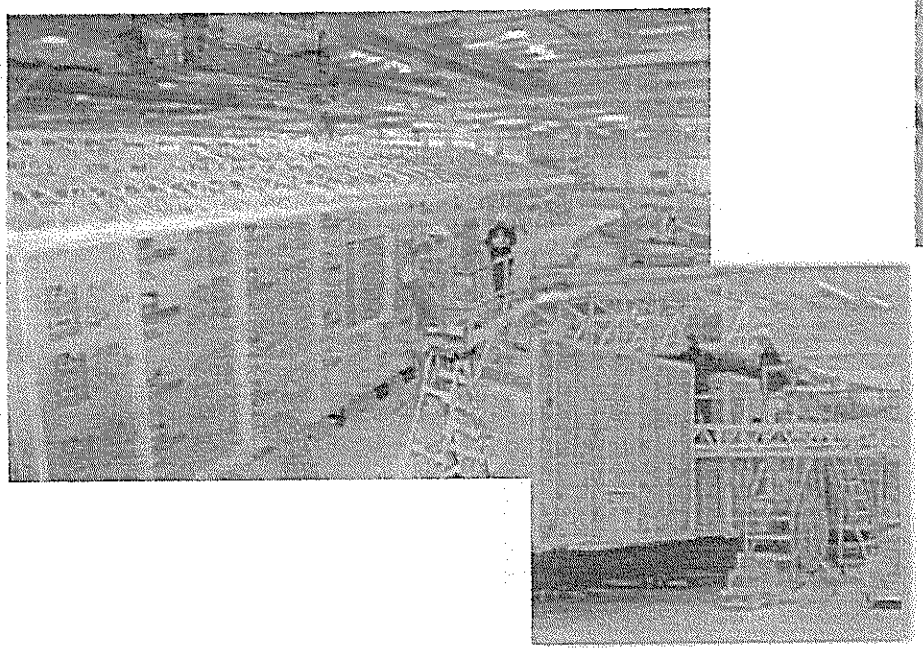
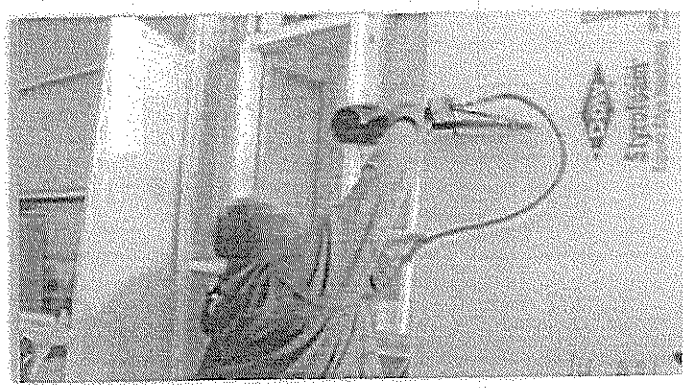
Progress and Accomplishments: TOs 3-4

Tested, prototyped and perfected the advanced wall design over five prototype builds at different manufacturing plants.

TO3 – Component prototyping and testing

TO4 – Whole-house prototyping and constructability assessment





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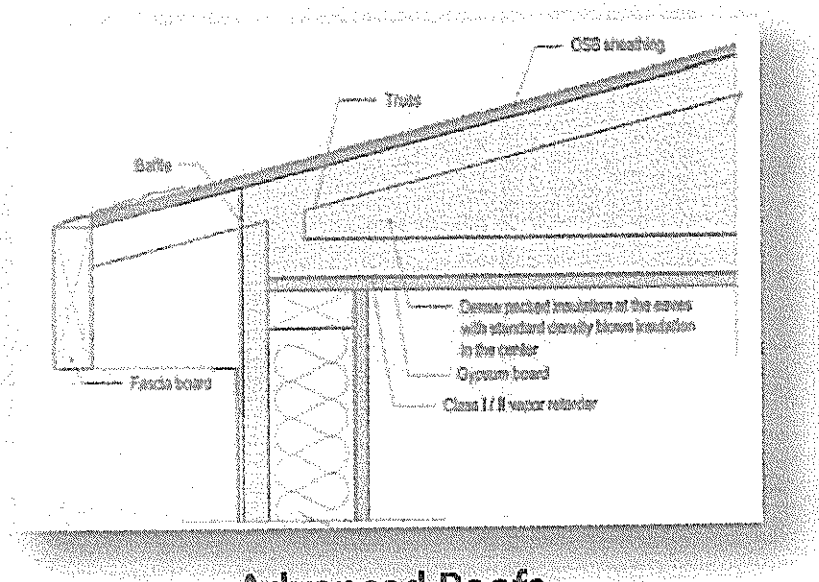
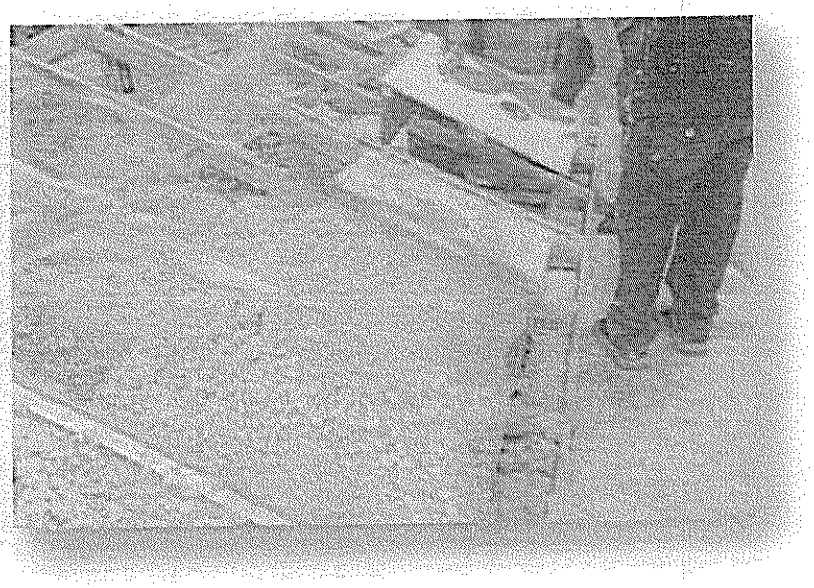
Progress and Accomplishments: TO5

Developed advanced roof design that reduces heat loss at the eaves – traditionally a weak link in the thermal performance of attics.





Advanced Roofs

Progress and Accomplishments: TO5

Full-scale wall and roof prototyping; instrumentation and testing of advanced roofs, monitoring of moisture and thermal performance.

- Constructed and instrumented three side-by-side lab homes
- Monitored for one year (on going)

Traditional MH Home	Advanced (ZERH) MH
Standard fiberglass batt in wall cavities	Reduced thermal bridging with exterior rigid insulation
Cooling equipment site installed	High efficiency equipment plant-installed, commissioned
Ducts under floor and in crawl	No ducts
Code minimum 13 SEER / 8 HSPF or electric resistance	22 SEER / 12 HSPF
Envelope U_o = 0.116	Envelope U_o = 0.063

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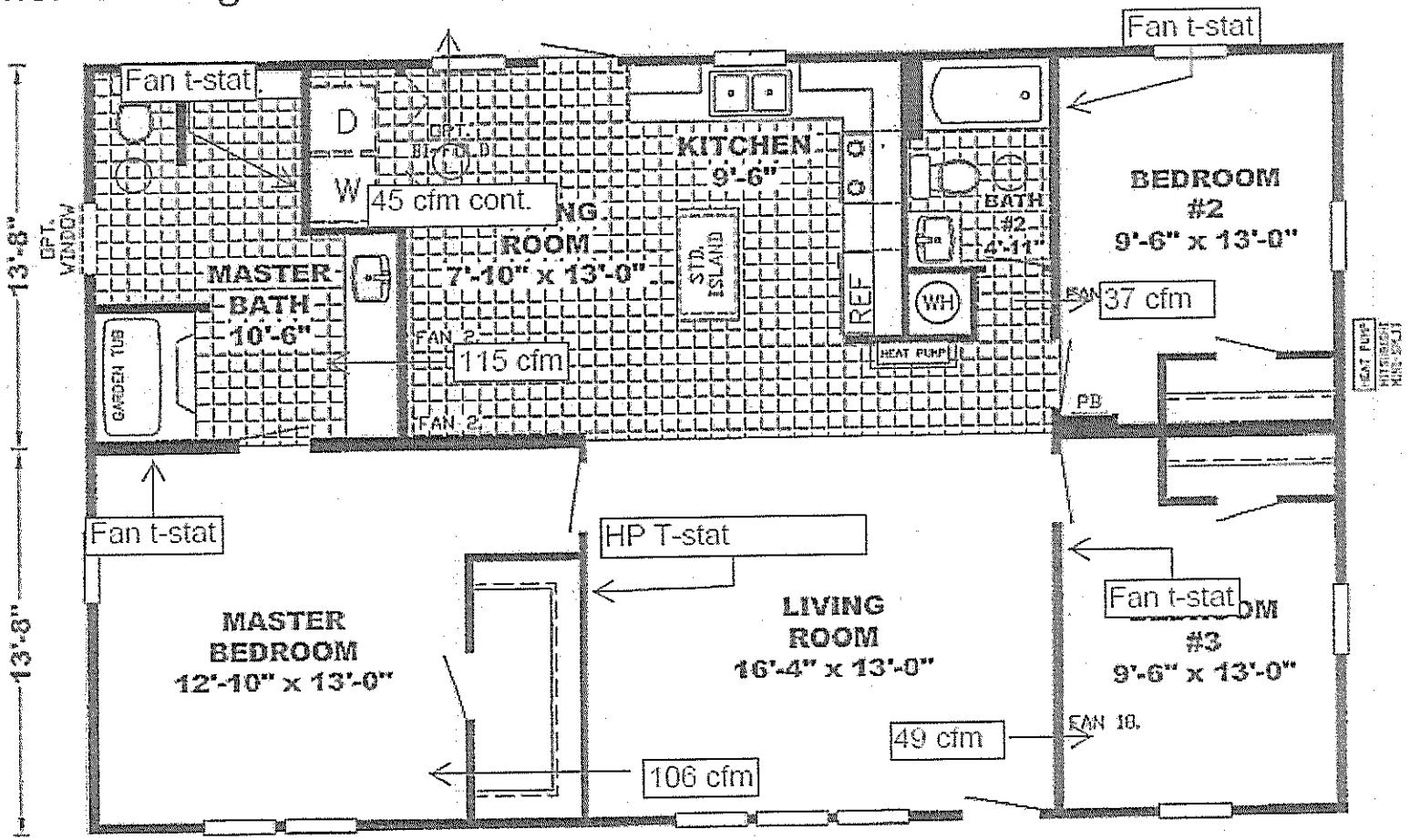
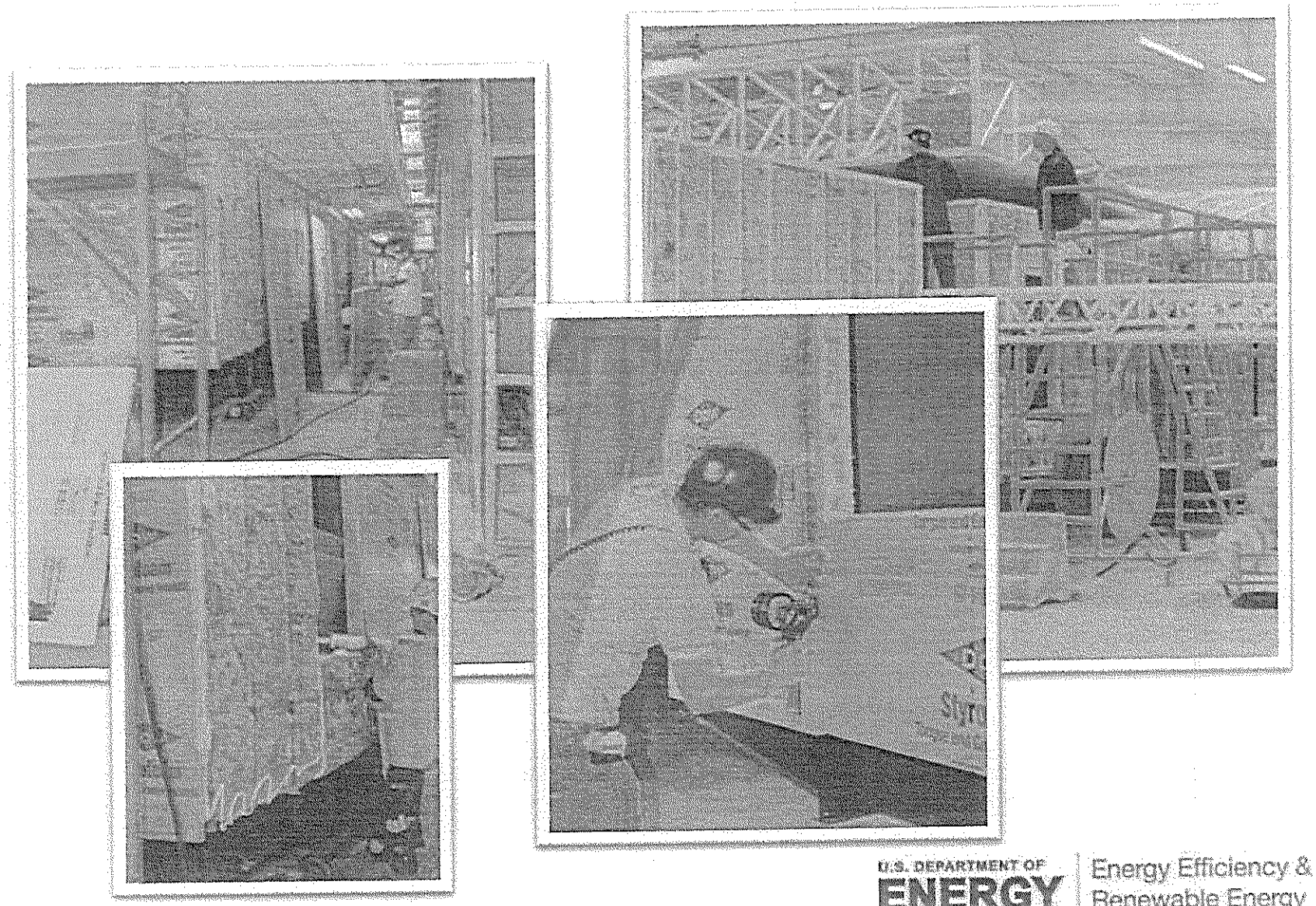
Progress and Accomplishments: TO5

