

# 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**

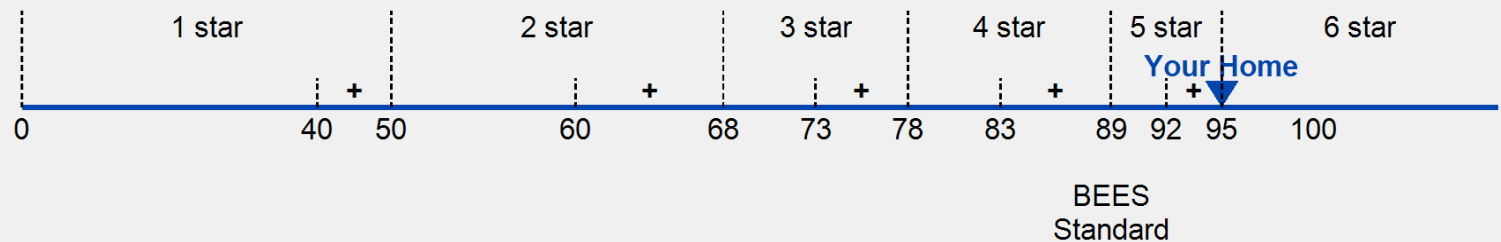


## OVERVIEW: Building 6 Star Homes in Southcentral Alaska

- 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 Achieving a 6 Star Home in Southcentral Alaska
- Valuing energy efficiency in homes
- Marketing

# What is a 6 Star Home?

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

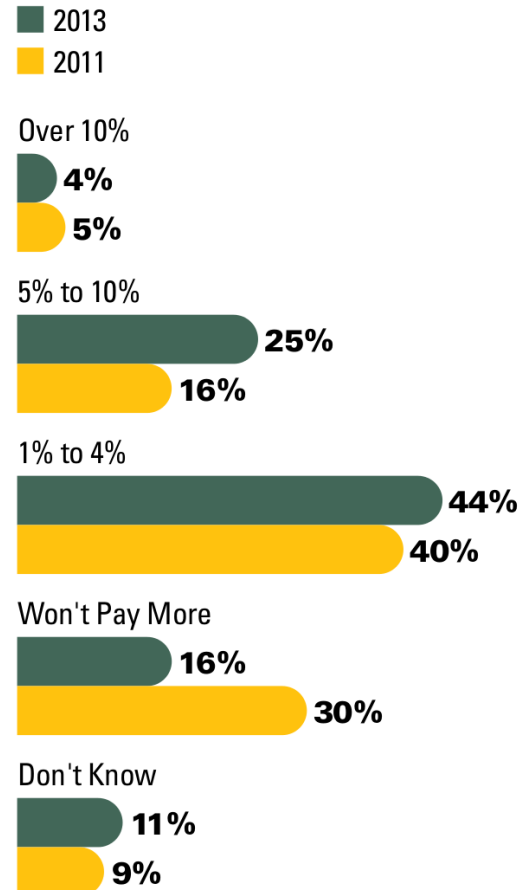


# Why Build a 6 Star Home?

- People care!
  - “Eco-friendly” features vs. luxury items: 49%
- Customers are paying more
  - 73% of builders thought 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?

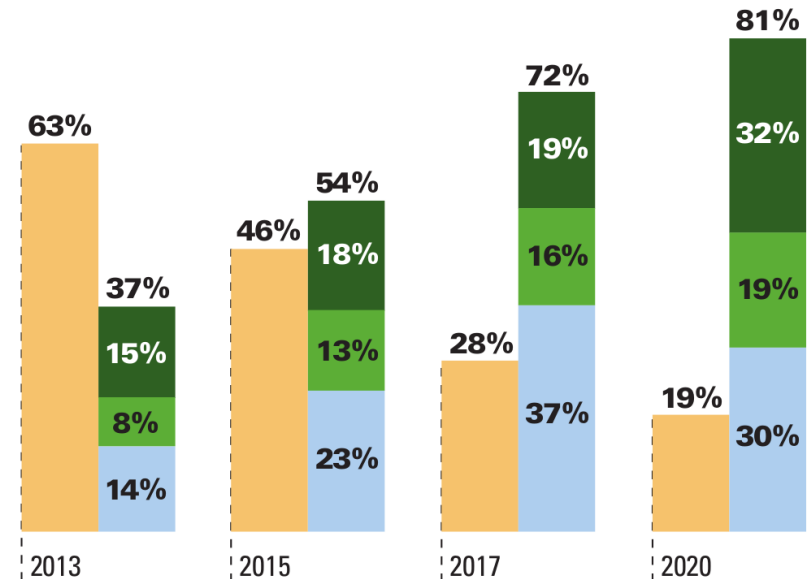
- The market is growing
  - National research
    - Growth rate has outpaced general construction in recent years<sup>1</sup>
    - Projection: 15%
    - ‘Green’ construction market expected to continue growth<sup>2</sup>

