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FACILITIES magazine



Infrastructure
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*Cultivating
the APPA Community:*

A Profile of President Ruthann Manlet

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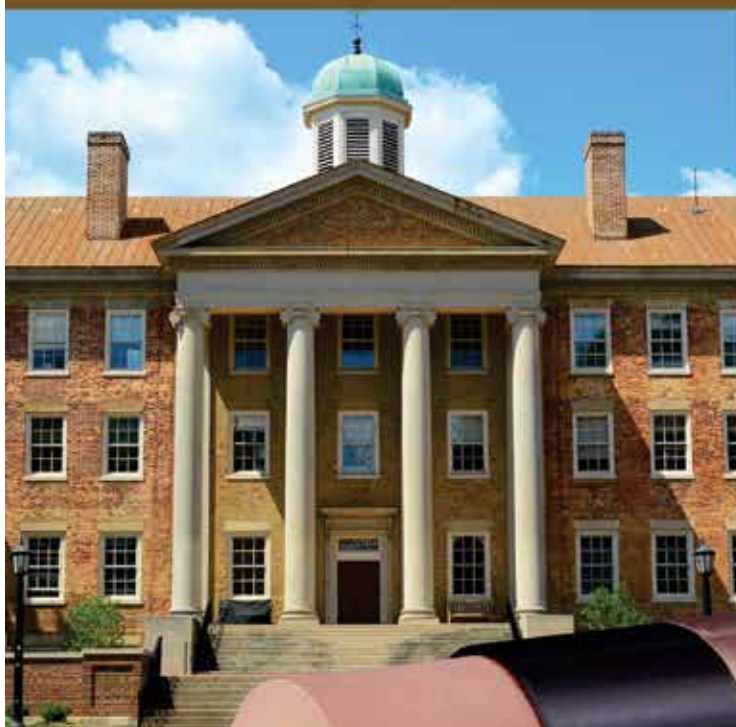
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APPA Staff Service; Member Reflections



25 Years of Service
Lander Medlin
Executive Vice President



20 Years of Service
Suzanne Healy
Director of Professional Development

Reflections from Retiring Members


We're pleased to share these unsolicited words of thanks from two longtime APPA members. **Jeff Grimm** retired from The Hill School in Pennsylvania on July 29, 2019, previously having served at Lehigh University. **Susie Reid** has spent her 40-year career at the University of Richmond in Virginia and will hit the retirement trail in December. We thank both of them for their support of APPA over the years.

From Jeff Grimm: "If you've been a member of the APPAinfo listserv for any time at all, you'll know that I came to the people who make up this asset and resource a lot—both for advice and sometimes merely to vent and feel the warmth of the 'misery loves company' perspective on our work lives in this industry.

Throughout my career, I have found the people who gravitate to this career field of Facilities Management to be some of the most knowledgeable, helpful, and dedicated employees in any of the organizations for whom I have worked. I also have found them to be some of the most under-appreciated, overworked, and mistreated/misunderstood group of PROFESSIONALS around! Keep doing what you do—taking on the challenges, solving the problems, and helping each other to survive and thrive. And keep using all the resources that APPA offers! It is a great organization and deserves all the support we can give it and its officers and staff. It has been a lifeline during my career in this profession and has helped to raise the esteem of what we do throughout the industry.

Thank you all for your help, support, and camaraderie over the years. They are much appreciated and will be remembered."

From Susie Reid: "My pending retirement has reminded me of my many years affiliated with APPA and the many friends I have made through APPA over the years. APPA helped educate me in this facilities business starting back in the early 1980s with the Institute for Facilities Management, and in more recent years with the Leadership Academy. And then there have been my trips to the annual VAPPA and SRAPPA conferences. I have been a strong supporter of APPA over the years and simply want to say thank you for all you have done for me. I started out here at UR as a groundskeeper on December 20, 1979 and will leave as a Facilities Director on the same date, 40 years later. Never did I imagine this would be my life—but man, what a great ride it has been! I wouldn't trade it for the world.

You are a great group of people who are out doing all the right things for our profession. Your commitment is evident in all that you do. APPA has made me proud to be in this business. APPA is an inspiration!" 

COMING IN NOV/DEC 2019

■ Recommendations for
Tree-Care Programs

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About APPA

APPA promotes leadership in educational facilities for professionals seeking to build their careers, transform their institutions, and elevate the value and recognition of facilities in education. Founded in 1914, APPA provides members the opportunity to explore trends, issues, and best practices in educational facilities through research, publications, professional development, and credentialing. Formerly the Association of Physical Plant Administrators, APPA is the association of choice for more than 20,000 educational facilities professionals at more than 1,500 learning institutions throughout the United States, Canada, and abroad. For more information, visit us at www.appa.org.

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facilities digest

By Anita Dosik

industry news & events

Become an APPA Officer: Nominations for 2020 Are Now Open

APPA's strong and steady volunteer leadership is one of the core forces making it the association of choice for educational facilities professionals. Consider becoming a candidate for an elected APPA office. Elected officers gain valuable leadership skills and a chance to develop professionally in many meaningful ways, and being an officer provides a major opportunity to give back to the entire profession. Serving as an APPA elected official does require a personal commitment of time and energy. However, past elected officers will tell you that the personal rewards and professional benefits outweigh the costs of engagement and time commitments. There are five elected officer leadership positions, only three of which will be on the 2020 ballot:

- President-Elect
- Vice President for Member + Community Engagement and Chair, Awards & Recognition Committee
- Vice President for Professional Affairs

Consider nominating yourself—or others—for the position that best matches your passion and areas of expertise. Learn more at <https://www.appa.org/elected-office>. All applications and nominations for APPA office are due no later than **December 9, 2019**.

NOMINATE

Job Express

2020 Award Applications Due November 30, 2019

Nominations and applications are now being taken for APPA's 2020 institutional and individual awards:

- Award for Excellence
- Sustainability Innovation Award
- Effective and Innovative Practices Award
- APPA Fellow
- Meritorious Service Award
- Pacesetter Award

Award nominations submitted after November 30, 2019 will be held and considered in the 2021 award cycle. To find out details about individual awards, visit <https://www.appa.org/appa-individual-awards>; and for institutional awards, visit <https://www.appa.org/award-for-excellence>. You can also contact Kristin Witters at kristin@appa.org.



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FPI + KFM Surveys Now Open for 2018-19 Data Input

The 2018-19 cycle of APPA's **Facilities Performance Indicators** (FPI) is underway! Participating in the survey yields potent peer comparison key performance indicators, making the FPI a flexible, sophisticated, and powerful tool for analyzing, planning, reporting, and managing your facilities operation. APPA is the only higher education professional organization that provides such a powerful tool to its members. The APPA/NACUBO **Key Facilities Metrics** (KFM) survey is also open for data collection on a handful of consumption metrics.

Although the deadline isn't until **December 16** for both surveys, the earlier you start, the more time you'll have to give your operations the critical analysis that the surveys foster, and to realize the benefits of the results they generate. Visit <https://www.appa.org/facilities-performance-indicators-fpi> and www.appa.org/appa-nacubo-facilities-metrics-survey-and-report for more information and to register to complete the surveys.

APPA 2019 Conference Photos Available Online

You can access and download electronic images of the Denver annual conference from our Shutterfly photo album at <https://appa2019denver.shutterfly.com/42>. You can also purchase prints and have them shipped to you.



SAVE THE DATE! APPA 2020 Annual Conference and Exposition

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Mark your calendar to attend next year's meeting and exposition to be held in Boston! You won't want to miss this exciting gathering of fellow facilities professionals and exceptional speakers.



APPA Events

Sep 25-27, 2019

Academy on Campus: Level 2,
Rhodes College, Memphis, TN

Oct 3-5, 2019

Academy on Campus: Level 1, SRAPPA,
Covington, KY

Oct 15-17, 2019

Academy on Campus: Level 1,
Aims Community College, Greeley, CO

Oct 16-18, 2019

Academy on Campus: Level 1, MAPPA,
Mall of America, MN

Nov 12-14, 2019

Academy on Campus: Level 2,
Woodward Academy, College Park, GA

Regional Events

Sep 16-18, 2019

RMA 2019 Regional Meeting
Banff, Alberta, Canada

Sep 29-Oct 2, 2019

ERAPPA 2019 Regional Meeting
Erie, PA

Sep 29-Oct 1, 2019

PCAPPA 2019 Regional Meeting
Las Vegas, NV

Sep 29-Oct 1, 2019

CAPPA 2019 Regional Meeting
Winnipeg, Manitoba, Canada

Oct 6-9, 2019

SRAPPA 2019 Regional Meeting
*Hosted by Northern Kentucky University,
Covington, KY*

Oct 13-17, 2019

MAPPA 2019 Regional Meeting
Mall of America, MN

For more events and programs, visit
www.appa.org/events.

Why Every School District Needs a Program Manager

By JP Grom



Bond programs play a critical role in K-12 education. Our children not only need strong instructional programs, but also excellent school buildings so they can prepare for their future. Often, a bond program is the only way to finance the construction of new school facilities or renovation of existing infrastructure.

Big bond programs, which can sometimes cost hundreds of millions of dollars, require careful management of resources and teams. School administrators typically don't have the necessary experience to handle these bond programs. They are not familiar with the rules and regulations, contracts, and processes that architects and contractors follow. And they don't have the specialized knowledge needed to implement these large bond programs. On top of that, they have a full-time day job. Expecting a chief financial officer, chief academic officer, or senior facilities officer to pick up the additional workload and understand the ins and outs of planning and implementing a bond program is unrealistic.

So, what should school districts do? The solution lies in hiring a competent program manager who can serve as a one-stop resource to develop, pass, and

implement a bond program. A competent program manager should have a combination of planning, design, engineering, construction, and project management expertise to manage the bond program from conception to completion. By selecting the right program manager, the school district can provide the best value for a taxpayer's hard-earned money. Below are five specific ways a program manager can play a vital role in a school district's bond program.

UNDERSTAND FACILITY NEEDS

Developing a good bond program requires understanding the needs of the school district in the first place. What are the deficiencies in the existing school facilities? Are they overcrowded? Are they deteriorated? Or are they functionally inadequate for the type of instruction that's being delivered?

Program managers can help school districts understand facility needs in a logical, fiscally sound manner using a condition assessment process. This process will enable the school district not only to assess the physical condition of its existing buildings but also to look at the educational adequacy and technologies in those spaces.

Once the information is collected from the condition assessment process, program managers can help school districts prioritize their facility needs. Do they need to fix the roof before they expand the classrooms? Do they need to improve the campus technology, or do they need to upgrade the lighting first? Working with a citizens advisory group, the program manager then develops a list of deficiencies and the ways and means to fix these issues. Collaborating with the community, the program manager then creates a master plan to address the future needs of the school district.

ACT AS AN INDEPENDENT THIRD PARTY

Program managers can serve as an independent third-party resource who can provide the information needed for the development of the bond. By do-

ing so, they can eliminate the potential perception in the community that the district's needs were identified exclusively by the administration. If a sentiment begins to emerge that the facility needs are being driven by the administration, it can be detrimental to community buy-in. As soon as that happens, it's generally a bad sign for a bond program.

Additionally, program managers bring a level of expertise that the community can see clearly. The community begins to understand that the bond program is being developed by a group of industry professionals who understand the different inputs, cost considerations, and means necessary to correct deficiencies. The community's expectation that the bond program is handled in a professional manner is satisfied.

SAVE MONEY

Program managers can also help school districts save money during the design and construction process. During design, program managers can help attain savings by eliminating additional project scope through rigorous value engineering. For instance, is the high-cost finish selection necessary? Are the corridors too wide? Are the floor plans inefficient? By finding and cutting down inefficiencies, unnecessary costs are trimmed without sacrificing the quality of the building.

A good program manager will also be able to reduce costs through creative construction phasing. By grouping similar projects together, compressing project schedules by ramping up construction during summer sessions or seasonal breaks, and minimizing disruptions that slow down the construction process, program managers can help school districts attain significant cost savings.

BUILD PUBLIC TRUST

Program managers can also help build public trust by providing financial accountability for every aspect of the bond program. It begins with developing a realistic budget. This includes identifying the different costs the school district will incur throughout a project, including land acquisition, surveying, material testing, hard costs, soft costs, permitting, moving, relocating, and connecting utilities, with a reasonable level of certainty. By taking these considerations into account early, program managers can help school districts avoid unknown future costs, which can be a barrier for project success.

As work progresses, a program manager's job is to monitor the budget and ensure that savings are generated. If costs are higher than anticipated in certain projects, are there other projects where these



costs can be offset? By continuously applying sound fiscal management throughout a project, program managers can help school districts make decisions that allow for the betterment of the entire program. Additionally, program managers can provide proper oversight of all financial transactions on the job and ensure that every dollar of the bond program is spent properly, without errors.

EXCEED QUALITY STANDARDS

Finally, program managers can ensure that all projects of a bond program meet/exceed the expected quality standards. During the design phase, the architects and engineers in the program management team can implement quality assurance/quality control checks, where design glitches and unforeseen problems are corrected, long before a project reaches the construction stage. This significantly minimizes the number of change orders during construction.

As a project moves into the construction phase, program managers employ inspectors to walk the site, report inefficiencies, and work with material testing labs and government entities to ensure that the construction conforms with the standards that are in place. Without a program manager, who will be responsible for reporting any mistakes on the part of the architect and contractor? By serving as the school district's eyes and ears, program managers can ensure that the project is delivered by the architect and contractor in a manner that meets or exceeds the community's expectations. §

JP Grom is a vice president at Lockwood, Andrews & Newnam, Inc., based in Houston, TX, and can be reached at jpgrom@lan-inc.com. This is his first article for *Facilities Manager*.

Overcoming the Identity Crisis of the Facilities Professional

By J.B. Messer

We come from varied educational, technical, and professional backgrounds. We are supervisors, assistant managers, managers, assistant directors, directors, assistant vice presidents, associate vice presidents, assistant

or associate vice chancellors, vice presidents, chief facilities officers, and hold many other titles too numerous to mention. We work in facilities, physical plants, operations, and any name that can fit the job description.

Our jobs can comprise so many areas of responsibility that they are frequently difficult to track even when we are doing them. Some of the more frequent include design and specifications, new construction and renovations, project management, space planning, master planning, facilities condition assessments, operations and maintenance, building and campus services, landscape and grounds, athletic facilities, campus residence, aquatic natatoriums, warehousing, surplus, fixed assets, shipping and receiving, transportation, parking, property leasing and acquisition, contract-

ing, printing services, food services, emergency management, safety and security, risk management, environmental health and safety, pest control, waste management, information technology and networks, and associated software systems—along with the

administration, planning, and budgeting for each. And we wonder why there is an identity crisis among facilities professionals!

