Single family home with two floors and full basement in Honeoye Falls, NY

PH Designer: Matthew Bowers – Airtight Services Inc
Architect: William Grate – Grater Architects PC
Builder: Tad Garbacik – Garbacik Construction

Special features: Drain Water Heat Exchanger; Whole House IAQ and Energy monitoring system

U-Value exterior wall: 0.103 W/(m²K)  PHPP Space Heating Demand: 15 kWh/(m²a)
U-Value exterior wall BG: 0.094 W/(m²K)  PHPP Primary Energy Demand: 66 kWh/(m²a)
U-Value roof: 0.057 W/(m²K)   Air Test (n50): 0.1 l/h
U-Value windows: 0.92 W/(m²K)   Heat recovery efficiency: 77%
2. Construction Task

Rochester Passive House, located in the rural setting of Honeoye Falls, NY, is certainly an example of how comfort is achieved though energy efficiency.

The 270 m² home’s traditional farmhouse aesthetic cloaks a 16-inch double-wall assembly that is insulated with dense-packed cellulose, achieving an R-55. The interior load-bearing 2x4 wall acts as a service cavity. The carefully sealed ZIP system on the exterior side of the interior wall is the air barrier layer. A 1.5-inch rain screen gap and a weather resistant barrier layer on the exterior side of the double-wall assembly guard against moisture intrusion.

The southern glazing with optimized overhangs ensures maximum solar gain in the winter months and full shade in the summer months. For more information or details visit: RochesterPassiveHouse.blogspot.com

This project was certified by the Passive House Academy (PHA)
3. Elevations

West Elevation

South Elevation

East Elevation

South Elevation
4. Interior Photograph
5. Cross-sections

Longitudinal cross-section:

Lateral section at main house / living room / entry:
6. Floor Plans

Basement

1st Floor

2nd Floor
7. Construction of Floor Slab / Basement Ceiling

The basement slab was constructed with 15 Mil Radon Barrier as the primary air barrier followed by was installed before 8" of EPS Insulation and a 4" Slab. The Basement wall is ICF construction with 2x4 wall installed 8" inboard. The 8" cavity is insulated with dense packed cellulose.

8" EPS Insulation  Slab Poured to Perimeter EPS  8" Cavity being insulated
8. Construction of the Exterior Walls

Double 2x4 wall construction with interior wall load bearing. Primary air barrier is Zip System. Insulated with Dense packed cellulose. Interior Service Cavity is insulated with damp spray cellulose.

Mento Plus bridged the inside face of ICF to Zip System around the Rim Joist.

Windows were sheathed over to do blower door test before window installation.
9. Construction Roof / Ceiling of the Top Floor

The roof system consists of wood trusses with blown in cellulose insulation above the Zip System Air Barrier.

Service Cavity created with 2x4 on flat with ½” OSB Scraps

Truss chords were painted at 28” so insulated knew he had to cover the orange marks
10. Windows and Installation of the Window

- Description of the construction of the window (frame): Zola Thermo uPVC window
- U-Value of frame Uf: 1.0 W/(m²K)
- Construction type glazing: Triple glazing with Swisspacer V
- U-Value of glass/ Ug: 0.60 W/(m²K)
- g-Value of glazing: 0.62 (South) / 0.49 (North) / 0.28 (East and West)
11. Airtight Building Envelope

- Roof: Zip System with taped joints
- Exterior wall: Zip system sheathing with taped joints
- Foundation wall: Inside face of ICF Wall

Pressurization test conducted Airtight Services Inc.

<table>
<thead>
<tr>
<th>Test Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Airflow at 50 Pascals: 49 CFM50 (±/− 3.9 %)</td>
</tr>
<tr>
<td>2. Leakage Area: 2.7 in² LBL ELA @ 4 Pa</td>
</tr>
<tr>
<td>3. Building Leakage Curve: Flow Coefficient (C) = 2.4 (±/− 24.1 %)</td>
</tr>
<tr>
<td>Exponent (n) = 0.765 (±/− 0.068)</td>
</tr>
<tr>
<td>Correlation Coefficient = 0.99419</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test Setting:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Standard: REGNET Multi-Point Test</td>
</tr>
<tr>
<td>Test Mode: Pressurization</td>
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</table>

<table>
<thead>
<tr>
<th>Infiltration Estimates</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Estimated Average Annual Infiltration Rate: 3.0 CFM</td>
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<tr>
<td>0.01 ACH</td>
</tr>
<tr>
<td>0.7 CFM per person</td>
</tr>
<tr>
<td>2. Estimated Design Infiltration Rate: Winter: 5.2 CFM</td>
</tr>
<tr>
<td>0.01 ACH</td>
</tr>
<tr>
<td>Summer: 3.7 CFM</td>
</tr>
<tr>
<td>0.01 ACH</td>
</tr>
</tbody>
</table>