## 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



<sup>1</sup>USGBC economic impact study

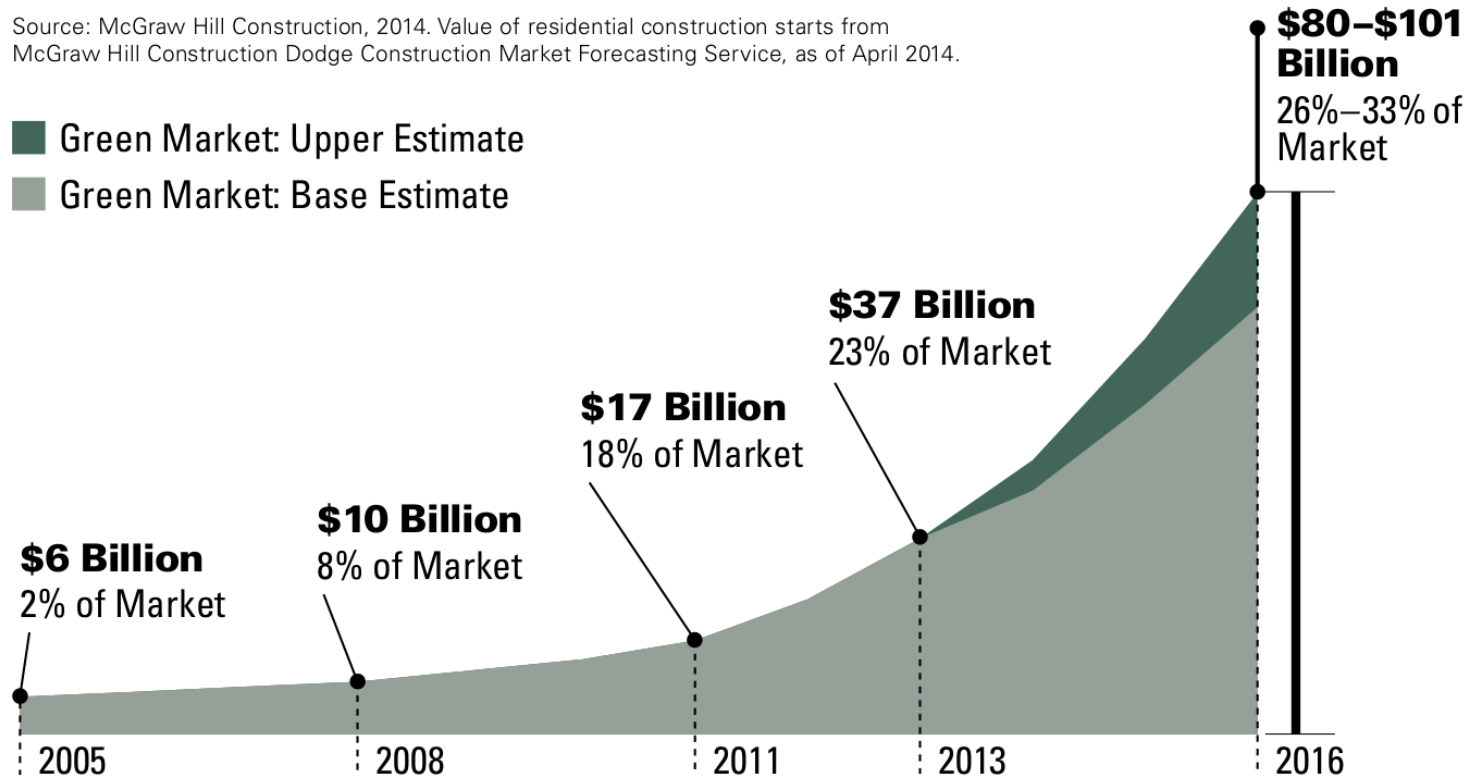
<sup>2</sup>U.S. construction outlook report

# 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:
  - If built properly, are more durable and have better indoor air quality
  - Save homeowners money
  - Contribute fewer greenhouse gases



**Healthy**

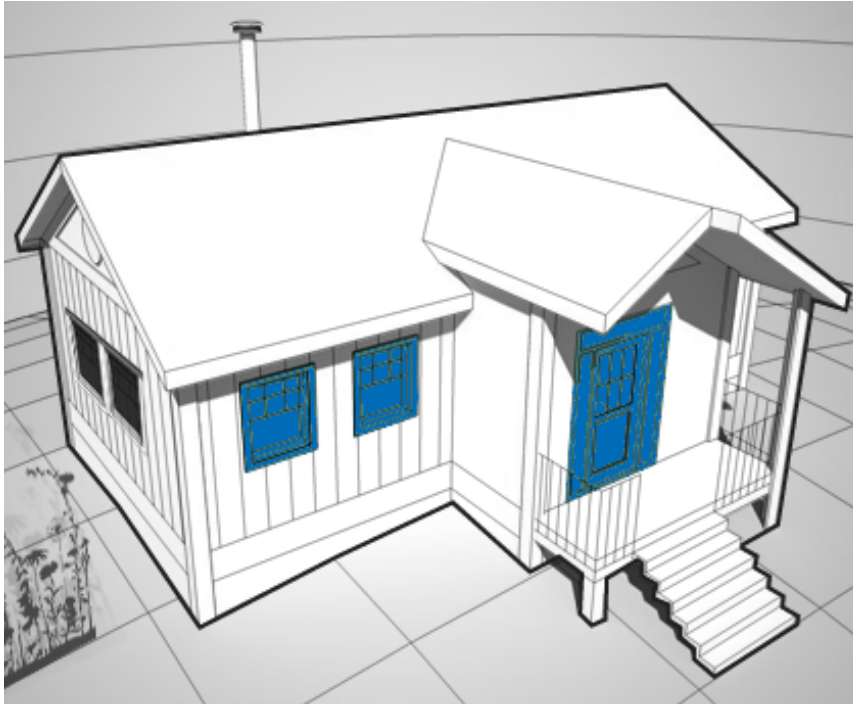
**Durable**

**Sustainable**

# How are Southcentral Builders Achieving 6 Star Homes?

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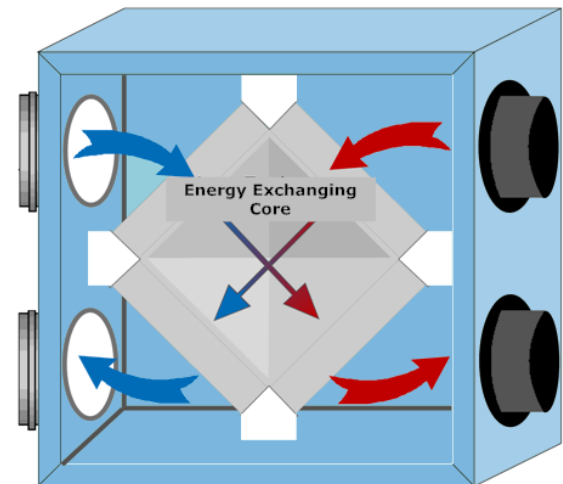


