CWRU Green Bag Lunch

Green & Sustainable Homes
Today and Tomorrow
Sustainable Home Design

- **Durability** - Make it to last 300 years or more
- **Flexibility** - Change the plan with lifestyle changes
- **Affordability** - Responsive to the cost of ownership
- **Beauty** - No one will take care of an ugly building

Fail on any of these points and the home will be left behind.
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What Is Your Footprint?
Population x Energy Demand = World Impact on Non-Renewable Resources

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In the 1970s what changed??

The Cost of ENERGY

The cost of that cold beer and hot shower got expensive.

We Looked For Energy Solutions!
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Solar & Wind Technology Grew From A Dream To An Industry
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Site Orientation And Sun-Tracking Were Added To The Design Criteria
The way we build homes today is the same as we built over 150 years ago. We deliver thousands of small pieces to a site and build it all outside.

Off-Site Panelization And Modular Construction Improved Economics
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Climate Zones Were Recognized
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OUR CLIMATE ZONE 5

Our Region Has Specific Climate Features That Make Designing With Nature A Challenge

• Very Cold Winters
• Hot Humid Summers
• Lake Effect Wind & Snow
• West Side of Alleghany Mountains
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PH Design: The Concept
Passive: Low Tech but High Performance

New York State’s First Passive House
Passive House Design Requirements:

Reduce demand for energy by improved thermal envelope and reduced energy lighting sources

- The building must be designed to have an annual heating demand as calculated with the Passive House Planning Package of not more than 15 kWh/m² per year (4746 btu/ft² per year) in heating and 15 kWh/m² per year cooling energy OR to be designed with a peak heat load of 10W/m²

- Total primary energy (source energy for electricity and etc.) consumption (primary energy for heating, hot water and electricity must not be more than 120 kWh/m² per year (3.79 × 10⁴ btu/ft² per year)

Reduce air leaks in the building envelope by sealing

- The building must not leak more air than 0.6 times the house volume per hour ($n_{50} \leq 0.6 / \text{hour}$) at 50 Pa (N/m²) as tested by a blower door.
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The Cleveland Museum of Natural History
Roof Insulation
- Typical - 6”
- SmartHome - 24” R-75

Wall Insulation
- Typical - 3 ½”
- SmartHome - 12” R-45

Basement wall
- Typical - ½” or none
- SmartHome - 8” R-33

Under Basement floor
- Typical - none
- SmartHome - 8” R-21
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Building Envelope Design

Off-Site Panelized Wall Construction
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Building Envelope Design

- Dense packed cellulose insulation
- All OSB joints taped
- Insulation applied behind window header
- Wood furring strips spaced 16" apart provide a drainage plane and allow free air flow behind the siding
- Ventilated furring strip at top and bottom of windows and walls allows airflow, even where normal horizontal furring would block airflow

Air Barrier - Stage 1
Stud framing is insulated and OSB skin is applied to the outside face. All OSB joints are taped and sealed.

Exterior finishes
Exterior siding and trim are applied. The design of the exterior matches the architectural character and style of the adjacent homes.
Windows

Windows are triple-glazed to minimize heat loss. Coated glass helps reflect heat back inside the house in winter and keeps some heat out in summer. The largest windows in the house face south, to take advantage of light and warmth from the sun.
Historic Preservation IS Sustainable – Because The Greenest Brick Is The Old One In The Wall!
Historic Preservation IS Sustainable – Durable...Flexible... Affordable...BEAUTIFUL!
Historic Preservation IS Sustainable – So What About Your Home?
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What Can You Do?
21st Century Building Design
Live With Nature

Our Future Will Be So Beautiful!