Multifamily Affordable Housing that is Healthy, Efficient, Cost Effective and LEED Platinum

September 27, 2016
No more asthma?!
Learning Objectives

• Analyze the strategies used to achieve low energy costs, HERS scores in the 40’s and long term value.
• Identify approaches to build healthy housing that residents appreciate and desire.
• Evaluate the lessons learned, challenges and preferences for subs and project teams.
• Discuss the potential next steps for multifamily affordable housing to take it to the next level.
Projects

- Cardona
- Rosslare
- Summerhill
- Bandon River
- Valencia
- Carlow
- Kinsale Place
- Vineyard at Broadmore
- 12th and River
- The Springs
- The Grove at Riverside
- Ross Island
Characteristics in Common

• All are located in Idaho, mostly rural
• Most are 3-story, 48-unit projects
• All are LEED Platinum
• All are affordable and tax-credit through QAP
• Some are senior, some are family
• Climate Zones 5 and 6
• Moderate to high radon risk
Cardona

- First LEED certified multifamily project in Idaho (2008)
- Developer began with a focus on air infiltration and waste reduction
- Challenges with building department
“LEED seems to us to be the most holistic from pre-construction to construction and more importantly long term sustainability. Our affordable apartment communities are designed to operate as such for a period of 40-50 years... what you build needs to be for the long term. We very much like the 3rd party certification processes.” – Tom Mannschreck, President and CEO of Thomas Development Co.

“Yes it does cost more. Is it worth it? Absolutely.”

“Operating costs are significantly smaller.”

“New math in the development business.”

“Decreased resident turnover.”

Tom had chronic asthma as a child. He brought LEED to the QAP.
12th and River

- Highest LEED for Homes score of 102.5
- Urban infill in Boise
- Very high density
- 56 HERS Score
- U-0.27 windows
- Heat pumps
Valencia and The Grove

• Lowest HERS scores of 48
## HERS Scores

<table>
<thead>
<tr>
<th>Project</th>
<th>Location</th>
<th>HERS score</th>
<th>Year Built</th>
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<tbody>
<tr>
<td>Cardona</td>
<td>Chubbuck</td>
<td>85</td>
<td>2008</td>
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<td>Rosslare</td>
<td>Idaho Falls</td>
<td>69</td>
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<td>Summerhill</td>
<td>Idaho Falls</td>
<td>52-55</td>
<td>2011</td>
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<td>Bandon River</td>
<td>Idaho Falls</td>
<td>51</td>
<td>2014</td>
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<td>Valencia</td>
<td>Fruitland</td>
<td>48</td>
<td>2015</td>
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<td>Carlow</td>
<td>Rexburg</td>
<td>53</td>
<td>2016</td>
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<td>Kinsale Place</td>
<td>Lewiston</td>
<td>54 (est)</td>
<td>2017</td>
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<td>Vineyard at Broadmore</td>
<td>Nampa</td>
<td>67</td>
<td>2013</td>
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<tr>
<td>12th and River</td>
<td>Boise</td>
<td>56</td>
<td>2012</td>
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<tr>
<td>The Springs</td>
<td>McCall</td>
<td>n/a</td>
<td>2011</td>
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<tr>
<td>The Grove at Riverside</td>
<td>Rexburg</td>
<td>48</td>
<td>2015</td>
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<tr>
<td>Ross Island</td>
<td>Emmett</td>
<td>50 (est)</td>
<td>2017</td>
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Energy Efficient
Strategies to Save Energy

1. Focus on thermal envelope
2. Duct sealing
3. 90-100% CFLs or LEDs
4. ES appliances
5. Efficient HVAC equipment
Thermal Envelope Strategies

1. Advanced framing techniques
2. Air sealing to below 4ACH50
3. Insulate to NW ENERGY STAR
4. Window U-factors of 0.27-0.29
Efficient Lighting Strategies

1. CFL to start
2. Transitioned to LED over last 1-2 years
3. Now preferring built-in LED can lights that are surface mounted
Efficient HVAC Strategies

1. Most either high efficiency gas furnace (94+) or heat pumps
2. Debate over tankless or tank water heaters
3. Good ventilation strategies per LEED/ASHRAE
4. Most have transitioned to ERV/HRV

Lessons Learned
- Maintenance is a concern in rural areas
- Resident education is important
Long Term Value

“From $250 per month to $50!” – resident of The Grove at Riverside
Healthy
Strategies to achieve Healthy Homes

LEED for Homes

EPA Indoor Air Plus

Qualified homes earn the Indoor airPLUS label. Place it next to the ENERGY STAR label.

