

# Building 6 Star Homes in Southcentral Alaska

*“Promoting and advancing the development of healthy, durable, and sustainable shelter for Alaskans and other Circumpolar people .”*

*Research • Innovation • Education*



COLD CLIMATE HOUSING RESEARCH CENTER

**CCHRC**

## OVERVIEW: Building 6 Star Homes in Southcentral Alaska

- What is a 6 Star Home?
- Why build one?
- How are Southcentral builders achieving 6 Star Homes?
- Cost-effective ways of getting to 6 Star
- Tips for Southcentral Alaska
- Valuing energy efficiency in homes
- Marketing



# What is a 6 Star Home?

- Alaska's "High Performance" homes
- Highest level of Alaska Energy Rating Score
  - AkWarm 6 Star: 95 points
- 20-35% reduction in energy relative to BEES



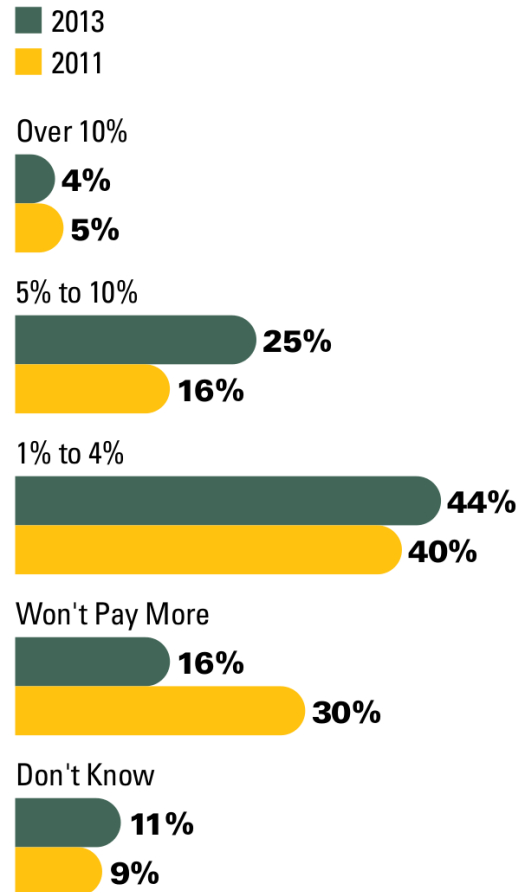


# Why Build a 6 Star Home?

- People care!
  - A 6 Star home may be seen as a measure of *quality*
  - “Eco-friendly” features vs. luxury items: 49%
- Builder survey:
  - 73% of people will pay more for high performance homes

## Additional Amount Customers Are Willing to Pay for Green (According to Firms Building New Single Family Homes)

Source: McGraw Hill Construction, 2014





# Why Build a 6 Star Home?

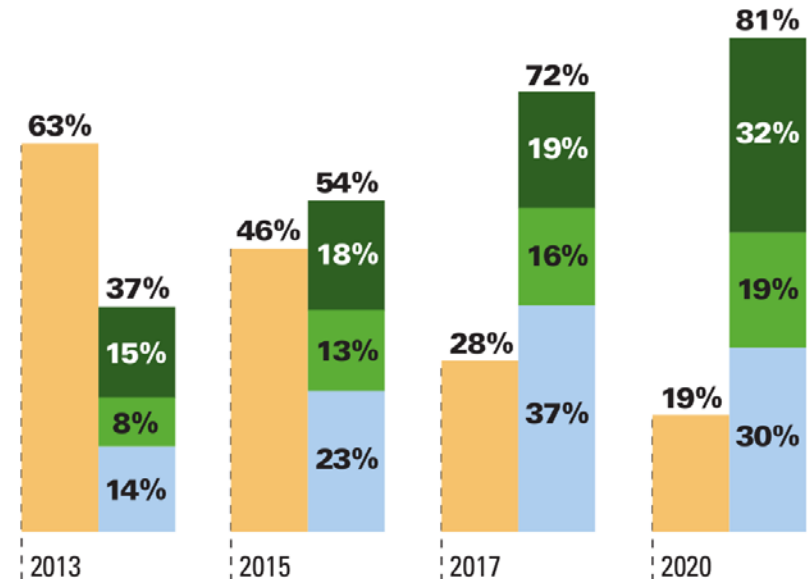
- The market is changing
  - National research has shown a growing market for green homes
    - Growth rate has outpaced general construction in recent years (USGBC economic impact study)
    - ‘Green’ construction market expected to continue growth (U.S. construction outlook report)

## Involvement in Green Activity Over Time

Dodge Data & Analytics, 2015

- Less Than 16% of Projects Green
- 16%–60% of Projects Green
- 61%–90% of Projects Green
- More Than 90% of Projects Green