## Efficient windows

The median u-factor is 0.23

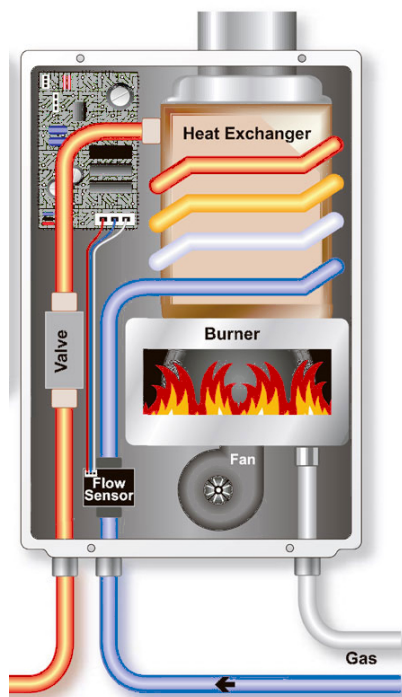
## Heat Recovery Ventilation Systems

96% of 6 Star Homes have an HRV





# How are Southcentral Builders Achieving 6 Star Homes?



## Very efficient hot water systems

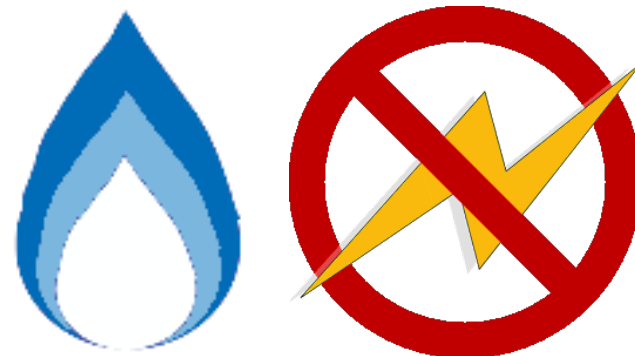
The median energy factor in 6 Star homes in Southcentral is 0.90

## 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 between 1-10%
  - 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

- More Than 60% Green
- 16%–60% Green
- 15% or Less Green

No/Insignificant Costs

8%

2%

1%

1%–4%

23%

18%

9%

5%–10%

46%

49%

37%

Greater Than 10%

18%

29%

46%

Don't Know

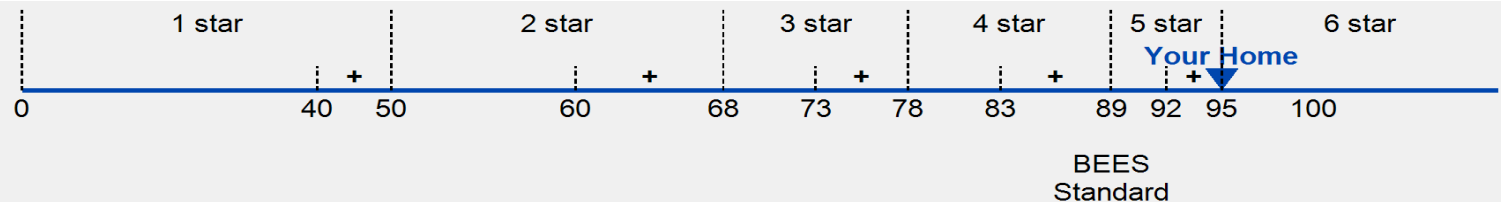
5%

2%

7%

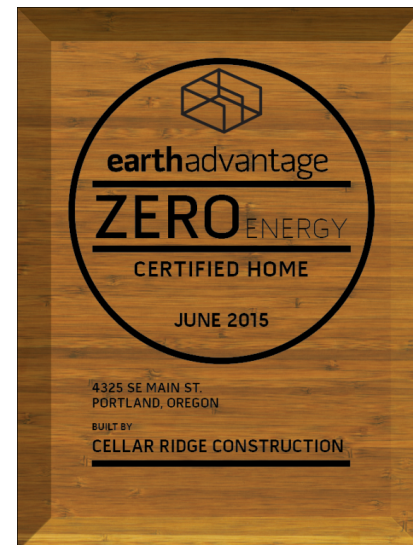
## ... But it can be worth more

- “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.
  - 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)
  - Including Overhead and Profit
- 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

Home	Size (square feet)	Description	Improvement Cost	Rating Point Increase	Cost Per Point
Builder A	1,831 + 280 garage	Upgrade to Triple Pane Windows	\$1,384	0.8	\$1,730
Builder B	1,152 + 410 garage	Add 2" blue board to garage floor perimeter	\$435	1.2	\$363
Builder C	1,404 + 409 garage	Upgrade ventilation to HRV and foam rim joist	\$1,950	1.4	\$1,393
Builder D	875	Increase blown attic insulation from R50 to R77	\$579	0.7	\$828
Builder E	1,606 + 560 garage	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: 1.8% to 5.4%

- **Potential Benefit:**
  - 2.6% - 3.6% sales premium in AK
  - Alaska average new home price:
    - \$379,588 (DOL)
  - Premium: \$9,900 - \$13,700
  - 2-9% sales premium for high performance homes in other areas
    - 9%: \$34,200



