Passive Building - Case Study
Pax Futura

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Passive House Institute US
www.PHIUS.org
AGENDA

1. Introductions
2. Project Overview
   • Pax Futura – Features & Design
   • Project Team – Culprits & Visionaries
3. Passive Building Process – Start to Finish
4. Process Autopsy (Lessons Learned)
Building Information

- Project Location: Hudson St., Seattle
- Number of Units: 35
- Interior Conditioned Floor Area: 14,820 sf
  - Exterior Corridors
  - Laundry outside of PH envelope
- Floors: 4 stories
- Occupancy Type: Micro-affordable units (~350 sf/unit)
- Mixed-Use: First Floor Retail Space
5 PASSIVE BUILDING PRINCIPLES

Thermal Control
CONTINUOUS INSULATION

Radiation Control
OPTIMIZED WINDOWS & SOLAR GAINS

Air Control
AIR-TIGHT CONSTRUCTION

Balanced Ventilation with Heat Recovery

Minimized Mechanical Systems

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Step 1: Install Approved SIP Tape

Step 2: Install VaproFlash. Ensure membrane is air-sealed to SIP. Where Fish-Mouths occur at perimeter, cover with VaproLiqui-Flash

Step 3: Install VaproLiqui-Flash from inside edge of SIP R.O. to min. 1” above Bracket Lags/fasteners

Step 4: Install Window

Step 5: Install Backer-Rod and Prosooco Air-Dam from window to VaproLiqui-Flash

WINDOW HEAD AT EXT. SIP WALL W/ SLIDING TRACK
SLAB ON GRADE AT EXT. SIP SHEAR WALL

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MECHANICAL SYSTEMS:

MECHANICAL VENTILATION:
- Zehnder ComfoAir 550 (x6)

DOMESTIC HOT WATER:
- Solar Thermal
- Boiler (97% eff.) (backup to Solar)

SPACE HEATING/COOLING:
- Chilltrix Heat Pumps + Hydronic Coil (Cooling & Some Heating)
- Electric Resistance (Backup heat)
PAX FUTURA – CASE STUDY
SEATTLE, WA
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CASCADE-HUDSON COOLING
SYSTEM CONCEPT

TWO CHILLTRIX
HEAT PUMPS

BUFFER TANK

PUMP

COOL AIR TO UNITS

ONE HYDRONIC
COIL PER ERV

COOL AIR TO UNITS

PAX FUTURA – CASE STUDY
SEATTLE, WA

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PROJECT TEAM: PLAYERS

DEVELOPER / OWNER:
- Sloan Ritchie

ARCHITECT:
- NK Architects
  - Joe Giampietro
  - Brittany Porter

MEP:
- Staengl Engineering

CPHC:
- Joe Giampietro

ENERGY MODELERS:
- Skylar Swinford

CONSTRUCTION:
- Cascade Built

ADDITIONAL CONSULTANTS / EXPERTISE:
- Dan Whitmore
Project Timeline (Rough)

- 2015 - 2016 – Initial Design / Permits / Finance / Land-use approval
- April 2016 – Ventilation Strategy approved by Code
- September/October 2016 – PHPP started
- Fall 2016 – Mechanical Design
- June 2017 – Demolition of previous building (Triplex)
- July 2017 – Excavation Starts
- October 2017 – Slab poured
- January 2018 – Framing
- September 2018 – Occupants move-in
1. **Pre-Certification**: Design review and energy modeling to verify compliance with the standard all happens during project development and **before** construction.

2. **Final Certification**: If a project is built to the pre-certified plans and specifications passes all on-site quality assurance checks by the PHIUS+ Verifier, it will become fully certified.
QUALITY ASSURANCE

Critical for success

• Built on US recognized systems
• 3rd Party inspection process
• Multiple site visits
• Blower door testing
• Ventilation system balancing/commissioning
• Insulation inspection

Provides assurance that the built product is what was planned.
Project Timeline (Rough)