### Builders of New Single Family Homes



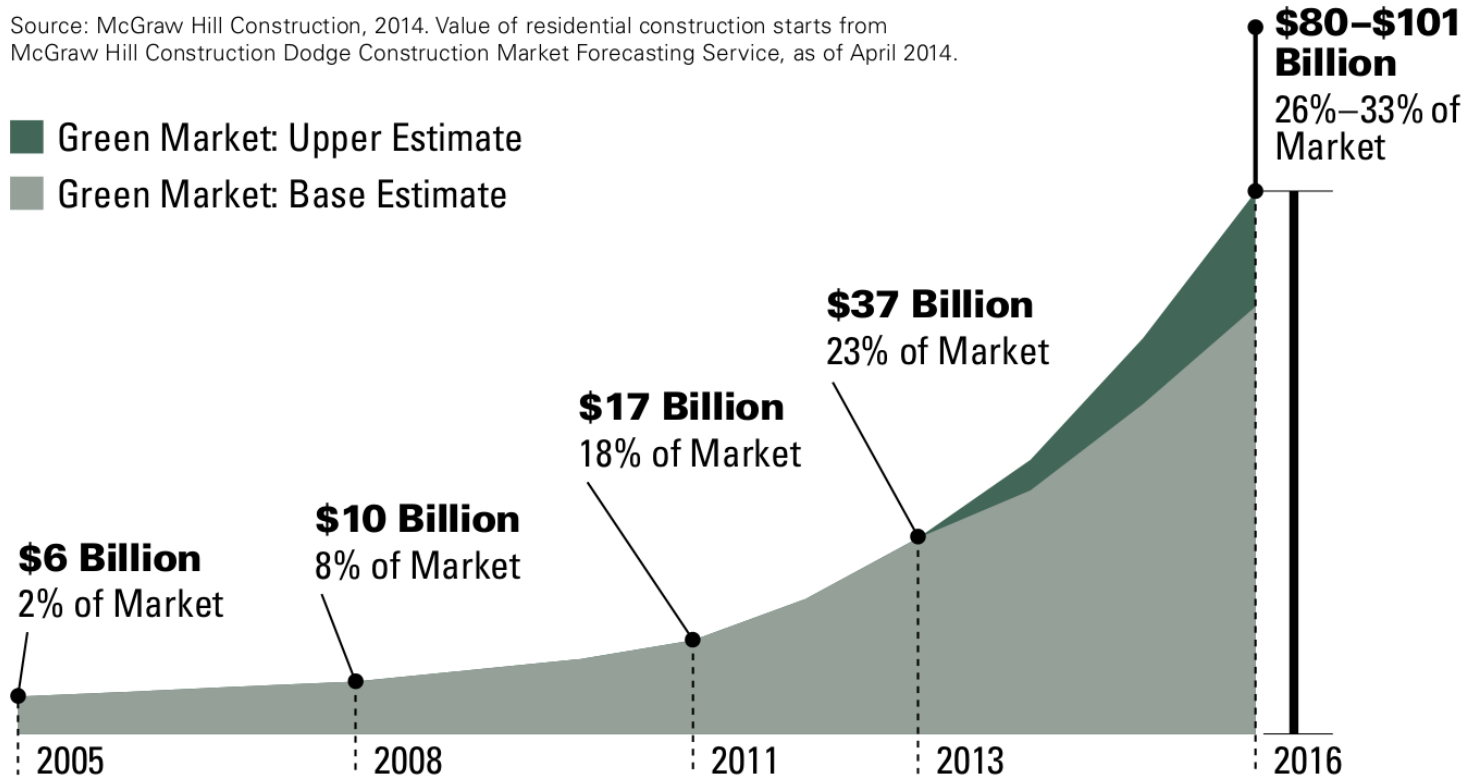


# Why Build a 6 Star Home?

## U.S. Single Family Housing Green Residential\* Market (Billions of Dollars)

Source: McGraw Hill Construction, 2014. Value of residential construction starts from McGraw Hill Construction Dodge Construction Market Forecasting Service, as of April 2014.

- Green Market: Upper Estimate
- Green Market: Base Estimate



\*MHC defines a green home as one that is either built to a recognized green building standard or an energy- and water-efficient home that also addresses indoor air quality and/or resource efficiency.

# Why Build a 6 Star Home?

- Be part of the solution. Energy Efficient Homes:
  - Contribute fewer greenhouse gases
  - If built properly, are more durable and have better indoor air quality
  - Save homeowners money, leave natural gas in ground for future



