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APRIL 2024



Energy Use Intensity — How Does Your Facility Measure Up?

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Earth Anchors Keep Structures Grounded

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Upgrading 190 S. LaSalle With AMS Industries, Inc.

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DON'T LET YOUR BUSINESS GO UP IN FLAMES!



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SPRINKLERS TODAY!**

DEDUCT THE FULL COST OF QUALIFIED PROPERTY IMPROVEMENT!

CARES ACT

The Coronavirus Aid, Relief, and Economic Security (CARES) Act closed a loophole that was included in the TCJA by making QIP 15-year property. This change made businesses of all sizes, regardless of the amounts spent on equipment, eligible to deduct the full cost of commercial fire sprinkler systems using bonus depreciation.

The time is now to upgrade your building's fire safety with a fire sprinkler system or a sprinkler retrofit. Under the new Section 179 guidelines, the one year deduction period phases out after 2022. Any new sprinkler system or retrofit completed between September 27, 2017 and December 31, 2022 will be able to be fully expensed in one year. After 2022, the allowed deduction percentage is as follows:

2021: 100%	2023: 80%	2025: 40%
2022: 100%	2024: 60%	2026: 20%

2027 and after: The depreciation schedule becomes permanently set at 15 years.

WHAT IS QIP?

The Tax Cuts and Jobs Act (TCJA), passed in December, 2017, gave small businesses the ability to deduct the full cost of Qualified Improvement Property (QIP) up to \$1.04 million in the year of installation using Section 179.

QIP is defined as improvements to the interior of an existing building that is not residential property. Commercial fire sprinkler systems, including upgrades of existing systems or retrofitting in existing structures, are considered QIP.

The Section 179 deduction is not phased out over time. However, there is a phase out of the amount allowed as a deduction based on a maximum spending amount of \$2.59 million on equipment in a year. Businesses that spend over that amount will see a dollar for dollar reduction of their eligible deduction. So a business that spends \$3.63 million or more on equipment in a given year would not be allowed any Section 179 Deduction.

WHAT HAS CHANGED?

Prior to the TCJA allowing Section 179 on qualified improvement property, including sprinkler systems, property of this type was only allowed a deduction on a straight line basis over a period of 39 years. In other words, a company spending \$390,000 on a commercial sprinkler system prior to the TCJA would only deduct \$10,000 per year for 39 years.

While many believe that the intention of Congress was to make Qualified Improvement Property 15-year property, which would have made this property eligible for bonus depreciation, the TCJA left the life of this property at 39 years. So, a taxpayer who did not elect to use the Section 179 Deduction or who has that deduction phased out would have been left to depreciate the remaining balance of the assets over a 39-year period.

Neither of these deductions is currently available for fire sprinkler systems installed in residential high rises. The National Fire Sprinkler Association (NFSA) continues to fight to obtain incentives for residential structures.

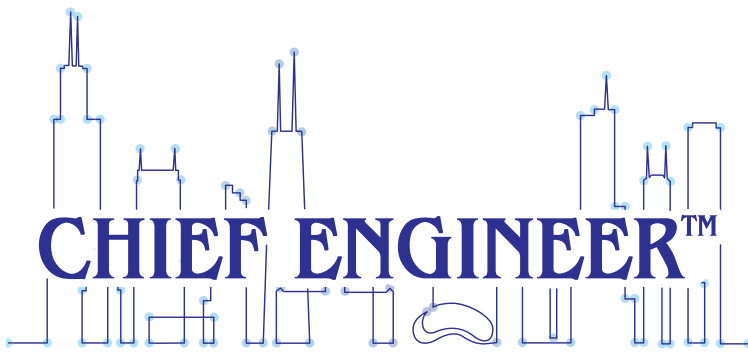
For more information on how these tax incentives might impact the business of your contractors, we would recommend that they contact their tax professionals, as situations differ based on the facts and circumstances for each business. As a general rule, we would not recommend that the Local provide tax advice to the contractors.



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We take a look at the property at 101 N. Wacker and how ComEd incentives were employed to save tens of thousands in energy costs.

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American Earth Anchors offer safety as temporary bracing guide anchors for pre-engineered metal buildings such as industrial facilities, offices or living quarters during construction, and more.

26 Upgrading 190 S. LaSalle With AMS Industries, Inc.

When the owners at 190 S. LaSalle wanted to upgrade to a new and open building automation solution, AMS Industries, Inc., knew just what to propose.

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Dear Members:

It was great to see so many of you at our annual St. Patrick's Day dinner at the Irish American Heritage Center. Even though many of us may reside on the South Side, this is one event that I know people don't mind traveling to the North Side to attend. We're grateful to everyone who attended and who made the event as memorable as it always is, from our always generous sponsors, including Affiliated Parts, Air Comfort, Chicago Backflow, Hill Group, Stone Group, and USA Fire Protection, and our Bar Sponsors, BEAR Construction, Chicago Filter, Chicago Fire, Door Service, Preservation Services and Rotating Equipment Specialists, as well as our Band Sponsor, ABM. It takes a lot of effort and sponsorship to make an event like this happen every year, and we're ever grateful that so many of our Associate Member organizations are willing to participate.



Our thanks also go out to our Events Committee for all of the planning and details that are involved, to the staff at the Irish American Heritage Center for all of their hard work in preparing and serving the dinner and drinks all night long, and to The Boils for providing genuine Irish flair to the evening's event.

Registration is now open for our April meeting, which will take place Wednesday, April 17, from 4:00-7:00pm at the Library and Stacks at 190 S. LaSalle St., Chicago. We hope to see everyone there!

As I write this, we're enjoying unseasonably warm weather, but am ever-mindful that we're entering that time of year when the forecast could throw nearly anything our way. But we do know that the warmer temperatures are going to be here to stay, and before long will give way to the heat of summer. To that end, we want to make sure that we're fine-tuning our cooling systems and readying them to do their heavy lifting in the months ahead. And, as always, should you find yourself in need of outside services, don't hesitate to consult your QuickShopper for the assistance of our Associate Member organizations, who are always deserving of our support.

Lastly, thank you to all of our members — Active, Associate, Lifetime and Retired — for your continued participation in our organization. You are the lifeblood of the CEAC, and I am proud to serve all of you as president of such a fine association.

I look forward to seeing you at the April meeting.

Sincerely,

Doug Kruczek



ASHRAE Standard 90.1-2022 Receives Model Energy Code Determination from the DOE

ASHRAE received a determination issued by the U.S. Department of Energy (DOE) stating that ANSI/ASHRAE/IES Standard 90.1-2022, Energy Standard for Sites and Buildings Except Low-Rise Residential Buildings, will increase energy efficiency in commercial buildings subject to the code.

The standard achieved this determination through the DOE's technical analysis estimating that buildings meeting 90.1-2022 (as compared to the previous 2019 edition) would result in a national average site energy estimate savings increase from 9.8 percent to 14 percent (reference as "net" savings).

"With the intensified demand for decreased energy consumption and carbon reductions in existing buildings, Standard 90.1 continues to offer essential guidance in shaping building regulations and amplified energy legislation," said 2023-24 ASHRAE President Ginger Scoggins, P.E., Fellow ASHRAE. "The DOE's latest determination further solidifies Standard 90.1 as the cornerstone for achieving energy efficiency goals and ultimately moves us closer towards widescale, global building decarbonization of the built environment."

The following are DOE's estimates of national savings in commercial buildings:

- 9.8 percent site energy savings
- 9.4 percent source energy savings
- 9.3 percent carbon emissions savings

Standard 90.1-2022 marks the first time that onsite generation of renewable energy systems is incorporated as a prescriptive requirement of the standard, recognizing the role of renewables in new construction, echoing similar requirements in several state and local building codes and better positioning new commercial buildings to achieve net zero energy in the future. Other key changes include customizable energy credits, a new mechanical system efficiency performance option, requirements to address thermal bridging, expanded criteria for whole-building air-leakage testing, updated lighting power allowances, and additional guidance for using emissions in addition to traditional site, source and cost-based metrics.

States are required to certify within 2 years of DOE's affirmative determination that the provisions of its commercial building code regarding energy efficiency have been reviewed and, as necessary, updated codes to meet or exceed the updated edition of Standard 90.1.

Learn more about DOE's model energy code determination, including specific requirements and deadlines, at energycodes.gov/determinations.

