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As with so many issues in institutional and commercial facilities, executives tend to focus on the latest and greatest. Newly announced construction projects, newly opened facilities, and newly installed, cutting-edge technology inevitably get their attention.

Then the lights fade, top executives turn their focus elsewhere, and it quickly falls to maintenance and engineering managers and their departments to ensure the new building or system performs as intended during planning and design.

Over time facility operations, occupants, conditions and activities change. Technology can break down. As a result, the initial parameters a building or system operated under eventually shift.

For example, facilities establish setpoints for HVAC control systems during the LEED certification process or system commissioning. But those parameters can begin to drift and eventually become outdated unless technicians update them in response to changing operating conditions in facilities. Unless managers and their staffs pay attention and take action, the result is likely to be wasted energy dollars.

As demonstrated by new-generation control systems on display at Lightfair in Philadelphia in May, manufacturers are addressing this challenge. Tapping into the power of the Building Internet of Things, they are introducing more intuitive control systems that put more power in the hands of technicians and more data in the hands of managers.

While top executives are not likely to notice changes in facility performance at first, they will notice rising energy costs. Technology advances are helping managers catch the drift of facility and system performance before they create bottom-line problems for organizations.

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FMD Facility Maintenance Decisions™

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Andrew Gager *— a.gager@nexusglobal.com — is managing director for North America with Nexus Global Business Solutions. He has more than 28 years of manufacturing and facilities experience, ranging from warehousing operations to plant management. He is a registered CMRP, CPIM, CRL, and Six Sigma Green Belt, and he is formally trained in change-management principles.*

Andrew Gager

Running the Numbers: Maintenance, Measurement and Equipment Reliability

Is anyone else like me? There's not a day that goes by that I don't measure something. I'm a triathlete, so I measure an unusual amount of stuff. How many miles I run, bike or swim? I track my 401k, my gas mileage, and yes, even my budget.

The reason I do these things is that I want to improve in some way. I don't think that we can ever escape measuring, tracking or following things. As goes our personal lives, so goes our work. "You can't manage what you don't measure", said Peter Drucker.

Whatever you call it — metrics, measurements, or key performance indicators (KPI) — maintenance and engineering managers must have performance measurements in place either to validate that the work their staffs are performing in achieving the departments' goals and objectives or to identify opportunities for continuous improvement.

Among the most commonly used measurements that managers can put into practice to determine performance are:

- mean time to repair (MTTR)
- mean time between failure (MTBF)
- availability.

These measurements enable managers to track equipment, personnel and reliability performance. At the end of the day, each of these measurements has a financial impact on the organization.

Measurements matter

For managers, measuring and monitoring their departments' activities is essential in determining the way that these activities affect the facility's overall condition and performance. Below are examples of tracking and measuring that can produce tangible results for both departments and facilities.

MTTR. Sometimes referred to as maintainability, MTTR is the measure of the department's ability to perform maintenance to retain or restore assets to a specified condition. It measures the average time required to restore an asset to its full operational condition after a failure. This measurement typically is expressed in hours. The equation is straightforward: the total repair time divided by the number of repairs or replacement events.

For example, a facility is responsible for maintaining a standard air-handling unit (AHU) that has operated for 3,600 hours over the past two years. The AHU's blower unit has failed 12 times over this period. The chart on this page shows the follow times to repair. Taking the total time to repair the unit and dividing that number by the number of failures produces an average time to repair the unit of 60 minutes. So the MTTR is one hour.

Failure	Time-to-Repair (minutes)
1	50
2	60
3	25
4	45
5	35
6	45
7	120
8	75
9	60
10	60
11	100
12	45

MTBF. MTBF is a basic measure of an asset's reliability. It is calculated by dividing the total operating time of the asset by the number of failures over a given period of time. Taking the example of the AHU above, the calculation to determine MTBF is: 3,600 hours divided by 12 failures. The result is 300 operating hours.

Availability. This measurement expresses the probability that an asset can perform its intended function satisfactorily when needed in a stated environment. The availability of an asset will diminish over time as the equipment is being used. The availability will not improve unless changes are made to upgrade the asset.

Technicians can extend the equipment's availability by increasing its reliability. There is a generally accepted availability standard of 95 percent for equipment, but mission- critical equipment in facilities requires a much higher level of availability.

To calculate availability, use the formula of MTBF divided by (MTBF + MTTR). By continuing with the above example of the AHU, its availability is: 300 divided by 360. The result is 83.3 percent availability

Probability of failure. This calculation gets a little more complicated mathematically. At times, managers need to calculate the probability that a piece of equipment will fail. Continue with example of the AHU. A manager needs to ensure the availability of the AHU for the next 72 hours. What is the probability of failure?

The calculation for this is: $R(t) = e^{(-\lambda t)}$, where:

- e is the weighted average value of a random variable, or the expected value.
- λ - In probability theory and statistics, the exponential distribution, which is also known as negative exponential distribution, is the probability that describes the time between events.
- t is 1 divided by MTBF. In the AHU example, the MTBF is 300, so 1 divided by 300 is 0.00333.

So the calculation is: $R(72) = e^{-(72)(0.00333)}$. The result is 78.68 percent.

Adding it up

What does all this math add up to? If managers do it properly, the calculations can determine when a piece of equipment might fail or the probability of when it will fail. With this information, managers can develop strategies that will manage risk, improve preventive maintenance processes, introduce predictive maintenance technologies and ultimately reduce costs.

Managers who opt not to measure, track and respond to the results are putting their organizations at risk. It has been reported that reactive maintenance can be three-four times more expensive than proactive maintenance and that 30-33 percent of a department's average maintenance budget is wasted on poor maintenance practices.

By measuring failure rates and probability of failure the potential could pay big dividends by refocusing our efforts to eliminate failure, unscheduled downtime, and risk. Now if I could only use this data to help me bike faster!

If equipment availability is lower than 95 percent, that could be a valid reason for a manager to conduct a formal root-cause analysis or a failure-modes-and-effects analysis. Finally, in facilities with mission-critical equipment that must maintain a high level of availability and where the probability of failure is high, managers must take action to remedy the risk, such as redesigning or upgrading the component or the system.

When attempting to implement a reliability culture within a maintenance and engineering department, it actually will take managers some time to acclimate department staff and front-line technicians to a new way of performing and of thinking. It is considered common that when embarking on the reliability path, maintenance costs actually increase initially.

In Ron Moore's book *Making Common Sense Common Practice*, he sights two studies.

The first study, Ormandy's "Achieving the Optimum Maintenance and Asset Strategy and Ensuring They Are Aligned with Business Goals," found that maintenance costs increased by 15 percent in departments making the transion to a reliability culture, but over time were reduced by 20 percent.

The second study, by C.D. Kelly, entitled "Leadership for Change: Developing a Reliability Improvement Strategy," found the following results.

- Repair expenses increased by 30 percent during the first 12-18 months, then declined to 50-80 percent below the original levels after 24 months.
- Breakdowns declined by 50-60 percent.
- Downtime declined by 60-80 percent.
- The spare parts inventory decreased by 20-30 percent.

By measuring failure rates and probability of failure, the potential could be major dividends that help managers refocus their efforts to eliminate failure, unscheduled downtime and risk. Now if I could only use this data to help me bike faster.

