OFFSITE CONSTRUCTION: THE FUTURE?

BuildingEnergy Conference 2016

PHIL KAPLAN – BRIGHTBUILT HOME
BILL AYLOR – LAKE|FLATO
GEOFFREY WARNER – ALCHEMY
BRYAN HUOT – PREFERRED BUILDING SYSTEMS & NEW ENGLAND HOMES
TEDD BENSON – UNITY HOMES
ANDREW DEY – UNITY HOMES (MODERATOR)
BRIGHTBUILT HOME
PORTLAND, MAINE

THEY DO EXIST: AFFORDABLE NET-ZERO HOMES THAT GO UP WICKED FAST.
BEAUTIFUL • TOUGH • HEALTHY • ENERGY EFFICIENT • COMFY
BRIGHTBUILTHOME.COM
BRIGHTBUILT HOME
WHY OFF-SITE CONSTRUCTION?

over the next 30 years 75% of the built environment will be new or renovated
## BRIGHTBUILT HOME
### DEMOGRAPHIC & COSTS

#### Background & Demographics

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Approach</th>
<th>Income</th>
<th>Actives/seekers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender: M/F</td>
<td>Emotional</td>
<td>Comfortable, Whole Foods AND Trader Joes</td>
<td>19%</td>
</tr>
<tr>
<td>Age: 35-60</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Role: Varies - broad demographic</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$170 - $200 / SF, ABOUT 10% LESS THAN STICK-BUILT...SOMETIMES

#### Challenges/Pain Points

- **Getting modern conveniences but with minimal environmental impact**
- **Comps, appraisals, cost**

- **Can’t find what they want in the existing home inventory**
- **Wants to “do things right”**

- **Current homeowner with a large house that requires a lot of cleaning and maintenance**
- **Concerned about multi-story house and aging in place**

#### Background & Demographics

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Approach</th>
<th>Income</th>
<th>Actives/seekers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender: Primarily male</td>
<td>Pragmatic</td>
<td>Comfortable, but doesn’t spend frivolously</td>
<td>52%</td>
</tr>
<tr>
<td>Age: 40-60</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Role: Scientist, engineer, educator</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Background & Demographics

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Approach</th>
<th>Income</th>
<th>Actives/seekers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender: Couples/families, single or divorced</td>
<td>Pragmatic and emotional</td>
<td>Comfortable, but fixed</td>
<td>45%</td>
</tr>
<tr>
<td>Age: 55+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Role: Professional nearing retirement</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
BRIGHTBUILT HOME

WHAT DOES THE FUTURE HOLD?

Village Run
off Sligo Road, Yarmouth, Maine
4000-6000 kWh/year
R-20/20/40/60
1.5 ACH50
Porch House is founded on the idea that dwellings shelter us, adapt and respond to the environment, and connect us to our surroundings. Our dwellings are realized using sound principals that have guided Lake|Flato for over 30 years; principals of design, sustainability, quality, and efficient fabrication and construction.

We've identified the consistently successful attributes of our Lake|Flato residences and applied them to a library of pre-designed living and sleeping rooms. Working closely with the clients and the opportunities of the site, we determine the optimal combination, arrangement, and construction of Rooms and Porches. The result is a site-specific Lake|Flato house connected to the landscape, and delivered with an efficient and predictable process.
IDEALS vs. PRACTICE

The Lake|Flato Porch House studio was developed to streamline the design process through the timely, economic, environmental, and structural benefits of modular construction techniques.

We focus on executing the most appropriate and efficient methods of construction and fabrication on a project-by-project basis, whether elements should be fabricated for site assembly or site-built.
Porch Houses are not designed for a particular demographic, but rather designed toward flexibility and simplicity. The modular design of our Porch House Rooms allows for easy customization, arrangement, and connection.

We arrange Rooms on the site to take advantage of sun, breeze, and views. We connect these Rooms on the site with custom Porches, which serve to link the events of our daily lives, draw us into the landscape, and connect us to the outdoors. Together they provide the shade, light, circulation, and living spaces that make each Porch House particular to its place.

Every Porch House is unique to its site and homeowner, but a typical completed Porch House will require roughly one year and will cost about $250-$300 per square foot.
LAKE|FLATO ARCHITECTS
PROJECTS COMPLETED

MILLER RANCH

BLUFFVIEW

PROW

CLINTON CORNERS
WHAT DOES THE FUTURE HOLD?
LAKE|FLATO ARCHITECTS

BUILDING DATA | PROW

DATA COLLECTED AT THE PROW USED FOR ANALYSIS AND TROUBLESHOOTING:

Energy end uses at a per second level, energy sources, Indoor temperature, outdoor temperature, CO₂ concentrations, Relative Humidity, solar thermal collected, boiler thermal output, water heating and central heating thermal flux.

R-30 WALL ASSEMBLY
BUILDING BLOCKS
How much space are you looking for?

