



Zero Energy Ready Home The Road Ahead

SAM RASHKIN

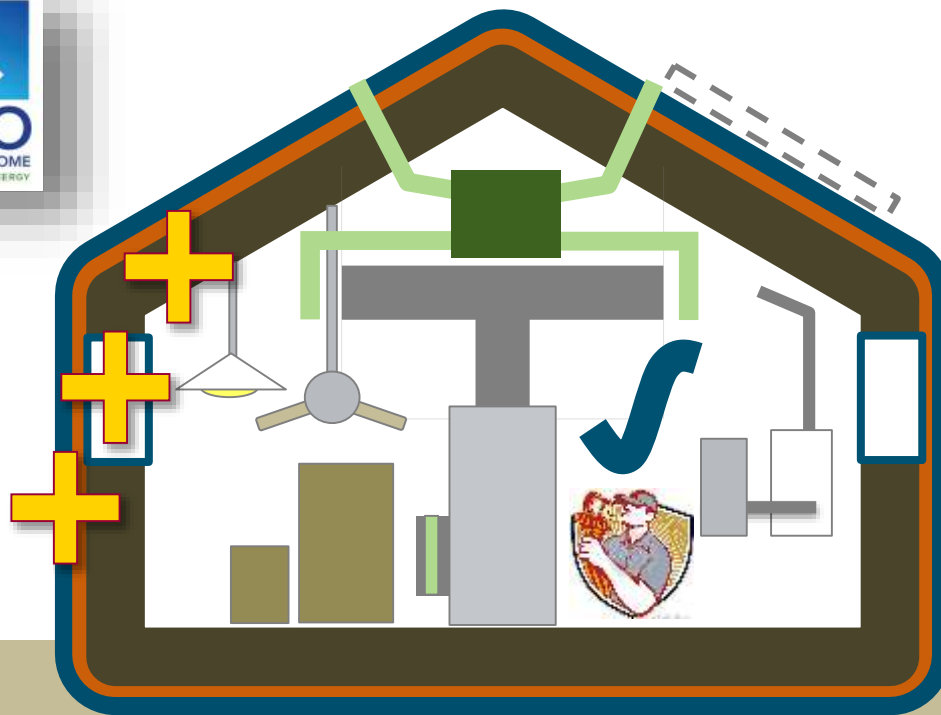
Chief Architect

Building Technologies Office

Zero is a Reverse Engineering Process



ZERH = Six Brand Promises



Optimized
Enclosure

**FUTURE
READY**

Water
Protection

**MOISTURE
READY**

Advanced
H+AC+H

**COMFORT
READY**

Indoor Air
Quality

**HEALTH
READY**

Efficient
Comps

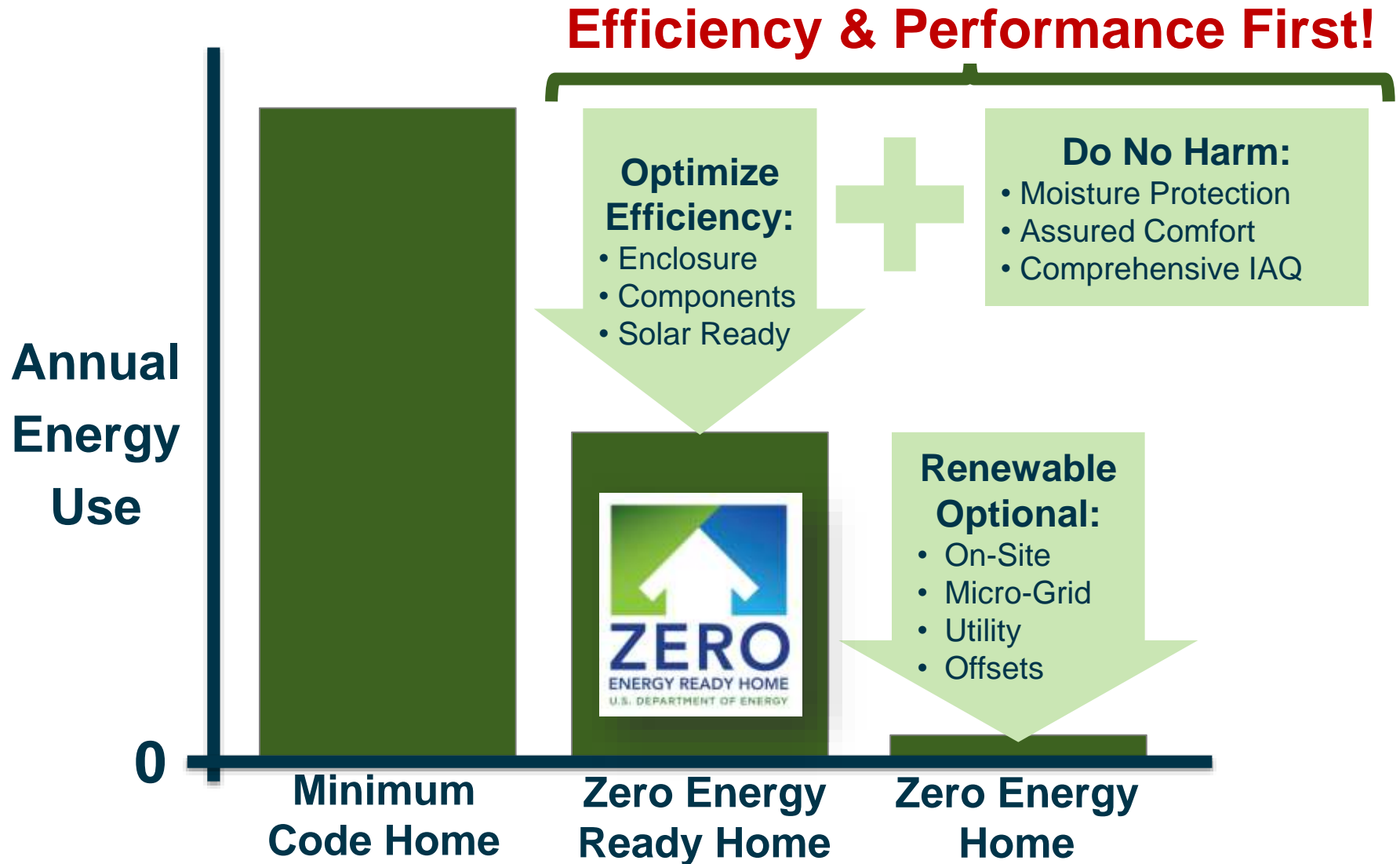
**TECH
READY**

Solar
Ready

**ZERO
READY**

ZERH Staircase

				Solar Ready	Solar Ready
				Eff. Comps. & H ₂ O Distrib.	Eff. Comps. & H ₂ O Distrib.
				EPA Indoor Air Package	EPA Indoor Air Package
				Optimized Duct Location	Optimized Duct Location
		HVAC QI with WHV	HVAC QI with WHV	HVAC QI with WHV	HVAC QI + HRV
		Water Management	Water Management	Water Management	Water Management
		Independent HERS Verif.	Independent HERS Verif.	Independent HERS Verif.	Independent PHIUS Verif.
IECC 2009 Enclosure	IECC 2012 Enclosure	IECC 2009 Enclosure	IECC 2012 Enclosure	IECC 2012/15 Encl./ES Win.	Ultra-Efficient Enclosure
HERS 85-90	HERS 70-80	HERS 65-75	HERS 55-65	HERS 48-55	HERS 35-45
