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SMAC NEWS

New Technologies Promise Improved Safety and Efficiency

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UV-C Report

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CAPITOL HILL UPDATE

SMACNA Endorses Major School Construction and Retrofit Legislation

School Construction, COVID Tax Credits and Recently Endorsed Bills

SMACNA has expressed support for S. 96, "The Reopen and Rebuild America's Schools Act" sponsored by Sen. Jack Reed (D-RI) and 27 cosponsors. S. 96 would invest more than $100 billion in needed school building grants and $30 billion in bond financing for public school repairs and energy efficient building retrofits.

In the House, Rep. Bobby Scott (D-VA), Chairman of the Education and Labor has introduced an identical bill, H.R. 604, which has 155 cosponsors and is awaiting action by the House Education and Labor Committee and the House Ways and Means Committee.

S. 96 / H.R. 604 would:

- Invest $100 billion in grants and $30 billion in bond authority targeted at high-poverty schools with facilities that pose health and safety risks to students and staff.
- Create over 2 million jobs based on an Economic Policy Institute analysis that each $1 billion spent on construction creates 17,785 jobs.
- Allocate 2021 program dollars on an emergency basis to aid in safely reopening public schools in line with Centers for Disease Control public health guidelines — such as for HVAC and indoor air quality systems.
- Require states to develop comprehensive state-wide public databases that track the conditions of public-school facilities; most states do not track school facility conditions and a database would provide much-needed insight into the condition of U.S. public schools.
- Expand access to high-speed broadband in public schools for digital learning.

The bill is moving to become part of President Biden's infrastructure package advancing in Congress, with a July 4th target enactment date.

SMACNA Joins Bipartisan Effort to Defeat Legislation to Limit, Repeal Davis-Bacon Act

SMACNA also expressed strong opposition to H.R. 2218, legislation that would repeal the Davis-Bacon Act. H.R. 2218 was introduced March 26th by Rep. Good (R-VA) and cosponsored by Reps. Norman (R-SC) and Duncan (R-SC).

Opposing this misguided legislative effort demonstrator support for construction workforce training quality, public project safety and productivity. Prevailing wage laws and registered apprenticeship standards are important to SMACNA's thousands of members and their hundreds of thousands of highly skilled construction trades employees.

SMACNA urged members of the House to support Davis-Bacon enforcement and understand that any major investment in public infrastructure should recognize the importance and merit in prevailing wages as part of any quality-based public procurement policy. Enforcing federal, state and local prevailing wage laws encourages employers to:

- Pay a locally prevailing wage.
- Offer health care coverage to their employees and their employees' families.
- Provide for the future retirement of their employees.
- Make a significant investment in the registered apprenticeship training and safety programs, producing an unmatched productive and safety conscious workforce.

SMACNA also emphasized that while some in Congress have seen largely misleading, exaggerated and inaccurate information on the application of prevailing wages in federal contracting, both the estimated savings and the positive policy outcomes of using locally prevailing wages had often been missed entirely. Due to active labor-management coalitions, bipartisan support for the Davis-Bacon Act in the 117th Congress appears to be growing as a vehicle for boosting registered apprenticeship and quality construction on federal infrastructure projects.

SMACNA Again Endorses H.R. 1944, the Healthy Workplaces Credit

H.R. 1944 was introduced March 16th by Reps. Darin LaHood (R-IL), Stephanie Murphy (D-FL), Tom Rice (R-SC) and Jimmy Panetta (D-Calif). The Senate bipartisan companion bill is S. 537, introduced by Sens, Portman (R-OH) and Sinema (D-AZ). If enacted, H.R. 1944 / S. 537 would help businesses cover costs to clean workplaces, protect worker safety and stay open safely while ensuring employee and customer confidence by:

FROM THE PRESIDENT

Angie Simon

- Providing a refundable tax credit against payroll taxes for 50 percent of the costs incurred by a business for COVID-19 testing, PPE, disinfecting, deep cleaning, workspace reconfiguration, as well as education and training until the end of the year.
- Encouraging and enabling businesses to take the recommended steps to prevent the spread of COVID-19 in their workplaces.
- Limiting this benefit to a maximum of $1,000 per employee for a business's first 500 employees; $750 per employee for the next 500 employees; $500 for the next 1,500; $250 for the next 2,500; and $50 for each employee thereafter.
- Providing an income tax credit for expenditures made to reconfigure workspaces in 2020 (March 12 through December 31) and allowing businesses that have already adapted to public health guidelines to receive a benefit on their 2020 tax return. The credit provides 50 percent of costs incurred up to $3,000 per employee for a business's first 500 employees.

The tax credit directly addresses productivity and cost burdens post-pandemic construction and small business operations are experiencing. SMACNA advocates that necessary safety and health protocols overburden small businesses and could wipe out construction project margins routinely expected before the COVID-19 pandemic disrupted workplace safety. ▼

Technology and the Future of Contracting Work

The economic recovery continues as we manage the new jobsite reality of additional processes and procedures to help combat the transmission of SARS-CoV-2. My virtual and now in-person visits with members have revealed that there is more focus on the jobsite, especially through two lenses: what keeps our people safe and what can help keep projects on time and on budget.

We are not the only ones focused on these goals. The construction jobsite is gaining more attention than ever from manufacturers, suppliers and technology companies looking to provide solutions to our challenges. This focus on jobsite safety is generating solutions that make work safer, more efficient and more cost effective.

With the onset of COVID-19, contact tracing on jobsites has become a necessity that many have turned to technology to address. Whether it's an app on a phone or a mobile device attached to clothing, tracking movements within the jobsite is now more commonplace. Some technology companies are taking it a step further, studying efficient movement and organization on jobsites to help contractors effectively schedule crafts persons and maximize productivity over the course of an entire construction project.

One of the devices featured in the issue measures jobsite progress. It "walks" a job site, measures changes via 3D laser imaging and reports progress to the project team, thereby eliminating the need for multiple people to walk the jobsite to verify what work has been completed and what areas are ready for the next stage — a great productivity tracking tool!

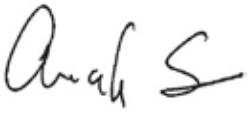
Another new technology is the robot that drills holes for our hangers. This hits what I call the sweet spot, combining improved safety with increased efficiency — a goal we contractors all like to accomplish.

Operated by a single craftsperson, this "cobot" can drill up to 700 holes per day in a ceiling slab (on a good day my field can manually drill 120 holes). That is 700 less opportunities for a person to get hurt climbing a ladder or operating a scissor lift. It also removes the possibility of repetitive motion shoulder or back injuries. The ability to drill 700 holes in a day is also a productivity eye-opener. Getting the job done quicker and safer is something our industry should always try to achieve.

The last technology we cover in this issue makes me think of a car assembly line. It's a new coil line that takes rolled sheet metal, cuts it, creases it, folds it and applies insulation. The laser cutter is now part of the coil line and makes all cutouts necessary to speed prefabrication and assembly. Very efficient and a great time saver — as we all strive to become more productive in our shops.

SMACNA remains committed to educating members on technology impacting our industry. Bottom line: Thoughtful technology adaptation helps keep us competitive as well as safer as an industry, while expanding our capacity to better serve our customers. ▼

Sincerely,



Angie Simon, SMACNA President

Metal Press Brakes, Automation Lead to Architectural Improvements

Metal presses are one of the most basic tools of the sheet metal trade. "When we renovated the USS Arizona Memorial in Pearl Harbor, we shaped the gutters, flashings and downspouts with our press brake," said David Parke, VP of construction operations at Honolulu-based Dorvin D. Leis Company, Inc. "The public has no idea how it was made, but they see the results day in and day out."

CNC PRESS BRAKES MIGHT BE 20 OR 30 PERCENT MORE EFFICIENT THAN A STANDARD BRAKE.

Automation is transforming basic equipment, helping to save time while opening up new architectural possibilities. "I'm a former shop worker, and the technology is light-years beyond what it was when I started," says Rick Ferguson, chief estimator at Black and McDonald's in Toronto, Canada. Michelle Lee, co-owner of GES Sheet Metal in Fontana, Calif., agrees, "Presses have really evolved. Now you put a piece of metal in, and the CNC will grab it, bend it, and fold it. The dies are easier to work with and provide more variety for shapes and forms."

Contractors find that CNC press brakes might be 20 or 30 percent more efficient than a standard brake, speeding jobs up. They even automate tedious work. "CNCs are software driven, so they give you repeatability if you need multiple parts," says Mike Clark, VP of sheet metal operations at Matherly Mechanical in Midwest City, Okla. "You plug the code in, and the press does the work."

California Sheet Metal in San Diego takes full advantage of the changing technology. "We do a lot of new things, so we're constantly using new techniques and technology," says CSM shop superintendent Gino Murray. "The challenges the architects give us make the job exciting."

CSM has won many impressive bids, and that has included all sheet metal aspects of the expansion of the Mingei International Museum in San Diego. The $55 million, two-and-a-half-year renovation is enlarging the two level 1915 Spanish Colonial-style facility from its original 40,000 square feet footprint to a larger 100,000 square feet space, transforming the 43-year-old folk art museum. Lead shop fabricator Dario Montez guides a team of three while field foreman Dustin Vicars and a team of four install 50,000 pounds of stainless steel on site. They started in January 2021 and expect to finish by May.

The Mingei's new design requires fabricators to radius 138 sheets of quarter-inch thick stainless-steel. "The

FAR LEFT: CSM extended their 16-foot 250-ton Wysong press brake into a 20-foot press brake by designing and fabricating two feet of extension on each side. The process took about six weeks.

