Solis Capitol Hill

A case study in multifamily passive house design

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Architect, Weber Thompson

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Presentation Format

• 20 minute project presentation, review passive house strategies and sharing some lessons learned
• 10 minute conversation with the owner, discuss the business case for passive house
• 10 minute audience Q&A
Solis Condominiums

Seattle, WA

- 45-unit condominium
- 576 SF average unit size
- 1 level of underground parking
- 1 level of retail/commercial
- 5 levels of residential above
- Pursuing PHIUS+ 2015 Certification
Project Team

**Solterra**
*Owner / Developer*

**Weber Thompson**
*Architect, Landscape & Interior Design*

**Cascade Built**
*Contractor*

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**Decker Consulting Engineers**
*Civil Engineer*

**Quantum Consulting Engineers**
*Structural Engineer*

**CT Engineering**
*Shoring*

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**Pan Geo**
*Geotech*

**ArchEcology**
*Energy Modelling*

**BEE**
*Building envelope*
Project Timeline

• 2015 - Design start
• 2017 (summer) – Permitted
• 2017-2018 – Hold
• 2018 (fall) -- Construction start
• 2020 (winter) – Targeted construction completion

• Units pre-selling now!
  www.livesolis.com
Project Goals

- Passive House Certification (PHIUS+ 2015)
- Market Rate
- Replicable / Standard Construction
Context
Site

- SE Corner Lot
- Zero-lot line to the North and East
- Power Lines on 13th Ave
Massing

- Maximize FAR
- West setback for power lines
- East setback for power lines
- Simple geometry allows for high exterior wall to floor area ratio & simple detailing

Powerline Setback

Zero-lot line Setback
Art

NORTH WALL MURAL PLACEHOLDER

SOLterra BUILDING, PORTLAND
Passive House Strategies

1. Enhanced Building Enclosure
   - Continuous Insulation
   - Airtight construction

2. Managed Solar Heat Gain

3. Balanced Mechanical
   Ventilation/Exhaust

Images source: Passive House Institute US

- Mechanical penthouse
- Passive House envelope/boundary is limited to the residential portion of the building
- Interior exit stair comes down to grade
- Type V Wood Construction
- Type I Concrete Construction
Passive House Strategy: Enhanced Building Enclosure
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Passive House Strategy: Enhanced Building Enclosure
Reduced Envelope Penetrations

Note: no horizontal unit venting!
Passive House Strategy: Managed Solar Heat Gain

INTERNAL HEAT GAINS

SUN-SHADOW STUDY: SOUTH WALL IS ALWAYS IN SUN
Passive House Strategy: Managed Solar Heat Gain

Fixed Balconies

27% Glazing

SOUTH ELEVATION
Passive House Strategy: Managed Solar Heat Gain
Passive House Strategy: Balanced Mechanical System

- Centralized Energy Recovery Ventilators (ERVs) on each floor provide filtered, fresh air.
- Exhaust needs are tuned to the size of the space, not over-ventilated.
- Minisplit heat pumps provide heating and cooling in each unit living space.
- Additional electric resistant heater in bedrooms for rare use.
Challenges and Takeaways
Industry Standard Assemblies = Competitive Bids
Design Challenge: Building Code (Proposed)
Design Challenge: Building Code (Proposed)

KEY:
- AIR BARRIER
- THERMAL ENVELOPE
- 2-HR FIRE RATED WALL

Air, Thermal & Fire ratings are consolidated
Smoke Control Doors
Openings must meet air barrier, thermal and fire rating requirements
Design Challenge: Building Code (Approved)

- Added 2-hr fire wall
- Protect ground floor lobby as exit passageway
Design Challenge: Building Code (Accepted)

KEY:
- AIR BARRIER
- THERMAL ENVELOPE
- 2-HR FIRE RATED WALL

- Fire door
- Openings into corridor must meet air barrier, thermal requirements only, no fire rating
- Added sprinkler standpipe
- Fire wall is separated from air barrier/thermal envelope
**Design Challenge:** Air Barrier vs Thermal Envelope vs Fire Barrier

**KEY:**
- **AIR BARRIER**
- **THERMAL ENVELOPE**
- **2-HR FIRE RATED WALL**

Proposed air barrier modification around mechanical room so that duct cleanouts do not need to meet PH air barrier requirements.
Design Challenge: Products going out of business
Design Challenge: Condo-ization

- WA State stringent condo laws
- High exposure to entire developer/construction/design team
- Increased Envelope Risk
- Increased Acoustic Expectations
- Decreased Accessibility Risk
Passive House Cost Premium

Costs: 3-5% increased cost from industry standard, primarily for:

- Mechanical System
- Exterior Shades
- Windows
- Labor for air barrier/ thermal details
- Oversight and Verification
Passive House Benefits

• Unparalleled thermal comfort

• Superb indoor air quality –
  o Continuous fresh filtered air
  o Meets the EPA’s Indoor Airplus standard
  o High indoor air quality is linked with measurable health benefits

• Resilient building –
  o A/C provides comfort in a warming climate
  o Filtered air provides healthy air during times of summer fires/increased air pollution

• Quiet interiors

• Ultra energy efficient

Passive House Institute US

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<tr>
<th></th>
<th>Average Existing Multifamily</th>
<th>Seattle New Construction</th>
<th>Passive House Target</th>
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</thead>
<tbody>
<tr>
<td>Energy Use Intensity (kBtu/sqft)</td>
<td>60.0</td>
<td>35.0</td>
<td>18.0</td>
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</tbody>
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**Passive House Benefits:**
- Ultra Energy Efficient
Thank you.