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WHITE PAPER / **EMERGENCY RESPONSE PLANNING FOR AGING CAMPUS INFRASTRUCTURE**

CREATING A CONTINGENCY PLAN GIVES A ROAD MAP DURING EMERGENCIES

By Jeff Easton, PE, CEM

Each day millions of people walk the grounds of college campuses for class and work, but sudden emergencies can halt day-to-day operations. These unanticipated emergencies result in unplanned expenses, but there's a way to prepare for the problems before they happen.

Campuses around the world can take proactive steps to prepare for emergencies — from something as destructive as a natural disaster to as simple as failed equipment or piping — regardless of the age of their infrastructure or mechanical systems, with little upfront investment. These contingency plans can provide simple yet powerful guidance to key campus staff on how to quickly address critical failures before they ever occur.

AGING INFRASTRUCTURE EXPOSES VULNERABILITIES

As legacy infrastructure nears the end of its useful life, college and university campuses become more vulnerable to unexpected system failures that can carry significant negative consequences for those who rely on it each day.

College campuses are a unique blend of tradition and history combined with innovation, groundbreaking research and forward-thinking ideas. These campuses often serve as a home away from home for students and as a workplace for academic leaders, administrative personnel, dining staff, public safety officers and maintenance workers. Mature campuses also feature a variety of systems, unique to their era, that each has its own specific requirements and vulnerabilities.

This eclectic mix of needs, facilities and functions makes college campuses particularly vulnerable as infrastructure begins to age. A frozen pipe could lead to major flood damage in a well-traveled lecture hall, while years of priceless lab research could be lost because of a simple power outage.

When problems do strike, campuses should be equipped with the tools and knowledge necessary to immediately react, with minimal disruption to campus life.

ON ONE CAMPUS, POWER LOSSES LEAD TO A STRONGER CONTINGENCY PLAN

The University of Denver (DU), a private campus spread across 125 acres 5 miles south of downtown Denver, recently saw the need for proactive contingency planning firsthand when it faced a series of unanticipated obstacles to daily operations in just three months.

First came a steam distribution failure that caused the loss of heat in three campus buildings. The failure lasted for several weeks and the repair was made just before freezing temperatures arrived.

On the first day of classes in January, Centennial Towers, a 10-story, 600-bed dormitory, lost power, leaving lighting, elevators and the heating system inoperable. The university was minutes from enacting a plan to relocate students to local hotels. Fortunately, the power was restored by sundown that evening. The administration narrowly avoided a minimum of $72,000 per night in hotel expenses, additional transportation costs, and a major disruption to students just beginning their term.

Finally, a condensate distribution failure at DU's main administrative building started in February and lasted through the remainder of the heating season. Because the Mary Reed Building houses the chancellor's office and all senior administration, permanent repairs couldn't be made until after graduation in the spring. Condensate, which typically returned to the plant, instead had to be drained locally at the building, requiring months of makeup water and additional chemicals in the system.

Through these events, DU, home to 11,500 students and 3,800 faculty and staff members, had seen the embodiment of some if its infrastructure vulnerabilities. Many buildings were constructed before 1900 and more than 70 percent of the buildings on campus have a renovation age that is 25 years or older. In addition, just 18 of the 88 buildings on campus are on the central plant's chilled water and steam, with the majority operating on standalone systems and individual electric meters.

Given the age of many of the buildings and the large quantity of buildings on standalone systems, officials don't fear if there will be a failure, but when the failure will occur.

CAMPUSES NEED TO PLAN NOW FOR UNEXPECTED EVENTS TOMORROW

Aging infrastructure can expose campus vulnerabilities, but limited university budgets may not allow for costly upgrades or new equipment. Emergencies will continue to arise, and systems will continue to fail, but taking steps now to prepare for those obstacles will better position campuses to recover quickly and with minimal added expenses.

By taking a proactive response to facing emergencies, campus personnel are placed in the best possible scenario to successfully respond even during a stressful, critical situation.

This proactive approach can be achieved by creating a thorough contingency plan that focuses on critical campus buildings and serves as a step-by-step checklist during emergency situations. The contingency plan is a fluid document that provides clear, straightforward information about a building, its main equipment, utility services, possible failure modes and specific steps that need to be taken in the event of a given emergency.

It starts with highly detailed information specific to a building and its equipment. These details include the square footage, electrical information, whether it has its own local equipment, and specific details about the equipment itself on-site. These details could include aspects like how much power the equipment draws, if the building is served from a central chilled water loop or central steam water loop, and the peak heating and cooling loads required.

It also evaluates possible failure modes and details the necessary reaction should such a failure occur. For instance, in the case of thermal line break from the steam system, a rental boiler may be needed. The plan goes on to detail where a rental boiler would be located on-site, outline exactly how and where it would connect into the existing system, and provide information about length, pressure rating and other details about interconnecting hoses.

ADVANTAGES TO CREATING CONTINGENCY PLANS

One of the biggest advantages to creating contingency plans is that it adds resiliency to a campus without a significant cost impact. The cost of conducting a contingency plan could easily pay for itself during the first incident by allowing campus staff to reduce the amount of downtime and the impact of any outage on students and staff.

A contingency plan also provides a clear road map for key campus personnel to follow immediately in the event of an emergency. By outlining specifics — including how to install temporary equipment, what additional materials are needed and what agreements are in place between the university and area service vendors — campus personnel can significantly reduce downtime by eliminating unnecessary mistakes or fact-finding missions when time is critical.

The exercise of creating the plan will often lead to discoveries of unidentified vulnerabilities, such as missing isolation valves and electrical disconnects.

