VCU decided to modernize and expand the existing 32,600 ft² historic building when it could no longer adequately serve the university’s growing population of students, faculty and staff. The 2009 expansion wraps around the existing building and adds 95,605 ft², for a finished project size of 128,205 ft². The addition includes a natatorium, group exercise rooms, a four-court gym, offices and racquetball courts.

Since the completion of the renovation, the percentage of students who use the facility has increased from 58% to more than 80%, and faculty and staff memberships have increased by more than 1,000 new members. The number of gym users increased by 99% when the new facility opened in 2010, and has continued to increase each year since. The expanded facility now serves up to 4,000 visitors daily during the academic year (74,000 visitors per month and over 700,000 per year).

To serve this large population, the facility is open from 6 a.m. until midnight. As an added benefit, the gym provides more than 400 student jobs paying more than $1 million.

Designing for Students, Community
The Cary Street Gym is the sole indoor venue for recreational sports on VCU’s Monroe Park Campus. The

The structure that houses Virginia Commonwealth University’s (VCU’s) Cary Street Gym could be a poster child for the concept of adaptive reuse. The brick walls originally housed an open-air market that opened in 1891. Over the next 90 years, the building was used in a variety of ways, including as storage space for postal trucks, before VCU transformed it into a student gymnasium in 1979. Choosing to again renovate and then expand the existing gym in 2009 allowed the university to maintain the gym’s central location, preserve the historic structure and conserve resources by using the existing shell.
expansion and renovation project sought to provide students with more opportunities for recreation, wellness, socialization and relaxation.

The gym addition is sited along a major north/south campus pedestrian thoroughfare and creates a gateway to the south entrance of the campus. An existing cobblestone alleyway (Green Alley) constructed in the 1880s that included livery stables constructed in the early 1900s sat in the footprint of the proposed addition. The alley was incorporated into the addition. A permanent photo exhibit was installed so students and visitors could better understand and appreciate the importance of this former pedestrian thoroughfare.

Beyond pedestrian accessibility, the project’s location in downtown Richmond affords building occupants access to many basic services and ample opportunities for alternative means of transportation, including campus and city transit. Bike spaces are also provided for those who prefer to get around the campus and city on two wheels. This chilled facility is designed to provide visual connection to multiple recreation activities, promoting health and wellness to the campus community and neighborhood participants. Spaces for activities include weight and fitness rooms, a climbing wall, a four-court recreational gym and elevated track, a spinning room, two racquetball courts, a multiuse athletic court, a natatorium with lap pools and a leisure pool, locker facilities and offices.

The natatorium space includes a “wet classroom,” which gives natatorium users access to an academic space at a temperature similar to the aquatic space. The space includes tile, drains and furniture that can get wet.

Energy-Efficient Design

Because of the historic nature of the building, energy efficiency was an important, but challenging goal to meet. The Virginia Department of Historic Resources reviews projects for compliance with the provisions of the National Historic Preservation Act of 1966. Overarching historic preservation requirements that influenced the ultimate design include:

- Maintaining the historical character of the site;
- Not obscuring the fabric of the historic building;
- Not adding to or removing any parts of the historic building; and
- Ensuring that free-standing structures are consistent in material and design with the existing building’s historic character.

These requirements precluded the design team from changing the historic envelope, even for reasons associated with thermal performance. Although the designers could not include big changes in the exterior wall construction, keeping the window-to-wall ratio low (8.6%) was helpful from an energy perspective.

Roof insulation was increased with 4 in. of rigid insulation (R-30). Coupled with a fenestration U-factor of 0.29 and solar heat gain coefficient (SHGC) of 0.25 for glazing, the envelope did see some improvement. Because of the energy-efficiency obstacles related to maintaining the existing historic envelope, much of this building’s energy savings come from the mechanical and lighting systems. For example, the primary HVAC system is variable air volume (VAV) with hot water and chilled water coils, with a partial air-side economizer. The chillers are 275 ton centrifugal variable flow, and the boilers are dual-fuel water use reduction.

Recycled Materials 25% (by cost).

Other Materials Forest Stewardship Council-certified wood flooring, low-emitting paints and coatings, locally sourced.

Daylighting. While the project did not meet the LEED definition for daylighting, it does include ample access to daylight throughout the majority of the facility via windows and skylights.

Lighting Controls. Motion sensors.

Carbon Mitigation Strategy. Renewable energy certificates (RECs) offset 35% of building energy use.

Transportation Mitigation Strategies. Public transportation available, bike racks provided, no new parking provided.

Indoor Air Quality. Construction indoor air quality management, demand-control ventilation.

Other Major Sustainable Feature. Salt/chlorine generation system (pool).
Initially, the project team tried to benchmark this site EUI against the 2003 Commercial Buildings Energy Consumption Survey (published by the Energy Information Administration, table E2). However, CBECS 2003 offers only a national average of all public assembly buildings (such as community centers, senior centers, museums, theaters/cinemas, libraries, and exhibition halls). It does not isolate only recreation centers, nor does it account for variables like climate zone, the extended hours of operation offered by a collegiate recreation center, nor the existence of a natatorium.