So how do you overcome these obstacles in order to be successful in your chosen field? Here are just a few factors to consider:

1. **Surround yourself with good people.** Make good hires, and inspire them to be better than they are. Provide them with the resources for success. You can never go wrong with this approach. But when you don't have the opportunity to make the best hires, you need to develop them.
2. **Knowledge.** It's essential to success. I always talk about relevance. You need to seek continuous improvement—always. If not, your peers will overtake you, leave you behind, and then you will lose the relevance of your position. You gain that knowledge through professional development classes, conferences, webinars, research, and professional papers. With that knowledge, you too become teachers and facilitators.
3. **Organization.** Every task or identified discrepancy must be recorded, organized, and prioritized. Each, no matter how large, can be broken down to doable parts, and you can celebrate the victories of accomplishment along the way. But organization goes further than this; it requires that you organize your offices, storage areas, warehouses, surplus, and even the organization as a whole in order to be more effective and efficient.
4. **Attitude.** A positive attitude can go a long way toward inspiring the people you work with each day. Most people enjoy working in an environment that is uplifting and brings joy. Being civil, kind, and positive, and saying the words “please” and “thank you” are all welcoming elements that promote good attitudes. Smile—always—and try to add some humor along with it.



5. **Clear communications regarding mission, goals, and expectations.** This requires the setting of good personal goals for every individual within the organization and frequent follow-up on those goals. Ensure that they are SMART (specific, measurable, attainable, relevant, and timely) goals. Celebrate the successes.

6. **Leadership.** It's the single most important factor that leads to success. There are so many books, training sessions, and courses on leadership that it is hard to know which model to follow. But after many years in facilities, I have it pretty much figured out—maybe!

The five items just covered are a great start for leaders, but a number of others come to mind: a) know your people, their capabilities, and what makes them tick; b) be calm under fire, even in the most adverse of situations; c) empower your direct reports; don't ignore them, but rather teach, communicate, trust, and provide resources for success; d) let your team know that you care about them and their success; e) be willing to work harder than

anyone on the team—don't ask them to do something that you would not be willing to do yourself; and f) invert the pyramid by being a servant leader.

The fact that our members are continually seeking to grow in these areas is one of the reasons why APPA is our *association of choice*. Through APPA's programming, professional development, certifications, webinars, workshops, and networking opportunities, we can make major strides in improving our leadership skills.

Is this going to solve our identity crisis? Perhaps not. But by working together and taking advantage of the possibilities that APPA offers, we can face all these challenges head-on every day and come out winners. ☺

J.B. Messer is vice president and chief facilities officer at Community College of Allegheny County in Pittsburgh, PA. He can be reached at jmesser@ccac.edu.

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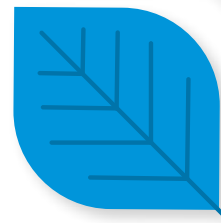
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Dedicated to Cultivating the Community

A Profile of President Ruthann Manlet

By Ruth E. Thaler-Carter

RUTHANN MANLET, associate director of facilities management at the University of Minnesota, Twin Cities Campus, West Bank District, in Minneapolis, literally grew up in facilities management and at this institution: Her father worked at the University of Minnesota, including in the physical plant department.

When Manlet finished high school, her father encouraged her to join the university facilities management team and pursue a degree through a Regents Scholarship. She started at 18 as a buildings and grounds worker and was promoted to supervisor by age 30. Along the way, she earned her BA in business administration.

“I loved facilities management,” Manlet says. “It’s a career that many of us fall into and never leave. I fell in love with the level of care and commitment to serving people that facilities management professionals share. I enjoyed learning all aspects of facilities management, from administration to the day-to-day side that

our front lines deliver with consistency and quality.”

The work and the nature of the environment—and her colleagues—keep Manlet going. “With the everyday change of pace, no two days are alike,” she says. “It’s the collaboration and interaction with our staff and customers; the staff we work with who come from all walks of life and constantly encourage me to do better; the challenge of improving our campus to make it the best experience for everyone who walks through it—and knowing that I’m helping to create some of the best research in the world.”

EARLY INFLUENCES

Manlet calls her commitment to the people she serves her strongest asset, and credits her childhood for that. She learned to work with people by working in her family’s grocery stores. When her family moved to a small farm,

Except where noted, all photos are © Patrick O’Leary Photography.



Above: Manlet and student Adam Kostanecki enjoy the new community garden, a collaboration between students and FM.

Right: The UM West Bank Facilities Management leadership team.



she found that she also loved working on the land. “Watching what you planted and nurtured grow into something that you supplied for the family was incredibly rewarding,” she says.

Her first community was the Girl Scouts, which she says “taught me many life lessons and shaped me into the leader I am.” She later became a Girl Scout leader and “to this day, some of my girls still reach out to me.”

That involvement is typical of Manlet’s approach to leadership and connections. “We are all involved in different communities, based on our interests and passions,” she says. “I found it important to give back.”

THE APPA CONNECTION

Manlet found out about APPA from Becky Hines, Midwest APPA’s (MAPPA’s) first female president, whom she met at a Big Ten and Friends Building Services Administrators conference in Minnesota. “Becky and I held similar positions, and I found myself seeking her out for advice. I set a goal to follow in her footsteps as a leader.”

In 2005, Hines asked Manlet to join MAPPA’s board as Chair of Professional Development. “I had a passion for training and professional development, so I accepted the invitation,” she says. “She said it was time for change and that I could bring some new ideas and energy to the MAPPA board. I think that if you ask anyone, they would say I did that.”

Manlet quickly learned how incredible APPA was. “From the professionals to our business partners, everyone is willing to share and help you in any way,” she says. “You can pick up the phone at any time with a question, concern, or challenge, and someone has an idea or is willing to listen and guide you. The amount of knowledge and experience in APPA creates a think tank that makes facilities management the profession it is. I have had the opportunity to learn and grow from some incredible

leaders in our organization, and the APPA community has given me so many rich opportunities. The more I learned about the APPA community, the more I wanted to do. The more I became involved, the more I found myself blossoming. I find myself saying yes every time someone asks or an opportunity comes up.”

Being involved in APPA has contributed to gaining confidence and knowledge in her chosen profession and helped Manlet become a better leader. “I need to have a seat at the table, be at the right table, and be a vocal player at this table to help our industry, especially since every day we are being asked to do more with less and to be more effective,” she says.

MOVING ON UP

In her 34 years at the University of Minnesota, Manlet has moved through the ranks to her current role, earning recognition as a University Services Star Performer along the way. She also holds certificates in communications, supervision, project management, and human resources.

Being a strong leader is a core value. “I believe that part of my job responsibility is to lead a team that exhibits extraordinary skills with passion and dedication,” she says. “I will do whatever it takes to help my staff develop. I love being a mentor and sharing and teaching.”

Manlet enjoys being a presenter, coach, and trainer in all aspects of APPA and has served in several roles at the international level, including as a Supervisor’s Toolkit trainer, Mexico Initiative cochair, credentialing faculty, and Vice President for Professional Development. In MAPPA, she has served in progressive leadership roles from committee member on up to president, including introducing MAPPA’s mentorship program. She credits the MAPPA region for its encouragement and engagement throughout her APPA journey.

Manlet’s honors include the MAPPA and APPA President’s Awards, the Pacesetter Award, and recognition as a Credentialing Lead Facilitator. She is a Certified Educational Facilities Professional (CEFP), and at the recent APPA conference in Denver was honored with the Meritorious Service Award.

THE IMPORTANCE OF COMMUNITY

Manlet illustrates her presidential theme of “Cultivating the Community” with lessons from one of her favorite activities—gardening. “Whether planting flowers or vegetables, we all benefit from getting our hands a little dirty, because our efforts will result in a beautiful visual

or delicious flavors,” she says. It is because APPA has “watered and fertilized” her, she says, that she has gained the confidence she has now. “I have blossomed more than I ever would have without this organization,” she adds, and aims to encourage similar growth among her colleagues.

Just as gardening requires picking the right spot, “facilities management professionals have to pick the right organization to customize what we need, and APPA can do that,” Manlet explains. “We have launched an online community platform, led by VP for Member and Community Engagement Tony Guerrero and his committee, where you can discuss what you need to develop and nurture yourself in the profession.”

Gardening also requires improving the soil, notes Manlet—and APPA can provide the “nutrients” to help its members grow. “Do you need to read a book, attend some professional development training, or find a mentor? APPA is there for you,” she says proudly.

Planting the seeds of success means “making a commitment to yourself about what you want or need from our organization,” she says. “With the help of VP for Information and Communications David Handwork and his committee, we can customize exactly what you need.”

Gardens thrive when they are watered properly, Manlet observes, commenting that “our VP for Professional Development Beth Clark and her committee have developed many opportunities to ‘water your needs,’ from the Supervisor’s Toolkit to the Institute for Facilities Management, the Leadership Academy, and our new Continuous Learning Series. Led by VP for Professional Affairs Dan Bollman and his committee, we also



Manlet with dayshift custodians.
From left: Terel Bridges, Abdias Shube,
Manlet, Luc Asuncion, and
Adanech Meskela.



Above: Manlet with U of M colleagues Ron Mapston and Greg Berger.

Right: Manlet receives recognition from Chris Kopach for her term as VP for Professional Development.



Photo by Rhonda Hole

Above: Manlet speaks to APPA members at the 2018 conference.

‘cross-pollinate’ through more than 20 opportunities to work with related associations such as NACUBO, ASHRAE, and the Society of American Military Engineers.”

In the same way that mulch protects a garden, says Manlet, “APPA is there to support you and ensure that you are getting what you need. Under the direction of Chair of the Senior Representatives Ian Hadden and Vice Chair Luis Rocha, you can receive the support of our whole organization. These representatives are all seasoned APPA Board members and former presidents of our regions.”

In addition, says Manlet, “through APPA, you can see yourself develop and blossom.” Bringing along others and investing in APPA’s credentialing program helps members “bloom.”

It’s also true that including a variety of plants makes a garden thrive. Along these lines, Manlet is focused on “creating diverse environments where more people feel invited and welcomed into the group(s) in ways that are meaningful to us both,” she says. “We’re not trying to build community as a ‘one-off’ experience. We’re building a supportive infrastructure by using our growing technology presence to glean more relevant



Photo by Rhonda Hole

information about our members—or non-members—so we can meet them where they are and pull them into this fantastic community. If we do it right, they will naturally want to join the association *and* become more engaged.”

Manlet’s vision of the university as a garden has more than just a personal connection for her: She supported the creation of a community garden on the West Bank of the campus that she says “ties what we are doing to the importance of growing or enriching a community.”

THE IMPORTANCE OF INCLUSION

One important area for Manlet is, understandably, the role of women in both facilities management and APPA. As president, she aims to emphasize that women and minorities are welcome as equals. “I believe that APPA is ahead of the profession in this area and leading the way in understanding the importance of having a diverse workforce,” she says. “We have made strides, but we still have some frustrations. APPA continues to look at various ways to engage and grow a community that is inclusive to all.”

Manlet is committed to seeing APPA continue to support its diversity and inclusion efforts with all members and their orga-

nizations. “We lead by example at our international, regional, and chapter levels,” she says. “As leaders, we need to acknowledge the many identities that make us unique and amazing, and be willing to be open to learning and understanding. If we take the time to be interested, we will create an inclusive environment and cultivate a community in which we will grow and learn. As facilities management professionals, it is important that our organizations are also made up of diverse populations. This lets us meet the needs of our customers—staff, students, and visitors. We need to always be open to different viewpoints and beliefs. As we strive to add more people from different backgrounds, we will continue to bring more ideas and creativity to our profession. A diverse workforce will always make an organization stronger and richer.”

Manlet is humbled and honored to have been the third female president of MAPPA and to become the fifth woman president of APPA, and has been inspired by her predecessors. “These incredible women—not only MAPPA’s Becky Hines and APPA past presidents Mary Vosevich and Polly Pinney, but also APPA executive vice president Lander Medlin—have helped shape me and push myself to continue to grow and learn.”

She notes that “just as many strong men have encouraged me, challenged me, and supported me throughout my life, starting with my number-one supporter: my father. I have been fortunate to come across inspirational leaders who have been willing to teach and guide me. I believe it takes a community to be successful. No one truly succeeds unless everyone succeeds.”

HONING THE STRATEGIC EDGE

Manlet credits APPA’s Immediate Past President Don Guckert and the APPA Board of Directors for their dedication to and emphasis on APPA’s Strategic Plan. She will continue to focus on the plan during her presidency, because it relates not only to the future and stability of APPA, but to its profession, member institutions, and individual members.

“The opportunity for real-world conversations and experience with my APPA peers has given me knowledge to prepare for and be part of strategic planning at the university,” she says. “As I brought back what I learned from APPA’s professional development opportunities, it became evident that the University of Minnesota leadership—especially Bill Paulus, associate VP of facilities management, and Dave Hutton, senior director of district operations—relished this knowledge. We have brought



Manlet, center, discusses West Bank Student Union Skyway exterior resurfacing project with Sawyer Stecher of Loeffler Construction, left, and Karen Haakonson, right, U of M project manager.

APPA’s Supervisor’s Toolkit and Leadership Academy to our campus as part of our commitment to the development of our future leaders.”

Manlet sees APPA’s Strategic Plan, *Preparing for Every Future*, as the key to educating APPA members “so we can focus on cultivating our APPA community,” she says. “We know that changes in educational facilities management are happening simultaneously, exponentially, and interdependently while higher education is at a critical juncture. APPA leaders realize that the association must meet the demands for continuous learning and skill-building, which will be the core to the success of our members in serving the ever-changing needs and demands of our institutions. We will focus on enhancing the vision outlined in our strategic plan to create a future of continuous learning and strategic principles.”

BEYOND THE WORKDAY

There is more to Manlet than her rewarding campus career and extensive involvement with APPA. When she is not at work, she spends time with her family and gives back to her community. She enjoys volunteering with organizations like Special Olympics and Ventures Travel’s True Friends program, and credits her brother, who is intellectually disabled, for opening her eyes to this community. “I wanted to find a community that would embrace my brother as APPA had done for me.” These organizations and the people she has met through them “have fed my soul and filled me with energy.”

Manlet was especially moved that APPA supports her passion to help others. “In 2011, when the MAPPA annual conference



Above: University of Minnesota West Bank Facilities Management 1st shift.



Left: West Bank 2nd shift.

was held in Minneapolis, my MAPPA/APPA community supported my other community by opening their hearts and contributing more than \$1,500 through a Hot Wheels charity race," she recalls. "These funds gave some special needs travelers the adventure of a lifetime."

Manlet also has worked in real estate and still holds a license, although she doesn't sell real estate these days. "That experience contributed to my facilities management career by teaching me the importance of having great communication skills," she says. "It is important to educate your facilities management customer about what our standards are and how our funding structure works. Real estate taught me that letting your customers, staff, and visitors know that you care will ring true throughout your career and pay big dividends. It is important to take the time to be an attentive listener."

Her real estate work showed Manlet that "everyone's time is im-

portant," she says. "I practice this in my day-to-day life." Her time in real estate has also taught her to hone her negotiation skills.

THE BOTTOM LINE

Facilities management goes beyond a mere "job" for Manlet. "In our profession, you never stop learning and growing. Every day is a new and exciting challenge, but knowing that I am having a positive influence on the staff, customers, and our world-class facility makes it all worth the effort," she says. "I believe the folks in the FM profession and throughout APPA live this. It is exciting to me and is what has drawn me to—and kept me in—this incredible profession." ☞

St. Louis, Missouri-based freelance writer/editor Ruth Thaler-Carter (www.writerruth.com) is a frequent contributor to APPA publications.



