

Better Than Code

Passive Powerhouse

The largest PHIUS certified project in New England is also affordable.

BY CATI O'KEEFE

THE 54,000-SQUARE-FOOT VILLAGE Centre Apartments in Brewer, Maine—developed and owned by Community Housing of Maine (CHOM)—was just awarded its final PHIUS (Passive House Institute U.S.) certification after opening its doors in May. And the best news? It's an affordable project.

The 48-unit building—designed by CWS Architects with sustainability consulting by Thornton Tomasetti and constructed by Wright-Ryan Construction—had to be the epitome of energy efficiency. Wright-Ryan developed cost-benefit analysis and detailed estimates to support challenging decisions between various window details, five wall section alternatives, and more than ten different HVAC options to help the team select and install the highest-performing, most cost-effective systems possible.

It also leveraged progressive methodologies in project management, including Lean Construction, to ensure the achievement of the stringent results set forth by PHIUS.

The project is estimated to be over 60% more energy efficient than a code building and is targeting a site energy use intensity of 22 kbtu/sf/yr. These results were achieved within the fixed cost of construction (roughly \$139/sf) defined by the project requirements as a publicly-funded development under the Maine State Housing Authority.

Cordelia Pitman, Director of Preconstruction Services for Wright-Ryan, is thrilled with how the project turned out and credits a collaborative relationship with all parties for the results. “These [affordable] projects are severely budget challenged,” she points out. “Maine sets aggressive targets for cost per unit of housing. We are not a wealthy state, and we don't think low-income housing should cost hundreds of thousands a unit.”

“Passive House means comfort and efficiency,” notes CHOM Executive Director, Cullen Ryan. “This building is super insulated, and the development team carefully ensured that the building envelope was completely tight.”

Let Models Inform Choices

Once it was determined Passive House was the route, the team used 3D energy modeling to figure out what systems and products to use. “The beauty of Passive House is that it is basically a performance goal,” Pitman explains. “The building has to consume a limited amount of energy, and occupant comfort is a critical metric. It's not based on how far you schlepped your drywall or where you bought your brick.”

Because human comfort is a main driver in the Passive House program, the team had to pay careful attention to product choices. “The temperature and humidity of the units needs to stay near constant. You can see how different choices would affect the occupants. For example, inside the window can't be 32 F; it has to be comfortable to the extent that you'd want to sit by the window year-round,” Pitman says.

Like all projects, trade-offs had to be made. With a tight budget, the team consulted the modeling and opted to move insulation from under the slab to the walls and to amp up air sealing. The group also explored a large number of window options and ultimately chose to invest in a more energy efficient window because it reduced the HVAC load appreciably.

Hold Feet to the Fire

When it came to air sealing, the team got down and dirty. “Air sealing is a challenge on the exterior shell,” Pitman says. “We used a spray-applied air vapor barrier, lapping it into windows and door openings. There was specialized tape at windows and doors and caulking at electrical and plumbing penetrations. We asked ourselves, ‘Who is responsible for air sealing these penetrations properly in the field?’”

Once subcontractors were selected, Rick Bergeron, Wright-Ryan's Chief Estimator, created a “very simple” spreadsheet that coupled each air sealing scope with a sub. “We literally said to them: ‘This is what we have you down as responsible for. Do you take responsibility for it?’”

During construction the team checked their work as they went. “Several people on our staff are trained to use the blower door apparatus we have in-house,” Pitman says.

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“And we found and corrected leaks: ‘No one put the ring around the plumbing,’ ‘No one caulked this.’ You really need to do your work to make sure these things get done.”

Horizon Residential Energy Services Maine served as the PHIUS Rater and conducted readings to verify compliance as well.

Flexibility Wins the Day

Because of the high R-Value of the envelope the team was able to downsize the HVAC and leverage ERVs over traditional systems. The team also received a waiver from the State of Maine for an exception to use electric (instead of hot water) baseboard heat. “The state has legislation in place to shelter occupants from potentially high electric rates. However, with today’s more efficient heat pumps, the tight envelope, ERVs tempering air, and human heat and cooking heat, the demand for heat from electric is low.”

According to Cullen Ryan, CHOM’s Executive Director, subtracting a heating system counterbalanced most of the cost of the improvements. “For very cold winter days, there is some electric heat—about the equivalent of a third of a hairdryer in each apartment. That’s very minimal, and it is quite possible it will never be used, even in this climate. Imagine not needing any heat in Maine for most of the winter.”

Overall the design and construction costs were approximately 3% higher than a typical building, but Erin Cooperrider, Development Director for CHOM, states, “we think that was worth the effort and investment, and we are pleased to be a pioneer in this area.”

Although AC is not required, Wright-Ryan priced split systems as an add-alternate, which CHOM was able to select during construction. (Window units were not an

option because casement or tilt-turn windows were spec’d for their higher efficiency compared with double hung.)

“What surprised me was the ERVs,” Pitman says. “One product offered tiny ERV tubes in the wall that would draw in fresh air and recover heat. That would have been

the cheapest option, but we needed two for every living, dining and bedroom—that’s over 300 holes in the building!” Shuddering at the thought of potential air infiltration, the team spec’d one ERV for each stack of 12 units.

Pitman also notes that the results are tougher to achieve in Maine than in more temperate Europe where the Passive House program originated. “PHIUS developed the PHIUS+ 2015 pilot program to define climate-specific standards. To achieve the aggressive results here you need to crush your energy use with an efficient envelope and offset with solar or wind.” Village Centre features a 100-panel, roof-mounted 26kW Photovoltaic Array that is grid connected

Katrin Klingenberg, Co-Founder and Executive Director of PHIUS, is excited about the exponential growth of PHIUS+ certification for affordable multifamily projects in recent years. “Hats off to CHOM and the entire development team on going the extra mile to achieve PHIUS+ certification for this outstanding project and working collaboratively to achieve the health, comfort, safety, resiliency, and efficiency benefits that are the hallmarks of the passive building standard,” she says. “The success of projects like Village Centre sends a powerful message to the industry that these levels of comfort and performance are possible and affordable and serves as an inspiration and model for what is achievable for future building projects in North America.” CW



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**Cordelia Pitman,
Director of Preconstruction
Services, Wright-Ryan**