All Indoor airPLUS qualified homes meet strict guidelines for energy efficiency set by ENERGY STAR, the nationally-recognized symbol for energy efficiency.
Leadership in Energy and Environmental Design

A leading-edge system for certifying the greenest performing buildings in the world

For residents, LEED is a seal of quality, providing peace of mind that they are living in a home designed to deliver fresh air indoors and improved water and energy efficiency.
39% of Certified LEED Homes are Affordable Homes

*As of March 2009
The EPA Estimates...

We spend **90%** of our time indoors.
Durability Plan

Review and Select Strategies

Management

Inspection
## Indoor Moisture Control Measures

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<tr>
<th>Location or equipment</th>
<th>Required moisture control measure</th>
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<tr>
<td>Tub, showers, and spa areas</td>
<td>Use nonpaper-faced backer board on walls.</td>
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<tr>
<td>Kitchen, bathroom, laundry rooms, and spa areas</td>
<td>Use water-resistant flooring; do not install carpet.</td>
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<tr>
<td>Entryway (within 3 feet of exterior door)</td>
<td>Use water-resistant flooring; do not install carpet.</td>
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<td>Tank water heater in or over living space</td>
<td>Install drain and drain pan.</td>
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<tr>
<td>Clothes washer in or over living space</td>
<td>Install drain and drain pan, or install accessible single-throw supply valve.</td>
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<tr>
<td>Conventional clothes dryer</td>
<td>Exhaust directly to outdoors.</td>
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<tr>
<td>Condensing clothes dryer</td>
<td>Install drain and drain pan.</td>
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Indoor Environmental Quality (EQ)

1.0 Indoor airPlus
2.0 Combustion Venting
4.0 Outdoor Air Ventilation
5.0 Local Exhaust
6.0 Distribution of Space Heating and Cooling
7.0 Air Filtering
8.0 Contaminant Control
9.0 Radon Protection
10.0 Garage Pollution Protection
### EPA Indoor airPlus Verification Checklist

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<thead>
<tr>
<th>Section</th>
<th>Requirement Details</th>
<th>Date</th>
<th>Verified by</th>
<th>Note</th>
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<td><strong>Sequence</strong></td>
<td><strong>Day/Start-Up</strong></td>
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<td><strong>Walls-Window and Foundation</strong></td>
<td>1.1 Site &amp; Foundation drainage, graded grade, protected drain line, foundation from house</td>
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<td>1.2 Capillary break below concrete slabs &amp; in expansi nes (Ex: concrete box fill)</td>
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<td>1.3 Foundation dams poured or waterproofed (Ex: for homes without below grade walls)</td>
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<td>1.4 Batiment/membranes installed &amp; conditioned (Exc: see specification)</td>
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<td><strong>Window Wall Assembly</strong></td>
<td>1.5 Continuous drainage plane behind exterior cladding, properly flashed to foundation</td>
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<td>1.6 Weather &amp; door seals functioning properly</td>
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<td><strong>Walls-Partial Assemblies</strong></td>
<td>1.10 Insulation meets IFC (Except In Climate Zones 1-4)</td>
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<td><strong>Exterior Wall Assembly</strong></td>
<td>1.11 Irrigation systems installed (Ex: LP, vinyl, other)</td>
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<td><strong>Heating &amp; Cooling</strong></td>
<td>1.13 No vapor barriers installed on interior side of walls with high condensation potential</td>
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<td><strong>HVAC</strong></td>
<td>1.15 HVAC filter present &amp; filter system installed, including exhaust fans</td>
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</tbody>
</table>
All EPA indoor airPLUS qualified homes meet strict guidelines for energy efficiency set by ENERGY STAR, the nationally-recognized symbol for energy efficiency.
Combustion Venting

