

Affordable Housing and Wood Construction: How to Make the \$ Work

Presented by Todd Rothstein & Maggie Stanley

Disclaimer: This presentation was developed by a third party and is not funded by WoodWorks or the Softwood Lumber Board.

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Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.



Course Description

Affordable housing development is stuck between a rock and a hard place. The need is immense, with most major cities facing urgent demand for thousands of units. At the same time, escalation of construction and real estate costs makes the feasibility of such projects increasingly difficult to make financially work. Facing specific caps on per unit construction and rental costs, subsidies can only go so far in helping to provide more affordable housing. Increasingly, the onus is being placed on the design and construction teams to come up with innovative ways of lowering costs in a time of price inflation. This webinar will look at two affordable housing projects—one in Portland, ME and one in Seattle, WA—and examine unique ways that wood's value was leveraged to make the projects pencil out. You'll hear from an architect, contractor, and housing agency representative, and learn how you too can use wood to solve cost concerns on your affordable housing projects.

Learning Objectives

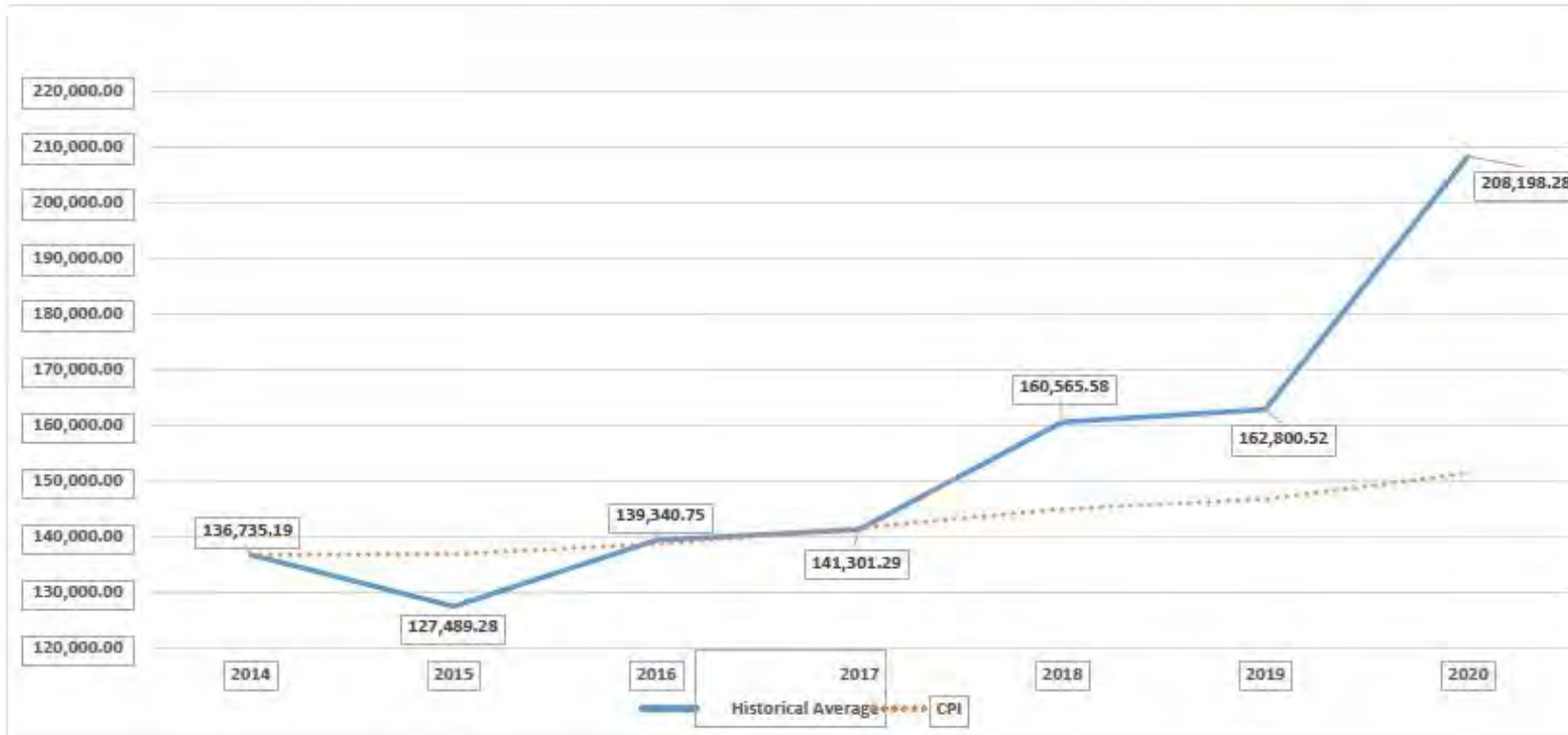
1. Highlight the unique financial constraints of affordable housing projects and underline the societal importance of providing equitable housing options.
2. Demonstrate how the use of cross-laminated timber shaft walls resulted in several benefits on an affordable housing project in Maine, including reduced construction schedule and enhanced worker safety.
3. Discuss framing optimization strategies for wood-frame multi-family construction, with an emphasis on code compliance for fire, life safety and acoustic design, and repeatability.
4. Review other design enhancement strategies being considered on affordable housing projects, such as passive house construction, which can result in lower operating costs and higher levels of occupant comfort.

Learning Objectives

1. Highlight the unique financial constraints of affordable housing projects and underline the societal importance of providing equitable housing options.

