Triple Bottom Line of Passive Building

Environmental:
- Improvement in public health outcomes
- Reduction in Carbon Footprint
- Decreased operating expenses in affordable housing
- Decreased per unit subsidy requirements

Social:
- Public health insurance savings
- Limited housing subsidy goes further

Economic: 
A Comparison of Typical Annual Maintenance & Operational Expenses

Affordable Housing

- Other Maintenance & Operational Expenses: 50%
- Utilities (heat/gas/electricity): 25%
- Real Estate Taxes & Insurance: 15%
- Water & Sewer: 10%

Market Rate Housing

- Other Maintenance & Operational Expenses: 50%
- Utilities (heat/gas/electricity): 35%
- Real Estate Taxes & Insurance: 10%
- Water & Sewer: 5%
Pathway 1
Impact on funding: 50% reduction in gas & electric cost

**Uses of Funds**
- Passive House Construction
- Traditional Construction

- Operating Cost
- Development Cost
- Acquisition Cost

**Sources of Funds**
- Bank Loan
- Equity
- Subsidy

- Passive House Construction
- Traditional Construction
New Construction COSTS
# Understanding Costs - Extras and Credits

<table>
<thead>
<tr>
<th>Items That Change For Passive House</th>
<th>Extra</th>
<th>Credit</th>
<th>Unit</th>
<th>Amount</th>
<th>$/sf</th>
</tr>
</thead>
<tbody>
<tr>
<td>Windows fiberglass instead of aluminum</td>
<td>$500</td>
<td>157</td>
<td></td>
<td>$78,500</td>
<td>$2.16</td>
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<tr>
<td>Ranges - electric instead of gas-no gas piping</td>
<td>($400)</td>
<td>25</td>
<td></td>
<td>($10,000)</td>
<td>($0.28)</td>
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<tr>
<td>EIFS insulation instead of brick at façade</td>
<td>($10)</td>
<td>11,912</td>
<td></td>
<td>($119,120)</td>
<td>($3.28)</td>
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<tr>
<td>AC covers/sun screens</td>
<td>$200</td>
<td>157</td>
<td></td>
<td>$31,400</td>
<td>$0.87</td>
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<tr>
<td>AC structure bar</td>
<td>$5</td>
<td>157</td>
<td></td>
<td>$785</td>
<td>$0.02</td>
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<tr>
<td>Reduced heating system</td>
<td>($1,750)</td>
<td>24</td>
<td></td>
<td>($42,000)</td>
<td>($1.16)</td>
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<tr>
<td>ERV instead of typ exhaust only</td>
<td>$750</td>
<td>24</td>
<td></td>
<td>$18,000</td>
<td>$0.50</td>
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<tr>
<td>Insulation completely under slab</td>
<td>$5</td>
<td>6708</td>
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<td>$33,540</td>
<td>$0.92</td>
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<tr>
<td>R 40 at roof instead of R30</td>
<td>$1.50</td>
<td>6708</td>
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<td>$10,062.00</td>
<td>$0.28</td>
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<td>Credit for int insulation</td>
<td>($0.75)</td>
<td>11912</td>
<td></td>
<td>($8,934.00)</td>
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<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td>($7,767.00)</td>
<td>($0.21)</td>
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</tbody>
</table>
New Construction

Mennonite United Revival Apartments

- 24 units, 100% affordable with Sect 8 PBV, Passive House Design
- Hydronic Heating, Unitized ERV, Solar Thermal
- Completed December 2013
- Total Hard Cost $235 sqft

Knickerbocker Commons

- 24 units, 100% affordable, Passive House Design
- Hydronic Heating, Unitized ERV
- Completed June 2014
- Total Hard Costs $225 sqft
How Are We Doing?
Passive House - PERFORMANCE

- July 2016 - July 2017 data
- All buildings hydronic heat
- All building less than 15 years old
- Passive House less than half of heating usage
Passive House - PERFORMANCE

- July 2016–July 2017 data
- All buildings hydronic heat
- All building less than 15 years old
- Passive House EUI 30–50% less
How Can We Help?

• Utility Allowance Reform
• Underwrite to Savings
• Create Incentives for Homegrown Passive House Material Manufacturing
• Retainage withheld from Contractor for Building Performance
• Energy Reserve
  Funded From Developer Fee Performance-based
Future: Sustainable Construction & Renovation

Local Laws/Code Standards

Increased Data Collection

Improved Efficiency/Technology

Renewables & Net Zero

What is Passive House?
A building constructed to “Passive House” standards must meet ultra-energy efficiency criteria for its insulation, space heating and cooling, and primary energy demands within the building. These standards require minimizing heating and cooling loads through substantial insulation, the “passive” use of solar heat and internal heating sources, such as people and electrical equipment, to heat the building, solar shading to cool the building, and heat recovery systems for space heating that is required. Because the building is essentially airtight, a continuous supply of low volume filtered fresh air must also be supplied into living and working spaces, and stale air regularly exhausted from spaces with high efficiency heat exchange to minimize heating losses.

Passive House standards can be applied to both new construction and renovations. For the renovation of existing buildings, the performance standard is slightly more lenient, but still results in a roughly 90 percent reduction in average heating and cooling energy usage and up to a 75 percent reduction in primary energy usage. A Passive House building can also be any type of building, including an apartment building, a school, an office building, a factory, a supermarket, or a single-family house.

Case Study: Knickerbocker Commons Affordable Housing

803 Knickerbocker Avenue, Brooklyn
Architect: Chris Benedikt, AIA
Owner: Ridgewood Bushwick Senior Citizens Council
General Contractor: Galaxy Construction
Construction Cost: $160/Square Foot
No. of Units: 24

Knickerbocker Commons, the first mid-sized apartment building designed to Passive House standards in the United States

Knickerbocker Commons, a six-story residential building containing 24 units of affordable housing, is the country’s first mid-sized apartment building to conform to Passive House design standards. To achieve the strict Passive House standards, each rental unit in Knickerbocker Commons has its own ventilation system and small radiators for heating and air/heat window air conditioning units for cooling. In addition, the building features triple-pane windows and a sculpted exterior that shade windows from the sun in the summer and maximize exposure in the winter. According to the project’s architect, Chris Benedikt, the building will use 95 percent less energy than its typically required to heat a New York City apartment building in the winter.

The apartment is located in the Bushwick neighborhood of Brooklyn and was developed through HPD’s Low Income Rental Program. Of the 24 units, six units will be rented to households earning up to 30 percent of Area Median Income (AMI), five units will be rented to households earning up to 50 percent of AMI, 12 units will be rented to households earning up to 60 percent of AMI, and one unit will be set aside for a building superintendent. In addition to the residential units, the project includes almost 5,000 square feet of community facility space.
THANK YOU
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