Better understanding of the interplay between heat pump, fan locations and home configuration



Progress and Accomplishments: Advanced Wall Construction



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Progress and Accomplishments: Advanced Roof Construction

Dense-pack insulation

Baffles and insulation dams

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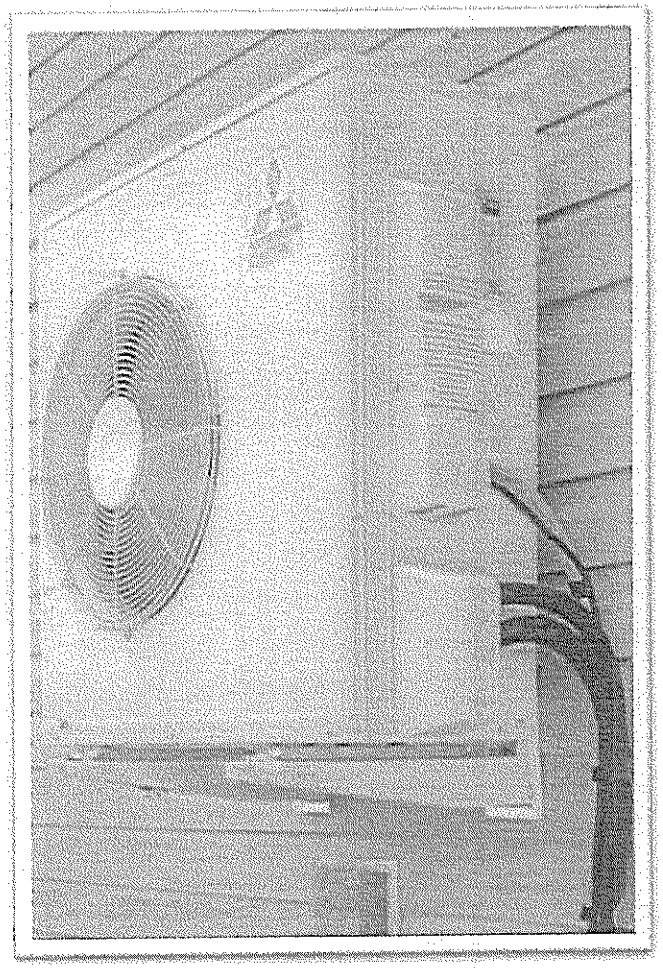
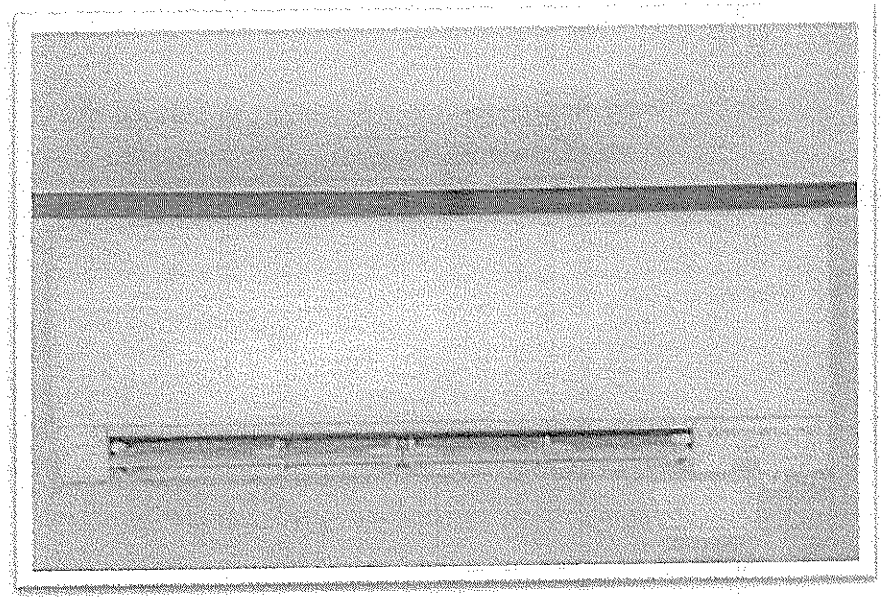
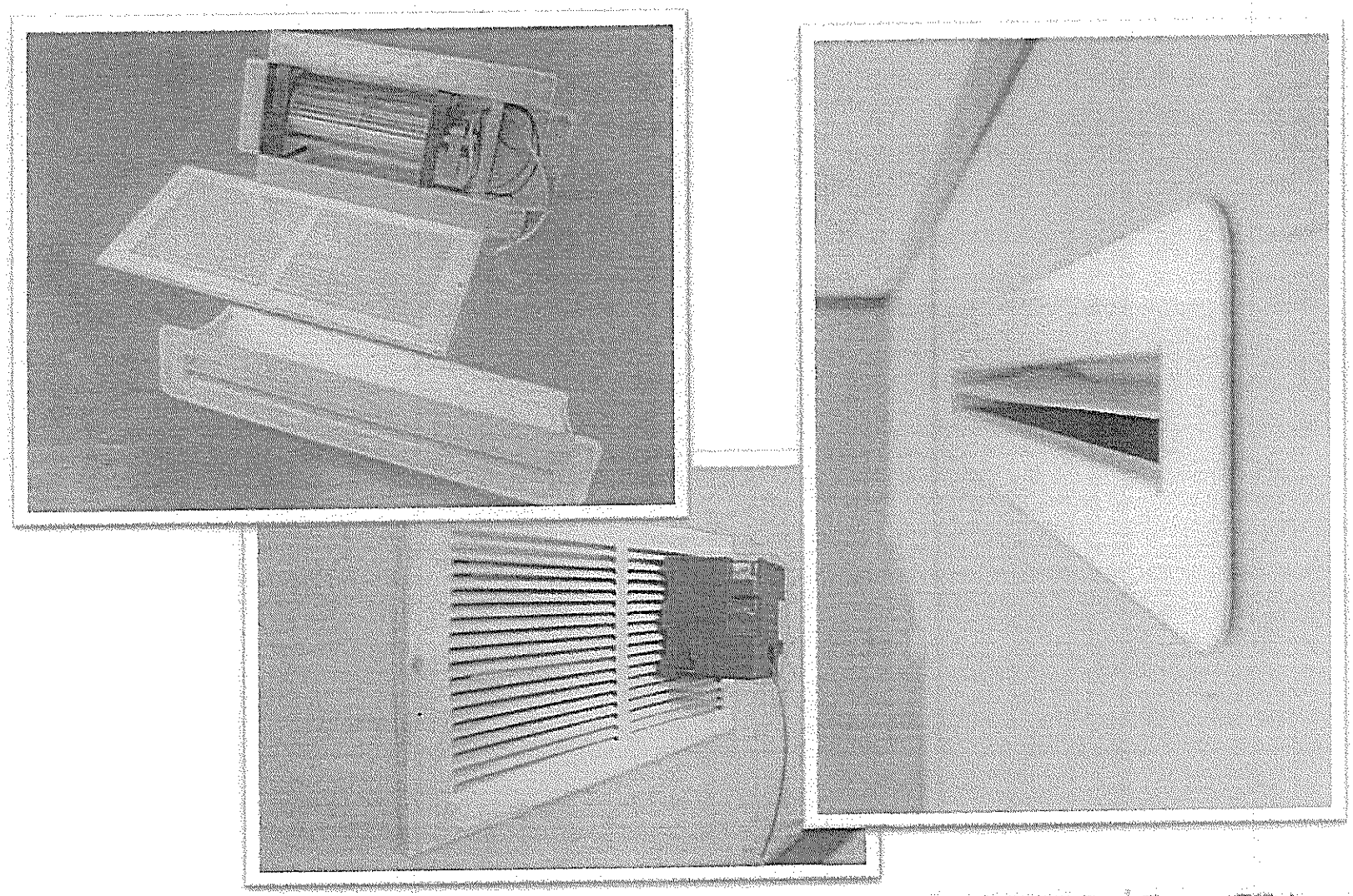
Progress and Accomplishments: Ductless Mini-split Heat Pump





Progress and Accomplishments: Transfer Fan Distribution



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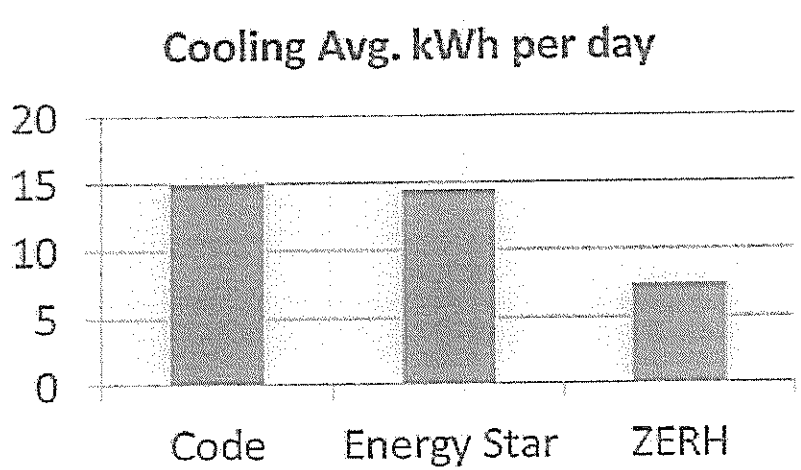
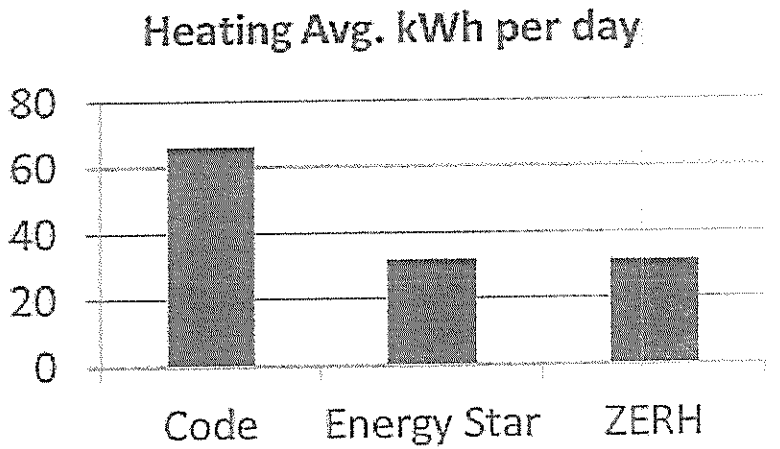
Progress and Accomplishments: Lab Home Results





Code and ES used similar cooling energy because less cool-off for ES home in evening.