In all of the mechanical equipment, refrigerants with lower global warming and zero ozone depletion potentials are used (R-123, R-410A and R-407C). Because the equipment is designed to accommodate these refrigerants, the engineering team did not feel that there was an appreciable trade-off between energy efficiency and ozone/climate concerns.

In addition to efficient building systems, all cardio equipment “goes to sleep” when not in use, and the only pieces of equipment that require power are the StepMills and the treadmills. Energy-efficient lighting was selected, resulting in an interior lighting power density of 0.96 W/ft². (The maximum allowable under ASHRAE/IESNA Standard 90.1-2004 is 1.1 W/ft².)

The building team determined that adding renewable energy sources on site would not be cost efficient. So VCU purchased renewable energy certificates (RECs) to offset 35% of the building’s energy use for 2010 and 2011 with Green-e certified biomass energy production. Additional RECs have not been purchased for the gym.

The building’s energy performance has been monitored since it opened. For the most recent fiscal year monitored (July 2011–June 2012), the Cary Street Gym operated with a site EUI of 114 kBtu/ft². Initially, the project team tried to benchmark this site EUI against the 2003 Commercial Buildings Energy Consumption Survey (published by the Energy Information Administration, table E2).

However, CBECS 2003 offers only a national average of all public assembly buildings (such as community centers, senior centers, museums, theaters/cinemas, libraries, and exhibition halls). It does not isolate only recreation centers, nor does it account for variables like climate zone, the extended hours of operation offered by a collegiate recreation center, nor the existence of a natatorium.

The project team also turned to the Association for the Advancement of Sustainability in Higher Education (AASHE), hoping its members might be able to offer some credible benchmarks,
Additional site water use savings come through efficient landscaping comprised of native and drought tolerant plants. To help manage storm water and provide irrigation when needed, two 6,000 gallon cisterns collect runoff from the building’s roof for use in a drip irrigation system.

When calculating a theoretical mid-summer baseline case (in accordance with LEED-NC v2.2 WEC1 requirements), a traditional irrigation system would need to apply a calculated 13,130 gallons of water to the landscaping around this building in the peak watering month of July. By selecting plant species that require less water, and applying water through drip irrigation (instead of sprinkling), the projected amount of water needed for irrigation was reduced to 5,210 gallons (a 60% reduction) during this peak month calculation.

The cisterns are capable of supplying up to 12,000 gallons of water, resulting in a 100% decrease in the amount of potable water required for irrigation during this worst-case scenario month. Selected plants include native and adapted species that are equipped to handle periods of drought in the case that the cisterns ever run dry.

Materials and Indoor Environmental Quality
Eighty-nine percent of the demolition and construction waste generated was diverted from landfills, including 5,437 tons of waste that was recycled. Of the new materials put into the gym, 25% (by cost) contained recycled content and 23% (by cost) were manufactured and contained raw materials obtained within a 500 mile radius from Richmond.

Building History
Built in 1891 as an open air market, the existing Cary Street Gym is an architectural monument in Richmond’s Oregon Hill neighborhood. In the early 1900s, the building was converted to a theater and used until 1946. Then the city began using the building as a storage warehouse and supply center until its sale to private businessmen in 1965. Under private ownership the building served many functions, including a discount furniture store, federal post office truck storage, a local studio to film commercials, and J.S. Archer Door Company facility.

The building sat vacant from 1976–1979 when it was acquired by the university and used as a gym. The original walls of the Cary Street Gym were retained and restored to conserve resources and preserve the historic character of the building.

Building Team
Building Owner/Representative
Brian Ohlinger, Associate Vice President for Facilities (VCU)
Design Consultant
Hastings/Chivetta
Architect of Record, Environmental Consultant, LEED Consultant
Moseley Architects
Building Owner/Representative
Brian Ohlinger, Associate Vice President for Facilities (VCU)
Design Consultant
Hastings/Chivetta
Architect of Record, Environmental Consultant, LEED Consultant
Moseley Architects
General Contractor
Kjellstrom and Lee Construction
Mechanical, Electrical Engineer; Energy Modeler; Lighting Design
Vandewell Engineers, LLP
Structural Engineer
Durham-Minyard and Partners
Civil Engineer
Draper Aden Associates
Landscape Architect
Higgins & Genstenmaier, PC

Clockwise from top left
A student enjoys a jog on the gym’s elevated track.
The four-court gym is used for various purposes, including table tennis.
The gym houses a natatorium comprised of a lap pool, a zero-depth entry leisure pool and a whirlpool spa.
The building sits on a pedestrian promenade that connects with the former site of Green Alley, a previously existing cobblestone thoroughfare.
Some of the recycled-content products include structural steel, aluminum (windows), wood doors, lockers, tiles, and rubber track flooring. Some of the regional materials include grout, mortar, grout, flooring and toilet partitions. Forest Stewardship Council (FSC)-certified wood is used for flooring, including the racquetball courts. In addition, wood materials were also chosen according to low-emitting standards.