MIDDLE: The gauges of the Cincinnati 175-ton 5-axis press brakes can move independently of each other, whether back and forth or side to side. Operators can lower the back gauges for parts that require a different flange.

RIGHT: Arched portal installation at the Mingei International Museum in San Diego, Calif. The CSM shop fabricated the quarter-inch thick stainless steel panels in house.

panels have a high-end finish that we can't damage during the forming process," Murray says. Fortunately, CSM has the right equipment for the job.

"We updated the tooling for our press brake inventory to include radius tooling, whether it be for columns or for making a radius part for a building," says Buddy Boles, CSM job captain. "We can match the radius the architect gives us with the tooling we buy and make a seamless curve that doesn't look bumpy or segmented."

Choosing equipment is a huge responsibility. "We go to shows to see the technology, then do cost analysis," Murray says. "We did a year plus of research on all the equipment we're talking about." Of course, buying quality equipment is not enough.

"We do daily, weekly and monthly maintenance on our press brakes, and a serviceman comes in for a yearly maintenance and functionality check," says Boles. "If one of those went down, it would impair what we need to do."

Sometimes there isn't time for a purchase. "A job jumped up that required a 20-foot press brake, and we didn't have anything that size," Murray says. The best option was to modify a 16-foot 250-ton Wysong brake.

"We had to design and fabricate two feet of extension on each side to encompass the 20 feet. We gathered all the press brake operators and all the job captains and figured out how we could do this. We determined how much it was going to cost and got the design approved by an independent person. Now we can do 20-foot jobs at a minimal cost without buying a new brake," said Murray.

CSM's success is possible because of their internal culture. "It starts upfront with communication," notes Murray. "Making a 16-foot into a 20-foot press brake takes about six weeks. If our CEO and vice president don't let us know what's coming, there's no way we're going to be ready."

Safety and training are also vital. "These machines can do serious damage if you're not properly trained, or if you don't have safety features in place," Murray warns. "I don't like to learn from a guy who learned from a guy who learned from another guy. We spend the effort and the money it takes to send our people to get the specific training and expertise we're looking for."

The combination of new technology and meticulous preparation allows CSM's creativity to soar. ▼

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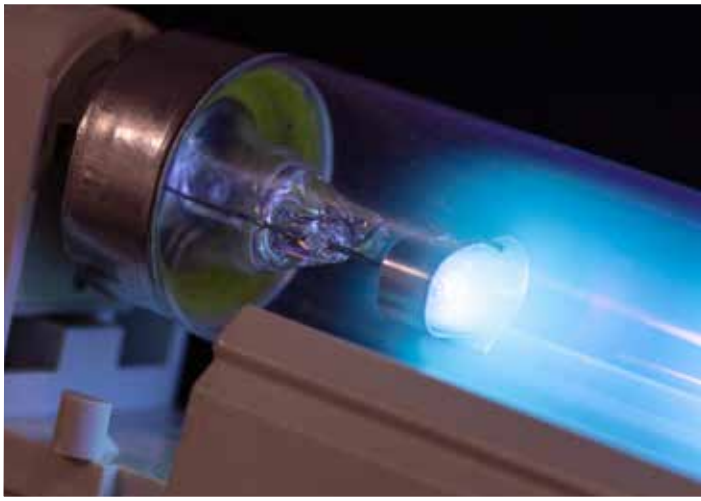


As cities and states begin to loosen capacity restrictions, SMACNA members are finding their ventilation expertise in demand as operators work to ensure patrons' comfort and safety.

Many of the guests at Russell's Restaurant & Loft in Bothell, Wash., probably don't notice the two silver boxes strategically placed around the establishment. They're nearly silent, and only take up a few feet of space.

But while restaurant patrons are focusing on their steaks and seafood, the equipment, called Hands-Free UVC, is using ultraviolet light and MERV-13 filters to purify the air in the dining room, removing bacteria and viruses, potentially including COVID-19.

THE PANDEMIC HAS SPARKED A KEEN INTEREST AMONG BUSINESSES AND THE PUBLIC IN THE ABILITY OF HVAC SYSTEMS TO IMPROVE AIRFLOW AND CREATE SAFER ENVIRONMENTS.

The two units are on loan from Johansen Mechanical, an engineering and design firm based in Monroe, Wash. Company President Keith Johansen said he's letting the restaurant use the equipment as a way to support a favorite local business.

For Russell's, the unobtrusive units are a way to let customers know that it takes the pandemic and the safety of guests seriously, said Ryan Lowell, the restaurant's wine and spirits director.

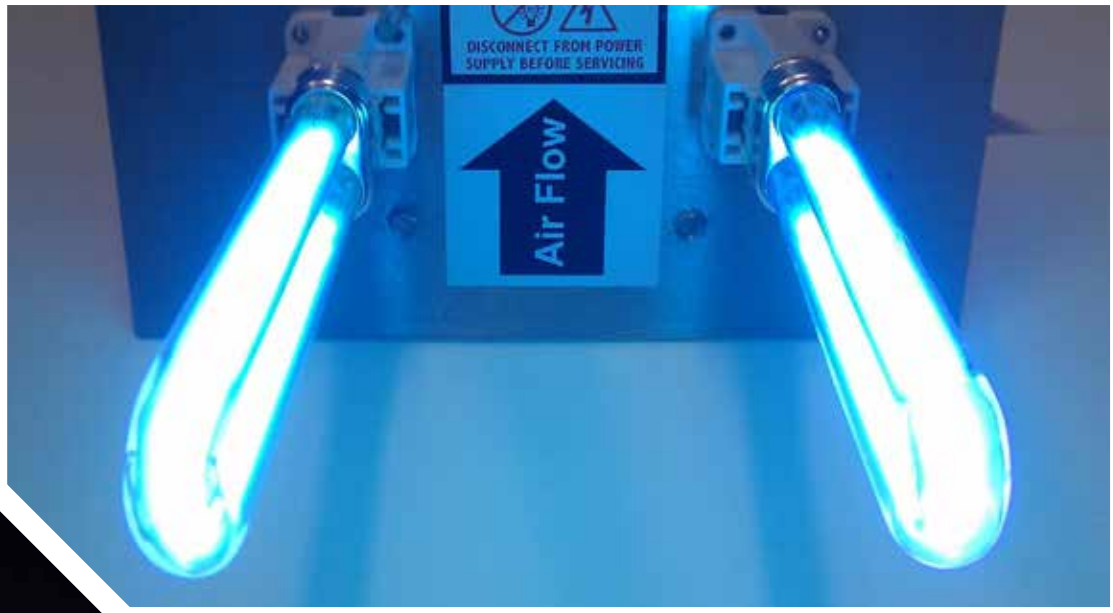
And that's the idea, Johansen said. "(Guests) can physically see it, so they know that something is being done."

Reassurances that businesses like Russell's are doing everything they can to control COVID has become an essential part of re-engaging the nation's economy. Ventilation has a critical role in reducing the spread of the spread of SARS-CoV-2, according to groups such as ASHRAE and the Centers for Disease Control and Prevention. The pandemic has sparked a keen interest among businesses and the public in the ability of HVAC systems to improve airflow and create safer environments.

That's led to many SMACNA members becoming in-demand consultants to restaurants and local government officials as they try to ensure public safety while restoring economic activity.

To Angie Simon, P.E., SMACNA National president and CEO of Western Allied Mechanical in Menlo Park, Calif., it's a welcome development and great positioning for the association's member contractors and their workers.

"It really brings our profession to the forefront … and demonstrates how important we are," she said. "It gives us new opportunities."



Russell's, a restaurant in the Seattle area, uses a portable air purification system invented by Johansen Mechanical, to help improve indoor air quality.

RESTAURANTS: A HARD-HIT INDUSTRY

From shutdowns to strict capacity limits, few sectors of the economy have been more impacted by coronavirus and attempts to control its spread than the restaurant industry.

However, even with increasing vaccinations and COVID cases trending down in much of the country, public health experts warn that indoor dining still presents risks. To help keep struggling restaurant owners afloat while also keeping the public safe, a number of cities and states have unveiled programs that encourage establishments to strengthen HVAC mitigation efforts. As an incentive, restaurants that complete the process may be able to increase capacity or advertise their certified status.

HVAC plays a critical role in many of these initiatives. In Michigan, the state's MI COVID-19 Safer Dining program matches restaurants with a local HVAC contractor who evaluates the establishment's existing system and recommends changes to improve airflow and reduce the chances of an outbreak.

Robertson Morrison Inc. of Ann Arbor, Mich., has performed several restaurant HVAC inspections and upgrades as part of the program. According to company President Brent Johnson, in many cases the work to bring restaurants into compliance isn't extensive.

"In most stand-alone buildings or complexes, their HVAC systems are pretty adaptable to make the changes required, and they're pretty inexpensive as well," he said. "It can be as simple as increasing outdoor air ventilation to the building through an air-side economizer or increasing the filter efficiency … of the unit."

A similar program was recently enacted in Philadelphia, where city officials are allowing restaurants that meet the health department's enhanced ventilation standards to boost indoor dining from 25% to 50% capacity. The restaurant's HVAC system must:

- Bring in at least 20% outside air
- Ventilate all of the dining room
- Use MERV-11 — or better — filters
- Provide at least 15 air exchanges per hour

System exhaust vents must be at least 6 feet from tables and chairs. In addition, performance must be certified by an HVAC contractor or self-certified by the restaurant owner.