IECC 2009	IECC 2012	ENERGY STAR v3	ENERGY STAR v3.1	ZERH	PHIUS+





Wouldn't it be great
to know what
leading experts
would look for in a
new home
that performs
to their expectations?

ZERH Simple Core Message



Well now you do.

When building performance professionals are polled, they overwhelmingly choose homes that meet Department of Energy Zero Energy Ready Home specifications.

- Mandalay Homes: 3,000 Units in Prescott, AZ
- Caliber Wealth Dev.: 3,000 MF Units in Phoenix
- Capstone: 200 Units in Flagstaff, AZ
- LendLease: 500-Acre Community in Denver
- HF2M: 3,000 Unit Community in Fort Collins
- Meritage Homes: 4 Subdivisions (CA, AZ, FL)
- Garbett Homes: 300+ Homes in Salt Lake City
- Parallel Housing: 91 Units on Atlanta Belt Line
- Stapleton: 10% Min. Phase 10 in Denver
- Modular Plants in VT (VerMod) and DE (ZeMod)

Response to question about the secret of his success:

*“I skate to where the puck
is going to be,
not where it has been.”*

Wayne Gretsky
Canadian Hockey Player

Where is the housing 'puck' going to be?

- Informed Homebuyers
- Fault Detection and Diagnostics (FDD)
- Off-Site Production
- Disaster Resistance

