

Building a Net-Zero Home in Middletown, NJ

Once becoming empty nesters, John and Diane Burke decided it was time for them to downsize, sell their home in Rumson, New Jersey, and embark on a new journey. After searching for years, they finally found the perfect plot of land, totaling 11 acres in Middletown. The Burkes completed their new 3,000 square foot home in 2023.

The Burke's were inspired by their week-long stay at a home in New Mexico that was completely off the grid and remained comfortable even when the temperature plunged to 10 degrees. It felt like the right fit for them, leading the Burkes on a path to learn more about Passive Houses and eventually undertaking the construction process.

They were drawn to the energy efficiency of the [Passive House Standard](#), which provides greater comfort in all seasons. The Passive House Standard is a building certification that focuses on the measured energy efficiency and comfort levels of a given building. Passive Houses are able to achieve energy use reductions of 75% or more, while also providing a comfortable, draft-free and allergen-free indoor environment.

The Construction Process

The Burke's did their homework to learn more about this relatively new approach to construction. They visited several Passive Houses throughout the state and attended Passive House conferences. After considering custom construction, they opted for Unity Homes, which offers panelized high-performance, carbon-neutral houses that are produced offsite in a factory and assembled onsite. Unity Homes provided flexibility in the design, allowing the couple to customize their house to their needs, including a larger garage and open, flowing spaces.

The prefabricated panels were delivered to the site and assembled by Unity Homes and their contractor, Tommy Gemellaro, of T.K.O. Operations LLC. After this, exterior finishes were installed, and the interior was completed. "I love Unity, and I love Tommy," John said. "He was careful, honest, thoughtful and open-minded. He's been a builder for 45 years, but this was completely different. Tommy called Unity often; they were helpful."

The total cost of their home, including both Unity Homes and final construction, was projected to be \$900,000, or about \$300 per square foot. Unfortunately, the cost for final construction escalated since the work was done during the pandemic when prices for many construction supplies doubled. The Burkes estimate that the price to complete a similar home today would be close to the original \$900,000 budget. Unity Homes delivered the home for the pre-pandemic fixed price of \$450,000.

HVAC System

The Burke's house has 18-inch-thick exterior walls filled with densely packed cellulose, and highly efficient, triple-pane European windows. The walls weren't only insulated, but also airtight, leading to an impressive ACH (Air Changes per Hour) of 0.227. In comparison, average homes in New Jersey have about 10 ACH, and older drafty homes can have 20, while current building codes aim for 3 ACH. This level of airtightness makes the home incredibly quiet, dust-free, and comfortable year-round.

Diane, who has allergies, appreciated the air-tight construction, thick walls, and the Zehnder ComfoAir Q350 ERV (Energy Recovery Ventilation) system, which ensures excellent indoor air quality.

The home's heating and cooling are managed by a single outdoor Mitsubishi heat pump condenser connected to three mini-split room units. The heat pump works seamlessly with the Zehnder ERV, which circulates fresh air throughout the house while capturing 90% of the indoor air temperature, minimizing energy loss.

John was particularly impressed by the intelligence of the mini-split room units, or heads. Sensors divide each room into small cubes, allowing precise temperature control — something that wouldn't be possible with a traditional ducted system. The entire HVAC setup, including the heat pump and ERV, cost about \$40,000.

Solar Power and Energy Efficiency

In addition to the heat pump system, the Burke's home includes a 15.6 kW solar array with battery backup. This not only allows them to produce more energy than they consume (even while charging two electric vehicles), but also keeps their home running when the local electric grid loses power during powerful storms.

The couple also installed a Fisher-Paykel induction stove, which saves energy since it doesn't heat the cooking surface, and they're amazed at the performance of the stove and how quickly it boils water.

The added bonus of having an energy efficient home is also having virtually nonexistent energy bills. The Burkes pay only a \$3.50 monthly connection fee to JCP&L, their electricity provider, which also includes powering their EV car and truck batteries, and since they often produce more solar than they can use, they're able to sell back to the grid.

Lessons Learned

The Burke's have invited many friends, neighbors, and the community to visit their home. Many are surprised to learn the panelized home that was partially built in a factory, feels entirely as it should — quiet, comfortable, and modern. John's advice to other homeowners is simple: "Just do it! Heat pumps, mini-splits, and ERVs are great."

The couple is incredibly satisfied living in their modern, comfortable, quiet, and healthy home — which also consumes zero energy.