Time & Temperature

Georgia school district overcomes schedule and weather challenges to deliver successful roofing projects

By Dan Hounsell, Editor-in-Chief

Facility retrofits are rarely easy projects for maintenance and engineering managers. Success depends on specifying and coordinating the delivery of a host of materials, equipment and tools, as well as ensuring the presence of enough qualified labor to complete the job — on or under budget, ideally.

As if that were not enough, managers overseeing exterior projects also need to deal with inevitable problems caused by the weather. Mike Blackerby, director of operations with the Camden County (Ga.) School System, understands that challenge all too well.

"We're in the extreme corner of Southeast Georgia near the (Atlantic) ocean and just north of the Florida state line," Blackerby says. "We have continual afternoon thundershowers that pop up very quickly. It's pretty much a guarantee that every afternoon in late May through September, you're going to have a thundershower. Combine that with the high humidity, it makes the roofing business down here a little tricky."

CAMDEN COUNTY SCHOOL SYSTEM

Blackerby faced twice the challenge when he and his department undertook two roof retrofit projects at two of the district's schools in 2015. The projects challenged both his planning skills and his patience.

Dealing with aging

The Camden County School System, with an enrollment of 9,054 students, is made up of 12 schools containing about 1.5 million square feet. The district

(continued on page 10)

CAMDEN COUNTY SCHOOL SYSTEM

Raising the Roof on Efficiency

The three reroofing projects completed by the Camden County (Ga.) School System between 2013 and 2015 eliminated a host of problems related to deteriorating roofs on elementary schools. They also have helped the district's maintenance and engineering technicians work more effectively when it comes to troubleshooting interior water leaks.

"We have very hard water, which eats through copper pipes that most of our buildings are plumbed with," says Mike Blackerby, the district's director of operations. "Most of our plumbing is in the ceiling. In these three buildings, if the ceiling tiles are wet, we no longer assume it's the roof. We assume it's a water pipe. There's no guesswork. We know we've got a water pipe leak somewhere."

Efficiency is essential for Blackerby's department, given the staffing considerations facing many publicly funded school districts that result from ongoing budget and financing issues.

"We feel at times that we work with almost a skeleton crew, given the number of facilities and the amount of land we have to maintain," Blackerby says. "We do it with a relatively small group of employees and a relatively small budget compared to school systems around us that are of a similar size. We try to handle all of our maintenance in-house, whether it's HVAC or electrical or grounds or plumbing.

"We have a very fiscally responsible superintendent who actually came up through the operations side of things. We don't cut costs and sacrifice quality, but we're very cognizant of how much we spend on operations. Anything we can save, whether it's general maintenance or energy savings or anything else related to the operations budget, goes right back into the instructional budget of the schools, which is what we're here for."

— Dan Hounsell

(continued from page 8)

SIKA SARNAFIL

In 2015, the Camden County (Ga.) School System opted to cover the existing standing seam metal roofs on two of its elementary schools with PVC systems.

needed to expand quickly with the arrival of the Naval Submarine Base Kings Bay in the mid-1980s.

"Shortly after that time, we had a boom in population associated with the navy," Blackerby says. "As a result, we built a lot of new schools. From 1987 or so through the mid-'90s, we were building about a school a year. Now, they've all started to come of age in terms of needing some of these major renovations and repairs."

The district built Mary Lee Clark Elementary School in 1987 and Matilda Harris Elementary in 1989. Fast-forward 28 years, and Blackerby and his staff faced growing maintenance challenges.

"While there were no catastrophic failures in the existing roofs, they were both beginning to show their age, and we were have periodic issues with leaking," he says. "The roofs were well beyond their warranty years. So anything that did cause an issue we had to address by paying for it to be done, which eats into the budget because we didn't have any warranty left on the roofs.

"From an aesthetics standpoint, these two roofs didn't have any problems. But on some of the standing seam metal and on some of the flat portions of the roofs, we did have some leak issues — nagging, ongoing problems with leaking. We have some extreme heat in the summer, and we do have some cold days, so there's a lot of shrinking and expanding

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of roofing materials. Over time, whether it's the seams or the fasteners, they begin to show wear, and we get leaks."

In considering product options for the schools' deteriorating roof systems, Blackerby revisited a similar project that the district had completed two years earlier at Woodbine Elementary School.

"Woodbine was having a lot of leakage issues, and when we put (a new roof) on that school, we liked the installation process," he says. "We had a few kinks because it was new to us, but once we fixed those, the project went smoothly. We gave the roof a year, which is not a long time in the roofing world, to see how it reacted and performed. It had no issues, so we began the process of placing it on the other two schools."

Blackerby also had another issue to factor into the specification and planning for the 2015 retrofit projects.

"We also wanted to try to replace that roof without pulling the existing roof off," Blackerby says. "It's disruptive, and if we can do anything without pulling the roof off the building, it's going to save us in the long run."

Working with weather

Blackerby's reasons for not wanting to remove the previous roof system involve, in part, the region's tumultuous weather, which kicks up thunderstorms regularly.

"They can really wreak havoc if you're in the middle of a roofing project and you start getting high winds and that type of stuff," he says. "Mary Lee Clark School is located less than 8 miles from the ocean. Every afternoon, as the wind blows across the ocean, it stirs up a thunderstorm. If you're trying to replace a roof, you pretty much have your morning hours. After lunch, you better start looking out and getting your materials stored because you're going to have bad weather."

The district covered the standing seam metal roofs with a PVC roofing system from Sika Sarnafil. The installation involved filling the pans between the existing roof's standing seams with expanded polystyrene insulation and overlaying polyisocyanurate insulation on top, which also increased the R-value of the roofing system. Installers then adhered the new membrane using an adhesive with low levels of volatile organic compounds. To give the new roof the look of standing seam metal, installers adhered ridges over that layer.

The projects were completed during mid-May through the end of July.

"Work began during the last few weeks of the school year, and the majority of the job was completed before school started in first week of August," Blackerby says. The total cost for the new 86,000-square-foot roof on Mary Lee Clark was $1.3 million, while the total cost for the new 84,700-square-foot roof on Matilda Harris Elementary School was $1.4 million.

Benefits and lessons

One important goal of any facility retrofit project is to curtail the costs by eliminating failing systems and equipment that cut deeply into resources of the organization, particularly the maintenance and engineering department. By that measure, the district's dual roof replacement projects succeeded.

"It's almost been install and forget it," Blackerby says. "Going back to Woodbine in 2013 and then through these

two projects, we just haven't had to address any issues. It's not even a thought in our minds that we need to do a lot of inspecting and worrying about the condition of the roof.

"It does free up that time because we don't have to go check to see if any seams are separated or any fasteners have come loose. For our maintenance guys, it's not something they have to think about on a day-to-day basis."

'Every afternoon as the wind blows across the ocean, it stirs up a thunderstorm. If you're trying to replace a roof, you pretty much have the morning'

The projects also have helped the district streamline the process of managing facility upgrades in the face of daunting challenges related to time and weather.

"When we did the Woodbine elementary roof, it took longer than we wanted," Blackerby says. "It overlapped with some key dates on our school calendar, and we had to stop work a few times, which was not ideal. As we got to the Mary Lee Clark and Matilda Harris projects, we did stick to the schedule a little better.

"We'll continue to refine the installation schedule. The end of the (school) year is always a big time with testing, and teachers don't like to be disturbed. As we roll into summer, weather becomes a factor. Then we need to have all these projects wrapped up before people start coming back into the buildings for early enrollment at the end of the summer. We have a short window to operate in. We only have about seven good weeks, so staying on top of the schedule is important."