**Healthy**

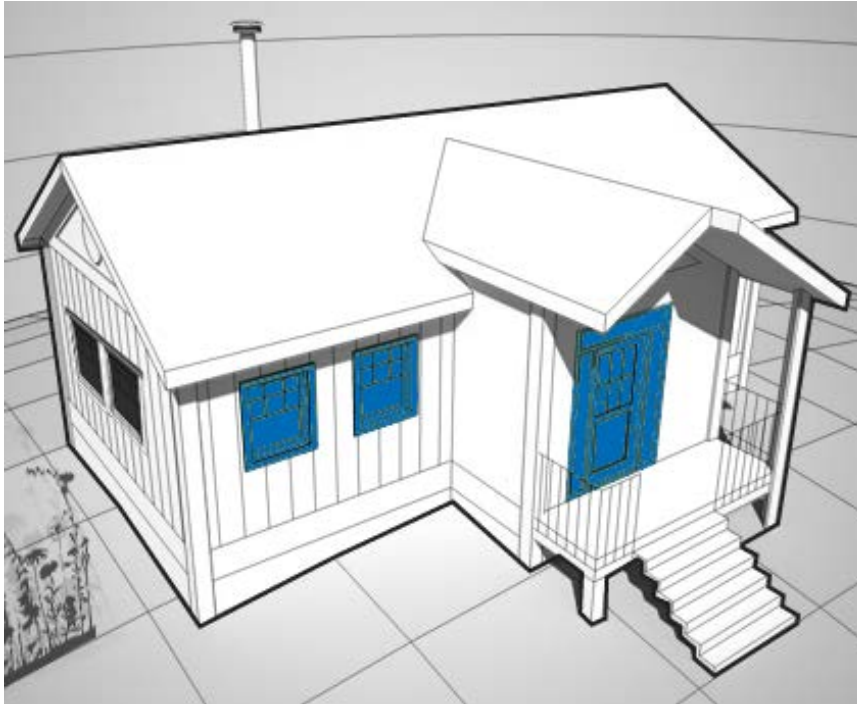
**Durable**

**Sustainable**



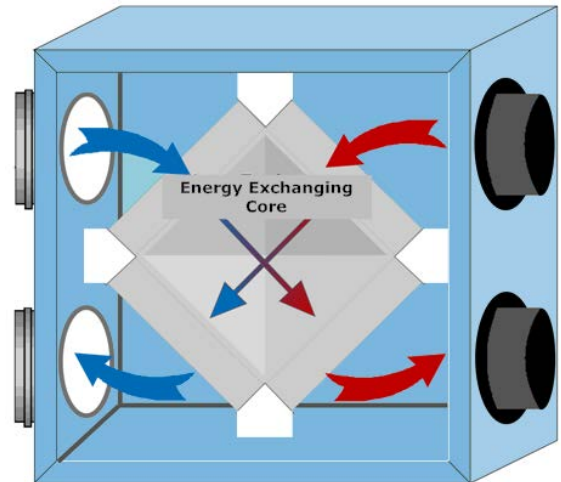


# How are Southcentral Builders Achieving 6 Star Homes?



**Efficient windows**  
The median u-factor is 0.23

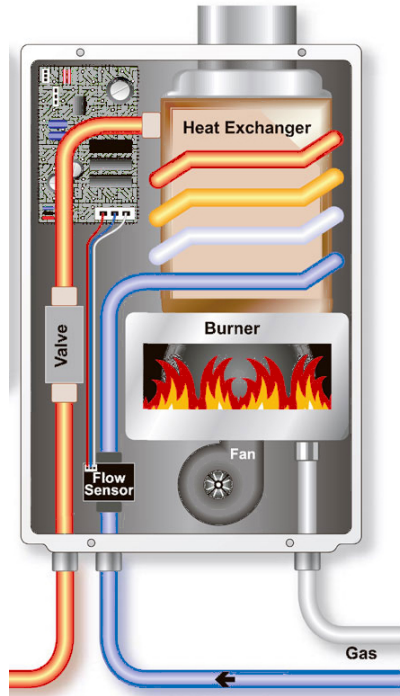
**Heat Recovery Ventilation Systems**  
96% of 6 Star Homes have an HRV







# How are Southcentral Builders Achieving 6 Star Homes?



## Very efficient hot water systems

The median energy factor in 6 Star homes in Southcentral is 0.90

## Efficient heating systems

The median AFUE of heating systems is 95% in Southcentral 6 Star homes

## They don't use electricity for heating or hot water

95% did not use electricity; the other 5% ALL use heat pumps

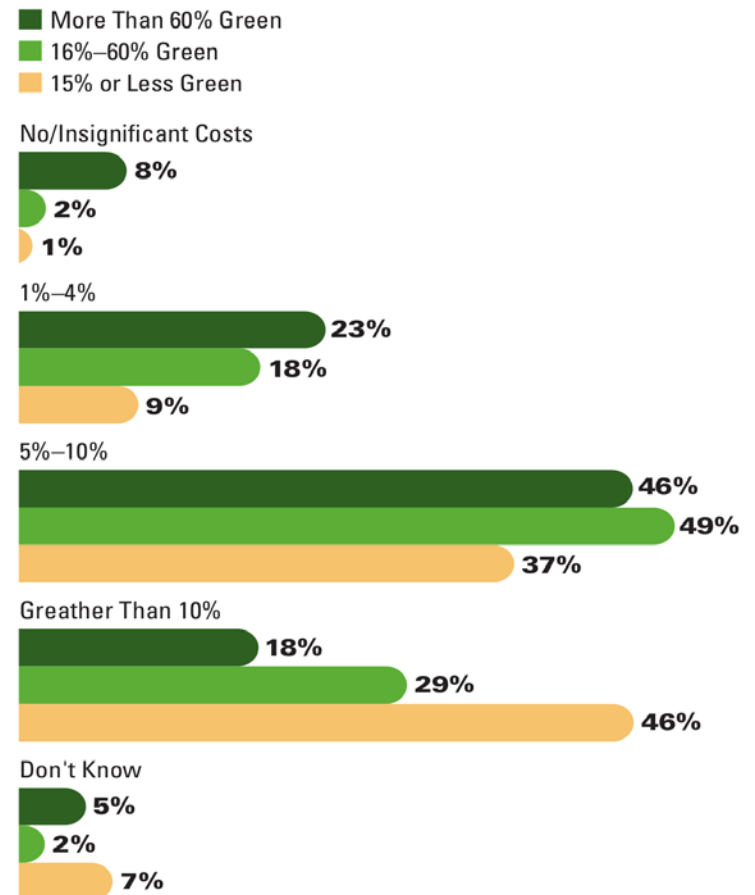


# Building a High Performance Home Costs More...

- Builder survey:
  - Most report increase in costs
  - More green building experience = Lower expected costs

## Incremental Cost of Incorporating Green Features and Practices in New Homes (By Level of Green Involvement)

Dodge Data & Analytics, 2015



## ... But it can be worth more

- “High Performance” homes research: 2-9% sales premium over comparable homes in different U.S. markets
  - Data suggests proper marketing is important part of getting premium
- Anchorage research:
  - Sales premium increased by between 1.3% and 1.8% for each rating step between 3 Star and 5 Star.
  - If true for higher ratings: Premium for 6 Star from 5 Star (2 steps) would be between 2.6% and 3.6%



... especially in tight markets

- High-Performance Homes are Resilient
  - “Data generated on ENERGY STAR homes in western Washington suggests that premiums for homes with third party certifications are higher during depreciating or flat markets than in rapidly appreciated markets.”



