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

Why Build a 6 Star Home?

- The market is growing
  - National research
    - Growth rate has outpaced general construction in recent years\(^1\)
    - Projection: 15%
    - ‘Green’ construction market expected to continue growth\(^2\)

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\(^1\)USGBC economic impact study
\(^2\)U.S. construction outlook report
Why Build a 6 Star Home?

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


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

$6 Billion 2% of Market
$10 Billion 8% of Market
$17 Billion 23% of Market
$37 Billion 26%–33% of Market
$80–$101 Billion 26%–33% of Market

* 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?

**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
Builder survey:
- Most report increase in costs between 1-10%
- More green building experience = Lower expected costs
... 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%
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

<table>
<thead>
<tr>
<th>Home</th>
<th>Size (square feet)</th>
<th>Description</th>
<th>Improvement Cost</th>
<th>Rating Point Increase</th>
<th>Cost Per Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>Builder A</td>
<td>1,831 + 280 garage</td>
<td>Upgrade to Triple Pane Windows</td>
<td>$1,384</td>
<td>0.8</td>
<td>$1,730</td>
</tr>
<tr>
<td>Builder B</td>
<td>1,152 + 410 garage</td>
<td>Add 2&quot; blue board to garage floor perimeter</td>
<td>$435</td>
<td>1.2</td>
<td>$363</td>
</tr>
<tr>
<td>Builder C</td>
<td>1,404 + 409 garage</td>
<td>Upgrade ventilation to HRV and foam rim joist</td>
<td>$1,950</td>
<td>1.4</td>
<td>$1,393</td>
</tr>
<tr>
<td>Builder D</td>
<td>875</td>
<td>Increase blown attic insulation from R50 to R77</td>
<td>$579</td>
<td>0.7</td>
<td>$828</td>
</tr>
<tr>
<td>Builder E</td>
<td>1,606 + 560 garage</td>
<td>Upgrade ventilation to HRV</td>
<td>$2,176</td>
<td>1.2</td>
<td>$1,814</td>
</tr>
</tbody>
</table>
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.)

<table>
<thead>
<tr>
<th>Building</th>
<th>Year Built</th>
<th>Building Cost per sqft</th>
<th>Rating Points</th>
<th>Rating Stars</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuller Lakes</td>
<td>2016</td>
<td>$71.01</td>
<td>95.8</td>
<td>Six Star</td>
</tr>
<tr>
<td>Sourdough</td>
<td>2014</td>
<td>$70.49</td>
<td>91.5</td>
<td>Five Star</td>
</tr>
<tr>
<td>Difference</td>
<td>2</td>
<td>$0.52</td>
<td>4.3</td>
<td></td>
</tr>
</tbody>
</table>
6 Star Economics in Southcentral Alaska – ACDC Example

- **How?**
  - Shallow, frost-protected foundation

<table>
<thead>
<tr>
<th>Building</th>
<th>Foundation Type</th>
<th>Foundation / Floor Costs (per building square foot)</th>
<th>Average R-value of Floor components</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuller Lakes</td>
<td>Shallow frost protected slab-on-grade</td>
<td>$ 17.65</td>
<td>41.6</td>
</tr>
<tr>
<td>Sourdough</td>
<td>Insulated crawl space</td>
<td>$ 17.80</td>
<td>33.6</td>
</tr>
<tr>
<td>Difference</td>
<td></td>
<td>$ (0.15)</td>
<td>8.0</td>
</tr>
</tbody>
</table>
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.
## Practice 1

<table>
<thead>
<tr>
<th>Example</th>
<th>Bedrooms</th>
<th>Floor Area</th>
<th>Garage Area</th>
<th>Rating Points</th>
<th>Assessed Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anchorage - Example 1</td>
<td>3</td>
<td>2,253</td>
<td>663</td>
<td>90.8</td>
<td>$525,200</td>
</tr>
<tr>
<td>UPGRADES</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2.6 to 3.6% = $13,660 to $18,910</td>
</tr>
</tbody>
</table>

**GOAL:** 95 POINTS
# Practice 1 - Discussion

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

TREATED TIMBER SILL PLATE W/ 
3/4" GALV. ANCHOR BOLTS W/ 2"x2"x3/8" PLATE WASHER @ 4'-0" O.C. X EMBED 7"

STUD WALL

(2)#5's x CONT NOTE: AT EXPANSION JT PROVIDE 24" LAP WRAPPED WITH DUCT TAPE

#4 HOOK @ 2'-8" O.C.

FLASHING

SLOPE 4" IN 8 FT

2" RIGID FOAM, TYP 2'-0" 2'-0"

LIMITS OF EXCAVATION

COMPACTED NFS GRAVEL

SECTION 1/2" = 1'-0"
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

- 5 Star Plus / 6 Star visible in market
- Consumers value 5 Star Plus / 6 Star
- Appraisers value 5 Star Plus / 6 Star
- Price Premium for 5 Star Plus / 6 Star
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

<table>
<thead>
<tr>
<th>Example</th>
<th>Bedrooms</th>
<th>Floor Area</th>
<th>Garage Area</th>
<th>Rating Points</th>
<th>Assessed Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kenai – Example 2</td>
<td>3</td>
<td>1,890</td>
<td>910</td>
<td>90.7</td>
<td>$316,200</td>
</tr>
<tr>
<td><strong>UPGRADES</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>PRICE PREMIUM:</strong> 2.6 to 3.6% = $8,220 to $11,380 9% = $28,460</td>
</tr>
</tbody>
</table>

**GOAL:** 95 POINTS
### Practice 2 - Discussion

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

<table>
<thead>
<tr>
<th>Source Energy</th>
<th>Extraction, Processing &amp; Transportation</th>
<th>Generation</th>
<th>Distribution</th>
<th>Delivered to Customer</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 MMBtu</td>
<td>7% Energy Loss</td>
<td>No energy conversion necessary, therefore no energy loss</td>
<td>1% Energy Loss</td>
<td>92 MMBtu</td>
</tr>
<tr>
<td>93 MMBtu</td>
<td></td>
<td></td>
<td>92 MMBtu</td>
<td></td>
</tr>
</tbody>
</table>

### Electricity

<table>
<thead>
<tr>
<th>Source Energy</th>
<th>Extraction, Processing &amp; Transportation</th>
<th>Generation</th>
<th>Distribution</th>
<th>Delivered to Customer</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 MMBtu</td>
<td>5% Energy Loss</td>
<td>64% Energy Loss</td>
<td>6% Energy Loss</td>
<td>32 MMBtu</td>
</tr>
<tr>
<td>95 MMBtu</td>
<td></td>
<td>34 MMBtu</td>
<td>32 MMBtu</td>
<td></td>
</tr>
</tbody>
</table>