Use of Internet for Home Buying

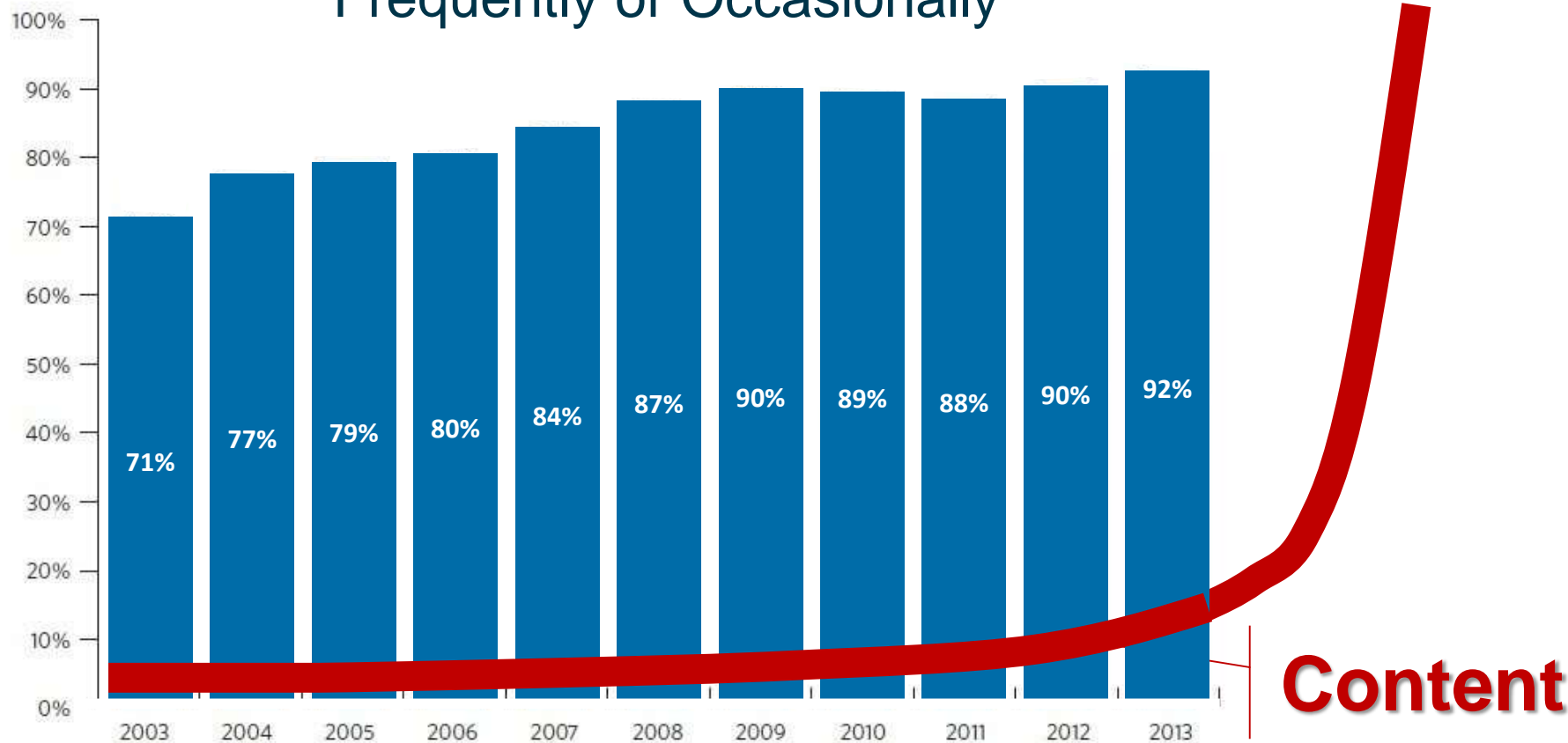
Informed Homebuyers

Fault Detection and Diagnostics

Off-Site Production

Disaster Resistance

Frequently or Occasionally



Source: National Association of Realtors®

Informed
Homebuyers

Fault Detection
and Diagnostics

Off-Site
Production

Disaster
Resistance

...will know a lot more about

Thermal Defects



Informed
Homebuyers

Fault Detection
and Diagnostics

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Resistance

Minimize Thermal Defects:

- Maximum Framing Factor 8%
- Ratchet up Air Tightness
(1-2 ACH50 instead of 1.5-3 ACH50)

**Informed
Homebuyers**

**Fault Detection
and Diagnostics**

**Off-Site
Production**

**Disaster
Resistance**

...will know a lot more about

Advanced Windows



Why Advanced Windows

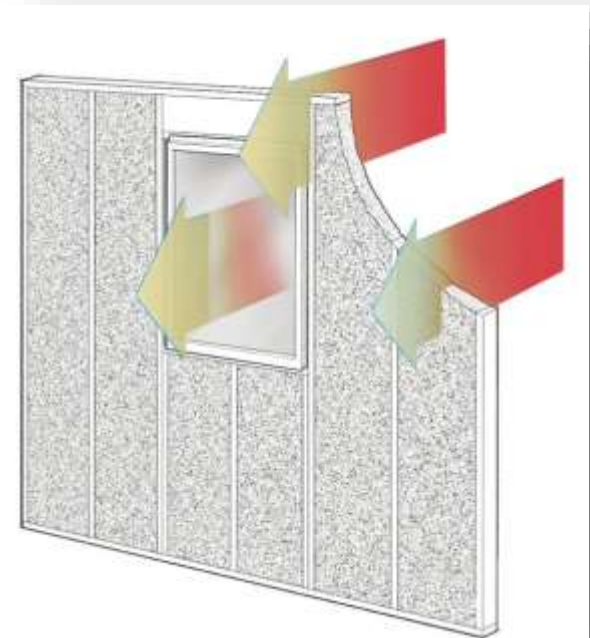
Informed Homebuyers

Fault Detection and Diagnostics

Off-Site Production

Disaster Resistance

Window 15% of Wall Area	Wall R-Value with Windows w/Variied Wall Insulation Levels			
U-Value	R-0	R-18	R-39	R-60
0.30	R-5	R-11	R-15	R-17
0.20	R-5	R-13	R-19	R-23
0.15	R-5	R-14.5	R-23	R-28
0.10	R-5.5	R-16	R-27	R-34



* In Cold Climates

• **Sources:**

“Holes in the Wall: To Improve the Energy Performance of Walls, Look at the Total R-Value,” Journal of Light Construction, February 2014;

Multi-Assembly R-Value / U-Value Calculator – Cascadia Windows and Doors;