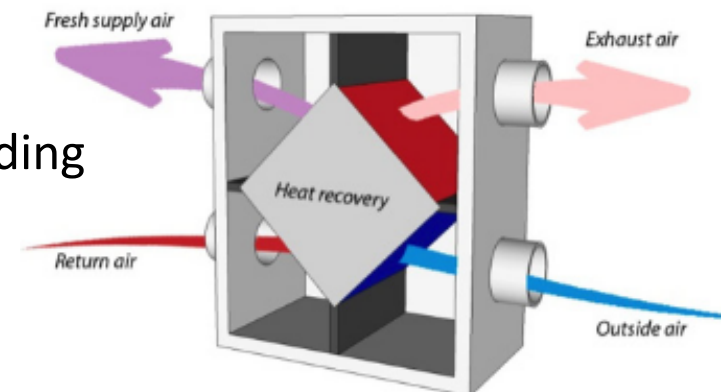
*6 Star home built by Jon James Construction*



# 6 Star Economics in Southcentral Alaska - Examples

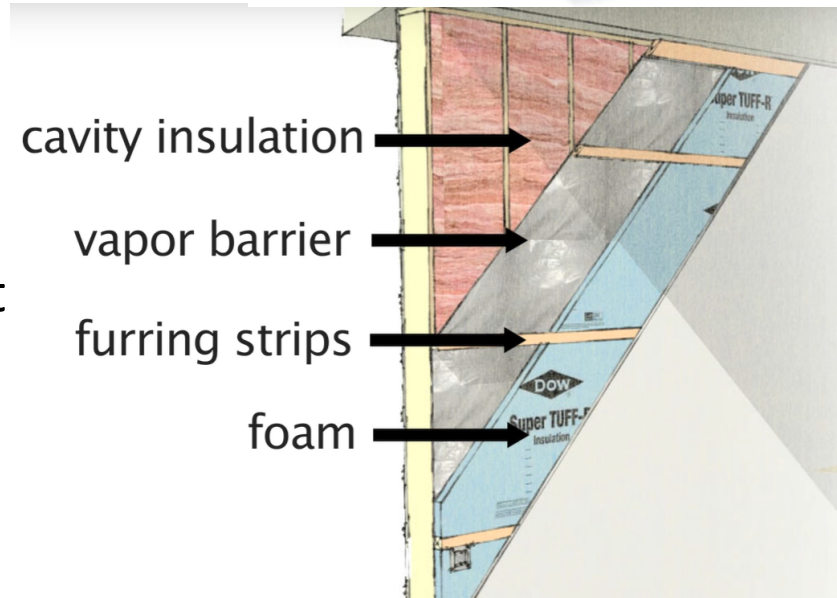
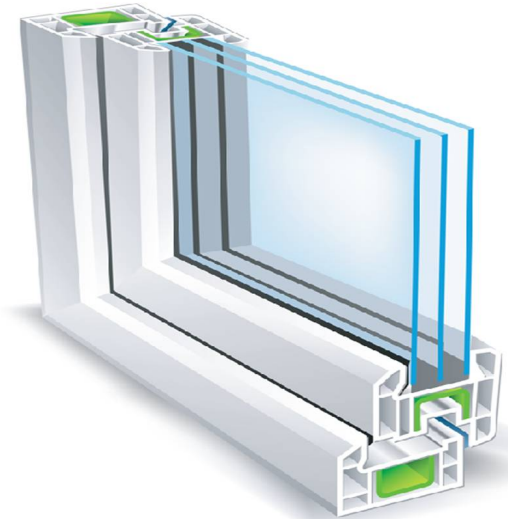
## ○ Reaching 6 Star Example:

- Start: 92 points
- Upgrades:
  - Ventilation upgrade to HRV
  - Spray foam rim joist for air-tightness
  - 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



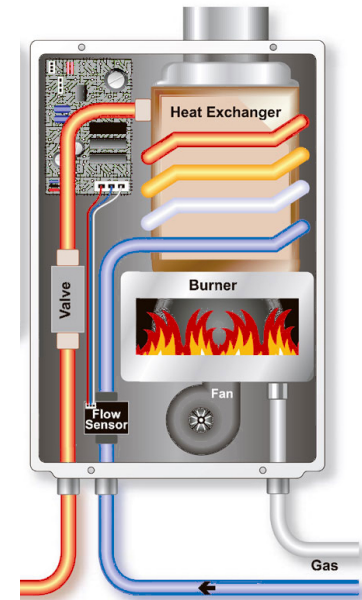
# 6 Star Economics in Southcentral Alaska - Examples

- 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



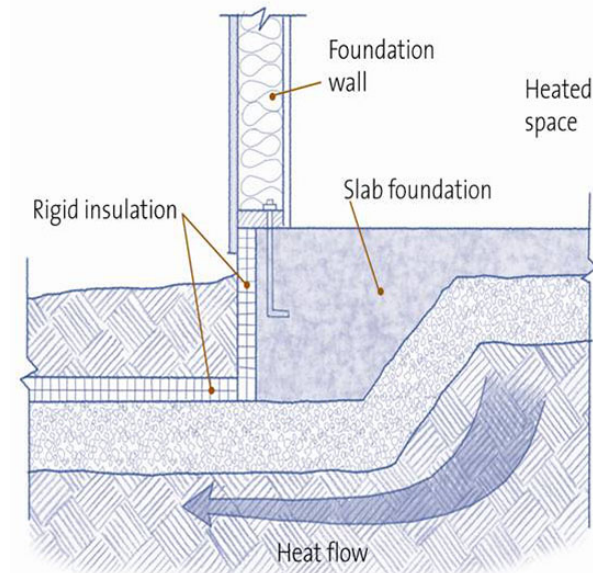
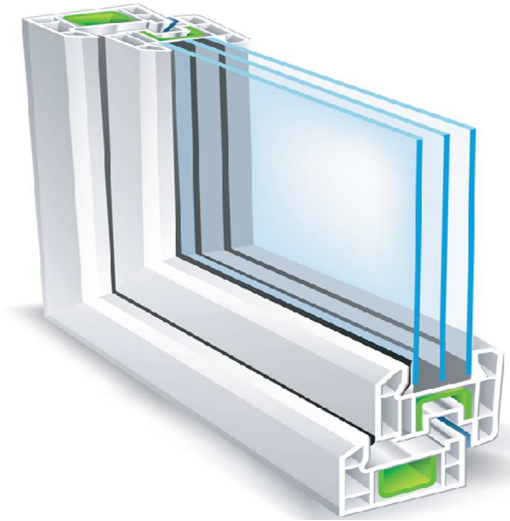
# 6 Star Economics in Southcentral Alaska - Examples