1x
200 ±30 SF

2x
500 ±70 SF

3x
1200 ±190 SF

4x
3000 ±490 SF

PAIR
TAIL
TWIN
CROSS

ALCHEMY
ST. PAUL, MN

MODELS
www.alchemyarchitects.com

ALCHEMY Architects
www.alchemyarchitects.com

ALCHEMY Architects
www.alchemyarchitects.com
ALCHEMY
WHY OFF-SITE CONSTRUCTION?

Site Design Considerations

- Landscape and drive view
- Roof overhangs
- Backyard
- Entry to access
- Deck or roof deck

prevailing wind
break

Solar orientation

top - house
elevation

site
opportunities

urban sites

rural sites

Site Design Considerations

Intelligent site design is crucial.

- Landscape and drive view
- Roof overhangs
- Backyard
- Entry to access
- Deck or roof deck

prevailing wind
break

Solar orientation

top - house
elevation

site
opportunities

urban sites

rural sites

Site Design Considerations

Intelligent site design is crucial.

- Landscape and drive view
- Roof overhangs
- Backyard
- Entry to access
- Deck or roof deck

prevailing wind
break

Solar orientation

top - house
elevation

site
opportunities

urban sites

rural sites
### ALCHEMY DEMOGRAPHIC & COSTS

**We can design your weeHouse anywhere in the U.S. and potentially beyond!**

Building your weeHouse is a factory- or site-built process determined by the specific laws of your location.

---

**How much does a weeHouse cost?**

It depends upon where you want to live, how big your weeHouse is, and what upgrade options you choose.

<table>
<thead>
<tr>
<th>Type</th>
<th>Size</th>
<th>Cost Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1x 450 SF</td>
<td>1 bed, 1 bath</td>
<td>$80K-$90K</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$90K-$100K</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$110K-$125K</td>
</tr>
<tr>
<td>1x 850 SF</td>
<td>2 bed, 2 bath</td>
<td>$120K-$150K</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$130K-$160K</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$180K-$210K</td>
</tr>
<tr>
<td>2x-3x 1350 SF</td>
<td>3 bed, 2 bath</td>
<td>$180K-$220K</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$180K-$230K</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$290K-$330K</td>
</tr>
<tr>
<td>4x 2000 SF</td>
<td>3 bed, 2 bath</td>
<td>$240K-$300K</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$270K-$330K</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$350K-$400K</td>
</tr>
</tbody>
</table>

---

Cost for modular portion of the work only - no site or delivery fee included. Budget ranges allow for all standard finishes, plus costs for additional materials and systems such as spray foam insulation, floor radiant heat, wood wrapped walls or ceilings, custom stair design, and custom cabinetry upgrades. All of the above estimates are for single stories. Developments and duplicate modules would reduce the total project cost.

---

**LOOK WHERE we CAN GO**

[ALCHEMY Architects](https://www.alchemicas.com) | [MODULAR BUDGET](https://www.alchemicas.com)

---

**ALCHEMY Architects**

[www.alchemicas.com](http://www.alchemicas.com) tel: 401.447.4800

---
ALCHEMY
PROJECTS COMPLETED
ALCHEMY

WHAT DOES THE FUTURE HOLD?
The greenest square foot is the one you don’t build.
Growth of the Average Home Over the Past 100 Years:

- 2598 sq ft
  Average American Home Size in 2013
- weeHouse 3BR Pair 1400 sq ft
- weeHouse 2BR Tall 1150 sq ft
- weeHouse Studio 435 sq ft

LARGE SPACE, smaller package
The weeHouse is contained within a smaller package for a smaller footprint. Low-energy design and requirements allow for high-quality insulation and use of floor-to-ceiling glasses open outdoors, reduced circulation spaces, and added ventilation.

MORE QUALITY, LESS CONSUMPTION
With less stuff, your money and our Earth's resources go further. Simple, easily cleaned.

PASSIVE SOLAR DESIGN
The construction of the house is designed to maximize passive solar energy, overhangs that are shaded, and natural ventilation allow the house to be heated by the sun and cooled within the underground façade. Overhangs protect your glassing and walls from summer sun and rain.

REFLECTIVE ROOF
With reflective materials, reflect the sun's heat. Vented roof spaces allow additional heat separation.

RENEWABLE ENERGY
Our homes are essentially integrated with solar PV (electricity) and solar thermal collectors which collect the sun's energy.

GEOThermal HEATING
Ground-source heat pumps which use the Earth's constant temperature to heat or cool floors in your home. Ground-source systems are the most efficient heating and cooling systems ever created.

UPGRADE TO weeZERO
Heating, cooling, and lighting systems are powered by 100% renewable energy (wind, solar). The weeZERO is designed to produce as much energy as it consumes. Talk to us about the costs and energy reductions you can expect. It's good for you and good for our Earth.

GREEN DESIGN
www.alchemyarchitects.com  434-427-5610
We are a manufacturer that sells wholesale to builders & developers throughout New England.
WHY OFF-SITE CONSTRUCTION?

