Trolley Square

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Trolley Square in North Cambridge, Massachusetts is prominently located at the juncture of two major transportation arteries. Developed by Homeowner's Rehab, Inc., the site is directly adjacent to an electric bus terminal. The City of Cambridge negotiated a land swap in exchange for a portion of the site being developed for public use, including affordable housing and open space. The mixed income, mixed-use development comprises 32 rental units and 8 homeownership units for first-time buyers. An additional 2,800 square feet of commercial/community space, a below grade parking garage, and 4,100 square feet of open space is included in the project. The site is adjacent to the Linear Park Bike Path that runs through four communities and links residents to alternative transportation. The Trolley Square development is accessible to subways and bus transit, as well as pedestrian and bicycle paths. The underground parking facility allowed for the creation of a plaza and more open space within the development. Durable and resource efficient materials were used for exterior siding, cabinets, doors, hardware, and flooring. Energy Star rated lighting, appliances, and mechanical equipment, as well as insulated doors and energy efficient windows, were used throughout the development. Water conservation methods were included, as well as additional insulation in the roof and walls.

Greening Goals:

The goals of the project were to create attractive, affordable, healthy, energy-efficient housing and to achieve the Smart Growth principles adopted by the State of Massachusetts. These principles encourage development near transportation nodes, the creation of open space, and mixed-use projects. In keeping with Smart Growth ideals, Trolley Square incorporates a newly constructed park on the site, as well as commercial space, and community space. Other green goals included conservation of natural resources, and the utilization of energy-efficient products and practices with the least harmful impact on the natural environment.

Project at a Glance

Location: Cambridge, Massachusetts

Project Type: New Housing Construction

Ownership/Rental:
Both; 32 rental; 8 homeownership

Size:
40 total units (1-3 BR)
45,380 sq. ft. total residential space
40 units per acre
2,800 sq. ft. of commercial/community space
4,100 sq. ft. of open space

Project Completion Date:
November 2006

Affordability:
- 17 families at 0-30% Area Median Income
- 6 families at 31-50% AMI
- 9 families at 51-80% AMI
- 8 homeownership units 70-90% AMI

Project Team:
- Developer: Homeowner's Rehab Inc.
- Architect: Mostue & Associates, Inc.
- Civil Engineer/Landscape Architect: Geller Devellis, Inc.

Development Cost:

Construction costs:	$12,347,967
Soft costs:	$2,864,696
Syndication costs:	$110,730
Total:	$15,323,393

Cost/Savings of Greening:

Increased Cost of Greening:	$400,000
Rebates and Grants:	$168,562
Net Cost of Greening:	$231,438

Standards Used:
Energy Star Homes
Enterprise Green Communities

Key Green Features:
- Site is adjacent to the Linear Park Bike Path that runs through four communities and links residents to alternative transportation
- Durable and resource efficient materials used for exterior siding, cabinets, doors, hardware, and flooring
- Energy Star rated lighting, appliances, and mechanical equipment, insulated doors, energy efficient windows were installed

Green Features

Integrated Design Process:
The design team was larger than for a typical development. It met often to review documents and plan for the most efficient systems. At the same time, it considered long-term operating costs as well as first costs in its cost benefit analysis. Regular sustainability meetings were held from the early stages of design though construction. At the initial planning charrette, the team developed a Charter that included sustainability and guided the team through design. The Charter was then incorporated into the project specifications. Ongoing sustainability meetings were attended by engineers, the commissioning agent, management, the owner, the architect, and the contractor.

Site Design/Landscape Planning:
The site was a vacant parking lot adjacent to the bike path and Linear Park. During construction, care was taken to protect existing drains and catch basins. As part of Trolley Square, the community expressed a strong desire for more open space. As a result, the City of Cambridge constructed the adjacent bike path and a new community park, and parking was built underground. Existing healthy trees were protected and saved as part of the park improvements, while unhealthy trees were removed and new ones planted in their place. The bike path has been integrated into the housing with new walkways and seating areas.