- Reaching 6 Star Example:
  - Start: 89 points (bigger change)
  - Upgrades:
    - Add 4" exterior sheathing to walls
    - Add 2" XPS to garage slab perimeter 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, closing 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	\$0.52	4.3	

# 6 Star Economics in Southcentral Alaska – ACDC Example

- How?
  - Shallow, frost-protected foundation

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



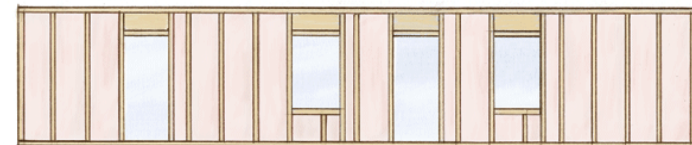
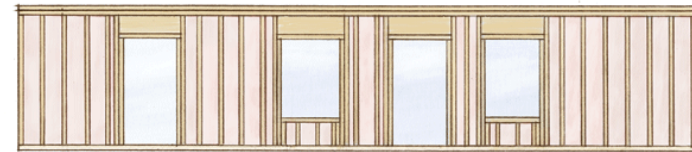
# 6 Star Economics in Southcentral Alaska – ACDC Example

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



# 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.



Cellulose Fiber



Fiberglass

# Practice 1

Example	Bedrooms	Floor Area	Garage Area	Rating Points	Assessed Value
Anchorage - Example 1	3	2,253	663	90.8	\$525,200
UPGRADES				<b>GOAL: 95 POINTS</b>	<b>2.6 to 3.6% = \$13,660 to \$18,910</b>



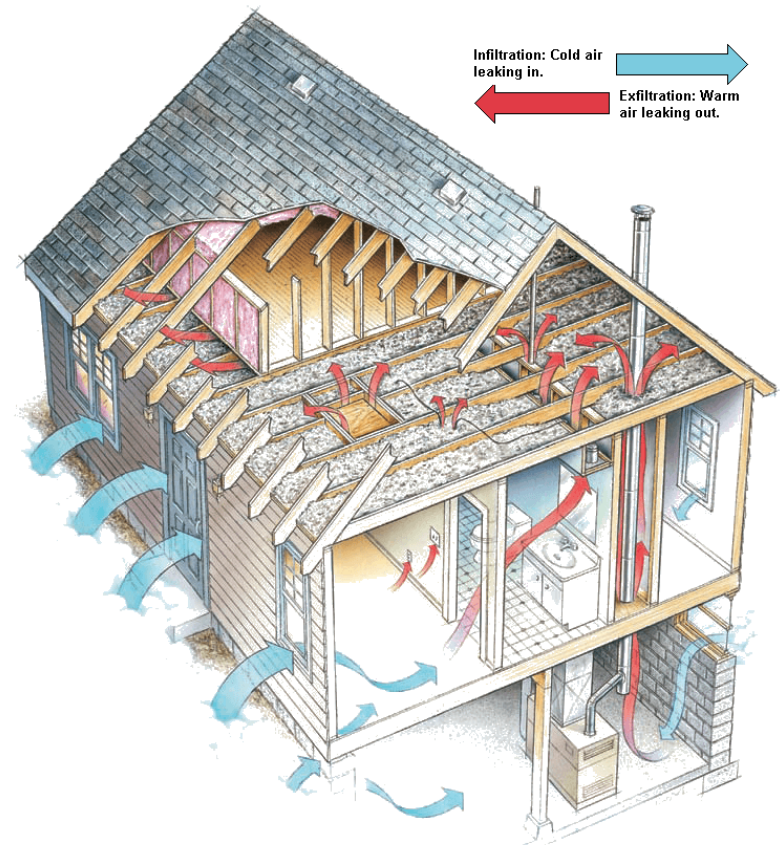
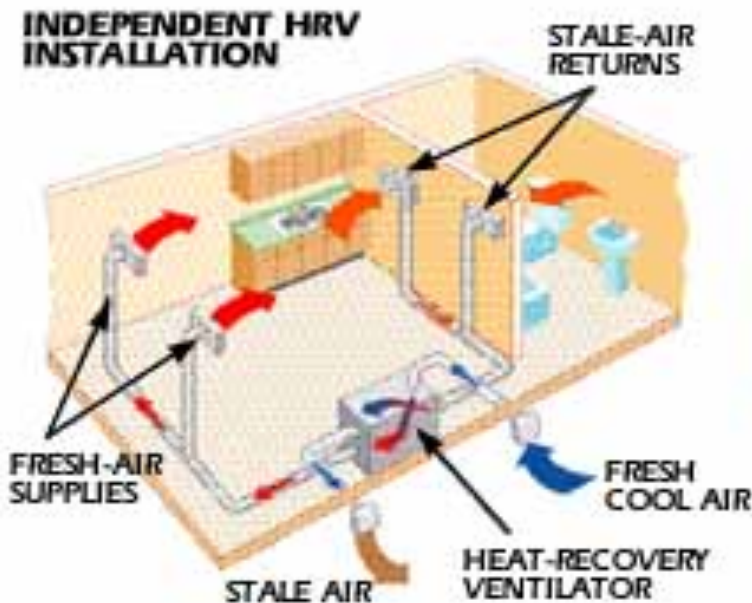
# Practice 1 - Discussion