Date of Test: 6/29/2017  Test File: 0530 Bowers multipoint BD 50CFM Pres PHI 29Jun17
12. Layout of the ventilation system ducting
Ventilation ducting utilizes Zehnder Comfotube system. Drawings below are labeled with supply and return locations.
13. Ventilation Unit / Central Ventilation Unit
The home utilizes a central heat recovery ventilator located in the basement, connected to round ducts that distribute air in a home-run arrangement from a manifold.
- Product type of the ventilation unit: Zehnder Comfoair 350
- Effective heat recovery: 0.84
- Electrical efficiency [Wh/m$^3$]: 0.29 Wh/m$^3$
14. Heat Supply
Heating and cooling is provided by 2 separate ductless minisplit heat pumps

1st Floor:

[Diagram of 1st Floor layout]

2nd Floor:

[Diagram of 2nd Floor layout]
## 15. Short Documentation of PHPP-Results (Verification Sheet)

<table>
<thead>
<tr>
<th>Specific building demands with reference to the treated floor area</th>
<th>Treated floor area</th>
<th>Requirements</th>
<th>Fulfilled?*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Space heating</strong></td>
<td>270.0 m²</td>
<td>15 kWh/(m²a)</td>
<td>yes</td>
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<tr>
<td>Heating demand</td>
<td>15 kWh/(m²a)</td>
<td>yes</td>
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<tr>
<td>Heating load</td>
<td>10 W/m²</td>
<td>yes</td>
<td></td>
</tr>
<tr>
<td><strong>Space cooling</strong></td>
<td></td>
<td>10 W/m²</td>
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</tr>
<tr>
<td>Overall specif. space cooling demand</td>
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<td>-</td>
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<tr>
<td>Cooling load</td>
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<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Frequency of overheating (&gt; 25 °C)</td>
<td>1.8 %</td>
<td>-</td>
<td>-</td>
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<tr>
<td><strong>Primary energy</strong></td>
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<td>120 kWh/(m²a)</td>
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<tr>
<td>Heating, cooling, dehumidification, DHW, auxiliary electricity, lighting, electrical appliances</td>
<td>90 kWh/(m²a)</td>
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</tr>
<tr>
<td>DHW, space heating and auxiliary electricity</td>
<td>49 kWh/(m²a)</td>
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<td>-</td>
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<tr>
<td>Specific primary energy reduction through solar electricity</td>
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<tr>
<td><strong>Airtightness</strong></td>
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<td>0.6 1/h</td>
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<tr>
<td>Pressurization test result n₅₀</td>
<td>0.1 1/h</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

* empty field: data missing; ‘-’: no requirement

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15. Short Documentation of PHPP-Results (Verification Sheet)
16. Construction costs
Withheld.

17. Year of Construction
2016-2017

18. Information about the designer / Architect
Matthew Bowers spent 6 years in the Navy as a nuclear engineer and became interested in Thermodynamics and Fluid Mechanics. Once his tour was over, he attended RIT's Mechanical Engineering Technology Program where he wanted to become a HVAC designer. While at RIT he learned of “homes so efficient they don’t need furnaces”. He then focused his career path on Passive House. He graduated with the highest honors in 2010. Since 2013 Bowers has worked as a Certified Passive House Consultant and Tradesman and HERS Rater. In 2017 Matt started his own Company - Rochester Passive House Consulting - specializing in high performance homes. He has been featured in the Journal of Light Construction’s Energy Column under multiple topics including Blower Door Testing for extremely tight homes, Infrared Scanning, Blower Door Testing and Retrofitting airtightness and trouble spots for airtightness in new homes. He was the designer of Rochester’s 1st Certified Passive House – his personal home. Matt started certifying Passive Houses in 2019 and providing assistance with PHPP and FLIXO.

19. Information about the planner of building services
Matthew Bowers – Airtight Services Inc

20. Information about the planner of building physics
Airtight Services Inc – 5856 DeFisher Rd Marion, NY 14505

21. Information about the structural designer
Grater Architects PC

22. User’s experiences
RochesterPassiveHouse.blogspot.com
Very Satisfied with house

23. Available Research Materials / Publications
Listed on Passive House Database:

Blog on Construction and further details:
RochesterPassiveHouse.blogspot.com