• No unvented combustion appliances allowed.
• A carbon monoxide (CO) monitor must be installed on each floor (or unit).
• All fireplaces and woodstoves must have doors.
• Space and water heating equipment that involves combustion must:
  – Be designed and installed with closed combustion;
  – Be designed and installed with power-vented exhaust; OR
  – Be located in a detached utility building or open-air facility.
• 2 Points = No fireplace or woodstove
Air Flow/Exhaust Requirements

Table 30: Minimum Air Flow Requirements for Continuous Ventilation Systems, in cfm

<table>
<thead>
<tr>
<th>Conditioned floor area (ft²)</th>
<th>0, 1</th>
<th>2, 3</th>
<th>4, 5</th>
<th>6, 7</th>
<th>&gt; 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 1,500</td>
<td>30</td>
<td>45</td>
<td>60</td>
<td>75</td>
<td>90</td>
</tr>
<tr>
<td>1,501–3,000</td>
<td>45</td>
<td>60</td>
<td>75</td>
<td>90</td>
<td>105</td>
</tr>
<tr>
<td>3,001–4,500</td>
<td>60</td>
<td>75</td>
<td>90</td>
<td>105</td>
<td>120</td>
</tr>
<tr>
<td>4,501–6,000</td>
<td>75</td>
<td>90</td>
<td>105</td>
<td>120</td>
<td>135</td>
</tr>
<tr>
<td>6,001–7,500</td>
<td>90</td>
<td>105</td>
<td>120</td>
<td>135</td>
<td>150</td>
</tr>
<tr>
<td>&gt; 7,500</td>
<td>105</td>
<td>120</td>
<td>135</td>
<td>150</td>
<td>165</td>
</tr>
</tbody>
</table>


Kitchen Exhaust ≥ 100 cfm  
Bathroom Exhaust ≥ 50 cfm  

*Directly to the outdoors*
Distribution of
Space Heating and Cooling

Room-by-Room Load Calculations (Manual J and Manual D)
Return Air Flow
Third-Party Performance Test
Room-by-Room Controls
Multiple Zones

(Lesson Learned – thermostat guides and set dampers in the supply vent)
Air Filtering

7.1 Good Filters: MERV ≥ 8

7.2 Better Filters: MERV ≥ 10

7.3 Best Filters: MERV ≥ 13
Contaminant Control

8.1 Indoor Contaminant Control during Construction
Seal all ducts and vents

8.2 Indoor Contaminant Control
Permanent walk-off mats
Shoe storage
Central vacuum

8.3 Preoccupancy Flush for 48 Hours
Radon Protection

- **Zone 1** counties have a predicted average indoor radon screening level greater than 4 pCi/L (pico curies per liter) - Highest Potential
- **Zone 2** counties have a predicted average indoor radon screening level between 2 and 4 pCi/L (orange zones) - Moderate Potential
- **Zone 3** counties have a predicted average indoor radon screening level less than 2 pCi/L (yellow zones) - Low Potential
Garage Pollutant Protection

10.1  NO HVAC IN GARAGE
10.2  Minimize Pollutants from Garage
10.3  Exhaust Fan in Garage
10.4  Detached Garage or No Garage
Low Emission Products

Low Emission Flooring

- Carpet & Rug Institute Green Label Plus
- SCS FloorScore Certified

Additional 0.5 pt – 100% Hard Surface Flooring
Low Emission Products

Low Emissions Paints and Coatings, Adhesives and Sealants

– Comply with Green Seal Standard GS-11
– (Comply with Green Seal Standard GC-03)
– Comply with SCAQMD 1113
Strategies to Achieve LEED Platinum
Strategies to achieve LEED Platinum

- Design charrette / Sub training
- Integrated project team meetings
- LEED AP Homes
- Durability plan
- Site selection, Infill, Existing infrastructure
- Community resources, Access to open space
- Limit turf, most over 90% drought-tolerant plants
- 100% stormwater on site, manage roof runoff
- Nontoxic pest control
- High density
- High efficiency irrigation
- Low-flow showerheads, faucets and toilets
- ENERGY STAR / HERS Score / IndoorAir Plus
Strategies to achieve LEED Platinum