## Data from builders in Southcentral Alaska

- 5 builders:
  - Spinell Homes
  - Hall Quality Homes
  - Cook Inlet Housing Authority
  - Jon James Construction, LLC
  - Alaska Community Development Corporation
- Modeled Homes in AkWarm
- Builders estimated costs (increase or decrease)
- Economic analysis



# What are the most cost-effective ways of getting to 6 Star in Southcentral?

- Different for every builder
  - Costs vary
  - Homes have different starting equipment
- From 5 Star to 6 Star: Need 6 points



# What are the most cost-effective ways of getting to 6 Star in Southcentral?

- Energy Efficiency Measures: Lowest cost **per rating point improvement** by builder

Description	Improvement Cost	Rating Point Increase	Cost Per Point
Upgrade to Triple Pane Windows	\$1,384	0.8	\$1,730
Add 2" blue board to garage slab	\$435	1.2	\$363
Upgrade ventilation to HRV and foam rim joist	\$1,950	1.4	\$1,393
Increase blown attic insulation from R50 to R77	\$579	0.7	\$828
Upgrade ventilation to HRV	\$2,176	1.2	\$1,814





# What are the most cost-effective ways of getting to 6 Star in Southcentral?

- Cost per square foot to reach 6 Star
  - Builder profit margin built-in to all these prices
  - Large range: \$3.65 to \$11.34 per square foot
  - Percent of total building price: 3.1% to 7.1%
  - Percent of total sales price: 2.2% to 5.4%
- Remember:
  - Potential 2.6% - 3.6% sales premium in AK
  - 2-9% sales premium for high performance homes in other areas



*6 Star home built by Jon James Construction*

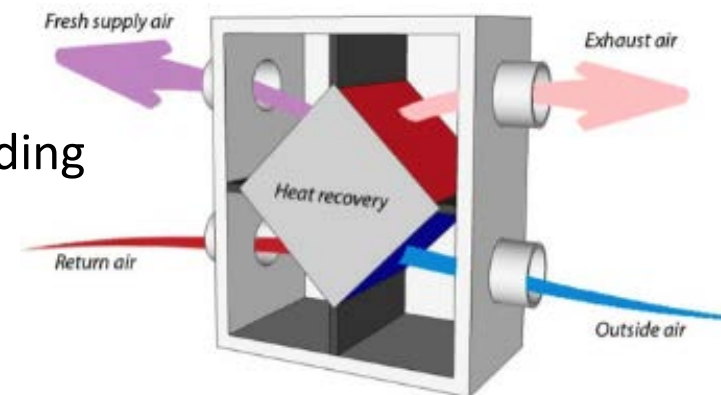




# 6 Star Economics in Southcentral Alaska - Examples

## o Reaching 6 Star Example:

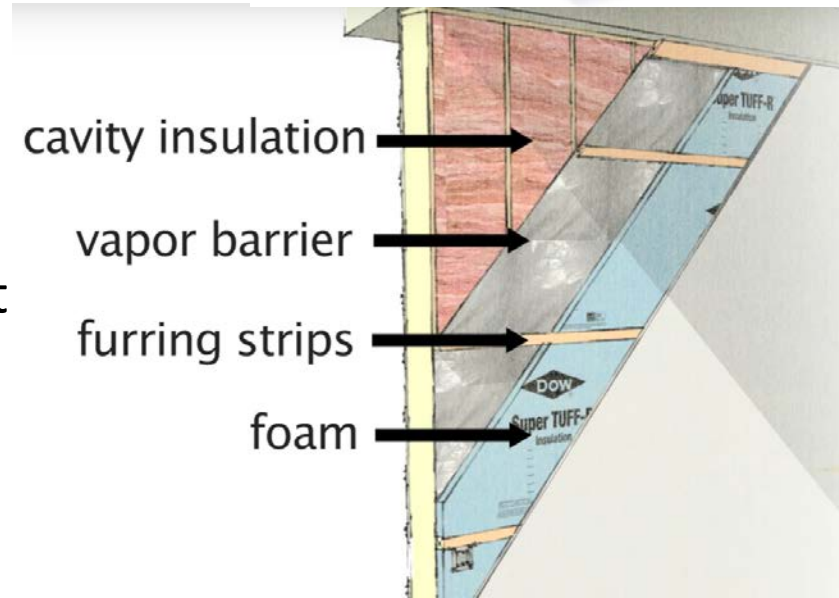
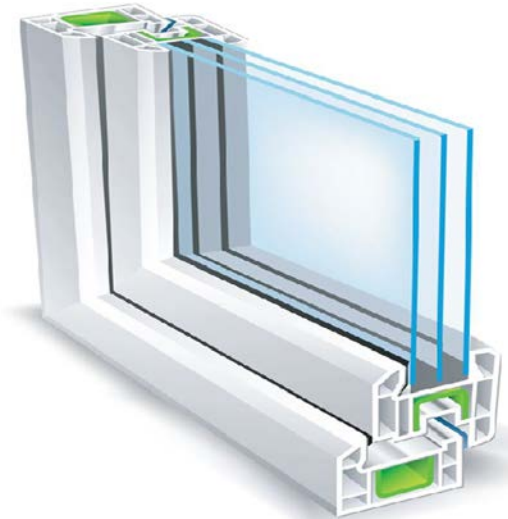
- Start: 92 points
- Upgrades:
  - Ventilation upgrade to HRV
  - Spray foam rim joist for airtightness
  - Upgrade windows to triple pane
  - Add 4" EPS to floor perimeter (horizontal wing or vertical against crawl walls)
- Cost:
  - \$3.65 per square foot (including garage)
  - 2.2% of sales price





