Greening Affordable Housing

By F. L. Andrew Padian


Melrose Commons II

Affordable, lower income, supportive, special needs… call it what you may, but there is an increasing need for greater access to housing for all types of people —students, working poor, homeless, disabled, and those in transition. Affordable housing advocates range from the far left to the far right, from non-profits to for-profit developers.

A disturbing trend began in the 60's to build affordable housing first-cost least-cost, and let the chips fall as they may. The trend has turned. Builders, developers, architects, engineers, and government agencies have since begun to take notice: sustainable is affordable. Sustainability or "green" traditionally conjures up visions of high costs and untested technologies. On the contrary, buildings that are built tighter with better windows and insulation have significantly smaller and more efficient heating systems, use less energy and water, are more durable, comfortable, and affordable, use sustainable building materials, and use well-proven technologies. The incorporation of these features brings benefit to the homeowner, renter, or multifamily building owner, creating a high-performance building that is affordable to maintain.

Mistakes made in affordable housing built over the last 20 years center around eight major areas:

1. Buildings are not sealed well from floor-to-floor and from inside-to-outside. These air leaks cause much of the mold, mildew, comfort and callback problems in the building.
2. Heating, cooling, and domestic hot water (DHW) systems are the least efficient available on the market, and are typically oversized.
3. Insulation is incorrectly or poorly installed, or sometimes not installed at all.
4. The combination of metal studs and masonry walls causes "bridging" of cold temperatures into the building, causing insulation degradation and "ghosting" of studs on sheetrock walls.
5. Ventilation systems are not properly sized or balanced, and perform poorly.
6. Poor window specifications and high resistance to new window technologies create problems.
7. Construction management is poor, with little penalty for contractors.
8. Electricity concerns are ignored, even when efficient lights and appliances can cost the same or less.

Generally, the U.S. homebuilding industry has been slow to adopt innovative materials and practices. Plywood was invented before World War I but was not seriously adopted until the 1950's. In

Melrose Commons, a community of affordable townhomes in Bronx, NY.

1952 the National Association of Homebuilders (NAHB) invented a unique framing technology that made buildings stronger while using less framing materials: Optimum Value Engineered (OVE) framing. Based on a 24"-on-center framing technique that reduces material use by 30% and is structurally stronger, OVE framing celebrates its 53rd anniversary this year, but has been adopted by less than 5% of the housing industry in America.

As banks, funding agencies, architects, engineers, developers, and contractors continue to understand that their work affects all aspects of the durability of the building, they will find that a better building costs less to build. Much of the savings will be found in reduction of wasteful practices, reduced insurance claims, and most importantly, reduced callbacks. Large tract developers across the country who have participated in programs such as the U.S. Department of Energy's Building America Program have found that their costs were reduced when they implemented sustainable design strategies and technologies. Builders have also witnessed the truth to Energy Efficient Builders' Association's (EEBA) nickname "the cure for the common callback."

Case Study

Melrose Commons II, a community of 30 townhomes located in Bronx, New York, exemplifies how high-performance and affordability can successfully be combined to create a home that is not just affordable to purchase, but affordable to maintain as well. Melrose Commons II broke the mold of building on first-cost least-cost principles, implementing various technologies and design strategies that lower the lifecycle costs. Funded by the New York City Department of Housing Preservation and Development through the New York City Partnership, these homes were developed by MC II Associates and built by Blue Sea Construction Corporation. These homes are the first affordable three-family housing in New York State that meet the US

Environmental Protection Agency (EPA) and the New York State Energy Research and Development Authority (NYSERDA) ENERGY STAR Standards. The basement, the first full floor, and half of the second floor comprise the owner's two-bedroom residence. There is a half-floor one-bedroom apartment on the second floor and a full-floor two-bedroom apartment on the top floor. The top two units can be rented out to further subsidize the already affordable mortgage. The completion of this project brought much needed affordable housing to a community in the midst of revitalization.

These homes feature several proven advance technologies highlighted below.