Construction Costs Per Unit vs. Inflation - New Construction

| Program Year | Sample Size | Avg Constr. Costs Per Unit | | Generic Project | CPI |
|--------------|-------------|----------------------------|------------|-----------------|-------|
| 2014 | 6 | | 136,735.19 | 136,735.19 | |
| 2015 | 6 | | 127,489.28 | 136,871.92 | 0.10% |
| 2016 | 5 | | 139,340.75 | 138,651.26 | 1.30% |
| 2017 | 4 | | 141,301.29 | 141,562.93 | 2.10% |
| 2018 | 6 | | 160,565.58 | 144,960.44 | 2.40% |
| 2019 | 12 | | 162,800.52 | 146,699.97 | 1.20% |
| 2020 | 3 | | 208,198.28 | 151,394.37 | 3.20% |



Constraints:

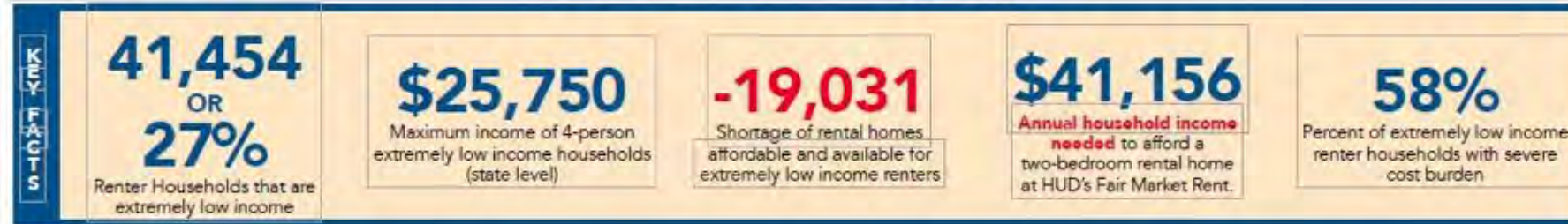
- Fixed Cost Caps
- Regulated Rent Fees
- Rising Material Costs
- Shrinking Labor Market

2021 MAINE HOUSING PROFILE

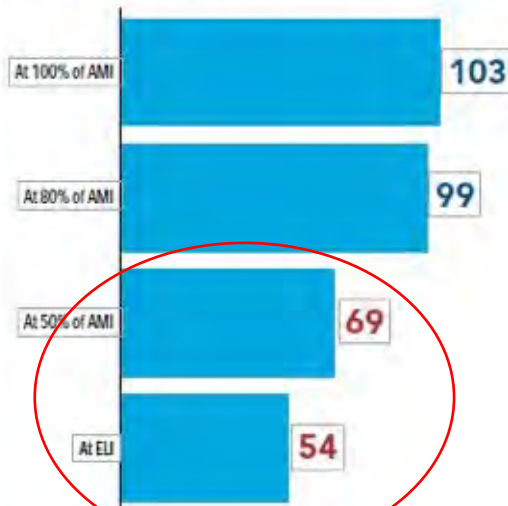


Across Maine, there is a shortage of rental homes affordable and available to extremely low income households (ELI), whose incomes are at or below the poverty guideline or 30% of their area median income (AMI). Many of these households are severely cost burdened, spending more than half of their income on housing. Severely cost burdened poor households are more likely than other renters to sacrifice other necessities like healthy food and healthcare to pay the rent, and to experience unstable housing situations like evictions.

SENATORS: Susan Collins and Angus King, Jr.

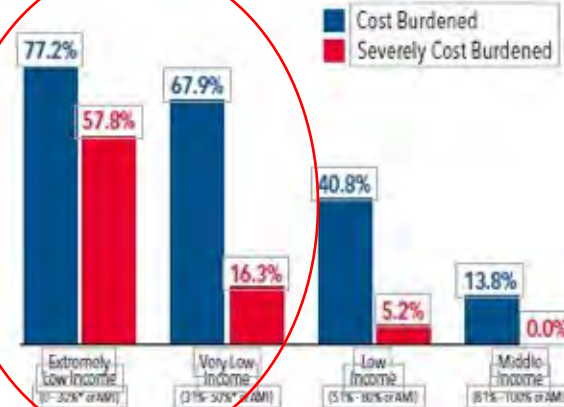


AFFORDABLE AND AVAILABLE HOMES PER 100 RENTER HOUSEHOLDS



Source: NLIHC tabulations of 2019 ACS PUMS.

HOUSING COST BURDEN BY INCOME GROUP



Note: Renter households spending more than 30% of their income on housing costs and utilities are cost burdened; those spending more than half of their income are severely cost burdened.
Source: NLIHC tabulations of 2019 ACS PUMS.

The Societal Importance of Providing Equitable Housing Options



CAUSES Of Poverty

- ☐ Rural Poverty is a challenge throughout the country
- ☐ Inner city gentrification is now pushing residents out
- ☐ Suburban Poverty is on the rise as cities develop
- ☐ Cyclical Poverty is caused by a myriad of life experiences

AFFECTS of Poverty

- ☐ Stress, depression, anger can lead to legal problems
- ☐ Mental & physical illnesses are less likely to be treated
- ☐ Many people live in unfit or unmanageable situations
- ☐ Some people elect to try it alone on the street

Learning Objectives

2. Demonstrate how the use of cross-laminated timber shaft walls resulted in several benefits on an affordable housing project in Maine, including reduced construction schedule and enhanced worker safety.

Maine: The Pine Tree State

Long history of foresting in Maine.

Bangor, Maine once the lumber capital of the world with over 300 sawmills.



Paper mills in Maine are seeing a decline and closing.

89% of the land in Maine is still forest.

University of Maine and the Maine Mass Timber Advisory Committee is actively researching and working to attract a CLT manufacturing company to Maine.