# 6 Star Economics in Southcentral Alaska - Examples

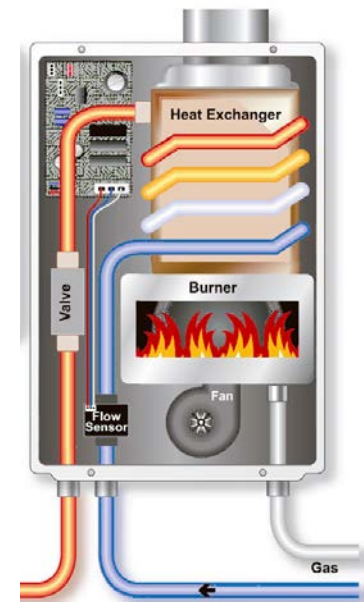
- Reaching 6 Star Example:
  - Start: 93 points
  - Upgrades:
    - Walls -> 2x8, 24" o.c., R25 FG batts, 1.5" interior foam board sheathing
    - Upgrade to triple pane windows
  - Cost:
    - \$5.21 per square foot (including garage)
    - 3.2% of sales price





# 6 Star Economics in Southcentral Alaska - Examples

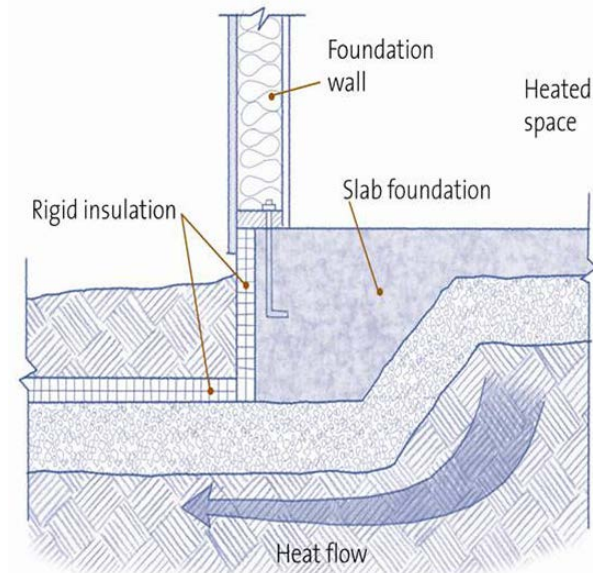
- Reaching 6 Star Example:
  - Start: 89 points (bigger change)
  - Upgrades:
    - Add 4" exterior sheathing to walls
    - Add 2" XPS to garage slab down to 4'
    - Upgrade garage door
    - Upgrade windows
    - Install on-demand DHW
    - Blow more fiberglass in attic for R70
  - Cost:
    - \$11.34 per square foot (including garage)





## 6 Star Economics in Southcentral Alaska – Example from a 6 Star home

- Reaching 6 Star Example:
  - Start: 91.4
  - End: 96.0
  - Upgrades:
    - Double to triple pane windows
    - Slab-on-grade: Additional 2” of rigid foam subslab, vertical on perimeter, and horizontal wing
  - Cost:
    - \$6.28 per square foot
    - 1.8% of sales price





# 6 Star Economics in Southcentral Alaska – ACDC Example

- Reaching 6 Star:
  - Self-help home program
  - Building Costs
  - <1% of total cost (building, land, losing fees, etc.)



Building	Year Built	Building Cost per sqft	Rating Points	Rating Stars
Fuller Lakes	2016	\$71.01	95.8	Six Star
Sourdough	2014	\$70.49	91.5	Five Star
Difference	2	<b>\$0.52</b>	<b>4.3</b>	



# 6 Star Economics in Southcentral Alaska – ACDC Example

- How?
  - Shallow, frost-protected foundation

<b>Building</b>	<b>Foundation Type</b>	<b>Foundation / Floor Costs (per building square foot)</b>	<b>Average R-value of Floor components</b>
Fuller Lakes	Shallow frost protected slab-on-grade	\$ 17.65	41.6
Sourdough	Insulated crawl space	\$ 17.80	33.6
Difference		\$ <b>(0.15)</b>	<b>8.0</b>

