

The High Cost of Building a Better University

Higher education facilities seem to come at premium cost, even taking into account that educational facilities tend to cost more. The authors argue that this is due to appropriate and strategic high aspirations.

by Donald J. Guckert and Jeri Ripley King

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Coauthors Don Guckert and Jeri King received APPA's 2003 Rex Dillow Award for Outstanding Article for "The High Cost of Building a Better University."

This article is reprinted from *Facilities Manager*, May/June 2003, pp. 18-21, published by APPA: The Association of Higher Education Facilities Officers.

Higher education design and construction project managers perform their work on the forward-edge of an ever-changing world. We face increasingly complex facilities, shortening time lines, proliferating code and regulatory requirements, emerging technologies, and growing concerns for indoor air quality and environmental sustainability. As we strive to keep abreast of these changes, we continue to hear one question from governing boards, administrators, and customers: Why does it cost so much?

We cannot deny that educational facilities cost more to build than many other types of construction. Even in the realm of education, there is a hierarchy ranging from sophisticated research facilities to parking structures. Yet, all our facilities seem to come at a premium cost. Lower cost alternatives are always available, but our institutions choose, instead, to build to a quality level that is above the baseline. These choices flow from the institution's vision and strategic plan. The facilities we construct reflect the values and aspirations of our institutions.

A Sense of Place

Many universities are vying for national and international recognition. To do this, they compete for students, faculty, and research funding. More than ever before, university building designs are viewed as enhancing and preserving our institutional heritage while creating an attractive environment in which to learn, discover, and live. We do not just build or renovate structures; we create a "sense of place."

Clearly, this sense of place plays an important role in marketing the institution. In a 2001 study of college-bound high school seniors by Noel-Levitz, a market research firm, the most notable experiences seniors encountered on their best college visit had to do with the appearance of the campus and its facilities (Noel-Levitz 2002). This study confirmed the 1986 report by the Carnegie Foundation for the Advancement of Teaching that found that for 62 percent of prospective students, the most influential factor during a campus visit was the appearance of the buildings and grounds (Carnegie Foundation for the Advancement of Teaching 1986).

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The attractive appearance of the grounds and buildings comes at a cost. In constructing a new building for a campus environment, we seek elaborate designs that convey emotions and reactions that range from stimulating debates over architecture to communicating notions of continuity and timelessness. Often the little extras add a lot to the quality of the built campus environment: prominent building entrances, buried utilities in tunnels and chases, hidden downspouts in interior walls, screened waste receptacles, underground cooling towers, discrete access for service vehicles, and extensive landscaping and courtyards.

Land must be used carefully, with attention to gathering places and circulation. The need for green space must balance the need for building space. This drives us to optimize building footprints by building skyward and below grade to conserve precious campus real estate. Multiple stories require more costly foundations and structures designed to withstand seismic and wind loading standards. Stair towers and elevators consume project resources and decrease the percentage of assignable space. All these factors lead to a higher cost per square foot.

Codes, Regulations, and Standards

The type of occupancy determines the applicable building code requirements. The large assemblies found in most university facilities dictate the highest level of life safety design. These code requirements have a tremendous impact on cost by requiring stair towers, fire-rated corridors, fireproofing on structural members, fire alarm systems, sprinklers, and smoke evacuation systems. Even

the grade of carpeting in a university facility is selected to minimize concerns about flame spread.

In addition to codes, building design and construction must meet a myriad of legislative mandates and regulations. The list reads like alphabet soup: ADA, EPA, OSHA, and more. These laws and agencies govern building accessibility, removal of hazardous waste, asbestos, light ballasts, lead paint, storm water runoff, construction dust control, noise control, and more. Then, there are the state permits, local permits, contracts, agreements, and requirements by donors and funding agencies that must be managed.

The type of facility and occupancy also drives ventilation requirements. Labs require more ventilation than classrooms; classrooms require more ventilation than offices. Increased ventilation leads to upsizing HVAC systems, because outside air must be heated or cooled before it is delivered to the finished space. In a trend toward thwarting indoor air quality problems, building mechanical codes have increased ventilation requirements far beyond the infrastructure capacities in many buildings built before the 1990s. The impact is profound on renovation projects where HVAC costs alone can consume the majority of the project budget.

Institutional and Statutory Requirements

Institutional and statutory requirements can drive up costs too. Contractors must provide the highest industry coverage for insurance and bonding and construct in accordance with the highest industry standards. Architects may be required to furnish professional liability insurance. Public owners must follow state procurement statutes, which increase design and bidding costs and constrain the use of more cost-effective delivery approaches. Many institutions require contractors to pay prevailing wages to their workers, equating to union-scale.