Blackerby and his department also tapped into outside expertise in bringing greater efficiency to the reroofing process.

"The state of Georgia has a capital outlay program that reimburses us for some of the costs of a renovation project if it meets certain qualifiers. As part of that program, we're required to have an architect oversee the project, and that has helped us further refine the installation schedule. It also gave us an extra set of feet on the ground to make sure that everything was happening accordingly. If we did another (re-roofing project), I think we'd be even more prepared as far as making sure we had the materials when we need them and the workers on the ground — or the roof, as the case may be." ■

Temporary Cooling

HVAC Project Management: Planning for Cooling

When upgrades call for temporary cooling, managers need to specify equipment that meets facility needs

By James Piper, P.E.

HVAC systems in institutional and commercial facilities have a finite life. Normal wear and tear takes its toll on systems. Systems age. Components fail. While best maintenance practices can slow the process, they cannot entirely stop it. Eventually, systems require replacement.

For maintenance and engineering managers, this means major disruptions to operations. Depending on the scope and size of the system being replaced, areas of the facility might be without air conditioning for periods of time ranging from days to months.

The issue can greatly affect building occupants. Some might be able to shift operations to other areas temporarily, but most will have to continue to operate in place. As a result, managers must find a way to provide temporary cooling.

Fortunately, managers have options when it comes to meeting requirements for temporary cooling. They can purchase or rent relatively low-cost temporary cooling systems ranging from small, self-contained units that can cool a single area, to trailer-mounted units that can cool entire buildings.

Using these products and systems requires that managers develop a temporary cooling plan ahead of time. They must size the units to meet the cooling load, they must understand the power requirements for the temporary unit and make power available, and they need to ensure that purchase or rental contracts are in place well ahead of time. Waiting for a crisis to occur, which requires the use of a portable unit, will result in project delays or disruption of services.

Knowing needs

Not all areas served by an HVAC system have the same cooling requirements. Some functions within facilities can relocate. Some areas, such as corridors or restrooms, might not need temporary cooling during the system upgrade, but others will.

Managers should start the planning process by identifying areas served by

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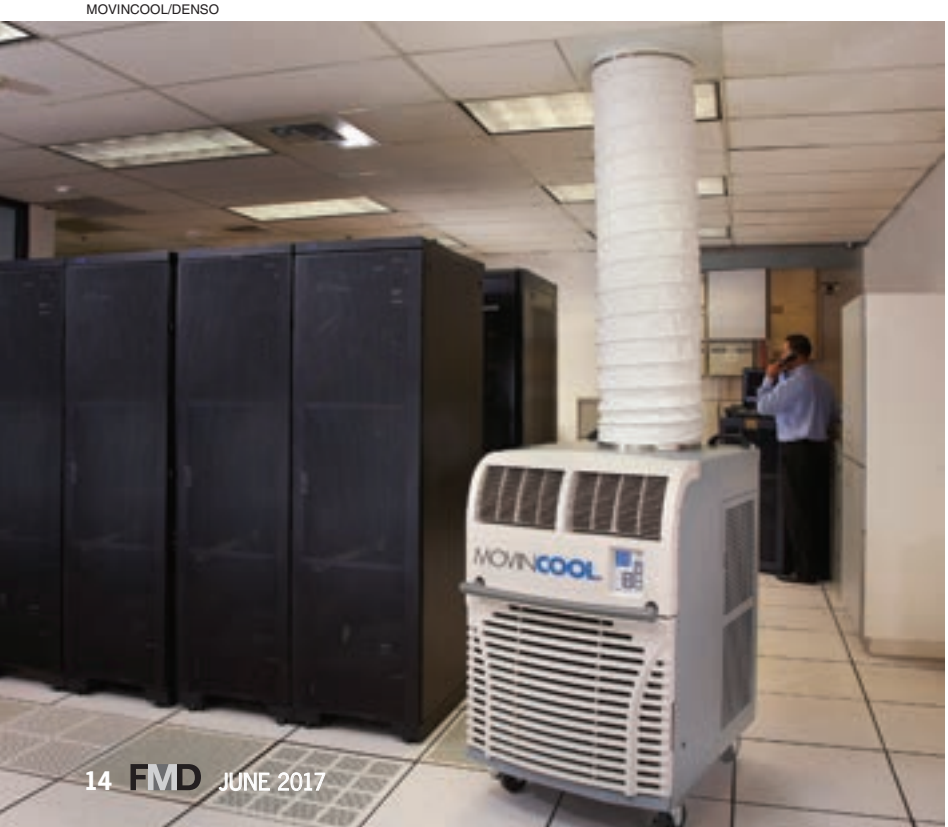

Managers can purchase or rent relatively low-cost temporary cooling systems ranging from small, self-contained units to cool one area to trailer-mounted units that can cool entire buildings.

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the system being upgraded. If building drawings are available and accurate, they provide much of the information managers need, but not all. Over time, systems are modified. Operations being conducted in the impacted spaces change, as do their cooling requirements. So it is important to go beyond the drawings and determine the areas that the system actually serves.

Once managers understand the areas that the temporary cooling system will serve, they will have to determine the amount of cooling capacity the areas need. Managers need to size temporary units so they have adequate capacity to properly cool and dehumidify the area the units served. A unit that is too small will not be able to provide sufficient cooling to regulate temperatures. A unit that is too large will have a difficult time controlling humidity levels.

Strategy for Success: Planning Ahead

In most cases of HVAC renovation projects in institutional and commercial facilities that require temporary cooling, managers purchase smaller units but rent larger units. Both approaches require planning.

Well ahead of time, managers need to identify the requirements of purchased units in terms of numbers, capacity, and power in order to ensure the units will be available when the renovation project commences. Similarly, managers also need to identify rental unit requirements and write rental contracts, particularly for larger units. Those contracts also must spell out who is responsible for delivery, setup, making the required connections at the facility, maintenance of the unit once installed and removing it after the project has been completed. The more lead time that managers build into the process, the more options they will have.

— James Piper, P.E.

The lowdown on loads

Managers can choose from three methods to determine the appropriate size of the temporary unit to meet the facility's cooling load: rule of thumb, ton-for-ton replacement, and heat-load calculations.

Rule of thumb. Rules of thumb have be used for decades when sizing HVAC systems. Sometimes they are successful and fairly accurate, but sometimes they are not. Managers use them because they are quick and easy. The most common rules of thumb for temporary cooling are based on the area of the space served.

For example, one commonly used rule of thumb for general office areas is that the cooling load is 200-300 square feet of floor area per ton of cooling. For data centers, the cooling load is 150-300 square feet per ton of cooling. Retail areas are in the range of 250-400 square feet per ton.

These numbers are for a typical application, and managers will have to consider such factors as climate, the amount of glass in exterior walls, the lighting system, the kind of heat-producing equipment present in the space, and space occupancy.

Rules of thumb are best used in emergency situations when a unit has failed and the facility needs a temporary unit immediately. They can be fairly accurate, but they can also seriously underestimate or overestimate the temporary cooling requirements.

Ton-for-ton sizing. Another quick and dirty estimating technique for sizing a temporary cooling system is to size the tonnage of the temporary system equal to the tonnage of the system it is replacing. For example, if the existing system provides 40 tons of cooling capacity, the temporary system also would need to provide 40 tons. This method requires no calculations as long as the existing system adequately cooled the space. If so, the temporary system most likely will perform satisfactorily.