Location & Linkages:
Trolley Square is located on the site of a former bus storage facility at a busy intersection in Cambridge. The adjacent Linear Park links to an active bicycle and pedestrian path that extends 25 miles into the suburbs. Prior to its development, the site was essentially a barren asphalt lot.

Building Design Greening:
Energy: The HVAC system was designed to meet or exceed the requirements of the Massachusetts State Building Code, and Energy Star qualified equipment was selected. The rental buildings are heated with energy efficient central boilers with digital controls. Energy efficient lighting and controls have also been installed throughout the project. Many common area lights are controlled by occupancy censors, daylight sensors, and timers in order to reduce electricity use. Energy Star products, such as light fixtures, refrigerators, dishwashers, boilers, washing machines, and dryers were installed in residential units, the laundry room, the garage and other common areas. Photovoltaic solar panels were installed to offset energy costs of the garage and common areas.

Indoor Environmental Air Quality: Low-VOC paints and sealants were used throughout the project to minimize the potential sources of indoor air pollutants. Linoleum, rubber, ceramic tile, wood, and "Green Label" carpet flooring types were selected for this purpose as well.

Water Conservation: Every toilet at Trolley Square has a dual-flush option. Flushes for solid waste use 1.6 gallons of water, and flushes for liquid waste use just 0.8 gallons of water. Kitchens and baths have been outfitted with low-

Green Highlights

- Central plaza provided large areas for planting, with drainage below the paving system
- Stormwater is retained and collected to irrigate plants in the plaza
- Native and draught tolerant landscaping was installed
- Plaza designed to reduce "heat island effect" by installing white roofs, light colored plaza paving, and extensive landscaping
- Dual-flush toilets
- Materials selected based on durability and resource efficiency criteria
- Exterior materials and interior finishes that have the least environmental impact were chosen
- Panelized construction for framing utilized to reduce upfront material consumption
- Materials with recycled content or sustainable properties used, including cellulose insulation, engineered lumber, marmoleum and rubber flooring
- Construction waste management and recycling program minimized the amount of construction waste sent to disposal facilities
- Quiet dual speed bathroom fans installed with specialized controller switches to provide low-level continuous ventilation
- Heating provided by energy efficient central boilers with digital controls
- Multiple thermostats located in each unit allows the system to provide heat only where is it needed
- Building envelope is tightly sealed and insulated
- Energy efficient lighting and controls installed, as well as occupancy censors, daylight sensors and timers
- 42 kW photovoltaic system to offset energy costs of common areas

Green Features

flow faucets and showerheads. Since the Trolley Square Charter aims to use products and practices that cause the least harm to the natural environment, native and draught tolerant landscaping was chosen to conserve water. The central plaza is a roof garden that provides large areas of planting, with drainage below the paving system. Stormwater drains from the plaza into retention tanks, which minimize the flow of stormwater into the City system. A separate chamber in the tanks collects water used to irrigate the native and drought resistant plants in the plaza.

Windows: Windows are aluminum-clad wood with double pane, insulated, argon-filled glazing with a low-emittance (low-E) coating. The aluminum cladding is a durable low-maintenance finish. Despite Massachusetts' variable year-round temperature, the high-performance glazing will help control heat gain and heat loss in both the summer and winter months.

Reduced Material Use: The project team was committed to selecting the most durable, resource efficient materials available within the project's budget constraints. Exterior materials such as fiber-cement siding, thermoplastic polyolefin (TPO) roof, concrete and metal entry stoops, and aluminum-clad wood windows were selected for their longevity and appearance. Durable interior finishes included plywood cabinets, steel doors, hardware, linoleum and rubber flooring.

Commissioning: A commissioning agent was involved very early in the project. From schematic design through punch listing, the engineer's third party perspective was critical in both design and configuration of Trolley Square's systems. The agent reviewed drawings and specifications and met with the design team and their engineers throughout the design process. They assisted in obtaining energy and utility rebates and helped evaluate value-engineering options. The cost for commissioning Trolley Square was $17,000.