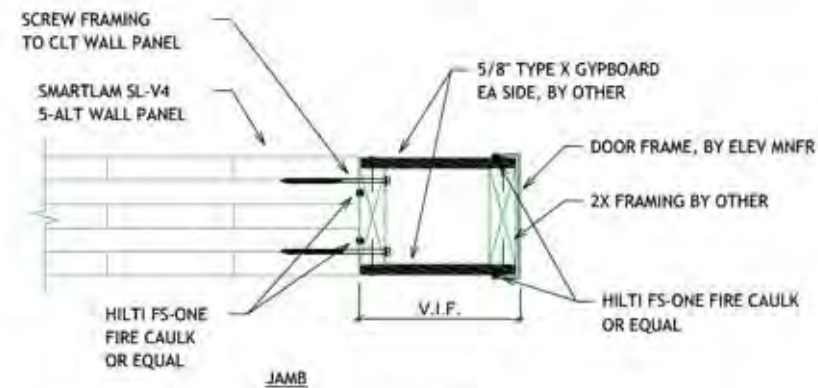
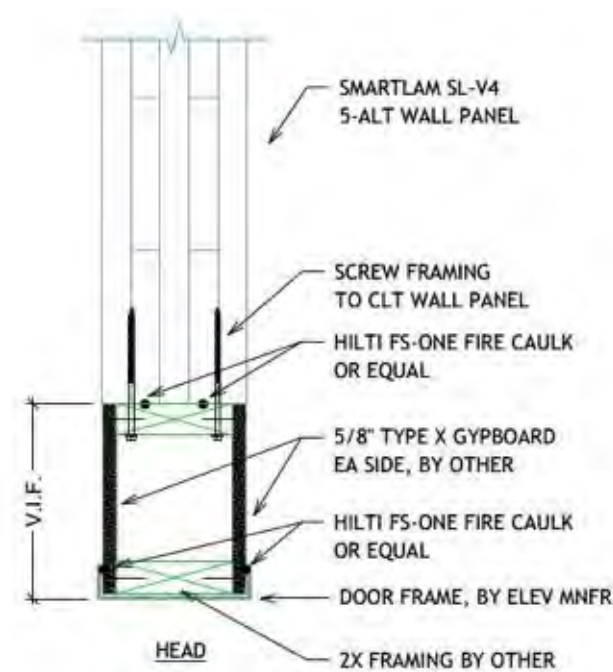
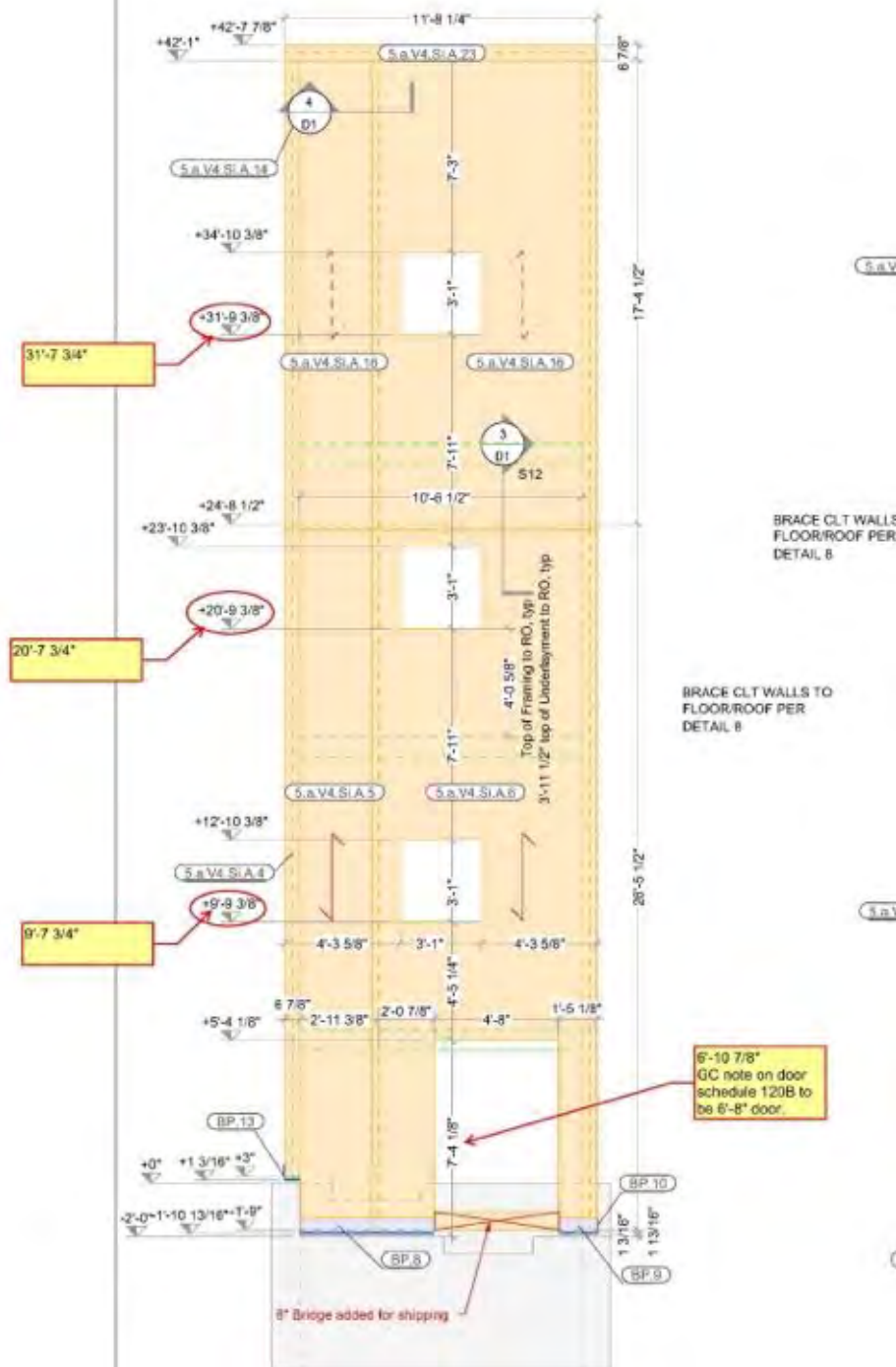
Maine's "Lead by Example" report this year emphasizes use of climate-friendly building products like cross-laminated timber in new state construction, in order to reduce emissions and help build demand for new forest products in Maine