Example	ACH50	Window	DHW	Floor	Doors	Ceiling	Vent.	Assessed Value
ANC – Example 1	3.2 ACH50	Double pane, U-0.29	Gas tank, EF-0.58	Basement, 2" EPS sub-slab, perimeter around house & garage	Entry R-3.2, garage R-5.3	14.5" blown fiberglass	Cont. exhaust	\$525,200
UPGRADE	Tighten to 2.0 ACH50	Triple Pane, U-0.19	On-demand EF-0.93	4" EPS sub-slab, vertical perimeter AND horizontal wing	Garage w/ 2" thermal break, 1/2 lite to 1/4 lite	20" blown cellulose	HRV	<b>PRICE PREMIUM:</b> 2.6 to 3.6% = \$13,660 to \$18,910
POINT +	<b>0.2</b>	<b>0.9</b>	<b>0.8</b>	<b>0.7</b>	<b>0.3</b>	<b>0.4</b>	<b>0.9</b>	<b>TOTAL: 4.2</b>
UPGRADE PRICE RANGES	<b>\$0 - \$700</b>	<b>\$3,230 - \$6,830</b>	<b>\$1,500</b>	<b>\$3,100</b>	<b>\$200</b>	<b>\$590</b>	<b>\$1,950 - \$3,500</b>	<b>COST:</b> 2.0 - 3.1% \$10,570 - \$16,420



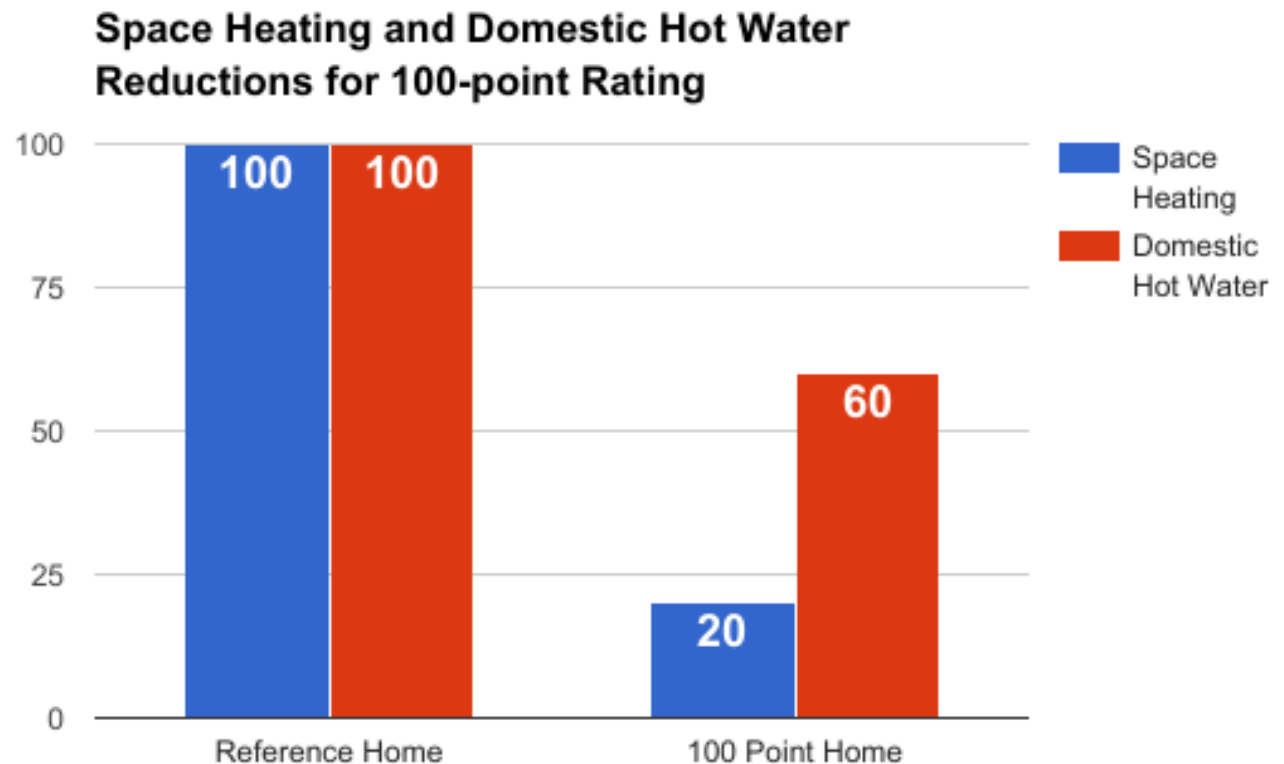
# Tips to Reaching 6 Star in Southcentral