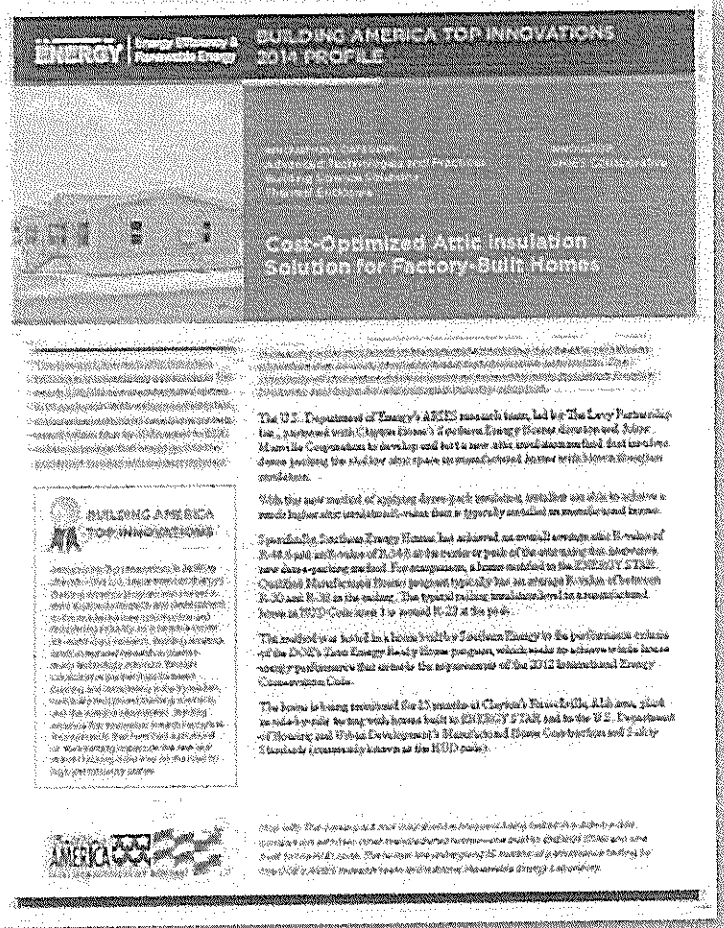
ES and ZERH used similar heating energy because the mini-split heat pump unexpectedly operated at about the same COP as a traditional, split system heat pump.

Other Results:

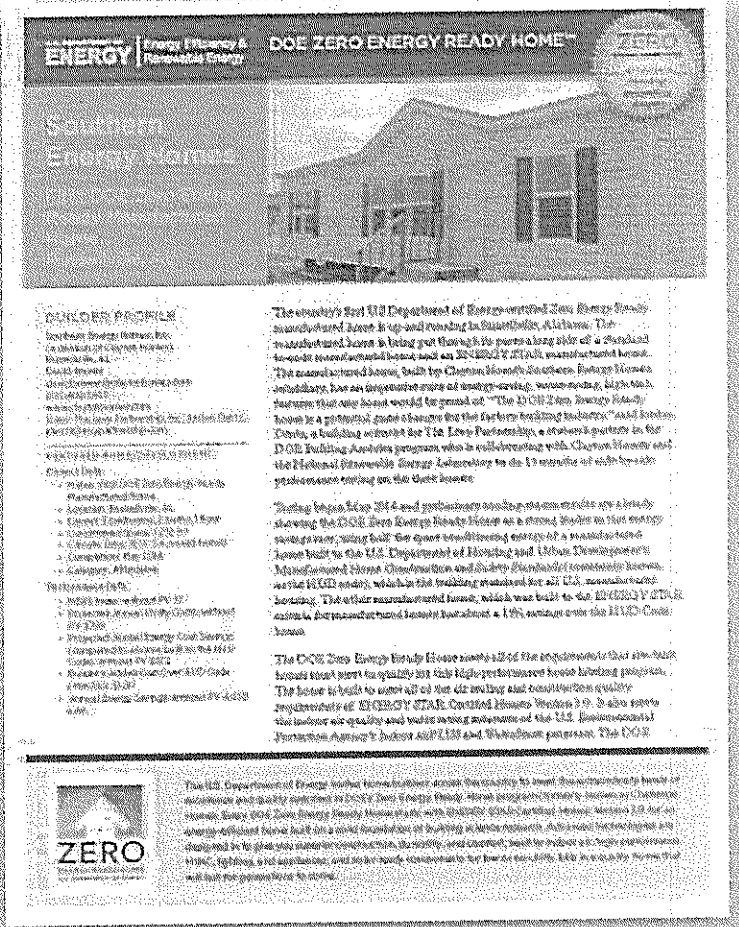
- Site-installed equipment problems – how typical is this?
- Transfer fan configuration in heating.
- Effective ventilation rates with traditional POS systems.

Progress and Accomplishments: Awards/Recognition

Building America Top Innovation Award 2014



ZERH Housing Innovation Award 2014



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Progress and Accomplishments: Summary

Lessons Learned	In-situ performance of mini-split heat pump in heating unexpected (further analysis needed)
Accomplishments	Developed, tested advanced wall and roof designs that improve envelope thermal performance, reduce energy use, cut CO_2 emissions, reduce equipment size, improve comfort and durability
Market Impact	Impacted ASRAC process –new standard based on IECC 2015. Engaged many factories in demonstrating new building methods
Awards/ Recognition	BA Top Innovation Award 2014 and ZERH Housing Innovation Award 2014

Project Integration

Left to Right: Emanuel Levy, TLP; Brian Lieburn, DOW; Kevin Clayton, Clayton Homes; Bryan Mallon, DOW; Jim Morey, DOW; Sam Rashkin, DOE; David Brewer, Southern Homes

- Stakeholders participate and guide the research
- Bi-monthly stakeholder conference calls
- All major decisions owned by steering committee
- Participation of many companies, not just those involved in the prototyping
- More than 70% of industry
- In-kind contributions $274k
- Demos/prototyping/testing at industry facilities

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Project Collaboration

- **Funding Partners:** DOE, TVA, CEC
- **Research Collaboration:** NREL on lab home instrumentation, experiments and analysis
- **Industry Partners:**

SEhomes

DOW

Building AMERICA U.S. Department of Energy

Clayton homes

JM Johns Manville

NREL

SENCO

ZERO ENERGY READY HOME

ARIES Collaborative

TVA

Systems SBRA Building Research Alliance

MHI Manufactured Housing Institute

MITSUBISHI

CALIFORNIA ENERGY COMMISSION

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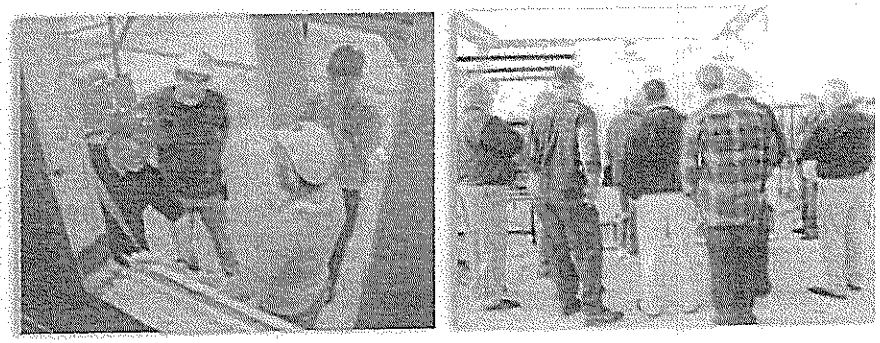
Project Integration and Collaboration: Roles

Industry Partner	Role
Clayton Homes	Engineering, plant selection and logistics
Southern Homes	Manufacturer of lab homes
Mitsubishi	Provider of space conditioning equipment and technical support
DOW	Provider of wall insulation, flashing system and technical support
Johns Manville	Provider of roof insulation and technical support
Accuvent	Provider of roof ventilation system and technical support
Tjernlund	Provider of transfer fans and technical support
Senco	Provider of fasteners, fastening tools and technical support



Collaboration on Lab Home Construction

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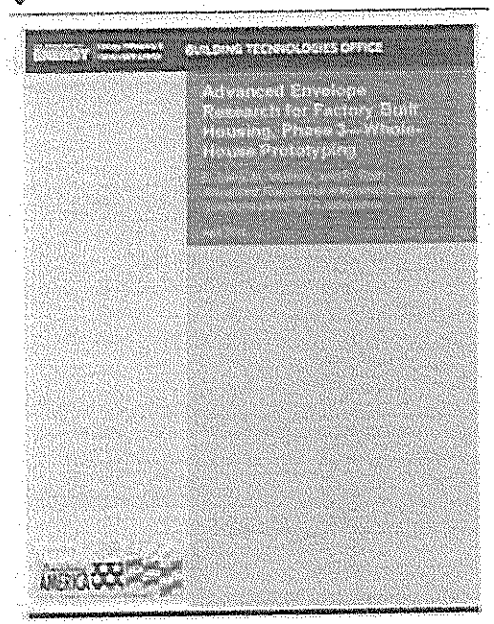
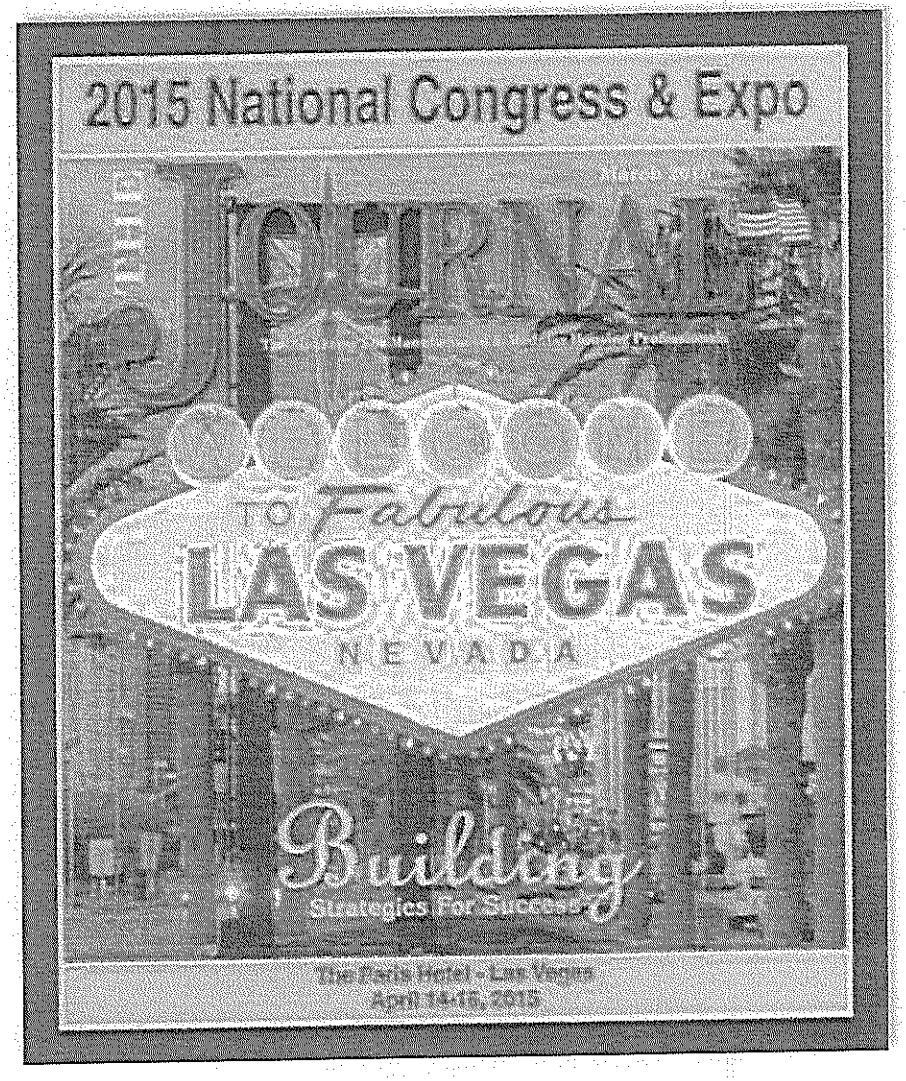
Project Integration and Collaboration: Communications