- Framing efficiencies and documentation
- Recycled doors, trim and insulation
- PEX piping
- Low emission flooring, adhesives and sealants, paints and insulation
- Local framing lumber, concrete (sometimes gypsum)
- Waste diversion
- No fireplaces
- Enhanced ventilation and exhaust
- Third-party performance testing (OSA, exhaust, supply flow rates)
- Contaminant control during construction, walk-off mats
- Pre-occupancy flush
- Radon mitigation
- Resident and building manager training, public awareness
Case Studies
Rosslare & Summerhill in Idaho Falls
Cardona, Rosslare and Summerhill

Developer – Thomas Development
Architect – Glancey Rockwell
Builder – Pac West
Cardona & Rosslare – LEED Platinum

**Cardona Apartments**
Chubbuck, Idaho

15 units per acre
99.5% of construction waste diverted from landfills
48 homes available for low-income seniors

**LEED Facts**
Cardona Apartments
Chubbuck, Idaho

- Platinum: 89%
- Sustainable Sites: 17.52%
- Water Efficiency: 7/15
- Energy & Atmosphere: 21.5/38
- Materials & Resources: 14/16
- Indoor Environmental Quality: 10/21
- Innovation & Design: 7/11
- Awareness & Education: 3/3
- Locations and Linkages: 7/10

*(Out of a possible 100 points)*

**Rosslare Apartments**
Idaho Falls, Idaho

19.9 units per acre
48 homes available for low-income families

**LEED Facts**
Rosslare Apartments
Idaho Falls, Idaho

- Platinum: 79%
- Sustainable Sites: 17.52%
- Water Efficiency: 8/15
- Energy & Atmosphere: 31.5/38
- Materials & Resources: 12/16
- Indoor Environmental Quality: 11/21
- Innovation & Design: 7/11
- Awareness & Education: 5/5
- Locations and Linkages: 7/10

*(Out of a possible 100 points)*
Rosslare – LEED Platinum

48-unit multifamily building in Idaho Falls

- Non-toxic pest control measures
- SCS FloorScore hard surface flooring
- CRI Green Label Plus carpet and pad
- Low-VOC interior paint, primer, adhesives and sealants
- Low-Emission insulation
- No unvented combustion appliances
- Carbon monoxide detector in each unit
- No fireplace
- Third-party performance testing of outdoor air ventilation and air flow rates in each room
- Bath and kitchen exhaust fans exhaust directly to outdoors
- MERV 8 air filters
- Indoor contaminant control during construction
- Permanent walk-off mats at each entry
- Pre-occupancy flush for 48 hours
- Radon-resistant construction (Zone 2)
- No garage
Summerhill – LEED Platinum
Summerhill – Pervious Pavement
The Springs

Developer – The Housing Company
Architect – CSHQA
Builder – Wright Bros.
The Springs – LEED Platinum
The Springs – LEED Platinum
The Springs – Targeting Platinum
The Springs – Targeting Platinum
The Springs – Targeting Platinum
The Springs – Targeting Platinum
The Springs – Targeting Platinum

3-building multifamily project in McCall
- Non-toxic pest control measures
- SCS FloorScore hard surface flooring
- CRI Green Label Plus carpet and pad
- Low-VOC interior paint, primer, adhesives and sealants
- No unvented combustion appliances
- Carbon monoxide detector in each unit
- No fireplace
- Bath and kitchen exhaust fans exhaust directly to outdoors
- Enhanced local exhaust (continuous ventilation)
- Mini-split air source heat pumps (20 SEER, 11.3 HSPF)
- Permanent walk-off mats at each entry
- Show removal and storage at each primary entryway
- Pre-occupancy flush for 48 hours?
- Radon-resistant construction (Zone 1)
- No garage
Mercy Housing in Boise
Mercy Housing Idaho

Developer – Mercy Housing
Architect – Glancey Rockwell
Builder – Scott Hedrick
Mercy Housing – LEED Platinum