# 6 Star Economics in Southcentral Alaska – ACDC Example

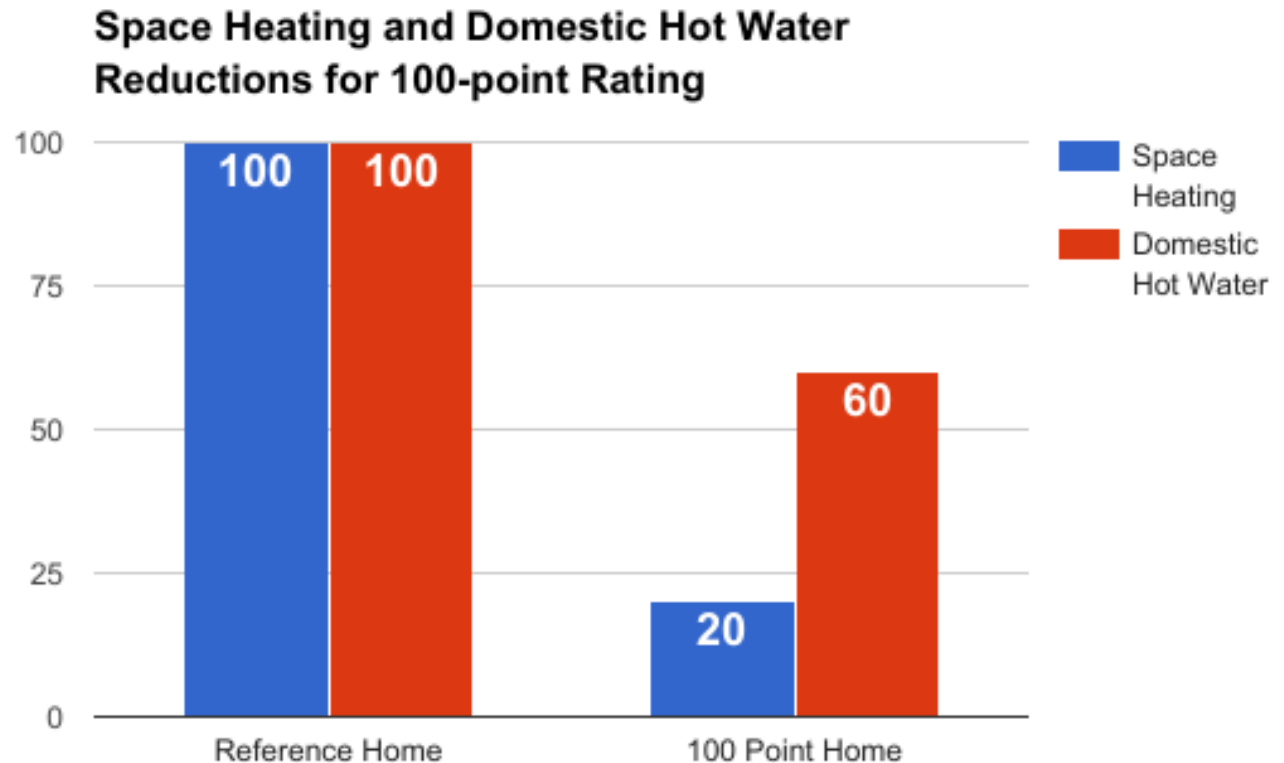
- How?
  - Double walls w/ Fiberglass batts
  - HRV
  - Additional 6” of blown cellulose in attic





# Tips to Reaching 6 Star in Southcentral

- **Domestic Hot Water**
  - ↑ Efficiency, ↑ proportion DHW
  - DHW efficiency limits



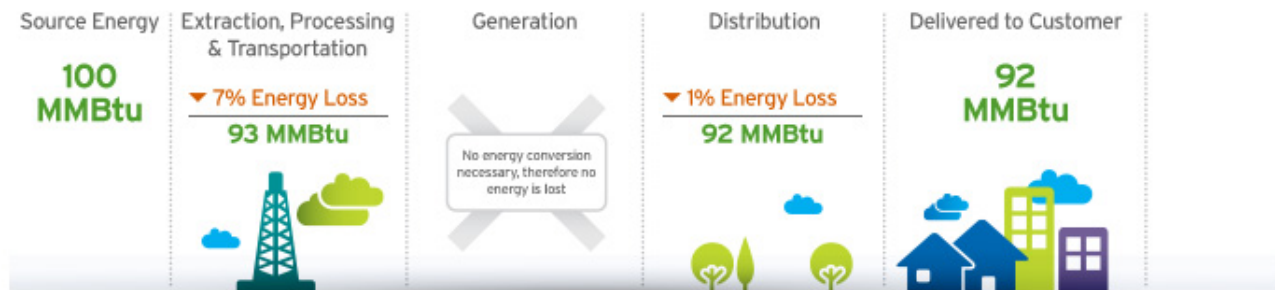




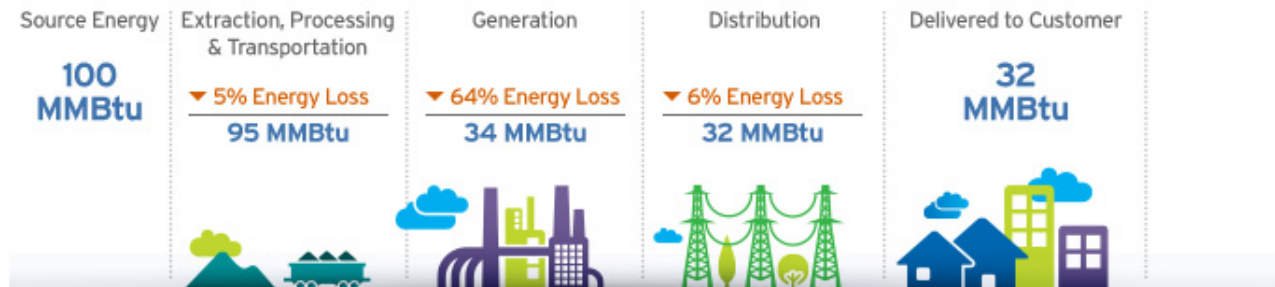
# Tips to Reaching 6 Star in Southcentral

