Exploring A Path...

- Framing the Issues...
  - Affordability / Cost
  - Climate Change
- Addressing the Issues...
  - Energy Efficiency
  - Cost Efficiency

• Demonstration projects

Energy-Efficient Affordable Housing
Orchards at Orenco

• 167 unit affordable housing development in Hillsboro, Oregon (western suburb of Portland)

• Three phases

• 2012: design commenced

• 2018: completed third phase

• Developer/Owner: REACH Community Development

Photo Credit: Casey Braunger
Orchards at Orenco, Hillsboro, Oregon

- PHASE II - 2016
- PHASE I - 2015
- PHASE III - 2018

Orchards at Orenco Ph. I

- 57 units of affordable workforce housing
- 57,750 SF building
- Completed June 2015
- PHIUS+ certification
- Construction cost: $159,000/unit ($158/sf)
- Based on PHI Passivhaus Standard: EUI = 21
- 11% cost premium over typical project by REACH

Construction cost: $159,000/unit ($158/sf)
Orchards at Orenco Ph. II

- 58 units of affordable workforce housing
- 49,900 SF building
- Completed July 2016
- PHIUS+ certification
- Construction cost: $147,000/unit ($173/sf)
- EUI = 22
- PHIUS+ 2015 Passive Building Standard
- 8% cost/unit reduction from Phase I
- 5% cost premium to achieve Passive House
- 15%+ cost reduction in market escalation

PHIUS+ certification
Completed July 2016
49,900 SF building
58 units of affordable workforce housing
Orchards at Orenco Ph. III

- Two years of severe cost escalation in Portland market
- Construction cost: $198,000/unit ($164/sf)
- Somewhat better than code minimum...
- Did not pursue Passive House certification
- Completed September 2018
- 62,750 SF building
- 52 units of affordable family housing
- Construction cost: $198,000/unit ($164/sf)
- Two years of severe cost escalation in Portland market
- Somewhat better than code minimum...
- Did not pursue Passive House certification
- Completed September 2018
- 62,750 SF building
- 52 units of affordable family housing
Major Components of Construction Cost

- Div 17: Other
- Div 16: Electrical
- Div 15: Mechanical
- Div 14: Conveying Systems
- Div 12: Furnishings
- Div 11: Specialties
- Div 10: Finishes
- Div 09: Conveying Systems
- Div 08: Doors & Windows
- Div 07: Thermal & Moisture
- Div 06: Wood
- Div 05: Steel
- Div 04: Masonry
- Div 03: Concrete Work
- Div 02: Site Work
- Div 01: General

Overhead & Profit/Insurance

Major Components of Affordable Housing Development Cost

Source: Blue Sky Consulting Group

Cost Components as % of Total Development Costs (Net of Land)

- Construction Costs: 68%
- Developer Fees: 9%
- Demolition/Site Prep: 3%
- Architect/Engineering/Legal: 5%
- Permits/Systems/Custom Charges: 4%
- Office Equipment: 2%
- Other Costs: 9%

Affordable Housing New Construction Projects: 30%
Pushing Cost Back to Achieve Better Buildings

Major Components Added Up = Hard Cost
Pushing Cost Back to Achieve Better Buildings

HOW?

- Cost Efficient Design & Construction (CEDC)
- Lean Construction Methods

HARD CONSTRUCTION COST
+ 5% FOR PERFORMANCE
+ 5% FOR JOY

10% cost reduction
CEDC - Key Working Principles

• Strive to “keep it simple”
• Simple and compact forms
• Efficient unit plans (narrow “aspect ratio”)
• Efficient building plans (net to gross area > 80%)
• Larger projects = economy of scale
• Seek out "unencumbered" sites
• Larger projects = economy of scale
• Larger projects = economy of scale

COST-EFFECTIVE DESIGN AND CONSTRUCTION OF AFFORDABLE HOUSING

Walsh
Construction Co.
CEDC - Key Working Principles

- Efficient structural layout (i.e. advanced framing: studs @ 24” o.c.)
- Floor to floor heights set for drywall (increments of 48”, 54”, 96”)
- Stack the units (duh!)
- Back to back plumbing
- Avoid cantilevers
- Avoid steel (yes it is possible…)
- “Disciplined” approach to windows
- Typical interior finishes
- MEP systems
- Structural system
- Building system:
  - Building plan / layout
  - The space between buildings
  - Interface with the street
  - Response to the site
- Community area finishes
  - Public stairway
  - Typical interior finishes
  - Cabinets
- Laundry facilities
- Elevator(s)
- Light
- Appliances
- Standards / Optimize
- Customize
- Typical unit plans
- A few select unit plans
- A few select window types
- Select common area finishes
- A few select interiors
- Typical interior finishes
- Cabinets
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- Light
- Elevator(s)
What About Modular?
Demonstration ("Beta Test") Projects