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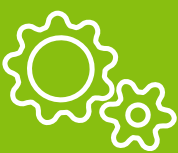
INFRASTRUCTURE RESILIENCY MODEL

**ELIMI
A**



**REPORT
PROGRESS**

By Brian Cowperthwaite and John D'Angelo, P.E., CHRM, CHEP, CMVP



MEDIATE, MITIGATE, AND REDUCE RISK

Deferred maintenance, facility condition index (FCI), and critical backlog are not inherently bad benchmarks; they just miss an opportunity to programmatically address risk mitigation as the primary function of facilities maintenance and operations, and fail to engage other critical stakeholders in the program development process. Each creates a mathematical model expressed either directly or indirectly in terms of cost to establish a current state. They each can express their future state in terms of positive, negative, or neutral trends based on future investment levels. However, they each fail to engage institutional leadership within a framework and a business language that can be clearly understood or directly (without need of translation) tied to institutional goals and imperatives.

For most asset portfolios, the magnitude of dollars contained within the benchmarks are so large that investment is either seen as potential competition to institutional initiatives or as eroding the credibility of the facilities organization. A \$1 billion deferred-maintenance benchmark would not be welcomed by even the wealthiest institutions, and a \$1 billion investment to eliminate it would not really eliminate organizational risk as the primary driver of why the benchmark is measured.

Focusing the benchmark on risk mitigation allows the team to express readiness in terms that are important to the organization and in the language that institutional leadership can understand without translation. It also allows the team to create a programmatic response that aligns processes, priorities, and deliverables toward that common goal. Using the Infrastructure Resiliency Model (IRM) allows the facilities team to specifically apply the data already developed for its deferred-maintenance or FCI benchmark within a framework that addresses probability and severity of risk while allowing for real-world drivers, constraints, and restraints. IRM also integrates operating account maintenance with recapitalization projects within the same framework.

The foundational driver of resiliency is found in appropriately matching the strategies of redundancy, reliability, and recoverability to the organizational risk. Each is based on the assumption that all systems will fail and will usually do so at the worst possible time.

RESILIENCY = REDUNDANCY + RELIABILITY + RECOVERABILITY

Redundancy is the most expensive strategy and should only be applied where system failure causes unacceptable consequences. Life-safety systems are generally protected from disruption due to a power failure with a statutory requirement for a backup emergency generator. Data centers and high-acuity research may have redundant temperature and humidity control systems, and patient care areas have backup plans in place for medical gases.

Both the initial cost and the maintenance of redundant systems are costly, and they are generally employed when the cost of failure to the services they provide far exceeds this investment. In other words, most organizations employ at least an informal risk model in their redundancy business case.

Reliability can be achieved through a variety of strategies. The simplest is by increasing preventive or predictive maintenance on critical systems or equipment and by ensuring that system components are purchased based on durability and functionality factors and not on price alone. Reliability can also be improved with easy-to-use computerized maintenance management systems, which contain accurate and up-to-date information. Drawings, spare parts lists, manuals, and options for rapid service both reduce and improve maintenance cycle times. Low or no-cost improvements to reliability can also be created with policy changes, such as response prioritization or support agreements, such as a standby contract for bulk bottled water delivery.

Recoverability is a measure of the speed and cost required to restore normal conditions after a system failure. Common examples of recoverability strategies may include a HAZMAT spill cleanup kit located near storage areas or electrical pigtails prewired into a main disconnect to accept a portable generator. Recoverability can also be expedited with a focus on prioritized risk identification. Identification of life-safety and critical systems can enable a preplanned response as well as the critical spares available to limit severity.

Redundancy, reliability, and recoverability will not prevent failures, but they can mitigate or eliminate the risk to safety and disruption of business continuity. The following fictional example helps illustrate how an organization can implement an IRM.

INFRASTRUCTURE RESILIENCY MODEL

1. Identify Risks

Each institution will have different risks and risk priorities dependent upon their mission, their culture, their infrastructure portfolio, and their geographic location. In general, the primary risks that institutions will focus on are those that impact safety, operational continuity, and brand. These risks can be further categorized into environmental drivers, technological drivers, and human drivers. Whichever categories an institution chooses should have the goal of engaging key stakeholders from across the organization in risks and impacts. An example list developed from these stakeholder conversations may resemble the table below.

2. Prioritize Risks

The impact of each risk depends upon the probability of occurrence, the severity of the occurrence, and the ability to

recover from the occurrence. Creating an algorithm with weighting factors appropriate to the organizational mission and culture provides a manageable framework for stakeholder agreement on prioritization. Once developed, this framework provides a baseline mathematical model that can measure changes to organizational risk over time or due to changes to probability, severity, or recoverability from real-world events.

Additionally, the framework becomes integral to evaluating and prioritizing institutional projects and processes and to communicating those recommendations to resource decision-makers. Furthermore, there is no need to speculate what the most probable and likely risks facing an organization might be. Institutions have an overabundance of data and information at their fingertips within computerized maintenance management systems (CMMS), building automation systems, and condition assessments; the IRM provides a specific, repeatable algorithm through which this data can be applied.

Looking at the example in the table below, the highest organizational risks are from an internal flood (126.7 score), a cooling system failure (102 score), or a fire (93.8 score). The drivers for each risk are different, and therefore the mitigation strategy for each needs to be different. This organization rated the probability of an internal flood at 50 percent due to a behavioral challenge with vandalism intentionally blocking toilet and shower drains, and due to mechanical rooms located above finished space; these are real issues identifiable via their CMMS. They rated the probability of a cooling system failure at 60 percent due to an end-of-life chiller that is undersized for the load it supports. This stakeholder group rated fire risk high



Risk Examples and Types

Risks		
Environmental	Technological	Human
Extreme Heat	Electrical Disruption	Labor Strike
Extreme Cold	Natural Gas Disruption	Hacker/IT Attack
Blizzard	Potable Water Disruption	Active Shooter
Icing	Sewer Failure	Civil Unrest
Hail	Fire Alarm Failure	Mass Casualty
Tornado	Heating System Failure	Transportation Disruption
Strong Winds	Cooling System Failure	Supply Disruption
Hurricane	IT Failure	Accessibility Disruption
Lightning	Telephone Failure	Epidemic
Flood	Internal Flood	HAZMAT Exposure
Fire	BAS/SCADA Failure	OSHA Compliance
Earthquake	Roof/Facade Failure	VIP Visit

due to the high-severity scores for impacts to safety, operations (business continuity), and physical damage, even though the probability of a fire is not high.

As the table below shows, the internal flood causes more damage than the cooling system failure, and both the internal flood and cooling system failure equally impact safety and operations. The cost and time



to recover from internal floods has been higher than the cost and time to recover from cooling system failures for this organization. Based on the knowledge gained from the stakeholder conversations and leveraging work order data and the high risk ranking, the team decides to pursue mitigation strategies to reduce this risk.

3. Eliminate, Mitigate, and Reduce Risk

Understanding the drivers and relative scale of each risk allows the organization to prioritize its efforts and resources

Risk Weightings and Ratings

		Probability (0-10)			Severity (0-10)				Recoverability (0-5)			Risk
	Risk	External	Internal	Overall	Safety	Operations	Damage	Overall	Time	Cost	Overall	(P*S*R)
Environmental Risks	Electrical Disruption	2	2	2.0	3	9	1	4.3	2	2	2.0	17.3
	Natural Gas Disruption	1	2	1.5	2	7	0	3.0	2	2	2.0	9.0
	Potable Water Disruption	3	4	3.5	6	9	4	6.3	3	2	2.5	55.4
	Sewer Failure	1	2	1.5	1	3	3	2.3	1	2	1.5	5.3
	Fire Alarm Failure	N/A	3	3.0	8	4	1	4.3	4	3	3.5	45.5
	Heating System Failure	N/A	4	4.0	6	5	5	5.3	2	2	2.0	42.7
	Cooling System Failure	N/A	6	6.0	6	7	4	5.7	3	3	3.0	102.0
	IT Failure	2	2	2.0	3	7	0	3.3	1	2	1.5	10.0
	Telephone Failure	2	2	2.0	3	5	0	2.7	1	1	1.0	5.3
	Internal Flood	N/A	5	5.0	5	7	7	6.3	3	5	4.0	126.7
	BAS/SCADA Failure	N/A	3	3.0	3	5	3	3.7	1	1	1.0	11.0
	Roof/Facade Failure	N/A	4	4.0	6	4	6	5.3	2	3	2.5	53.3
Technological Risks	Extreme Heat	2	2	2.0	6	2	1	3.0	1	0	0.5	3.0
	Extreme Cold	2	2	2.0	6	3	2	3.7	1	1	1.0	7.3
	Blizzard	3	3	3.0	4	5	3	4.0	2	1	1.5	18.0
	Icing	2	2	2.0	5	3	2	3.3	1	1	1.0	6.7
	Hail	1	1	1.0	3	0	3	2.0	1	2	1.5	3.0
	Tornado	1	1	1.0	6	6	8	6.7	5	3	4.0	26.7
	Strong Winds	3	3	3.0	5	3	8	5.3	3	3	3.0	48.0
	Hurricane	0	0	0.0	8	8	10	8.7	4	4	4.0	0.0
	Lightning	2	2	2.0	7	1	1	3.0	1	3	2.0	12.0
	Flood	0	0	0.0	4	4	4	4.0	4	4	4.0	0.0
	Fire	1	4	2.5	8	8	9	8.3	4	5	4.5	93.8
	Earthquake	0	0	0.0	4	2	7	4.3	3	4	3.5	0.0
Human Risks	Labor Strike	4	1	2.5	0	7	0	2.3	2	0	1.0	5.8
	Hacker/IT Attack	2	1	1.5	2	7	2	3.7	1	1	1.0	5.5
	Active Shooter	1	1	1.0	10	5	0	5.0	1	0	0.5	2.5
	Civil Unrest	2	1	1.5	4	4	2	3.3	1	0	0.5	2.5
	Mass Casualty	2	1	1.5	1	4	1	2.0	1	0	0.5	1.5
	Transportation Disruption	2	1	1.5	1	8	0	3.0	1	0	0.5	2.3
	Supply Disruption	2	1	1.5	1	6	0	2.3	1	2	1.5	5.3
	Accessibility Disruption	0	4	2.0	2	2	0	1.3	1	1	1.0	2.7
	Epidemic	1	1	1.0	2	4	0	2.0	1	0	0.5	1.0
	HAZMAT Exposure	N/A	1	1.0	5	1	2	2.7	1	1	1.0	2.7
	OSHA Compliance	N/A	2	2.0	4	1	1	2.0	1	1	1.0	4.0
	VIP Visit	1	1	1.0	0	5	0	1.7	1	0	0.5	0.8
738.4												

toward eliminating and mitigating root causes in order to reduce overall risk to the portfolio. Absent this knowledge and prioritization, the organization may spend significant effort and resources repeatedly treating symptoms.

In order to deal with the internal flood example shown above, the organization evaluated ways to reduce both *probability* and *severity* (see table below). Understanding their drivers, they found that the majority of the cost and time (*severity*) related to recovery was from floods in the mechanical rooms located above finished spaces. Although they were not able to relocate equipment from these rooms, the team discovered that cleaning unnecessary storage out of the mechanical rooms, sealing the floors, and creating a monthly preventive maintenance task to check for leaking equipment and clogged floor drains cut the time and cost to recover in half for this entire category of risk. An added level to reduce severity may introduce a mixture of water sensors that allow the staff to respond more rapidly and limit the impact.

Additionally, the removal of storage in the mechanical room also reduced the *probability* of an internal fire by a full point. The stakeholders estimated the cost of these measures and combined it with the significant portfolio risk reduction as the business case to request funding.

The organization further found that the high *probability* of internal floods was primarily due to the behavioral issue. They evaluated several strategies to reduce the impacts, including



increased day porter staffing in high-vandalism areas, switching to waterless urinals, and replacing paper towels with electric hand dryers, the item primarily used to vandalize the fixtures. As the cost for these initiatives was roughly equal to the mechanical room initiatives above, and the resultant risk reduction was much poorer in comparison, the organization chose to fund the former.

Regarding the cooling system failure, the organization looked at replacing the chiller with the same-size model or with a larger-capacity model. The larger chiller had a more expensive first cost and a more expensive annual operating cost, and lowered the probability of failure more than the direct replacement. The organization also calculated a reduced recovery time based on the larger chiller capacity, making its higher initial cost well worth the investment (see table below).

4. Transparently Report Progress

Unlike deferred maintenance, FCI, and critical backlog, the IRM described above connects investment and deferral decisions directly to the risks involved as opposed to age of plant or proxy financial benchmark. Also, unlike these other indices, IRM uses an “all-hazards” approach, meaning that it is not limited to buildings and systems, but evaluates all aspects of the physical environment. By evaluating all hazards, the stakeholder team evaluation of risk extends beyond facilities professionals, yielding a better understanding of the second- and third-order impacts, better response and recovery protocols, and more focus and agreement on investment priorities. One final difference is that IRM is not restricted to routine capital solutions. Prioritized

Reducing Risk Probability and Severity

Risk	Probability (0-10)			Severity (0-10)				Recoverability (0-5)			Risk (P*S*R)
	External	Internal	Overall	Safety	Operations	Damage	Overall	Time	Cost	Overall	
Internal Flood (as is)	N/A	5	5.0	5	7	7	6.3	3	5	4.0	126.7
Internal Flood (proposed)	N/A	5	5.0	4	5	4	4.3	1	3	2.0	43.3

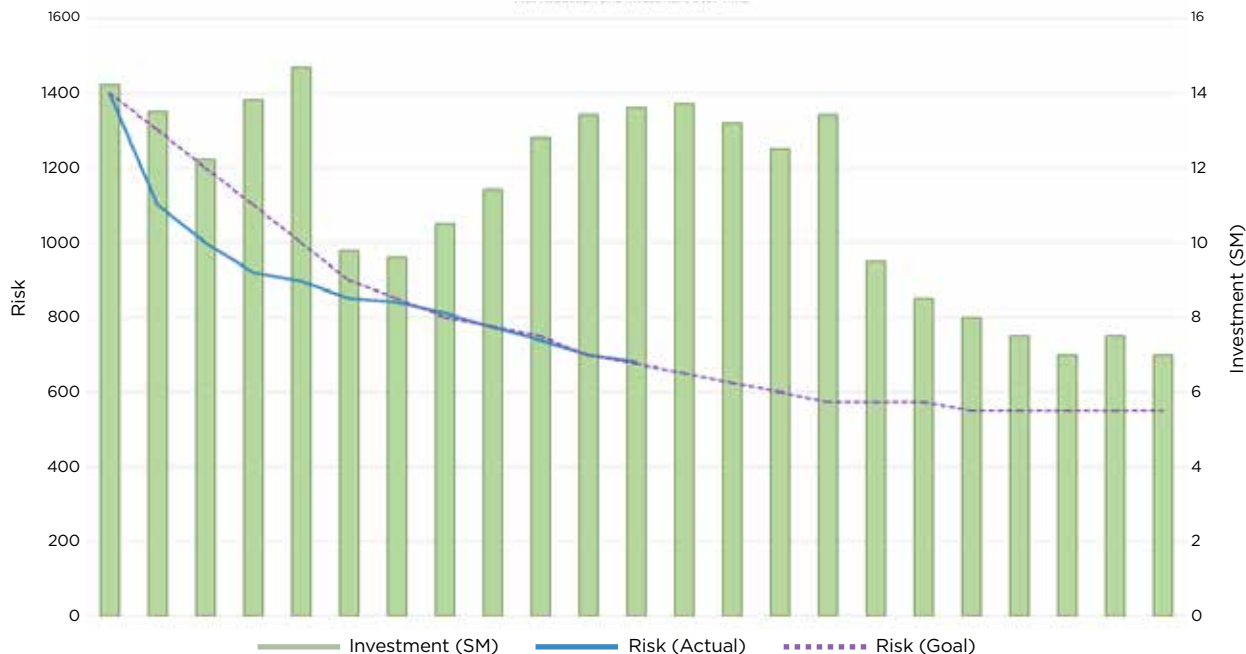
Fire (as is)	1	4	2.5	8	8	9	8.3	4	5	4.5	93.8
Fire (proposed)	1	3	2.0	8	8	9	8.3	4	5	4.5	75.0

Calculating Risk Recovery and Costs

Risk	Probability (0-10)			Severity (0-10)				Recoverability (0-5)			Risk (P*S*R)
	External	Internal	Overall	Safety	Operations	Damage	Overall	Time	Cost	Overall	
Cooling System Failure (as is)	N/A	6	6.0	6	7	4	5.7	3	3	3.0	102.0
Cooling System Failure (replace chiller)	N/A	5	5.0	6	7	4	5.7	3	3	3.0	85.0
Cooling System Failure (larger chiller)	N/A	4	4.0	6	7	4	5.7	12	3	2.5	56.7

Risk Reduction and Investment over Time

Risk Reduction and Investment Over Time



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risks can be abated or mitigated by any combination of capital replacement, operating maintenance, policy and procedure creation, or recovery plan development.

