SUSTAINABLE BUILDING IN A COLLABORATIVE ENVIRONMENT

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John McMichael, Interface Engineering
Steven Ehlbeck, SERA Architects
AGENDA

- Project overview
- Project vision
- Project design and delivery
- Project results
- Learning forward
TEAM

Owners

Owners’ Rep

Design Team

CMGC Contractor

… along with 18 Consultants including Interface, KPFF, OTAK and Mayer-Reed

… along with several consultants

… along with 8 Best-Value Subs including Harmon, Deamor, Skyline, Temp Control, JH Kelly, OEG, Western States, KONE

OUS/OHSU Collaborative Life Sciences Building and OHSU Skourtes Tower
SUSTAINABLE BUILDING IN A COLLABORATIVE ENVIRONMENT
LOCATION

• Portland South Waterfront Neighborhood
• 1st building on OHSU Schnitzer Campus
• 2 block construction site (650,000 GSF)
COLLABORATIVE LIFE SCIENCES BUILDING

- $295 million
- Multi-modal hub
- Brownfield Development
SCHEDULE

A/E Contract
May 2011

37 MOs

Substantial Completion
June 2014
INTER-PROFESSIONAL EDUCATION

SEPARATE SPACE
SEPARATE CURRICULA

SHARED SPACE
SEPARATE CURRICULA

SHARED SPACE
SHARED CURRICULA
UNIQUE PARTNERSHIP

3 Higher Ed Institutions
(OHSU, OSU, PSU)

- Challenges: Different student populations, different business models, different technical design standards
- Benefits: Promotes innovative sustainability at each campus because each institution can share past successes and experience that allows staff to look at sustainability in a new light.

3 person steering committee

- One from each institution
- Empowered to make decisions
- And they did!
VISION

- Highly sustainable (USGBC LEED Platinum) complex that promotes interaction;

- Undergraduate sciences, dental, medical, life sciences, engineering and pharmacy students learn and explore;

- Faculty perform cutting edge research and discover the next evolution of medicines, cures, and medical devices that positively affect lives in Oregon and worldwide
PRINCIPLES OF INTEGRATED TEAM

OWNERSHIP – Everyone is a co-owner

PROCESS – Transparent Process

IMPROVEMENT – Continuously improve, innovate, reinvent, learn

FOCUS – Biggest Bang for the Buck

OPTIMIZATION – Optimize BIM, technologies, skills, talents

TRUST – Trust each other and support each other’s goals
CO-LOCATION

BETTER COMMUNICATION

✓ Highly coordinated overall design.
✓ Fewer assumptions made by disconnected design team members.
✓ More spontaneous design coordination discussions.
✓ Better understanding of other disciplines’ work flows and design problems.

LESS WASTED TIME

✓ Less time spent waiting for answers from email and voicemail.
COLLABORATION TECHNOLOGY

❖ Design, Analysis, & Documentation

❖ Coordination & Information Management

❖ File Sharing
BUILDING INFORMATION MODEL

PROGRAM TRACKING → DESIGN COMMUNICATION → CONSTRUCTION COORDINATION
BUILDING INFORMATION MODEL - CONSTRUCTION
ELECTRONIC DOCUMENTS

OUS/OHSU Collaborative Life Sciences Building and OHSU Skourtes Tower
SUSTAINABLE BUILDING IN A COLLABORATIVE ENVIRONMENT
PROJECT GOALS

• LEED PLATINUM (A/E/C TEAM INCENTIVIZED)
• ECO-DISTRICT READY BUILDING
• GREEN ROOFS AND RAIN WATER CAPTURE FOR NON-POTABLE USES
• 30% MORE EFFICIENT THAN CODE (COST BASIS)
• HIGH PERFORMANCE HEATING AND COOLING SYSTEMS (HEAT RECOVERY, RADIANT HEATING AND COOLING SURFACES, DISPLACEMENT VENTILATION, ENERGY EFFICIENT LIGHTING)
• HEALTHY MATERIALS THAT ENHANCE INDOOR AIR QUALITY
SUSTAINABILITY

STRATEGIES AND SAVING
ATTACK LARGER ENERGY USE AREAS FIRST

- FUME HOOD SASH MANAGEMENT
- AIR FLOW REDUCTION
- HEAT RECOVERY
- CASCADE AIR SYSTEMS
- HYDRONIC/RADIANT SYSTEMS
- DAYLIGHTING
- GOOD ENVELOPE
- ENERGY EFFICIENT LIGHTING

