



U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

Advanced Housing in Bedford Stuyvesant Habitat for Humanity of New York City

TECHNOLOGY HIGHLIGHTS

ENERGY STAR® Homes

Continuous Rigid Insulation

Air Sealing

Low-E Insulated Windows

High Efficiency Direct Vent
Sealed Combustion Boiler/Water

Programmable Thermostats

Reflective “Cool” Roofing

Durable Design and Materials

ENERGY STAR® Appliances and
Fixtures

This Brooklyn-based demonstration project developed by Habitat for Humanity of New York City (HfH-NYC) was a unique partnership between HUD’s Partnership for Advancing Technology in Housing (PATH) and the New York State Energy Research Development Authority (NYSERDA). These are the first single-family affordable homes built by HfH-NYC to meet New York ENERGY STAR® Homes criteria. Technical assistance for these projects was provided by Steven Winter Associates, Inc. (SWA) and was co-funded by NYSERDA and PATH. The development consists of 20 homes near the intersection of Wiloughby and Marcus Garvey Avenues in the Bedford Stuyvesant neighborhood of Brooklyn. All lots were formerly vacant and piggy back on an earlier HfH-NYC project nearby on Hart Street at Marcus Garvey Avenue.



The small non-profit encountered problems endemic to New York City construction, such as difficulty getting designs approved and challenges with material deliveries and the general contractor. Theft was an obstacle until proper methods of securing tools and materials were found. HfH-NYC generally works on smaller projects and is less equipped for the communication and consistency challenges of bigger projects. Due to budget constraints, not all suggested PATH technologies were implemented in the houses.

Despite these challenges, the volunteer-based labor force and its organizers prevailed to produce good quality, energy- and resource-efficient homes. The houses incorporate a number of high-performance features that represent a significant departure from traditional building practices used by the HfH affiliate. PATH technical advisors confirmed that PATH technologies were correctly installed, and the builder continues to use its PATH knowledge on subsequent homes. Homeowners are enjoying the benefits of comfort and affordability at their new residences, despite some initial unfamiliarity with new technologies (fan timers and digital thermostats in particular). Project impact also reaches beyond the homeowners: HfH-NYC sees many high-profile “celebrity” volunteers and thousands of dedicated hard working “weekend warriors” who contribute to each project’s success.

Advanced Technologies

It is the goal of PATH to accelerate the development and use of technologies that radically improve the quality, durability, energy efficiency, environmental performance, and affordability of America's housing market. Based on a balance of cost, availability, volunteer-friendliness, environmental and health benefits, and long-term durability, the following sustainable and PATH-identified technologies and smart building practices were included at the HfH-NYC homes in Brooklyn.



1

ENERGY STAR® Homes

All of the homes in the Brooklyn project will meet ENERGY STAR® Home standards. Engineers providing PATH technical advising performed energy modeling to predict and optimize home efficiency. Homeowners will benefit from long-term energy savings offered by a tight building envelope. Home performance tests were conducted to verify that the design goals for efficiency were met (1).

Continuous Rigid Insulation

Habitat for Humanity affiliates all over the country receive rigid extruded polystyrene (XPS) insulation free from Dow Chemical Company, so the PATH team looked for ways to maximize this cost-effective HfH resource in masonry buildings with metal stud walls. All exterior walls were continuously lined with XPS insulation between the framing and the masonry to prevent thermal bridging (2). Thermal bridging normally occurs where studs interrupt the insulation blanket and transfer heat and cold from the exterior to the interior, degrading the R-value of the insulation and also causing condensation where the studs meet the sheetrock. By insulating between the studs and the exterior, this thermal bridge is reduced, and the walls perform more effectively, increasing occupant comfort and energy efficiency.



2

Air Sealing

Applying urethane foam and other sealants around windows, doors, and other breaks in framing helps prevent air infiltration and loss of conditioned air. Because HfH affiliates rely on volunteers for the bulk of their labor, materials and products are also selected for their "volunteer friendliness." For example, caulk works much better as an air sealing product for volunteers than the less forgiving spray foam. Professing that "caulk is cheap," PATH technical advisors encouraged the use of caulk for air sealing to the maximum extent possible on the project's homes.

Low-E Insulated Windows

High-performance glazing provides daylight without sacrificing energy efficiency. Cost-benefit analysis showed that installing insulated vinyl windows with low-e coatings increased initial cost by no more than \$1 per square foot (3). The resulting energy savings justified the investment.