Because the IRM uses a numerical evaluation of *probability*, *severity*, and *recoverability*, it can easily be converted to a time-based key performance indicator that shows how investment or deferral decisions impact risk. Although impossible to reduce risk to “zero,” this indicator allows the institution to establish a risk goal to achieve and maintain. Transparent reporting assists in this goal becoming an institutional imperative: to preserve the balance between investing in new opportunities and maintaining the existing portfolio.

Certain trends in the above fictional graph can be expected in most cases. Initial risk reduction per capital dollar invested will be high as noncapital (targeted maintenance, policy creation, and recoverability plan development) opportunities are available. Risk reduction opportunities will become more reliant on capital investment during a “catch-up” phase. As the investment decisions are driven by risk, this total tends to be much less expensive than similar investments in deferred maintenance or FCI “catch-up” phases. Finally, maintaining the institutional risk goal requires continued investment at a much lower, but consistent level.

5. Things Change

As discussed above, the stakeholder conversations inherent in the Infrastructure Resiliency Model have a secondary benefit when real-world events cause changes to probabilities. The decision framework provides an opportunity for the organization to respond to these changes within the redundancy, reliability, and recoverability realms. A simple example could be taking the car in for an oil change, deep service including tire evaluation, and the purchase of a road-hazard plan such as AAA before taking a long road trip with the family. This is warranted in the IRM framework, as the recoverability factors increase due to being far from home on the long trip, and the severity factors increase from having your spouse and children in the car.

A real-world example of the above methodology includes Superstorm Sandy. On October 29, 2012, Sandy made landfall just north of Atlantic City, New Jersey. Despite being compliant with some of the most stringent codes in the facilities management industry, several New York City (NYC) hospitals were forced to evacuate during the height of the storm. One in particular had to evacuate 45 critical-care patients and 20 babies down stairwells lit by cell phones, while another hospital attempted to carry diesel fuel by bucket brigade from its underground storage tanks to its rooftop generators. The challenge for NYC residents did not end with Sandy moving on, as one hospital took more than

four months to recover and reopen, putting pressure on all other hospitals in the area to make up their bed count.

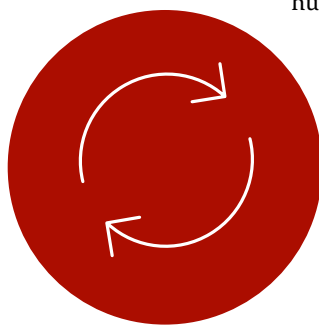
Other large, nearby hospitals with the exact same aging infrastructure challenges not only survived Sandy but were able to fully recover and work on providing increased capacity to make up for that lost by their area competitors. Although hurricanes did not receive a high priority during their annual review of risks, tracking Sandy allowed these organizations to update the probability and reevaluate risks and appropriate mitigations in real time.

Being comfortable with this process allowed one hospital to understand the secondary and tertiary risks that the hurricane posed, and the hospital anticipated that both commercial power could be lost and that Manhattan’s bridges and tunnels could be closed. The growing probability of the storm increased these risks and resulted in mitigation plans that allowed the hospital to put in place a plan for resupply, including diesel fuel for their generators. In this case, they rented a diesel tanker and driver and sheltered them on the island.

Both anticipated events eventually occurred: A commercial power substation failed, resulting in a complete blackout to lower Manhattan; the tunnels flooded; and the bridges were closed. Had this hospital not prepositioned the diesel truck and driver, they would not have been able to provide the same level of service to patients, as their storage tanks would have run dry.

In the aftermath of Sandy, NYC reevaluated its codes and discovered that despite existing codes being well thought out, well written, and well enforced, they applied to discreet, tactical elements instead of holistic preparedness strategies. The city set up a task force to change this, and on June 11, 2013, they released a comprehensive plan entitled “A Stronger, More Resilient New York” (<https://www1.nyc.gov/site/sirr/report/report.page>). Hopefully, more cities will follow NYC’s example and, in the interim, more institutions will adopt a risk-based approach to keeping our campuses safe and functional. 💡

Brian Cowperthwaite (cowperthwaite@uchicago.edu) is director of facilities operations and maintenance, and John D’Angelo (dangelo@uchicago.edu) is assistant vice president, facilities services, at the University of Chicago. This is their first article for *Facilities Manager*.



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LOGISTICS and PLANNING Considerations for Major **INFRASTRUCTURE UPGRADES**

By Mary Acciani, P.E., CEM





Upgrading campus infrastructure can be one of the most challenging aspects of facilities management on a campus. Whether the upgrade involves chillers and boilers in the main power plant, underground piping or power distribution throughout campus, or individual building infrastructure, the disruption to campus stakeholders is significant. Most consulting engineers know how to get a project done from a technical perspective but don't always understand how infrastructure projects impact a campus. Consequently, construction documents may not address all the logistics necessary to limit impact. This can lead to heartache when the campus is disrupted, stakeholders get angry, and the facilities professional is on the receiving end of unhappy calls. Upfront planning before engaging the design professionals and additional planning with them during the design process can help assure a more successful project.

SHUTDOWNS AND DISRUPTIONS— PLANNING TO MINIMIZE THE IMPACT

Rarely (probably never) do you have the luxury of shutting down a building for an extended period to replace the infrastructure. Digging up large sections of the campus to replace underground utilities can create unsightly and even dangerous areas that can cause problems where heavy foot traffic is common. Understanding the useful life of infrastructure and planning for replacement before failure is essential to limiting negative impact.

Planning ahead allows for an organized approach and provides enough time for temporary provisions to be put in place and long lead items to be procured. Including affected campus stakeholders in the planning process whenever possible allows them to get a clear understanding

of the challenges to successful completion of the project, and with this knowledge, they can be “ambassadors” of the project to others on campus.

For underground infrastructure distribution, whether steam, high-temperature hot water, chilled water, electric or fiber, you need to determine whether the system is a loop that can be backfed and where isolation points are located. Ideally the project will be timed such that contractors start excavating the day after commencement and have all openings filled by mid-August. This will usually require the contractor to be on board by late December or early January at the latest. Shop drawings need to be created, submitted, and approved, and material can be ordered for delivery by the start of excavation. Depending on the individual



Utility infrastructure upgrades on a main campus roadway.

circumstances of the institution, it may be prudent to plan the infrastructure replacement in sections over several years, so that disruption can be limited to the summer when most campuses have much smaller populations.

One of the issues that can delay an underground infrastructure project is the discovery of unexpected asbestos or other hazardous material. Planning for that possibility is critical, and including a process for handling hazardous material in the construction documents can prevent an unexpected stoppage in the progress of the project during construction.

If aging systems need replacement and are not part of a loop, it may be prudent to construct new sections to create a loop prior to replacing the existing sections. While more expensive than simply replacing the aged sections, creating a loop provides long-term benefits to the institution in the form of resiliency and options when problems arise in the system.

Some systems can be fed by temporary means. Temporary boilers, chillers, and generators can provide the ability to keep buildings occupied and working while equipment is replaced. Electric and hydronic systems are generally easier to feed on a temporary basis than air systems, but in some cases even air systems can be fed on a temporary basis. There is a cost impact to the project when temporary equipment is used, so it's always beneficial if projects can be planned to limit shutdown time. Some buildings cannot tolerate any shutdown no matter how short: Typically this means laboratory and research buildings. For those buildings it is imperative to start the planning process long before the necessity of replacing infrastructure occurs and

to include the building stakeholders in the planning from the beginning. They should be fully aware of the challenges and buy into the process, including any temporary feeds for infrastructure and the contingency plan for possible issues.

THE INS AND OUTS—GETTING OLD EQUIPMENT OUT AND NEW EQUIPMENT IN

What do boilers, chillers, and air handlers have in common? Unlike a rooftop air conditioning unit, which can simply be plucked from the roof, many of these items are located within buildings with no apparent way of easily removing and replacing them. Before beginning an infrastructure replacement project, gather available drawings from the initial construction of the building to see if any provision was made for the removal of equipment. Sometimes removable panels are designed into a building during construction, and finding them can feel like winning the lottery! Most central boiler/chiller plants have this feature. Sometimes individual buildings do, especially if they are science or research buildings.

If there is no removable panel, most equipment can be dismantled or cut apart to be removed. However, it's important to understand the environmental impact of dismantling equipment to remove it. The equipment may have asbestos or other hazardous substances that will need to be addressed prior to dismantling and removal.

Getting the new equipment into a building without a removable panel is more challenging than getting the old out. The equipment must be able to travel from the loading dock or other

delivery area and through the building to the mechanical room. It needs to fit through doors and may need to fit around corners. Some equipment is available to be shipped broken down in pieces for site assembly, to allow for travel through buildings.

Centrifugal chillers can be separated into bundles and assembled onsite after rigging into the mechanical room. Alternately, the system may be modified to use modular chillers, which are designed to fit through existing doorways. There are capital cost and efficiency differences between the different chiller types, but it may come down to what you can get into the building.

Some types of boilers can be carried into the mechanical room in sections and assembled in place. Depending on the system served, replacing the boiler with modular boilers may be the best option. Modular boilers typically fit through existing doorways. Boiler systems should be looked at for opportunities to improve efficiency, and modular boilers can allow for better load matching and efficiency.

Replacement air handlers can be ordered in sections or completely broken down and shipped on a pallet for constructing in

the field. Many times, air handlers can be reconstructed in place if the overall casing is intact. Almost all the air handler components can be replaced in the existing housing, including fans, coils, condensate pans, dampers, and controls.

A consideration for any equipment that is broken down for shipment and reassembled in the field is to require full factory testing prior to dismantling for shipment in addition to testing after reassembly. It's a good idea to have someone representing the campus (the consulting engineer or a knowledgeable member of the campus facilities staff) witness the factory test. It's essential to ensure that the equipment is tested at the factory before disassembly and that factory representatives supervise the reassembly. This helps avoid finger pointing if the equipment doesn't perform as expected after it's installed.

Make sure the bid documents your design professional prepares details any limits and constraints. They should show allowable passages for equipment removal and show travel in for new installation. Let contractors know whether they can or cannot use elevators or if there are areas they cannot go through. Let



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contractors know if there is any limit to the time they can access the building. Can they bring equipment in during the day when the building is occupied, or do they need to work after hours? Make sure the equipment specified by the design professional can be rigged in through the allowable passageway.

The bid documents should also require that any proposed substitution made by the contractor be accompanied by evidence showing that the substituted equipment will fit through the identified allowable passage and that it will operate as effectively as the originally specified equipment.

Some design professionals will resist showing allowable passages and the information described in the preceding paragraph, arguing that these items are contractors' means and methods. That is not the case. Telling a contractor he has to rig something in using a specific method or that he needs to have five workers on the rigging crew is means and methods; making sure there is at least one solution that works for getting the basis of design equipment into the building is not. The contractor may propose a different route once he's on board or propose a substitute piece of equipment, but those changes should be accompanied by the contractor's detailed plans for making them work. If the bid documents identify a workable solution, then any proposed changes by the contractor should also be accompanied by the deduction in cost and/or reduction in schedule to be gained if the institution accepts the change.

THE WAITING GAME—PLANNING PROJECTS AROUND EXTENDED EQUIPMENT AND MATERIAL LEAD TIMES

Project schedules will vary based on many factors, including an institution's procurement policies, the length of time needed for a thorough design/bid package, the institutional and permit review process, and the contractor's schedule. Working backward from the ideal completion date, include all the necessary construction milestones as well as procurement, permitting, design and documentation of the project, funding requests, and up-front planning by the facilities department. In general, for any work desired to be completed over the summer, contractors should be on board no later than late December or early January—ideally earlier.

One of the longest time frames in the construction process can be that connected with the approval and procurement of the material and equipment. Contractors will often try to substitute equipment, and the approval process can take a number of iterations in order to determine that the substituted equipment is equal to that specified and will fit. Once the equipment is approved and the contractor places an order, it may take 12 to 26 weeks or more for the equipment to be shipped. Piping systems for high-temperature hot water and steam also involve extremely long lead items, often taking more than 26 weeks for delivery.

Some institutions prefer to prepurchase long-lead equipment. This can be a good strategy, but it's not without risks. Prepurchasing guarantees that the equipment is as specified and that approval and ordering can take place prior to having a contractor on board. This can reduce the overall schedule and can often save money in terms of contractor's profit on the purchase price. Ideally, the project bid specifications will assign the equipment contract to the contractor, and the contractor will be responsible for receiving and handling it. The prepurchase equipment specifications given to manufacturers should also include the requirement that the equipment contract be assigned to the contractor. The contractor can schedule delivery such that the equipment can be unloaded and rigged into place when the contractor is ready for it. If the specifications don't assign the responsibility to the contractor, the institution will need to receive the equipment, rig it, and store it prior to the contractor installing it. This creates an opportunity for finger pointing if something happens to the equipment or it doesn't perform as required.

CONCLUSION

Replacing campus infrastructure is one of the most challenging parts of a facilities manager's job. These projects are disruptive, and the end product is not a beautiful new building that everyone can admire. Infrastructure is essential to the proper functioning of the campus; but ironically, when infrastructure projects are completed, they're most successful when no one notices—because they're working as designed. Infrastructure upgrade projects can be less painful when you plan well ahead of the needed replacement, consider contingency plans to help mitigate the impact on campus stakeholders, and overcommunicate the need, progress, and benefits of the upgrade. Include the affected campus stakeholders in the planning process whenever possible, so they get a clear understanding of the challenges to successful completion of the project. §

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A Survey Study of University **Tree-Care Practices**

By Mikaela Schmitt-Harsh, Ph.D.