Ton-for-ton sizing usually works. Where it runs into trouble is in applications where the cooling loads in the space have either increased or decreased. Small changes are not a problem, but large ones are.

If the cooling load has increased sufficiently, managers might not be aware that the existing system was not properly cooling all areas within the space. If the load has decreased significantly, the temporary system will be oversized, and control and dehumidification issues will result. Remember, one of the reasons the existing system is being replaced might be that it is oversized or undersized.

Ton-for-ton sizing for temporary cooling systems also is best used in emergency situations where there is not sufficient time to calculate cooling loads, or in applications where the cooling loads are simple and straightforward.

Load calculations. The most accurate and most difficult method of determining the size of the temporary cooling system is cooling load calculation. Calculations are typically performed by an engineer that take into account the volume of the space being cooled, the climate where the facility is located, the construction of the building, the solar load on the conditioned space, how much fresh air is being introduced into the space, how many people will be occupying the space, and what type of heat producing loads are present.

Load calculations cannot be left until the last minute. The area will have to be surveyed and detailed information recorded on the space and the activities being performed there. Calculation will then be made to determine the required size of the temporary system. All of that takes time and money. In spite of that, the load calculations method will give managers the most accurate estimate of the capacity for the temporary cooling system.

Size matters

Depending on the cooling needs for the application, managers have a range of options in selecting temporary systems for purchase or rental. For smaller spaces, the most commonly

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used temporary systems are self-contained units that can be rolled into place. These units run on 120 volts or 240 volts and offer cooling capacities of up to 5 tons. They use a flexible duct to direct the cooling air where it is needed. A second flexible duct removes heat from the unit out of the space, typically through a window into an adjacent, unoccupied space.

Larger self-contained units and split systems are available with capacities of up to 100 tons. Too large to be placed in or adjacent to the space being conditioned, these air cooled units typically are placed outside the facility. Flexible ducts supply the conditioned air to the various spaces within the facility.

Managers can use even larger, trailer-mounted units to cool large sections of, or entire buildings. These units are self-contained and include a chiller, circulation pumps, and an air-cooled condensing unit. Some are configured with a generator that supplies power to the system.

Managers need to size temporary units so they have adequate capacity to properly cool and dehumidify the area the units served

Managers looking at cooling system options must consider a number of installation and operation factors, including temporary piping, connections to existing building utility systems, the way the conditioned air will be distributed to building spaces, the power requirements of the temporary system, and the system's location. Larger units, particularly those placed outside the facility, take up a great deal of space and can produce significant levels of noise and vibrations.

HVAC renovation projects are difficult enough on their own. They do not need complications arising from inadequate planning for temporary cooling. By following these steps, and carefully planning the process, managers can avoid many of the crisis management issues that tend to crop up in any major renovation project. ■

James Piper, P.E., is a national facilities consultant based in Bowie, Md. He has more than 30 years of experience with facilities maintenance, engineering and management issues.

Supplier Perspectives: Lifts

The Ups and Downs of Lift Safety

Understanding the lift safety features and standards can help managers and operators ensure safer jobsites

By Ryan Berlin, Managing Editor

Designed to elevate operators to hard-to-reach places, lifts and aerial work platforms have become essential tools in commercial and institutional facilities. As essential and useful as they are, lifts and aerial work platforms create hazards if not operated responsibly.

Before using a lift, operators need to understand lift features and functions, as well as how to properly and safely use the equipment. Managers need to be sure that operators familiarize themselves with the equipment and receive proper training when it comes to using a lift or aerial work platform safely.

Site assessment

In order to specify the most appropriate aerial work platform for a project or department, managers need to assess the job site to identify all potential hazards.

"This means looking for holes, bumps, drop-offs, slippery surfaces, and obstructions, as well as any obstructions that could impede movement of the lift on the ground or in the air," says Bill Dovey, product manager with JLG. "Be especially cautious of high-voltage power lines, and maintain safe approach distances from them and other items specified in the operator's manual. Check the ground slope to be sure it meets the manufacturer's slope limits."

Job sites are ever-changing areas, and the conditions on a job site can have a significant impact on the safe operation of aerial work platforms. Operators need to be aware of more than just the terrain and ground pressure. Weather conditions and exposure to wind, even in indoor environments, can jeopardize safe operation.

"Operators should always be aware of their surroundings – electrical lines, uneven terrain and wind conditions are factors that some operators frequently overlook," says Ben Taft, national sales manager with Teupen. "It is also important that the aerial work platform be used as it was intended, as a boom.

JLG INDUSTRIES INC.

Before operators use an aerial work platform, they need to familiarize themselves with the lift safety standards to protect themselves and coworkers.

"Job site conditions vary from site to site, and each one has its own challenges. Prior to using a aerial lift, do a 360-degree safety walk around the site to identify potential hazards, and create a plan to tackle the job in the safest and most efficient way."

When the site assessment is complete, the operator must visually inspect the lift itself to determine if the equipment is mechanically safe as part of the pre-operation inspection, Dovey says. In addition to checking operating and emergency controls, outriggers, and personal protective equipment, operators need to be sure to:

- check levels of engine oil, hydraulic oil and antifreeze
- check the battery for corrosion, dirt and charge level
- check bearings and bushings for proper lubrication
- check boom cables for proper tension
- check the steering mechanism for wear in washers and related components
- check wear pads for signs of wear and be certain bolts holding them are not cutting into the boom
- review the machine for safety decals and placards to make sure all relevant information is available to the operator
- read and understand the operations and safety manual for your specific lift to ensure you know and follow all of its unique requirements.

"A function test is required to ensure the lift functions safely and to detect malfunctions that would prevent the machine from being put into service," Dovey says. "Safe operation of an aerial work platform is directly affected by job site conditions and the tasks needed to be completed on that job site."

JLG INDUSTRIES INC.

Job sites are ever-changing areas, and the conditions on a job site can have a significant impact on the specification and safe operation of aerial work platforms.

Lift specification

Once they understand the specific challenges of the job site, managers can specify the most appropriate aerial work platform for the task.

"There is a vast range of different types of aerial lifts on the market," says Matthew Elvin, CEO with Snorkel. "Managers should seek guidance from their aerial lift supplier — whether a manufacturer, distributor or rental company — on making sure that the equipment they have specified for the job provides a safe method of working at height taking into account the location, conditions, work height and lifting capacity, to name but a few."

With so many options, the choice of which lift to use for a particular task can present challenges. Answering the following questions about the tasks to be performed and job site conditions can help narrow the choices, Dovey says:

- Will the work be performed indoors or outside?
- Will the task require more than one worker?
- What materials and tools will the lift need to hold?
- What is the working height of the job?
- Does the machine need to go up steps or into an elevator to reach the job site?
- Does it need to fit through doorways or another narrow opening?

What are the conditions at the job site? Is the surface uneven? Are there obstacles to work around?

"Bigger is not always better," Elvin says. "It is very important that aerial lift users specify a lift that is designed for the job. There is a vast selection of aerial lifts available, with many that are designed for specific purposes, such as low level lifts or narrow lifts with low ground pressure. Those specifying lifts should work with a supplier who can provide expert advice and access to a wide selection of equipment.

"Choosing the right lift will not only provide a safer method to work at height but potentially will reduce rental or purchase costs and increase productivity."

Training and certification

When the most appropriate lift is specified to handle the task at hand, managers next need to ensure operators are familiar with the safety standards and guidelines associated with lift safety.

