Glens Falls Vertical Farm Project Heated by a 2-t Heat Pump

Jessie Haas

After considerable supply chain delays, Glens Falls, NY, is close to going live with its vertical farm pilot project at 22 Ridge Street. The project is funded in part through a $96,700 grant from Empire State Development's Smart Cities Innovation Partnership, with partnership support from the New York city-based Re-Nuble company. The grant supplied 50% of the cost, with the city and other partners putting in the remainder. Building owner Brian Bronzino offered the space at no charge for the duration of the pilot project.

Essentially a box within a box, the farm unit consists of a 20-by-24-by-10 foot plastic-walled cube, built inside a large third story room in an old downtown building. Inside the cube are racks on rolling tracks containing grow trays and energy-efficent LED lights. The configuration helps keep the box as compact as possible, thereby saving energy. The cube will be heated and cooled by a Daikin two-ton heat pump installed on the roof of the building. A Vert-Air air handling system that provides circulation is designed into the grow racks, which also deliver and recirculate organic hydroponic nutrients. The growing medium is fully compostable. Once the reverse-osmosis unit is installed to purify the water, the project is ready to go. Director of Economic Development Jeff Flagg expressed hope that it would start up in February.

Currently the plan is for the farm to be as automated as possible. National Grid has been helpful in providing the capacity for remote monitoring and sensing, which should help keep manual labor to a minimum. Originally, project planners hoped to create jobs in what was expected to be a depressed post-pandemic labor market. But the realities of tight labor supply may end up fitting well with the realities of indoor vertical farming. Sheltered from pests and adverse weather, the plants should grow contentedly without much need for care. The racks will be planted and harvested on a six week cycle. In any one week, one rack should be planted and one should be ready for harvest with two-thirds of the plants requiring little or no care.

Top: Construction of the outside box. Middle: Inside the box are racks on rolling tracks containing growing trays. Bottom: The farm is a plastic-walled cube, built inside a large third story room on an old downtown building. (Photos: Sustainable PR)

Flagg emphasizes that this is a pilot project, as does Re-Nuble in the articles on its website. The goal is to create a template, Flagg said, "a reasonably replicable model that identifies pain points and opportunities that can be replicated in any community."

A "pain point" for the Glens Falls project is the third story location, which necessitates venting the heat pump through the roof. Opportunities? The space was vacant, centrally located, and free. There are many empty industrial spaces in the northeast that might profitably host box-within-a-box vertical farms.

Part of the pilot project is to figure out what makes sense in terms of delivering the produce. The avoided carbon footprint of not trucking in lettuce from California should not be squandered by delivering in too wide a radius. Flagg hopes to figure out what distance makes sense. Is Lake George (11 miles) too far away? Is Saratoga (32 miles)? Should those municipalities have their own vertical farms? As for hyperlocal delivery, bikes or electric robots similar to the small delivery units that have been operating on campuses like Flagg's alma mater, Bowling Green University, might be employed.

Flagg emphasizes that these decisions are not his to make. Glens Falls is not going into the farming business. Once the pilot project is tested for and the template developed, it's time for commercial entities to dive in and make their own decisions.

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The farm units are heated and cooled by a Daikin two-ton heat pump installed on the roof of the building. (Courtesy photo)

Champlain College McDonald Hall Deep Energy Retrofit

Barb and Greg Whitchurch

"We track every BTU in every building." – Nic Anderson, Sr. Director of Operations and Campus Planning, Champlain College

When is a better time to inculcate young adults with socially responsible values than while they're in school? Regardless of age or education level, why not provide them with examples of good moral principles in action, a living environment where those principles are embedded all around them all day long, and surroundings that showcase the practices and technology that enable sustainable living?

This article was triggered by Champlain College's (CC) recent ribbon-cutting for McDonald Hall (www.bit.ly/vbm-mc-donald), a deep energy retrofit of a 19th Century mansion-turned-dormitory for first-year students. Unless one has done it before, such an ambitious project as this might seem daunting. But CC has done it before at Perry Hall (www.bit.ly/ln-perry-hall) and with these same partners as below.

We share with you here the various companies and professionals who made this happen – even in the face of COVID, supply chain delays, and inflation pressures – and who have done it before for other clients. As CC well knows, once accomplished, this climate-friendly, low-pollution, healthful and cost-saving approach is easily replicated.

Setting the goals – specific metrics for energy loads, indoor air quality (IAQ) and comfort, while figuring out how to accomplish those goals within the restrictions of historic preservation requires some fancy footwork in the design stage. Having an experienced architectural firm such as Colin Lindberg is very helpful. In turn, Lindberg has established relationships with several firms to form the team for this project.

In order to reduce the sizes, costs and energy needs of the heating and cooling equipment, they first addressed air tightness and insulation of the envelope: the outside walls, basement and roof. Where necessary, they dug down as far as 12 feet around the foundation to install foam board and to air-seal those "ancient" walls. They removed the top floor's ceilings, and foamed and sealed the underside of the roof. They drilled holes in all of the window and door jambs and foamed those, while upgrading the windows themselves. All other penetrations (chimneys, etc.) were carefully addressed separately. This work made controlling the interior temperatures and IAQ a far less costly endeavor, and moisture control was easily piggybacked in the same mechanicals.