An often overlooked impact on cost is the expectation that construction activities will be conducted with minimal disruption to campus life. The campus is a protected environment that accommodates learning, social interaction, discovery, living, dining, recreation, and public service. As invited guests into this haven, contractors are required to conduct their activities in a manner that minimizes the impact on the institution's primary missions. This is not a typical construction site. Project costs go up dramatically when universities restrict access to building sites; limit space for staging; require off-campus parking; enforce

jobsite cleanliness; add fencing and protection; route construction vehicles around, rather than through, the campus; limit noise and hours of operation; and impose complex phasing schemes to accommodate academic calendars.

Time Is Money

Demanding schedules are an inherent part of higher education design and construction efforts. In general, shortening the time line will drive up costs, lengthening the schedule will drive them down. An aggressive three-month renovation will be unaffordable if we only allow six weeks for completion of the work. Conversely, easing the schedule to six months will yield savings.

Contractors, when bidding a shortened schedule, will increase their bids to reflect overtime payments to workers, incentive payments to vendors, reduced worker productivity, and contingencies to cover the risks of falling behind schedule or completing late. On the other hand, extra time in the schedule reduces the contractor's risk, facilitates effective coordination among subcontractors, and provides sufficient time for fabrication and delivery of materials and equipment and other accommodations that result in a more cost-effective project delivery.

More often than not, we aggressively work toward inflexible milestones, such as semester starts and athletic event schedules. In research environments, the need to be up-and-running is paramount. When the higher education environment demands design and construction projects delivered on increasingly shorter time lines, this drives up the cost of university projects.

Complexity

The facilities we build are among the most challenging in the building construction industry. We build state-of-the-art research facilities, high-occupancy performance and athletic venues, heavily trafficked and technological learning environments, and living and social environments that must appeal to a new generation. In short, we are constructing complex communities.

Program activities often dictate the need for a combination of classrooms, laboratories, meeting rooms, and offices. Although grouping one type of activity in a facility would reduce costs, our buildings rarely house only one type of activity. In addition, they must meet the functional requirements of the campus environment.

For example, classrooms and auditoriums are usually on the lower levels of a building and demand larger, column-free spans. The lower levels may then have to support upper floors designed to accommodate floor loadings for bookshelves and lab equipment. Inverting these spaces, by placing the column-free classrooms on the upper floors and the heavy load-bearing spaces on the lower floors, would be more cost-effective but less functional in a campus setting.

Our facilities must accommodate a mix of functions and heavy traffic. To manage this, we install complex building systems. Mechanical systems are designed for extreme conditions: hottest and coldest temperatures, humidity extremes, strictest climate control, and highest occupancy. We recognize that the design of a mechanical system represents the greatest opportunity for energy conservation in the future. Investments in energy-efficient mechanical systems will yield a lower stream of future utility costs.

Maintainability, Sustainability, and Longevity

Good stewardship involves constructing buildings that will last, buildings that can be easily maintained, and buildings that can be converted to other programmatic or technologic uses in the future.

With many people using university facilities in frequent cycles throughout the course of a day, not only do the structures need to be able to handle this, but also the components of these facilities must be of a quality to withstand constant heavy use and abuse. Because of the campus building boom in the 1960s, we know all too well the consequences of cheaper designed and constructed

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facilities that were not built to survive the test of time. Our requirement for durability raises the price of doors, door hardware, carpeting, entrance mats, floor tile, and restroom fixtures, but it lowers the future costs of maintaining and replacing the lower quality products. We are resolved not

Your House on Campus

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"You've got to be kidding! I could build a nice house for that amount!"

