



U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

Rowhouses Rehabbed for Efficiency University Place Cooperative in Washington, D.C.

TECHNOLOGY HIGHLIGHTS

OVE Framing

Formaldehyde-Free Insulation

Mastic Sealed Ducts

Insulated Ducts in Unconditioned Space

Light-Colored "Cool" Roof

ENERGY STAR® Appliances

Compact Fluorescent Lighting

Founded in 1982, Manna, Inc. is a nonprofit community-based housing and neighborhood development organization. Manna designs, renovates, and builds houses for sale to lower- and moderate-income families in Washington, D.C. Manna also provides training services needed to help families grow and develop as homeowners. To date, Manna has helped more than 600 families become homeowners, with only three foreclosures.

This demonstration project for the Partnership for Advancing Technology in Housing (PATH) program is the University Place Cooperative—six rowhouses converted into condominiums. Manna wanted to make the units available to families in the \$18,000 to \$35,000 income range. The project was conceived as a model for affordable and sustainable design and construction. While the project itself was a

success in many ways (more than 15 new homeowners moved into homes in 2004), it turned out to be a challenge to incorporate PATH and sustainable technologies because of cost and acceptance issues. Nevertheless, Manna plans to use some of the recommendations and lessons learned from the demonstration project for future projects.

The D.C. Housing Authority assigned Manna the six rowhouses at University Place as part of the Public Housing Scattered Site Demonstration Project for the D.C. Housing Authority. The existing buildings were configured as multiple units. Five of the buildings had two units each and one had three units. Existing construction consisted of masonry footings and foundation walls, brick bearing party walls, painted brick exterior finishes, interior wood framing at 12-to-16 inches on-center, plaster and gypsum wallboard interior wall partitions, and hot asphalt roofs—typical of older rowhouses in urban areas of the Mid-Atlantic states. All buildings also had basement level living spaces.



PATH technical team recommendations focused on improving energy efficiency and the health and safety of occupants while minimizing environmental impacts.

When finished, the rehab contained a mix of condominium styles: five one-bedroom units; seven two-bedrooms; and three three-bedrooms, ranging from 700 to 1,200 square feet. Even though the renovations of the properties were gut rehabs, the design and construction team were challenged with some fixed constraints, including the buildings' location, orientation, massing, and basic structural systems. As with most rehab projects, these issues limited the extent to which Manna could optimize the design of the units. PATH advisors identified a number of strategies to maximize energy efficiency and sustainability within project constraints.

Advanced Technologies

It is the goal of the U.S. Department of Housing and Urban Development's PATH program to accelerate the development and use of new technologies that will substantially improve the quality, durability, energy efficiency, environmental performance, and affordability of America's housing stock.

PATH technical team recommendations focused on improving energy efficiency and the health and safety of occupants while minimizing environmental impact. REM/Rate analysis showed that if the basic recommendations were implemented, there could be a 30% annual savings in cooling energy, a 28% savings in annual heating energy, and an 18% savings in annual domestic hot water heating savings. However, Manna had a strict requirement preventing any increase in first costs, even when it was shown that the increased costs could be paid off within an average of 6.15 years. Moreover, because Manna had long-term relationships with their suppliers and subcontractors, their base prices for materials and services were already deeply discounted. Faced with these challenging factors, only a handful of PATH's proven technologies were implemented.

OVE Framing

The Optimum Value Engineered (OVE) framing technique reduce the amount of lumber used to build a home while maintaining the structural integrity of the building. Using OVE results in lower material and labor costs and can also improve energy performance. While the system can be applied as a whole package, many of its components can be used independently, depending upon the specific needs of the project. At the University Place rehabs PATH technical advisors recommended 24-inch-on-center framing. With on-site training from the technical team, the spacing of steel studs on exterior walls was increased from 16 inches to 24 inches on-center (1). Reducing the number of studs installed saved both material and labor cost. PATH also recommended this technique for interior walls, but Manna was concerned about durability of the interior walls and elected not to make the change.