ANNUAL ENERGY SAVINGS: $450,000
Using 2013 energy costs
<table>
<thead>
<tr>
<th>DESCRIPTION OF MEASURE</th>
<th>CAPITAL COST ESTIMATE</th>
<th>POTENTIAL INCENTIVE FUNDING</th>
<th>NET COST AFTER INCENTIVES</th>
<th>ENERGY SAVINGS (KWH) OR WATER SAVINGS (GALS)</th>
<th>ANNUAL OPERATING SAVINGS</th>
<th>SIMPLE PAYBACK (YEARS)</th>
<th>OWNER VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add Shading Devices</td>
<td>$22,000</td>
<td>$6,600</td>
<td>$15,400</td>
<td>50,000 kWh</td>
<td>$3,500</td>
<td>4.4</td>
<td></td>
</tr>
<tr>
<td>Heat Recovery Ventilation</td>
<td>$280,000</td>
<td>$84,000</td>
<td>$196,000</td>
<td>33,000 therms</td>
<td>$33,000</td>
<td>5.9</td>
<td></td>
</tr>
<tr>
<td>Occupancy Sensors</td>
<td>$31,600</td>
<td>$9,480</td>
<td>$22,120</td>
<td>55,000 kWh</td>
<td>$3,500</td>
<td>6.3</td>
<td></td>
</tr>
<tr>
<td>Low Velocity Variable Volume Fume Hoods</td>
<td>$1,350,000</td>
<td>$240,000</td>
<td>$1,110,000</td>
<td>900,000 kWh, 60,000 therms</td>
<td>$123,000</td>
<td>9</td>
<td>Higher velocity. Improved comfort with higher ventilation rate.</td>
</tr>
<tr>
<td>Ground-Couple Foundation Piles</td>
<td>$1,250,000</td>
<td>$100,000</td>
<td>$1,150,000</td>
<td>100,000 therms</td>
<td>$100,000</td>
<td>11.5</td>
<td></td>
</tr>
<tr>
<td>Operable Windows</td>
<td>$105,000</td>
<td>$10,000</td>
<td>$95,000</td>
<td>70,000 kWh</td>
<td>$4,900</td>
<td>19.4</td>
<td></td>
</tr>
<tr>
<td>Chilled Beams for Localized Cooling</td>
<td>$462,000</td>
<td>$30,000</td>
<td>$432,000</td>
<td>200,000 kWh, 5,000 therms</td>
<td>$19,000</td>
<td>22.7</td>
<td>Superior comfort. Quieter environment. Improved ventilation.</td>
</tr>
<tr>
<td>Radiant Heat w/ Displacement Ventilation</td>
<td>$358,509</td>
<td>$26,000</td>
<td>$332,509</td>
<td>100,000 kWh, 6,000 therms</td>
<td>$13,000</td>
<td>25.6</td>
<td>Better air quality.</td>
</tr>
<tr>
<td>Solar Thermal Panel System</td>
<td>$375,000</td>
<td>$30,000</td>
<td>$345,000</td>
<td>10,000 therms</td>
<td>$10,000</td>
<td>34.5</td>
<td></td>
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</table>
SITE ANALYSIS

ZONING ENVELOPE

View Corridors
Podium Height 75’
Tower Height 250’
Tower Zone Restrictions
DATA DRIVEN MASSING

SOLAR ACCESS ANALYSIS

Original Proposal by Developer-Led Team

Final Massing
SOLAR ACCESS
OCCUPANT ENGAGEMENT
RESULTS

OUS/OHSU Collaborative Life Sciences Building and OHSU Skourtes Tower

SUSTAINABLE BUILDING IN A COLLABORATIVE ENVIRONMENT

Building Facts
Size: 650,000 sf
Cost: $295 million

<table>
<thead>
<tr>
<th>Structural Support</th>
<th>10 miles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Piling to support foundation</td>
<td>10 miles</td>
</tr>
<tr>
<td>Electrical</td>
<td></td>
</tr>
<tr>
<td>Light Fixtures</td>
<td>6,000</td>
</tr>
<tr>
<td>Power Outlets</td>
<td>5,100</td>
</tr>
<tr>
<td>Data Outlets</td>
<td>8,100</td>
</tr>
<tr>
<td>Conduit</td>
<td>665,280 lineal ft. (126 miles)</td>
</tr>
<tr>
<td>Wire</td>
<td>2,844,980 lineal ft. (539 miles)</td>
</tr>
<tr>
<td>Cat 6 cable</td>
<td>2,101,770 lineal ft. (398 miles)</td>
</tr>
<tr>
<td>Electrical Panels/Switchboards</td>
<td>500</td>
</tr>
<tr>
<td>Floor Boxes</td>
<td>368</td>
</tr>
<tr>
<td>Bus Duct Risers</td>
<td>21 (5,450 lineal ft., total)</td>
</tr>
<tr>
<td>2.5 megawatt generator with 9 automatic transfer switches</td>
<td>1</td>
</tr>
</tbody>
</table>

| Mechanical |
| HVAC Piping | 6.77 miles |

| Plumbing |
| Piping | 24.5 miles (excluding underground) |
| Plumbing Fixtures | 900+ |
| Individual Plumbing Systems | 19” |
| Lab gas/Med gas outlets | 2,490 |

- Radiant Heat and Cooling
- Rainwater harvesting
- Occupancy Sensors
- Heat Recovery Systems
- Displacement Ventilation
- Daylight Sensors