2024 ASHRAE Annual Conference to Convene in Indianapolis

Registration is now open for the 2024 ASHRAE Annual Conference taking place June 22-26, at the Marriott Indy Place in Indianapolis, Ind. Early bird registration ends April 29.

"The 2024 ASHRAE Annual Conference promises to be an exceptional event, providing valuable insights and networking opportunities for professionals in the field," said 2023-24

ASHRAE President Ginger Scoggins, P.E., Fellow ASHRAE. "The conference offers a great opportunity to forge meaningful connections and stay at the forefront of industry trends, while enjoying the vibrant city of Indianapolis."

The conference will include activities such as tours, social events, award recognitions and a comprehensive technical program featuring more than 80 sessions. Attendees will have the opportunity to explore industry-related topics related on the following eight technical tracks:

- HVAC&R Systems and Equipment
- Fundamentals and Applications
- Workforce Development
- Research Summit
- Artificial Intelligence and the Built Environment
- Building Life Cycle Assessment
- Legislation, Standards, Codes and Guidelines
- Electrification: Possibilities and Pitfalls

The plenary session will feature a keynote presentation from Julia Landauer, two-time champion NASCAR driver and advocate for STEM Education and women's empowerment.

During the President's Luncheon, on Monday, June 24, incoming 2024-25 ASHRAE President Dennis Knight, P.E., BEMP, Fellow ASHRAE, will present his inaugural address and the 2024-25 officers and directors will also be installed.

The 2024 ASHRAE Conference For Integrated Design, Construction & Operations, will be held in conjunction with the ASHRAE Annual Conference, June 24-26, also in Indianapolis, Ind. Formerly known as the Building Performance Analysis Conference, this conference provides a comprehensive look at existing tools and applied knowledge, along with the examination and integration of new technologies such as machine learning, artificial intelligence, virtual reality and robotics. Early bird registration ends April 30. For more information, visit ashrae.org/cidco24.

For complete information and registration for the 2024 ASHRAE Annual Conference, visit ashrae.org/2024Annual.

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American Coatings Show & Conference

April 30-May 2, 2024

Indiana Convention Center
Indianapolis, IN

The American Coatings Show (ACS) is the leading North American coatings industry event, setting trends for future developments in the industry. Attending the show facilitates immediate business opportunities, access to a complete portfolio of high-grade competitive products, and myriad networking and connection opportunities.


The dynamic offerings to which attendees can look forward include:

- The American Coatings Conference, which is held concurrently with the exposition, will provide an in-depth comprehensive overview of advancements in coatings formulations, as well as key technological developments. Speak directly to top decision-makers in international coatings development or present your own expertise.
- Live, onstage Product Presentations, which allow you to be among the first to learn about new innovations in the coatings industry

- The Industry Buyers Lounge, which provides a designated area for show participants to set up important meetings.
- The trade show and conference newspaper, the American Coatings Show Daily, published all three days of the show, features daily highlights, interviews with industry experts, exhibitor booth locations, and more.
- In 2024, the ACS will once again feature a Powder Coatings Pavilion.

The ACS also will feature a keynote presentation from Dr. Robert Roop, Senior Vice President and Chief Technology Officer at Axalta Coating Systems. His lecture, Coatings Innovation in the Future: Sustainability and Performance, will explore the shift in coatings innovation focus. He will show how, in the past, innovation was driven primarily by the need for improved performance — durability, cure rates, consumption, etc. — while meeting regulatory compliance. And he will discuss the future of the industry, in which innovation will be heavily focused on improved sustainability, driven by societal demands.

Dr. Roop has served in his current role at Axalta since July 2019, and in various technology leadership roles across Axalta over the preceding 10 years. Prior to those roles he spent 20 years in technology and operations positions at DuPont in various polymer and chemical businesses. Dr. Roop holds a B.S. in Chemical Engineering from West Virginia University and a Ph.D. in Chemical Engineering from Texas A&M University.

An added attraction for the benefit of the industry’s future is the ACS Fun Run, sponsored by BYK, which will take place Wednesday, May 1, 2024, from 7:15-8:15am. You can register online or in-person for this event. Cost is \$30, proceeds of which go toward funding student participation in future American Coatings Conferences. 

For more information and to register, visit american-coatings-show.com

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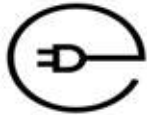
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Chicago's Rusu-McCartin Boys & Girls Club, built by BEAR Construction, was this year's winner of the CISCO Project of the Year Award.

Bear Wins 2023 CISCO Project of the Year Award

BEAR and the BEAR-built Rusu-McCartin Boys & Girls Clubs of Chicago received the 2023 Construction Industry Service Corporation (CISCO) Project of the Year Award during the Pride in Construction Award Program at the CISCO Annual Meeting.

According to witnesses at the presentation, throughout the event, the themes of passion and compassion repeatedly arose, describing well the members of the BEAR Team and representatives of the Boys & Girls Club of Chicago who accepted the award. "Being recognized by CISCO for this special project highlights the two things we're passionate about at BEAR Construction — building quality buildings with quality, skilled union labor, and being a partner and advocate for the Boys and Girls Club of Chicago," said Senior Vice President H. Dennis Hill.

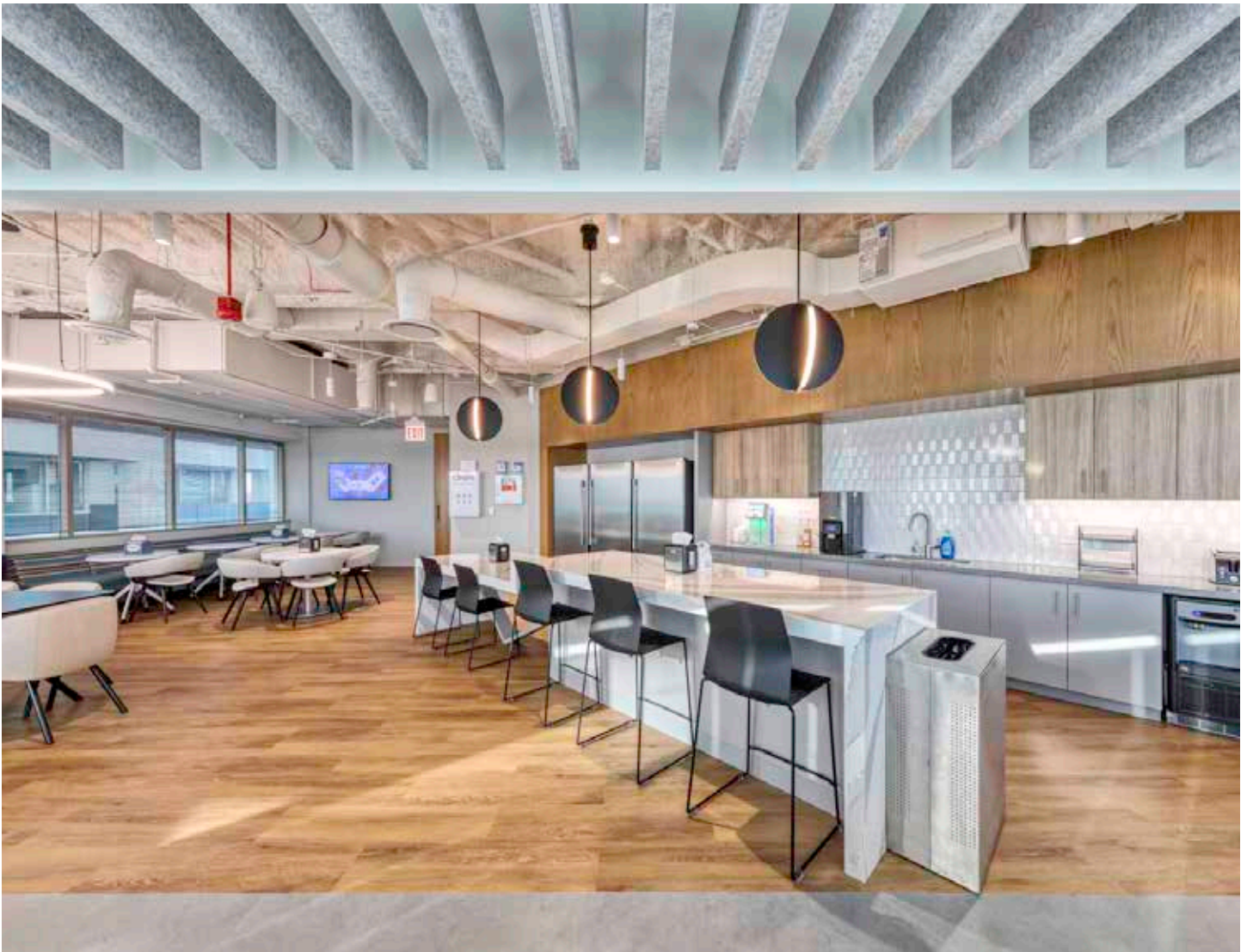
The Rusu-McCartin Boys & Girls Club, the first newly built Chicago Club in a generation, is a club for the community, built on a shared campus that includes a first responders training academy and several minority-owned businesses. The 28,000-sq-ft club offers transformational opportunities to build bridges and provide much-needed resources for Chicago's young people. This project features three stories of classrooms, a teaching kitchen, an ideas lab, a multi-sport gymnasium, an outdoor play area and a spectacular roof deck and meadow.