- **Electric Heating / Hot Water:**
  - Electric heating appliances → high efficiency ratings
  - Site-Source Ratio

## Natural Gas



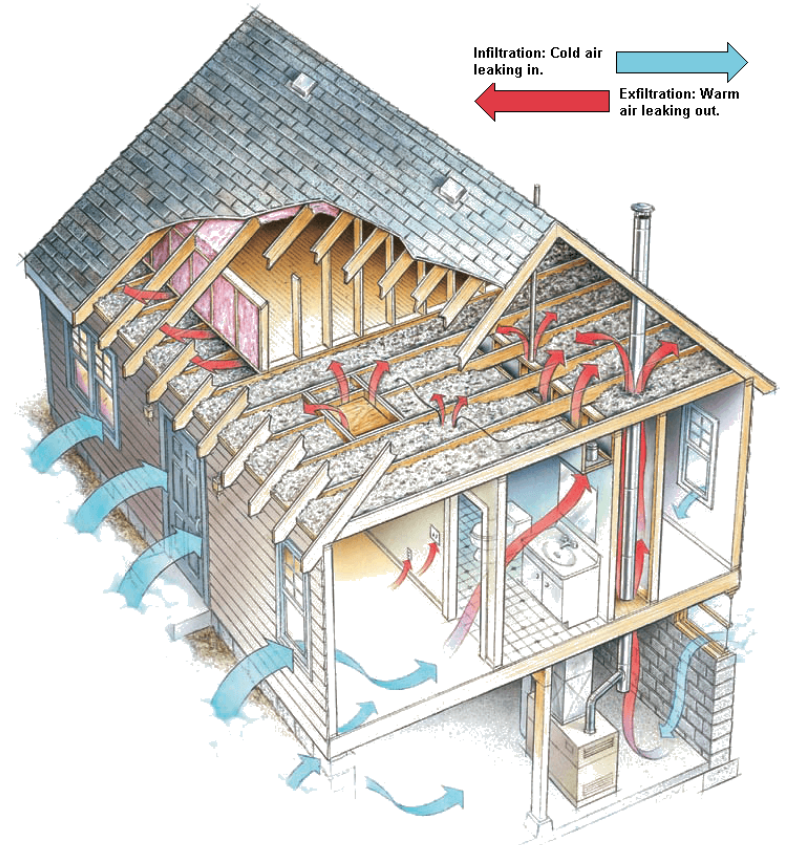
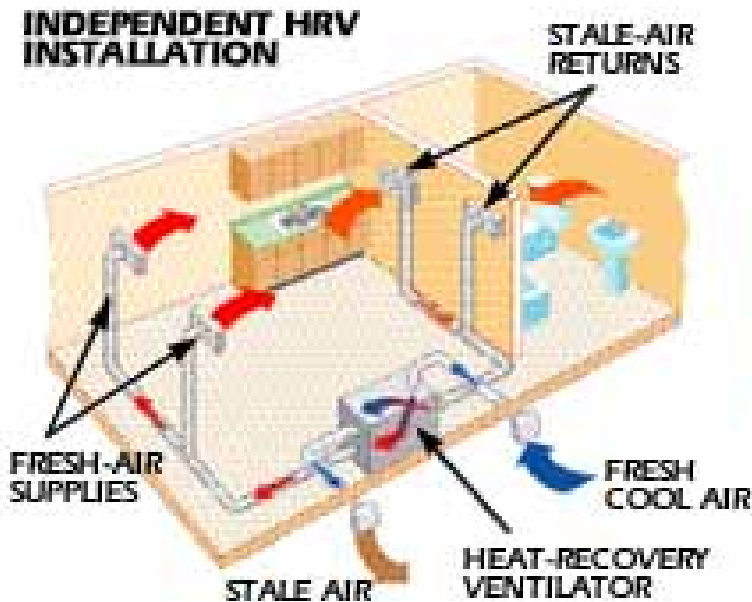
## Electricity





# Tips to Reaching 6 Star in Southcentral

- **Combine HRVs and air-tightness**
  - Synergistic effects
  - +0.4 vs. +1.6



# Tips to Reaching 6 Star in Southcentral

- **Build a shallow frost protected slab-on-grade foundation**
  - Faster to build
  - Less expensive\*
  - Better insulation value



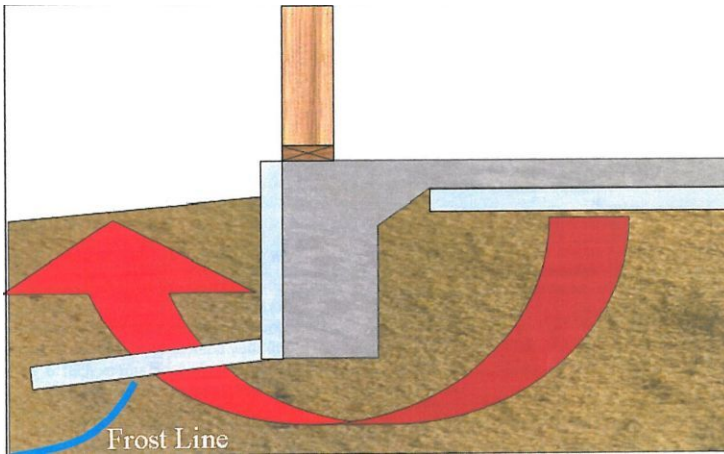
*“There’s nothing wrong with a well-built crawlspace, but for me, there’s no question that insulated slab on-grade is less expensive and a better product”*