Traditional Masonry Shafts:

- Delayed project schedule due to unforeseen unsuitable soils.
- No ability to make up time as waiting for masonry stair and elevator shafts to be built.





9

DOOR JAMB AND HEAD

SCALE: 1-1/2" = 1'-0"







Safety & Speed:

- Floor framing used as bracing and staging for worker safety and ease of install.
- Each panel took about 5-10mins to place with crane.

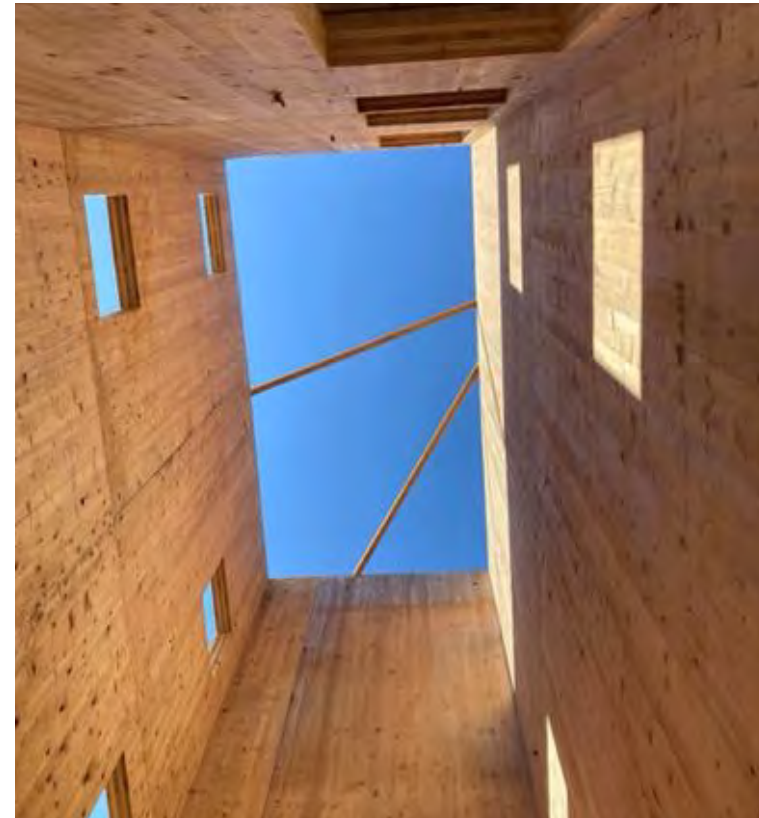




Biophilia: a hypothetical human tendency to interact or be closely associated with other forms of life in nature : a desire or tendency to commune with nature.

Code Requirements:

Due to the newness of the CLT in Maine, code enforcement was not comfortable allowing the wood to be exposed due to potential flame spread and one layer of gypsum board was required.



Learning Objectives

3. Discuss framing optimization strategies for wood-frame multi-family construction, with an emphasis on code compliance for fire, life safety and acoustic design, and repeatability.



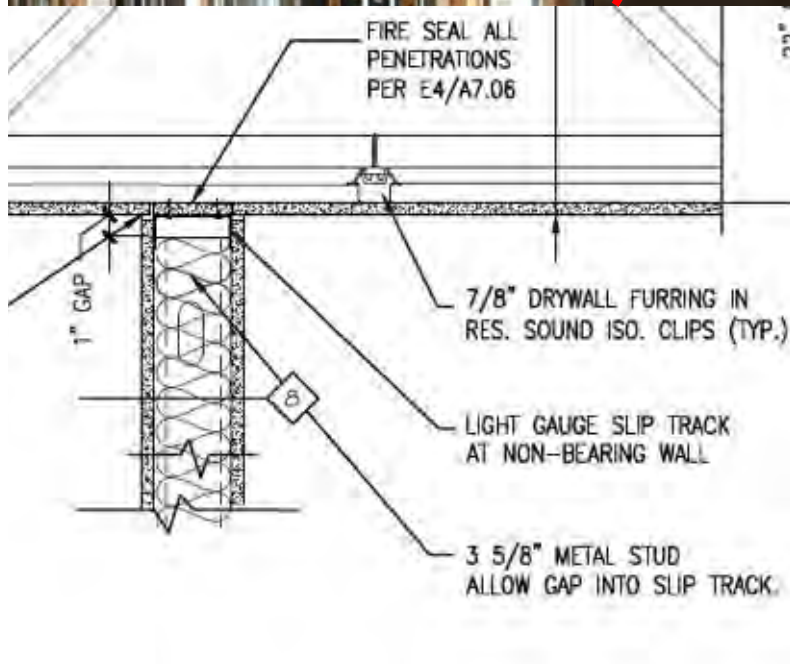
- 30 working days to erect masonry stair and elevator shafts.
- 10 days for each level constructed with wood panels - 5 for exterior walls and 5 for floor truss and sheathing.
- Engineered in a way that structural sheathing was able to be shop applied.