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



# Tips to Reaching 6 Star in Southcentral

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



# Tips to Reaching 6 Star in Southcentral

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

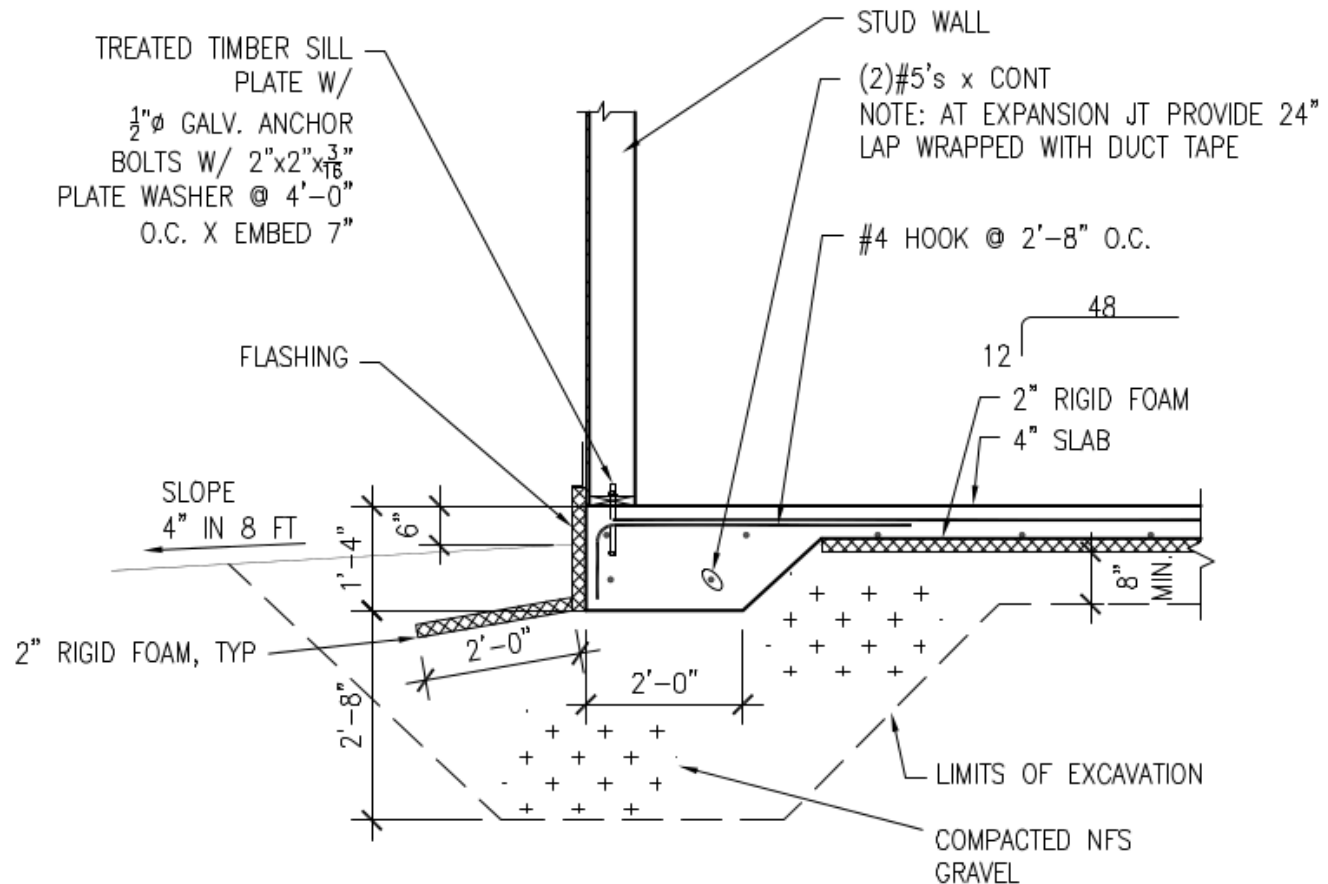


*“There’s nothing wrong with a well-built crawlspace, but for me, there’s no question that insulated slab on-grade is less expensive and a better product”*

*—Jon James Construction*

*\*Depending on soil and site conditions*

# Tips to Reaching 6 Star in Southcentral



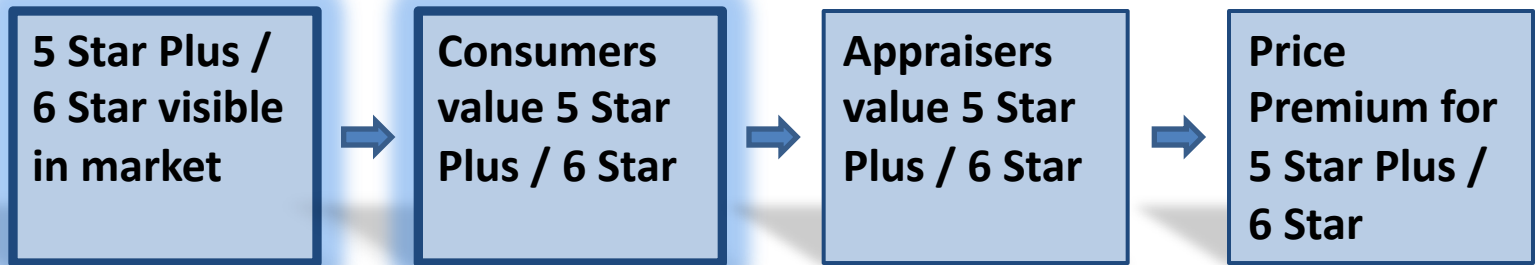
SECTION

1/2" = 1'-0"

F\_g04



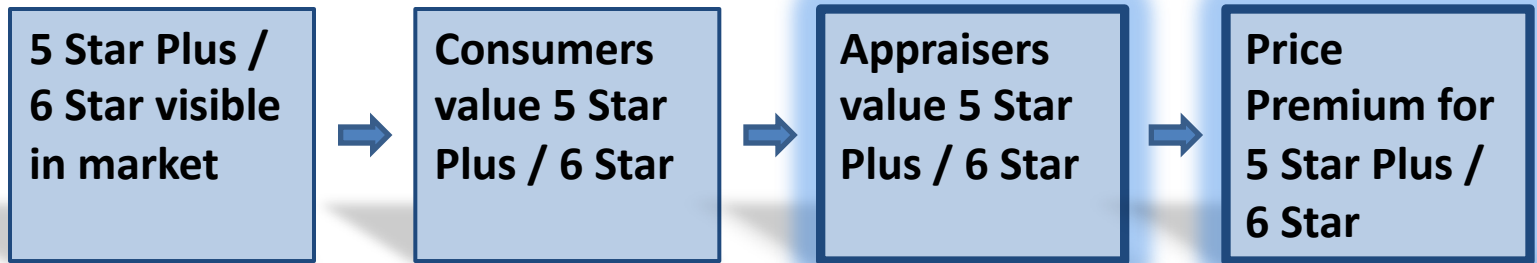
# Marketing your 6 Star Home



- 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”
- Communicate to Real Estate Agent too