■ **Precast Concrete Wall Panels** offered the builder a means to faster and more efficient home construction as compared to the 'block and plank" construction typically used. Panels allowed for speedy construction. Because the panels were fabricated off site, construction waste was significantly reduced. Concrete as a material offers increased durability and fire resistance. With each panel spanning the entire side of a building, the number of seams and connections is reduced.

■ **Fly-Ash Concrete** is used for the wall and floor panels of Melrose II. Fly ash is a common substitute for cement, an energy-intensive material typically used in concrete. Fly ash is a by-product of coal burning and comes from the impurities in the coal that evaporate in the boiler and then condense into tiny glass spheres. Fly ash is known as a "pozzolan" and reacts with hydrated lime, an unwanted byproduct of concrete, curing to produce additional cement-like gel. There are two types of fly ash, Class C and Class F, which are delineated by their source. The spherical shape of fly ash offers benefits to the concrete mixture by filling water channels and reducing permeability, and by increasing workability as a result of its easy-flowing shape. The use of fly ash also diverts material from the waste stream. Fly ash does increase the curing time. Precast panels eliminate this concern. The use of fly ash should not significantly increase project cost.

■ **Dual Sealed-Combustion Boiler**—Each three-family home comes equipped with a single sealed-combustion gas-burning Burnham Revolution boiler with a 65-gallon Bradford-White storage tank. The single boiler system in each home provides heating and hot water to all three units. The benefits of this system are three-fold. First, the boiler has an AFUE rating of 87.2, which means that 87.2% of the fuel is converted into heat while only 12.8% is lost. Second, the sealed combustion provides added safety. Third, the use of one system for both heat and hot water is simpler to maintain; yet if the system does malfunction, both heat and hot water are affected.

■ **Tekmar Outdoor Reset Control for Boiler**—Outside of each home is a Tekmar reset control used to modulate the water temperature in radiators based on the outdoor ambient temperature. The benefit of these controls is the reduced chance of overheating, and improved occupant comfort.

■ **Sustainable Finishing Materials** were chosen for the construction and the finishing of all Melrose II units. Off-gassing of chemicals has been shown to cause headaches, nausea and asthma. Environmentally sustainable materials may be sold at a higher cost than traditional materials; however, they are quickly penetrating the market, causing the price to drop. *Recycled polyethlene terephthalate carpeting* is said to be more resilient and colorfast than virgin fiber carpet. Also in response to concerns about adverse health effects, manufacturers now produce low-VOC (*Volatile Organic Compound)* paints and sealants. Benefits are an easier clean-up, faster drying time, and lower toxicity.

■ **Compact Fluorescent Lighting (CFL)**—All of the homes are equipped with 100% fluorescent lighting. CFLs can be placed in various types of lighting fixtures including table lamps, ceiling lights, and spotlights. CFLs offer electricity and cost saving benefits. CFLs use one-quarter to one-third as much electricity as incandescent bulbs and last up to ten times as long.

■ **Photovoltaic Panel**—Building on the success of Melrose II, the construction of Melrose III has been completed with identical layout and specifications, plus a 2.2-kW photovoltaic (PV) panel on one of the units, providing electricity to the owner's unit.

Steven Winter Associates, Inc. (SWA) has been tracking the electricity and fuel usage of Melrose II. On average each unit uses 8.4 kWh every day, compared to a 30 kWh national average for affordable housing. Going a step further, the PV panel in Melrose III generates on average 35% of the building owner's electrical needs. From data collected on fuel usage, it was calculated that on average the Melrose II buildings are heating at 4.45 Btu/ft^2/HDD, where the heating to hot water usage is approximately 41% to 59%. The homes are extremely efficient in comparison to the average affordable home in New York City, which heats on an average of 24 Btu/ft^2/HDD.

Coupled together, all of the aforementioned technologies combined provide a home that is affordable while maintaining a high level of quality. For a community that is accustomed to high maintenance costs (heating and hot water) and sub-par housing, these homes are confirmation that there is a better alternative through advanced technology. SWA has created a handbook for affordable housing developers, for information, contact the author at *padian@swinter.com*.

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