The additional impacts of outages vary by the specific event or building impacted — even what the specific department's core mission might be. Whether losing critical lab research, food spoilage at a dining facility, or an impact to donor funds during a fundraising event, the ability to restore electricity, heating and cooling swiftly could make the critical difference to make the function successful.

STEPS FOR CREATING A SUCCESSFUL CONTINGENCY PLAN

Contingency plans are intended to provide universities and campuses with a safety net in the event of an unexpected problem, but the plans themselves need to be carefully thought out. Owners should engage a team with a deep knowledge base who can accurately anticipate the most likely failures in any given building or system and craft an effective response to address those failures.

Steps to a successful emergency contingency plan:

Step 1: Consider a variety of failure modes and goals.
The number of possible failure models is nearly infinite. To create the most powerful and individualized contingency plan, campuses will need to consider what factors are unique to their sites and which would have the largest impact on students, staff and administrators if they were to occur.

For DU, aging underground distribution piping was already beginning to fail, making this failure mode a very likely possibility to consider. Location is also an important consideration. In areas like Denver, a power outage could lead to freezing pipes — which could lead to further damage, legitimate safety concerns and likely evacuation of occupants.

Other facilities may be dependent on water. In dormitories, central plant facilities and other buildings where a water outage would shut down operations, campus personnel may want to focus on a means to quickly restore water services.

For each building, university staff and engineering teams need to assess the local equipment in use, the utility distribution lines, the impact of a power outage and the building function to identify and customize the most probable — and most impactful — system failures before determining where to devote time and resources.

Step 2: Examine the building site.
Once the most critical failure modes have been identified, building site examinations need to be done to determine what should be included in a contingency plan. To improve efficiency, team members should include individuals familiar with the building's layout and systems. The team will need to consider every relevant aspect and document each one thoroughly to reduce the need to return for further examinations.

A thorough building site examination should include determination of tie points, locations where rental equipment can be installed, existing valves, pumping restrictions and generator connection points.

The team also needs to consider the pathway, size, length and ratings of any hoses or equipment necessary to tie in new or temporary pieces of equipment.

Step 3: Organize the data.
Before creating the contingency plan, it is essential to understand what information key staff will need in the event of an emergency, and then organize the tool accordingly.

At DU, for example, employees who had handled similar events in the past could confirm what information they would need most during the event.

Such feedback would allow the most critical pieces of information to be highlighted and presented in a way that the most crucial data would be easy to access within the plan. Creating a database structure that is expandable and easy to use also allows the tool to be a living document that can be expanded or modified over time as circumstances change.

The presentation and appearance should also be consistent between buildings so that there is a universal format staff members will be familiar with regardless of the building they enter.

The information in the plan must be in a simple and consistent format that minimizes the chance of miscommunication when stress is high during emergencies. Staff working to fix the problem must be on the same page with each other, with customers to manage expectations, with leadership for communicating the problem, and with outside vendors to provide the correct equipment and materials needed to fix the problem.

Step 4: Verify with campus staff.
Once the preliminary document has been prepared, it's important to go back through the buildings with campus staff to walk each location and perform a quality review of the contingency plans. This sees that staffers understand the process, provides fertile opportunity for suggested improvements, and allows for minor modifications or changes to be made prior

to finalizing the documents. Working closely with staff allows for the validation of the plan. Success can be achieved when the entire team takes responsibility to verify that the information is correct and accurate.

Long term, it is also essential that the owner designate a point person or someone to champion, maintain and update the plan as new buildings are added or systems are updated. Training personnel on the tools developed allows the contingency plan to be expanded by campus staff whenever necessary.

Step 5: Put the plan into practice.
The final step is implementing the emergency contingency plan and adapting future projects to accommodate any insights or best practices identified during the development process.

In the DU example, the university plans to budget improvements to existing facilities and install the necessary electrical, heating and cooling connections in easy-to-access locations. Following such upgrades, the contingency plan document must be updated to reflect the physical updates.

DU continues to add buildings and systems to the plan as time allows. The process also helped officials identify existing shortcomings within buildings that would make it challenging to connect the necessary hoses or equipment to a building in the event of an emergency. To address these shortfalls, they plan to rewrite their design standards to extend emergency piping taps out to exterior walls of new buildings so that it will be easier to connect to temporary equipment. A small investment has also been set aside to make minor building piping and electrical modifications to make the process easier if an emergency occurs.

DU and other campuses are better prepared for future challenges by proactively coordinating with rental companies to establish rental agreements and predetermined equipment sizes. Tabletop exercises and actual simulated dry runs further streamline the process. All of these steps will only further reduce the timeline to a full recovery and will enable DU and other schools to react more efficiently in the years ahead.

CONCLUSION

It isn't possible to predict when an emergency will happen at a campus. Taking a proactive approach to emergency management can save a university campus time, money and negative exposure when disaster does strike.

This level of planning has been successfully used in critical facilities such as military installations and medical facilities for years. Likewise, a college campus can realize the same benefits by setting aside the resources necessary to develop the plan and put it into practice.

BIOGRAPHY

JEFF EASTON, PE, CEM, specializes in campus-level utility systems, including large-scale central utility plants, combined heat and power, utility distribution and utility master planning. Jeff manages the *On*Site Energy & Power Group in the Denver office with recent projects at University of Denver, Denver International Airport, and Arizona State University. He received his Bachelor of Science in mechanical engineering, from the University of Texas at Austin, and is a licensed professional engineer in Colorado, Arizona, Oregon and Texas.

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