Many owners realize that they're not knowledgeable enough about HVAC equipment to assess the performance of a restaurant's ventilation system, said Matt Sano, the president of Fisher Balancing Co. in Williamstown, N.J. That presents work opportunities for SMACNA members like his company.

Sano was involved in writing the performance standards the city is using for the program, and his client list includes a number of Philadelphia restaurants.

As part of the process, Fisher workers calculate an establishment's exchange rate and its total airflow and evaluate the air-handling system. The cost for the service ranges from $1,500 to $3,000, Sano said.

Although Fisher has only performed certifications for a few restaurants so far, Sano said he believes the program can spur owners to fix long-overlooked ventilation issues.

"I think it's an excellent idea, because they probably need to update anyway." ▼

JOHANSEN MECHANICAL
johansenmech.com

WESTERN ALLIED MECHANICAL
westernallied.com

ROBERTSON MORRISON INC.
rob-mor.com

FISHER BALANCING COMPANY
fisherbalancing.com

P1 GROUP
p1group.com

Putting on the Finishing Touch

The heater boxes fabricated and installed by H.M. White help ensure the paint looks great on every Ford vehicle built at a suburban Detroit factory.

If you've ever admired the paint job on a new Ford, General Motors or Stellantis vehicle, you might want to thank SMACNA member H.M. White.

The 85-year-old Detroit-based industrial sheet metal contractor has been involved in designing, fabricating and installing the multistage paint finishing systems automakers use to ensure that the candy-apple reds pop and metallic blues sparkle on their cars, SUVs and trucks.

FROM THE FILTER HOUSING TO THE PAINT SPRAY BOOTHS AND UNDERGROUND WATER TANKS, H.M. WHITE'S FABRICATION AND INSTALLATION WORK CAN BE SEEN IN ALMOST EVERY STEP OF THE MODERN AUTOMOTIVE PAINTING PROCESS.

At first, it might not seem like a natural fit for a company with an extensive background in factory ventilation and custom metal fabrication, but the work has a lot more in common than many people think, according to Nick Colone, the vice president at H.M. White LLC.

"We focus on large air-handling systems, spray booths, ovens, abatement and pre-treatment systems" Colone explained. "We also act as a general contractor in the automotive (industry) for the paint shop OEM's, due to our extensive experience, engineering capabilities and contract management."

From the air supply houses to the paint spray booths and their scrubber system, H.M. White's fabrication and installation work is in almost every step of the modern automotive painting process.

EXTENSIVE BACKGROUND

"We engineer and manufacture all types of ovens, whether it's for the pretreatment area, the color ovens, sealer ovens (or) primer ovens," Colone said. "We have our hand in all areas of the paint shop, even though sometimes our contracts have no sheet metal in them."

Ford Motor Co. awarded H.M. White a $15 million turnkey contract in late 2019 to add new ovens and upgrade the existing ones at the Michigan Assembly Plant in Wayne, Mich. The massive, 5 million-square-foot facility has been the manufacturing site for such well-known Ford vehicles as the Focus and Ranger.

The paint ovens that H.M White was hired to work on are used in the paint process for the relaunched Ford

H.M. WHITE
hmwhite.com

FAR LEFT: The inside of a heater box fabricated at the Michigan Assembly Plant.

MIDDLE: An outside look at a sealer oven at the Michigan Assembly Plant.

BELOW LEFT: An H.M. White employee works inside of a sealer oven at the Michigan Assembly Plant.

Bronco. As part of the project, H.M. White was tasked with fabricating and installing seven new heater boxes that service the ovens during the paint application and drying process.

The automotive painting process has come a long way from when primer and a few coats of lacquer were applied by hand. Today, the process starts with immersing the chemically cleaned bare metal of the auto body in a paint bath that electrically charges the metal to attract the paint particles. This process is known as electrocoating or "E-coat." Then primer and several coats of UV-resistant enamel paint is robotically applied before being dried in zoned ovens that can reach well over 300˚F. H.M. White's work at Michigan Assembly touched many of these steps.

CRITICAL AIRFLOW

Delivering proper Airflow is critically important during the painting process. The heater boxes built by H.M. White for the Ford plant can produce up to 60,000 cubic feet per minute (cfm). They were assembled using 12- and 16-gauge aluminized sheet metal, welded together.

Each heater box is constructed with 6 inches of insulation and includes around a 3 million BTU burner necessary to produce the searing heat needed to cure the automotive paints.

"The heater boxes are fabricated from aluminized metal for the high temperatures," explained Todd Redinger, a project manager at H.M. White who was in charge of the project. "You have to bring it up to temperature … then you have to hold that temperature for a specific duration to cure the paint."

The oven work required installing or reworking a total of 3,620 linear feet of oven duct and oven modules, and almost 182,000 pounds of sheet metal including access doors, nozzles, structural steel and fans.

"We size the ductwork and nozzles for the different areas of the vehicle — the pillars, the rocker and the body. Everything gets profiled and the nozzles get adjusted accordingly," Colone said.

About 24,000 sheet metal fabrication hours were spent for the project, Redinger said. The metal fabrication was done at H.M. White's Detroit sheet metal shop.

Although H.M. White has tackled similar projects at automotive factories throughout the Midwest and Southern U.S., Colone said the work is never the same.

"No two jobs are alike. There's no cookie-cutter oven. There's no cookie-cutter heater box," Colone added. "Everything we do is custom — custom engineered for the customer and the product they manufacture." ▼

HVAC Rebates Help "Frontline" Customers

When COVID-19 hit, SMACNA St. Louis looked for ways to help contractors help their customers who worked on the frontline of the pandemic. Eligible customers were offered $100 off any service they received, or $400 off a full installation and received their rebate at the time of service. For these specific rebate promotions, the St. Louis chapter reimbursed contractors through surpluses from the existing residential rebate program that were never cashed by customers.

Frontline worker-customers were offered the new rebates first, followed by teachers during the back-to-school season, and veterans in November. Hospitality workers are currently eligible for the ongoing rebate.

"WE SAW A NEED TO HELP THOSE ON THE FRONTLINE FIGHTING THIS PANDEMIC. IT WAS THE RIGHT THING TO OFFER ASSISTANCE TO THE PEOPLE HELPING SO MANY OTHERS."

Kyle Tibbs, executive vice president of SMACNA St. Louis, thought using the surplus funds in the rebate program was a great idea. "With the hours being down, it only felt right for us to spend money on something that had good PR, where we could give back, but that would also help us keep hours up and keep some of our local members employed."

Ray Reasons, president and business manager of Local 36, was immediately supportive of the idea. "With the climate of our market at the time, we saw a need to help those on the frontline fighting this pandemic. It was the right thing to offer assistance to the people helping so many others." While it was good for market share, Reasons notes that wasn't the point. "We're not talking huge gains, but every little bit helps. And I'm sure every little bit would help a customer working on the frontline as well."

Contractors advertised the rebate program on their company websites and social media with the help of SMACNA St. Louis staff. To ensure that no one missed out on the rebate, technicians would also ask customers if they were part of the eligible groups.

Seth Goldkamp, vice president at Design Aire in Maryland Heights wasn't sure people knew the price of a service call and wanted to be sure customers understood the value of the rebate. After getting the OK from the Better Business Bureau, he chose to market the rebate as a free air conditioner or furnace maintenance tune-up, instead of $100 off.

He notes that the residential HVAC industry did well in 2020. The rebate program "felt like the right thing to offer customers, and it felt good to be able to provide something for free to people who had a completely different experience than we did — people who were either working nonstop or who had hardship in their job," said Goldkamp. "There were a lot of people, a lot of industries,

FAR LEFT: A Design Aire HVAC technician

MIDDLE: The third and fourth generation Goldkamp family owners of Design Aire.

TOP: A social media marketing post targets hospitality workers, who were hit hard by the effects of COVID-19, as eligible for a rebate.

BELOW: A Welsch employee performs maintenance and changes a media filter.

a lot of occupations that were hurt terribly by COVID and so it felt like we were doing something to give back to the community and to the people who were hurt by it."

Paul Heimann, controller at St. Louis's Welsch Heating and Cooling, helped develop the rebate program. "Participating contractors came up with the idea of offering a discounted service call. Customers on the frontline were doing everything they could to help keep people safe and healthy and take care of their home life," Heimann said.

The team at Scott-Lee Heating in St. Louis was also on board with the program from the get-go. Service manager Jim Baillargeon noted that everyone was affected by the pandemic and wished the rebate program had begun sooner. "Customers are obviously combating and dealing with all sorts of stress at work every single day. The last thing they want to do is deal with an HVAC problem at home."

Scott-Lee company president Russ Scott was very impressed with the idea and the initiative taken by SMACNA to start it. "If you look at groups that have benefited, it made us feel good to help them, to help the community, and it helped Scott-Lee. So everyone here was excited to take part in a win-win-win opportunity," Scott said.

"This was a feel-good program for everyone," added Paul Heimann, who also noted that his employees were "happy they could help provide a service to the community. The customers obviously were ecstatic to get a rebate that they would not normally qualified for, but I think they were just grateful that people were doing everything that they could to help out in that situation." ▼

LOCAL 36
smw36jatc.org

DESIGN AIRE
designaire.net

WELSCH HEATING AND COOLING
welsch-heatcool.com

SCOTT-LEE HEATING
scottleeheating.com

COVER STORY

NEW TECHNO PROMISE IMP SAFETY AND E

By now, many of us have seen the videos on the internet of industrial robots traversing warehouse obstacle courses like contestants on American Ninja Warrior. They can scale blocks, do backflips off platforms and execute gymnastics maneuvers with aplomb. The robots can even break it down on the dance floor when the spirit moves the technicians who control them.