The project also was a finalist for the CoreNet Chicago '23 REAL Awards Small Project of the Year.

Congratulations, BEAR Construction! 🏆🏆

Learn more at loom.ly/scybh00

View the project at bearcc.com/project/rusu-mccartin-boys-girls-club-of-chicago/



J.C. Anderson recently completed an office build-out for Network Distribution at 1400 American Lane out in Schaumburg.


J.C. Anderson Completes 40,000 Sq Ft Office Buildout for Network Distribution

J.C. Anderson is pleased to announce that the firm has completed an office build-out for Network Distribution at 1400 American Lane in Schaumburg.

The project was a comprehensive transformation of the interior space of an existing business office, full floor of Tower 1 and a portion of Tower 2. The initial phase involved the meticulous demolition of non-structural interior walls, ceilings and MEPs. This set the groundwork for the subsequent construction phase, which included installation of new partitions, ceilings, decorative finishes, plumbing fixtures, and early delivery of new IDF/MDF rooms. Additionally, there were MEP alterations and modifications to life safety devices to ensure compliance with standards. This project features custom millwork and switch lite glass film, while the corridor connecting the two spaces is enhanced with specialty baffle lighting and acoustical baffles. These

elements not only contribute to the visual appeal but also address acoustic considerations, creating a well-balanced and functional environment. Operable sliding partitions were also installed. This design element adds flexibility to the space, allowing for dynamic configurations as needed. A standout feature of the project is the incorporation of a comprehensive audio/visual package for the featured conference room.

“An initial delay in permitting posed a significant challenge for our project timeline, however, JCA proposed and executed overtime for the required trades, allowing us to reclaim almost three weeks that had initially been impacted,” said JCA Project Executive Seth Erlich. “This proactive approach ensured that we not only caught up to the original schedule, but also maintained momentum throughout the course of the project.”

The construction team for J.C. Anderson was led by Erlich, Project Manager Nick Sinitzki and Superintendent Darrel Panfil. Nelson provided architectural services. 



Best Practices: Springtime Roof Inspection

Our rooftops can be complicated by the amount of necessary equipment on them that also require regular maintenance. Make sure your roofing system is receiving regular inspections and upkeep to prevent costly service and/or downtime.

Regardless of what kind of winter we have here in Chicago, it's usually a pretty trying time for the roofs on our buildings. We might have brutal cold and lots of snow, or it might be mostly milder temperatures with more rainfall like we've had in recent years. But the fluctuating temperatures, the precipitation and moisture that can freeze and thaw — all of that can put wear and tear on the surface of your roof. This is why the National Roofing Contractors Association (NRCA) recommends routine inspection and maintenance twice a year, typically in spring and fall. If there is roof damage as a result of rough weather conditions, you'll want to make sure things are in good repair before the rains of spring or worse, a warm-weather hailstorm comes along to do its worst.

Odds are you have a roofing contractor who is qualified to perform an inspection, but it should be said that inspections should be done at least once a year, if not twice, by qualified personnel who observe sound safety precautions, as should anyone who has access to the roof of your building. Roofs tend to be out-of-sight, out-of-mind, and it's easy for us to take them for granted, but this is precisely why it's important to have them regularly inspected, so that their reliability isn't undermined by our faith in them turning into neglect.

Your roof may be under warranty by its installer. Your installer or inspector should be notified in the event of any leaks, standing water, mold and mildew, sagging, or other visible damage to

your roof. If still under warranty, these issues can be remedied without major expense. But even if not, it's important to address them as soon as they've been discovered.


Of course, major storms are another event that should initiate a roof inspection. In the rainy seasons of spring and early summer, hail damage to the flashing and membrane, or windstorms shearing either of them loose, are a concern. If your building endures a particularly violent storm that has distinct potential to harm elements of your roofing system, you should consider scheduling an inspection to ensure that any problem areas can be mitigated immediately before they become chronic issues requiring much more expensive repair.

While regular inspections are among the top priorities for caring for your roofing system, there are a number of other ways you can be proactive about protecting your roof and your investment in it.

- Ensure that your roof remains clean and free of debris, avoiding clogs in AC units, gutters and any other drainage systems. With care, a stiff-bristled broom on single-ply roofing membranes can be used to clear accumulations of dirt, leaves and other debris from around drainage systems.
- Take care to inspect for any punctures, tears or splitting in the roofing membrane. These should be addressed immediately and repaired as soon as possible. Any leaking discovered inside the building should be brought to the attention of your roofing contractor as soon as possible.

BEST PRACTICES

- Limit roof access to only those authorized personnel performing service to the roof or to rooftop equipment.
- Adhere to your rooftop equipment maintenance schedule and have your mechanical contractors inspect them to prevent problems arising from leaking A/C units, loose or damaged equipment. Ensure that all rooftop equipment is secure and stable and resistant to dislodging in the high winds that can accompany many spring storms during tornado season.
- Check the metal counter flashings on your roofing system — around vents, rooftop equipment, skylights or at roof-to-wall transitions. Immediately reseal any re-secure any loose sections you find.
- Check for ponding water — defined by the NRCA as water that remains 48 hours after a rainfall in conditions conducive to drying. Persistent ponding should be monitored and mitigated as soon as possible, to prevent slip hazards in addition to any problems with the roofing system that can lead to further or even irreparable damage.
- Remove snow in the winter to prevent undue stress from the weight of accumulation.
- If relevant, prune any overhanging trees to mitigate risk of falling branches, and to reduce the risk of leaves clogging your gutters and drains.

Always remember that if you find damage, addressing it quickly is key to extending the life of your roofing system and preventing leaks, greater damage and anything that might cause interruption to your building's business, or that of its tenants. And, as ever, please keep in mind that if you require a roof inspection or repair, to consult your QuickShopper for an appropriate contractor so we can support the businesses that support the CEAC. 



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101 NORTH WACKER

Energy Use Intensity — How Does Your Facility Measure Up?

On the Cover: 101 N Wacker Chief Operating Engineer Tim Maloney

Pounds Per Square Inch (PSI), Gallons Per Minute (GPM), and British Thermal Unit (BTU) are a few of the engineering terms the Chief Engineer is all too familiar with. Whether we are obtaining these readings through analog gauges or reading them off of a graphic on our building automation system, these units of measure are used to determine system performance, analyze load conditions, and serve as a baseline when performing equipment diagnostics. What we aim to achieve through interaction with these measurements is to evaluate processes so we can operate safely and at optimal efficiency.

So how do we use this information for future design consideration or to evaluate against while determining energy code compliance? We use Energy Use Intensity (EUI), which is a measure of how much energy a building uses per area over a given period of time.

I had the opportunity to talk with Chief Engineer Tim Maloney, who operates and maintains 101 N. Wacker, a 23-story, 600,000-square-foot commercial office building in Chicago's West Loop. This facility has 100-percent electric heat, two 900-ton York centrifugal chillers for cooling, and is LEED Gold-Certified by the U.S. Green Building Council.