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Building Envelope Improvements

The technical team recommended adding 1-inch rigid EPS insulation between the brick and steel stud framing. This would increase the overall R-value of the wall, creating a thermal break between the outside temperature and the metal studs, boosting total R-value from 6.8 to 15. Adding insulation in the air cavity would also mitigate air leakage and prevent condensation within the cavity, lessening concerns about moisture and mold and improving durability. Manna was not able to implement the strategy because it increased first cost, but they were able to follow another PATH technical team recommendation for the building envelope: installing formaldehyde-free batt insulation (2). Formaldehyde, a known carcinogen, can degrade indoor air quality for occupants and installers. The formaldehyde-free batts were also used in the roof.



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PATH also provided on-site training on air-sealing techniques. However, Manna's belief that sealing all the cracks would lead to moisture problems or mold could not be dispelled and they did not follow this recommendation.

HVAC

Mastic Sealing of Ducts (3) was implemented at the suggestion of the technical team. Air leakage from duct joints and connections causes significant energy losses and affects pressurization, air distribution, and indoor air quality. Mastic is a putty-like sealant used to fill cracks and crevices that does not harden and crack but rather remains flexible over time, resulting in a much better air seal than traditional duct tape. In unconditioned space, insulated ducts will minimize energy losses.

PATH recommended a Hydro-Air heating system instead of a furnace for University Place. A loop, supplied by the domestic hot water heater, can provide hot water to the air handler. By increasing the capacity and efficiency of the hot water heater, one gas-fired device can serve both purposes. In addition, if the equipment is power-vented, concerns for back drafting (with the standard B-vent) are eliminated. Manna was not able to implement the recommendation.

Right-Sized Air Conditioners were calculated by the technical team. It was determined that the air-conditioning units should be sized at 1.5 tons for the first and second floors and 2 tons for the third floor in order to optimize the systems. Nevertheless, larger systems (2 tons for the first and second floors and 2.5 tons for the third floor) were ultimately specified because the mechanical engineer was concerned about professional liability issues and the property management staff was concerned about receiving service calls from tenants.

Interior Finishes

Manna and the technical team organized a linoleum training with Forbo Industries representatives. Linoleum is a durable flooring material and natural linoleum, made from linseed oil and other organic products, is considered a green material. However, linoleum was not installed because it was cost prohibitive when compared to vinyl flooring.

Low-VOC Paints, Sealants, and Adhesives can substantially reduce the indoor air pollution that causes irritations of the eyes, lungs, and skin and respiratory and internal organ problems. Nationally, these products are often cost-competitive with traditional counterparts. However, Manna's special pricing agreements allow them to obtain traditional materials at below-market rates; for example, Manna purchases flat white paint for \$32/five gallons, while the lowest price found for no- or low-VOC paint was \$72/five gallons. These price increases prevented Manna from changing their standard practice.

Cool Roofs

White granulated roofing (APP, torch down) was installed at University Place (4). White and metallic surfaces reflect more of the sun's heat, lowering solar gain and reducing air-conditioning load. For granulated roofing, white material rather than dark aggregate can increase reflectance by 40% or more. Air-conditioning equipment can be downsized as a result, and the roofs tend to last longer by reflecting more damaging ultraviolet rays.

Other Energy Savers



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ENERGY STAR® dishwashers were installed, and occupants will have an option to upgrade to an ENERGY STAR® refrigerator. Compact fluorescent lighting (CFL) was installed in the common stairwells. Fluorescent lighting was also installed in the kitchen (5). Fluorescent bulbs use about one-quarter of the energy of conventional incandescent light bulbs.

Construction Waste Management

Manna partnered with GreenHOME, a local non-profit organization, to carry out a construction waste management program. Materials were salvaged from demolition and salvaged wood studs were used for bracing, blocking, and other purposes.

Conclusion

The Manna PATH demonstration project was a challenge for all parties involved. With a mandate to not increase first costs, already deeply discounted materials, and some resistance to change common practices, Manna was able to implement only a few of the recommendations from the PATH technical team. Nevertheless, Manna’s partnership with PATH has exposed Manna to the technologies, techniques, and strategies to help them produce higher quality, affordable housing for the citizens they serve. The designer-builder has already incorporated PATH recommendations. As they undertake future projects, Manna’s design and construction staff is hopeful it they will be able to incorporate more of the recommended features, if they are available locally and the cost is acceptable.



Future residents and Manna staff celebrate the start of construction of the University Place Cooperative project, also known as the Ella Jo Baker Cooperative.