In addition to improved indoor air contributing to building occupants’ comfort, on/off and motion-sensor lighting controls are provided throughout the building. These controls are designed to meet the needs of the occupants and the specific functions of each area.

Thermal comfort was considered during design and verified after occupancy through surveys distributed to building staff. The results of the occupancy surveys showed that respondents are happy with the building overall.

However some noted less comfort in the morning. Much of this discomfort was reported in office spaces around the fitness floor. These respondents felt cool as a result of the fitness floor having a lower temperature setpoint to keep exercisers from overheating during their workout.

More than 98% of respondents were satisfied with the lighting provided in the building. It was noted by multiple respondents that there was a great use of natural light, a feature that was enhanced during the renovation process by expanding masonry openings back to their original context.

LES S ONS LEARNED

Involve the Facility Director in Design. The VCU recreation director was part of the VCU Sustainability Committee and participated in numerous design meetings. He is still actively involved in running the facility, and has remained engaged in post-occupancy data gathering and analysis activities. This involvement has been crucial to the overall energy efficiency of the facility, because he set the tone for the way the facility was designed and also for how it is operated over time.

Involve Students in Design. VCU had a student representative at design meetings, and this representative actively advocated for the inclusion of green strategies and energy-efficiency strategies. Listening to the voices of the student community was an important part of this project’s success.

Sustainability Committee Helped Identify Project Goals. Because VCU has an active sustainability committee (comprised of students and staff) with clear goals and expectations for the incorporation of green features into campus projects, the design team was able to readily address those goals and expectations in the design and construction of this project.

Varying Occupancy Addressed with Demand-Control Ventilation. The varying levels of occupancy in this gym made it difficult to plan for the quantity of ventilation air; accordingly, carbon dioxide sensors were included in the design to allow for demand-control ventilation.

Avoiding Internal Heat Gain. Large expanses of glass are frequently a problem for mechanical engineers trying to save energy; this project does not have large expanses of glass and has an automated shading system to keep direct beam sunlight from heating up the interior space.

Benefits of Fabric Ductwork. The use of fabric ductwork in the natatorium and main gym turned out to be a cost-saving strategy while offering great performance characteristics.

Focus on Cost-Effective Strategies Resulted in Higher Certification Level. LEED Silver was the minimum requirement for this project. Despite concerns about costs on bid day, the design team was able to exceed the minimum LEED requirement and obtain LEED Gold certification while staying within budget. This was possible because of the commitment from day one, by the owner and the design team, to focus on cost-effective sustainability strategies.

Building Scale Designed for Residential Context. It is possible to design a recreational facility that is not large and boxy, which is typical of these types of facilities. This design team was able to reduce the sense of scale by lowering cornices and breaking down the massing into components that were compatible with the residential context.
office spaces expressed a desire for daylight dimming capability, but this option was not included in the project’s scope for cost control reasons. Additionally, survey responses indicated that more than 90% of the respondents were satisfied with the building’s indoor air quality.

**Innovation**

An innovative feature of the project is the use of environmentally responsible natatorium equipment. This recreation center includes a 2,600 ft² lap pool (25 yards), a 2,800 ft² indoor leisure pool and a 260 ft² whirlpool spa.

A salt/chlorine generation system is used in lieu of traditional solid or liquid chlorine to cleanse the facility’s pool water. While this system is widely used now, it was relatively new technology at the time of this project.

This approach to pool sanitation reduces hazards and risks associated with exposure to gas, liquid and solid chlorine by eliminating chlorine delivery to, and storage in, the facility. In the case of the Cary Street Gym, 2,700 gallons of chlorine don’t need to be manufactured, transported to and stored at the facility each year.

**Conclusion**

With the Cary Street Gym, VCU and the project team met its goals of furthering overall campus sustainability, preserving the historical character of the building and area, and providing students and the community with more opportunities for recreation, wellness, socialization and relaxation. Energy and water conservation measures have decreased the operating bills for the gym, while setting an example for students and the community at large.

**About the Author**

Bryn Cosgriff Dunn, Associate AIA, LEED Fellow, is a vice president at Moseley Architects in Richmond, Va. She serves as the firm’s director of Sustainability Planning and Design, and was the LEED project administrator for the VCU Cary Street Gym project.

**Comments from Post-Occupancy Survey**

- “Love the integration of historic and new.”
- “I really appreciate the large amount of use that the building gets. It also seems to attract students that are just looking for something to do.”
- “The overall look is very nice. Modern, clean, and comfortable.”
- “It’s a clean and safe environment in which to work and play.”
- “Building the gym was the best thing VCU has done.”

The VCU Cary Street Gym is located along Cherry Street, in proximity to the historic Oregon Hill neighborhood. The design of its façade relates to the neighborhood in terms of scale, materials and façade details.