- 2015 – Permits / Finance / Land-use approval
- April 2016 – Ventilation Strategy approved by Code
- September 2016 – Project registered with PHIUS for Certification
- September/October 2016 – PHPP started
- Fall 2016 – Mechanical Design
- December 2016 – PHIUS Preliminary Energy Model Review
- January 2017 – Ventilation Strategy approved by PHIUS
- June 2017 – Demolition of previous building (Triflex)
- July 2017 – Excavation Starts
- October 2017 – Slab poured
- January 2018 – Framing
- Fall 2018 – Occupants move-in
- October 2018 – Transferred model to WUFI & 1st round of Pre-Cert Review
- November 2018 – 2nd round of Pre-Cert Review
- March 2019 – PHIUS+ Pre-Cert pending....
How much extra does PHIUS+ Certification Cost?

It depends on what’s in the bag
What does a building cost?

- Pro Forma
- Costs
  - Hard costs (sticks & bricks)
  - Soft costs (architecture, permits, consultants, finance fees, etc.), land, construction costs
- Financial Resources
  - Equity Investors
  - Debt from financial institutions
- Revenue
  - Rent
  - Vacancy rate (lower = higher revenue)
  - Net Operating Income (NOI)
    - Left over income after property taxes, utilities, maintenance and management

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NOI – Drives Value

- For Profit Development
  - NOI used to value the property
  - IF 5% return, property = 20 x NOI
  - Typically aim to be positive

- Affordable
  - NOI – sometimes planned to be ‘0’
    to use property as a tax shelter

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What happens PHIUS+ added to a market-rate building?

- Experienced developers
  - Can do it for no premium
- First-time developers
  - ~5% premium
  - (adding in total land and soft costs, closer to 3%, but 5% makes the math easier)
- How to fund?
  - More Debt
  - OR
  - More Investors

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Developers & Investors are Risk Takers, Banks are not

• Sloan Ritchie’s rule for communicating with bankers
  “Never say ‘passive house’, ‘passive building’ or anything like that. They do not know what it is, so – by and large- it is a red flag”

• Do Talk About
  • Comfort
  • Air-Conditioning
  • Exterior Shades
  • Quite
  • Low Energy
  • Durability
  • Futureproof

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More Debt?

- Get the right appraiser
  - Needs to recognize the added value
    - Comfort
    - Durability
    - Healthful Indoor Environment
- “The owner should ask the banker (both in person and via email) to include the most vital high-performance property information when posting for bids to select a qualified appraiser.” – James Finlay (former appraiser at Wells Fargo Bank)
- Until the market recognizes the value, you need to find the extra 5% through investors

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Revenue Benefits

- Safe to assume
  - Higher Rent
  - Lower Vacancies
- Utilities – extremely low
- Maintenance – likely lower
- Management, taxes and debt = same

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How much more will tenants pay?

- Most people ~$20 more
- $10 thermal comfort
- $5 indoor air quality
- $4 quiet
- $1 lower carbon footprint
- $20/month x 35 units x 12 months/yr = $8400/yr
- 20 x NOI = $170,000 for adding PHIUS+ to the grocery bag

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Will vacancy be lower?

- 5% vacancy is common rate for underwriting
- Reasonable to expect tenants will stay longer because of superior living environment
- Owners of energy efficient homes (Energy Star) – 33% less likely to default on mortgage – study from Univ. North Carolina (71,000 home loans from 38 states and D.C.)
- PHIUS+ assume a 3% vacancy rate?
  - = $183,000 of value
- Has the potential to pay for PH upgrades, but you don’t know for certain and can’t prove it to the bank

https://multifamily.phius.org/service-category/breaking-down-business-case-phius
Lessons Learned

- Mechanical System – careful design
  - Design to run at less than peak capacity
  - Consider fan noise
  - Duct Design – structure didn’t allow for straight runs

- Circulation outside of envelope
  - Bonus in rentable square footage
  - 42 exterior doors
  - No hallway for ventilation ducts

- Heating/Cooling strategy
  - Considered VRF – cost prohibitive
  - Natural Night flush – challenging with wildfire potential – Chilltrix used
  - External Shading – user-operable

- Separating mixed-use spaces
  - Isolation a challenge – in practice
  - Line on the plans is not that simple in real life
QUESTIONS?

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