Why the Roof Hasn’t Caved In:
How Creative Facilities Leaders Have Prevented Catastrophic Failures
In 1980, Rick Biedenweg and Robert Hutson’s article *Before the Roof Caves In* shouted a warning that more effective planning approaches were needed to address higher education’s looming facilities challenges. Their research served as a precursor to modern lifecycle management. Many leaders and professional organizations, used their research to make predictions of imminent system failures in order to compel action. However, the reality is that over these last 35 years, funding has remained well below estimated needs but the widespread failures that have been publicized in the facility management industry have not occurred. That requires us to pose the question “why?” With rising backlogs and more institutions forced to defer a growing list of repairs each year, why haven’t we seen systems degrade to the point of program interruption?

Sightlines decided to answer these questions with data. With a history of capital and operating data for over 450 institutions across the U.S. and Canada, Sightlines is uniquely qualified to weigh in on the subject. The database does confirm that investments have been significantly below target levels and therefore lifecycle expectations. So again, with funding continually falling short, why hasn’t the roof caved in? Luckily there are several contributing factors; some are systemic, and others are the result of resourceful facilities operators. This paper outlines the root causes of compounding capital needs, the reasons we do not see crumbling facilities, and some simple strategies that are used to avoid program interruption on higher education campuses.

**Why are we here?**

History is instructive. Let’s start by examining why Biedenweg and Hutson authored their article in the first place. Sometimes the simplest data can be the most illustrative. Sightlines tracks the construction age of each building at member campuses.

You can see that approximately 40% of all campus space nationwide was built during the “post-war” era of the 1960s and 1970s. Growth was fueled by the influx of baby boomers, the space race and the GI Bill. These spaces often had “cutting edge” mechanical and structural systems for the times, but finishes were not always of the best quality. You can easily pick these structures out today as you drive around a campus and see brick buildings with flat roofs and aluminum casement windows. In 1980, *Before the Roof Caves In* was written as this wave...
of construction neared its first renewal or “keep-up” cycle. If we didn’t invest heavily, backlogs would accumulate and lead to failures.

Today the situation is different. We not only have one spike, but two. A second peak of construction began in the 1990s, and reflected the growth in student population, expanding research and greater funding. We call this the complex era, and these new spaces benefited from the lessons of the past. They were of better quality, but also tended to be more complicated to operate with more sophisticated controls and systems.

Biedenwig and Hutson’s warning from two decades earlier was heard, but unfortunately the resulting action was not what they intended. Our review of the renovation age of campuses, which takes into account large projects that essentially “reset the clock” of older buildings, shows that most of these transformative projects were completed in facilities built in the pre-war era, leaving the extensive post-war boom buildings alone. With this shift, these two spikes in construction and renovation intensified rather than dissipated. Today, both groups of spaces approach major lifecycles and compete against each other for limited funding.

Holding up the roof

In the 1980s there were a lot of different levers that institutional leaders could pull to fund deferred maintenance. Many relied on “growing” their way out of the problem through expanding enrollments, increased tuition and robust debt capacity. During this period, federal government and state support grew and endowments soared. Today, with flat or declining enrollments in most states, and tuition increases under fire, most of these options are simply not available to campus leaders. To top it off, facilities budgets and capital allocations are just returning to the pre-recession funding levels of 2008/09.

So what does this mean empirically? Our database tells us that the project backlog on campuses averages more than $90 per square foot. That totals more than $115 BILLION in our database alone, which represents less than 20% of the campuses in the nation.

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But does documenting a bigger problem compel action? In our experience, few campuses presented with vast backlogs actually embark on far reaching programs to invest in maintenance correction. More often than not, the seemingly massive need freezes administrations and actually hampers action. Greater information is requested as the large “imminent/past due” number is simply unbelievable. As one board member asked us during a presentation, “If the problem is truly this big, why don’t we need flak jackets and helmets to walk the campus?”

So again, with this level of backlog never before seen, why hasn’t the roof caved in? Some of it is the result of fortuitous planning, and some of it is the result of creative facilities leaders having to combat this “analysis paralysis.”

Below are several tactics used to avoid failures, and there is one common thread. Since the post-war era, facilities leaders have shifted from a practice of conducting “clock resetting” major renovations, to a more systems- or component-level renewal strategy. This partly due to necessity and partly to the new realities of funding. Either way, the dire predictions have not come to fruition largely for the following reasons.

Facilities leaders have access to better data and management systems. Through a variety of predictive models, including Sightlines’ Return on Physical Assets (ROPA+) service, institutions have greater foresight into pending lifecycles as well as the conditions and repair requests of line-item components. The availability of this data allows a more proactive system-by-system approach to maintenance, even when large-scale capital programs are in doubt.