Operations and Maintenance: The property manager attended commissioning meetings with the engineer and received training from the MEP contractors about the building's systems. Maintenance contractors and the site staff held regular meetings with the property manager and the owner to review the "Living Green Guide" and discuss green cleaning practices. The maintenance staff has a list of green cleaning products approved by the owner. In addition, a resident services coordinator reviews the Green Guide with residents and helps facilitate training workshops.

Resident Education: Each rental tenant receives a copy of the Trolley Square Living Green Guide, which describes the green features in each unit, green housekeeping tips, recycling guidelines, and the importance of sustainability. The guide also educates residents about local farmers markets, environmental outings, and other community resources for living green.

Occupant Satisfaction:

"This new healthy environment is very good for everyone and I support the great effort that was put into building more of these great apartments. We are all grateful and thankful for this opportunity."

– Trolley Square Resident

Measurable Benefits

Construction Waste Reuse/Recycling: 90% of all construction waste was recycled, including wood, steel, concrete, gypsum, and cardboard.

Energy Efficiency: Insulation in the walls, roof and floors exceeds the MA Building Code requirement by 30%. The buildings have received the Energy Star rating.

Project Financing

Total development costs for Trolley Square were $15,323,393. Greening Trolley Square cost an estimated $400,000. The total funding committed to greening the project was over $168,500, leaving a net greening cost of about $231,000 or 1.9% of construction costs. The funding for the greening aspects of the project included utility rebates and grants as well as private foundations, which funded the energy conservation improvements. Funding sources for both the greening aspects and general construction and development costs included the following:

- The City of Cambridge
- MA Department of Housing and Community Development
- Massachusetts Affordable Housing Trust (AHT)
- Cambridge Neighborhood Apartment Housing Services, Inc.
- Neighborworks® America
- Citizens Bank
- Massachusetts Housing Investment Corporation (MHIC)
- U.S. EPA's Residential and Commercial Energy Star Programs
- New Ecology, Inc.
- Enterprise Community Partners
- Private local foundations

Looking Ahead

Challenges:
A lengthy community process and competing stakeholder demands were key challenges to the development of Trolley Square. The neighborhood wanted the property to have open space, community space, commercial space, and affordable housing on a site that is less than one acre in size. The City's goal, however, was to create as much affordable housing as possible. To alleviate this conflict, the City funded the construction of an underground garage, which allowed for the construction of 40 units of affordable housing, a small park, and community and commercial space. Additionally, some in the community were concerned about the development being mostly affordable rental and the perceived stigma with affordable housing development. These concerns were addressed by designing an attractive exterior, notwithstanding limited construction funds.

Partnerships:
HRI as a developer worked closely with the community to provide not only attractive green affordable housing, but also the community space and type of commercial space that local residents desired. HRI also worked with the City of Cambridge to design a new public park and integrate Trolley Square into the park and adjacent bike path, which is undergoing major improvements. This bike path allows for alternative transportation and is the second busiest bike path in the country. Trolley Square also partnered with the City of Cambridge Department of Public Works to implement a traffic-calming plan to create safer vehicular traffic. In addition, Trolley Square is negotiating a lease with a café that will create a vibrant gathering place for the neighborhood.

Policy/Practice Implications:
Trolley Square reestablishes both economic and architectural elements in an area that had lost much of both. It serves a population that is typically priced out of this expensive area. However, after using careful planning and contextual clues from surrounding neighborhoods, the property has become an attractive addition in the City of Cambridge. A small site less than one acre, Trolley Square is now a vibrant community, not only for the new families living there, but for the entire neighborhood. It represents the success of working with the neighborhood and municipality, and demonstrates what can be done to encourage, create and maintain a sustainable community.

"In the Trolley Square project, Homeowners Rehab, Inc. has done a remarkable job of creatively balancing multiple demands on a small urban site. As a mixed use development with 32 rental units perpetually affordable for low- and very low-income families in high-priced Cambridge, Massachusetts, an Energy Star Homes rating with impressive energy efficiency equipment and performance, and underground parking that allowed construction of a small park and a direct link to a major bike path, Trolley Square is an exemplary project."

-Member, Awards Advisory Committee

Contacts

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