I asked Maloney to provide some details on a recent energy-related project in the building and how that process is started. "With energy costs rising, we were asked to come up with some solutions to reduce operational expenditures (OpEx) and how we could reach another one of our goals

which was Energy Star Certification," Maloney explains. "With the help of our consultant, we started out by taking a comprehensive look at the building's energy use through our electric meters, water meters, gas meters and waste streams in order to identify areas in need of improvement. We also analyzed previous years of work orders, such as hot calls and cold calls, to assist in developing a detailed plan. This initial benchmarking data was entered into Portfolio Manager on the Energy Star website."



101 North Wacker Engineering Team

KNOW THIS!

Under the City of Chicago Energy Benchmarking Ordinance, the city recognizes the following data verifier licenses and training program credentials:

- Building Operator Certification (BOC) - Midwest Energy Efficiency Alliance
- Building Energy Technology Certificate (BET) - City Colleges of Chicago
- Building Energy Assessment Professional Certification (BEAP) - ASHRAE
- Certified Energy Manager Certification (CEM) - Association of Energy Engineers
- Energy Management Professional (EMP) - Energy Management Association
- Facilities Engineering Technology Energy Conservation Course (FET 220) - Offered jointly by IUOE Local 399 and Triton College
- Licensed Architect - State of Illinois: Licensed by the Illinois Department of Financial & Professional Regulation
- Professional Engineer (PE) - State of Illinois: Licensed by the Illinois Department of Financial & Professional Regulation

Benchmarking your building with Portfolio Manager is the first step in measuring and comparing your buildings' consumption and/or performance to similar buildings. Maloney and his team worked together to gather data from all potential resources. "After benchmarking our building with Portfolio Manager, the next step in the process was to turn all of that information into actionable data," Maloney says. "We hired MEPC Inc. [McGuire Engineering Firm] to perform an MEP Study on our building. The engineering team scope of work included MEP drawings and new sequence of operations for our building automation system (BAS)."

Partnering with a good engineering firm can provide clear and concise plans for building improvements. Operating Engineers are a critical piece of those plans during the development process; we are the first ones on the job and always there long after completion. We spend a large percentage of our lives operating and maintaining every aspect of our buildings, which makes all Operating Engineers subject matter experts — make sure you get involved!

I asked Maloney to talk about the upgrades MEPC Inc. recommended. "The upgrades included the installation of high-end Tamco dampers on our outside air (OA), return air (RA), and exhaust air (EA)," he offers. "We replaced the pneumatic actuators with Belimo electric actuators, allowing for better control and faster response time. The Building Automation System (BAS) was upgraded to



New Belimo actuators and Tamco damper system.

Tridium Niagara N4, and the Building Automation System (BAS) technicians from Precision Controls were responsible for installing and programming the new system. The project also included the installation of sensors and programming for demand control ventilation (DCV) as part of the second phase of work."

Demand control ventilation (DCV) is an energy-savings control strategy that allows for us to use a feedback control method that includes a carbon dioxide (CO₂) sensor to automatically adjust the ventilation rate in response to changes in occupancy or pollutants. This can help create positive changes toward our energy reduction goals. However, consider implementing additional programming modes or overrides alongside this to accommodate for situations that may require additional fresh air.

Were there any challenges Maloney's team faced during construction? "We had to make sure shutdowns were clearly communicated to all stakeholders ahead of time to reduce any potential operational impacts to our tenants," he says.

Maloney shared some impressive improvements that were achieved after the first phase of work was completed. "We would normally experience low temperature shutdowns on our air handling units during extreme cold conditions where return air temperature (RAT) would sometimes get as low as 34°F," he says. "Since we have installed the Tamco high-end dampers, we typically see return air temperatures (RAT) around 60°F during similar extreme cold conditions, which has eliminated the low-temperature shutdowns and increased comfort conditions for all occupants. We are also saving on manhours that were used to restore equipment operations during those outages."



York centrifugal chiller.

Maloney then described his approach on the second phase of work. "The team at 101 N. Wacker has applied for a ComEd incentive on the project, with an estimated savings of around \$24,000.00," he explains. "This phase of the project will include additional sensors and programming for our demand control ventilation (DCV) system to further optimize building performance. This incentive is one of the many benefits of investing in energy efficiency upgrades, which not only lead to significant cost savings but also contribute positively to the environment."

Maloney introduced me to Ian Firestone (ComEd Outreach Representative), who was extremely helpful and had a wealth of knowledge on how ComEd incentives work. I started a Q & A with Firestone to help understand what the entire process looks from soup to nuts.

Chief Engineer: How were ComEd incentives applied to projects at 101 N. Wacker?

Ian Firestone: "101 N. Wacker has undergone several projects that have taken advantage of ComEd Energy Efficiency incentives to improve building efficiency and resulted in energy savings totaling over 1.8 GWh. In each case, ComEd worked with Tim Maloney and his team to determine if the projects were eligible for ComEd Energy Efficiency incentives, then supported them through the

application, implementation, and closeout processes."

CE: What types of buildings and/or properties would benefit from looking into potential ComEd incentives?

IF: "Any building in the ComEd service territory may benefit, particularly those whose management would like to improve the long-term energy efficiency of their property and operations. ComEd has worked with every building type, from high-rise and mixed-use residential/office towers down to small, family-owned businesses looking to upgrade their furnace or lighting systems, and which have resulted in energy savings."

CE: How would a typical owner/operator of a building get started on this process?

IF: "If your business is assigned a ComEd account manager, you can reach out to them to find out the best way to get started on your energy efficiency journey. If you're not sure whether you have an account manager, or don't know who that person is, visit the ComEd Energy Efficiency Program website or contact us by email or phone to get connected with someone from ComEd's Outreach Service Provider network, like me! Working with an Outreach Service Provider can help a building manager better understand what incentive opportunities are available for their property."



Chilled water system pumps.

We can help determine the offerings that best fit a given project and provide the correct application documentation for them. If a building manager doesn't have any upcoming projects in mind, a free ComEd Facility Assessment is a great way to have an engineer identify potential energy-saving projects for a property to undertake, as well as any associated estimated incentives that might be available."

CE: What does a ComEd incentive look like from start to finish?

IF: "The process for the ComEd Energy Efficiency Program is meant to be as streamlined as possible so that ComEd customers can receive incentives for eligible projects with the least amount of effort and delay. While nearly every ComEd business customer can apply for incentives, the project starts after approval from the ComEd program is granted. The process is slightly different depending on which Incentive offering is being utilized but, in general, the Standard Program process looks like this:

- 1) Customers with a specific project in mind submit a pre-application form that's available on www.ComEd.com with support from an Outreach Representative, as needed.
- 2) ComEd reviews and approves the pre-application, notifying the customer.
- 3) Customer proceeds to complete the project.

- 4) When the project is complete, the customer submits the final application.
- 5) ComEd reviews and approves the final application and sends an incentive check to the project contact."

CE: Are there any resources you could share to help an owner/operator of a building get started?

IF: "The ComEd website has a wealth of information to help folks understand the kinds of incentives that are available. Here's the link to the ComEd Incentives landing page: ComEd.com/BusinessSavings And here are the main email and phone number for the ComEd Energy Efficiency Programs: BusinessEE@ComEd.com and 1-855-433-2700."

Maloney was an I.B.E.W. Local 134 Electrician for 8 years, and has now been an I.U.O.E. Local 399 Operating Engineer for the last 11 years. He received his bachelor's in political science from Northern Illinois University. He has been an Adjunct Instructor at Local 399 Technology Center teaching Variable Frequency Drives & Electricity I for 8 years. He has been a Member of the Chief Engineers Association of Chicagoland (CEAC) for 4 years and lives in Mount Greenwood on the South Side of Chicago.



Although the need for a structure in a particular location may be temporary, there can be no compromising on how well it is secured to the ground.

Earth Anchors Keep Structures Grounded

Many industries utilize portable, modular, or temporary structures or buildings due to the speed, flexibility, and cost-effectiveness advantages offered by this approach over permanent facilities. The construction industry, educational institutions, the events and entertainment industry, logistics/warehousing, military/defense, and emergency/disaster relief all utilize modular buildings as portable offices, classrooms, housing, storage, and shelters.

There are many reasons why these structures need to be secured to the ground and stabilized including:

- Protecting occupants, workers, and visitors from accidents due to unstable structures
- Preventing liability, tipping, shifting or structural collapse during strong winds or storms
- Securing buildings to the ground to enhance structural stability, especially in areas prone to seismic activity or soil erosion
- Meeting building code, public safety or insurance requirements.