The American National Standards Institute (ANSI) writes the standards for aerial work platform training, and the Occupational Safety and Health Administration enforces the standards. Before managers and operators use a lift or aerial work platform, they need to familiarize themselves with the ANSI lift standards.

"It is important that operators and service personnel are properly trained to use and maintain boom lifts," Dovey says "Proper training also helps ensure safe and efficient operation of equip-

ment, decreases downtime, increases productivity on the job site, and contributes to longer machine life. All of this impacts profitability, making it more important than ever to identify quality operator training programs for those who pilot machines and service training for those who maintain them. Operator training may include online, classroom and hands-on formats or a blend of all three."

Hands-on training teaches operators in training how to operate actual equipment, under the watchful eye of an experienced, certified instructor.

"The minimum requirements for operator training in the United States include formal operator training plus product familiarization for each piece of equipment the operator will be using," Elvin says. "In some cases, the general contractor on a project could prescribe job site specific requirements and maintain operator training records."

Manufacturers are continually upgrading aerial work platforms with the latest technology and features designed to help operators work more safely and productively on the job site. Because of this, it is important for managers and operators to remain knowledgeable about lift safety.

"A recent and global change within the industry was the introduction of secondary guarding devices on boom lifts," Elvin says. "These provide either warning or cut-out functions if the operator is in a situation where they become or may become entrapped in the platform by an overhead obstacle, such as ceiling beams,"

In addition to online, classroom and hands-on training, operators should also familiarize themselves with the manufacturer's guidelines.

"Operators should follow the manufacturer's guidelines at all times, which can be usually found in the operator manual that comes with the lift, and on labels, decals and the serial plate applied to the lift," Elvin says. "All operators should be suitably trained and familiarized with the piece of equipment that they are required to operate, and complete the daily checks as prescribed within the operator manual."

When operator have become familiar with the manufacturer's guidelines and the ANSI Standards, they can take their safety one step further and begin assessing the job site with safety in mind. ■

Ask the Drain Brains

By Marty Silverman
General Pipe Cleaners

Drain Cleaning – Do it yourself and save money

Q: I'm new to the apartment rental business and I want to do the maintenance myself to save money. What type of drain cleaning tools would you recommend to meet the inevitable clogged drain emergency?

A: You've made a good decision. A drain cleaning tool can pay for itself in just 4 uses. The first thing to consider is what drains are most likely to clog.

#1. Clogged Toilet. I'm sure you've got a plunger, but so does your tenant. If they've called you, the plunger didn't work. The best tool for clearing a clogged toilet is a closet auger. Get a professional grade telescoping auger with Flexicore cable, not a cheap one from a hardware store. It won't kink on you the first time you use it. And the extra length will clear the stoppage just beyond the bowl, saving you the headache of removing the bowl to get at the stoppage.

#2. Clogged sink or laundry drain. A hand-held power drain cleaner like the Super-Vee will make quick work of this common clog. A 1/4" or 5/16" snake can easily negotiate the 1-1/4' to 2" pipes under a kitchen or bathroom sink. It is easier on the cables if you remove the P-trap under the sink rather than wrestle your way past it with a snake. Consider an automatic feed version like the Power-Vee. It's faster, easier, and safer to use.

#3. Slow draining tub or shower. Snakes have a hard time getting through drum traps under showers and tubs. The Water Ram uses a burst of compressed air that drives a shock wave through the water to break up the stoppage. You get instant impact so there's no pressure build up.

For more information, or to ask a drain cleaning question, contact the **Drain Brains at General at 800-245-6200,** or visit **www.askthedrainbrain.com**.

Power Players: UPS and Generators

Understanding applications can help managers ensure power system reliability

By John Lutz

Emergency and backup power are integral to the reliable operation of mission-critical systems and facilities. Without a robust infrastructure, small anomalies in incoming power can lead to significant outages and incidents. For maintenance and engineering managers, developing a high level of confidence in an electrical infrastructure can lead to a stronger sense of system ownership and trust that it will respond as designed.

The phrase backup power is used often when discussing generator and uninterruptible power supplies (UPS), but each system performs different tasks. The facility's generator provides an emergency or alternate source of power during an incoming power event. On the other hand, the UPS provides a source of backup power in the form of a battery or energy storage system to maintain continuity of power to the load while the system is transitioning to backup power.

Generator applications

The typical institutional or commercial facility uses one or more emergency generators as the primary means of backup power. In a typical configuration, backup generators connect to the electrical system using automatic transfer switches (ATS) or an automated switchgear application, and they constantly monitor the incoming main power supply. If an outage occurs or if that power supply deviates from acceptable limits, the generator starts automatically and restores power to the system once it is transferred to the generator.

Most data centers use standby diesel generators to provide backup power. These engines are the typical application due to their ability to start quickly, to maintain steady-state output power within relatively tight limits, and to respond to load transients quickly with minimal deviation. Depending on the cost of fuel, stockpiling and running a diesel generator can have considerable cost impacts, but the cost has been long accepted by the industry due to the engines' capabilities.

As fuel costs continue to escalate, and as the industry shifts toward more sustainable fuel sources, managers have expressed more interest in alternative-fuel systems for backup power generation. Traditionally, managers have avoided alternative fuel sources because of slow starting times and slower transient response.

Due to advances in generator governor control and engine design, low-pressure natural gas engines — both reciprocating and turbine driven — have made inroads into facilities, providing the transient response and start times data center that owners and designers require and offering a sustainable alternative to standard diesel generators.

Developing a high level of confidence in an electrical infrastructure can lead to a stronger sense of system ownership and trust that it will respond as designed.

UPS modules

UPS modules protect facility loads, not only in the event of a loss of incoming power but also if that incoming power falls outside of acceptable limits. In a typical configuration, redundant UPS systems provide power to critical loads. Two or more UPS modules support the total load of a single module, thus allowing that module to maintain all critical loads in case of failure.

The typical application involves the use of a double-conversion module backed up by a battery, but managers can use alternative sources, such as flywheels, which come with substantial sticker and maintenance costs. To increase redundancy and critical power capacity, multiple UPS modules can operate in parallel. This application typically is accompanied by a distributed static-bypass system.

The typical UPS module operates in three modes: normal, or on inverter with battery backup; internal static bypass, operating on an

internal static switch with no battery backup; and external or maintenance bypass. The normal mode of UPS provides battery power to the load in case of an interruption to the incoming power supply. While operating in both internal or external bypass mode, there is no battery backup and, thus, the continuity of power to the load is interrupted during a loss of incoming power.

Eye on energy

In typical applications, the emergency generator operates on standby. But in some advanced configurations and designs, generators can supplement incoming power and reduce power consumption, which is known as peak shaving. While this does not have a direct correlation to efficient energy use, using the backup generation system to offset utility consumption can curtail energy costs.

Even with a generator that is shut down, managers can improve energy efficiency by assessing the auxiliary support systems that are always online. By effectively sizing and specifying these systems and properly maintaining them, managers can reduce waste and unnecessary costs.

Generators with alternative fuel sources — LP gas, for instance — also can increase energy efficiency and lower energy costs. But in some cases, alternative fuel sources also require additional support systems and hardware, which can lead to a higher overall energy use when the generator is in automatic standby.

On the other hand, specifying and operating UPS systems with energy efficiency in mind — especially where 24/7 operation is required — can produce considerable savings. UPS efficiency at all load levels is a key selling point, even for simpler systems. While most UPS systems operate at relatively low load compared to capacity, specifying and selecting units that have high efficiencies at lower load levels can reduce energy waste.

