

RE-IMAGINED HISTORIC FIRE STATION MAXIMIZES FIRE FIGHTER SAFETY AND ENERGY EFFICIENCY

Michael J. Daley

The grand opening in April this year of the new Central Fire Station in Lebanon, New Hampshire (www.lebanonnh.gov/) was marked by a ceremonial uncoupling of linked fire hoses strung in place of the more familiar ribbon. This is a traditional way to let the citizens know a new fire station is complete and ready to serve the community.

The design and construction of the \$23.78 million facility was anything but traditional. The need to replace the Central Station was identified in 2022 as the building was constructed in 1954 and no longer met current operational needs. ReArch Construction (www.rearchconstruction.com) was the construction manager. Lavallee Brensinger Architects (www.lbpa.com/project/fire-station-1/) was chosen to provide the design and directed to aim for net-zero-ready status.

The City of Lebanon chose to reach the highest standard of energy efficient design by participating in the NHSaves (www.nhsaves.com) program and partnering with Liberty (www.libertyutilities.com) to take advantage of the best state of the art technical assistance and highest cost savings incentives. NHSaves requires a public safety facility to achieve an energy use intensity (EUI) of 35 or less to receive a construction incentive of \$1.50 per square foot.

EUI is calculated as annual energy



Lebanon, NH's Central Fire Station was designed to aim for net-zero-ready status which included solar, heat pumps, and RTUs on the roof. (ReArch)

consumption divided by building area. The Central Fire Station design EUI is 26.9 based on the 24,531 square foot building. The project qualified and is expected to receive over \$50,000 in energy efficiency incentives. Franklin Energy (www.franklinenergy-nhsaves.com) was instrumental in helping the town navigate through the evaluation and application process required by Liberty's energy efficiency program.

NHSaves is a performance-based program, and the final payments will depend on the actual performance as recorded during the next year. As the partner utility, Liberty will pay the City these savings. In return, the utility and ratepayers benefit by deferring the

need for expensive new electricity generation and limiting harmful emissions.

Because the new Central Fire Station was to occupy the same historic site as the original Central Fire Station, several challenges were encountered meeting energy goals. The site location and size were not sufficient to support a geo-thermal well-field. To maintain required clearances to the neighboring lot lines, much of the mechanical equipment (heat pumps, exhaust fans, dedicated outdoor air system, energy recovery ventilation units and intake vents) needed to be consolidated on the roof levels. Operating as an emergency center requires building conditions to be maintained during periods of power loss and periods of extremely low ambient temperatures.

Another handicap toward high efficiency came from a key feature of the new facility – a state-of-the-art decontamination zone. Exposure to toxic particles from our modern chemicalized buildings is the main occupational hazard faced by firefighters. The decontamination area allows cleaning of gear and bodies after a fire, moving

personnel from a dirty zone to clean zone. Because of the risk of cross-contamination of water systems, heat recovery strategies for wastewater could not be employed.

Nevertheless, many specialized air-to-air heat pumps and heat exchange and recovery strategies were installed throughout

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The interior vehicle bay was designed with LED lights and energy-saving ventilation systems. (Photo: Patrick Rogers)

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LEARNING, NETWORKING, AND BETTER BUILDING:

Inside Vermont's Premier Building Conference

Barb and Greg Whitchurch

If you want to know where the region's top builders, architects, and eco-conscious minds gather to talk about the future of housing, look no further than Efficiency Vermont's Better Building by Design (BBD) conference. As regular attendees, we can tell you firsthand that the energy in the room is unmatched. It is the premier event for anyone interested in the best ways to design and construct energy-efficient buildings, be they commercial, municipal or residential. Whether you are a seasoned contractor, a student, or a homeowner wanting to learn, BBD offers incredible workshops and networking opportunities.

Interestingly, the cutting-edge building science discussed currently looks back to the 1970s. After the energy crises of that decade subsided, many sustainable practices fell out of favor. Today, the industry is happily embracing those environmentally responsible roots again—just with much better technology.

At this year's conference, two presentations we were able to attend showed exactly how far the industry has come, and where it is going.



Efficiency Vermont's Better Building by Design conference. (Courtesy photo)

Can We Afford This? Balancing the "Triple Bottom Line"

Jacob Deva Racusin and Mike Xenakis (New Frameworks, www.NewFrameworks.com/) hosted a fascinating workshop focused on affordability, climate impact, and what they call the "triple bottom line." These aspects are a part of every project, but they are not always addressed directly and carefully.