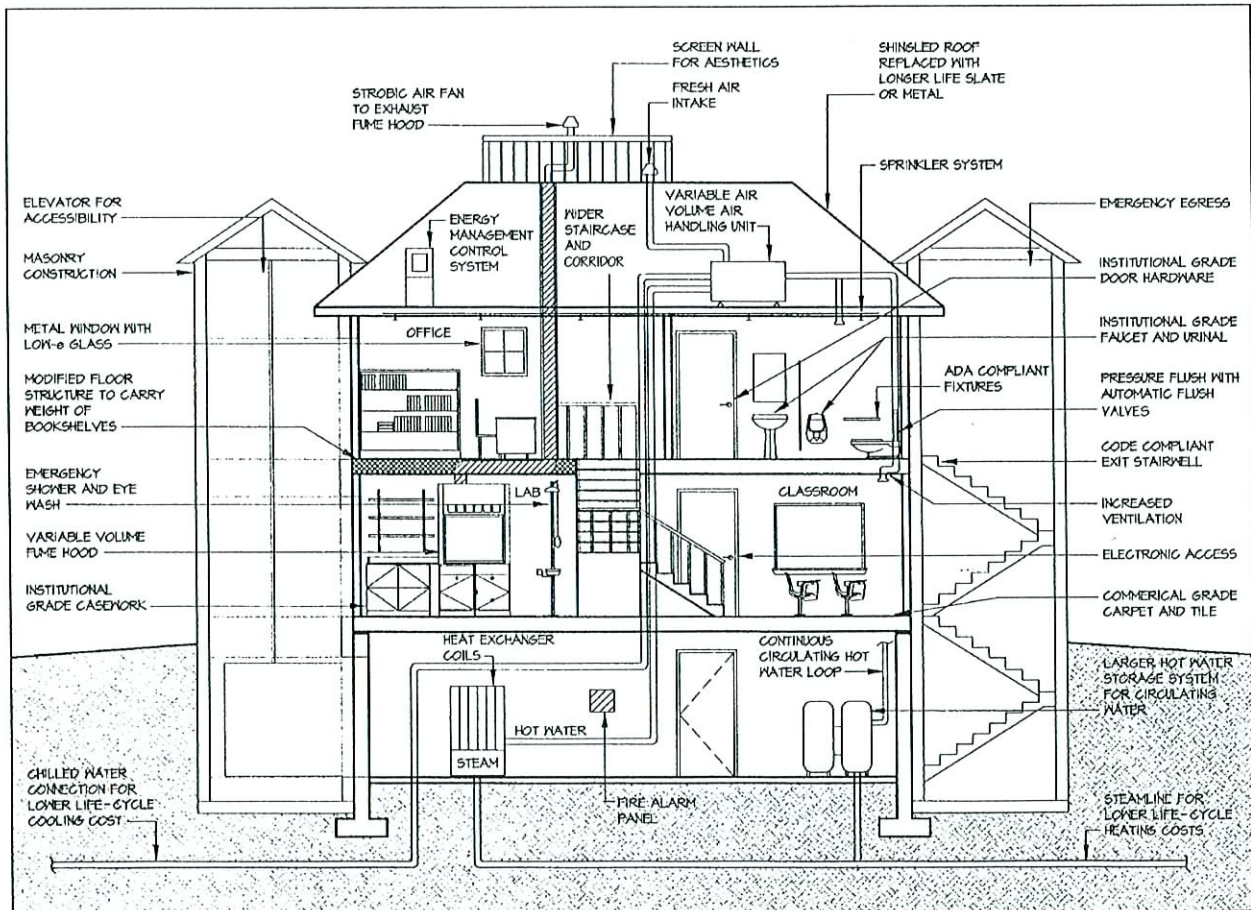
How many times have we heard that the cost of a "simple" renovation would buy a high-end home in a nice neighborhood? Customers typically react with sticker shock over the cost of a campus renovation when they receive the initial project estimate. This is the point at which worlds collide; where the institutional construction world of the project manager meets the customer's residential construction frame of reference.

Trying to justify the costs of institutional construction within a residential frame of reference is not easy. These

two types of construction are a world apart. However, just for the fun of it, we wondered, what would it take to renovate your house into a campus facility? Suppose you request that we renovate the living room into a classroom, the kitchen into a lab, and the bedroom into an office. In addition, you request that this facility is located on campus. Let's take a walk through your house (figure 1) to see what we will need to do.

To begin with, we'll need to make the facility safe and accessible. We'll add an elevator to the second floor, and an exit stair tower connecting all floors to the outside. To make this building look like it belongs

Figure 1 Your House on Campus



on our campus, we'll arrange for matching towers and give the building an identifiable look. Unfortunately, this will add considerable cost and space to the building while not adding any space for program needs. After we widen the interior hallways and stairways for increased traffic and install a utility chase from the basement to the attic, we will actually reduce the amount of assignable space.

As a university facility, the house will fall under a different classification as far as building codes are concerned. This means we'll need to replace the \$15 battery-operated smoke detectors with a \$15,000 fire protection system. This system, which includes a fire alarm panel, wired sensors, and sprinkler system, meets all of the requirements of the local fire marshal. To inhibit the spread of flames and smoke from one room to another, we will have to reconstruct the walls that separate the rooms from the hallway and make them "fire-rated walls." This is not cheap! The solid doors mounted to the metal doorframes that we'll use to replace the house's hollow doors and wooden frames are also not cheap.