3

High-Efficiency Direct Vent, Sealed-Combustion Boiler/Water Heater

The combined building envelope energy saving measures applied to this project (continuous rigid insulation, air sealing, and low-e insulated windows) resulted in a downsized heating system. This not only saves dollars during construction when the builder purchases a smaller unit, but it also saves the homeowners money for years of operation yet to come.



4

A single high-efficiency sealed-combustion boiler with domestic hot water storage tank was installed in each home (4). This type of unit eliminates the need of a chimney in the house, as the unit is vented through the exterior wall. An insulated storage tank holds domestic hot water, while heating is delivered via a baseboard hydronic system, powered by the same boiler. The combination unit reduces the need for two appliances and increases system efficiency.

Programmable Thermostats

Homes are separated into two heating zones, each with its own ENERGY STAR® programmable thermostat (5). There were some challenges in settling on a piping diagram and deciding which zones should be linked to which thermostats because there is one bedroom in the basement while the other bedrooms are on the second floor. Many of the homeowners complained of the basement bedroom being cold, but after teaching them how to adjust the thermostat most of the problems were resolved. When used properly, programmable thermostats save heating and cooling energy when the house is unoccupied.



5

Reflective “Cool” Roofing

PATH’s technical team suggested that the adhered-rubber membrane roofs on all houses be painted silver. White and metallic surfaces reflect more of the sun’s heat, lowering solar gain and reducing air-conditioning load. Air-conditioning equipment can be downsized as a result (saving both initial and operating costs) and the useful life of the roof is extended as more damaging ultraviolet rays are deflected. Cool roofs also help mitigate the urban heat island effect, which degrades quality of life in New York City.

Durable Design and Materials

Attention to detail during specification and construction can reduce future maintenance and repair needs. Durable materials used at HfH-NYC homes are designed to last, reducing solid waste, saving money, and spreading environmental impacts of product manufacturing over a longer time period.



6

On the exterior of the first story, brick (6) was chosen for its durability and its tradition as part of the Brooklyn vernacular. On upper stories, exterior finish stucco was used on top of DensGlass Gold (6), a gypsum sheathing product by Georgia-Pacific that is extremely mold and weather-resistant. This combined with the brick created an energy efficient and durable home exterior.

In keeping with the Habitat for Humanity goals of simple, decent, affordable housing, the interior finish material palette was kept to a minimum. Kitchen floors were vinyl (7) and bedrooms were carpeted. Exceptions were made for any families that had children with respiratory problems, who were given the option of having parquet style hardwood flooring installed throughout the house. The project team found that after closing on the sale of the homes, many homeowners were anxious to rip out their carpeting (which, fortunately, was inexpensive) and install hardwood flooring or tile.



7

ENERGY STAR® Appliances and Fixtures

ENERGY STAR® refrigerators were installed (7), along with compact fluorescent lighting (CFL). Fluorescent bulbs use about one quarter of the energy of conventional incandescent light bulbs. ENERGY STAR® washing machines along with high efficiency dryers were donated to the project by Electrolux Home Products North America in another example of HfH maximizing its resources to achieve high levels of energy efficiency.

Conclusion

The key to this home's energy and resource efficiency is the "whole building" approach to design and construction. With well insulated walls and roof, an insulated basement, double pane low-e windows, white roofing, a high-efficiency boiler and domestic hot water system, ENERGY STAR® refrigerator, compact fluorescent lamps, ENERGY STAR® clothes washer, high-efficiency dryer, and diligent air sealing, these homes have proven to have lower energy bills than homes of comparable size. This helps the homeowners feel confident that they will be able to afford their homes in the face of rising energy costs.

The HfH-NYC PATH demonstration project has been a success for the affiliate as well as HFHI. Together, the goal of simple decent, affordable, efficient, and sustainable housing has been achieved for 20 first-time homebuyers in a place where homeownership is a fleeting dream for many people. The HfH-NYC construction serves as a model for urban Habitat affiliates all over the country. The construction methods have changed how this affiliate and others in urban areas will carry out their mission of simple, decent, affordable housing for everyone. The three projects HfH-NYC has built since have been designed and constructed with energy- and resource-efficient construction methods. All homes have achieved their goal of an ENERGY STAR® rating and homeowners are reaping the benefits of lower fuel bills and safer, healthier homes.

