
VELCOME TO
PIPER HALL

# Revitalizing Architecture

## FROM A SUSTAINABLE POINT OF VIEW

By Maura Williams

The recruiting mandate of universities—to attract and graduate a diverse student population—can sometimes be hampered by small intangibles, such as how a student tour guide is perceived during a visit or word-of-mouth through friends.

Fortunately, focusing on what matters most to college-bound students can positively influence their emotional responses. High on this list: a demonstrated commitment to causes that young collegiates care about, such as sustainability, and the impact of their potential college's environment on the environment as a whole.

Universities across the country have been showcasing a passion for sustainable life, from green roofs to eco-smart food services to zero carbon campuses. Another key way that a school can illustrate its commitment to the environment is through intelligent use of existing architecture. Architect Carl Elefante, Director of Sustainable Design at Qunin Evans Architects, Washington, D.C., coined the phrase "The greenest building is the one that is already built"—a concept that students intuitively understand and support, and the first one that they'll appreciate when touring a campus filled with the grace and presence of well-established, well-preserved buildings.

## Everything Old is New Again

The challenge, of course, is containing the costs of operating an older educational building. From leaky building envelopes to ill- or non-functioning openings, the opportunity for inefficient energy use is massive. The good news is this: The very same elements that increase the efficiency of a structure also enhance a building's overall historic appearance: its windows and doors.

Windows are one of the defining elements of a building, and therefore are a key component to preserve whenever possible. Short of that, well-designed replacement windows can go a long way toward maximizing a university building's aesthetic appeal—and preserving the historic feel of a long-established campus. Additionally, the advancements in modern window technology often translate to higher performance openings that lower heating/cooling costs and increase energy efficiency.

Buildings constructed before modern air conditioning and heating tend to incorporate design that uses passive energy-saving elements, such as the careful placement of windows outside of direct sunlight, the simple additions of awnings, and other shading and insulating features. Older buildings also often made better use of natural air flow and ventilation in the absence of modern air cooling. Add the positive impact of state-of-the-art fenestration technology, and preserving a vintage structure isn't just a way to show smart use of existing resources—it also gives prospective students a sense of shared values.

## Repair vs. Replace

School administrators are often faced with the dilemma of repairing windows versus replacing. Finding the perfect balance of initial investment vs. long-term payoff involves several factors. A Life Cycle cost analysis can help determine what type of window solution offers the most lasting value. Energy modeling based on an integrated system that synchronizes window operation, HVAC, and lighting can help forecast potential savings. If properly done, a university can gain both the short-term financial advantage of repair and long-term advantages in energy costs, plus create an aesthetically pleasing and physically comfortable environment that supports learning.

One example of a way to achieve the desired balance of authenticity, weather-tightness and affordability is a staged-form repair, where some elements of a refurbishment are new while others are renovated. For instance, simply replacing the sash where less renovation is needed can upgrade energy efficiency significantly, while preserving both

exterior and interior trim. For example, one public university in New Jersey was faced with the task of renovating its oldest building. The administration building had 600+ windows (nearly all of differing sizes) that needed an upgrade; the cost-effective sash and panning system replacement improved functionality at a fraction of the cost of total replacement.

The repair vs. replace decision can also be weighted based on the size of a project. Because of the potential cost of replicating the interior millwork at the University of Minnesota's Wulling Hall, a compromise proved to be the best route for the enormous undertaking: While nearly 200 new windows were crafted to replicate the original units, all of the original wood interior millwork was refurbished. Again, the greenest solution was to utilize as much of the existing materials as possible, while adding the environmental benefit of higher energy efficiency.

Another example of a successful renovation through replacement: Pillsbury Hall at the University of Minnesota. The goal was to match the look of a revered 112-year-old building, as well as complement the Richardsonian Romanesque

historic architecture. Materials and designs needed to fit the building's complicated existing curved units, plus satisfy a mandate for energy efficiency. In the end, replacement was the preferred alternative to renovating existing windows because of long-term weather tightness and the ability to maintain the look of the original windows, even though new, more durable materials were used.

## Replacements That Fit in Every Way

There are some universal challenges that universities face when opting to outright replace windows. In addition to matching existing profiles and materials, these projects are typically subject to institution-wide sustainability goals, LEED project certification objectives, or tight budgetary/schedule constraints. Also, energy efficiency often plays a significant role in the choice to replace rather than repair, and several issues should be considered.

Two measurements can help compare the energy efficiency between replacement window options. The U-factor of a window indicates the rate that heat escapes. The lower the U-factor, the higher the resistance to heat flow and better a window can insulate, making it ideal for retaining heated or cooled air and minimizing energy use for temperature maintenance.