Photo credit: James Madison University Creative Media

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Trees and forests play a significant role in the college campus landscape. Many campuses are borne out of a pastoral legacy and are intentionally designed as extroverted, expansive spaces that provide important services to the people who work, study, recreate, and visit campus grounds. Trees help beautify the campus landscape; in fact, many institutions are defined by their canopy of trees, their stately old landmark trees, or their unusual specimens.

Beyond recognition of the aesthetic value of trees, research embedded in the urban forestry discourse demonstrates an ever-expanding portfolio of benefits that trees provide, including carbon sequestration, air pollution abatement, stormwater-run-off mitigation, and building energy conservation. Contact with nature and green infrastructure can also improve one's well-being. For example, it can restore attention, lower blood pressure, reduce aggression associated with mental fatigue, reduce stress, and promote social cohesion; these findings have direct implications for college students and university staff.

The 4,600-plus colleges and universities in the United States and Canada offer ideal places to showcase efforts to beautify and manage landscapes sustainably, but how treed are campus landscapes? Are campus forests being managed sustainably and systematically? Are the campus departments who are responsible for tree care and management adequately staffed and financially supported?

To the author's knowledge, little to no research has been conducted to understand the extent to which college campuses are treed, and the ways in which institutions manage their trees. In contrast, national longitudinal studies that collect information on municipal tree care and management have been conducted since the 1970s; these datasets provide useful data to benchmark

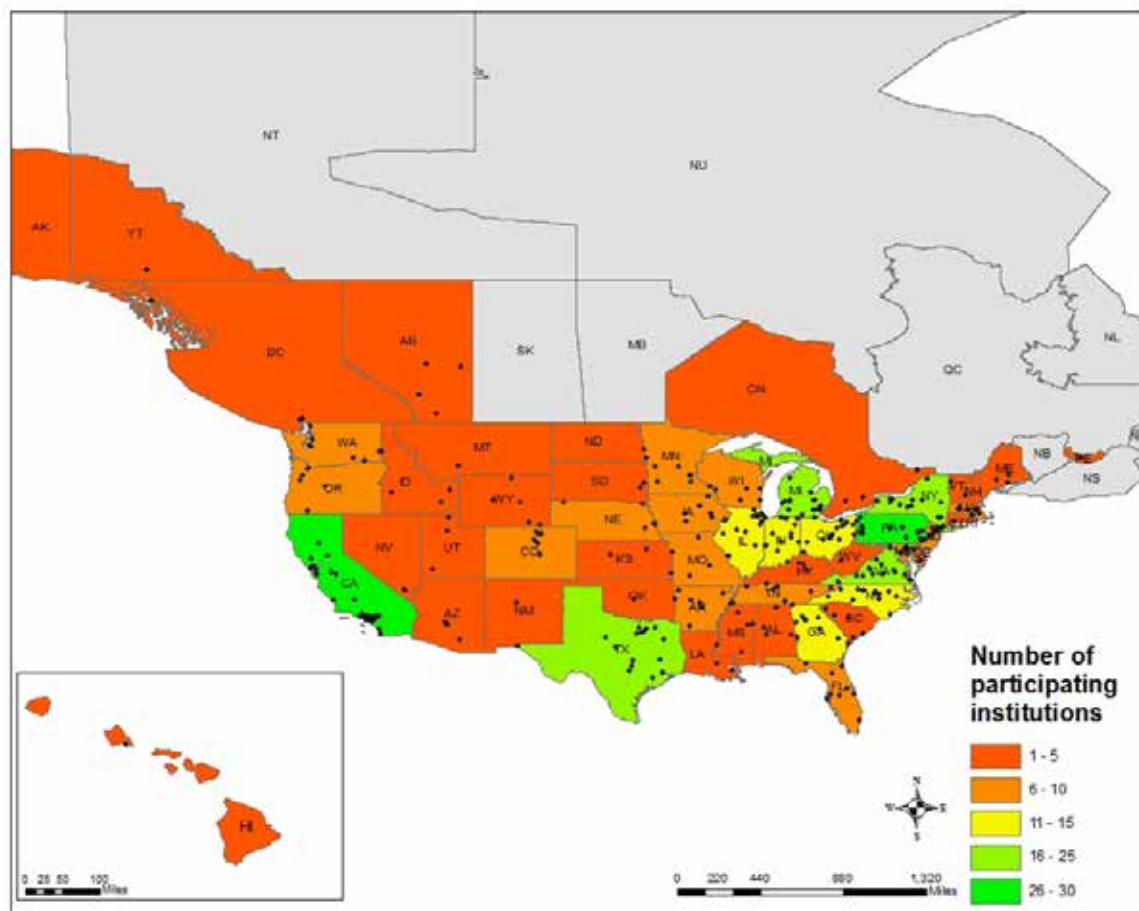
and track future progress. As college campuses continue to grow and, in many cases, become more urbanized, there is a need to understand the forest assets that reside on campus, and the ways in which such forests are being managed.

Against this backdrop, a survey was disseminated to colleges and universities in the United States and Canada to collect information about the ways in which campus trees are managed. Specific objectives of this survey were to:

- Estimate the number of trees and the extent of tree canopies on campuses.
- Characterize the strategies employed by institutions to manage trees on campus.
- Characterize the key personnel involved in setting tree-care rules and strategies, and the stakeholders involved in cooperating in these strategies.
- Examine the perceptions of institutions regarding their strengths and weaknesses as they relate to their tree-management program.

This article briefly describes the survey and provides an overview of the primary results. From institutional responses to this survey, and an extensive review of the urban forest sustainability

Figure 1. Number of participating institutions per state (n=378).



literature, a set of recommendations for colleges and universities has been developed and will be discussed in the next issue (November/December) of *Facilities Manager*.

THE SURVEY

A web-based survey was administered to institutions across the United States and Canada in 2017 and 2018, with the assistance of the Arbor Day Foundation and APPA's Center for Facilities Research (CFaR), using three alternative approaches. The first was an email blast from the Arbor Day Foundation to all institutions certified as Tree Campus USA. The second consisted of directed emails to institutions that were identified using a stratified random sampling approach from the Carnegie Classification of Institutions of Higher Education system. The third consisted of an email blast to institutional members of APPA. Use of these three approaches aimed to solicit feedback from as wide of a network of colleges and universities around North America as possible, including institutions with established tree-management plans and institutions that lack a formally recognized tree-management program. Individuals contacted to participate in the survey included campus arborists and facilities staff members who are active in campus tree-management efforts.

SURVEY RESPONSE

The author received 378 responses to the survey (response rate indeterminate given sampling approach). Institutions in each of the 50 states and Washington, D.C., with the exclusion of Delaware, participated in the survey, with some states having almost 30 participating institutions (Figure 1). Twelve of the responding institutions were from Canada, representing four provinces and one territory. The majority of respondents were from 4-year public institutions (4YPU) (n = 200) and 4-year private institutions (4YPR) (n = 142), with a small number of respondents from 2-year public institutions (2YPU) (n = 36) (Table 1). A number of colleges with active Tree Campus USA certification responded to the survey (n = 138, 36%), though the majority of respondents do not currently take part in the program (n = 240, 64%) (Table 1).

Table 1. Participating institutions by control, level, and enrollment size, determined by the number of full-time equivalent students enrolled.

Classification ¹	Respondents (n)	Tree Campus USA certified	
		Yes	No
Total, all institutions	378	138	240
Two-year public (2YPU)	36	7	29
Small (500 – 1,999 students)	3	0	3
Medium (2,000 – 4,999 students)	13	2	11
Large (5,000 – 9,999 students)	14	4	10
Very large (≥10,000 students)	6	1	5
Four-year public (4YPU)	200	88	113
Very small (≤1,000 students)	1	0	1
Small (1,000 – 2,999 students)	13	4	9
Medium (3,000 – 9,999 students)	63	20	43
Large (≥10,000 students)	122	64	58
Exclusively graduate/professional	1	0	1
Four-year private (4YPR)	142	43	99
Very small (≤1,000 students)	6	1	5
Small (1,000 – 2,999 students)	78	22	56
Medium (3,000 – 9,999 students)	40	14	26
Large (≥10,000 students)	17	6	11
Exclusively graduate/professional	1	0	1

¹ Classification categories are set by the Carnegie Classification of Institutions of Higher Education. Note that the classifications are time-specific snapshots of institutional attributes and behavior. The categorization used here is based on 2013-14 data (Carnegie, n.d.).

HIGHLIGHT OF SURVEY RESULTS

A detailed review of survey results is available in the full report (see <https://www.appa.org/cfar-completed-projects>). Provided here are a few highlights from this study.

Campus Tree Cover and Goals

- Respondents of this survey study were diverse in their stated tree abundance. The majority of respondents indicated having somewhere between 1,000 to 5,000 trees, though estimates ranged from 10 trees to 50,000 trees. Most respondents indicated their tree abundance value was an estimate rather than an accurate account.
- Currently, 36% of responding institutions either have a tree planting goal (20%) or are developing one (16%). The frequency was higher for 4YPU institutions (43%) than for 4YPR (31%) and 2YPU institutions (22%) (Figure 2A); however, for all institutional groups, the majority have not identified a planting goal.
- In this study, 76% of responding institutions provided a canopy estimate for their campus, with values ranging from 1% to 95%. The wide variability in canopy cover across institutions can be attributed to a number of factors (e.g., location, local environmental conditions, size of campus, historical legacy); from a purely methodological standpoint, the wide range may simply be the result of incomplete or absent canopy data. Just under 10% of those that provided a canopy estimate cited it was an “accurate record.”

- 21% of responding institutions either have a tree canopy goal (9%) or are in the process of identifying one (12%). Again, the frequency was higher for 4YPU institutions than for 4YPR and 2YPU institutions (Figure 2B); however, for all institutional groups, the majority have not identified a canopy goal.

Tree Inventory Efforts

- Two-thirds of the responding institutions (67%) indicated they have some level of a tree inventory, with just over 50% of these computerized. The software used to collect and track inventory data varied; the most common responses included Microsoft Excel, ArcGIS, ArborPro, and ArborScope.
- Tree inventories regularly included information about tree species (99%), tree location (97%), tree diameter (69%), and tree condition (69%). Other information, such as insect/disease problems, tree conflicts, height, tree risks, year planted, and tree value were also collected by some institutions.
- Inventories were commonly used to identify tree planting locations (72%), select tree species to plant (69%), remove trees (62%), and schedule tree pruning (55%).

Tree Planting and Removal Decisions

- In terms of the major expenditures associated with tree care and maintenance, three major work activities dominate: planting, pruning, and tree removal, including the disposal of trees. Closely following these three was the cleanup of tree debris associated with storm damage.

Figure 2. (A) Does your institution currently have a tree planting goal? (n = 370). (B) Does your institution currently have a tree canopy goal? (n = 360).

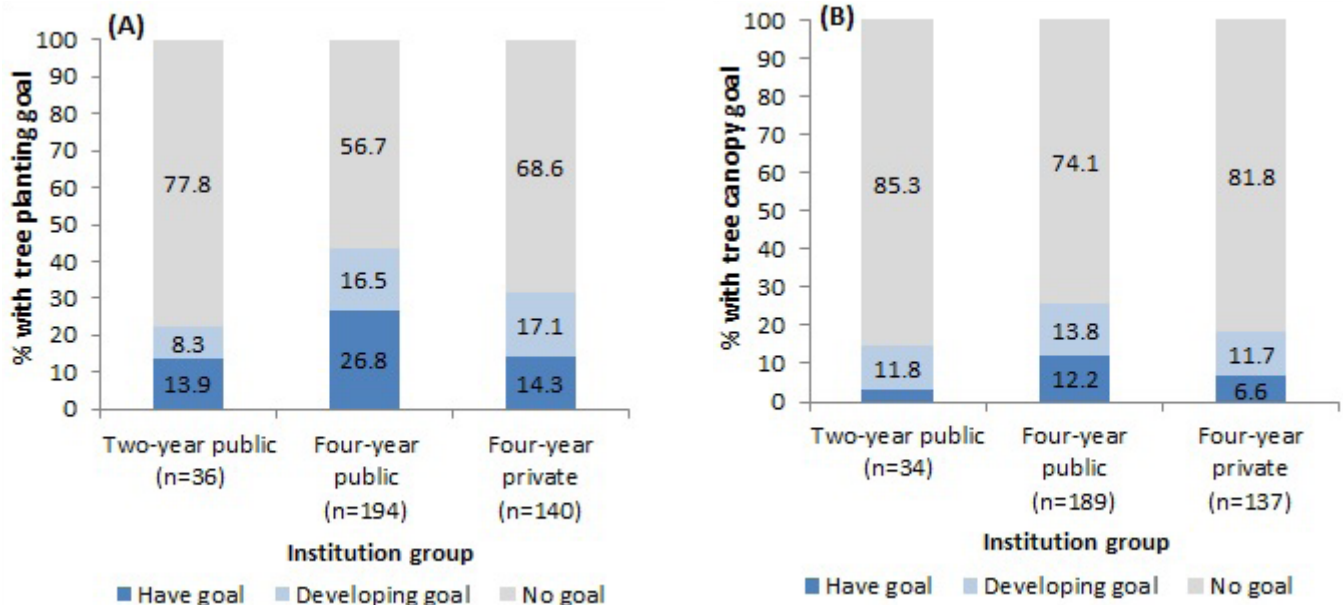


Figure 3. Which of the following are *formally* considered in the decision to plant trees on campus property? ($n=365$), though some of the categories had fewer responses (minimum n equaled 347).