Building and system lifecycles are longer. We have seen that the engineering lifecycle projections are appropriately conservative and systems tend to degrade rather than fail. Proactive planned and preventative maintenance programs at many institutions actually extended the lifecycles of a system by replacing key components rather than wholesale system replacement. The result of these actions is that systems and components are routinely exceeding foreseen useful lives.

Diversity spreads risk. Most campuses are collections of buildings and not standalone assets. While each facility is important, fewer system deficiencies rise to the level of program disruption when that at-risk building is one of 100 or 200 buildings. The addition of more flexible and shared classroom space over the last decade has also helped distribute the risk.

Functional obsolescence drives renewal. Overall, new, more complex facilities have shorter mechanical system component lifecycles compared to pre-war era buildings. However, lifecycles have not decreased uniformly. During the post-war construction era, space and program cycles were aligned with those for mechanical and building systems; however, the two groups have diverged over the past 50 years. Fundamentally, since the 1960s, space and program lifecycles have shortened while mechanical and structural systems have lengthened. With today’s programmatic flux, the “churn” rate of space is substantially faster than the renewal cycle for building systems. It is
modernization and program adaptation that drives most investment. Therefore, the savvy facilities leader has been able to bundle critical mechanical projects with space updates in order to avoid failures and prolong the use of the building.

**Changing the Conversation**

If you accept the theory that the “roof hasn’t caved in” because of the aforementioned points, then one must conclude that there is tremendous elasticity in campus facilities. Even in an environment of finite resources, although failures will happen, widespread failures remain unlikely. Therefore a more targeted investment strategy, rather than a one-size-fits-all solution is needed. So, how do we keep campuses focused on the issues and encourage them to take action?

Earlier we discussed how making a problem seem insurmountable paralyzed the decision making process. So instead, to encourage action, we need to make the problem “smaller” and more manageable. This doesn’t mean that we should ignore a series of needs. It means that we need to segment and present those needs in a way that reconciles the technical with the programmatic.

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- Diversity spreads risk.
- Functional obsolescence drives renewal.

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Creating building portfolios is a useful tool to make the problem smaller and to enhance management’s ability to act. Just grouping buildings though is not enough. The projects need to be subdivided by issues such as safety, reliability, program, and asset management to assist in setting investment goals. This process will create a “balanced” investment portfolio strategy, which makes picking projects obsolete and will likely lower risk exposure. In this manner, Sightlines’ Building Portfolio Solutions gives campuses the ability to validate their backlog, tie it to mission, and develop a capital plan that optimizes limited resources.

On campus, the decisions to halt new construction, demolish non-functioning assets, or sell buildings to other organizations are difficult, and the process is often siloed rather than unified within an integrated facilities management strategy that most effectively supports campus mission. But armed with a new level of data, boards of trustees

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Not all buildings are created equal, therefore they should not be treated that way.

More complex facilities have shorter mechanical system component lifecycles.
and campus leaders are today making courageous decisions to do just that by asking the question, “Do we really need all of this space?” Through ROPA+ and our Space Utilization Solutions, Sightlines has helped many institutions understand how well they are using their biggest asset before they choose to expand or invest in a seemingly failing structure.

“Savings Help.” Across our database, we estimate that campuses need to spend approximately $5 per gross square foot (GSF) annually to “steward” the buildings and manage the assets. Campuses are funding on average 27% of this need - $1.35/gsf. But, campuses are spending on average $7.20/gsf on operations and utilities. A 10% savings is a 54% increase in stewardship funding. Campuses generally know how to do this, but policies are needed to reallocate savings from operations to stewardship to create the incentive to attain those savings. The data shows that that $1 increase in stewardship offsets $4 in capital – an amazing payback.

Conclusion

Today’s facilities leaders are faced with more challenges than ever before. Many say that their role at the institution is to “play the hand we’re dealt.” We disagree. Campus leaders’ real is job is to make a better hand. Discard cards you don’t want and come out ahead. Institutions across the country are making such decisions about facilities.

Higher ed can do more within the existing resources, and can manage the risks more effectively. However, real progress calls for a holistic approach that bridges space, capital, and operations. It requires leadership to incentivize change, track it and reward positive results. Finally, it takes patience. Campuses were not built overnight, nor will they fall apart in a day. If money was no object, you wouldn’t need a plan. The reality is that resources are finite and without a sound plan mistakes can and will be made.

Sightlines is here to help. Our Return on Physical Assets (ROPA+) program gives our members the ability to manage space, capital and operations more effectively. Technicians are needed to fix the systems but without the resources the technician is ineffective. Our job is to effectively make the case for change by developing and articulating a strategy that can be understood from the boiler room to the boardroom.

“When you can measure what you are speaking about and express it in numbers, you know something about it; when you cannot measure it… your knowledge is meager and unsatisfactory.”

- Lord Kelvin, 1863

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