Users can program Spot™ to navigate the terrain of construction sites to collect data.

LOGIES PROVED EFFICIENCY

Spot™ comes equipped with imaging devices supplied by Trimble and Hilti that link up to cloud-based applications for managing construction projects.

Naturally, construction technology and software companies see these cutting-edge technologies too, and are exploring, developing and even rolling out innovative new technologies that will change the job site forever. For example, European-based construction equipment manufacturer Hilti last year unveiled Jaibot, the company's first cobot. Hilti is billing the product as a "step toward the digitization of construction sites."

Hilti and other construction technology companies are creating these innovative products to boost productivity, promote safety and complement the labor force.

JAIBOT IS READY TO ROLL

Based in Lichtenstein, Hilti operates in more than 120 counties and sells its technology and software services directly to construction contractors. The company debuted Jaibot, which it describes as a "semi-autonomous mobile ceiling-drilling robot," in October after a development process that required "several years," according to Aidan Maguire, the measuring business unit manager for Hilti's North American arm.

"Jaibot as a product is done," Maguire says. "It is an off-the-shelf robotics solution that is ready to go", and already deployed in several jobsites in North America.

Hilti designed Jaibot for companies in the mechanical, electrical and plumbing trade. At a width of fewer than three feet, the robot doesn't struggle to pass through doorways. Using building information modeling (BIM) data, the robot can autonomously drill and mark holes around indoor job sites. If all goes according to plan, Jaibot drills all the holes it can reach with a diameter of six feet.

Hilti doesn't sell Jaibot commercially. Instead, the company leases the robots on either a short- or longer-term basis. When all is said and done, according to Maguire, leasing one of the machines can cost a company anywhere from $5,000 to $7,000 per week.

HUMAN AUGMENTATION

Maguire says construction companies are getting a "human augmentation solution" in Jaibot. In other words, it's not fully autonomous. Hilti provides training for operating the robot and utilizing its related software.

CONSTRUCTION TECHNOLOGY COMPANIES ARE CREATING THESE INNOVATIVE PRODUCTS TO BOOST PRODUCTIVITY, PROMOTE SAFETY AND COMPLEMENT THE LABOR FORCE.

"Jaibot and the operator are really kind of a system together," he says. "It's not a robot that just runs out and drills."

Fundamentally, Jaibot requires a human operator to drive its base unit, so it cannot move around a job site without the operator directing it. Operators also have responsibility for watching over the robot's arm while it's working.

Additionally, operators are needed to shift course on the fly. If the robot hits a piece of rebar while drilling, for example, that necessitates giving it new directions. Similarly, operators can stop the robot from venturing into areas of the job site where it shouldn't go.

SAFETY AND PRODUCTIVITY ARE KEY

Supporting the health and safety of workers on job sites stands out as one of Jaibot's most important benefits. Specifically, it can save workers from hours of repetitive activities that are

Jaibot uses BIM data to autonomously drill and mark holes around indoor jobsites.

Spot™ comes equipped with imaging devices supplied by Trimble and Hilti that link up to cloud-based applications for managing construction projects.

physically strenuous, including drilling countless numbers of holes overhead.

"All contractors can agree it's safer to have a robot arm doing the drilling than have workers going up and down ladders or scissor lifts and reducing fatigue and stress on the installers' joints as they work overhead," Maguire says.

Furthermore, construction companies can realize productivity gains by deploying Jaibot effectively. The machine's precision cuts down on layout and drilling errors and helps ensure a constant and consistent level of performance. Meanwhile, Jaibot can execute its tasks at a faster speed and with greater transparency thanks to its integration with BIM data.

Maguire says Hilti's internal research shows the productivity increases from using Jaibot over more traditional methods of drilling are significant. A two-person team may have the capacity to drill between 70 and 100 holes in a day on a construction site. Jaibot has completed upwards of 700 holes in a day, and Maguire says that number could climb higher if used as part of a project managed specifically with the cobot in mind.

Even More Innovations

Boston Dynamics and California-based technology company Trimble last year announced an exclusive alliance to integrate construction data collection technology with Boston Dynamics' Spot robot platform. The jointly developed solution will combine the Spot robot's autonomous mobility with Trimble's data collection sensors and field control software to enable automation of repetitive tasks such as site scans, surveying and progress monitoring. Spot's unique capabilities to navigate dynamic and potentially unsafe environments represents one of the robot's key advantages.

"ALL CONTRACTORS CAN AGREE IT'S SAFER TO HAVE A ROBOT ARM DOING THE DRILLING THAN HAVE WORKERS GOING UP AND DOWN LADDERS ... GOING UP AND DOWN SCISSOR LIFTS AND ... BLOWING OUT THEIR SHOULDERS TRYING TO DRILL OVERHEAD."

Users can program Spot to navigate the terrain of construction sites to collect data. That enables contractors to evaluate the status of its projects, such as which tasks have been completed and what work remains outstanding. They can also use the robot to support routine activities around job sites. Meanwhile, the robot can capture data in a consistent fashion and transmit its findings to a cloud application for real-time analysis.

Spot can carry and power about 30 pounds of inspection equipment. In addition to Spot's base Explorer model, customers can purchase an upgraded model known as the Enterprise. The Spot Explorer can cover up to 1,000 meters on its autonomous missions, while the Enterprise has no limits on the length of its missions.

According to David Burczyk, construction robotics lead at Trimble, the goal is for a crew to show up on the job site with a report on the status of the project automatically prepared and waiting for them. In that sense, Spot functions as a "co-bot," helping workers augment their own productivity.

"Spot can do more mundane and repetitive tasks on a fre-

Mestek's inline plasma cutting system allows contractors to make sheet metal cutouts from computer aided drawings.

A two-person team may have the capacity to drill between 70 and 100 holes a day on a construction site. Jaibot can drill upwards of 700 holes in a day.

quent basis," Burczyk says. "The early adopters are using it for quality control and documenting site conditions, but it could become part of their facilities management down the line."

Meanwhile, Massachusetts-based Mestek Inc., which operates a family of 45 manufacturers of HVAC equipment and building envelope products, is focusing on the technology needed for prefabrication of duct work. Mike Bailey, Mestek's senior vice president of sales, says Mestek's IPI Pro Fabriduct with full-width in-line plasma cutting system is one of its most promising technologies. It has the ability to accept computer-aided manufacturing code via computer-aided drawing downloads to produce sheet metal cutouts.

Installation of the IPI Pro Fabriduct with full-width in-line plasma cutting capabilities takes about two weeks, according to Bailey. Bailey describes the interface between the technology and software and BIM applications as "pretty seamless." Overall, he says the plasma cutter enables contractors to work more efficiently largely due to its ability to cut down on errors in the prefab stage.

As the demands of the construction contractors continue to evolve, expect those same recurring themes of efficiency, precision and safety to continue driving the technological innovations that serve them.

"Less input, greater output, less chance of error — all while producing a better deliverable for the field," Bailey says. ▼

UV-C for HVAC Air and Surface Disinfection

The COVID-19 crisis is sparking interest in a long-established, yet not widely utilized, method of inactivating dangerous microbes.

Note: This article originally appeared in the 2020 edition of AMCA inmotion *magazine. Reprinted for SMACNA members with permission.*

For nearly a century, short-wave ultraviolet (UV-C) energy—similar to sun rays—has been used to destroy airborne and surface-bound microbes, including chickenpox, measles, mumps, tuberculosis (TB), and cold viruses. Yet, despite decades of research and thousands of applications in hospital emergency and operating rooms, urgent-care centers, universities, and first-responder locations, UV-C has not been widely leveraged. The coronavirus disease 2019 (COVID-19) pandemic, however, is highlighting UV-C's potential as an effective air and surface disinfectant.

This article will provide engineer-level guidance for the use of UV-C light to continuously reduce and even prevent the growth of dangerous microbes in HVAC systems and the circulation of infectious pathogens in air streams.

GERMICIDAL UV-C BASICS

UV light is a band of electromagnetic radiation classified into four wavelength ranges: vacuum UV (100 to 200 nm), UV-C (200 to 280 nm), UV-B (280 to 315 nm), and UV-A (315 to 400 nm). Wavelengths from 100 nm to 280 nm are germicidal. At 253.7 nm (commonly referred to as "UV-C"), the UV wavelength changes the structure of DNA and RNA, the genetic code of all life forms, inhibiting the ability of cells to reproduce. While bacteria and viruses absorb UV-C energy at different rates, no microorganism tested to date has proven resistant when subjected to an appropriate dose.[1]

Although UV-C energy has proven effective in inactivating other coronaviruses, such as the 2003 severe acute respiratory syndrome (SARS) and the 2012 Middle East respiratory syndrome (MERS), scientists have limited information about UV-C's impact on SARS-CoV-2, the virus that causes COVID-19. Early indications from ongoing studies at Columbia University and elsewhere, however, indi-

cate that, "UV is very efficient for killing this virus."[2,3,4]

In May 2020, the Centers for Disease Control and Prevention (CDC) recommended to businesses preparing to reopen following the pandemic the use of germicidal UV to reduce the likelihood of disease transmission.[5]

KILLING/INACTIVATING AIRBORNE PATHOGENS

During the 1940s, many hospitals began utilizing UV-C energy for the control of airborne infectious diseases. With the arrival and proliferation of antibiotics, use of germicidal UV began to wane. During the 1990s, drug-resistant "superbugs" and hospital-acquired infections renewed interest in UV-C, which can kill virtually any microorganism, including antibiotic-resistant germs.