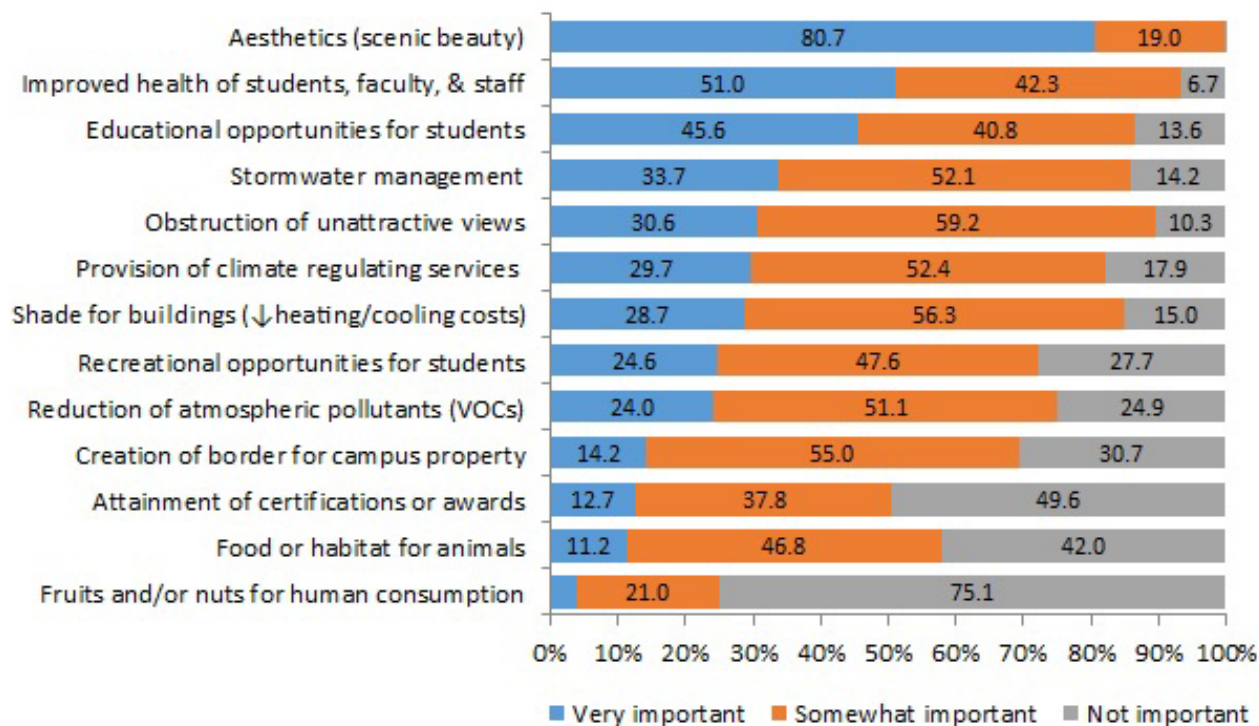
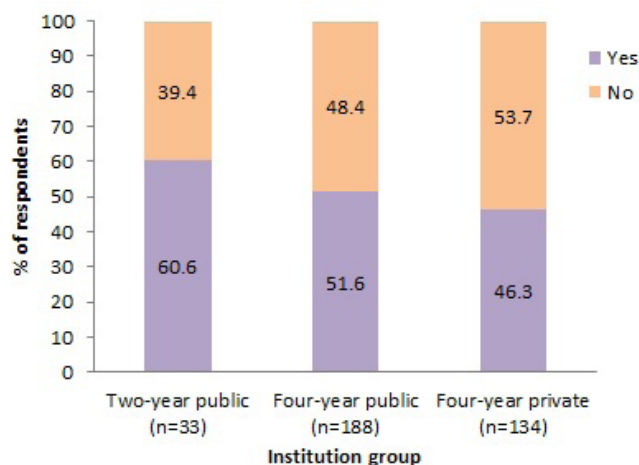


Figure 4. What training and/or credentials are held by staff responsible for tree activities and/or management of trees? ($n=357$).



Figure 5. Is your budget adequate to meet the current needs of your work plan or your future goals for tree-care program activities? (n = 355).



- What influences tree planting decisions? The most commonly cited reason for trees to be planted was aesthetics. Two other common reasons included improved health of students and personnel, and educational opportunities for students (Figure 3).
- Reasons for tree removal included tree death or decline (100%), disease/insect problems (84%), conflict with a development project (82%), and storm damage (79%). About a quarter of respondents identified additional reasons such as utility conflicts, request of a top-level administrator, and damage to sidewalks as reasons for tree removal.
- After removal, trees may be disposed of in many ways. 78% of all respondents create mulch from campus trees. Other common disposal methods included production of firewood (41%), disposal in a landfill (25%), and reuse of lumber for on- or off-campus projects (23%).

Personnel and Budgets

- A large proportion of the training and credentials held by staff at responding institutions were on-the-job (81%) and from attendance at tree-care/management workshops (70%). The most commonly pursued certification among responding institutions was the ISA (International Society of Arboriculture)



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Certified Arborist program (45%), followed by a state-specific license or credential program (21%) (Figure 4).

- Is the current budget adequate to meet identified needs of current or projected future tree-care goals? Roughly equal numbers of respondents indicated the budget was adequate (50%) and not adequate (50%). There were small differences by institutional group, with 2YPU institutions viewing their budget more positively than 4YPU and 4YPR institutions (Figure 5).
- When asked to rate their satisfaction with the budget for tree-related work, over half of all respondents indicated they were satisfied (43%) or very satisfied (10%). Just over 30% of all respondents indicated they were unsatisfied (27%) or very unsatisfied (5%) with their budget.

Tree-Care Program SWOTs

Respondents were asked to identify the four most significant strengths, weaknesses, opportunities, and threats (SWOTs) to their institutions' tree-care program. For each SWOT category, respondents were given 9 to 10 potential characteristics. The SWOT categories were defined in the survey as shown on box at right.

Common strengths, identified by more than half of all respondents, included the institution's diversity of campus tree species (72%), quality of tree care (55%), and extent of tree canopy (50%) (Table 2).

The two most common weaknesses included limited staff (66%) and lack of funding/resources (56%), followed by the absence of a proactive management plan (30%) or inventory data (29%) (Table 2). Perhaps in response to these weaknesses, commonly identified

SWOT Categories



Strengths: *Internal* characteristics that are unique, special, highly valued, and/or positive relative to other institution's tree-care programs.



Weaknesses: *Internal* challenges that limit progress or place the institution at a disadvantage relative to other institution's tree-care program successes.



Opportunities: *External* elements that could be exploited to accelerate an existing strength of the program, or create and accelerate a new potential strength of the program.



Threats: *External* elements that could cause trouble or could reduce the capabilities and effectiveness of the tree-care program.

Table 2. The top strengths, weaknesses, opportunities, and threats to campus tree-care programs, identified by respondents. For each category, a number of other characteristics were identified as being important (but were collectively identified less frequently so are not included here).

	HELPFUL	HARMFUL
INTERNAL ORIGIN	STRENGTHS <ul style="list-style-type: none"> • Diversity of tree species (71.7%) • Quality of tree care (55.4%) • Extent of tree canopy (50.3%) • Staffing expertise in tree care and management (38.6%) • Contractor performance/relationship (38.0%) 	WEAKNESSES <ul style="list-style-type: none"> • Limited staff (66.1%) • Lack of funding/resources (55.5%) • Lack of proactive/planned management (30.0%) • Lack of data, records, and surveys (29.4%) • Lack of technical expertise in tree care (23.6%)
EXTERNAL ORIGIN	OPPORTUNITIES <ul style="list-style-type: none"> • Increased funding and resources (61.9%) • Increased staffing (46.2%) • Improved data, records, and surveys (43.8%) • Production of a more proactive tree-management plan (42.6%) • Improved staff skills (37.5%) 	THREATS <ul style="list-style-type: none"> • Funding and resources (66.2%) • Spread of pests (53.5%) • Staff numbers (44.7%) • Development conflicts (41.7%) • Climate change (26.3%) • Lack of institutional support (25.1%)


opportunities for institutions to exploit included increased funding, increased staffing, completion of inventory data, and production of a proactive tree-management plan (Table 2).

A diverse set of external threats to the institution's tree-care programs were identified, including but not limited to lack of funding (66%), spread of pests (54%), limited staff (45%), development conflicts (42%), climate change (26%), and lack of institutional support (25%) (Table 2).

CONCLUSIONS AND NEXT STEPS

Many universities are making commitments to campus sustainability efforts, and through carbon sequestration, air pollution abatement, reduction of stormwater runoff, provision of habitat for animals, and improved building energy conservation, campus trees can help both the economic and environmental bottom line of universities. As such, creating a culture of campus forest stewardship and sustainability that goes beyond beautification should be encouraged.

Collective responses to this survey point to a strong institutional sentiment for trees and investment in their care,¹ but

many opportunities remain to strengthen and enhance efforts that promote campus forest stewardship and conservation. As such, results from this survey and an extensive review of the urban forest sustainability literature have informed development of a set of seven recommendations for colleges and universities. These recommendations aim to promote effective management and stewardship of campus trees. An extensive discussion of these recommendations is forthcoming in the November/December 2019 issue of *Facilities Manager*. 

Mikaela Schmitt-Harsh is an assistant professor in the departments of biology and interdisciplinary liberal studies at James Madison University in Harrisonburg, VA. Her research examines the social-ecological dynamics of human-dominated forest ecosystems, such as urban forests and agroforests. She is an ISA Certified Arborist. The research presented in this article, her first for *Facilities Manager*, is adapted from her research project (CFaR037-18) conducted under the auspices of APPA's Center for Facilities Research. She can be reached at schmi2ml@jmu.edu.

¹ The potential for response biases should be noted. That is, people are inclined to participate in surveys on topics that are familiar to them, interesting to them, or align in some way with their beliefs or values. Therefore, it is possible that survey respondents (and the institutions they represent) were predominantly "tree advocates" and that the survey does not adequately represent viewpoints of people (and institutions) who are less active in, or indifferent to, the management of campus trees. That said, this survey sought feedback from a wide network of universities and provides a good foundation from which future surveys may be developed about tree-care program efforts.



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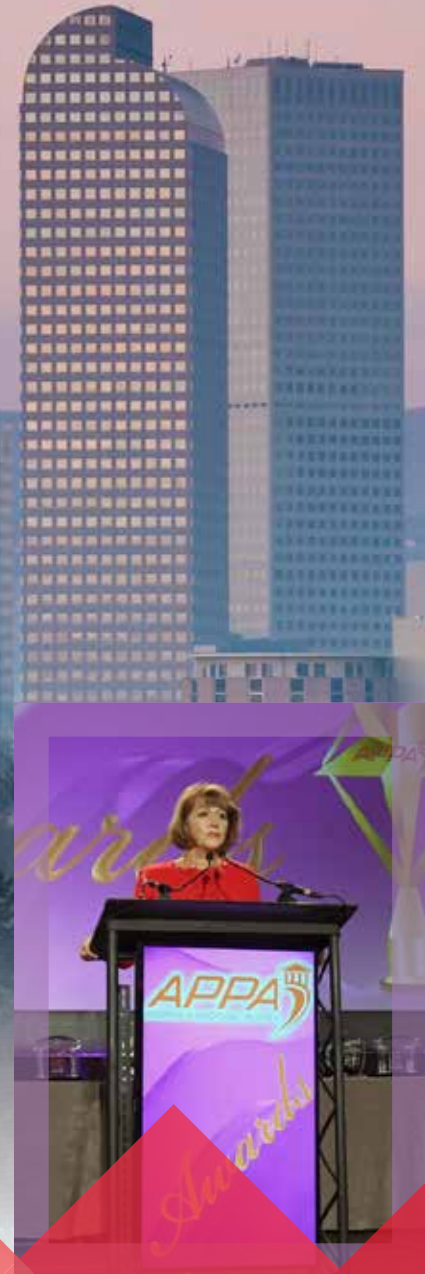
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Rex Dillow Award



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"The Custodian's Role in Student Success"
November/December 2018 Issue of *Facilities Manager*

Presented to
Steven D. Gilsdorf
Western Michigan University

Unsung Hero Award



**Don Guckert with, from left: Nicole Sanderson (PCAPPA),
Phillip Melnick (ERAPPA), Randy Culver (CAPPA), Tim Dobson (RMA).**

***Not present: Amy Baker (ERAPPA), Kim Case-Nichols (PCAPPA),
Holly Pape (SRAPPA)***

President's Award

Not present: Jack Hug, Bill Nelson, and Mark Valenti.



Joe Bilotta



Jeff Gee



Jeri King



Lander Medlin

CFaR Research Award



Mikaela Schmitt-Harsh
For the successful completion
of research project
CFaR037-18:

*Managing Trees on Campus:
A Survey of North American
College and University Tree Care
Practices and Operations*

Outgoing Board Members

Not present: Kathia Gin, At-Large



Tony Ichsan, Chair Senior Rep.



Nina Wollman, At-Large

2019 Institutional Awards

Award for Excellence



Brigham Young University



Brigham Young University, Idaho



Soka University of America



University of Kansas Medical Center

Effective and Innovative Practices Award



- Illinois State University, "Illinois State University Improved Salt Practices"
- University of Alabama, "Mobile Work Order System Application"
- University of California, Davis, "TherMOOstat"
- University of California, San Francisco, "First Impressions Court - A Campus Contest"
- California State University, San Marcos (not in attendance), "Clear The Path - Create Numerical Transparency"

Sustainability Innovation Award



- College of Lake County (not in attendance)
- Stanford University Residential and Dining
- University of California, Davis
- University of Texas at Dallas
- Virginia Polytechnic Institute and State University

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5
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APPA's TCO—What Are We Waiting For?

By Ana Thiemer and Deke Smith

As facilities professionals, we live and breathe stewardship and are passionate about the assets in our care. APPA's standard for Total Cost of Ownership (TCO), *APPA 1000-1, Total Cost of Ownership for Facilities Asset Management (TCO)—Part 1: Key Principles*, recognized by the American National Standards Institute (ANSI), moves the facilities manager into a position to make better long-term decisions with improved ability to plan, budget, and care for current and future assets in our care.

APPA TCO:

- Gives greater credibility to strategic planning by helping ensure facility and infrastructure resources exist to enable our vision.
- Increases organizational team focus, visibility, and understanding of key common data elements associated with asset-related decision-making processes.
- Creates better understanding of the long-term effectiveness of resource allocation.
- Improves our ability to assign and utilize resources in an efficient manner with continuous feedback.
- While funding may come annually, TCO enables us to prepare for future resource allocation and ensure that assets remain sustainable.

In APPA's first published standard for TCO, the definition of TCO and its Key Principles were introduced.

APPA TCO Definition: A holistic approach to maximizing return on investment of managed physical assets that includes the summation of all known and estimated costs to include first, recurring, renewal/replacement, and end-of-useful-life costs revised at critical decision points to aid in life-cycle asset management decisions.

AN OVERVIEW OF TCO

APPA TCO can be defined in two parts—one part summation of costs and one part decision-making based on information that goes beyond just the basic calculations. In its simplest form, the first part of the definition for TCO is the addition of costs: $1 + 1 = 2$.

Assets cost money. We purchase assets for a cost, and whether we acknowledge it or like it, they carry a cost long after their purchase: maintenance, repair, replacement, or demolition. Just like a house purchased for ownership, the total cost of owning a home over its life must be considered, not just the initial purchase price.

The second part of the APPA TCO definition shows how the information collected—but not just from costs—can assist facilities professionals to make decisions that can catapult our industry to new levels.

TCO PART 2

APPA 1000-2, Total Cost of Ownership for Facilities Asset Management (TCO)—Part 2: Implementation and Data Elements, scheduled for release in early 2020, outlines just how facilities managers can join the Key Principles of TCO and the summation formula to catapult our passion further into reality. Three major decision areas can be supported utilizing APPA TCO:

1. Procurement of new assets, products, facilities, infrastructure and any asset selection decisions
2. Sustaining and ensuring resilience of existing facilities and infrastructure assets, including renovation or removal decisions
3. Long- and short-term financial planning, budget analysis, and reporting

ON THE HORIZON

The upcoming Part 2 APPA TCO standard will offer facilities professionals the tools to get started implementing TCO or to enhance ongoing efforts that may align with TCO. The standard is a guidebook for successful implementation of APPA's TCO, which will allow organizations to implement it at a pace that works in their current environment. Every organization, large or small, can implement APPA TCO.