Modes of operation available in newer UPS applications can reduce steady-state energy use even further. For some managers, using these applications can introduce an additional layer of risk, but thoroughly testing these applica-

Backup Basics: Testing, Testing

While a comprehensive list of recommended testing steps for generators and UPS systems in institutional and commercial facilities requires a major commitment of time and energy, basic testing of these essential systems can be beneficial.

For generator systems, minimum testing should include:

- complete visual inspection of generator and auxiliary system components
- full-load, transient-response testing with power quality analysis
- startup timing and engine-ramp rate testing and full-load burn-in with infrared thermography
- full warning and shutdown testing, locally and at the building management system or electrical power monitoring system
- auxiliary system testing, including redundant starter testing
- testing required by the National Fire Protection Agency or other local authorities.

For UPS systems, minimum testing should include:

- complete visual inspection of components, including battery systems and maintenance-bypass components
- full-load, transient-response testing while on inverter with power-quality monitoring powered by the utility and the generator
- full-load burn with infrared thermography
- rectifier walk-in timing and verification
- complete battery discharge with battery monitoring
- bypass transfer sequence and interlock testing
- full alarm and status indication testing, locally and at the building management system or electrical power monitoring system
- power-saving and efficiency-mode testing and failure response.

Specifying these tests can give managers a basic level of confidence in generators and UPS systems. And while comprehensive testing of these systems at the component and system level requires a greater commitment, managers and facilities should at least consider its benefits, which include increased energy efficiency. But even basic-level testing can help managers understand and trust system capabilities, and it can minimize risk and protect critical loads.

— John Lutz

tions can lead to increased confidence and comfort with their implementation.

Beyond installation

Effective testing of UPS and generators can ensure that the facility operates effectively as designed and without operator intervention. While operators can perform some testing during facility operation, the tests can be intrusive and could interrupt power to the load. Thorough testing should occur following installation. Preferably, each system should undergo complete component and system-level commissioning.

Before the equipment is put in service, operators should put the equipment through its paces to ensure proper operation in all modes and conditions specified by the owner. Performing post-installation testing also enables operators to identify potential issues early and resolve them with the installing vendor instead of trying to resolve issues while supporting a live load, which can result in considerably less impact.

Specifying field-testing requirements for UPS and generator systems is as important as specifying power-quality and operational requirements for each. Detailed field quality control requirements provide guidance and assurance that critical systems operate at their designed capacity and reliability levels.

During the project design phase or when sourcing equipment for upgrades, managers, design engineers and the supplying vendor should discuss post-installation testing required by the specification. If the commissioning provider has been brought onto the project at this point, that input can also be valuable because agents allow for the continuity of knowledge and best practices from previous projects.

Ultimately, managers need to ensure testing requirements for generator and UPS systems are clearly defined before installation. Setting these requirements allows for the installing vendor and project team to plan accordingly for the way components and operations will be tested and to have the required materials and test equipment on hand.

To smooth out the testing process, managers need to identify the scope of the project team members and their responsibilities. For example, responsibilities that are often ambiguous and, thus, disputed include load-bank rental equipment, power-quality metering equipment, and infrared thermography.

Clearly defining these responsibilities, as well as testing expectations, can result in a more streamlined testing program. To identify issues early and assist in post-installation testing, managers also can require factory witness testing, where project stakeholders work to identify so-called show-stoppers early and help vendors work out ambiguous specification requirements or sequences. ■

John Lutz is director of mission-critical services for Horizon Engineering Associates — www.horizon-engineering.com — in Charlotte, N.C. A nuclear electricians mate in the U.S. Navy, John has more than 13 years of experience in the operation, maintenance and management of critical systems and facilities.

Product Focus

The Outside Story on **Lighting Upgrades**

Planned properly, retrofits of exterior lighting systems can improve energy efficiency and protect occupants and visitors

By Thomas A. Westerkamp

From sidewalks and parking lots to facades and signage, an array of exterior areas of institutional and commercial facilities require lighting. Even though exterior lighting systems often go overlooked when conversations turn to lighting upgrades, these projects can offer benefits such as energy-efficiency gains and enhanced appearance, security, and safety — if maintenance and engineering managers plan and perform them properly.

By understanding advances in exterior lighting technology, including LEDs and lighting control technologies, managers will be better able to match new-generation lighting products to their facilities' exterior lighting needs.

Technology talk

Technology advances have affected most lighting components in institutional and commercial facilities.

Advances in network-controlled LED street lights, area lights, post-tops, landscape lighting, signage lighting and wall packs offer managers significant cost and functional opportunities. By incorporating dimmable LEDs as a part of the network control system, managers can strategically place motion sensors in key areas to detect activity, which can lower energy use by 50 percent and increase lighting to a safe level.

LED lamps with solar and battery capabilities provide an efficient combination for landscape, wall packs and post-top lights. The solar panel located in the fixture housing charges the battery during daylight hours and switches to the battery for light-time illumination at a fraction of the energy cost.

Luminaire designs offer distinct lighting advantages while keeping costs lower. New technology, such as reflector designs like automobile headlight and taillight lenses, increase the range of light.

Induction lamps can last up to 100,000 hours and seldom need replacement or maintenance. These benefits makes them, like LEDs, a good choice for hard-to-reach exterior spaces. Their lumens per watt is 90 compared to 120 for LEDs. These lamps are compatible with many types of lighting controls but might require special adaptations for dimming.

Lighting controls' increased flexibility and functionality offer managers improved energy efficiency. The control requirements of energy standards aim to maximize the energy efficiency of lighting systems while also ensuring building occupants are comfortable and safe.

Managers can employ many control strategies, including occupancy control, scheduling, tuning, and automated demand response. Regardless of the strategy, many lighting control systems are certified by authorities having jurisdiction, such as California. This

EXTERIOR LIGHTING

Cree

OSQ High Output features a top lumen output with up to 65,000 lumens and can replace multiple metal halide 1,000 watt fixtures. The product extends the application range for open area and flood luminaires to projects with high mounting heights, including high mast and large parking lots, and it has special packages for outdoor automotive frontlines. The luminaire supports true-to-life colors with a color rendering index of 90 and delivers efficacy of up to 125 lumens per watt.

Super Bright LEDs

The SBL Pro brand includes a variety of profile housings for creating custom LED light fixtures and effects. They can be used for recessed or surface-mount office and commercial area lighting, task lighting, accent lighting, desk-hutch lighting, cove lighting, step lighting, trim alternatives, and more. The aluminum housings are designed to fit LED strip lights that are 10-40 millimeters wide. They're available in multiple lengths with frosted, etched, or clear lens options, mounting accessories, and end caps.

certification verifies that a device has the minimum functionality required by the Title 20 Appliance Efficiency Regulations and that it meets all state and federal energy efficiency standards.

Setting goals

When planning upgrades of exterior lighting systems, it is essential for managers to pay close attention to a host of project goals and considerations.

Metrics. They will need to use other metrics as the watt measure declines in usefulness. The foot-candle measures the amount of light a source produces. The lumen is the degree to which a source illuminates an object some distance away. The lux — the English measure of lumens — expresses lumens per meter squared, or illuminance over a larger area, 1 square meter.

The higher a light source's incandescent wattage, the greater its illumination. But now that other sources, including compact fluorescent lamps (CFL), light emitting diode (LED), and induction lamps, provide superior energy efficiency, the lumen will become the unit of measure. Watts become an important measure when comparing energy cost of different options with the same lumens.