ASHRAE has recognized that the UV-C wavelength inactivates virtually all microorganisms living on HVACR surfaces, with kill ratios of up to 99 percent, depending on the intensity of the UV-C and the length of exposure.[6]

UV-C dose is determined by the amount of germicidal energy a pathogen absorbs over a specific period of time. In other words, UV-C dose is a function of time multiplied by intensity. Consider, for example, a surface-disinfection application involving cooling coils. The disinfection target (the coil surface) is stationary, so exposure, or "residence," time is continuous. As a result, the intensity of the UV-C energy striking the surface can be relatively low. In the case of a moving air stream, however, exposure time is limited—a mere fraction of a second, in some cases—so UV-C intensity must be much greater.

It is important to note that microbe inactivation is a nonlinear function of UV-C exposure. In other words, "If a certain UV exposure kills 90 percent of a bacterial population (frequently referred to as 'one-log kill'), doubling the exposure time or intensity can kill only 90 percent of the residual 10 percent, for an overall germicidal efficacy of 99 percent ('two-log kill')."[7]

In addition to reducing HVAC-surface and airborne bacteria, germicidal UV can be used to supplement and improve other infection-control strategies, such as room air exchange. When a required number of air changes per hour (ACH) cannot be achieved using outside-air ventilation alone, upper-room UV systems can perform germicidal "equivalent" ACH. "It has been estimated that when an average UV intensity of 10 µW/cm^2 is present in the upper room, 63 percent of airborne tuberculosis germs that arrive there will be killed in 24 sec (the germicidal equivalent of one room air change), and, therefore, 99 percent will be killed in 2 min (equivalent of five air changes)."[8] This is important, as pathogenic aerosols can be spread through HVAC systems.[9] In fact, in July 2020, more than 200 scientists petitioned the World Health Organization to acknowledge that SARS-CoV-2 can be transmitted through air as an aerosol.[10]

ACH equivalents increase with germicidal intensity (**Figure 1**).

UV-C can supplement protocols for disinfection, sterilization, and manual cleaning, providing a level of protection in the event a protocol fails. Facility managers are encouraged to implement a layered approach incorporating multiple infection-control measures to ensure that any pathogen that cannot be removed by one method (e.g., filtration, cleaning) is inactivated by another (UV-C).[1]

Germicidal Engineering Control	Recommended Application
Upper-room/air systems	• Goal: greater than 50 µW/cm^2 • Wall-mounted • Installation height: above 7 ft in occupied spaces
HVAC air-stream disinfection	• Lamps spaced every 14 in. of coil height • Duct-run length: greater than 24 in. • Air velocity: less than 500 fpm • Minimum exposure time: greater than 0.24 sec • Upstream of coil
HVAC coil/surface irradiation	• Downstream of coil • Lamps spaced every 30 to 40 in. of coil height

TABLE 1. Germicidal-UV application.

APPLYING UV-C ENERGY

There are three primary means of applying UV-C energy to protect HVAC surfaces and air streams against infectious agents: upper-room/air systems, HVAC air-stream disinfection, and HVAC coil/surface irradiation (**Table 1**).

Upper-room/air systems. One of the oldest applications of germicidal UV for space infection control, upper-room/air systems work by effectively intercepting pathogens and

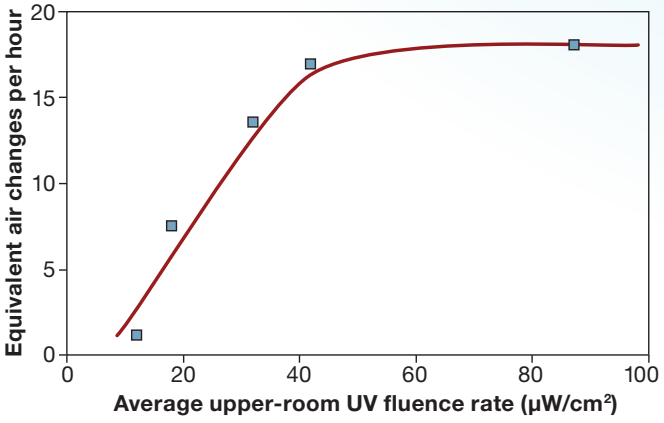


FIGURE 1. UV-C-induced inactivation of Mycobacterium parafortuitum in a test room under well-mixed conditions at 50-percent relative humidity[11]

Duct/Plenum Surface	UV C Multiplier
Stainless steel	1.40
Galvanized steel	1.50
Aluminum	1.75
Use of reflective materials can increase germicidal-UV disinfection dosage/fluence.	

TABLE 2. Reflectivity of different metals.

viruses at their source in room air. These fixtures are efficient against droplet nuclei from coughing, sneezing, or talking, as well as pathogens circulated by drafts, pressure differentials, or the movement of people.

Airborne droplets containing infectious agents can remain in room air for 6 min or longer. Operating 24/7/365, upper-room/air germicidal fixtures can inactivate these microbes in a matter of seconds.

Upper-room/air UV-C fixtures utilize the natural rise and fall of convection or mechanical air currents to circulate airborne infectious agents into the upper room, where they are exposed to UV-C radiation and killed. Studies have shown that one hour of use of an upper-room/air UV-C fixture can be equivalent to 10 to 16 air changes.[11]

Wall-mounted at a height above 7 ft, these fixtures use non-reflective baffles to direct UV-C energy upward and outward, ensuring that stray emissions do not enter the occupied portion of the room. First-pass kill or inactivation ratios of up to 99 percent have been modeled, with concentrations further reduced with each subsequent pass of recirculated air ("multiple dosing"). The goal, relative to coverage, is to maintain a UV-C irradiance level of at least 50 µW/cm^2 in the upper room.

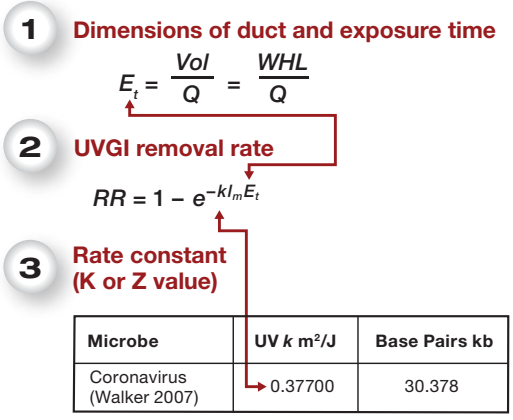
While upper-room/air UV-C "is very effective in areas with no, or minimal, ventilation,"[12] in spaces with no or weak air circulation, ceiling fans can compensate for the lack of sufficient mechanical air movement and improve inactivation rates (see **sidebar**, "Improving Upper-Room UV With Ceiling Fans," below).

HVAC air-stream disinfection. In HVAC air-stream disinfection, UV-C fixtures installed in air-handling-unit (AHU) plenums, air-distribution systems, or HVAC ductwork inactivate microorganisms "on the fly." Simplified, the germicidal dose is determined by the UV-C intensity, exposure time, and target pathogen's susceptibility to UV-C.

In addition to the amount of germicidal energy absorbed by a pathogen over a specific amount of time, a variety of other factors are taken into consideration when UV-C is applied for HVAC air-stream disinfection. These site-specific considerations will be explored in the next section.

HVAC coil/surface irradiation. The most common type of germicidal-UV system, HVAC coil/surface irradiation continuously targets bacteria, viruses, mold, and biofilm that proliferate on coils, air filters, duct walls, and drain pans, preventing them from becoming reservoirs for pathogen growth.

A coil/surface-irradiation system can eliminate up to 30 percent of airborne pathogens on a first-pass basis, with



Exposure time
Vol = volume of UV chamber, m^3
Q = airflow, m^3/s
W = width, m
H = height, m
L = length, m

Removal rate
RR = removal rate, fraction or %
k = UV rate constant, m^2/J
I_m = mean irradiance, W/m^2
E_t = exposure time, seconds

FIGURE 2. Air-stream disinfection.[15]

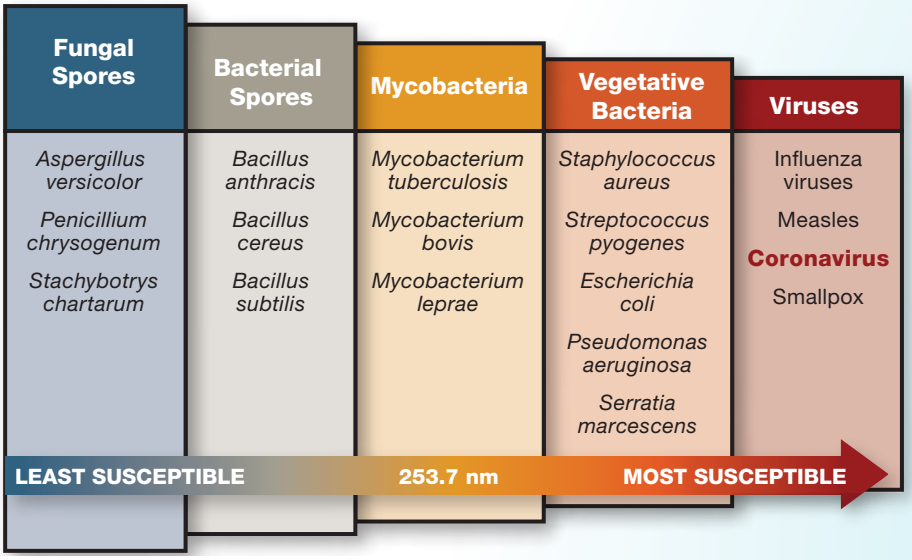


FIGURE 3. Microorganisms susceptible to germicidal UV-C.[12]

concentrations reduced further with each subsequent pass.