- MHI Meetings
- MH Congress & Expo
- MH NewsWire
- The Journal
- BA Reports
- CFED and others





cfed
expanding economic opportunity

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Next Steps and Future Plans: Ongoing CEC Work

Roof test structure: Five roof configurations being tested in Jamestown, CA

2015 Plans:

- Radiant barrier/cool roof testing
- Full scale production testing
- Multiple full-scale homes at multiple plants
- Multiple occupied homes monitoring

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Next Steps and Future Plans: Integrated Solution

Ongoing experiments will answer important outstanding questions pertinent to high performance MH and site built homes, including:

- In-situ performance of mini-split heat pumps
- Performance of transfer fan distribution strategy (heating & cooling)
- Impact of open doorways on airflow and comfort

Future Work – Important for commercialization

- Understand airflow dynamics via calibrated CONTAM/TRNSYS model
- Level of envelope efficiency by climate necessary for success of point-source space conditioning strategy
- Interaction of real life homeowners with advanced home

REFERENCE SLIDES

Project Budget

Total Project Budget: $1,084,364 ($810,425 DOE; $273,939 cost-share)

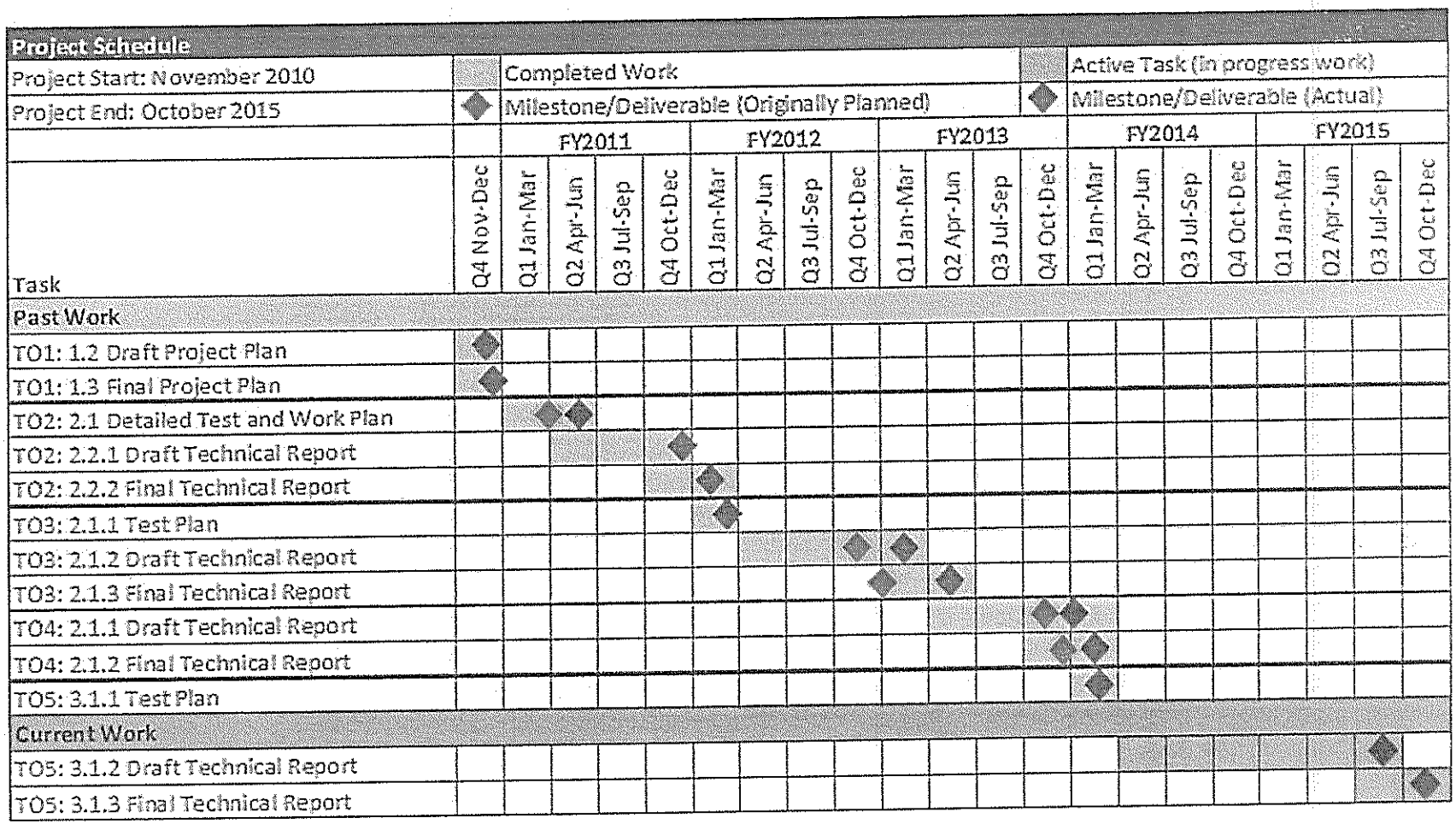
Variances: $95,000 increase in TO5 for additional tasks/modified scope of work

Cost to Date: 81% of project budget expended to date (FY2011-FY2015 to date)

Additional Funding: California Energy Commission, Tennessee Valley Authority, Industry partners

Budget History					
FY2011–FY2014 (past)		FY2015 (current)		FY2016–FY2018 (proposed)	
DOE	Cost-share	DOE	Cost-share	DOE	Cost-share
$580,570	$95,647	$229,855	$178,262	$1,090,113	$353,500

Project Plan and Schedule



The Future of Energy Efficiency In Factory Built Housing

Moderator

Lois Starkey, Manufactured Housing Institute

Speakers

Emanuel Levy, Systems Building Research Alliance

Robin Roy, Ph.D., Natural Resource Defense Council

Tony Wicke, Land/Home Financial Services

Barry Noffsinger, CU Factory Built Lending

Energy Efficiency in Manufactured Housing:

Federal standards, ENERGY STAR and other programs

National Congress & Expo

Las Vegas

April 15, 2015

Robin Roy
Natural Resources Defense Council

NRDC

DOE Energy Standards

- ***Consensus, not contentious***
  - negotiated agreement among stakeholders
  - adoption by DOE expected unless a monkey-wrench is thrown in
  - enforcement approach tbd *(e.g., via HUD)*
- ***Great energy savings***

  ...of ***20-35%*** compared to current (1994) HUD standards
  ...that ***surpass Energy Star***
  ...and ***approach IECC 2015*** model code

- ***Consumer savings***

  ...Present value net savings typically ***$1000 to over $3000***
  ...despite ***costly financing***
  ...and recognition of ***purchase cost constraints***
  ...with ***short simple payback*** time of 5-10 years
  ...and affordability from a ***1st buyer's perspective***

Further Technical Opportunities

- ***Installation measures*** (outside of DOE's authority)
- ***Heat pumps*** for water and space heating
- ***Ductless*** AC and space heating
- ***Full life cycle cost*** measures going beyond 1st buyer perspective
- other ***emerging technology***

...could increase savings by perhaps ***50%***

- Also, over ***100,000 new homes*** will likely be built before DOE standards are in place

Support for Efficiency Beyond DOE Standards

- Updating ***EPA ENERGY STAR*** for MH
  - Consensus proposal for DOE Standards surpasses current ENERGY STAR requirements
  - EPA starting to revise, including industry and stakeholder outreach
  - Interest in harmonizing with ENERGY STAR for other homes
- ***Utility incentive programs***
  - Topping up for ENERGY STAR new homes
  - For upgrades to existing homes
  - Replacement of existing old, very inefficient homes
  - Include packages in utility Consortium for Energy Efficiency?
- Other ***leading edge efforts***, e.g., NEEA, Next Step, VEIC, SBRA
- More energy efficiency ***tax credits***?

2015 National Congress & Expo

April 15, 2015

Energy Standards:
From Laggard to Leader

Emanuel Levy

Systems SBRA
Building Research Alliance

CONTEMPORANEOUS EVENTS

- *Schindler's List* wins the Oscars for Best Picture
- Richard Nixon (81) and Jacky Onassis (64) die
- O.J. Simpson accused of double murder
- NY Knicks make it to the NBA finals
- Newt Gingrich becomes House Speaker
- The last time HUD updated the manufactured home energy standards

Highlights and Low Lights of 1994

Systems SBRA Building Research Alliance

THE 2007 ENERGY ACT

- **Requirements**: *"...standards .. shall be based on the most recent version of the IECC... except in cases in which ...the code is not cost-effective.."*
- **Considerations**: *"... standards may take into consideration the design and factory construction of manufactured homes; be based on the (HUD) climate zones rather than the (IECC) climate zones; and provide for alternative (compliance) practices ..."*
- **Updating**: *"...standards shall be updated not later than one year after the date of enactment of this Act; and one year after any revision to the IECC."*