Difficult to Mix:

- Wood Trusses, Metal interior framing.
- Special EJ needed for fire rating at top of wall.
- Difficult to sequence with separate subs





COVID:

The framing company used for Wessex Woods was a small family company that did not want to expand their bubble and work closely with too many people. Panelization allowed fewer crew members to erect panels without effecting schedule greatly.



Coordination:

- Under slab Utilities - Below
- Truss alignment with structure - Right
- Field modifications create more wood in exterior wall, less room for insulation.



Learning Objectives

4. Review other design enhancement strategies being considered on affordable housing projects, such as passive house construction, which can result in lower operating costs and higher levels of occupant comfort.

Housing Criteria – Meeting the Challenge

Budget

- ☐ Fixed cost cap financing
- ☐ Rising Labor and Material costs

Nature

- ☐ Exterior Temps Range from **-10 to 90 +**
- ☐ Exterior Humidity Range from **45% - 95%**

Resident

- ☐ Interior Temp Range from **68 to 72**
- ☐ Interior Humidity Range from **40% - 60%**

Management

- ☐ Properties that reduce Energy Demands
- ☐ Provide Residents with Thermal Comfort





- Portland Maine
- Completed in 2017
- 45 Units – Family Housing
- 1 Bldg. 37,815 SF
- Wood Frame Construction
- Electric Baseboard
- Solar Array
- Natural Gas for DHW



BAYSIDE ANCHOR 2017 NEW CONSTRUCTION PASSIVE HOUSE

Two Year Energy Usages

- Cost per watt - \$0.15
- Cost per therm.- \$1.14

- Average Energy Cost –
- \$32,404 per year

- Number of Units – 45
- Total Gross SF – 37,815

- Unit Energy Cost –
- **\$69.71 per month**

- Building Energy Cost –
- **\$0.99 per SF / per year**





RIDGEWOOD II 2017 NEW CONSTRUCTION LEED PLATINUM

- Gorham Maine
- Completed in 2017
- 24 Units - Senior housing
- 1 Bldg. 23,026 Gross SF
- Wood Frame Construction
- Electric Baseboard
- Solar Array
- Natural Gas for DHW

Two Year Energy Usages

- Cost per watt - \$0.15
- Cost per therm.- \$1.14

- Average Energy Cost –
- \$23,358 per year

- Total Unit – 24
- Total Gross SF – 23,026

- Unit Energy Cost –
- **\$70.74 per month**

- Building Energy Cost –
- **\$0.88 per SF / per year**



1BR (Bedroom)

Heating \$ 93

Cooking \$ 10

Lighting \$ 29

DHWS \$ 27

Fridge \$ 9

Total \$168

2 BR

(Bedroom)

Heating \$140

Cooking \$ 13

Lighting \$ 38

DHWS \$ 34

Fridge \$ 9

Total \$234

| Locality/PHA | | Unit Type | | | | | | Date (mm/dd/yyyy) | |
|--|----------------------|--|-----|-----|---------------------------|-----|-----------|-------------------|--|
| 4, 5, 6, 7 | | Low Rise, Walkup, Row, Garden, Townhouse | | | | | | 2/1/2021 | |
| Utility or Service | Fuel Type | 0BR | 1BR | 2BR | 3BR | 4BR | 5BR | 6BR | |
| Heating | Fuel Oil | 45 | 63 | 83 | 102 | 130 | 146 | 167 | |
| | Electric | 70 | 93 | 140 | 177 | 202 | 235 | 271 | |
| | Natural Gas | 49 | 69 | 81 | 90 | 106 | 116 | 129 | |
| | Bottled Gas | 75 | 103 | 133 | 160 | 205 | 235 | 270 | |
| | Wood | 38 | 51 | 67 | 81 | 94 | 110 | 138 | |
| | Other: Kerosene | 57 | 80 | 105 | 129 | 164 | 184 | 212 | |
| | Electric - Heat Pump | 36 | 43 | 51 | 57 | 63 | 70 | 75 | |
| Air Conditioning | | | | | | | | | |
| Cooking | Electric | 8 | 10 | 13 | 16 | 21 | 25 | 27 | |
| | Natural Gas | 5 | 7 | 9 | 11 | 14 | 16 | 18 | |
| | Bottled Gas | 15 | 18 | 23 | 28 | 35 | 40 | 45 | |
| | Other | | | | | | | | |
| Other Electric | | 22 | 29 | 38 | 47 | 59 | 68 | 73 | |
| Water Heating | Oil | 18 | 22 | 28 | 35 | 45 | 51 | 59 | |
| | Electric | 27 | 37 | 49 | 61 | 78 | 90 | 96 | |
| | Natural Gas | 20 | 27 | 34 | 42 | 52 | 61 | 70 | |
| | Bottled Gas | 38 | 43 | 55 | 68 | 88 | 100 | 115 | |
| Water | | 11 | 13 | 17 | 21 | 25 | 29 | 34 | |
| Sewer | | 13 | 15 | 20 | 25 | 30 | 35 | 40 | |
| Trash Collection | | 27 | 27 | 27 | 27 | 27 | 27 | 27 | |
| Other - Specify | | | | | | | | | |
| Range/Microwave | | 9 | 9 | 9 | 9 | 9 | 9 | 9 | |
| Refrigerator | | 11 | 11 | 11 | 11 | 11 | 11 | 11 | |
| Actual Family Allowances - May be used by the family to compute allowance while searching for a unit | | | | | Utility/Service/Appliance | | Allowance | | |
| Head of Household Name | | | | | Heating | | | | |
| | | | | | Cooking | | | | |
| Address of Unit | | | | | Other Electric | | | | |
| | | | | | Air Conditioning | | | | |
| | | | | | Water Heating | | | | |
| | | | | | Water Heating | | | | |
| | | | | | Sewer | | | | |
| | | | | | Trash Collection | | | | |
| | | | | | Other | | | | |
| | | | | | Range/Microwave | | | | |
| Number of Bedrooms | | | | | Refrigerator | | | | |
| | | | | | Total | | | | |

