Passive House Construction
Passive house
The universal standard in very low energy buildings

1. Annual heat requirement ≤ 15 kWh/m².year
2. Annual active cooling needs* ≤ 15 kWh/m².year
3. Airtightness n50 ≤ 0.6/hour [≤ 1/hour in hot climates]
4. Total primary energy consumption ≤ 120 kWh/m².year

* hot climates

- Triple-glazed windows with high insulated frames (recommended Uw ≤ 0.8 W/m²K)
- Solar thermal collectors (optional)
- Ventilation system with high efficiency heat recovery (double flow ventilation unit)
- Brine-operated ground heat exchanger (optional)
- High thermal insulation of building envelope (recommended Uw ≤ 0.15 W/m²K)

Supply air
Extract air
Exhaust air
Outdoor air
BENEFITS OF PASSIVE building

• Quality of Life
• Innovation
• Environmental
• Economic
## CONSTRUCTION COSTS

<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></td>
<td>157</td>
<td>$78,500</td>
<td>$2.16</td>
</tr>
<tr>
<td>ranges - electric instead of gas-no gas piping</td>
<td></td>
<td>($400)</td>
<td>25</td>
<td>($10,000)</td>
<td>($0.28)</td>
</tr>
<tr>
<td>eifs insulation instead of brick at façade</td>
<td></td>
<td>($10)</td>
<td>11,912</td>
<td>($119,120)</td>
<td>($3.28)</td>
</tr>
<tr>
<td>ac covers/sun screens</td>
<td>$200</td>
<td></td>
<td>157</td>
<td>$31,400</td>
<td>$0.87</td>
</tr>
<tr>
<td>ac structure bar</td>
<td>$5</td>
<td></td>
<td>157</td>
<td>$785</td>
<td>$0.02</td>
</tr>
<tr>
<td>reduced heating system</td>
<td></td>
<td>($1,750)</td>
<td>24</td>
<td>($42,000)</td>
<td>($1.16)</td>
</tr>
<tr>
<td>erv instead of typ exhaust only</td>
<td>$750</td>
<td></td>
<td>24</td>
<td>$18,000</td>
<td>$0.50</td>
</tr>
<tr>
<td>insulation completely under slab</td>
<td>$5</td>
<td></td>
<td>6708</td>
<td>$33,540</td>
<td>$0.92</td>
</tr>
<tr>
<td>R 40 at roof instead of R30</td>
<td>$1.50</td>
<td></td>
<td>6708</td>
<td>$10,062.00</td>
<td>$0.28</td>
</tr>
<tr>
<td>credit for int insulatrion</td>
<td>($0.75)</td>
<td></td>
<td>11912</td>
<td>($8,934.00)</td>
<td>($0.25)</td>
</tr>
</tbody>
</table>

| total                                                                  | ($7,767.00)| ($0.21) |

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7
Knickerbocker Commons

EIFS Shading Functionality
Mennonite United Revival Apartments

Exterior
Effective Passive **Solar Shading**

**Individual Unit** Ventilation

**Continuous** Air Sealing

**Highly Insulated** Walls
Energy Index and Annual Energy Spending

Filter: [site-filtered:[41830, 44622, 45749, 41827, 41836, 42005, 41839, 41842], year:Full Year 2016]

Properties

- Energy Index (Owner, Full Year 2015 Scorecard)
- (Owner, Most Recent Year Scorecard)

EnergyScoreCards.com
Properties in Context
Properties Ranked by Owner Energy Index

Owner vs. Total
Payment Code
Compare to Region
Owner ▼
Central Heating (TTO*) ▼
NY ▼

A
B
C
D

200
150
100
50
0

Owner Energy Index (kBtu/ft²/yr)

424 Melrose Street
Score: A
Index: 29.87
Brooklyn, NY

Selected Properties ▼
Comparison Model ▼
## Usage and Fuel Summary

<table>
<thead>
<tr>
<th>Full Year 2014 - Owner</th>
<th>Heating</th>
<th>Cooling</th>
<th>Baseload</th>
<th>Usage</th>
<th>Rate</th>
<th>Spending</th>
<th># of Accounts</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Electricity (kWh)</strong></td>
<td>7,820</td>
<td>0.00</td>
<td>51,587</td>
<td>59,406</td>
<td>$0.2028</td>
<td>$12,047</td>
<td>1</td>
</tr>
<tr>
<td><strong>Gas (therms)</strong></td>
<td>1,443</td>
<td>0.00</td>
<td>2,344</td>
<td>3,787</td>
<td>$1.10</td>
<td>$4,171</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total Energy (mmBTU)</strong></td>
<td>171</td>
<td>0.00</td>
<td>410</td>
<td>581</td>
<td>$27.90</td>
<td>$16,218</td>
<td>2</td>
</tr>
<tr>
<td><strong>Water (kGallons)</strong></td>
<td>0.00</td>
<td>0.00</td>
<td>1,048</td>
<td>1,048</td>
<td>$12.70</td>
<td>$13,312</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total Utilities</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$28,530</td>
<td>3</td>
</tr>
</tbody>
</table>

### Full Year 2014 - Owner - Total Utilities

![Graph showing energy usage from Jan to Dec 2014](image)

(01 Jan 2014 - 31 Dec 2014)
50-80% utility savings
# PRH UTILITY analysis

<table>
<thead>
<tr>
<th></th>
<th>Water</th>
<th>Gas</th>
<th>Electric</th>
<th>Oil</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015 Utilities</td>
<td>$308,231.17</td>
<td>$164,828.00</td>
<td>$112,691.15</td>
<td>$131,736.33</td>
<td>$717,486.65</td>
</tr>
<tr>
<td>Passive House Rehab Estimates</td>
<td>$246,584.94</td>
<td>$55,202.40</td>
<td>$98,158.88</td>
<td>$16,477.15</td>
<td>$416,423.36</td>
</tr>
</tbody>
</table>

Est. Annual Savings
Supportable Debt based on savings
Supportable Debt (per unit)

ASSUMPTIONS
20% Water savings
38kBTU/sqft/yr or 70% savings from current usage
10% DHW savings

$301,063.29
$4,184,569.37
$15,850.64
Future of High Efficiency Construction

Local Laws

Increased Data Collection

Improved Efficiency/Technology

Renewables & Net Zero