Michael Blasnik Presentation, 2014 ACI Conference

Informed
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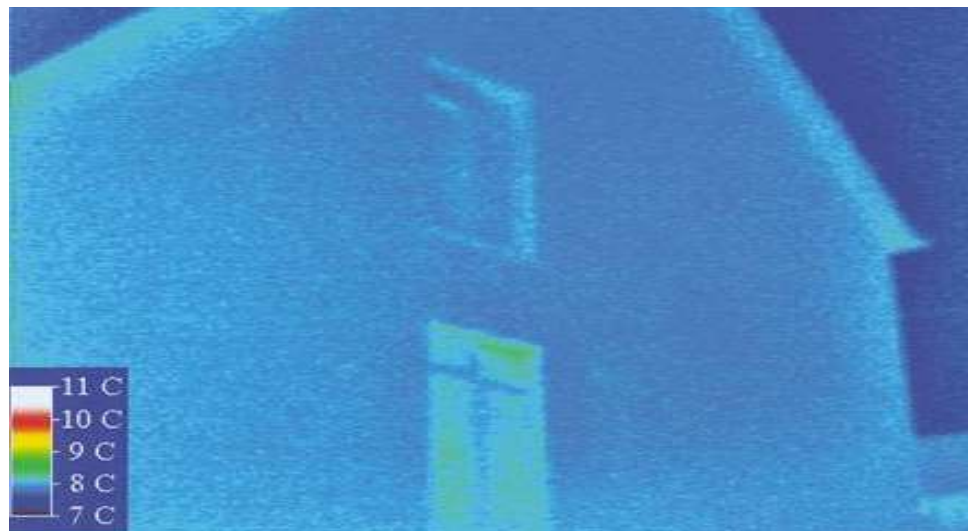
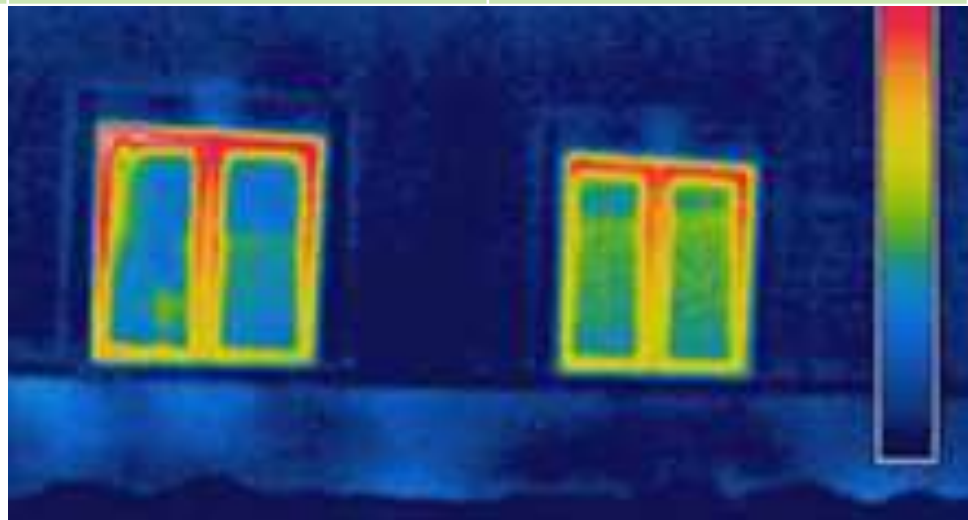
Fault Detection
and Diagnostics

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High-R Windows:

- R-3 Climate Zones 1-3
- R-5 Climate Zones 4-5
- R-7 Climate Zones 6-8

**Informed
Homebuyers**

**Fault Detection
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**Off-Site
Production**

**Disaster
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Moisture Risks



**Informed
Homebuyers**

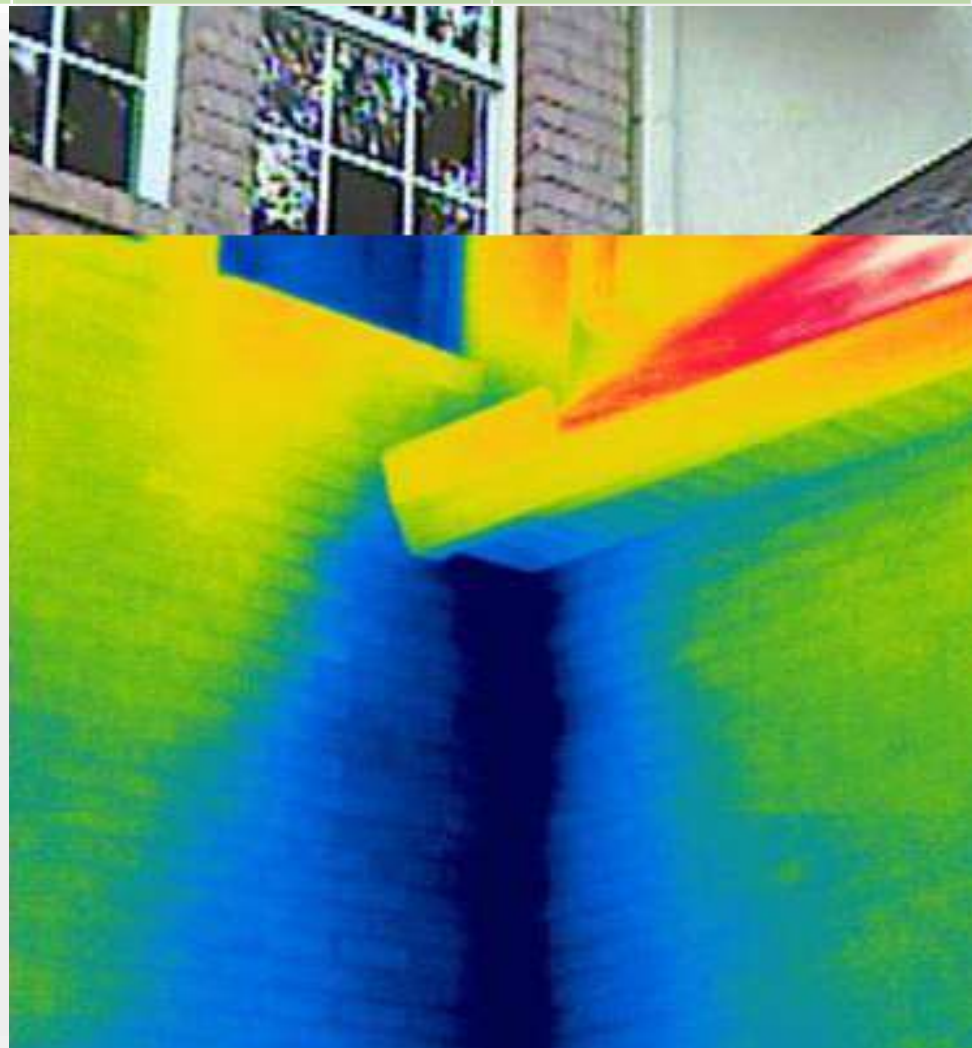
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**Off-Site
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Moisture Risks



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Moisture Management:

- Capillary Break Between Footing and Foundation Stem Wall
- Mandate Low-Risk Wall Assemblies (e.g., IRC Assemblies with Exterior Insulation or Systems Built Walls such as SIPs, ICFs, ICPs, etc.)