Systems SBRA
Building Research Alliance

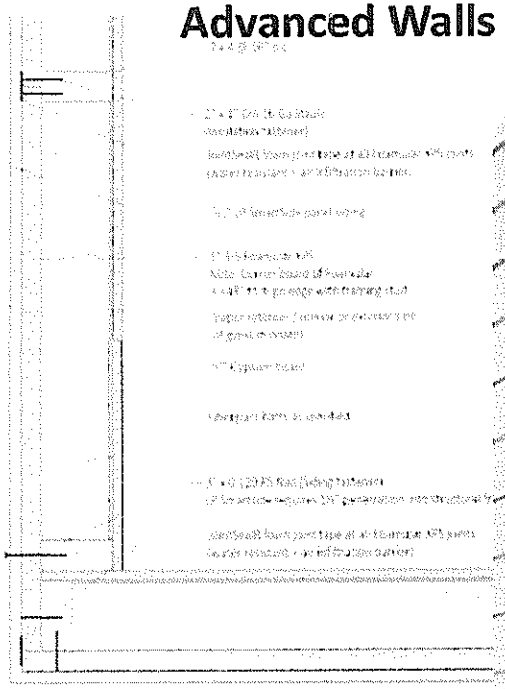
ADVANCED WALLS PROTOTYPING

Prototyping hosted by
Karsten Homes, Sacramento, CA

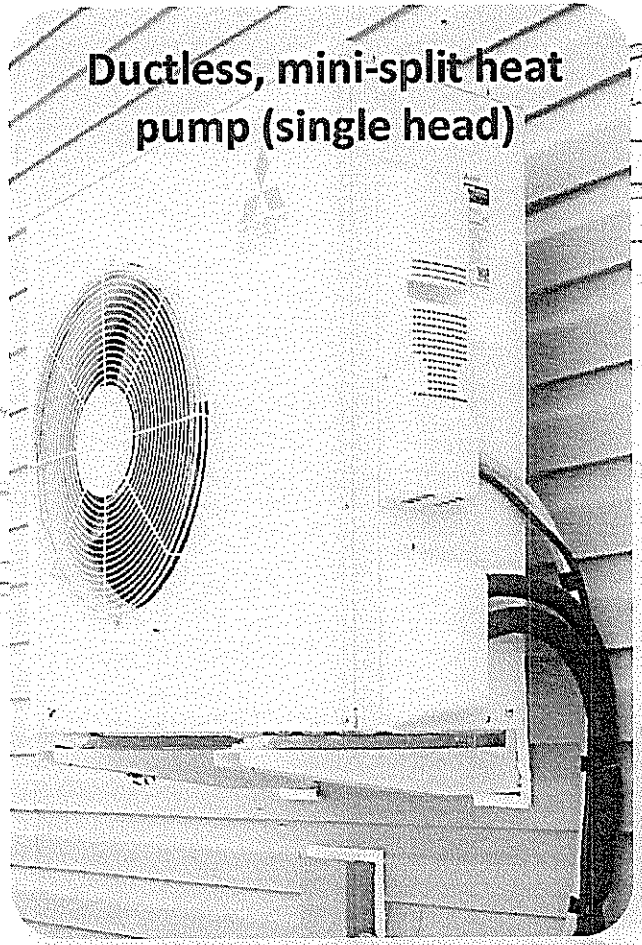
Systems SBRA
Building Research Alliance

THREE TECHNOLOGIES

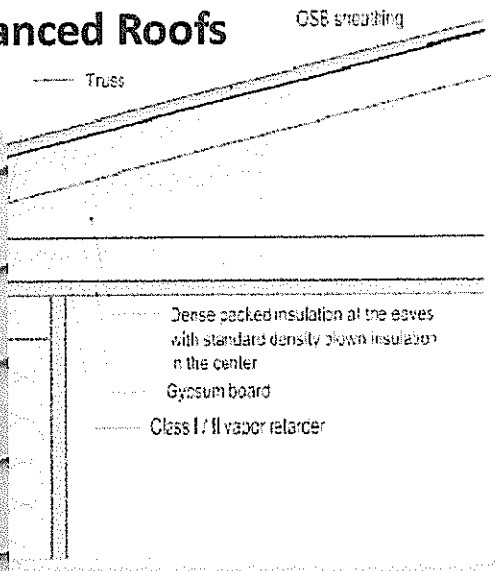
Advanced Walls



Ductless, mini-split heat pump (single head)



Advanced Roofs



Systems SBRA
Building Research Alliance

Responding to the Challenge: Next Generation Technologies

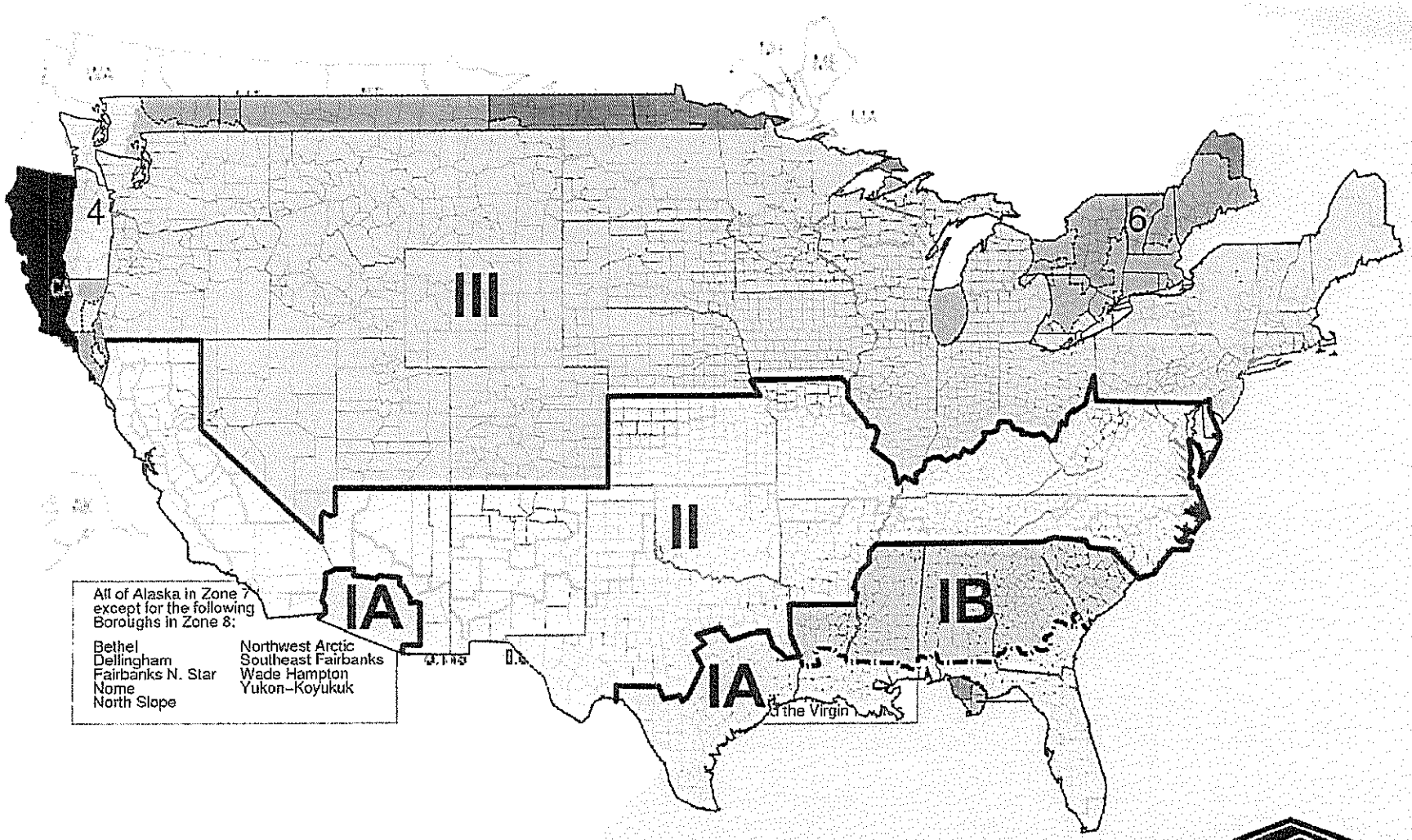
COMPARING THERMAL TARGETS

New region number	Sub-region	Home type	HUD (1994) U_o-value (package)	ISCE (2015) U_o-value (package)	ASRAC U_o-value (package)	Change vs. HUD	Cost (ASRAC vs. HUD)
1	A	S	**0.116** (22-11-19-S)	**0.086**	**0.087** (30-13-13-Low E)	25%	$2,009
		M		**0.083**	**0.084** (30-13-13-Low E)	28%	$3,024
	B	S		**0.086**	**0.089** (30-13-13-Low E)	25%	$2,009
		M		**0.083**	**0.084** (30-13-13-Low E)	28%	$3,024
2		S	**0.096** (22-11-19-S/S)	**0.066**	**0.070** (30-21-19-Low E)	27%	$1,416
		M			**0.068** (30-21-19-Low E)	29%	$1,843
3		S	**0.079** (30-13-22-Low E)	**~0.050**	**0.059** (38-21-30-Argon)	25%	$1,504
		M			**0.056** (38-21-30-Argon)	29%	$2,248

[1] Costs were estimated by SBRA based on input from eight manufacturers.