Not a significant source of greenhouse gas

*Includes DWV, sanitary sewer, hot/cold domestic water, fuel oil, dental vacuum, dental air, waste anesthesia gas disposal, reverse osmosis, deionized water, rainwater harvesting, storm water management, acid waste, non-potable hot/cold water, natural gas, carbon dioxide, oxygen, and nitrous oxide systems.
RESULTS
STORMWATER REDUCTION

GREEN ROOF
PROMOTE HABITAT
REDUCE SITE RUNOFF

20%
RESULTS
RAINWATER HARVESTING

60% POTABLE WATER REDUCTION

OUS/OHSU Collaborative Life Sciences Building and OHSU Skourtes Tower
SUSTAINABLE BUILDING IN A COLLABORATIVE ENVIRONMENT
**LEED RESULTS**

- **platinum**
  - **SUBMITTED:** 83 pts
  - **ACHIEVED:** 80 pts

Approved Design Pts = 48
Approved Construction Pts = 32

<table>
<thead>
<tr>
<th>Tracking Key Points:</th>
<th>FINAL</th>
<th>Threshold</th>
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</thead>
<tbody>
<tr>
<td>Recycled Content (2)</td>
<td>29.7%</td>
<td>20%</td>
</tr>
<tr>
<td>Regional Materials (2)</td>
<td>22.7%</td>
<td>20%</td>
</tr>
<tr>
<td>Construction Waste Mgmt (2)</td>
<td>85.1%</td>
<td>75%</td>
</tr>
<tr>
<td>FSC Wood (2)</td>
<td>74.0%</td>
<td>50%</td>
</tr>
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</table>

80-110pts

83 pts
## INCENTIVE RESULTS

<table>
<thead>
<tr>
<th>Incentive</th>
<th>Amount</th>
<th>Status</th>
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<tbody>
<tr>
<td>ETO Early Design Assistance</td>
<td>$1,200</td>
<td>PAID</td>
</tr>
<tr>
<td>ETO Energy Modeling</td>
<td>$25,000</td>
<td>PAID</td>
</tr>
<tr>
<td>ETO Incentive</td>
<td>$499,999</td>
<td>PAID</td>
</tr>
<tr>
<td>ETO Commissioning</td>
<td>$40,000</td>
<td>PAID</td>
</tr>
<tr>
<td>City of PDX Green Roof Incentive</td>
<td>$82,150</td>
<td>PAID</td>
</tr>
<tr>
<td>ODOE EIP (tax credit of $450,577)</td>
<td>TBD</td>
<td>PENDING</td>
</tr>
</tbody>
</table>
RESULTS - 12 MONTH DATA

CLSB Natural Gas: Actual vs Modeled

Natural Gas Usage (therms)

- Natural Gas Modeled
- Natural Gas Actual

RESULTS - 12 MONTH DATA

CLSB Total Energy: Actual vs Modeled

Total Energy Usage (kBtu)

- Total Energy Modeled
- Total Energy Actual


OHSU/OHSU Collaborative Life Sciences Building and OHSU Skourtes Tower
SUSTAINABLE BUILDING IN A COLLABORATIVE ENVIRONMENT
RESULTS - 12 MONTH DATA

\[
\text{EUI (kBTU/SF/YR)} = \frac{\text{NATURAL GAS} + \text{ELECTRICITY} - \text{RENEWABLES}}{\text{GROSS BUILDING AREA}}
\]
RESULTS - 12 MONTH DATA

CLSB EUI

197 Base EUI
110 Modeled EUI
79* Actual EUI (kBTU/sf/yr) (Sep 14 - Aug 15)

*Factors:
1. LEED Requires modeling at full build.
2. East Retail not yet occupied.
3. 7th floor research lab remains a shell space.
4. Early occupancy low density.
RECOGNITION

- LEED Platinum
- AIA COTE Top Ten (2015)
- AIA TAP Honorable Mention for Delivery Process Excellence (2015)
- SCUP/AIA-CAE Excellence in Architecture Merit Award (2015)
- ENR Northwest's Best Project of 2015 for Higher Education Research
LEARNING FORWARD

COLLABORATIVE PARTNERSHIPS - AT A VARIETY OF SCALES - HAVE POTENTIAL TO YIELD MANY BENEFITS
LEARNING FORWARD

ADAPTABILITY WITHIN CONSTRAINTS
LEARNING FORWARD

ETHOS OF SUSTAINABILITY
LEARNING FORWARD

SUSTAINABILITY ON DISPLAY

OUS/OHSU Collaborative Life Sciences Building and OHSU Skourtes Tower
SUSTAINABLE BUILDING IN A COLLABORATIVE ENVIRONMENT
QUESTIONS
OUS/OHSU Collaborative Life Sciences Building and OHSU Skourtes Tower

SUSTAINABLE BUILDING IN A COLLABORATIVE ENVIRONMENT