People (Social Good): This focuses on the health, safety, and comfort of the people living in the home, as well as fair labor practices for the workers building it.

Planet (Environmental Good): This means using local, eco-friendly materials and re-

ducing the building's overall climate impact.

Prosperity (Financial Good): This ensures the project makes sense financially, supports the local economy, and generates ethical revenue.

The presenters pointed out an important truth: homebuyers don't usually walk into an office asking to buy "decarbonization." Instead, they want to buy comfort, affordability, health, and safety. Racusin and Xenakis reminded us that every

construction decision carries a risk. For example, making a building incredibly airtight without proper vapor control can lead to moisture issues and long-term health risks for the occupants. Their golden rule? Mechanical ventilation is an absolute requirement in a modern tight, high-efficiency building.

Real-World Results: The Putney School Dorms

Another highlight was a presentation by Andy Shapiro (www.veep.org/our-staff-board/andy-shapiro/). Shapiro is a regionally famous energy expert, known not just for his brilliant engineering, but for his refreshing honesty. Rather than just patting himself on the back, he is highly critical of his own

work—a trait that makes him a favorite among newer builders looking to learn. Shapiro shared a full year of monitored data from the Putney School's two new high-performance dorms, a project we have highlighted in *G.E.T.* in the past (www.bit.ly/get-putney1). He walked the audience through the real-world performance of the buildings' heavy-duty insulation, triple-pane windows, and high-tech moisture control systems.

He also kept the crowd laughing with some real-world school statistics. While the school decided against composting toilets (turns out, students and parents weren't quite ready for that!), they did successfully implement gender-neutral bathrooms. He also shared a funny data point: the co-ed dorm used twice as much water as the all-male dorm!

Endless Opportunities to Learn: These two workshops represent just a fraction of what BBD has to offer. For professionals looking to maintain their licenses, many of the classes offer continuing education credits for organizations such as BPI, AIA, PHIUS, RESNET, and CSI/AEE.

Whether you want to learn the latest shortcuts for high-efficiency construction or simply want to connect with a community dedicated to a greener future, keep an eye out for next year's conference. To learn more, visit www.efficiencyvermont.com/partners/trade/bbd. 

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the facility by ARC Mechanical Contractors (www.arcmech.com). Revision Energy (www.revisionenergy.com) installed 60 kW of solar panels on the very crowded roof space. The solar array supplies 58% of the building's needs, including heating, and was grant funded with planning support from the city's planning and energy departments.

Most occupied spaces are conditioned through multi-zone variable refrigerant flow systems allowing for simultaneous heat and cooling operation as well as recovery and transfer of heating or cooling energy between disparate indoor spaces.

An obvious challenge is the fact that responding to emergencies requires opening the huge bay area to immediate exposure to external climate any time of day or night. To

mitigate these frequent and serious losses, the design incorporated dedicated kitchen and vehicle exhaust systems and energy recovery from exhaust air streams to make-up and outdoor air streams to meet ventilation requirements. Air source heat pumps also provide tempering and conditioning of the make-up air supply for kitchen exhaust and the main ventilation air supply to the building. General exhaust and ventilation of the apparatus bay is provided with integral energy recovery through a unit with fixed plate air-to-air heat exchange section while a dedicated exhaust fan provides vehicle exhaust capture at each bay. An air source to water heat pump unit in combination with high efficiency, gas-fired boilers provide heating hot water to in-slab radiant floor serving the apparatus bay and hydronic

terminal units or coils serving other spaces throughout the building.

All these sophisticated energy saving strategies were made possible, in part, by the financial and technical assistance of the NHSaves program and is a fine example of its core mission: When the municipalities in our communities save, we all benefit from a healthier, more sustainable environment. Franklin Energy can help Liberty commer-

LEBANON, NH FIRE STATION SAVINGS

Measure	kWh Saved	Incentive
Building Plug Load + Domestic Hot Water heat pumps	27,390	\$2,89€
Ventilation Fan Controls	77,870	\$11,08€
Lighting +Controls	16,150	\$3,44€
Pump and Aux	670	\$191
Heating - VRFs	27,940	\$7,95€
Cooling - VRFs	12,010	\$3,41€
Gas Misc Equipment (i.e Kitchen equip)		\$3,14€
Gas Heating		\$3,657
Total	162,030	\$35,79€

cial, industrial, and municipal customers navigate the NHSaves program. They can be reached at 603-637-4346 or NHSaves@franklinenergy.com. 

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