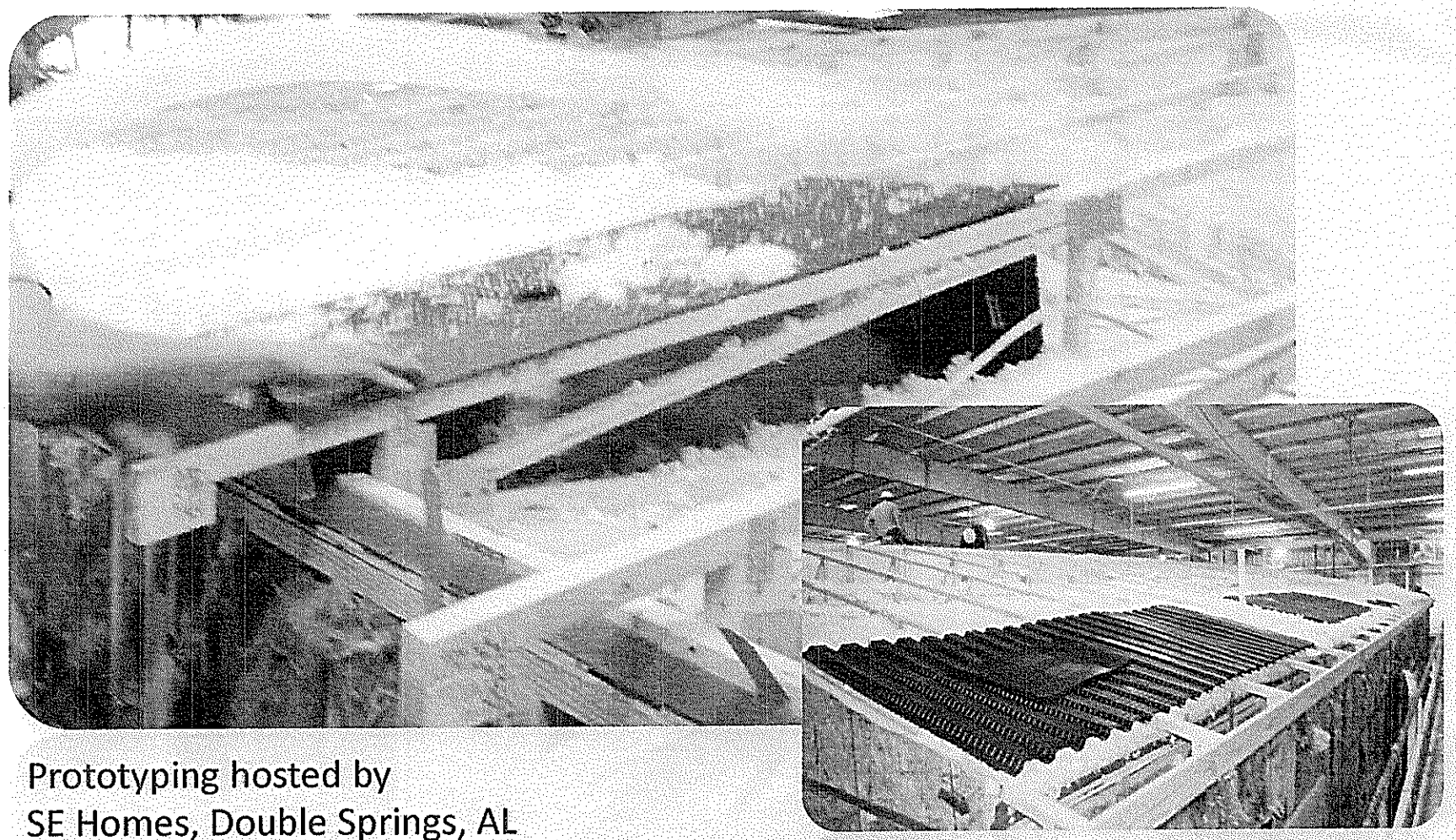
Systems SBRA Building Research Alliance

MAPS, MAPS AND MORE MAPS



Systems SBRA
Building Research Alliance

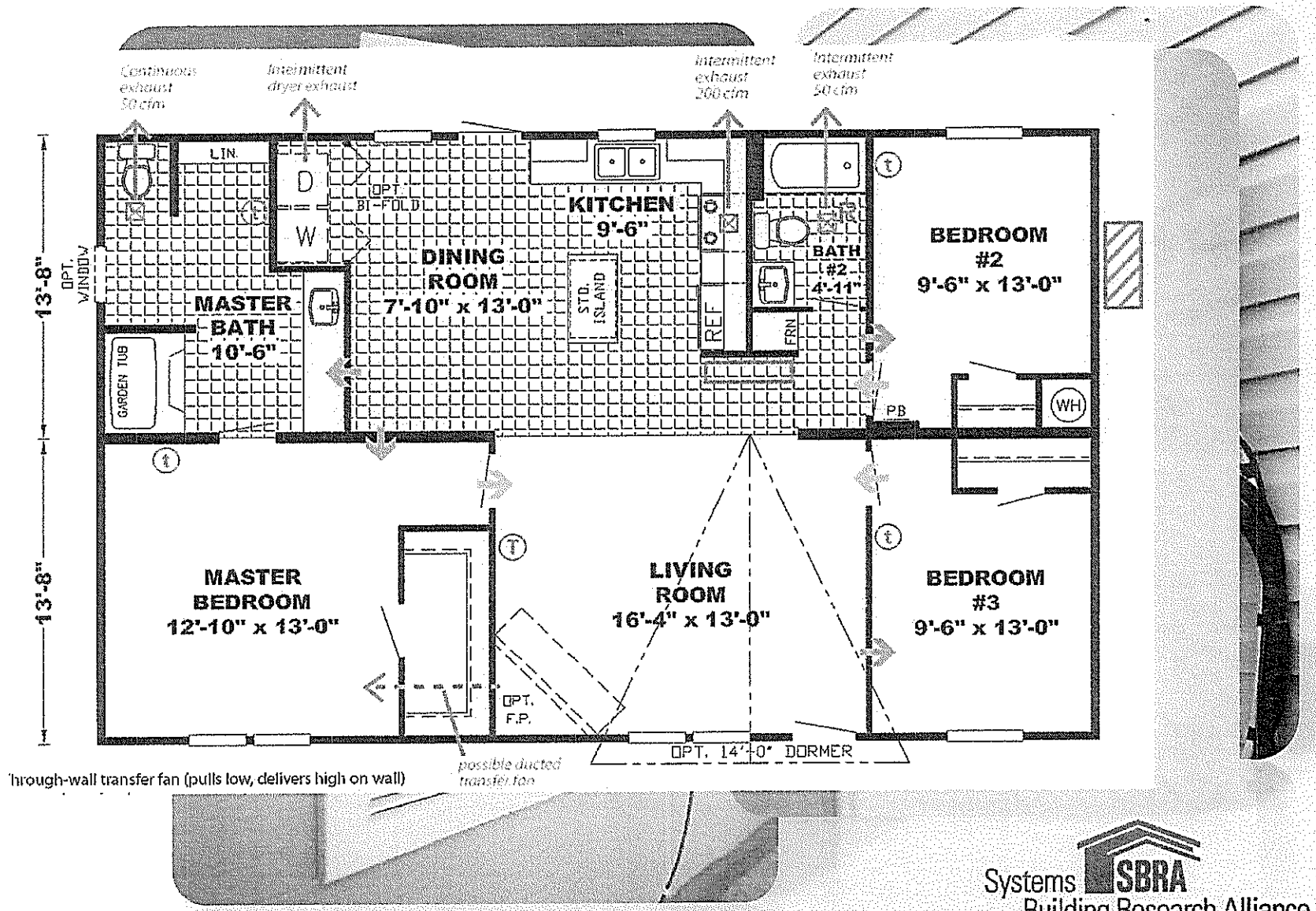
ADVANCED ROOF PROTOTYPING



Prototyping hosted by
SE Homes, Double Springs, AL

Systems SBRA
Building Research Alliance

DUCTLESS MINI-SPLIT HEAT PUMP



Systems SBRA Building Research Alliance

Subj: **[mhexecs] RE: DOE changes**
Date: 7/27/2016 11:11:12 A.M. Eastern Daylight Time
From: lois.starkey@mfghome.org
To: mhao@mhao.org, mhexecs@googlegroups.com, MHARRDG@aol.com
CC: LGooch@mfghome.org, theinemann@mfghome.org

Dear Deanna:

Thank you for your question regarding the Department of Energy's (DOE) proposed energy conservation standards for manufactured housing. Attached is a copy of the June 17, 2016 Federal Register (FR) Notice of Proposed Rulemaking (NOPR). Page 39781 of the FR notice includes a table with all the changes that DOE is proposing. The MHI Week in Review article below offers an update about MHI's actions in response to the proposed Rule. As you know, MHI has been actively engaged in this rulemaking process, since its inception.

The DOE's estimated cost impact of the proposed standards (see page 39757 of the FR Notice) is based in large part on detailed cost analysis provided by the Systems Building Research Alliance (SBRA) who obtained cost information from large, medium and small manufacturers. The estimated average cost increase uses the minimum HUD Code thermal standards as the basis for the analysis. In all regions of the country, only a very small percentage of manufactured homes are built to the minimum standards. Therefore, the cost impact should not be as great as stated in the NOPR. It should be noted that MHARR did not provide any cost data from its members (whose names have never been disclosed) during the ASRAC negotiations despite the invitation to do so.

MHI will continue to express its concerns about the adverse cost impact of the rule during the comment period, and advocate for a workable compliance path. Also, MHI has been working with SBRA on a number of cost effective building methods to address the anticipated new standards, including new roof truss designs and building envelope techniques.

Again, thanks for your inquiry. Please let us know if we can answer further questions, and be assured that MHI will continue to effectively represent all segments of the factory-built housing industry in Washington, DC.

Regards,

Lois

MHI Week in Review, July 22, 2016
MHI Calls on the Department of Energy to Reduce Impact on Home Prices and Implementation Challenges Posed by its Energy Conservation Proposal

On July 13, MHI participated in a public meeting hosted by the Department of Energy (DOE) regarding its Notice of Proposed Rulemaking (NOPR) for Energy Conservation Standards for Manufactured Housing.

MHI expressed concern that the proposed standards will increase the cost of a manufactured home and will be a burden to many lower-income homebuyers, who already struggle to obtain the necessary housing credit to afford to purchase a home. While the DOE contends that the proposed standards would result in increased monthly utility savings for consumers, MHI argued that the costs of the regulatory process outweigh the benefits in savings.

MHI also argued that the proposal does not address implementation of the new standards, which could result in

manufacturers facing complicated and overlapping requirements, since it could end up that two separate entities (DOE and HUD) would oversee the standards. MHI reasoned that the proposed standards should not be finalized until DOE and HUD can determine an efficient and practical enforcement strategy.

The proposed standards are based on a flawed statute – the Energy Independence and Security Act (EISA) of 2007. EISA required the energy conservation standards to be based on the 2015 International Energy Conservation Code (IECC), while also considering cost-effectiveness criterion. However, the authors of IECC did not consider the economic impact of that standard on manufactured homes. As a result, the two criteria are incompatible.

As part of their Rulemaking process, the Department of Energy created a manufactured housing Working Group called the DOE Appliance Standard Rulemaking Advisory Committee (ASRAC) Working Group on Manufactured Housing. It included representatives of manufacturers, specialist manufactured housing equipment and materials suppliers, manufactured housing homeowner advocates, utilities, state regulators, energy efficiency advocates, and environmental advocates. Several MHI members served on the task force.

To deal with the flaws in EISA, the ASRAC Working Group started consideration with the IECC before considering the cost effectiveness of individual measures. As a part of the process, an exhaustive and detailed cost analysis was conducted by SBRA, using cost data from a representative sample of large and small home manufacturers. In October 2014, the ASRAC Working Group forwarded its energy efficiency recommendations to DOE. The recommendations were based on the 2015 edition of the International Energy Conservation Code (IECC), the impact of the IECC on the purchase price of manufactured housing, total lifecycle construction and operating costs, factory design and construction techniques unique to manufactured housing, and the current construction and safety standards set forth by U.S. Department of Housing and Urban Development.

For detailed information about the standards recommended by the ASRAC Working Group on Manufactured Housing, click here. Following these recommendations, MHI's Members of the ASRAC Working Group and DOE provided a presentation to MHI members at its 2015 Winter Meeting in New Orleans. To see the presentation, click here.

In addition to its participation at the public meeting, MHI will submit comments on the proposed rule, which are due August 16, 2016. A letter template will also be provided to MHI members so numerous comments are submitted during the open comment period. MHI also continues efforts to on Capitol Hill to eliminate the duplicative and burdensome regulatory framework imposed by EISA.

For additional information, please contact Tom Heinemann, MHI's Vice President of Federal Government Relations, at (703) 229-6207 or theinemann@mfghome.org or Lois Starkey, MHI's Vice President for Regulatory Affairs, at (703) 558-0654 or Lstarkey@mfghome.org.

Lois Starkey
703-558-0654

From: Deanna Fields [mailto:mhao@mhao.org]

Sent: Tuesday, July 26, 2016 11:17 AM
To: 'mhexecs' <mhexecs@googlegroups.com>; MHARRDG@aol.com; Lois Starkey <lois.starkey@mfghome.org>
Subject: DOE changes

Does anyone have the laundry list of proposed DOE changes (itemized checklist) that if implemented will increase the cost to $2k-$3.5k of a home as being alleged?

Deanna Fields
MHAO Executive Director
6400 S. Shields Blvd., OKC, OK 73149
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Website: www.mhao.org
Office Phone: 405/634-5050
Cell: 405/760-5530

Find us on Facebook at https://www.facebook.com/mhao.org

Oklahoma Rocks!!

Systems Building Research Alliance

About SBRA
Publications
Membership
Projects
ENERGY STAR
PATH Research
Links
Contact Us

Who We Are

The Systems Building Research Alliance, formerly the Manufactured Housing Research Alliance, is a non-profit organization with the mission of developing new technologies to enhance the value, quality, and performance of the nation's factory built homes, both manufactured and modular. SBRA's research supports the industry by developing new methods for using factory built homes in a wide array of housing applications, by solving technical challenges, and by paving the way for innovations in home design, construction, and installation. To carry out its mission, SBRA develops, tests, and promotes better methods and materials for designing, manufacturing, and marketing factory built homes. These activities include research, new product development, training and educational programs, testing programs and demonstrations, commercialization efforts, workshops, conferences and other events.

Collaboration is the Key to Innovation

Members of SBRA include home manufacturers, retailers and community owners, suppliers, consumers, associations, financial institutions, insurance companies, power suppliers, and other research organizations involved in the factory built housing industry. Working together, and in partnership with other organizations, members chart the course for SBRA's initiatives and are the catalyst for moving results into practice. Pooling the varied experiences and perspectives of its members, SBRA is able to provide practical, marketable solutions to the challenges and opportunities facing factory built housing. Factory built housing is the fastest growing and most vibrant part of the home building industry. Today, one-third of all single family sales and one-fourth of all new single family housing starts in the nation are factory built homes. Demand for factory built homes continue to grow as more homebuyers and developers recognize that factory built housing offers quality homes at affordable prices. At the same time, industry continues to seek ways to enhance the value of new factory built homes. Fostering technological advances and building innovation, SBRA plays a vital role in this process.