For coils, ASHRAE recommends irradiance levels of 50 µW/cm² to 100 µW/cm².[12] Perhaps a better way to achieve a desired dosage is to convert 100 µW/cm² to the more easily understood and specifiable 7.5 lamp watts (as printed on the lamp surface) per square foot of coil surface area.[13] By making this conversion, frontline engineers easily can verify that submittals conform to their specifications.

ENVIRONMENTAL FACTORS

There are many operational and site-specific conditions that impact inactivation or kill rate, including:

- The target pathogen and its susceptibility to UV-C. The amounts of UV-C energy needed to inactivate individual bacteria, viruses, and spores have been identified through decades of research.[14]
- The volume and velocity of air traveling through the HVAC system, which will impact the length of residence time. A higher volume of air and/or faster-moving air requires greater intensity (more UV-C lamps) and/or a longer run of duct to increase residence time. Said differently, as velocity increases beyond the typical 500 fpm, UV intensity must increase with it. Conversely, less UV intensity is required for air velocities below 500 fpm.
- The length of the plenum/duct—the longer the plenum or duct run, the better, as residence time and, thus, dose are increased.
- Fixture spacing—decreasing lamp-row spacing (e.g., from the surface-irradiation standard 36-in. centerlines to 15-in. to 18-in. centerlines) increases UV-C fluence.
- Temperature—because cold air reduces the output of UV-C lamps and high relative humidity affects pathogen susceptibility to UV-C, air-stream-disinfection measures can be more effective on the upstream side of a coil. Although on-the-fly disinfection can be

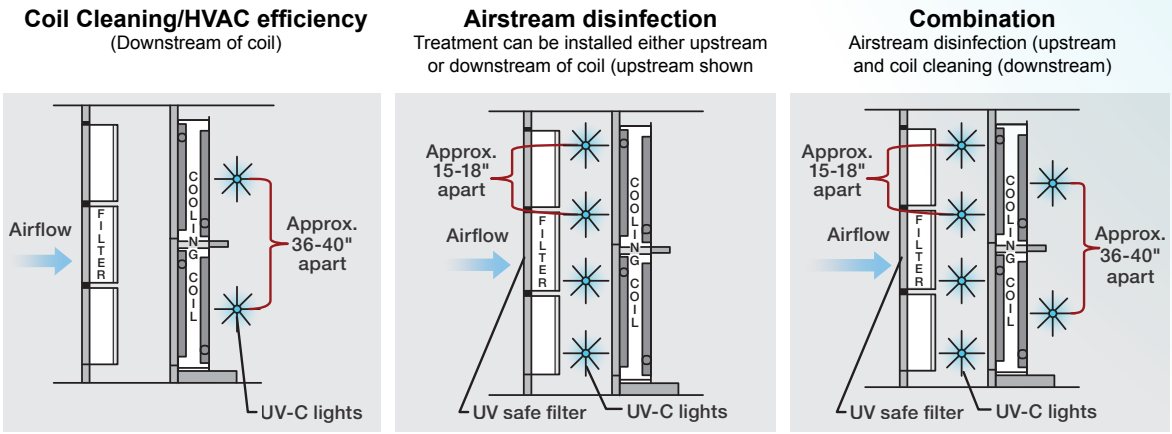


FIGURE 4. Options for UV-fixture placement in an air handler. Left: downstream of a coil for coil/surface cleaning, with fixtures spaced on 36- to 40-in. centerlines. Middle: upstream of a coil for air-stream disinfection (treatment also can be installed downstream). Right: dual application, with more tightly spaced UV-C lamps upstream of a coil for air-stream disinfection and less UV-C intensity downstream of the coil for coil/surface cleaning.

Improving Upper-Room UV With Ceiling Fans

Studies show that, in spaces with limited air mixing, natural convection generated by heat gains from occupants and equipment at the floor level can reduce the effectiveness of upper-room/air UV systems. In such instances, the use of ceil ing fans for air mixing has been shown to increase UV effec tiveness by more than 60 percent.[1]

This is especially true in the case of facilities with high ceilings, where even HVAC systems with high airflow rates can struggle with air mixing and distribution. This issue is particu larly problematic during the heating season, when the rate of illness among occupant populations tends to be the highest.

With ceiling fans, the volume of air that is actively cleaned in the disinfection zone is more frequently circulated back to the occupant level and replaced in the disinfection zone with air that has a higher concentration of contaminants. With continual mixing of the disinfection-zone and occupant-breath ing-zone air volumes, the effectiveness of the upper-room/air system is improved, increasing the effective air-change rate. This effect reduces the concentration of contaminants in the space without the need for a three- to six-time increase in outdoor air-change rate. Once the space air is well-mixed, additional air turnovers are not likely to increase system effectiveness.[2]

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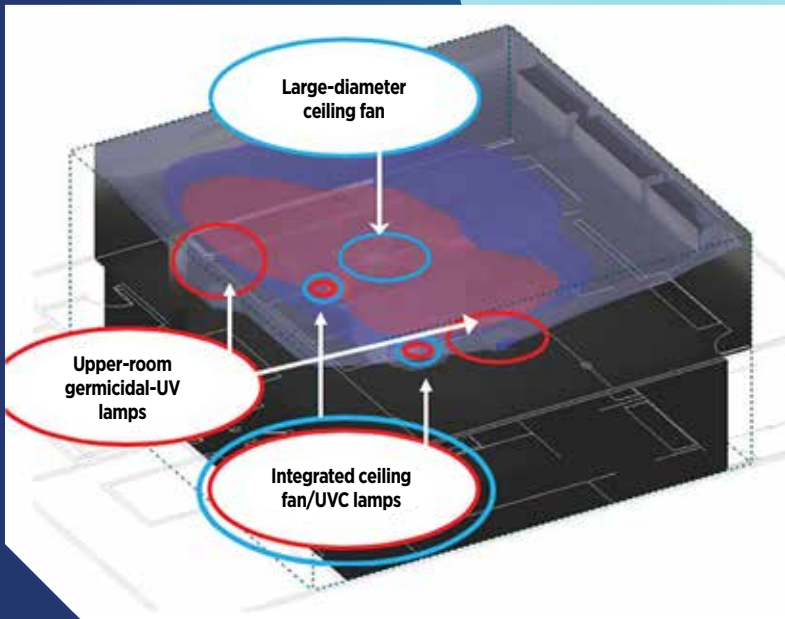
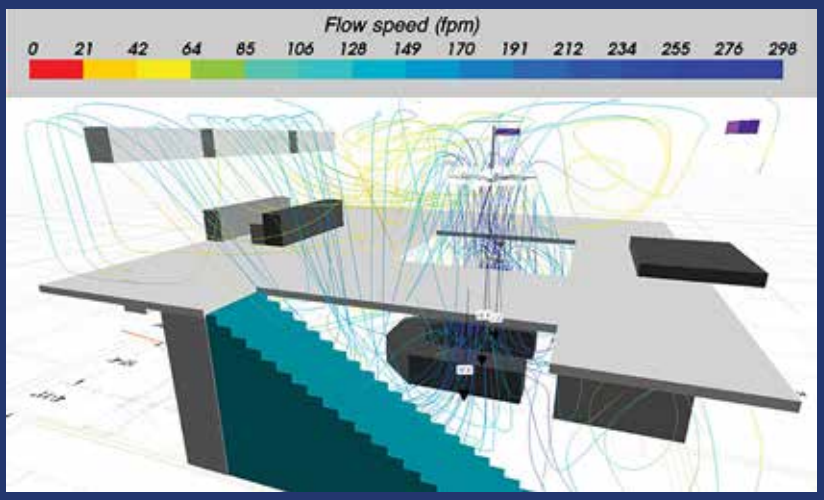


Lighting simulation showing upper-room-UV fluence rates (red = 10 uW/cm2, dark blue = 5 uW/cm2, light blue = 1 uW/cm2).



Computational-fluid-dynamics image tracing exposure of particles to upper-room UV-C lamps (purple rectangles in the upper right and center of the image) with the use of large- and small-diameter ceiling fans. Small-diameter ceiling fans integrated with UV-C lamps are not visible. The height of the large-diameter fan is 18 ft 4 in.; the heights of the small-diam eter fans are 10 ft 4 in. and 9 ft 3 in.

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accomplished downstream of coils, it typically requires an increase in UV-C intensity (more lamps).

- The lamps—using more or higher-output lamps will increase the total dose—that is, the microwatt-seconds per square centimeter (µW-s/cm^2). Lamps with 360-degree irradiation allow more UV-C energy to saturate a plenum, increasing UV-C fluence. Some UV-C lamps are encapsulated with an anti-shatter fluorinated-ethylene-propylene (FEP) coating or outer sleeve that helps to insulate the lamp surface from changes in temperature and/or air volume. This protection can be beneficial when the temperature is low and/or the air-stream velocity is high, but it also can reduce UV output by up to 10 to 12 percent.
- The reflectivity of the plenum—reflective metals boost UV-C dose, as the germicidal wavelength "bounces" throughout the plenum and remains "in play" instead of being absorbed by the surfaces. Different metals have different reflectance multipliers that can significantly increase UV-C fluence levels (**Table 2**).

Pathogen Susceptibility

Although environmental factors influence UV-C dosing, it is best to consider all aspects of an application in a predictive-modeling formula when designing an air- or surface-disinfection strategy.