Efficacy. Luminous efficacy measures lighting energy efficiency. To calculate it, managers can divide lumens by rated watts. The LED bulb has the highest efficacy rating and is the most energy efficient, providing the same lighting while using the fewest watts.

Color. The color of light can have a distinct effect on its quality. Cool, white fluorescent lights reduce the natural color perceived by the eyes as compared to incandescent lights. Actors do not use cool white fluorescents in their makeup table lighting because of this tendency to distort true color.

Safety. Managers need to understand the impact of a retrofit on occupant and visitor safety. The safest lighting minimizes shadows and glare around buildings and parking lots. It directs most of the lighting downward, and it minimizes wasted upward lighting.

Life. Several factors can cause electric light sources to fail — faulty components, excessive heat, corrosion inside the lamp and lumen depreciation. Lumen depreciation is the gradual decrease in lumen output that occurs over the lamp's life cycle. Incandescent lamps typically last 1,000-2,000 hours and average 1,200 hours, and they lose 10-15 percent of their initial light output before burning out completely.

A CFL lamp lasts 8,000-2,000 hours and loses 10-15 percent of its output before burning out completely. Linear fluorescent lamps typically last 5,000-40,000 hours and lose 5-10 percent of their original lumen output before they fail and develop flickering as lamps and ballasts begin fail.

LEDs do not burn out suddenly in the same way as incandescent or fluorescent sources. Their lumen output continues to decrease gradually over time.

Many LED A19 replacement lamps are rated to last 25,000 hours or more before they lose 30 percent of their initial light output. Also, testing indicates the diodes in these products might maintain useful light output longer than these estimates — up to 50,000 hours. It is possible to replace the diode and LED lamp, but replacement of the fixture and lamp assembly also might be required. Managers should follow the best practices recommended by the lamp manufacturer or lighting engineer in order to maximize the life of LED lighting.

Making upgrades work

These recommended practices can help managers meet upgrade goals:

- Follow installation instructions from manufacturers, including references to base position for replacement lamps — base-up, base-down or horizontal.
- Pair LED lamps and luminaires with manufacturer-recommended dimmers and other controls.
- Observe manufacturer recommendations on operating temperature in order to prevent heat-related performance degradation.
- Follow-up the installation with an assessment by a lighting engineer to ensure the footcandles emitted are appropriate for the application.
- Use reflectance of lighter colors from ceilings, walls and floors in order to optimize energy use.

The system upgrade will deliver the desired improvements related to safety, efficacy, life, and cost if the specifier understands the capabilities of the lamp-fixture-control combination and pairs them with the environmental conditions under which the lighting system and controls will operate. ■

Thomas Westerkamp is a maintenance and engineering management consultant and president of the work management division of Westerkamp Group LLC, www.westerkampgroup.com.

For a complete version of this article, visit ***facilitiesnet.com/17236FMD***

EXTERIOR LIGHTING

EYE Lighting

The new EYELED glass jacket series mogul-base retrofit lamp is a fully self-contained retrofit in a familiar HID glass lamp package. The EYE GJ series screws directly into conventional and historically styled post-tops, floodlights, wall packs, high bays, and other high-output luminaires. The lamp offers customers the latest in AC-direct Driver On Board technology that optimizes thermal management and prevents discoloration.

Eaton

ConnectWorks connected lighting systems provides cities, utilities, departments of transportation and universities with easy-to-manage, interactive control of outdoor street, roadway and utility lighting applications. End users can monitor and control their lighting infrastructure in real time, while creating a scalable wireless ecosystem that can integrate with other smart-grid platforms and key city services. The system provides asset management and real-time fixture status, including automated fault detection and notifications for efficient maintenance.

product pipeline

A JOHN DEERE

Crossover utility vehicle

The Gator XUV590i is equipped with a twin-cylinder engine and an independent four-wheel suspension that can handle more than 75 attachments. Powered by a 586 cc, 32 horsepower, liquid-cooled inline twin-cylinder gasoline engine, the vehicle can reach more than 45 mph. It offers operators 10½-inch minimum ground clearance, 800-pound load capacity, and 1,100-pound towing capacity.

B BRADY CO.

Floor-marking stencils

PaintStripe stencils are paint-compatible alternatives for use in areas where abrasive traffic, wet floors, wash-down conditions or aesthetics make paint preferable over line-marking tape. They are available in continuous or dashed-line formats with line widths of 2, 3 and 4 inches. The stencil face features a repeating 12-inch ruler for accurate measurement and printed cut lines for rapid alignment of 90 degree corners.

C LEGRAND

USB charging receptacles

The new PlugTail receptacles feature dual USB Type A and Type C ports that allow for mobile charging without the need for an AC adaptor. The receptacles are equipped with two UL Fed Spec AC receptacles and available in 15 and 20A configurations and have a 15.5 watt, 125 volt power supply. Charging receptacles also are available in multiple color options and soon will be available in hospital-grade configurations.

D TRANE

Air handlers

Custom Performance Climate Changer air handlers are configured with variable-aspect-ratio design and can be customized to more than 200,000 cubic feet per minute capacity. They feature an ASHRAE 111 Class 6 leakage rating, double-walled casing panels up to 4 inches thick and high-performance foam insulation reduces air leakage and deflection.

E MILWAUKEE TOOL CO.

Miter saw stand

The stand weighs 31 pounds and is equipped with a bracket system that fits all brands of miter saws. Featuring a weight capacity of more than 500 pounds, the stand can support large building materials when fully extended.

LIFTS

TEUPEN

Track-mounted lift

The TL72A offers 39 feet and of outreach and a platform height of 72 feet. The lift comes equipped with both a 14.5 HP diesel engine and an electric motor that can be used indoors or outdoors. The TL72A also come in a BAT model, which replaces the diesel engine with a Relion AGM31 gel battery.

JLG

Electric scissor lift

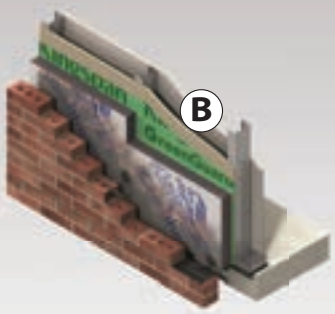
The 4045R features feature side forklift pockets, allowing for a wide range of forklifts to be used for loading or unloading the units. Operators can drive the machine at full height indoors and at a maximum 28 feet outdoors. The lift features compact dimensions, including a 32-inch machine width, a platform height of 15 feet, and a platform capacity of 600 pounds, allowing the unit to fit through narrow spaces and work in confined areas.

SNORKEL

Boom lift

The MB26J is designed for working in narrow aisles at only 39 inches wide and with an inside turning radius of just 11 inches. This all-electric lift provides a maximum platform height of 25 feet 6 inches, while the 130 degree jib provides horizontal reach of up to 9 feet 10 inches. The mast boom lift is rated to lift 475 pounds and has a stowed height of 6 feet 6 inches. The one-hand controls allow for positioning of the platform, and it can be driven while fully elevated. Standard features include a tilt alarm; non-marking tires; a self-seeking, automatic battery charger; a power line to the platform; and an automated battery top-up.

For more information on aerial work platforms, see article on page 19.