Our Search For Innovation

By developing and promoting new technologies and manufacturing methods, SBRA is helping to shape the factory built housing industry. As the industry's research and development arm, SBRA has set its

International Codes-Adoption by State (May 2016)

ICC makes every effort to provide current, accurate code adoption information. Not all jurisdictions notify ICC of code adoptions.
To obtain more detailed information on amendments and changes to adopted codes, please contact the jurisdiction. To submit code adoption information: www.iccsafe.org/adoptions

X = Effective Statewide A = Adopted, but may not yet be effective L = Adopted by Local Governments S = Statewide adoptions with limitations XL = Adopted by the State for Local Adoption
12= 2012 Edition 09 = 2009 Edition 06 = 2006 Edition 04 = 2004 Edition 03 = 2003 Edition 00 = 2000 Edition

* The title of the 2000 and 2003 IUWIC Code was changed to IWUIC in the 2006 version.

Jurisdiction	IBC	IRC	IFC	IMC	IPC	IPSDC	IFGC	IgCC	IECC	IPMC	IEBC	ISPSC	ICCPC	IWUIC	IZC	ICC 700
Alabama	A15, L	XA15, L	A15, L	A15, L	S09, L	L	A15, L		XL	L	L		L	L	L	
Alaska	X09	L06, L09	X09	X09			X09		L06, S12 SFR							
Arizona	S12, L	S09, L	S12, L	S12, L	S12, L	S12,L	S12, L	L	S09, L	L	L	L	L	L	L	L
Arkansas	X12	X12	X12	X09	X06	L	X06		X09	L	L					
California	X12	X12	X12							L	X12	L		L		
Colorado	S15, L	S15, L	S15, L	S15, L	X15, L	L	X15, L	L	S12, L	L	S15,L	L	L	S12,L	L	L
Connecticut	X03	X09	X03	X03	X03				X09	L	X03					
Delaware	L12	L12	L12	S15	S12		S15		S12	L	L					
District of Columbia	X12	X12	X12	X12	X12		X12	X12	X12	X12	X12	X12				
Florida	X12	X12		X12	X12		X12	X	X12	L12	X12					
Georgia	X12	X12	X12	X12	X12		X12		X09	XL12	XL12	XL12		XL12		XL08
Hawaii	X06	X06, L06							X06, L09							
Idaho	X12	X12	X12	X12			X12	L12	X12, L12		X12					L
Illinois	S09, L	L	S09, L	S09, L	L	L	S09, L		X15	S09, L	S09, L	L12	L	L	L	
Indiana	X12	X03	X12	X12	X06		X12									
Iowa	S09, L	S09, L	X09	S09, L	L	L	L		X12	L	S09, L				L	
Kansas	L	L	S06, L	L	L	L	L		S09, L	L	L					
Kentucky	X12	X12	X12	X12					X09/X12	L						
Louisiana	X12	X12	L	X12	X12		X12		X09,L	L	X12					
Maine	X09	X09							X09	L	X09					
Maryland	X15	X15		X15	L15	L	L	X12	X15	X15	X15					
Massachusetts	X09	X09		X09					X12		X09					
Michigan	X12	X15	L	X12	X12	L	X12		X09	L	X12		L			
Minnesota	X12	X12	X12	X12			X12	L	X12	L	X12					
Mississippi	A15, L	A15, L	A15, L	A15, L	A15, L	L	A15, L		L	L	A15, L		L			
Missouri	S12,L	S00, L	L	S12, L	S12,L	L	S00		S12	L	L		L	L	L	
Montana	X12	X12	L	X12			X12		X12		X12	S,XL15		S,XL 12		
Nebraska	S12, L	S12, L	L	L	L	L	L		S12, L	L	S12, L			L	L	
Nevada	S12, L	S12, L	S12, L	L	L	L	L		S12, L	L	S12,L		L	X09, L		
New Hampshire	X09	X09	L	X09	X09			L	X09	L	X09					
New Jersey	X15	X15	X15	X15			X15		X15	L		X15				
New Mexico	X09	X09	X03	L	L		L		X09	L	X09		L	L		
New York	X15	X15	X15, L	X15, L	X15		X15		X15	X15	X06			X15		
North Carolina	X09	X09	X09	X09	X09		X09	X	X09		X12					
North Dakota	S12, L	S12, L	L	S12, L			S12, L		S12, L	L	L					
Ohio	X09	A09	X09	X09	X09		X09		X09	L					L	
Oklahoma	X15	S09, X	X15	X15	X15	L	X15		S03, L	S06, L	X15		S06, L	L	L	
Oregon	X12	X09	X12	X12			X12	X	X12							
Pennsylvania - 16 2015 Amendments in effect 12/31 plus accessibility provisions.	X09	X09	X09	X09	X09		X09		X09	L	X09		X09	X09		
Rhode Island	X12	X12		X12	X12		X12	X12	X12	X12						
South Carolina	X12	X12	X12	X12	X12		X12		X09	XL12	XL12	XL12	XL12			
South Dakota	S15, L	L	S09, L	S09, L		L	L		L	S15	L		L	L		
Tennessee	S06, L	X09	S06, L	L	L		L	L12	X06	L	L	L12	L		L	
Texas	L	XL09	L	L	L	L	L		XL09	L	L	L	L	L	L	
Utah	X12	X12	X12	X12	X12		X12		X12					X06		
Vermont	S12	L			X15				X15							
Virginia	X12	X12	X12	X12	X12		X12		X12	X12	X12	X12				
Washington	X15, L	X15	X15, L	X15, L	L12, L15		X15, L	L	X15	L	X15, L	X15	L	L9,L12		
West Virginia	X15	X15		X15	X15		X15		X09	X15	X15	X15				
Wisconsin	X09		L	X09			X09		X09		X09					
Wyoming	X15, L	L15	X15, L	X15, L	L15	L12	X15, L		L15	S12	X15, L	L12	L12	L12	L12	
U.S.Territories	IBC	IRC	IFC	IMC	IPC	IPSDC	IFGC	IgCC	IECC	IPMC	IEBC	ISPSC	ICCPC	IWUIC	IZC	ICC 700
Guam	X09	X09	X09	X09	X09	X09	X09				X09					
Northern Marianas Islands	X09															
Puerto Rico	X09	X09	X09	X09	X09	X09	X09		X09		X09					
U.S. Virgin Islands	X12	X12	X12	X12					X12							

C-10-AO Housing Costs - All Occupied Units (NATIONAL)
2013 American Housing Survey

Numbers in thousands, except as indicated. Weighting consistent with Census 2010. (X) not applicable; - represents or rounds to zero. See Appendixes for definitions, methodology, historical changes, errors, and geography. ERRATA: This table, originally released on December 4, 2014, was revised on February 24, 2015.

Appendix A Definitions
Appendix B Sample Design and Weighting
Appendix C Historical Changes
Appendix D Errors

Geography: United States

1 - 67 of 67

Characteristics	Total occupied units	Tenure		Housing unit characteristics		Household characteristics				Regions				Inside MS	
		Owner	Renter	New construction past 4 years	Manufactured/ mobile homes	Black alone	Hispanic	Elderly (65 years and over)	Below poverty level	Northeast	Midwest	South	West	Central city	Ni cen ci
Total	115,382	75,650	40,201	2,371	6,917	15,015	14,875	26,784	18,457	21,110	25,912	42,551	25,379	34,768	58,
MONTHLY HOUSING COSTS															
Less than $100	631	283	347	14	117	145	77	182	379	97	119	268	149	231	
$100 to $199	3,125	2,353	772	68	704	553	388	1,257	1,278	292	538	1,654	593	894	1,
$200 to $249	3,310	2,479	831	48	628	398	286	1,582	1,184	358	739	1,685	528	902	1,
$250 to $299	3,677	2,916	761	22	450	474	375	1,678	1,043	385	847	1,841	621	892	1,
$300 to $349	3,935	3,230	706	36	437	516	374	1,783	823	454	1,022	1,736	653	942	1,
$350 to $399	3,815	3,080	735	38	377	452	330	1,748	765	491	1,022	1,604	698	934	1,
$400 to $449	3,829	2,833	995	73	377	401	371	1,668	839	542	1,083	1,550	653	1,027	1,
$450 to $499	3,978	2,814	1,163	40	345	535	372	1,518	870	630	1,143	1,542	663	1,114	1,
$500 to $599	7,945	4,777	3,168	93	701	1,093	934	2,617	1,710	1,341	2,218	3,014	1,372	2,443	3,
$600 to $699	7,851	4,085	3,765	75	657	1,223	1,036	1,998	1,608	1,309	2,110	3,118	1,319	2,576	3,
$700 to $799	7,626	4,062	3,564	94	585	1,162	1,204	1,636	1,399	1,279	2,129	3,057	1,472	2,659	3,
$800 to $999	14,419	7,485	6,934	212	608	2,234	2,250	2,484	2,118	2,459	3,552	5,582	2,805	4,825	7,
$1,000 to $1,249	14,182	8,521	5,662	225	417	1,916	2,116	1,993	1,473	2,676	3,128	5,130	3,248	4,541	7,
$1,250 to $1,499	10,917	6,592	3,425	247	171	1,222	1,427	1,262	813	2,030	2,092	3,266	2,603	3,036	5,
$1,500 to $1,999	11,861	8,794	3,067	474	69	1,134	1,633	1,376	734	2,762	1,977	3,518	3,604	3,575	7,
$2,000 to $2,499	5,815	4,796	1,019	272	33	447	668	709	277	1,436	879	1,835	1,665	1,668	3,
$2,500 or more	7,494	6,549	945	260	16	499	572	993	304	2,173	892	1,783	2,646	2,187	4,
No cash rent	2,091	X	2,091	16	204	408	279	502	691	325	388	999	378	568	
Median (excludes no cash rent) (dollars)	891	929	850	1322	501	815	921	693	696	1066	765	797	1024	906	1
MONTHLY HOUSING COSTS AS PERCENT OF CURRENT INCOME [1]															
Less than 5 percent	3,491	3,204	278	90	367	180	248	667	92	509	707	1,479	796	745	1,
5 to 9 percent	11,880	10,715	1,141	230	978	917	840	3,577	95	1,943	2,929	4,947	2,041	2,977	5,
10 to 14 percent	14,620	12,313	2,307	278	914	1,329	1,249	3,849	298	2,990	3,691	5,621	2,718	3,559	7,
15 to 19 percent	15,372	11,767	3,605	379	749	1,494	1,491	3,116	365	2,832	4,027	5,519	2,994	4,099	8,
20 to 24 percent	13,653	9,347	4,306	318	732	1,582	1,520	2,610	597	2,920	3,186	5,018	3,119	4,112	7,
25 to 29 percent	10,816	6,640	4,176	268	581	1,493	1,511	2,295	694	2,031	2,371	3,764	2,650	3,389	5,
30 to 34 percent	7,883	4,667	3,216	153	455	1,214	1,220	1,603	684	1,560	1,611	2,783	1,930	2,530	4,
35 to 39 percent	5,523	3,059	2,463	114	292	853	920	1,250	649	1,073	1,093	1,869	1,515	1,843	2,
40 to 49 percent	7,698	3,819	3,849	132	382	1,273	1,303	1,632	1,195	1,486	1,511	2,725	1,949	2,699	3,
50 to 59 percent	4,624	2,220	2,413	88	257	813	934	980	1,232	920	841	1,666	1,197	1,734	2,
60 to 69 percent	3,101	1,343	1,758	62	169	492	692	690	1,086	594	633	1,049	825	1,103	1,
70 to 99 percent	4,599	1,937	2,672	71	227	790	832	1,147	2,034	917	850	1,556	1,186	1,648	2,
100 percent or more [2]	7,847	3,514	4,333	125	372	1,552	1,202	2,331	5,660	1,769	1,456	2,723	1,899	2,991	3,
Zero or negative income	2,792	1,188	1,604	53	240	649	443	915	2,525	416	535	1,203	579	1,193	1,
No cash rent	2,091	X	2,091	16	204	408	279	502	691	325	388	999	378	568	
Median (excludes 2 previous lines) (percent)	23%	19%	33%	22%	21%	30%	30%	22%	75%	25%	21%	22%	26%	27%	2
Median (excludes 3 lines before median)(percent)	22%	18%	30%	21%	20%	27%	28%	20%	47%	23%	20%	21%	24%	24%	2
RENT PAID BY LODGERS															
Lodgers in housing units	1,221	454	768	20	62	165	262	95	191	221	212	422	366	502	
Less than $200 per month	222	110	112	9	18	46	33	22	30	13	62	59	48	104	
$200 to $299	148	41	107	2	13	21	33	8	30	10	19	74	46	65	
$300 to $399	160	69	111	-	11	26	62	12	18	42	37	65	36	71	
$400 to $499	144	62	82	4	10	13	33	12	7	22	21	57	44	65	
$500 to $599	106	42	65	-	-	14	24	9	8	12	30	27	36	49	
$600 to $799	128	49	78	-	3	8	19	11	12	40	15	23	41	55	
$800 or more per month	184	59	125	2	1	25	23	8	19	33	15	47	83	94	
Not reported	109	62	47	2	5	12	28	14	8	31	13	30	35	39	
Median (dollars per month)	400	375	400	50	250	300	350	330	300	518	308	325	475	400	