The technology or methodology utilized to secure a structure can take many forms. It can be as basic as using concrete blocks or ballasts placed on the corners or along the perimeter of a building to provide weight and stability. More sophisticated

solutions may use foundation systems that include footings, piers or concrete slabs to provide a stable base for the building.

An increasingly popular and economic solution to this issue is earth anchors. These heavy-duty aluminum anchors are driven or screwed into the ground and attached to structures using cables, straps or brackets. The anchors can be easily installed into sand, soil, hardpan, asphalt, and even underwater.

Securing Metal Buildings

Koehn Building Systems, a member of the Metal Building Contractors & Erectors Association (MBCEA), works with building owners, facility managers and qualified architects to design and erect pre-engineered metal buildings throughout Missouri and surrounding states. According to Jerel Koehn, Co-Founder of Koehn Building Systems, the company recently began using earth anchors, specifically Penetrators from Rhode Island-based American Earth Anchors (AEA), as temporary bracing guide anchors for pre-engineered metal buildings during construction.

AEA's Penetrators are screw anchors made of heat-treated 356 aluminum that can be installed with a portable impact wrench, machine PTO drive fitted with a suitable tool, or the company's manual ratcheting T-Handle. The screw anchors are available in lengths from 9" to 46" and can provide 2,500 to 14,000 lbs. of holding power in asphalt or hardpan soil.



The heavy-duty aluminum earth anchors can be easily installed into sand, soil, hardpan, asphalt, and even underwater.

According to Koehn, pre-engineered metal buildings can be utilized as warehouses, distribution centers, industrial facilities, auto dealerships, airplane hangars, offices, gyms, churches and living quarters.

The benefits of pre-engineered metal buildings include the speed of acquisition (being mostly off-the-shelf standard parts) and the rapidity of erection. These attributes save construction time (and cost) and speed occupancy. Due to the inherent strength of metal buildings and their built-in support structure, their clear span can far exceed wood-framed buildings. In addition, pre-engineered metal buildings tend to have longer lifespans than traditional wooden structures, since they do not age as quickly from damaging elements such as weather and termite damage.

Koehn Building Systems serves as both designer and erector of these structures. Customizable in almost any size or configuration, the pre-engineered metal buildings arrive with all the component parts, including permanent bracing that is used in the walls and roof for support, and to plumb the structures.

Koehn was concerned about strong winds that might possibly rise to 35 mph or higher during a storm, given that the structure's permanent bracing is not designed to withstand high wind conditions when unsheathed. Koehn Building Systems holds an AC478 accreditation, administered by the International Accreditation Service, that includes standards and guidelines for maintaining safe work practices.

With these concerns at top of mind, Koehn began searching for a solution to secure the structure temporarily, prior to sheathing. Koehn initially learned about Earth Anchors in a publication of the Metal Buildings Institute that addressed temporary bracing of metal buildings. He also attended an industry conference where earth anchors, and specifically the Penetrator screw anchors, were discussed.



Earth Anchors PE18 anchor and bracket to secure frame the specific conditions of use will help to ensure that the structures remain securely and safely grounded.

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Securing buildings to the ground enhances structural stability, especially in areas prone to high wind speed, seismic activity or soil erosion.

Although earth anchors are not mandated by building codes or regulations for pre-engineered metal buildings, after his personal research Koehn was convinced that AEA's anchors offered a superior solution. The company now utilizes 46-inch Penetrators as temporary bracing for metal buildings. The number of anchors required varies, and each is installed strategically to support end walls with vertical columns using guy-wires.

"The earth anchors definitely give me peace of mind," says Koehn. "When I install the 46-inch long Penetrators, we can drive them into the ground and attach them with a cable. I can walk away from the project and feel totally safe and secure that we have done everything we can to prepare for any type of weather."

Koehn considers the affordable earth anchors a "cheap insurance" against strong wind.



Penetrator earth anchors manufactured by American Earth Anchors can be easily installed into sand, soil, hardpan, asphalt, and even underwater.

An Earth Anchor for Every Structural Grounding Need

Although Koehn Building Systems uses the Penetrators, there are other types of earth anchors. Selecting an optimal anchor for a temporary structure requires matching the anchor to the nature of the project and configuration of the structure, the type and characteristics of the ground, and the anticipated loads — principally wind, in most cases. Key considerations include the class of soil and the project's load capacity requirements (e.g. Factor Safety to be applied to the maximum anticipated load).

Calculating the required load capacity involves many factors.

"When considering load capacity, you need to consider the soil's real-time moisture content and compaction," says Cy Henry, President of AEA. "In addition, you need to review the earth anchor's root penetration, installation method, pullout load angle, and any other factors that may be unique to the installation's particular time and place."

According to Henry, besides screw anchors, other earth anchor options include bullet anchors and arrowhead anchors, which are installed using a drive rod.

Bullet anchors, named for their bullet shape, are ideal for holding in tough soil such as hard clay, gravel, or soil intermixed with roots. An anchor is connected to a galvanized steel aircraft cable — typically available in 36, 60 and 120" lengths, but customizable — that attaches to the structure.

Similarly, arrowhead anchors offer superior holding in hard, compact and rocky soil. Once in the earth, the anchor twists like a toggle bolt and will not release from the ground without cutting the cable or digging it out. The arrowheads come in 4-, 6-, 8- and 10-inch sizes with 48-, 60-, 72- and 120-inch galvanized steel aircraft cable as standard. Custom cable lengths and stainless cable are available for special order.

"Arrowhead anchors are a great solution for softer and sandier soils," says Henry. "These anchors have more surface area in the ground when they flip around."

Grounded in Safety

Whether the environment is commercial, residential or military, the need to ensure that the structure is completely secured to the ground is paramount to the safety of everyone who uses it.

"Building codes and regulations often mandate anchoring for temporary and modular structures," says Henry. "If you fail to secure a structure properly, it can result in code violations, occupant safety risks, and valuable equipment and inventory losses, as well as property owner-operator legal liabilities."

The popularity of portable structures continues to grow across virtually all sectors. Although the need for a structure in a particular location may be temporary, there can be no compromising on how well it is secured to the ground.

While portability, ease of installation, and cost effectiveness may be the foundation of temporary storage structures' popularity, earth anchors matched to the specific conditions of use will help to ensure that the structures remain securely and safely grounded. ■■

For more information, call (866) 520-8511, visit americaneearthanchors.com or write to American Earth Anchors at 313 Pond Street, Woonsocket, RI 02895.



CHIEF ENGINEER MEMBER INFO AND REMINDERS

Here are a few things to keep in mind about your membership and Chief Engineer events.

- Members are invited to monthly meetings that take place once a month October-May
- Meeting topics, speakers and times can be found online at chiefengineer.org
- Membership dues are good for one year. If not renewed, your membership becomes inactive, and you will need to renew before or upon entering events

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UPCOMING EVENTS


For more information or to register, visit our website at chiefengineer.org/upcoming-events/



St. Patrick's Day Dinner

Always one of the most popular CEAC events of the year, the March St. Patrick's Day dinner was another unqualified success, with robust attendance, great food and music, and of course plenty of pints! Thank you to everyone who participated and made the evening so memorable, from the Events Committee to the staff at the Irish American Heritage Center, and, of course, our ever-generous sponsors, including Affiliated Parts, Air Comfort, Chicago Backflow, USA Fire Protection, The Hill Group and The Stone Group, our bar sponsors Chicago Filter Supply, Chicago Fire Protection, Door Service Inc., Preservation Services, Rotating Equipment Specialists and BEAR Construction, and our band sponsor ABM. It takes a lot of heavy lifting to get an event this big off the ground, and all of you came through for us in a major way. We are incredibly grateful to all of you. Our appreciation also goes out to The Boils, who always add such an air of distinctive Celtic atmosphere to the proceedings with their Irish music.

The April meeting will take place from 4:00-7:00pm on Wednesday, April 17, at The Stacks & Library at 190 S. LaSalle. We'll feature a presentation from AMS Industries, Inc., followed by dinner and plenty of stimulating conversation. We look forward to seeing you there!

The CEAC is always offering sponsorship opportunities for upcoming events. If your organization is looking to elevate its profile by sponsoring a CEAC meeting or event, please reach out at events@chiefengineer.org. 