*—Jon James Construction*

*\*Depending on soil and site conditions*

# Tips to Reaching 6 Star in Southcentral

- Shallow frost protected slab-on-grade foundation: Considerations
  - Insulation is non-negotiable to prevent frost-jacking
  - Use radiant in-floor heating for maximum comfort
  - Lose potential space for ducting, mechanical systems
  - Be prepared to work with code officials
    - CCHRC report
    - May require engineering work
  - Consider stained concrete for an inexpensive floor finish





# Tips to Reaching 6 Star in Southcentral

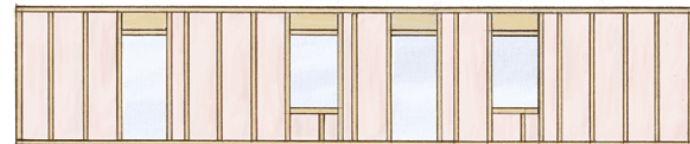
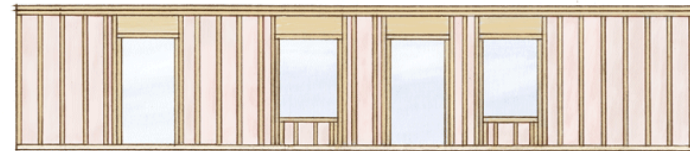
- **Do Zero Cost Upgrades First!**
  - Several builders reported zero cost for upgrades that made homes more efficient, including:
    - Blow in cellulose in the attic instead of fiberglass
    - Provide more oversight on air sealing details
    - Switch wall framing from 16" on-center to 24" on-center.
    - Switch from crawl space to shallow frost protected foundation



Cellulose Fiber

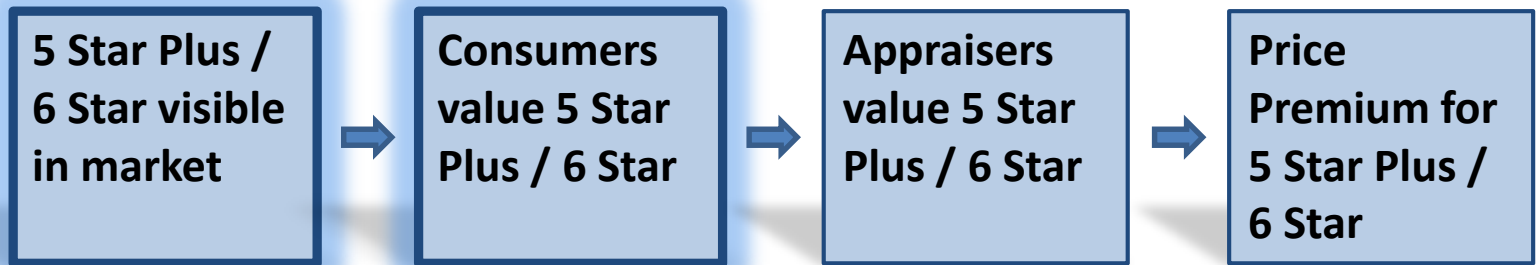


Fiberglass





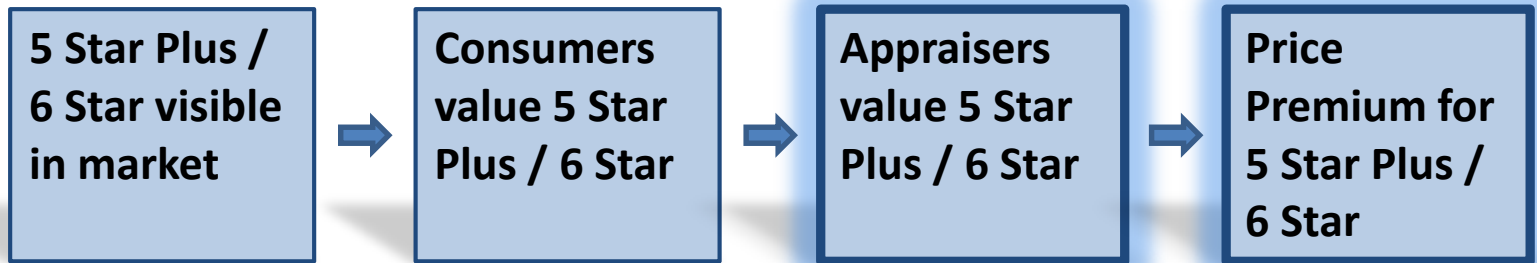
# Marketing your 6 Star Home



- Benefits are mostly invisible to customers – communicate
- Focus message on what your customers want, rather than on features
  - “Healthy place to live”
  - “Lower operating costs”
  - “Contributes to a more sustainable lifestyle”
  - “Warm and comfortable”



## Getting Price Premiums for your 6 Star Home



- Green Addendum
- Ask for an appraiser with green competency
  - Ask for justification for valuation of zero
- Point to research on the value of EE

## 6 Star Homes – Opportunity for the Future

- Lots of potential for market growth
- Need to fix appraisal issue
- Huge opportunity to create competitive advantage
  - **Builders:** Can you build it inexpensively
  - **Builders / Real Estate Agents:** Can you communicate benefits to consumers?
  - **Appraisers:** Do you have competency in appraising high performing homes?



Six Star



# Questions or Comments?

- Thanks!
- Contact info:
  - Dustin Madden
  - [dustin@cchrc.org](mailto:dustin@cchrc.org)
  - (907)-304-2142