Versions of this table are available for the following years:
2013
2011

MONTHLY COST PAID FOR ELECTRICITY															
Units using electricity	116,776	75,604	40,171	2,371	6,917	16,097	14,697	26,776	18,431	21,078	25,896	42,938	25,873	34,741	67,7
Less than $25	2,884	616	1,768	46	71	333	543	503	628	348	345	257	1,424	1,131	1,7
$25 to $49	9,673	3,766	5,897	124	347	1,250	1,693	2,355	2,159	2,355	2,351	1,331	3,697	3,931	4,7
$50 to $74	18,495	10,790	7,705	340	939	2,428	2,493	4,991	3,328	4,370	4,937	4,521	4,956	6,231	8,7
$75 to $99	21,721	14,712	7,010	482	1,115	2,578	2,713	5,362	3,174	4,370	5,053	7,179	5,118	6,473	10,
$100 to $149	30,070	22,321	7,749	759	2,052	3,697	3,492	6,495	3,811	4,713	5,993	13,624	5,450	7,528	15,
$150 to $199	14,317	11,512	2,805	336	1,265	1,831	1,508	2,931	1,640	1,880	2,280	8,074	2,094	3,239	7,
$200 or more	10,011	8,288	1,724	160	821	1,454	1,040	1,886	1,232	1,589	1,992	5,523	1,617	2,210	5,
Median (dollars)	101	111	81	105	119	101	94	95	89	90	92	124	85	90	
Included in rent, other fee, or obtained free	9,104	3,680	5,524	122	306	1,501	1,254	2,357	2,392	1,494	3,624	2,119	1,666	3,927	3,
MONTHLY COST PAID FOR PIPED GAS															
Units using piped gas	70,625	46,377	24,248	1,333	1,697	9,453	9,924	15,750	10,793	13,626	19,744	17,477	19,760	25,696	34,7
Less than $25	12,494	6,315	6,179	340	513	1,485	2,697	2,421	2,457	1,139	1,140	3,110	7,096	4,926	5,7
$25 to $49	21,996	15,494	6,552	483	622	2,737	3,221	4,757	3,039	2,404	5,903	7,455	6,225	7,716	10,
$50 to $74	12,741	9,877	2,863	195	290	1,561	1,185	3,052	1,490	3,141	4,173	2,880	2,647	4,151	6,
$75 to $99	6,770	5,629	1,141	103	167	739	453	1,814	694	1,697	2,513	1,230	1,330	2,068	3,
$100 to $149	5,283	4,488	795	81	43	719	431	1,329	488	1,842	1,801	941	673	1,555	3,7
$150 to $199	1,520	1,284	235	23	16	255	137	389	193	669	437	250	163	452	
$200 or more	879	716	163	1	24	190	75	237	111	385	280	123	111	316	
Median (dollars)	44	50	33	38	34	45	33	48	35	65	54	38	30	42	
Included in rent, other fee, or obtained free	8,984	2,704	6,280	102	222	1,778	1,616	1,743	2,331	2,250	3,517	1,437	1,691	4,513	3,
MONTHLY COST PAID FOR FUEL OIL [3]															
Units using fuel oil	8,279	5,732	2,546	33	243	818	840	2,345	1,185	6,332	526	719	202	2,259	4,7
Less than $25	263	205	58	-	7	27	6	93	67	133	39	71	17	32	
$25 to $49	278	234	44	-	18	19	3	76	30	186	20	61	11	31	
$50 to $74	468	376	92	-	56	28	22	106	43	293	76	61	14	49	
$75 to $99	450	376	74	3	30	30	18	114	61	330	50	57	13	78	
$100 to $149	1,227	1,094	134	1	54	53	69	408	139	904	99	167	37	105	
$150 to $199	1,055	961	94	11	25	44	40	344	91	843	82	93	32	103	
$200 or more	2,216	2,051	165	17	30	125	127	710	156	2,025	61	91	38	278	1,7
Median (dollars)	167	167	122	267	92	167	167	167	133	167	104	108	139	167	
Included in rent, other fee, or obtained free	2,321	436	1,885	6	28	491	553	500	603	2,109	99	72	40	1,578	
PROPERTY INSURANCE															
Property insurance paid	89,895	70,919	12,976	2,049	4,164	8,084	7,203	21,952	7,793	14,979	20,353	30,630	17,927	21,420	45,7
Median per month (dollars)	55	63	15	58	40	49	50	58	38	58	50	58	53	50	
MONTHLY COSTS PAID FOR SELECTED UTILITIES AND FUELS															
Water paid separately	68,566	52,615	10,951	1,550	3,170	7,022	7,192	15,532	7,297	9,764	13,927	26,109	13,765	17,004	34,7
Median (dollars)	42	42	33	42	31	40	50	40	33	42	40	38	50	44	
Trash paid separately	53,602	44,696	8,906	1,320	2,637	4,760	6,155	13,012	5,934	5,636	13,020	20,265	14,142	13,392	25,
Median (dollars)	23	23	21	20	18	25	30	21	21	22	20	23	23	23	
Bottled gas paid separately	6,512	5,843	669	170	892	841	392	1,994	715	1,337	1,667	2,624	884	290	3,7
Median (dollars)	24	25	22	21	23	25	25	24	22	25	23	26	18	25	
Other fuel paid separately	3,136	2,595	540	50	415	159	218	757	444	1,124	403	763	845	391	1,7
Median (dollars)	25	28	19	33	42	13	21	27	25	42	23	17	21	17	

[1]This item uses current income in its calculation; see Appendix A.

[2]May reflect a temporary situation, living off savings, or response error.

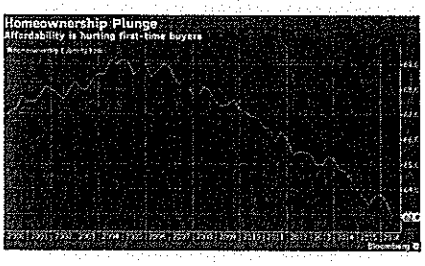
[3]Monthly costs are calculated from yearly estimates

Homeownership Rate in the U.S. Drops to Lowest Since 1965

Prashant Gopal
mrgopal
July 28, 2016 — 10:25 AM EDT
Updated on July 28, 2016 — 1:04 PM EDT

The U.S. homeownership rate fell to the lowest in more than 50 years as rising prices put buying out of reach for many renters.

The share of Americans who own their homes was 62.9 percent in the second quarter, the lowest since 1965, according to a Census Bureau report Thursday. It was the second straight quarterly decrease, down from 63.5 percent in the previous three months.



The drop extends a years-long decline from the last housing boom, in part because of tight credit and a shift toward renting in the aftermath of the crash. First-time buyers have been struggling to find affordable properties as low mortgage rates and an improving job market spur competition for a tight supply of listings. Home prices rose 5.2 percent in May from a year earlier, according to the S&P CoreLogic Case-Shiller index of values in 20 cities released this week.

"One of the biggest hurdles now is affordability," Mark Vitner, a senior economist at Wells Fargo Securities LLC in Charlotte, North Carolina, said before the Census Bureau report was released. "Home prices are rising so much faster than incomes, so it's hard for buyers to save for a down payment."

The homeownership rate reached a peak of 69.2 percent in June 2004.

More Renters

The decline may be the result of young people leaving parents' homes and entering the rental market, which dilutes the number of owner-occupant households, said Ralph McLaughlin, chief economist for data provider Trulia. He said the change from a year earlier, when the rate was 63.4 percent, isn't statistically significant because of the margin of error of 0.5 percentage points.

QUICKTAKE
Homeownership Reconsidered

"The drop in the homeownership rate this quarter to historical lows isn't necessarily a bad sign," McLaughlin said in an e-mail. "This is because renter households are growing at a much faster rate than owner households, reflecting growing confidence of those who were most likely impacted by the foreclosure crisis. Still, low inventory and affordability plagues those who do want to buy a home."

The homeownership rate for Americans ages 18-34 fell to 34.1 percent in the second quarter from 34.8 percent a year earlier, the Census Bureau said. The decline is within the margin of error for that age group of 0.8 percentage points.

Watch Next: Shiller: Normally Rising House Prices Are Now Flat

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FOR IMMEDIATE RELEASE

Clayton Homes Introduces Super Efficient Energy Smart Home™

First year's utility bills on Clayton Homes up to $3,000 as part of National Open House promotion*

MARYVILLE, Tenn., June 9, 2015—Clayton Homes has an exclusive offer for customers who purchase an Energy Smart Home™ this summer as part of its National Open House promotion.

The Energy Smart Home™ comes with several features designed to maximize energy efficiency and minimize monthly housing expenses. This energy efficient home takes housing to the next level when it comes to powering, heating and cooling. On top of this, if consumers purchase an Energy Smart Home™ between now and Aug. 29, the first year's utility bills are on Clayton Homes, up to $3,000*.

"The Energy Smart Home™ will save homeowners in monthly utility costs both now and for years to come," Clayton Homes CEO Kevin Clayton said. "We're going to give consumers a jumpstart on those savings by providing an incentive that they can use toward paying their utility bills for the first year."

The Energy Smart Home™ comes equipped with some of the latest homebuilding technology available. Some highlights of the money-saving features included in the package:

- Programmable thermostat—This increasingly popular smart-home technology adjusts to the homeowner's daily routine and regulates temperature based on their usability schedule.
- Low Emissive (Low-E) windows – These double-pane windows help keep UV rays from entering the house and regulate the home's temperature by keeping conditioned air in.
- R-33/11/22 insulation—Quality insulation is incorporated into the floors, walls and ceiling to contain the heat during the winter and the cool air during the summer.
- Air-tight construction – Additional sealants are injected around ducts and seams to make the home's central heating and air system much more efficient by preventing leaks.

"Consumers are more cost conscious than ever, and they're looking for an efficient home that is going to be a long-term investment," Clayton said. "The Energy Smart Home™ is going to give you more money to spend on your own family, instead of your power company."

Customers can learn more about the Energy Smart Home™ package and the National Open House offer by visiting the National Open House website. While there, take the Green IQ quiz and find out how being energy efficient can save money for years to come.

About Clayton Homes

Clayton Homes has built homes since 1956, winning multiple awards for design and construction. Through its affiliates and family of brands, Clayton Homes builds, sells, finances, leases, and insures manufactured and modular homes, as well commercial and educational buildings. Clayton Homes is a vertically integrated Berkshire Hathaway company whose purpose is *opening doors to a better life, one home at a time.*

**Terms and Conditions for the Energy Smart Program available at participating retailers or claytonhomes.com/national-open-house. $500 minimum deposit and new home purchase with the Energy Smart*

package required. Buyer incentive based on number of sections for the style of home purchased. Not available with certain financing, lender restrictions apply.

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