There are several elements to successful TCO implementation. APPA's TCO requires a culture shift, a mindset toward long-term collaboration across all levels of the organization, and a strong desire for decision-making.

ing to be information-driven. APPA TCO's Key Principles are a strong foundation for implementation, but it's equally important to remember that TCO is not just a summation formula or collection of data. Leadership and culture are strong binding elements that must not be taken lightly; they are essential to implementation.

APPA TCO implementation is achieved at various levels. Some organizations may not be prepared for a complex implementation strategy. The standard, which is scalable by design, allows organizations to start small, with one asset if needed, or to scale to a multitude of subsystems, systems, and assets across various locations or campuses. The implementation standard describes basic, intermediate, or complex levels at which an organization can assess their current TCO state. An organization may be at different levels of TCO implementation for each of the TCO Key Principles.

GOING FORWARD

Aging assets continue to age. Failures continue to occur, and many facilities departments find that it is becoming increasingly hard to keep up. APPA's TCO

standard assists our industry in addressing the complex issues we face today with reliable, executable answers. It offers us the means to align TCO with the organization's mission while increasing visibility, and to make informed decisions that provide the maximum return on investment. So, what are we waiting for?

The APPA 1000 ANSI-recognized TCO standard *Part 1: Key Principles* is available for purchase today at appa.org/bookstore. The accompanying TCO standard, *Part 2: Implementation and Data Elements*, will be released in early 2020. ☎

Ana Thiemer is associate director of planning in project management and construction services at the University of Texas at Austin, and can be reached at ana.thiemer@austin.utexas.edu. Deke Smith is president of DKS Information Consulting, LLC, in Herndon, VA, and can be reached at deke@dksic.net. They are co-chairs of APPA's TCO Work Group and have been instrumental in developing the new APPA TCO standard.

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Tight Constraints and Big Results: Adelphi University Turns Asset Renewal into Opportunity

By Adam Schachner and Robert Shipley

To add resiliency and improvements to a small central plant without breaking the bank, Adelphi University leveraged guaranteed project outcomes to obtain a low-interest loan.

Adelphi University's heart is located 30 feet underground, in a 1920s-era boiler room where a new 1.99-MW cogeneration unit (combined heat and power, or CHP) takes in natural gas and emits electricity and heat. Rubber-coated wires and shining pipes dotted with valves and joints radiate from this boiler room, feeding the campus electrical network and the district heating system, and keeping the buildings alive, warm, and lit. New air-handling units (AHUs) spread air throughout the campus, regulating the climate of research laboratories and supplying oxygen to classrooms, so students remain alert through the challenge of a difficult exam or the marathon of a long day of classes.

What could be more beautiful than HVAC equipment?

But some would say that this equipment is best kept hidden. It's true that a facility maintenance manager might wish for above-ground equipment, piping, and valves that are easy to service and troubleshoot. But everyone else's vision usually involves singing birds, green grass and trees, and a peaceful campus not obscured by "unsightly" technology.

Adelphi University's campus is based on this second vision. Located in Garden City, Long Island, New York, it is bordered by a golf course on one side and surrounded by quiet residential neighborhoods. Enjoying green open spaces and outdoor sports fields, students typically use the grounds to relax, reading under trees, and others take their dogs for walks there. The university administration wished to maintain that aesthetic, keeping all the CHP in the underground boiler room.

THE PREQUEL

Before the new CHP and AHUs were installed, Adelphi's energy system had several shortcomings:

- On October 29, 2012, Hurricane Sandy tore its way through New York and New Jersey, causing injury, death, flooding, and property damage. It also took down the electrical grid, leaving Adelphi University without power for 36 hours and disrupting the class schedule for a week. It became clear that the university needed greater resiliency.
- Adelphi's central plant had old equipment that was in need of replacement. Two huge 60-year-old boilers and a smaller 40-year-old boiler provided hot water heating for the campus. These boilers were inefficient and reaching their end of life.
- The university wanted to bring the fume hoods and ventilation system in the science labs to the highest standard.

Replacing the old boilers with a CHP was the best option for adding greater resiliency. With the CHP and some pre-existing backup generators, the university's electrical needs could be entirely met, even in the event of another grid shutdown. A \$2.2 million incentive from the New York State Energy Research and Development Authority (NYSERDA) for CHP installation made the choice even clearer.

OPTIONS AND GOALS

At first, Adelphi University contacted a large energy service company (ESCO) to discuss the project. The ESCO proposed that it would both pay for and manage the replacement of the equipment. However, for the next 15 years, the ESCO would also retain any utility bill savings that resulted from the project. Given the efficiency potential of replacing the three old boilers, this would equate to many millions of dollars. In addition,

the ESCO would receive any NYSEDA incentives.

Adelphi University decided to look for other options. They wanted to decouple the financing from project management, to find the best deal for both. They found two willing partners in First American and Ecosystem. First American would provide the financing, at a low interest rate, and Ecosystem would manage the project and guarantee the results.

Project outcomes and incentives were guaranteed: Project goals had to be met for a fixed total cost, with no change orders or extras.

The goals were ambitious:

- Eight-year payback on the project (compared to the original ESCO's proposed 15-year payback)
- 100% campus electrical resiliency
- Laboratory ventilation brought to the highest standard
- Equipment noise level kept to a minimum
- All equipment installed in the small (30 ft. x 60 ft.), underground boiler room

It was this last goal that would prove challenging.

The three old boilers had been built in place. They needed to be cut up and removed to make room for the new equipment. This had to be done on a tight schedule during the summer, in order to have the new equipment operational for the heating season.

Access to the boiler room was through a narrow ceiling hatch. Even after widening (which required the addition of support columns), the hatch measured no larger than 12 ft. x 17 ft., just enough for the 2-MW cogeneration unit to fit.


The boiler room is in the basement of Woodruff Hall, which houses sports facilities, offices, and classrooms. A sound-proof enclosure needed to be constructed around the CHP so its noise would not disturb staff and students.

GETTING CREATIVE

There simply wasn't enough room on the boiler room floor for the addition of a CHP sound enclosure, AHUs, and two smaller, more efficient boilers. Luckily, the boiler room ceiling was quite high. The engineers got creative. An elevated mezzanine was installed, and the AHUs were mounted on it. This left enough room on the floor for the CHP and boilers.

By September 2016, the equipment

was installed and running. Adelphi now has 100% electrical redundancy. The CHP's efficiency is 75%, significantly higher than the 60% required for the NYSEDA incentive, earning a \$200,000 bonus incentive. The laboratories are modernized. The total project cost was \$13.5 million, with annual energy bill savings of \$1.6 million, matching the guarantee. Adelphi uses part of these savings to pay back their loan, while the rest is used to fund campus expansion projects.

Thanks to guaranteed outcomes, Adelphi was able to replace aging equipment, address concerns with the energy system, and obtain a low-interest loan paid back through energy savings, to fund other infrastructure projects. This was all done while maintaining the peace and beauty of the campus. 

Adam Schachner is a junior mechanical engineer at Ecosystem in Montreal, QB, Canada. He can be reached at adam.schachner@ecosystem-energy.com. Robert Shipley is assistant vice president for facilities management at Adelphi University in Garden City, NY. He can be reached at shipley@adelphi.edu. This is their first article for *Facilities Manager*.



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Why Two-Way Radios Are Helping Move FM Professionals into the Next Age of Efficiency

By Ben Burns



When it comes to the world of higher education facilities management (FM), two priorities stand above the rest:

1) maintaining a functioning facility that enhances education, and 2) ensuring a secure and safe environment for administration, staff, and students. Both targets require an effective communications system to achieve these goals, and the proper tools to support it. That's why more FM professionals are incorporating the power of two-way radios as an important asset for improving educational productivity while simultaneously reducing the threat of unexpected emergencies.

THE EVOLUTION OF TWO-WAY RADIOS

Two-way radios have evolved significantly over the years, to the point where this technology has become indispensable for today's FM departments. From buildings and grounds maintenance to security,

fire safety, and cleaning, having reliable two-way radio coverage is critical for campuses that want to maintain campus performance, plan and supervise day-to-day activities more efficiently, and be better prepared for the unexpected. For example, professional-grade two-way radios include safety features such as emergency alerts programming that can be essential during a crisis.

In addition, they allow departments and classrooms to coordinate activities at the touch of a button, anywhere on campus. Finally, they include convenient features such as multichannel partitioning, text messaging, keypads, and global positioning systems (GPS). That's why today's top educational FM professionals are taking full advantage of the power of two-way radios.

THE WILLIAM ALVORD UNIFIED SCHOOL DISTRICT

The William Alvord Unified School District (AUSD) was ratified as a "unified" district in Riverside, California in 1960. Today, AUSD includes 14 elementary schools, 4 middle schools, 3 high schools, 1 alternative high school, and 1 continuation school. The district employs more than 2,000 teachers and staff and is responsible for educating more than 18,000 students.

Bob Turner assumed the role of AUSD's director of facilities and emergency management in 2014. He knew almost immediately that there was a need to incorporate two-way radios into the district's communications systems. As a highly trained electronic communications professional with both a bachelor's and master's degree in emergency and disaster management and technical communications, Turner knew exactly what the district needed: cost-effective, durable, and easy-to-use professional two-way radios that could be incorporated throughout critical areas of the campus.

IMMEDIATE COMMUNICATION IMPROVEMENT

"The improvement with the new two-way radios was immediate, and the quality is exceptional. Now we have radios at each individual site; we have radios for our security department, our school resource officers, and me," says Turner. "Every campus and every classroom is also equipped with two-way radios. I also programmed all the radios the same, with each campus having its own channel, so that if we must evacuate to another campus, all they would have to do is turn the channel knob and everyone is communicating."

ALWAYS SELECT PROFESSIONAL-GRADE TWO-WAY RADIOS

In the world of two-way radios, there are two distinct categories of radio: Family Radio Service (FRS) and professional-grade radios. Basically, FRS radios are consumer-grade radios that are made of plastic and can break easily in even the tamest environments. They are not meant to perform 40 hours a week. For serious industries like education, manufacturing, construction, and FM, investing in well-made radios that can withstand daily use will yield the best long-term strategy. In addition, commercial-grade two-way radios, such as RCA professional radios, offer the following benefits over consumer radios:

- **Durability:** Commercial radios are designed to hold up to abuse better than consumer radios. Consumer radios are usually built for infrequent use: weekend hunting trips, multiple car caravans, camping trips, and amusement park visits. They are lightweight with a thin plastic casing. Commercial radios are designed to be used for hours a day and are constructed with heavy-duty commercial housing. Many are built to military specifications and are also waterproof, with significant transmitting power.
- **Battery Life:** Never underestimate the importance of battery life. Most consumer radios include rechargeable batteries that are good for 8 hours of use or less. As is typical of batteries, this life will likely diminish slightly over time. Professional-grade radios by comparison will provide 12 hours or more on a single charge, and even longer when in digital mode.
- **Accessories:** Business radios typically have a far-better selection of accessories than consumer radios. If accessories such as headsets, earpieces, and speaker mics are important to your business, you should look at what accessories are available before you choose a radio. Accessories like rapid chargers and multiunit chargers are only available for business radios.

Although purchasing cheap, consumer-grade walkie-talkies may seem like a prudent communications solution in the short term, it will cost more in the long term than buying commercial two-way radios that are designed to be used in professional arenas.

FOUR REASONS WHY YOUR FM TEAM SHOULDN'T BE RELYING ON CELLPHONES

Chances are that nearly every facilities employee, from the front office to the laundry room, owns a cellphone or smartphone. However, while it might be tempting to rely exclusively on these devices, the truth is that cellphones can't compete with two-way radios in many aspects, including reach, reliability, functionality, durability, and price.

- **Reach:** Most maintenance professionals know that ultrahigh frequency (UHF) digital two-way radios provide a higher frequency than very high frequency (VHF) radios. As a result, it is easier for the signal to penetrate concrete and metal structures. Cellphones will frequently be unable to penetrate these surfaces.
- **Reliability:** Because cellphones will frequently encounter "blank spots" where they cannot transmit or receive, they can become liabilities rather than assets. Two-way radios operate immediately with just a push of a button.
- **Functionality:** While modern smartphones are chock-full of amazing features, they all require spotless reception and a lot of finger manipulation to activate them. Two-way radios, on the other hand, can connect with one or multiple people with the simple push of a button. In addition, with proper programming, each separate channel can be designated for specific maintenance responsibilities, thus improving the efficiency and functionality of most jobs.
- **Durability:** Cellphone fragility is legendary. Dropping them, allowing moisture to penetrate them, or inadvertently allowing software or application viruses to target them can make these devices inoperable. However, today's professional-grade two-way radios can be dropped on concrete or even in a puddle of water and will still respond, with rare exceptions.
- **Price:** Unlike cellphones that require monthly payment plans, two-way radios do not include monthly bills. 💰

Ben Burns is the founder and CEO of Discount Two-Way Radio, based in Rancho Dominguez, CA, and can be reached at ben@dtwr.com. This is his first article for *Facilities Manager*.

New technology and trends are emerging and evolving every day in facilities. Would you like to share a new technology or trend in this column? Please contact Anita Dosik at anita@appa.org for more information on submissions to this column.

Book Review Editor: Theodore J. Weidner, Ph.D., P.E., AIA, CEF, DBIA

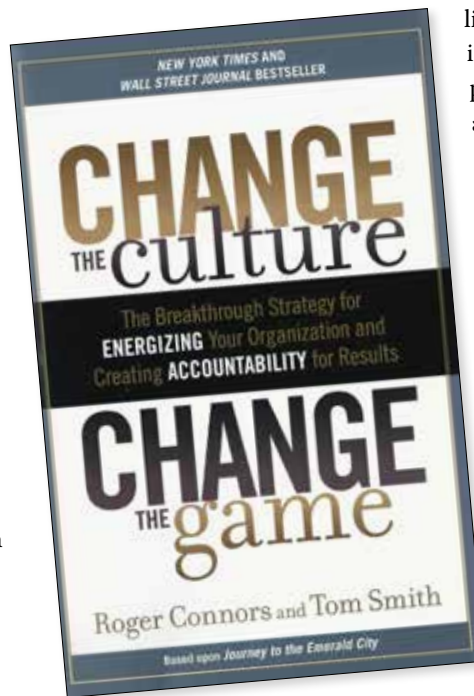
As facility officers and managers of people we are frequently challenged with finding ways to improve operations and/or continue operations with less. The two books reviewed this issue provide approaches to improve operations either through process-based steps or through random experimentation.

CHANGE THE CULTURE, CHANGE THE GAME: THE BREAKTHROUGH STRATEGY FOR ENERGIZING YOUR ORGANIZATION AND CREATING ACCOUNTABILITY FOR RESULTS

Roger Connors and Tom Smith, Portfolio/Penguin, New York, 2011, 214 pp., hardcover (\$30), softcover (\$17), ebook (\$14.99), audiobook (\$14.95).

Previous books reviewed here have looked at prior and current cultural differences or challenges faced by leaders of organizations. There are many ways to look at organizations and as many or more ways to implement changes. The industry is awash in organizational leadership and change publications; new ones appear every year, each advocating different strategies. One of the problems associated with these many books is that few include a clear, step-by-step approach for implementing change and a good measurement tool so one can see if progress has been made or not.