St. Patrick's Day Dinner



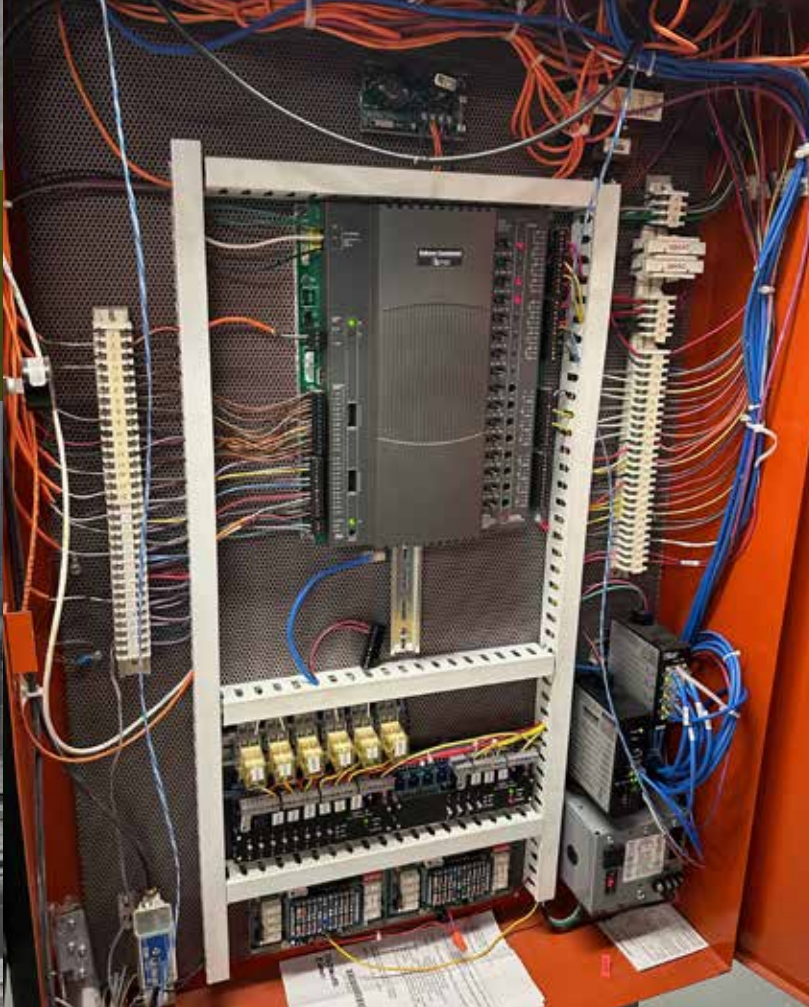
Upgrading 190 S. LaSalle With AMS Industries, Inc.

By Karl J. Paloucek



*AMS Industries, Inc., installed new drives,
replacing old starters for pumps/fans.*





The legacy AHU controls prior to upgrade.

It started with what could be termed a cautionary tale. The owners at 190 S. LaSalle were unhappy with their building automation system and service. They felt that the proprietary system currently in place was letting them down, and they wanted to go to an open system. But they were also looking for new and different building automation solutions — a new approach that would create greater flexibility and cost savings without having to invest millions of dollars at the outset. For a building of 798,439 sq. ft., this would be a challenge.

But it was a challenge that the folks at AMS Industries, Inc., eagerly took on. A full-service MEP+ contractor, AMS's comprehensive approach encompassing all aspects of building automation upgrading, from controls and HVAC mechanical servicing to tenant buildouts, having essentially a single point of contact who can easily and fluidly communicate with anyone involved in the process and take care of what needs to be done is a huge advantage, and one of which AMS Industries, Inc., Engineering Manager Brad Popovich is particularly proud.

"It's been great to be able to lean on those other people for issues that come up, and not have to hit Google and start calling others," he explains of AMS Industries, Inc.'s various service departments being onsite simultaneously. "I have a guy down the hall, if I have a mechanical question, I can just go and talk to, which then saves a lot of time. If the building has an issue, they know they can call any one of us here at AMS and get an answer, whether controls or mechanical, or



Updated controls, installed by AMS, for existing AC units

electrical — the building appreciates having one guy to call for anything that they need."

In the case of 190 S. LaSalle, the upgrades and retrofits are varied and ongoing, but the vision for the solutions involved were straightforward from the outset. Initially, it was then Chief Engineer Gerry McElligott whose familiarity with AMS led to their being brought on board to start exploring new alternatives to the Schneider and Andover systems that had been in place. "I had some previous experience — I worked for Schneider and Andover way, way, way years back," Popovich says. "The building, through some tenant buildouts, had replaced old, proprietary Schneider with BACnet Schneider, so we offered a phased approach — if we started ripping things out and started replacing it [we would] put in all new JACEs every three floors — start that route. They liked that we could phase it that way — keep the old, add the new, running simultaneously until we got it all done."

Though the phased approach proposed was a sensible and close-to-ideal solution, it depended, like most plans do, on everything going smoothly. But as can happen when integrating old systems into new, some unavoidable difficulties cropped up. "Even with the old Andover, the proprietary side — Tridium, on the AX side, before they went to N4 — had some drivers to integrate with the old Schneider [controls]," Popovich explains. "We tried to go that route. The issues were that the drivers were so old that it would pull in some data, but not all data. So we spent a few months trying to integrate everything that was existing."



AMS added a new plenum to existing AC units in order to accommodate new OA dampers.

Eventually, the effort at fully integrating third-party drivers that hadn't been properly updated proved more trouble and costly than it would be worth. Even bringing in the Schneider personnel to assist proved to no avail. "They were upset that they were losing the building, but understood," Popovich says. "To try to help get these drivers to work at either end, it was a fail the whole way."

AMS was not defeated — it just meant that the cost-effective solution would take a bit more planning and patience. "Anything that was update on the BACnet side of Schneider, we took off the proprietary system and were able to integrate that," Popovich says, explaining that there were approximately 15 floors that had the old Andover systems, with a couple of them still maintaining the legacy system. "Until tenant buildouts and stuff happen, they just stay on that system, and then we bring them over as we do buildouts."

"It's pretty much two phases," Popovich says of the changeover. "The first phase was to remove the old legacy Andover, update the controls with new Honeywell controls, adding a few points they didn't have before — like mixed-air temperatures. The building was using a water-side economizer that never really worked very well. So we were moving that stuff, changing logic in the controllers to now just run them like a normal air handler. As the building is getting funding and buildouts are happening, we are adding air-side economizers, now, to the units, since we're disconnecting the water-side economizers,

which entails adding brand-new outside air dampers. They only had a minimum of outside air dampers before, but now they're fully min/max outside air dampers, as well as airflow motion stations, VFDs on the drives, as well as space pressure sensors. So now we can control outside air, and the drives, and the exhaust — giving those air handlers a full air-side economizer without putting new air handlers in."

It's a major job that's ongoing and that will take a considerable amount of time yet to come. According to Popovich, at the time of this writing, of the 42 air handlers to be changed over, they had completed 11. "Every year, they budget three or four air handlers to get done," he says. "The ones that get done depend on if there's a full floor buildout. As we're gutting the floor, then we'll do that air handler, since it's unoccupied. We have done some that have been occupied floors, which is a little bit of a hassle, since the mechanical spaces are in tenant space, so getting in and out, and some tenants are more high-profile than others — lawyers' offices and stuff like that. It's a big job."

Cooling Tower Updates

While the updates to the controls and air handlers are an ongoing major challenge, the scope of the upgrades extends further out, including updates to the cooling towers. When AMS was called for the initial site evaluation, the cooling



To enable air side economizing, new dampers were added to the existing AC units.



New airflow measuring stations on upgraded AC units for controlling new OA dampers.

systems for the towers consisted of an antiquated fan system. “Each cell had a high and a low fan, and they would slam on, slam off, as temperatures rose and fell,” Popovich explains. In addition to working with ComEd and its rebate program, AMS completed a study of the system and updated the fans with variable frequency drives (VFD). “Now, with the controls and the logic, we’re able to ramp up and ramp down the fans, and save them a bunch of energy. Instead of one fan, two towers on low, we can actually run three towers at mid-speed, which is using half the energy it was before.”