53-unit multifamily building in Boise

- Non-toxic pest control measures
- SCS FloorScore hard surface flooring
- CRI Green Label Plus carpet and pad
- Low-VOC interior paint, primer, adhesives and sealants
- Low-emission insulation
- No unvented combustion appliances
- Carbon monoxide detector in each unit
- No fireplace
- Heat Recovery Ventilator (HRV)
- Bath and kitchen exhaust fans exhaust directly to outdoors
- Enhanced local exhaust (automatic controls)
- Mini-split air source heat pumps
- MERV 10 air filters
- Permanent walk-off mats at each entry
- Pre-occupancy flush for 48 hours
- Radon-resistant construction (Zone 2)
- No HVAC in garage and minimize pollutants from garage and exhaust fan in garage

102.5 pts!
Valencia
Valencia

Developer – Thomas Development Co / NIHC
Architect – Andy Erstad
Builder – Kier Construction
Valencia – LEED Platinum

48-unit multifamily building in Fruitland
• Within ½ mile of over 14 community resources
• 0% turf, 75% drought-tolerant plants
• Non-toxic pest control measures
• Framing efficiencies
• SCS FloorScore hard surface flooring
• CRI Green Label Plus carpet and pad
• ZERO-VOC interior paint, and Low-VOC primer, adhesives and sealants
• Low-emission insulation
• Local lumber, concrete, gypsum, cabinets
• Very low waste – only 2.5 CY /1000 SF
• Indoor Air Plus
• Heat Recovery Ventilator (HRV)
• Permanent walk-off mats at each entry

48 HERS Score
Student Housing

The G in Spokane, WA
LEED Platinum
HERS
Lessons Learned

Experience matters
Team training and coaching
Charrette – revisit lessons learned, define details
Integrated design approach
Communication
Resident training
QAP input
## Idaho QAP

### 2009 List, max 15 pts

<table>
<thead>
<tr>
<th>2009 List, max 15 pts</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Energy Star appliances</strong></td>
</tr>
<tr>
<td><strong>Developments that use 50% or more of their total lighting fixture cost (not including any engineering, installation, wiring, etc) for Energy Star rated fixtures. Total fixture cost includes both interior and exterior lighting fixtures</strong></td>
</tr>
<tr>
<td><strong>HVAC equipment that meets Energy Star for Homes requirements, or that is in accordance with ASHRAE handbooks or equivalent</strong></td>
</tr>
<tr>
<td><strong>Water saving shower heads</strong></td>
</tr>
<tr>
<td><strong>Programmable thermostats</strong></td>
</tr>
<tr>
<td><strong>Low or No VOC paints, primers, adhesives, and sealants</strong></td>
</tr>
<tr>
<td><strong>Green label certified flooring</strong></td>
</tr>
<tr>
<td><strong>Harvesting 15% of rainwater runoff from roof for landscape irrigation use</strong></td>
</tr>
<tr>
<td><strong>Reusable HVAC filters</strong></td>
</tr>
<tr>
<td><strong>High efficiency irrigation</strong></td>
</tr>
<tr>
<td><strong>Inclusion of environmentally preferred products, including recycled content and locally produced within 500 miles from the site for 40% of the total materials used for construction</strong></td>
</tr>
<tr>
<td><strong>Dual flush toilets</strong></td>
</tr>
<tr>
<td><strong>Electric or Gas tankless water heaters</strong></td>
</tr>
<tr>
<td><strong>Xeriscape landscaping</strong></td>
</tr>
<tr>
<td><strong>U.35 or lower rated windows</strong></td>
</tr>
<tr>
<td><strong>16 SEER or higher rated HVAC system</strong></td>
</tr>
<tr>
<td><strong>Any insulation in the walls and ceilings that provides a 20% increase over minimum code</strong></td>
</tr>
<tr>
<td><strong>Orienting building to maximize passive solar heating/cooling</strong></td>
</tr>
<tr>
<td><strong>Metal or rubberized roofing</strong></td>
</tr>
</tbody>
</table>

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**Final Approval by**
Idaho Housing and Finance Association
Board of Commissioners on
November 21, 2008

The Honorable C.L. “Butch” Otter, Governor, State of Idaho
on
December 22, 2008
Preferences

Developer – 3rd-party inspection and testing “QC”
Architect – Design charrette
Builder – Sub training and support
Residents – Health, operating costs, location
Next Steps

• Solar ready
• Adare Manor
• The Rose / Living Future
How much can we save energy and reduce health care costs by building green? This is what makes a home truly affordable.
Thank You!