We know the budget for this renovation is limited. Before the money runs out, we need to look at the mechanical systems. By code, our lab, classroom, office, and restroom require outside ventilation that your house doesn't have. The small air-conditioning unit and gas furnace will have to go. With the big increase in airflow, it wouldn't keep up after the first five minutes. We'll connect to chilled water and steam from our central plant. Our campus building will need redundant, dependable, code-compliant, and cost-effective mechanical systems.

Finally, we move to the kitchen. To convert it to a lab, we'll take out the \$600 kitchen stove and hood and replace it with a \$25,000 variable flow fume hood. Let's hope we won't need a strobic air fan for that hood; you don't even want to think about that cost. Those kitchen cabinets will come out to allow for the built-in lab casework. The refrigerator will have to go, too. In its place will be a \$10,000 environmental

chamber. We'll open up the walls when we install the lab gases, electrical conduits, and corrosion-resistant plumbing. While we are in the walls, let's replace the wooden studs with metal studs. Then, to complete this "kitchen remodeling," we'll replace the linoleum with an \$8,000 epoxy floor, and the Formica counters with epoxy resin.

We're going to need to remove the ceiling above the kitchen to increase the structural support necessary to handle the small library in the office above. The anticipated weight of books will stress the existing floor joists. While the ceiling is open, we'll install the circulating hot water system, designed to serve the lab and restroom, and we'll upsize the mechanical ductwork to meet the new airflow requirements. Speaking of airflow, that "whooshing" sound will be distracting in the classroom next door, so we will need to put in sound attenuation devices.

To meet institutional standards, the wooden windows will need to be replaced with metal, commercial-grade windows that have energy-efficient glazing. Similarly, the roof shingles will need to be replaced with slate, due to concerns about life-cycle maintenance and architectural consistency. While we're on the roof, let's screen the unsightly mechanical systems. Oh yeah, we can't forget to do something about the pigeons.

Let's look at the outside again, just for a minute. Only the front facade was bricked when your house was originally constructed, so we'll need to install bricks on three sides. After all, our university is trying to project a certain image, and your house is now on campus.

At this point, we have more scope than budget. Money is running out, and there are more things we need to do to bring your house into compliance with our institutional standards.

What happened here? In trying to meet the more stringent codes, efforts to reduce future operating costs, aesthetic requirements, and programmatic needs, we exceeded the funds available for this renovation. For the money this renovation will cost, you really could build a nice house. But not on our campus!

to repeat the shortsighted mistakes that were made by a previous generation of campus administrators and facilities managers.

The way we use our facilities demands that we construct utility systems within the building to high reliability standards. This often results in paying for system redundancies, generators, uninterruptible power supply systems, harmonics reduction, and central utility systems. In addition, telecommunication/computer wiring and pathways are often overbuilt to enable user flexibility and save the expense of rewiring and reconstructing walls or ceilings in the near future. We have learned that planning for tomorrow can cut down on the costs of retrofitting existing buildings.

Higher education constructs buildings to last beyond our lifetimes.

Environmental sustainability is another factor having an increasing impact on construction costs within higher education. Facilities are being constructed with recyclable materials, materials that are certified as manufactured from renewable sources, and building and system designs that use progressive methods and technologies to conserve energy and reduce the waste stream. Pursuing Leadership in Energy and Environmental Design (LEED™) certification, developed by the U.S. Green Building Council, brings the prestige and positive publicity sought by many institutions seeking a progressive and environmentally sensitive image. However, this comes at a higher cost.

Making these long-term, sound, investment choices is what separates higher education from the vast array of other building environments. Higher education, more than any other built community and commercial environment,

constructs buildings to last beyond our lifetimes. Every institution with an active building program envisions itself in existence into perpetuity. We make the choice to invest in higher quality construction of our campus, in part, because we have so many years ahead of us to reap the benefits on these initial investments.

Why Does It Cost So Much?

It is said that excellence is in the details. Thousands of details go into the construction of a university building. Rarely can we point to one item as driving the high project cost. The high cost of university construction is caused by the accumulation of investments in all of the details that go into building a quality facility. If we are to compete with the best institutions, we must meet the demands for higher quality facilities.

Construction costs mirror the values and aspirations of the institution. Our universities choose to provide stimulating, enriching environments that will serve our students, faculty, and researchers well into the future. We are building a better university, one that is built on the traditions of the past and constructed to compete for faculty and students into the next century. ❧

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