The building owners at 190 S. LaSalle aim to have AMS apply the same solution to the house pumps, as well. The plan for 2025 includes installing differential pressure sensors, and putting VFDs on the house pumps. In conjunction with the removal of the water-side economizers, this results in significant reduction of water flow, saving energy by not having to send water where it’s no longer needed.

Let There Be Lighting

Another dimension of the upgrade at 190 S. LaSalle involves the lighting controls. At the outset of the project, the building featured legacy Andover lighting controls as part of its automation system. To keep this system upgrade cost-effective, AMS worked with Blue Ridge Technologies. Blue Ridge supplied retrofit kits that enabled AMS to maintain the existing relays and contactors, motions and switches in the spaces, while installing new BACnet controls. The retrofit kits also dovetail with the building’s intent to eventually move

toward LED fixtures, since adding features like dimming and color-changing can be added modularly instead of involving expensive tear-outs and new installs.

What’s more, the new system enables the building to offer its tenants the option to further reduce their lighting costs. “Currently the Blue Ridge [system] is controlling the lobby and amenity spaces, but now as an offer, the building is allowing the tenants to integrate their lighting into the Blue Ridge side. Instead of having to go Wattstopper or whatever the architect picked, because the Blue Ridge is expandable, they’re telling the tenants, ‘Hey, if you want to put your lighting on our system, let us control on/off schedules like we do your air handlers, great.’ So far, three floors have gone that route.”

And the innovations and updates just keep coming. “Before, they didn’t even have things like night setback,” Popovich recalls. “Disabling chilled water based on outside air temperature — all of those things that they were manually doing before. ... They’re fully scheduling the building now — optimal start/stop. We’re doing some condenser water reset based on outside air — stuff like that. We’ve implemented probably six or seven different strategies already just to reduce energy costs.”

The upgrade at 190 S. LaSalle is an ongoing process, and one in which AMS Industries, Inc., is highly engaged, and of which they’re justifiably proud. The building will benefit from the insight and strategy laid out by AMS, saving abundant energy and costs for many years to come. 🏢🔌



The current lighting panel, after retrofitting.

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Danfoss's BOCK HGX56 CO₂ T transcritical 6-cylinder compressor is ideal for industrial refrigeration and large-capacity heat pumps.

New Danfoss BOCK® CO₂ Compressor Offers Larger Capacity with Strong Performance

The newest Danfoss BOCK compressor, the HGX56 CO₂ T, provides an optimized design solution for industrial and commercial refrigeration, including cold storage and ice sports facilities, as well as for large industrial heat pumps. With the 6-cylinder capacity, customers can reduce the number of compressors in their system, resulting in lower system complexity and investment costs.

With the approaching HFC phasedown and transition to natural refrigerants, the HGX56 CO₂ T transcritical compressor range is designed for demanding conditions with natural refrigerant R744 in commercial and industrial applications. The expansion to 6-cylinder capacity allows for a wider spread and faster uptake of large CO₂ heat pumps and industrial refrigeration

systems. Additional benefits of the increased capacity — up to 135 kW for cooling and 360 kW for heating — include greater efficiency and reliability, along with low noise and vibration, a compact and lightweight design, and a minimal oil carry-over rate.

As a result, the HGX56 is an attractive alternative to compressors using HFC or HFO refrigerants or ammonia and provides the same optimal performance at full and partial loads.

“The BOCK HGX56 CO₂ T compressor provides an ideal solution for industrial and commercial customers looking to increase efficiency at lower cost and reduces system complexity,” said Vikas Anand, vice president of Danfoss Climate Solutions sales in North America. “We are looking forward to helping our industrial and commercial customers make the transition to natural refrigerants while raising the bar on efficiency and the ability to prolong the service life of the application via fully serviceable design.”

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New CLP Smart series offers wireless control for easy use and high performance

SKF Lincoln Introduces Smart Compact Lubrication Pumps

Announcing its newest compact lubrication pumps, SKF Lincoln introduces its CLP Smart Series pumps that can be wirelessly controlled, monitored and set using the SKF eLube app on your phone. These easy-to-use lubrication pumps are designed for small, progressive lubrication systems.


The pumps are lightweight with compact design, but remain reliable for all mobile and industrial applications. All CLP models are suitable for grease applications and feature a follower plate to ensure continuous grease flow. The user can quickly refill the pumps with an easy-to-access standard grease nipple. The fill level can also be easily monitored.

CLP Smart pumps are equipped with three different operation modes (time, counter and progressive cycled controlled) to provide need-based lubrication for any application. The

new pumps extend SKF's eLube series of products. You can easily manage your product and project from the palm of your hand using the eLube App. This will save you time and reduce the risk of injuries.

Jordan Butler, Product Line Manager at SKF Lincoln, emphasizes the product's user-centric design: "The new CLP Smart pumps are built with performance, ease of use, efficiency and safety in mind. Our eLube App enhances the use of these new pumps, allowing users to access critical information and swiftly address issues such as blocked lines or low lubrication levels."

The CLP Smart Series pumps are offered in pre-defined packages which include offerings of 12V to 24V for mobile or industrial use. More information, videos, and installation instructions for download can be found at www.skf.com/clp-smart.

The pumps are now available through your local SKF Lincoln dealer. 

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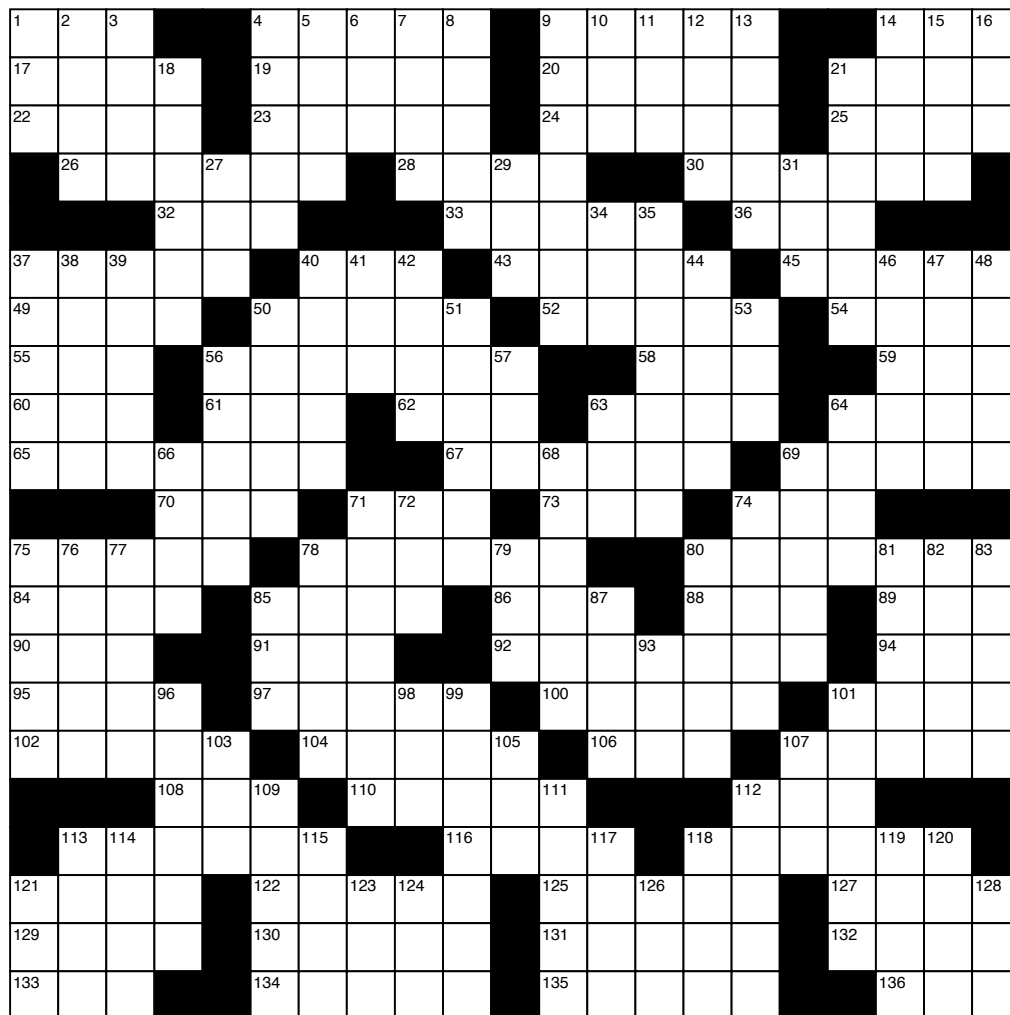
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ACROSS