In **Figure 2**, we can calculate the amount of time a pathogen is exposed to UV energy to determine the total exposure time.

Bacteria and viruses vary in susceptibility to UV energy, with environmental organisms, fungal spores, and mycobacteria being relatively harder to kill than more rapidly replicating and non-environmental microbes and most bacteria. But even fungi are killed effectively with high-dose UV.[7] For example, studies have demonstrated that viruses are more susceptible to UV-C inactivation than typical bacteria are (**Figure 3**).[15]

Lamp Placement

When designing a germicidal-UV disinfection system, engineers should consider the impact AHU location has on performance. Because cold air affects the output of UV-C lamps and high relative humidity affects pathogen susceptibility to UV-C, air-stream disinfection can be more effective when lamps are installed upstream of a coil. In fact, moving UV-C lamps from the typical downstream temperature of 55°F to the typical upstream temperature of 70°F can increase lamp output by up to 40 percent (**figures 4 and 5**).

Cooler temperatures downstream of a coil can be overcome with the use of FEP-coated lamps and/or more lamps.

Conclusion

Facility professionals can utilize germicidal-UV technologies to greatly reduce concentrations of pathogens in a highly reliable and cost-effective fashion.

The UV-C wavelength can kill 99 percent or more of all microorganisms living on HVAC air ducts and evaporator coils, depending on UV-C intensity,

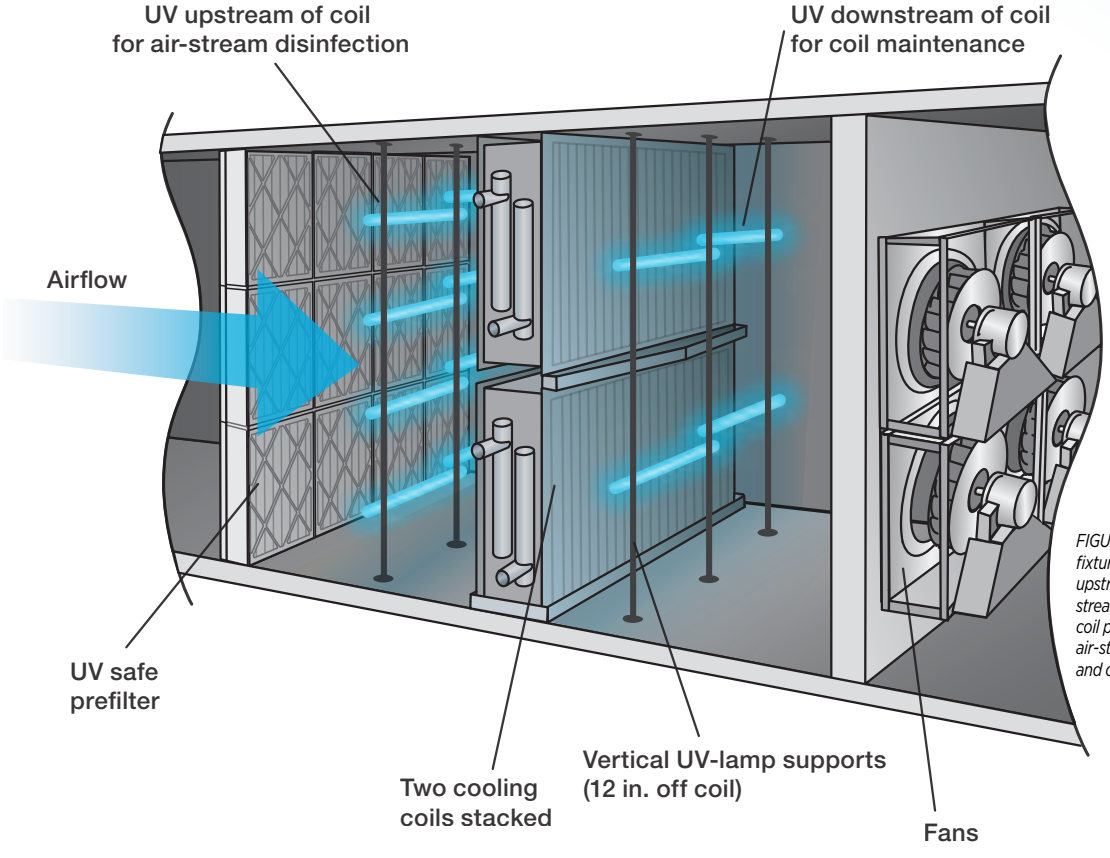
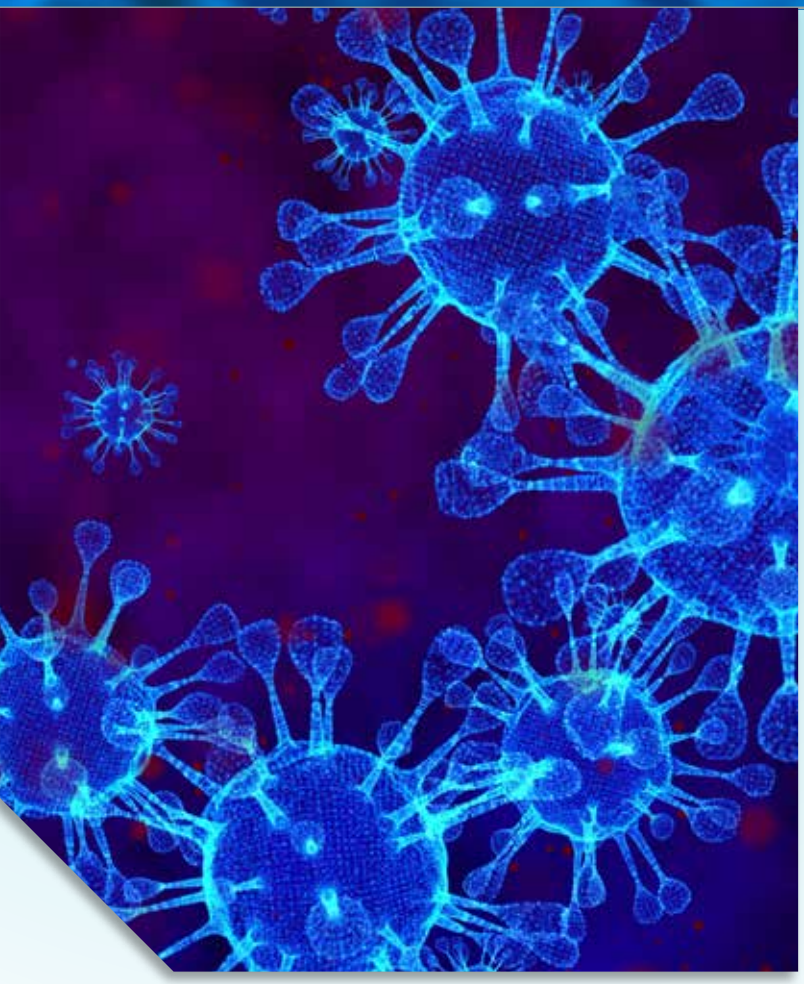


FIGURE 5. UV-C fixtures installed both upstream and downstream of a cooling coil provide both air-stream disinfection and coil cleaning.



length of exposure, UV-lamp placement, and lamp life cycle.[12] Operating 24/7/365, upper-room/air germicidal fixtures can inactivate microbes in under a second.

Germicidal UV has been extensively researched and is recognized in two *ASHRAE Handbook* volumes, *HVAC Applications*[12] and *Fundamentals*[16]; two ASHRAE test standards, ANSI/ASHRAE Standard 185.1, *Method of Testing UVC Lights for Use in Air Handling Units or Air Ducts to Inactivate Airborne Microorganisms*, and ANSI/ASHRAE Standard 185.2, *Method of Testing Ultraviolet Lamps for Use in HVAC&R Units or Air Ducts to Inactivate Microorganisms on Irradiated Surfaces*; and three ASHRAE position documents, Filtration and Air Cleaning,[6] Airborne Infectious Diseases,[17] and Infectious Aerosols.[18]

What's more, germicidal UV has been recognized in CDC guidance for office buildings,[5] health-care facilities,[19,20] and dental settings.[21] ▼

Daniel Jones *is co-founder and president of UV Resources, manufacturer of germicidal-UV disinfection and HVAC-efficiency solutions. The author of numerous articles on germicidal-UV air-stream and surface treatment, he is a corresponding member of ASHRAE Technical Committee 2.9, Ultraviolet Air and Surface Treatment, and the standard project committee for ANSI/ASHRAE Standard 185.2. He can be contacted at daniel.jones@uvresources.com.*

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LEADERSHIP

Ron Magnus

The Harder Work: Reputation Management and Trust Building

We continue the series on the "harder work" of leadership — important but not urgent responsibilities that are easy to put off, in some cases for decades. In this installment, we'll examine the responsibility of owners and senior leaders to incessantly enhance their organization's reputation, refusing to believe it will stand untarnished without constant attention.

Most often we think of reputation as being the opinions that people on the outside of an organization hold. Just as important, however, is how people inside the organization feel. Most leaders are aware of the dismal statistics around employee engagement. Across sectors, almost half of the American workforce do just enough to not get fired — a direct reflection of how they feel about their employer.

A simple way to understand reputation: It's the sum total of decisions made and promises kept. Imagine you have a trust account. Just like a bank account, you have to pay attention to the balance. Are you making more deposits than withdrawals, in both personal and business relationships? Everyone knows the misery of being in a cash crunch. Being in a reputation crunch is in many cases an even greater concern.