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Fault Detection and Diagnostics

Off-Site Production

Disaster Resistance

...will know a lot more about

Health Risks



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IAQ Measures:

- HRV or ERV in Cold Climates
- ERV in Humid Climates
- High-Capture Efficiency Kitchen Exhaust
- Smart Ventilation w/On-Board Diagnostics

Informed Homebuyers

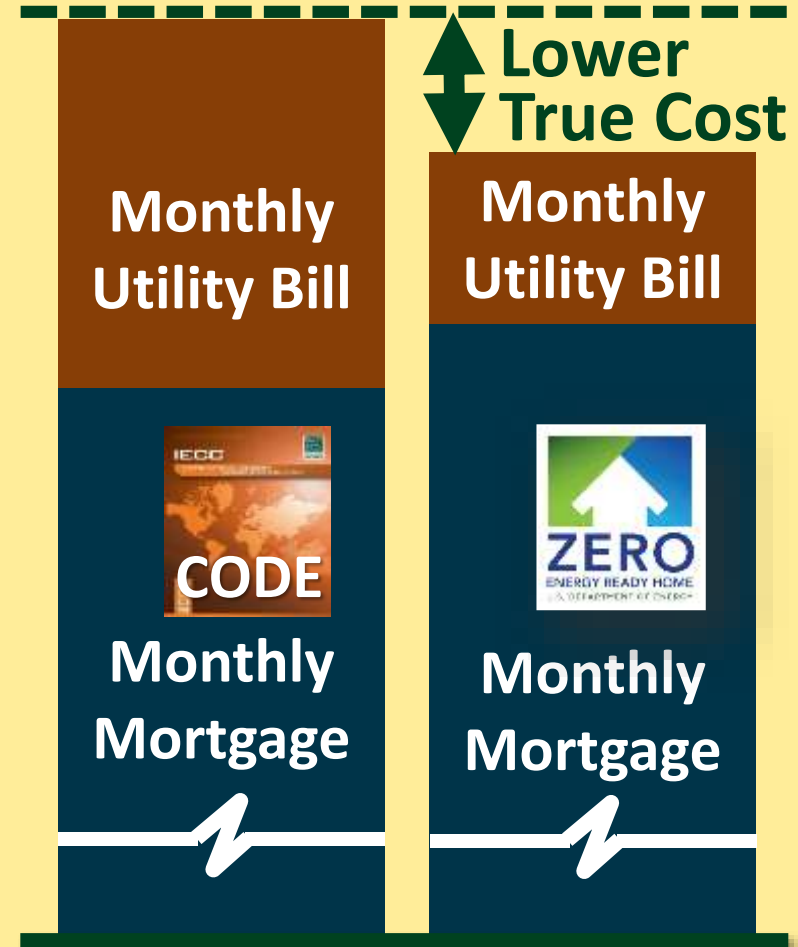
Fault Detection and Diagnostics

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True Cost



Informed Buyers...

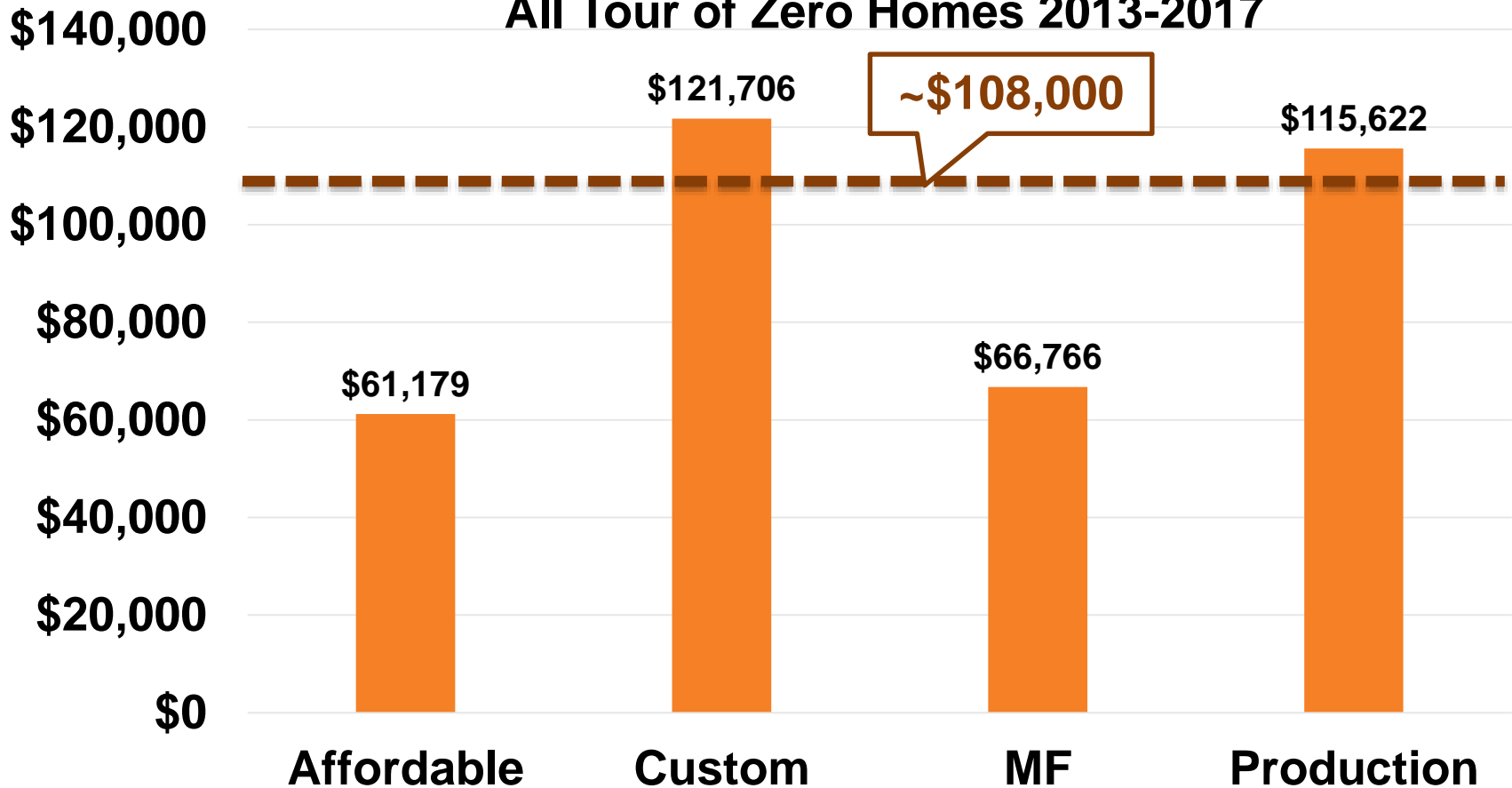
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**Average 30-Year Savings
All Tour of Zero Homes 2013-2017**