Ridgewood II

Average Utility Cost

\$70.74 per unit / month

Bayside Anchor

Average Utility Cost

\$69.71 per unit / month

Let's compare utility
performance!



Energy Performance

benchmarking tools & services

| AVESTA HOUSING - NEW CONSTRUCTION 2005 - 2017 | | | | | | | | | | | |
|---|-----------|---------------|-------------|------------------|-------------|--------------|-----------------|---|----------------------------|---------------------------------|------------------|
| Property | C.O. Year | Resident Type | Number Unit | Gross Floor Area | Total MMBTU | MMBTU / Unit | MMBTU / Sq. Ft. | Total Operating Costs (elec, heat, water) | Total Operating Costs/Unit | Total Operating Costs / Sq. Ft. | Building Design |
| Bartlet Woods | 2017 | Senior | 28 | 24,147 | 954 | 34 | 0.040 | \$23,175 | \$828 | \$0.96 | High Performance |
| Carleton Street | 2017 | Family | 37 | 26,986 | 1,519 | 41 | 0.056 | \$24,465 | \$661 | \$0.91 | High Performance |
| Bayside Anchor | 2016 | Family | 45 | 37,815 | 1,095 | 24 | 0.029 | \$37,474 | \$833 | \$0.99 | Passive Design |
| Huston Commons | 2016 | Housing First | 30 | 21,375 | 1,605 | 53 | 0.075 | \$34,607 | \$1,154 | \$1.62 | Code Compliance |
| Ridgewood II | 2015 | Senior | 24 | 23,026 | 644 | 27 | 0.028 | \$20,374 | \$849 | \$0.88 | LEED |
| Young Street | 2015 | Senior | 28 | 25,594 | 816 | 29 | 0.032 | \$24,127 | \$862 | \$0.94 | High Performance |
| 409 Cumberland | 2015 | Family | 57 | 56,286 | 2,337 | 41 | 0.042 | \$44,398 | \$779 | \$0.79 | High Performance |
| Thomas Heights | 2015 | Housing First | 18 | 13,452 | 916 | 51 | 0.068 | \$21,836 | \$1,213 | \$1.62 | Code Compliance |
| Meeting Place 1 | 2015 | Family | 39 | 35,780 | 3,069 | 79 | 0.086 | \$38,000 | \$974 | \$1.06 | Code Compliance |
| Pearl Street II | 2013 | Family | 54 | 56,764 | 3,594 | 67 | 0.063 | \$54,998 | \$1,018 | \$0.97 | Code Compliance |
| Oak Street Lofts | 2012 | Family | 37 | 25,263 | 1,504 | 41 | 0.060 | \$25,431 | \$687 | \$1.01 | LEED |
| Cascade Brook | 2012 | Senior | 30 | 29,278 | 1,753 | 58 | 0.060 | \$47,096 | \$1,570 | \$1.61 | Code Compliance |
| Florence House | 2010 | Housing First | 25 | 31,345 | 3,144 | 126 | 0.100 | \$79,922 | \$3,197 | \$2.55 | Code Compliance |
| Pearl Place | 2007 | Family | 60 | 65,279 | 3,629 | 60 | 0.056 | \$56,533 | \$942 | \$0.87 | LEED |
| Fore River Apartments | 2006 | Family | 20 | 20,189 | 1,272 | 64 | 0.063 | \$21,473 | \$1,074 | \$1.06 | Code Compliance |
| Little Falls Landing | 2006 | Senior | 24 | 20,805 | 1,766 | 74 | 0.085 | \$32,917 | \$1,372 | \$1.58 | Code Compliance |
| Logan Place | 2005 | Housing First | 30 | 18,407 | 1,604 | 53 | 0.087 | \$27,065 | \$902 | \$1.47 | Code Compliance |

Energy Performance

benchmarking tools & services

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Design Enhancement Strategies:

- ☐ 2x6 framing @2'-0" O.C.
- ☐ Sheathed roof with Polyiso R-50
- ☐ R-28 walls:
 - ☐ R-9 Pre-Insulated Sheathing
 - ☐ Dense Pak Cellulose R-21
 - ☐ Spray foam rim joists R-21
 - ☐ Smart interior vapor retarder
- ☐ Sub grade EPS & EXP insulation R-15
- ☐ Roof trusses and MEP are solar ready
- ☐ Blower Door results 0.09 @ 50 Pascal
- ☐ On site storm water retention system
- ☐ Locally harvested wood for raised beds



> QUESTIONS?