# Getting Price Premiums for your 6 Star Home



- [Green Addendum](#)
- Ask for an appraiser with competency appraising high-performance homes
  - Ask for justification for valuation of zero
  - Challenge appraisal
- Point to research on the value of EE





## 6 Star Homes – Opportunity for the Future

- Lots of potential for market growth
- 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?
- Need to fix appraisal issue



Six Star

## Practice 2

Example	Bedrooms	Floor Area	Garage Area	Rating Points	Assessed Value
Kenai – Example 2	3	1,890	910	90.7	\$316,200
UPGRADES				GOAL: 95 POINTS	PRICE PREMIUM: 2.6 to 3.6% = \$8,220 to \$11,380 9% = \$28,460

# Practice 2 - Discussion

Example	ACH50	Window	Walls	Floor	Doors	Ceiling	Points	Assessed Value
Kenai – Example 2	2.2 ACH50	Double pane, U-0.29	2x6, 16" o.c., R21 FG batts	Frost-Protected Shallow: 2" EPS subslab, vertical on perimeter	Steel u-0.25, garage R-5.3	17" blown fiberglass	90.7	\$316,200
UPGRADE	Tighten to 1.5 ACH50	Triple Pane, U-0.19	2x6, 24" o.c., add ½" interior polyiso	4" EPS subslab, vertical on perimeter, + horizontal wing	Garage w/ 2" poly core, u-0.16 man-door	17" blown cellulose	95.0	<b>PRICE PREMIUM:</b> 2.6 to 3.6% = \$8,220 to \$11,380
POINT +	<b>0.5</b>	<b>0.6</b>	<b>0.8</b>	<b>1.6</b>	<b>0.4</b>	<b>0.4</b>	<b>TOTAL:</b> <b>4.3</b>	
UPGRADE PRICE RANGES	<b>\$0 - \$700</b>	<b>\$2,020 - \$4,270</b>	<b>\$3,325</b>	<b>\$4,500</b>	<b>\$300</b>	<b>\$0</b>		<b>COST:</b> 3.2 - 4.1% <b>\$10,150 - \$13,100</b>





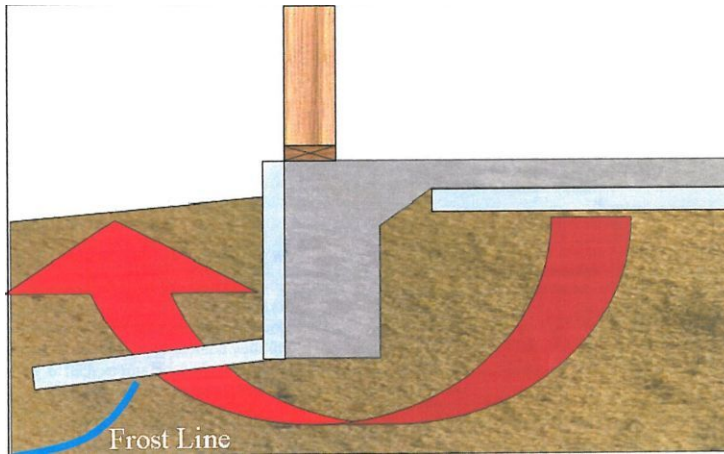
# Questions or Comments?

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



# Tips to Reaching 6 Star in Southcentral

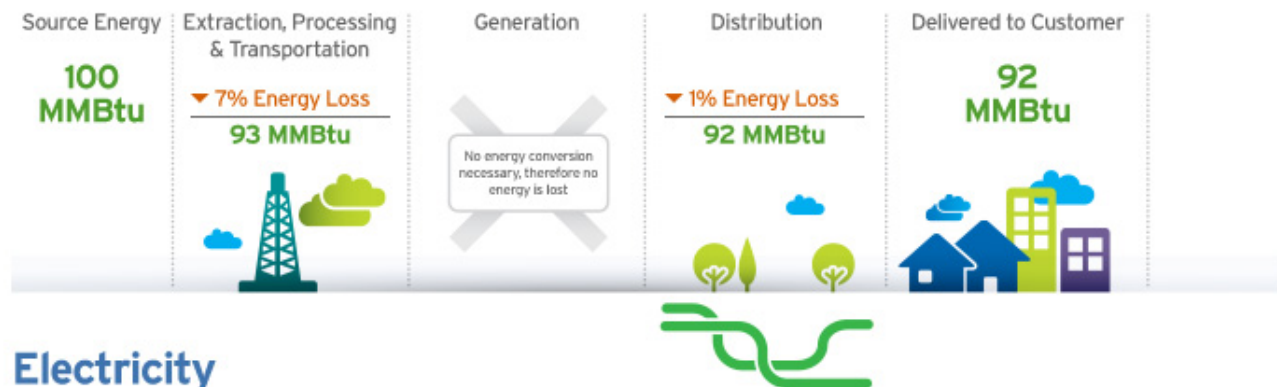
- Shallow frost protected slab-on-grade foundation: Considerations
  - Insulation is non-negotiable to prevent frost-jacking
  - Use radiant in-floor heating for maximum comfort
  - Lose potential space for ducting, mechanical systems
  - Be prepared to work with code officials
    - May require engineering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



# Tips to Reaching 6 Star in Southcentral

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

## Natural Gas



## Electricity