- 1 Fire remains
- 4 Right angle to a ships length
- 9 Several notes
- 14 Mole
- 17 Molt
- 19 **Device to regulate flow**
- 20 Swiss mathematician
- 21 Small amount
- 22 Pop
- 23 Metal tip on the end of a lance
- 24 Indigent
- 25 Persia
- 26 Charming tomboys
- 28 Professional football team
- 30 Taste and touch, for example
- 32 Urn
- 33 Weaving machines
- 36 **Cooling system lliquid (abbrv.)**
- 37 Bye
- 40 Radiation dose
- 43 Hang
- 45 Extent
- 49 Energy
- 50 Large brass instruments
- 52 Steeple
- 54 Tropical edible root
- 55 Hoopla
- 56 Jazz devotee
- 58 Governor (abbr.)
- 59 **Heating fuel type**
- 60 Large weight unit

- 61 Single
- 62 One of these
- 63 Portend
- 64 Style
- 65 Gist
- 67 Jew
- 69 Themes
- 70 Animal doctor
- 71 MGM's Lion
- 73 American Cancer Society (abbr.)
- 74 Extremely high frequency (abbr.)
- 75 Analyze for quality
- 78 Travel faster
- 80 Introduction
- 84 Applaud
- 85 Element
- 86 Pastry
- 88 Serving of corn
- 89 Swindle
- 90 Cation
- 91 Wing
- 92 Irony
- 94 Married woman
- 95 Worker
- 97 Vex (2 wds.)
- 100 _____ **detector**
- 101 Boyfriend
- 102 Small bunch of flowers
- 104 Light emitting ____
- 106 Spots
- 107 Smooth tightly twisted thread
- 108 Deoxyribonucleic acid (abbr.)

- 110 Cooperatives (hyp.)
- 112 Truck
- 113 Steep
- 116 Rodents
- 118 Solemn
- 121 Linden
- 122 Imprisonment
- 125 Got out of bed
- 127 Stream
- 129 Small licorice treats
- 130 Green skinned pear
- 131 Set in
- 132 Bark in pain
- 133 Ball holder
- 134 Tramps
- 135 Your equals
- 136 Cozy room

DOWN

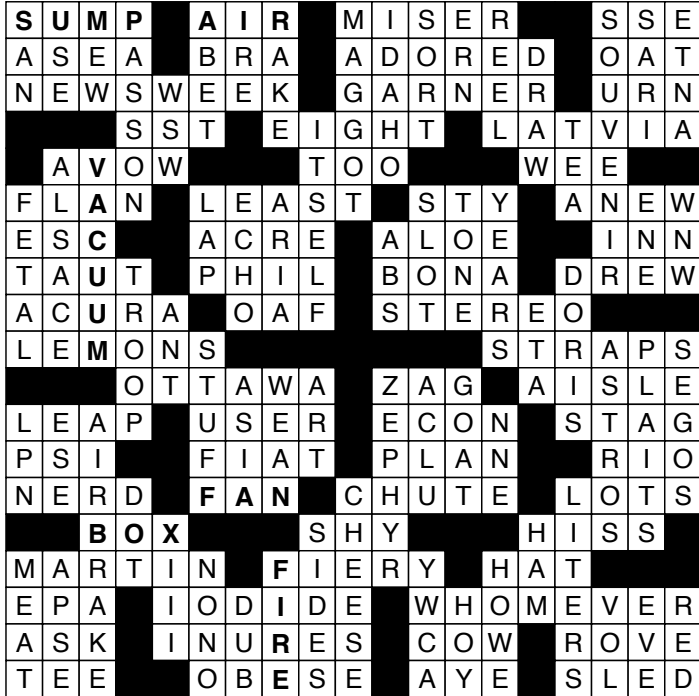
- 1 Viper
- 2 Thick carpet
- 3 **Filter type**
- 4 ____-garde
- 5 Sacks
- 6 Building addition
- 7 Affirm
- 8 **Duct material**
- 9 Critics
- 10 Shade
- 11 Roberto's yes
- 12 Cincinnati baseball team
- 13 Washer's partner
- 14 Father

- 15 Parent groups
- 16 Shekel
- 18 **Airflow control device**
- 21 Someone who doesn't fit in
- 27 Promissory note
- 29 Modern
- 31 Not old
- 34 Traveler's aid
- 35 Taps
- 37 Reduce
- 38 Tricks
- 39 Clothes pressers
- 40 Indian currency
- 41 Abdominal muscles (abbr.)
- 42 Information
- 44 Eat away
- 46 Chief ancient Philistine god
- 47 Swap
- 48 Lawn waterers
- 50 Dye
- 51 **HVAC monitoring component**
- 53 First woman
- 56 What bees make
- 57 Seed bread
- 63 Pen brand
- 64 Hand wear
- 66 **Coil that removes heat (abbrv.)**
- 68 Crazes
- 69 **100K BTUs**
- 71 Madman
- 72 And so forth
- 74 Rub out
- 75 Hydrochloric and sulfuric, for example
- 76 Sailing ship
- 77 Not as nuts
- 78 Greased
- 79 United Parcel Service
- 80 Apexes
- 81 Peaks
- 82 Type of reef
- 83 Result
- 85 Zig's partner
- 87 Writer Bombeck
- 93 Fish
- 96 Ledges
- 98 Also
- 99 Smelly
- 101 Computer number system
- 103 African antelope
- 105 Government agency
- 107 Fellow
- 109 God of Islam
- 111 Type of mall
- 112 **Air distribution and return**
- 113 Canal
- 114 Northeast by east
- 115 Pale sherry
- 117 Trigonometric function
- 118 **HVAC rating**
- 119 Same score
- 120 Women's magazine
- 121 Dynamite
- 123 Coffee brand
- 124 Condemn
- 126 South southeast
- 128 Licensed practical nurse

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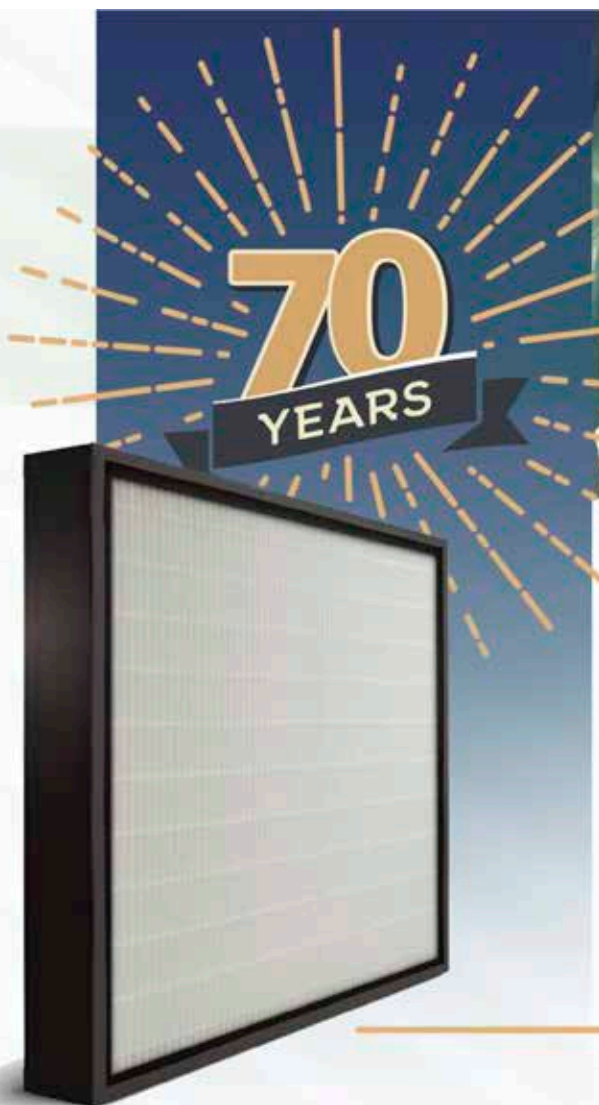
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