This concludes The American Institute
of Architects Continuing Education
Systems Course

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Maggie Stanley



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Affordable Housing and Wood Construction: How to Make the \$ Work

Presented by JJ Powell, Walsh Construction Company



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OTHELLO PARK PROJECT DATA



1. Location: Othello Neighborhood, Seattle

2. Number of Dwelling Units

- 106 affordable apartments, open to people making up to 60% AMI

3. Unit Types:

- Studios (7)
- “Open” One Bedroom (24)
- One Bedroom (39)
- Two Bedroom (22)
- Three Bedroom (12)
- Live/Work (2)

4. Amenities:

- Community/Media Room
- Ground Floor Patio Area
- Shared Laundries
- Top-Floor Community Room and Deck

5. Funding Sources:

- 4% LIHTC - NEF, Public - CoS & KC, Debt - US Bank

OTHELLO PARK PROJECT GOALS



1. Achieve budget reduction goals, -\$2M
 - Cost reduction as a prime driver
2. Analyze and potentially incorporate Type IIIA construction requirements
3. Increase unit yield on a challenging site



OTHELLO PARK STRATEGIES



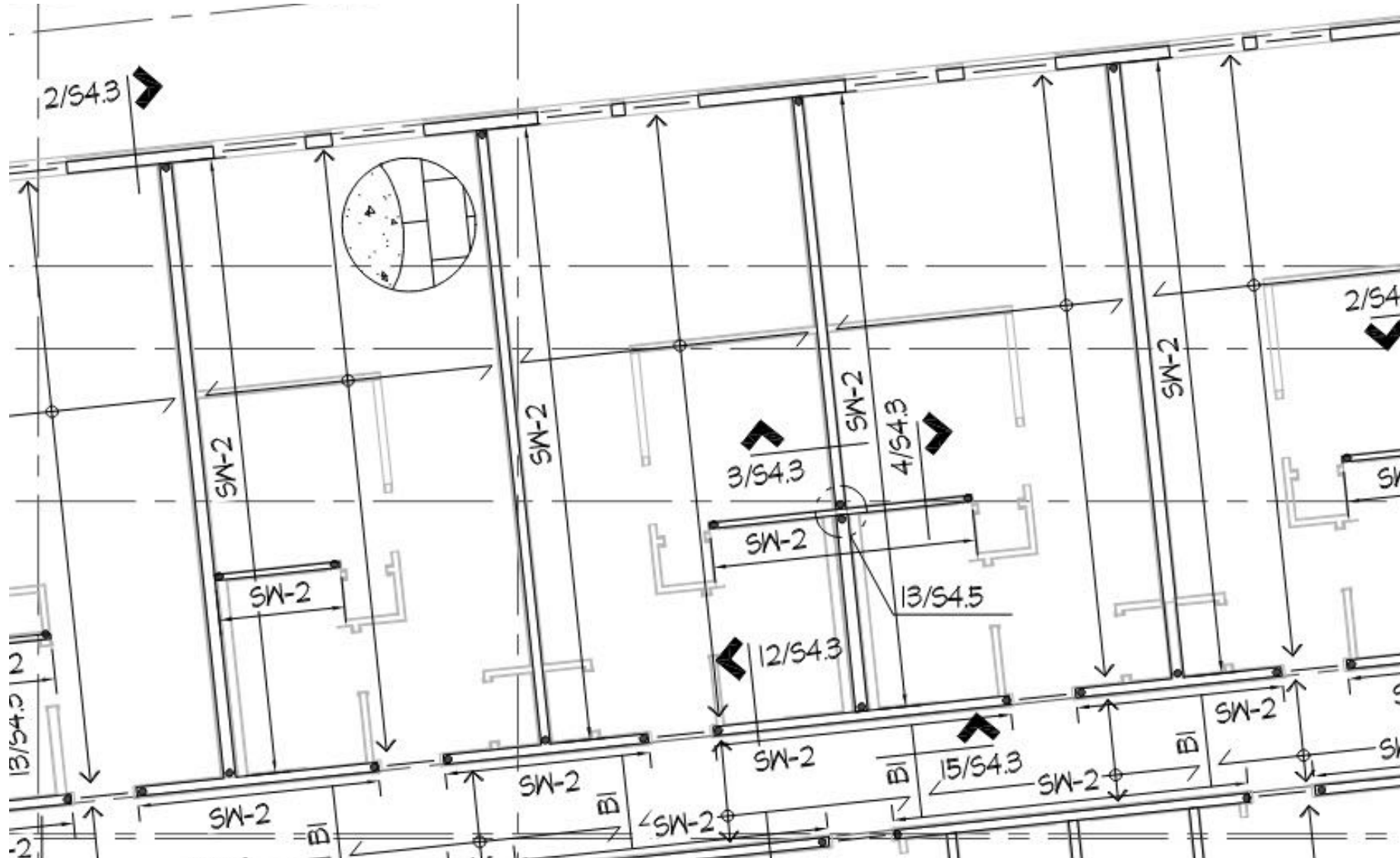
- Iterative process to test massing and layout to achieve better yields
- Target Value Design and Estimate
- Interview and integrate trade subcontractors into the design and estimating effort
- Continually asked ourselves “CEDC” questions
- Flipped the spec:
 - “Add” alternates, instead of “Deduct” alternates