Challenges with any construction project
- Labor
- Soft Costs
- Time lines
- Weather
- Job site security

Minimal site impact to neighborhood
Secure structure
Coordination support for the builder with labor allocation
Reduces risks of weather, security, safety concerns.
Reduces cost over-runs with change orders
Can reduce permit to completion time from 8-10 months* to as quick as 3-4 months.
Lowers builder’s in place costs for the structure

$ Frees up a builder to focus on developing new business

*2014 Survey of Construction
Who we serve:

Architects
Builders
Spec Builders
Municipal offices*
School Housing*
First Time Homebuyer*
Developers (Multifamily)
Empty nesters looking to downsize*
Energy Efficient/High Performance clients*

Retail Budget Costs: $130 - $200 per SF
PBS/NEH
PROJECTS COMPLETED


- Beach Houses
- City Infill lots
- Cottages
- Country Homes
- Municipal
- Primary Residential
Crystal Ball is only as good as to how we respond these challenges:

- New Construction will be subject to and directed by new regulatory standards and compliance
- Aging workforce
- Efficiency of supply chain management
- Educating public and traditional industry the benefits of offsite construction.

Market Potential:

Today - Off Site Construction with modular accounts for less than 3% of all new construction starts.*

* Modularhomecoach.com 1/21/16
Built First Modular Passive House in 2010 in the USA

Production line process is less than 3 weeks

Average annual square footage production 130,000 sf and growing
UNITY HOMES
WALPOLE, NEW HAMPSHIRE
UNITY HOMES

WHY OFF-SITE CONSTRUCTION?

1970’s-1980’s

Search for a Better Way to Build leads to

Timberframing

- Off-Site Fabrication
- Craft Skills
- Software Development
- Specialized Tooling
- Building Systems Innovations
- Craft of Business

1990’s

- Open Built Disentanglement
- Precision Connections
- CNC Automation
- OBGrid
- Site Logistics

2000’s

- Lean Manufacturing
- High Tolerance Interface Stds
- Modularization of Integrated Assemblies
- Short-Cycle Site Assembly
- Kitting

OB Cad Configurator

Supply Chain Integration

Montage Teams

Distributed Manufacturing

WHY OFF-SITE CONSTRUCTION?

1970’s-1980’s

Search for a Better Way to Build leads to

Timberframing

- Off-Site Fabrication
- Craft Skills
- Software Development
- Specialized Tooling
- Building Systems Innovations
- Craft of Business

1990’s

- Open Built Disentanglement
- Precision Connections
- CNC Automation
- OBGrid
- Site Logistics

2000’s

- Lean Manufacturing
- High Tolerance Interface Stds
- Modularization of Integrated Assemblies
- Short-Cycle Site Assembly
- Kitting

OB Cad Configurator

Supply Chain Integration

Montage Teams

Distributed Manufacturing
UNITY HOMES
DEMOGRAPHIC & COSTS

Retirees
Young families
Same Sex Couples
Environmentalists

Current homes
$200K-$400K
$150-$180 psf
UNITY HOMES
PROJECTS COMPLETED

Xyla

Tradd

Zūm

Värm
UNITY HOMES

WHAT’S THE FUTURE HOLD?
### UNITY HOMES

**BUILDING DATA**

**Typical Insulation:**
- Wall: R-28 – 35
- Ceiling/Roof: R-38 – 45
- Air-tightness: <.6ACH@50Pa

**Selected Product Line Features**

<table>
<thead>
<tr>
<th>Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ENERGY</strong></td>
</tr>
<tr>
<td>- Fossil Fuel Free</td>
</tr>
<tr>
<td>- 60 - 100% reduction in H &amp; C expenses over conventional</td>
</tr>
<tr>
<td><strong>BUILDING CYCLE</strong></td>
</tr>
<tr>
<td>- 20 days (2 days for weather-sealed building envelope)</td>
</tr>
<tr>
<td><strong>FINANCING COSTS</strong></td>
</tr>
<tr>
<td>- Reduced term, reduced exposure</td>
</tr>
<tr>
<td><strong>CONSTRUCTION COSTS</strong></td>
</tr>
<tr>
<td>- A 10-15% reduction over a conventional custom-built home</td>
</tr>
<tr>
<td><strong>RANGE OF DESIGN</strong></td>
</tr>
<tr>
<td>- Full range of design configured off of 4 volumetric platforms</td>
</tr>
<tr>
<td><strong>TRIM OPTIONALITY</strong></td>
</tr>
<tr>
<td>- 3-5 Trim Levels: Good, Better, Best, Custom, <em>Branded</em></td>
</tr>
<tr>
<td><strong>HEALTH</strong></td>
</tr>
<tr>
<td>- Highest air quality standard attainable; Low/No VOCs</td>
</tr>
<tr>
<td><strong>REPAIR &amp; REMODEL</strong></td>
</tr>
<tr>
<td>- 70-80% of renovation cost for a conventionally built home</td>
</tr>
<tr>
<td><strong>JOB SITE WASTE</strong></td>
</tr>
<tr>
<td>- &lt; 80 lbs vs 10,500 lbs standard construction</td>
</tr>
<tr>
<td><strong>ENDURANCE GUARANTEE</strong></td>
</tr>
<tr>
<td>- 50 yr guarantee on building envelope (shell)</td>
</tr>
</tbody>
</table>
CAN WE TALK?