A NORA
Luminaire

iLENE is offered in three apertures and outputs: 2 inches — 14 watts and 1,000 lumens — 3 inches — 25 watts and1,500 lumens — and 5 inches — 35 watts and 2,000 lumens. Each dimmable lighting fixture includes three field-changeable reflectors in spot, narrow flood and flood beams. Kelvin temperatures vary among 2,700K, 3,000K and 4,000K. The iLENE can be specified for 120V or 277V and up to 10V dimming applications.

B KINGSPAN
Insulation

The Kooltherm K8 cavity board and Kooltherm K12 framing board feature a fiber-free rigid thermoset phenolic core, faced on both sides with a low-emissivity composite foil facing, which is used for insulation in partially filled cavity walls and can be used in wood or steel frame walls. The insulation resists the passage of water vapor, is unaffected by air infiltration and can be used between studs or as an insulating sheathing.

C RELIANCE DETECTION TECHNOLOGIES
Leak detection shut-off

The FloodMaster RS-092 features a rope-style water sensor, controller and ½-inch NPT valve with ⅜-inch fittings to sound an alarm and automatically shut off the water supply to a hose-fed appliance when it detects a leak. Two kit options are available to power the unit —a standard 120 VAC wall wart and a 120, 208 or 240 VAC to 24 VAC and mounting plate.

D VERTIV
Network compact serial console

The Avocent ACS800 features two, four, or eight serial ports, with multi-protocol serial support, an environmental sensor port and a digital output port. Networking connectivity is available through dual gigabit ethernet ports, an optional internal analog modem, and an optional external 4G/LTE cellular router.

Case Study

Boiler Benefits: Hospital Taps into Energy Efficiency

A medical center in Chicago required a quick and efficient remedy to nurse its aging and failing boiler heating system back to good health. The newest high efficiency condensing boilers from Weil-McLain provided the medicine needed. Larry Latas, system director for multiple medical facilities in Chicago, needed to upgrade the aging boiler at the 15,000-square foot Presence Health facility.

"We had several issues with controls, the boiler was leaking, and we had to place multiple services calls to keep it operating effectively," Latas says. "We were exploring grant programs for energy savings projects, such as boiler replacement, and that's when we were approached by Carl Wigginton." Wigginton, vice president of service at Murphy & Miller Inc., a Chicago-based HVAC mechanical services firm, handles heating maintenance at Presence Health.

He recommended that Presence participate in a field trial for a condensing boiler that had just hit the market: the 96.5 percent annual fuel utilization efficiency Evergreen 399 thousand Btu per hour boiler from Weil-McLain. The Evergreen features advanced technology, flexible functionality for multiple applications and a durable design, and it is easy to install, use and maintain.

To improve heating efficiency, it was recommended to pipe two 399 Evergreen boilers primary-secondary so the boilers are hydraulically disconnected from the system when not operational. Primary-secondary piping enables the units to inject heating energy into a system regardless of the flow rate in the heating system main piping. This flexibility and simple operation makes primary-secondary a popular configuration for piping boilers.

Presence Health has experienced several benefits as a result of the heating system overhaul. One benefit is reduced fuel expenses.

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Trending NOW

New True-seal ROPs-Certified Cab Maximizes Air Flow and Withstands Tough Conditions

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The cab is engineered specifically to fit these two-wheel drive utility vehicles:

- Carryall® 300 utility vehicle
- Carryall 500 utility vehicle
- Carryall 550 utility vehicle
- Carryall 700 utility vehicle

The new cab comes standard with:

- Sliding windows in both doors
- A pre-wired windshield wiper
- A headliner
- A rear storage net for gloves and other loose items.

With fewer parts and fasteners, the cab is easier to install than many competitive products.

The New Carryall Fit-to-Task Series

The cab also fits most of the two-wheel drive vehicles in our new Carryall Fit-to-Task Series. Each vehicle in the series is configured for a specific task, such as security, facilities-engineering, food service, housekeeping, bell service, grounds keeping, snow removal, ambulance service and other applications.

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NEW UPGRADED CAB

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Manufactured by Curtis Cab, it features:

- *A tilt-out windshield*
- *Spacious sliding windows in the doors*
- *A large flip-out rear window*

The new cab improves safety, ease of use and durability with these upgrades:

- *ROPS certification with two-point seatbelts*
- *A plug-and-play wiring harness*
- *Door locks that match the ignition system*
- *Sturdy automotive all-steel doors that are more shatter resistant than all-glass doors*
- *A pre-wired windshield wiper*

The cab accommodates a range of accessories, including:

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- *Two outside mirrors*
- *Warning beacon*
- *Front LED work lights*
- *LED dome light*
- *Overhead console*

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maintenance alerts

Winter Watch: Resources Target Best Practices. The Snow and Ice Management Association offers a series of best practices documents designed to help grounds managers streamline their operations and practices. The resources cover topics such as snow service procurement and sustainable operations.

Check out this Maintenance Alert, at facilitiesnet.com/115-39127, and look for new Maintenance Alerts every Tuesday and Thursday at facilitiesnet.com.

social media

Facebook

Women in Data Centers. Women can build very successful careers in the data center arena. That was the message from a panel of women who have done just that. The panel session, held at Data Center World in Los Angeles in April, offered tips to help women get ahead in the field. Even if doors to advancement are no longer locked, women still have to understand the steps that will help them build their careers. The good news for women is that organizations now understand women can be just as effective as men in technical fields. *Learn more and like our page at facebook.com/fmdmag*

Twitter

Maintenance and Money. A group of Arizona school districts and several school groups say they plan to sue the state's legislature over cuts to funding for buildings and maintenance. The suit is expected to seek hundreds of millions of dollars for schools that the legislature has not funded since 2008. *Follow us on Twitter: @Maintenance_Mag*

Compiled by Ryan Berlin, managing editor of *Facility Maintenance Decisions* and Facilitiesnet.com, FMD's digital home for daily updates and 24-hour access to maintenance insights. **See something interesting online? Email ryan.berlin@tradepress.com.**

Management TRACK

Greener Grounds:

Medical School Seeks SITES Certification

Podcast guest
Michael Wallick
Landscape Supervisor
The University of Texas at Austin

In 2013, the University of Texas at Austin began planning for a medical school. Michael Wallick, landscape supervisor at the university's Dell Medical School, worked with general contractors, subcontractors and consultants on the project, and he knew he wanted his facility to be certified by the Sustainable Sites Initiative (SITES), www.sustainablesites.org.

"The premise for SITES is sustainability for the physical location, the soil, hydrology and plants," Wallick says. "This is (UT Austin's) first SITES project and could serve as a template for the main campus. Planning started in 2013, (and) substantial completion on phase one will be late spring 2017."

The Dell Medical School campus sits on 25 acres that include four buildings and a new hospital, as well as native plants and a green roof on the medical clinic. Reviewing landscape plans and specifications, Wallick and his staff developed a plan designed to deliver long-term sustainability.

"The SITES component has been a challenge both for us and contractors," Wallick says. "The impact (on our staff) has been minimal, as we were able to hire staff dedicated to (the project)."

Listen to Wallick discuss the challenges of overseeing this facilities grounds care project in this month's Management Track podcast at www.facilitiesnet.com/fiveminuteswith

Quick Read

How to Retrofit With TLEDs. TLED bulbs are easy to install, offer longer life and reduce energy use compared to fluorescent lighting. But there are tradeoffs, especially when a dimming control system is already in place and high-performance dimming functionality is desired. Before deciding on a TLED retrofit, managers need to consider the type of lighting performance necessary in the space. Read more at **facilitiesnet.com/28-39079**

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