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Engage Transaction Players:

- **Underwriters**
(Reduced Interest Rates, EEMS)
- **Insurance Companies**
(Reduced Cost Insurance)
- **Appraisal Associations**
(Training and Tools for Appraisers)
- **State Housing Agencies**
(Qualified Action Plan Incentives)

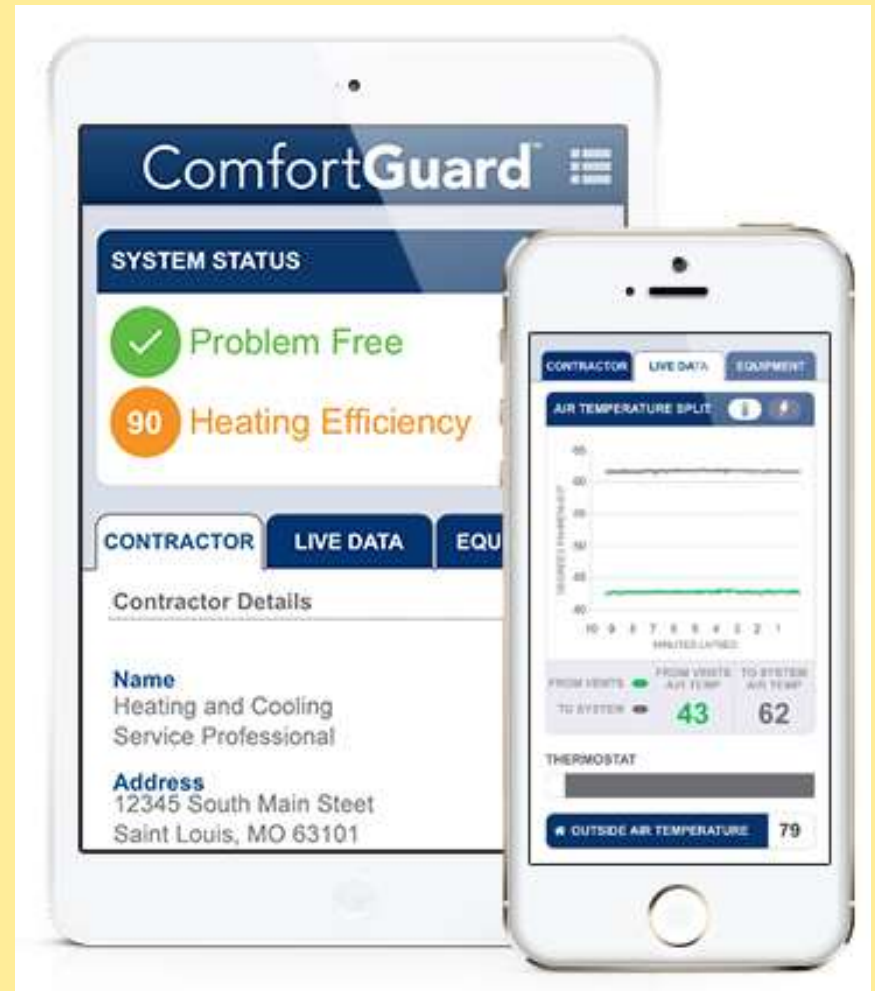
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...will drive
**Quality
HVAC**