A second measurement to consider is the Solar Heat Gain Coefficient (SHGC). The SHGC is the amount of solar radiation a window lets through, measured on a scale from zero to one. The lower the SHGC, the less solar heat is diffused, and the more effect solar radiation has in raising the temperature indoors—great in cool months for northern climates, not so great in warm ones.

To be completely apprised of a replacement window's performance, consider a quartet of metrics: U-factor, Solar Heat Gain Coefficient, Visible Transmittance (the amount of a window's visible incoming light ), and Air Leakage (heat loss/gain through cracks in the window's assembly). This chart offers an apples-to-apples look at how different frames and glazing perform. With the right partner, replacement windows can satisfy a range of project needs that go beyond energy efficiencies to include demanding design parameters. One example: Piper Hall on the Loyola University-Chicago campus. Leaded diamond-lite windows and countless other design details made the nearly 100 windows a particular challenge to accurately and authentically duplicate. A combination of simulated divided lites, factory-installed casing, and custom clad wood replication helped the project reach completion with aesthetic and schedule goals intact.

As more institutions seek updates with both aesthetic and functional appeal, new window options are meeting the demand. One versatile style, a classic-looking Simulated Double Hung Hopper, is specifically designed for large institutional buildings. Its energy efficiency, multi-point locks and hidden screens mean that it meets the goals of institutional renovators trying to satisfy building codes and address safety/security issues while still meeting the demands of both historical architecture and energy-use goals.

Carnegie Mellon University's Porter Hall is another example of a successful replacement endeavor that began as a potential problem for administrators. A massive, multi-piece assembly originally clad with copper had been sealed behind bricks for decades. The two-story windows were replicated through both archival architectural drawings and modern technology, with meticulous measurements and prototyping ensuring the final fit restored the building to its original glory.

## Formulas for Success

Several factors contribute to a successful integrated window design. In a university setting, such variables may affect not only energy efficiency, but also the learning environment itself.

As outlined by the Efficient Windows Collaborative, the following elements are critical in selecting a type of window that is energy efficient, visually appealing, and beneficial to both a building and those that use it: Orientation (which direction the window faces), daylight controls (systems that turn off or dim lights when there is

adequate daylight), window area (the ratio of window-to-wall) and shading condition (the shade offered by trees or other buildings).

Once a window design is chosen, university administrators may be pleased to discover that energy-efficient windows often translate to less expansive—and therefore less expensive—HVAC systems. Put simply, choosing a certain type of window for a new building or a renovation may help save money in other parts of the project.

## Preserving History

The ultimate challenge is restoring structures that are not only important to a university's visual and emotional appeal, but that also appear on the National Register of Historic Places. The bar is raised in terms of the structure's renovation and historic preservation, with extra careful attention being paid to a new feature (i.e., window or door). As the Secretary of the Interior's Standards for Rehabilitation states, any replacement must match the original "...in design, color, texture, and other visual qualities and, where possible, materials. Replacement of missing features shall be substantiated by documentary, physical, or pictoral evidence."

Notre Dame faced this situation with Washington Hall (built in 1881) and LaFortune Student Center (built in 1883). Both on the National Register of Historic Places, the structures needed replacement windows that could match not just original wood profiles, but also colors that were integral to each building's design. The wood profiles were successfully replicated in a long-wearing, custom color-finished extruded aluminum, greatly increasing the longevity of the windows while minimizing maintenance costs, thanks to the finish's exceptional durability.

## A Single Chapter in an Enduring Story

While the enormous undertaking of refurbishing a historically significant building on a campus can seem daunting, the potential benefits in the long term are significant. Refurbished or replaced windows preserve a building's character while enhancing its energy efficiency. With specialized glazings, security options and HVAC integration possibilities, the windows serve as more than daylight and ventilation openings, becoming a key element of a building's overall functionality.

And in the longest sustainable view possible, a high-quality renovation or replacement offers two more advantages: quality materials that can be renewed or recycled (as in wood and aluminum products), and building components that contribute to the preservation of a building overall. In a hundred years, the administration of your school will be able to refurbish and replace with minimum resource use, and carry on your wise vision of a green-minded, sustainable campus.

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**ABOUT THE AUTHOR:** As Marketing Communications Project Manager for Marvin Windows and Doors, Maura Williams manages Marvin's AIA Continuing Education program and other segment-specific initiatives. Marvin® brands provide an extensive range of standard and custom window or door solutions that can fulfill most any institutional, retrofit, adaptive re-use, historic restoration or new construction project requirement.


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