In *Change the Culture, Change the Game*, Connors and Smith have identified a reasonable, method-driven way of implementing change by focusing first on culture. They name four factors that form the culture of an organization: experiences, beliefs, actions, and results. Each of these factors must be examined as part of the overall process of changing outcomes (results). Experiences shape be-



liefs, which influence actions, which in turn produce results. Experiences provide the foundation for individuals or the organization that shapes the culture. Change the experiences of the individuals or the organization and there is a corresponding change in beliefs, actions, and outcomes. Organizational experiences and beliefs form the culture of the organization. If they are not aligned, nothing accomplished through action will deliver the desired outcomes.

Every organization must evaluate where it is along the sequence. Look at the results you are getting and see if they are due to actions, beliefs, or experiences. Then identify the results you wish to achieve.

Connors and Smith call this moving from stage one to stage two. Again, your goal is to align experiences, beliefs, and actions to obtain the desired result.

As an engineer, I like seeing focused and mechanical approaches to management (and human resource) processes. I plan on keeping *Change the Culture, Change the Game* in my library.

THE EFFICIENCY PARADOX: WHAT BIG DATA CAN'T DO

Edward Tenner, Knopf, New York, 2018, 220 pp., hardcover (\$27.95).

We are surrounded by big data: our own, others, and the information that the five biggest Internet companies (FAANG: Facebook, Apple, Amazon, Netflix, and Google) are gathering about us whether we know it or not. The big Internet companies have been able to profit from our data and have monetized it in numerous ways. They are highly efficient at this and know more about us than we do, sometimes. I like to think that there are ways we can use big data to make better decisions and improve our work efficiency. That may be true in some cases, but as Edward Tenner argues in *The Efficiency Paradox*, it may not be true all the time—or even some of the time.

We are under continuous pressure to become more efficient; we have fewer resources at our disposal and/or increasing demands for service. Some of us may look at the Internet giants for solutions frequently, because our customers are looking at them and wondering why we can't be more like Amazon. The trouble is, it's not that easy, but not for the reasons we may think.

Tenner looks back over the last century, summarizing the second and third industrial revolutions, and looking at our current, fourth industrial revolution. He explains why sifting through the data with a variety of sieves or other tools doesn't necessarily identify a more efficient solution or produce a creative breakthrough. The inventors or developers of the "next great idea" have done so through serendipity. Think of Edison, who spent thousands of hours trying different things and discovering what "didn't work." Alternatively, look at Kodak (if you are older than 30), which created digital photography and was then consumed by its own invention. Or consider IBM, which barely survived the Great Depression due to the demand for data processing for Social Security and then "re-survived" by moving away from its "big iron" machines to providing services.

Could any of these transformations have occurred

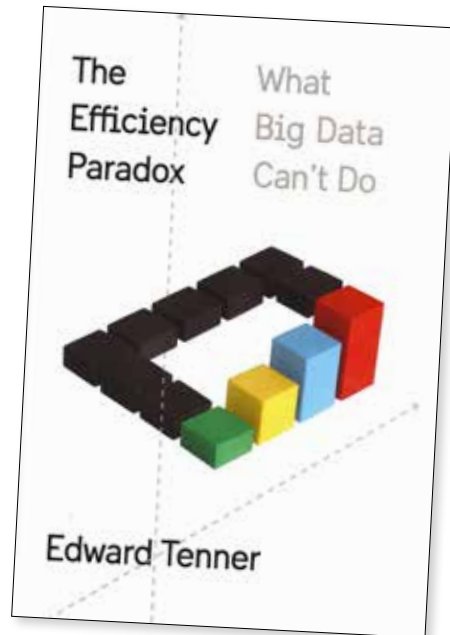
by looking at big data? No. The concept of making minor—or even major—improvements to what has been done previously does not necessarily result in greater efficiency or profits. That doesn't mean looking at big data cannot identify improvements; it

means it is not the only way to improvements. Serendipity and creative destruction of current technology can provide the leap to new technologies and efficiencies resulting in stronger companies or better service delivery.

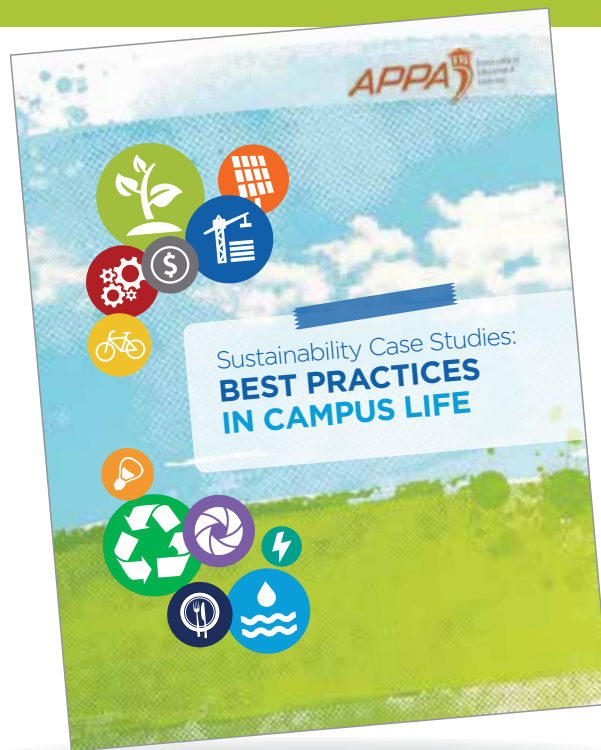
While I'm a firm believer in looking at data to identify opportunities and make better decisions, I also recognize that "thinking outside the box" (and luck) can result in greater efficiency. That's one reason why I read books, including books about history. The answer is not found in constant focus on the bottom line or the process; the answer can often be found in unusual places or through exam-

ining different perspectives. *The Efficiency Paradox* is a valuable read for someone looking to improve service delivery who has tried standard approaches and found them lacking; it's also for someone who is trying to understand why a nonstandard solution seemed to work when the data said it wouldn't. I'll use *The Efficiency Paradox* again, but I may not discover when it works until some later date. That's serendipity. 💡

Ted Weidner is an associate professor at Purdue University and consults on facilities management issues primarily for educational organizations. He can be reached at tjweidne@purdue.edu. If you would like to write a book review, please contact Ted directly.



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Sustainability Case Studies: Best Practices in Campus Life

This collection of short case studies highlights a range of best practices—both innovative and practical—in place right now that enhance environmental stewardship, improve cost and energy efficiencies, and provide for greater collaborations among students, faculty, and staffs at our colleges, universities, and schools.

The genesis of this project started with a simple call for case studies on projects and initiatives that campus sustainability, facilities, or energy departments were proud of and wanted to share with others. The response was tremendous. This book includes 123 total best practices from 92 separate colleges, universities, or schools. These programs represent only a small number of the depth and breadth of advancements in campus sustainability and environmental stewardship.

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Compiled by Gerry Van Treeck

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and commercial applications such as automotive, heavy equipment, and marine DC current measurements. All three models are rated CAT III 600 V. For more information visit Extech Instruments online at www.extech.com.



JET-VAC TECHNOLOGIES ejector-based vacuum chillers can deliver the required quantity of chilled water for efficient process operations. From ambient to just above freezing temperatures, JET-VAC ejector-based vacuum chillers can deliver during hot

seasons, when cooling loads and inlet water temperatures decrease. JET-VAC chillers can reliably cool water from conventional cooling towers and other sources. They can use low-pressure steam to achieve required chilling temperatures year-round, and have numerous industrial applications for processing liquids, solids, and heat-sensitive materials. For more information about JET-VAC Technologies visit www.jetvactechnologies.com



[jetvactechnologies.com/product/steam-jet-chillers](http://www.jetvactechnologies.com/product/steam-jet-chillers).

EXTECH INSTRUMENTS announces the launch of the MA44x series of 400-A clamp meters. The three meters offer comprehensive multimeter functions and a built-in, noncontact AC voltage (NCV) detector to meet the exacting needs of electrical contractors and HVAC/R technicians. Complementing the

OLDCASTLE APG's Echelon brand introduces Aria Slim Stone full-depth veneers, which deliver a distinctive, modern aesthetic, increased durability, and reduced installation time. Available in five colors and four finishes, Aria Slim Stone will help elevate any structure's aesthetic appeal. The diverse color pallet of Aria Slim Stone features Alabaster, Graphite, Limestone, and Buff. Aria Slim also offers a comprehensive range of finishes from smooth to shot blast. With contrasting colors and a range of textures, Aria Slim Stone beautifully complements mixed-material designs to deliver a timeless, contemporary look. The premium design of Aria Slim Stone offers flexibility for interior and exterior installation and features a unique, linear profile enabling application of the same veneer both on facades and in corners. Its versatility and workability come from the sleek, exclusive, 36-in.-long veneer design. The longer dimension also offers a solution to the labor shortage by reducing installation time, while a full 35/8-in. bed depth enhances durability. For more information on Oldcastle APG visit www.EchelonMasonry.com.






SPECIFIED TECHNOLOGIES INCORPORATED, also known as STI Firestop, announces E-Wrap Endothermic Wrap, which provides fire protection for a building's critical circuits and in-

frastructure, such as fire pumps, signaling equipment, elevators, alarms, process control equipment, or Emergency Responder Communications Enhancement Systems (ERCES). A supple, protective wrap that is installed around conduit or cable trays, E-Wrap provides up to 2 hours of circuit integrity, ensuring continued operation under fire conditions. Tested to ASTM 1725 for circuit integrity, E-Wrap Endothermic Wrap releases chemically bound water under fire conditions, providing a cooling effect. It may be used to achieve equal F&T (float and thermostatic) ratings on penetration firestop systems. For more information, please visit Specified Technologies Incorporated at <https://www.stifirestop.com/products/e-wrap>.

HOSPECO, maker of disposable gloves and other protective products, adds high-visibility neon green to its ProWorks Pyramid Grip nitrile glove assortment, known for its combination of protection, dexterity, and grip. The deeply textured diamond

pattern on the palm, fingers, and back offers superior gripping power in wet and dry applications. This heavyweight barrier glove combines 8.5-ml palms with 9-ml fingers to deliver protection where the wearer needs it most, and the cuff slims to 5-ml for comfort. In addition to high-visibility neon green, Pyramid Grip is available in high-visibility orange and stain-concealing black. The extra thickness built into the high-wear areas gives staff the barrier protection needed to confidently attack hot zones where hygiene is most desirable. Pyramid Grip is also ideal for wet-grip foodservice applications and janitorial scrubbing, affording the wearer a defense against contaminants and chemicals while still allowing a tight hold on critical parts, components, utensils, or tools. Additional information about HOSPECO can be found at www.hospeco.com. 



New Products listings are provided by the manufacturers and suppliers and selected by the editors for variety and innovation. For more information or to submit a New Products listing, email Gerry Van Treeck at gvtgvt@earthlink.net.

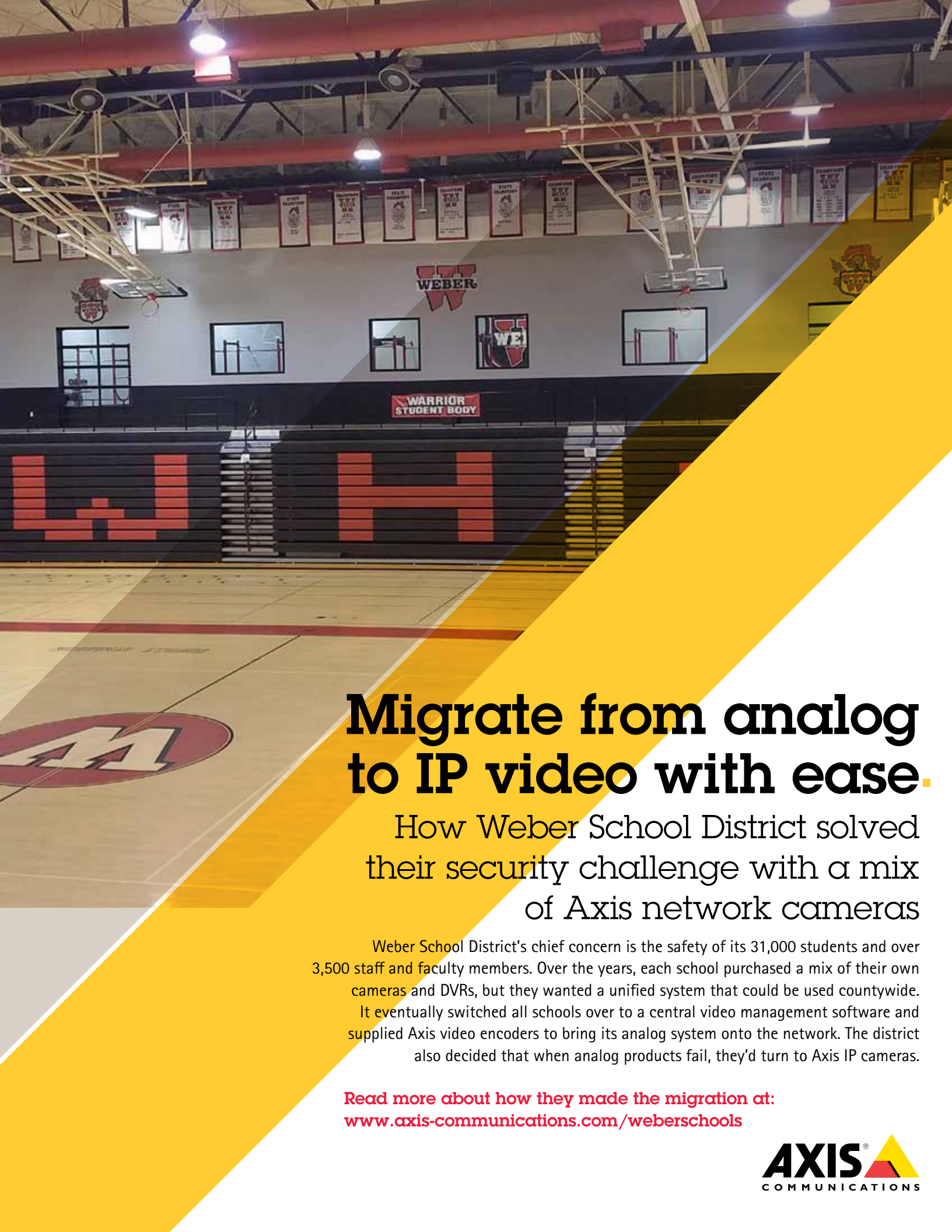
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Migrate from analog to IP video with ease.

How Weber School District solved their security challenge with a mix of Axis network cameras

Weber School District's chief concern is the safety of its 31,000 students and over 3,500 staff and faculty members. Over the years, each school purchased a mix of their own cameras and DVRs, but they wanted a unified system that could be used countywide.

It eventually switched all schools over to a central video management software and supplied Axis video encoders to bring its analog system onto the network. The district also decided that when analog products fail, they'd turn to Axis IP cameras.

Read more about how they made the migration at:
www.axis-communications.com/weberschools



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