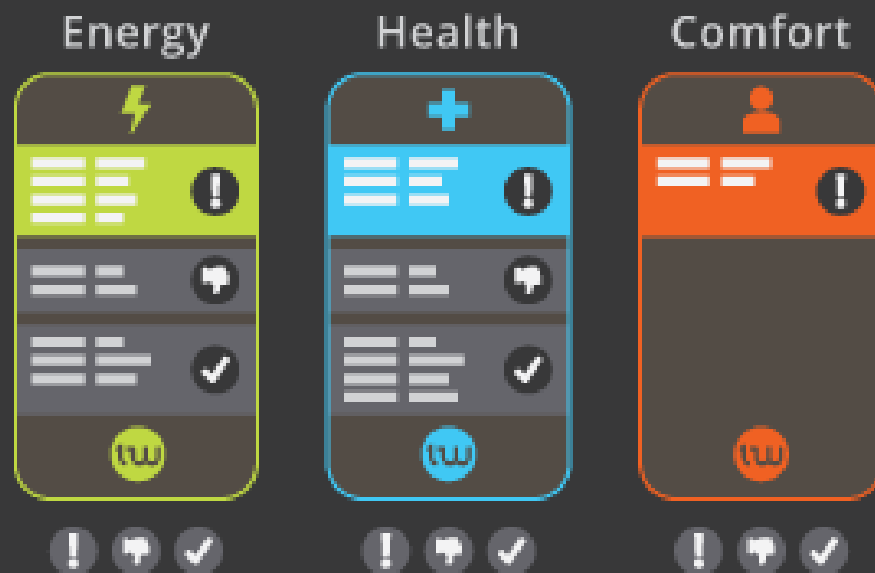
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**Quality
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Quality HVAC:

- Fault Detection and Diagnostics
- High-Efficiency HVAC
- Variable Capacity HVAC
- Integrated RH Control
- Smart Optimized Comfort Control Systems

Housing: Low Productivity

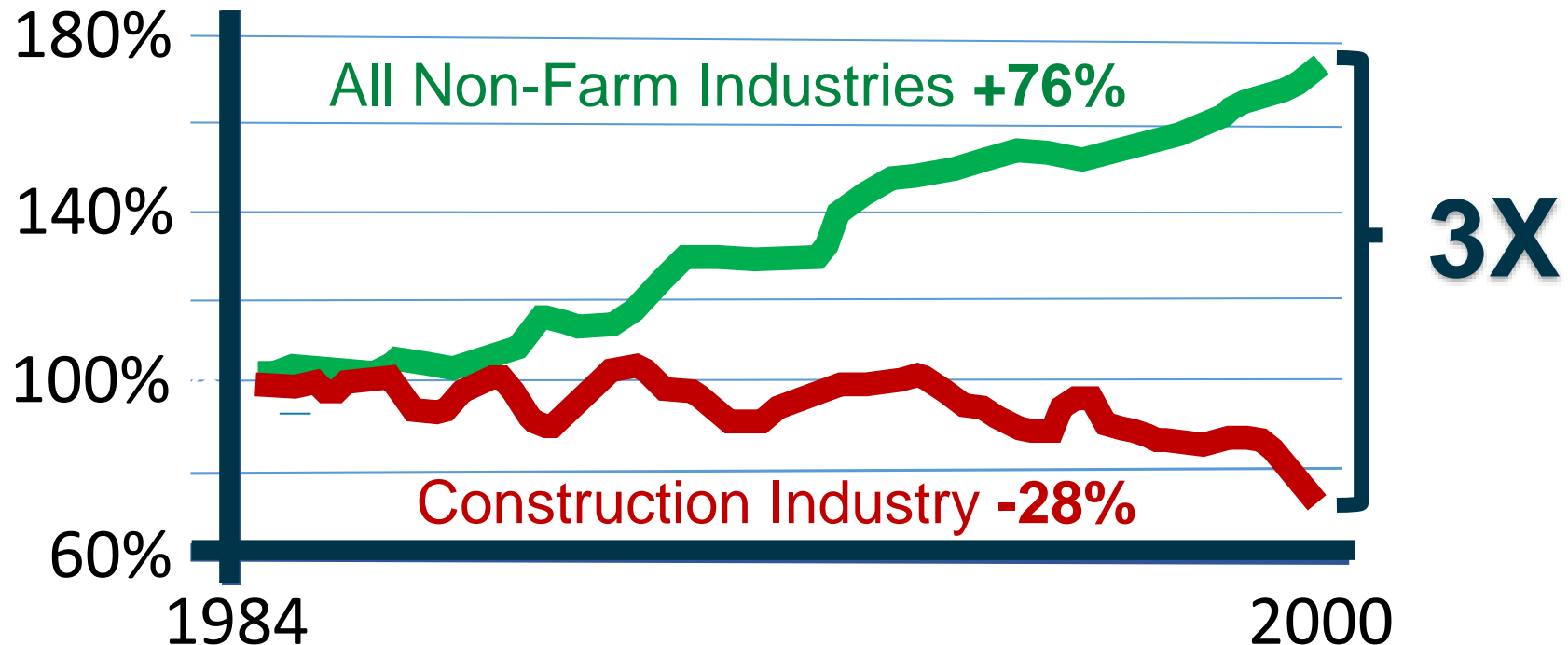
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Resistance

Labor Productivity Index



Sources: U.S. Bureau of Labor Statistics, U.S. Dept. of Commerce

Housing: Glacial Innovation

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1877: Wood Frame House, Omaha, NE



2015: Typical Wood Frame Structure

Housing: Visibly Poor Waste

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Trade Partner:

- Availability
- Quality
- Training
- Cost
- Productivity
- Waste

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Production

Disaster
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Integrate w/Off-Site Production:

- Kit Manufacturers
- Panelization Manufacturers
- Modular Manufacturers

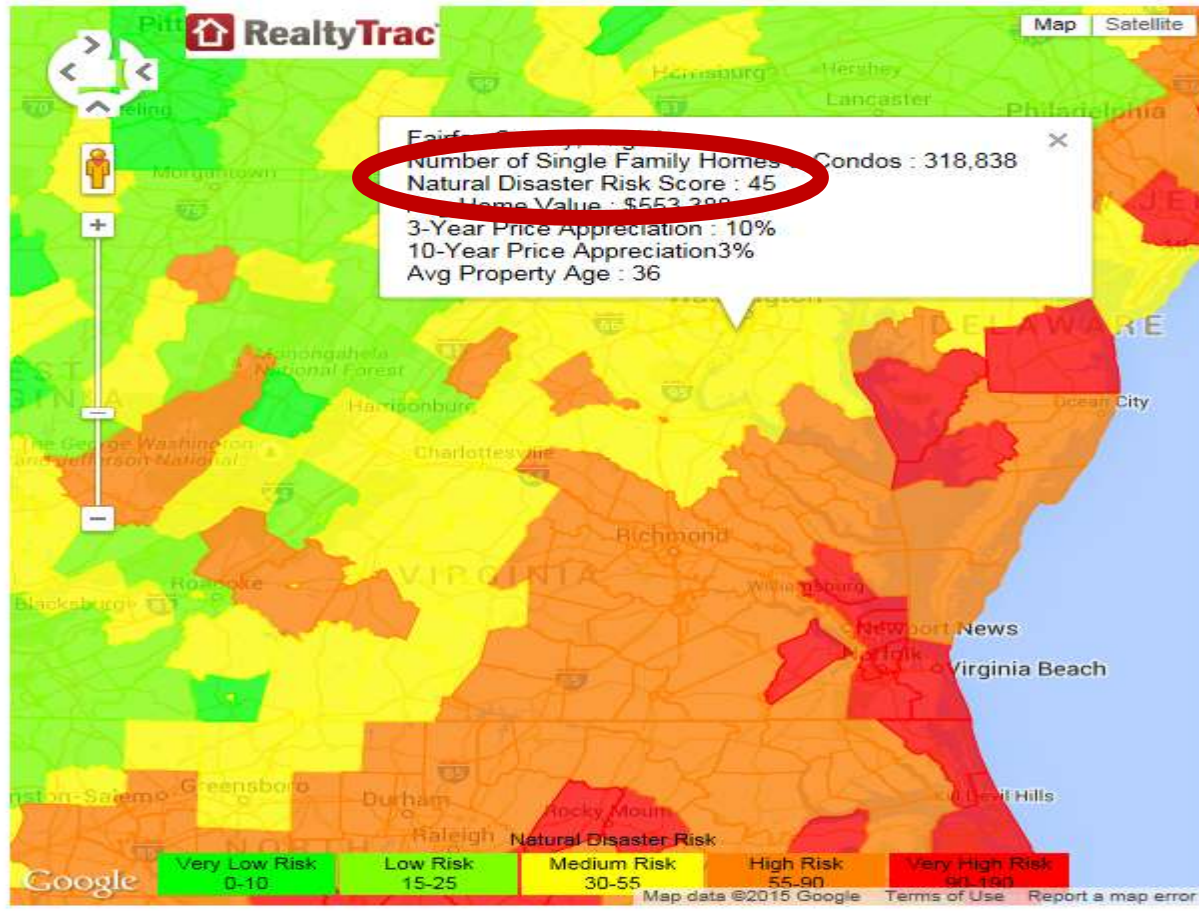
Disaster Resistance

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Fault Detection
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Disaster
Resistance



Disaster Resistance

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Fault Detection
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Off-Site
Production

**Disaster
Resistance**



Hurricane Harvey Aftermath: Houston, TX

Disaster Resistance

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Disaster
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Hurricane Irma Aftermath: Homestead, FL

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Production

**Disaster
Resistance**

Insurance Cost

Relative to Base Flood Elevation (BFE)

Premium at
4 Ft. Below BFE

\$9,500/year

\$95,000/ 10 Years

Premium at
BFE

\$1,410/year

\$14,100/ 10 Years

Premium at
3 Ft. Above BFE

\$427/year

\$4,270/ 10 Years



Disaster Resistance

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Wilmington, NC FORTIFIED Discount Sheet



Protect and Save by Choosing a FORTIFIED Home™

FORTIFIED offers homeowners several opportunities to increase the strength of their investment.



FORTIFIED HOME™
FORTIFIED Home™ is a third-party certification program specifying design and construction standards to increase a home's resilience and deliver superior performance during tropical storms and hurricanes. The FORTIFIED Home™ program has three levels of designation – Bronze, Silver and Gold – that build upon each other.

INSURANCE DISCOUNTS: 6% - 8%*
BRONZE: STRENGTHEN THE ROOF SYSTEM
Minimizes the risk of water getting into the home and of the roof detaching from the walls.

INSURANCE DISCOUNTS: 13% - 15%*
SILVER: STRENGTHEN THE WINDOWS & DOORS
Minimizes the risk of wind entering the home, and causing a roof failure. Also effective at reducing the risk of water getting into the home.

INSURANCE DISCOUNTS: 16% - 19%*
GOLD: STRENGTHEN THE STRUCTURAL SYSTEM
Creates a continuous load path that ties the roof to walls, walls to floors, and floors to the foundation. The most effective way to minimize structural risks from high winds.

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Fault Detection
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Off-Site
Production

**Disaster
Resistance**

Disaster Resistance:

- 'Fortified Homes' Certification
- Integrated Pest Management

Thank You



For More Information:

<https://buildings.energy.gov/zero/>

<https://energy.gov/eere/buildings/zero-energy-buildings>