- 124th & Ash
  - 175 units workforce housing

- Glisan Gateway
  - 159 units workforce housing
124th & Ash - Lean Construction Process

- Owner sets clearly defined goals / targets
- High degree of team collaboration
- Target Value Design
  - Walsh / AAM / REACH
- Owner: REACH Community Development
- Architect: Ankrom Moisan Architects
- Contractor: Walsh Construction Co.
- Programmed as 150-190 unit project → Final unit count is 175
- Awarded MHT Grant to support innovation in production of cost-efficient affordable housing
- Construction start: August 2019; completion November 2020
- Developed/Owner: REACH Community Development
- Trade partners involved early
  - Optimizing the widget(s)
  - Estimating the concept → Then design to the estimate
  - 30% reduction in total development cost compared to OHCS baseline

124th & Ash - Lean Construction Process
Construction cost: $111,000/unit

39% below target cost
Menu of Performance Upgrades

- Enhanced landscape
- "Irresistible" stairway
- Sunspaces / social nooks
- Roof deck / courtyard
- Balconies / patios
- Increased articulation
- Premium cladding / roofing materials

Menu of Architectural Upgrades

- Increased articulation
- Premium cladding / roofing materials
- Enhanced entry / lobby / common areas
- balcony / patio / outdoor spaces
- Sunspaces / social nooks
- "Irresistible" stairway
- Enhanced landscape

Menu of Performance Upgrades

- MEL: appliances (CEE Tier II/III, elevators (MRL traction)
- Plumbing: water heater, low flow fixtures, pipe insulation
- Lighting: (LED fixtures, lighting controls)
- Increased R-value (roof, windows, exterior walls, slab)
- Increased air tightness (roof, windows, exterior walls)
- Shading elements at windows
- Heat recovery at ventilation
- Balanced ventilation system
Performance Upgrades ➔ PH / ZE Ready

- Balanced ventilation system
- Heat recovery at ventilation
- Shading elements at windows
- Increased airtightness (roof, windows, exterior walls)
- Increased R-value (roof, windows, exterior walls, slab)
- Increased efficiency (water heater, low flow fixtures, pipe insulation, MEL: appliances (CEE Tier II/III))
- Lighting: (LED fixtures, lighting controls)
- Plumbing: (water heater, low flow fixtures, pipe insulation)

**TARGET EUI = 15-23 kBtu/sf/yr**
Performance Upgrades \( \rightarrow \) PH / ZE Ready

\[ \text{Budget} = \$19,487,763 \times 0.05 = \$974,388 \]

- Balanced ventilation system
- Heat recovery at ventilation
- Shading elements at windows
- Increased airtightness (roof, windows, exterior walls)
- Increased R-value (roof, windows, exterior walls, slab)
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\[ \text{TARGET EUI} = 15-23 \text{ kBtu/sf/yr} \]

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MEL: appliances (CEE Tier II/III), elevators (MRL traction)

Performance Upgrades ➔ PH / ZE Ready

$19,487,763 x .05 = $974,388 budget

$0 (already in)
$440,000 ($290k HRVS, $150k “ancillary”)
$108,000 ($1200/window x 90 windows)
$131,000 ($48k spray foam, 83k taped sheathing)
$193,000 ($37k framing, 0k windows, 28k walls, 78k ci, 33k roof)
$0 (already in)
$14,000 ($0k 95% eff. boiler, 0k faucets/showerheads, 14k pipe insulation)

$49,000 ($280/refr x 175 refrigerators)
$32,000 (elevators - $4k/stop)

TARGET EUI = 15-23 kBtu/sf/yr

$967,000 + 328,000 = $1,395,000 (13.7% premium)

VRF heating/cooling + HPWH

Glisan Gateway

Image Credit: MWA Architects
Glisan Gateway Workforce Housing

• Developer/Owner: Northwest Housing Alternatives
• Architect: MWA Architects
• Contractor: Walsh Construction Co.
• Awarded MHT Grant to support innovation in production of cost efficient affordable housing

Programmed for 120-160 units | Final unit count is 159

Construction start: April 2019; completion: July 2020

Glisan Gateway - First Floor Plan

Image Credit: MWA Architects
Portland Area Affordable Housing Pipeline

Construction cost: $123,000/unit

Glisan Gateway

Image Credit: MWA Architects
Portland Area Affordable Housing Pipeline

- We had it ten years ago...

- We have the technology, we have the discipline... (or do we?)

- low energy / low emission (PH, NZE) should be the standard not the exception...

- We need more homes 3,900 x 1.1 = 4,300 [yes!]

Conclusion
• WHAT ARE WE WAITING FOR?

• We had it ten years ago...

• We have the technology, we have the discipline... (or do we?)

• We need better homes

• We need more homes

\[ 3,900 \times 1.1 = 4,300 \] (yes!)

• We need low energy / low emission (PH, NZE) should be the standard not the exception...

Conclusions