

# CONCORD HOUSING AUTHORITY BUILDING RETROFIT

## SAVING ENERGY, MONEY AND IMPROVING COMFORT

George Harvey

There is a point where managing a project is not something that can be done on the back of an envelope. The large-scale heating system for the Crutchfield Apartments in Concord, New Hampshire definitely represents such an occasion.

The building has 116 apartment units. It was built in the 1970s using prefabricated modules, each about the size of a railroad car. It was a modern approach in those days, with the modules made of concrete. The heating system was also of a modern design, for that time. It was clean and efficient electric baseboard heating.

We really could defend the choices made in those days rather easily. But the fact is, times have changed. Concrete has its problems, and we can use electricity better for heating than resistance-type electric heating, despite the fact that it converts electricity into heat at what appears to be a perfect rate of about 100%. It happens that using electricity to move heat, as is done by heat pumps, delivers far more energy to a building than converting electricity to heat.

As we get more conscious of energy needs, it makes sense to look into improving our use of resources. And so, the time came to update the heating system of the Crutchfield Apartments. It was a job that could not be executed properly without careful planning and engineering.

The job was undertaken by Resilient Buildings Group (RBG), also of Concord. RBG provides a wide range of services aimed at efficient energy use and conservation. Prime among these is management. And among other things, management means making sure that the best people and organizations are chosen to do the job at hand.

RBG assembled a team for the Crutchfield Apartments project that included four other organizations. TFMoran did the structural engineering. The electrical work was done by Irish Electric. Shift Energy provided heating, ventilation, and air conditioning (HVAC), using equipment provided by Homans, a Mitsubishi distributor.



Crane lifting units to the rooftop. (Dana Nute, President of Resilient Buildings Group)

Some barriers for the project deserved extra attention. The fact that the building is constructed of concrete modules, presented difficulties that could not be addressed without careful planning, including detailed investigation of the structure. The concrete floors include cores and steel prestressing strands, which needed to be located. Some of the installation required drilling holes in the floors, walls, or ceilings, and drilling through prestress strands can compromise an entire building.

The new heating system was to be mounted on the roof, and so this placement required additional planning to verify that the roof was properly reinforced to manage the weight.

The new HVAC system and heat pumps are based on technology that is really worth looking at, especially since it is not usually covered in articles that appear in Green Energy Times. Heating and cooling are done by using a variable refrigerant flow (VRF) system. This is a ductless system that is a bit unlike the heat pumps used in most people's homes. The VRF name refers to the fact that the flow of the refrigerant can be varied to improve efficiency. The advantage of VRF technology is that the heating and cooling of each apartment unit can be varied according to specifics of the thermostat and conditions.

A very interesting technology, VRF can deliver heating and cooling at the same time. If the apartments on the south side of the building need to be cooled because of bright sunshine, while those on the north side need to be heated because of

cold outside air, this particular design can take warmth from the south side to deliver it to the north side, and at the same time move some of that cooling from the north side to the south.

Modeling shows that the new heating system should save 282,408 kWh per year. According to Dana Nute, president of RBG, this saving is from the combination of heating and cooling. The savings are not the only advantage of the system, however. With intelligence built into thermostat controls, heating can be monitored remotely. The problem of the heater and the air conditioner being on at the same time is no longer an issue.

The Crutchfield Apartment project came about with the support of Unitil and rebates from one of its NHSaves programs. NHSaves is a collaboration of New Hampshire's electric and natural gas utilities working together to provide NH ratepayers with information, incentives, and support designed to save energy, money and the environment. The project cost of \$950,000 will realize a payback by a reduction in energy usage.

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Unitil EE Program Coordinator Ben Stephenson said, "Unitil was proud to partner with Concord Housing on this large scale, first of its kind, project in the state of NH. There are so many benefits to an energy efficiency upgrade like this one starting with improved comfort for the tenants, management and overall efficiency of the system, and the large dollar/kwh savings realized year over year. RBG did a fantastic job pulling this project together and managing all aspects."



HVAC feeds in the 6th level hallway 