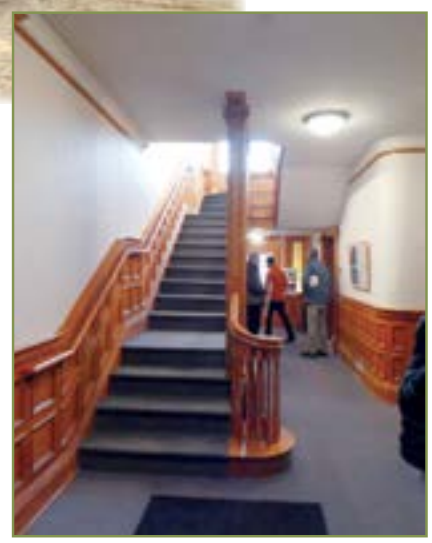
"After" photos of McDonald Hall, now a fossil-fuel-free, super-efficient dormitory. Note the carriage entrance at right. (Photos: Whitchurch)

This is now a fossil fuel-free building, and the "natural gas" lines have all been recycled!

Twelve years ago, CC drilled a number of 800-foot geothermal wells near the aforementioned Perry Hall. McDonald is the eighth building to tap into that resource for extremely efficient heating and cooling. The year-round 50-degree water flows through a large heat exchanger where coolant from the three Daikin heat pump condensers either sheds or picks up heat, as needed (www.bit.ly/daikin-w2a). The coolant is then pumped to the 19 heat pump heads located throughout the building.

The improved envelope and state-of-the-art HVAC permit vertical zoning of the living spaces so that the microclimate around the building – instantaneous solar heating, shading from trees and other buildings – can be counterbalanced. For example, in the "shoulder" seasons the south side can be cooled as the sun strikes it, while the shaded side is still being warmed. This flexibility provides finely tuned temperatures. Each room has a thermostat which can be adjusted within set limits.

IAQ is handled separately by an energy recovery ventilator (ERV: e.g., www.bit.ly/tempeff-ex). This unit removes stale inside air (including bathroom fans) and replaces it with highly-filtered "fresh" outside air. At the same time, it tempers the incoming air with the heating or cooling which has already been invested in the stale air. Thus, it provides savings over simple exhaust fan ventilation or traditional leaky building "breathing."



Speaking of not throwing away hard-earned heat, the sink and shower drains all exit the building through drain water heat recovery piping, in which the final drainpipe is wrapped with a coil of incoming service water so that it pre-heats it a bit before it enters the hot water tanks. There are three 80-gallon Rheem Proterra air-source heat pump (ASHP) hot water tanks within the utility room, where some waste heat of the other systems can be put to good use.

Of course, maintaining the historical visual integrity of a landmark building like this requires compromises, and this isall the more reason to take advantage of every possible pollution-fighting new technology one can. Geothermal energy and a high-performance envelope surely help when one is trying to hide the new stuff behind the beautiful old stuff – no big condensing heat exchangers outside or on the roof; inside, only small heat pump heads where necessary.

The lower level and first floors are fully ADA-compliant. All showers are completely enclosed, with an included changing stall. Special attention was given to making all rooms convenient and easy to navigate; space-saving furniture was chosen to preserve the feeling of spaciousness.

Champlain College has done all this even as it adds "carbon neutrality" to its goals! As one contemplates joining in such a pursuit of more responsible operations and examines the opportunities taken by CC (www.bit.ly/ccollege-sustain), one might well feel overwhelmed at the magnitude of their accomplishments. But that's not how they began! Taking that first step, then leveraging that success into further steps, gets one going down the path to someday recapturing the climate and environment we took for granted for too long.

The Whitchurches drive only EVs which also serve to back up their ownerdesigned net-zero+ Passive House (www.bit.do/phc-vtbiz2), and are Board members of www.VTPH.org. See also: www.bit.do/mdx-mec-bldg and www.bit.ly/get-w-build. ♻

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Could this spread in the region? Should it? Hydroponics are controversial within some parts of the organic and regenerative farming community, but there is no doubt that with care, growing indoors can save shipping costs, both to the consumer and the environment. Especially on the east coast, a continent away from the source of most winter salad greens grown in this country, projects like this may have strong economic and environmental benefits. The model of constructing grow boxes within disused space has some strong carbon footprint benefits as well. All in all, a project to keep an eye on, as hopefully the grow lights switch on in a few weeks.

Jessie Haas lives in an off-grid cabin in southern Vermont with husband and fellow G.E.T. contributor Michael J. Daley. She's the author of over 40 books, including the Bramble and Maggie series.

***Links:** Glens Falls, NY - Official Website | Official Website: cityofglensfalls.com; Projects – Re-Nuble: https://bit.ly/Re-Nuble-projects.* ♻