STANDARDIZE UNIT WIDTHS / STRUCTURAL SPANS

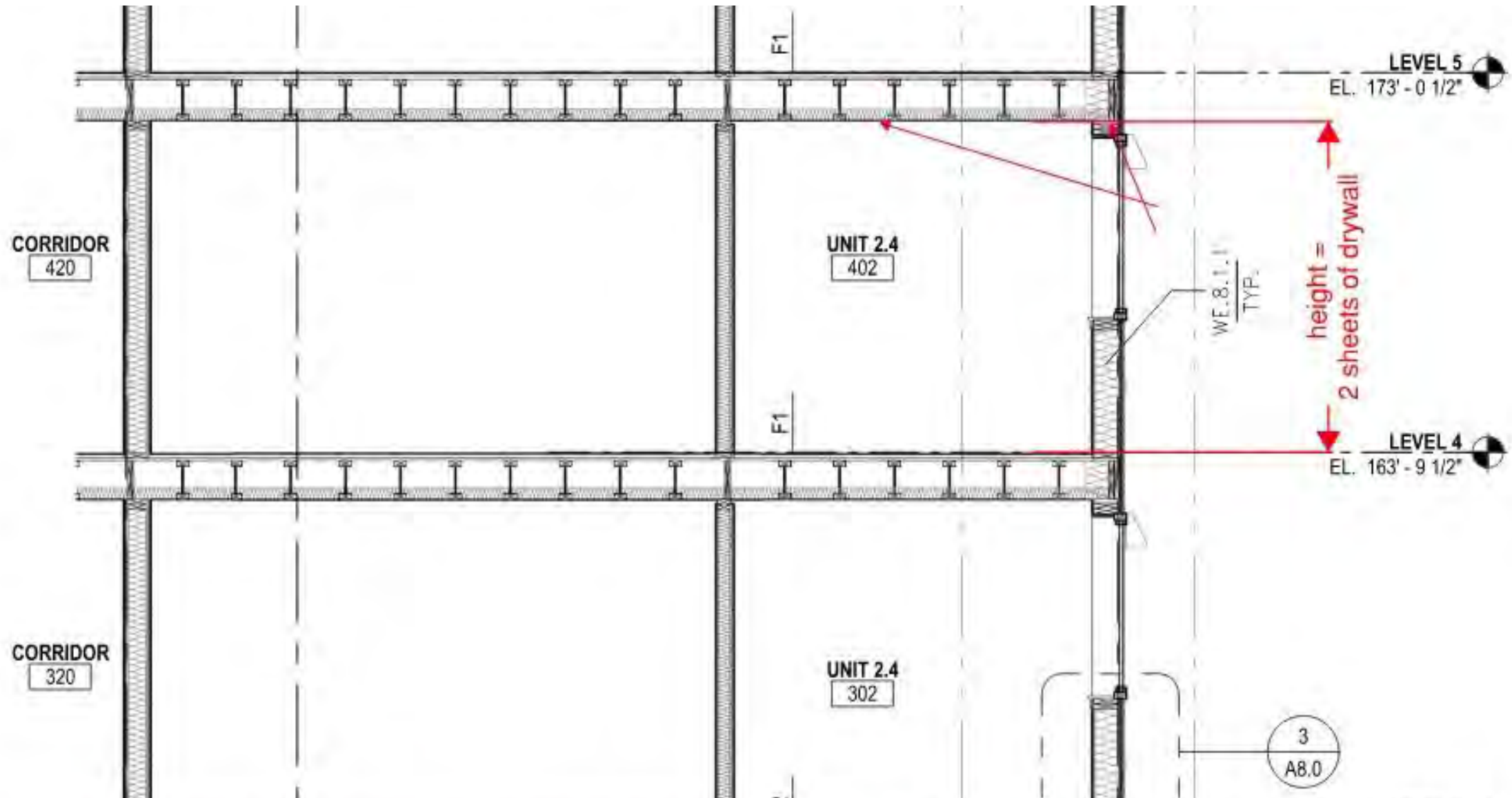


- Repetition and simplicity
- Material management
- Coordination

SINGLE-STUD PARTY WALLS



OPTIMIZED FLOOR-TO-FLOOR HEIGHTS



OPTIMIZED FLOOR-TO-FLOOR HEIGHTS



FLAT PT DECK / SOFFIT



PITCHED ROOF PROFILE / NO INTERNAL RAIN DRAINS



OTHELLO PARK COST DATA



Project Budget

\$22,410,307
\$211,418 / unit

Estimate History:

Sept 2018 Schematic Estimate \$24,801,600
Original design, 93 units, 6 stories

April 2019 TVD Estimate \$22,998,749 **↓ \$1.8M**
CEDC influenced scheme

November 2019 DD Estimate \$22,801,862 **↓ \$197K**
Sub numbers baselined

April 2020 GMP Estimate \$22,764,591 **↓ \$37K**

April 2020 GMP for Closing \$22,410,307 **↓ \$354K**
Additional measures from pricing

OTHELLO PARK COST DATA



Project Budget

\$22,410,307
\$211,418 / unit

Estimate History:

Reduction from 2018 to TVD Estimate:
\$1,802,851

Reduction from TVD Estimate to GMP: \$588,442

Reductions from TVD to GMP Estimate:

| | |
|-------------------------|-------|
| Drywall / Metal Framing | -18% |
| Wood Framing | -12% |
| Plumbing | -3.5% |

OTHELLO PARK COST ENGINEERING

Major Cost-Engineering Efforts

Evaluated 5 / 2, Type V versus 6 / 1, Type III-A
\$250,000 savings

Unit Yield – Span efficiencies and unit aspect ratios
Increased from 96 to 106 units
Significantly lower Unit Cost Basis

Panelized versus on-site wood framing
Project initially conceived of as panelized
Ended up being executed as stick-framed
Incorporated pre-cutting, “optimization”



CONVERT “COSTS” TO “VALUE”



- Savings afforded a Market-rate-quality amenity
- Trade involvement means buy-in
- Understanding practices and materials leads to reduction in waste

THE BIG TAKE-AWAY'S



- Internalizing the lessons
- Preconstruction:
 - Make budget a true priority
 - Nothing is sacred
 - Expanding the Team
- Execution:
 - Involving the site team
 - Installers, field leadership invested
 - Leads to a safer, less-costly build



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Questions?

This concludes The American Institute of
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