Think of how you express your opinions about those with whom you do business. "Their word is their bond." "I can count on him to do the right thing." "They will make it right."

Or, "Will he follow through this time or not?" "Better get it in writing."

In smaller organizations, a company's reputation is usually closely tied to the integrity of the owner or senior leader who makes most of the deals. Every decision he or she makes enhances or hinders that reputation. Most leaders understand this intuitively.

Because this responsibility feels so heavy, many hoard it, unintentionally become the bottle neck. This creates an organizational structure known as "a genius with a thousand helpers" where all decisions must pass through a single person. While that might feel efficient for a while, it creates major headaches when you experience significant growth.

> **EVERYONE KNOWS THE MISERY OF BEING IN A CASH CRUNCH. BEING IN A REPUTATION CRUNCH IS IN MANY CASES AN EVEN GREATER CONCERN.**

Any time your people are second-guessed, overridden by their boss or asked "What did you do that for?" they are being trained to not make decisions. And it inevitably creates resentment for a leader who feels he or she has to make all the big decisions.

A more effective approach is to create a model for decision-making through alignment with your core values. I'm not talking about the generic, table stakes values on the poster in the lobby that every other competitor in your market also claims to hold. I'm talking about those next level values that define your truest value proposition.

When everyone is empowered to make values-driven decisions and promises to external clients and internal staff, anchored in the bedrock of what you stand for, reputation becomes incredibly stable. That trust account grows and grows because everyone is making deposits.

You can then weather the inevitable withdrawals that may happen through no intentional breach of trust. And if you're the owner or senior leader, you can sleep better because you're not carrying the entire burden on your own back. ▼

Ron Magnus, managing director of FMI's Center for Strategic Leadership, with Ed Rowell, CSL consultant.

Ronald J. Eagar

Deteriorating Backlogs: Responding to a New COVID-19 Reality

When 2020 kicked off, the construction industry was flying high. With a steady flow of work and bidding opportunities, large infrastructure projects on the horizon and sureties offering a seemingly endless supply of bonding, most contractors were hitting all-time-high revenues and profits, with healthy backlogs to keep the momentum going.

Then came COVID-19, when public and private jobs came to a screeching halt and was put on hold indefinitely. Bidding opportunities and new jobs were nowhere to be found, payments on jobs slowed or stopped and bankers and sureties began to sing a more conservative tune.

In 2021, construction operations have adapted to and re-mobilized, but new jobs remain scarce, and bidding is fiercely competitive. Private work is slowed by lifestyle changes, including residential relocations, large amounts of vacant retail space and decreased commercial office space needs.

Public government agencies remain in financial distress, left with few funds to finance new projects or restart those on hold. Many agencies are not back to work yet and need to regroup and restart the process from where they left off a year ago.

Backlogs are being steadily worked down, but deteriorating at a rapid pace as contractors work through them to make up for lost time, meet project deadlines and replace lost revenues. With new construction jobs still limited, backlogs are not being replenished at adequate rates to ensure long-term cash flow and financial sustainability.

It is more crucial than ever for contractors to strategically plan for the continued erosion of backlogs.

SMARTER SOLUTIONS TO DETERIORATING BACKLOGS

It might be tempting to jump on any work you can find, but the opposite approach is more effective in the long run. As backlogs continue to dwindle, follow these recommendations to make smarter moves and come out ahead:

- **Bid smart.** Stick to your strengths and do not succumb to peer pressure as you see competitors rush into new market sectors to grab more work, which could bring increased risk and unknown challenges. Most likely, this work will yield little to no profit if a contractor lacks experience in the new arena or underbids to secure work.
- **Practice patience.** After quick opportunities to fill backlogs and surety programs max out, there will be fewer bidders as new jobs materialize, which will bring profits back up. With President Biden's American Rescue Plan, there is renewed hope that an influx of funding to states and cities will result in much-needed infrastructure projects and new work for years to come.
- **Re-envision the future.** If your organization has not revisited its business plans in light of COVID-19, it is essential to reassess and proactively identify ways to strengthen your organization. This evaluation should include complete financial and cash flow projections that show the peaks and valleys of projected revenues and what that portends for the future. You may determine that accelerating revenue now may not be your best move, and that "slow and steady" may serve you better and conserve more cash for the future. With these projections, you can draft a new plan for the company's future.
- **Identify cost savings.** Your new plan should include healthy cash flow, which is not only about the revenue you bring in, but also the money you keep through cost saving, including reducing overhead, addressing operational inefficiencies and workforce planning.
- **Maximize relief.** More than a year after COVID-19 relief was introduced in the CARES Act, these programs continue to evolve. Speak with your CPA and other financial professionals to ensure you secure the maximum relief under the Paycheck Protection Program, employee retention credit, qualified leave credit, Economic Injury Disaster Loans and more.
- **Communicate often.** Communication should extend to employees, bankers, sureties, job owners, subcontractors and other stakeholders. Share how your company is doing, your challenges and future plans. Their buy-in, support and collaboration will put your business in a better position to remain strong, healthy and ready for whatever the future holds. ▼

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TECHNOLOGY

Zac Hays

The Bidding Hack: 5 Ways to Increase Your Bid Win Rate

The pandemic led to one of the most difficult years in memorable history for the construction industry — one in which specialty contractors were hit particularly hard. According to a recent report from Autodesk, project bidding dropped roughly 34% in the 60 days following March 19, 2020, the day the first U.S. stay-at-home orders were mandated. But as the industry slowly recovers, bidding activity in January 2021 not only surpassed pre-pandemic levels, but they went on to hit an all-time high, representing a 36% increase from a three-month, pre-pandemic average.

After a year filled with project cancellations and delays, market data signals that projects are beginning to come back online and many businesses are finally getting back to work, which means competition for jobs is once again heating up.

In this competitive environment, the bidding process is becoming more important than ever. Winning new business and delivering on those bids will make or break the future of many companies.

Here are five strategies specialty contractors are using to stand out from the pack and improve their bidding practices to build more efficiently and effectively, and ultimately win more work.

1. CENTRALIZING DATA IN THE CLOUD

The days of manually tracking bids on paper are long gone. Hunting through filing cabinets in search of a single account number or line item wastes precious time that could be spent on the actual bidding process. Even managing bids in spreadsheets has proven to be an outdated and costly process. (Manual bid entry typically takes over 40 hours a week, with 99% of specialty contractors that track bids in email or Excel missing out on multiple bid invites a year.)

Centralizing the bidding process in the cloud ensures all bid information is in one, consolidated location. By keeping project details, deadlines and communications together, hours of wasted time searching for documents or duplicating work is saved. Storing information to the cloud also makes the data immediately accessible to anyone who needs it. As a result, teams miss deadlines less and are able to create more project opportunities.

2. USE DATA TO IMPROVE PERFORMANCE

Once bid data is centralized in the cloud, it can get to work. Data has become the not-so-secret weapon of the construction industry, and those who use it wisely often win. Continuously monitoring and tracking bid data means trends can be proactively spotted, helping to inform bidding technique and strategy. Tracking also helps contractors better determine which projects should be bid on and, as important, which should not be bid on.

Take project hit rate, for example. By monitoring this trend, specialty contractors can determine the general contractors who are worth engaging with and those who are not. Unfortunately, 65% of specialty contractors aren't actively tracking their hit rate. Why leave something as important as this to chance, or even to memory? Take advantage of available data and find tools to quickly and easily visualize, track and gain insights from the data.

3. BE REALISTIC ABOUT COSTS — AND FOCUS ON ACCURATE TAKEOFFS

Without accuracy, bids will fall short every single time. Ensuring costs, quantities and measurements are correct and on target is paramount to winning any bid, and when incorrect, serve as a quick ticket to being disqualified for a project.

General contractors can spot underestimated bids from a mile away, which can signal either inexperience or purposely undercut project costs, both of which are red flags. A well-executed takeoff process will help increase a bid win rate and allow for much more accurate and realistic cost estimates. Even more, digitizing the takeoff process allows manual tasks to be automated and greatly reduces errors.

4. ALWAYS FOLLOW-UP ON BIDS — AND TRACK WINS AND LOSSES

Most general contractors receive hundreds or even thousands of bid submissions on a given project. Something as simple as missing information could cause them to put a bid at the bottom of the pile. Proactively following up on bids provides a chance to fill in any information that may have been missed, ask if the contractor would like to see any revisions and creates an opportunity to make a connection with the decision-maker. If during the process it is revealed the job was given to another company, ask if the contractor is willing to provide feedback on the bid, which could reveal essential information to help win the next one.

However, if a contractor has a history of being unresponsive, it is a strong indicator that submitting bids to that particular GC might not be worth it in the future. Identifying and spending time on bids that are more likely to end up in the "win" column is half the battle. Be sure to track and catalogue this type of data to ensure a sound bidding strategy.

5. GET BIDS IN ON TIME

With delayed and cancelled projects beginning to come back online, it is no surprise there has been an uptick in bidding activity. And as more and more of these projects begin to resurface, effectively managing bid invites has become critical. Bids need to be accurate, yes, but there is now an urgency for bids to be delivered on time.

Despite the massive uptick in bidding activity in 2021, the vast majority of teams have still able to turn their bids around in seven days with the help of technology. Digitizing how bids are tracked and managed affords your team the opportunity to get more done in less time.

As more and more projects come back online, specialty contractors have a massive opportunity to win new work and let their employees get back to work too. Being smart about the bidding process increases the likelihood of winning bids, and it saves teams time in doing so. ▼

Zac Hays is head of product preconstruction at Autodesk.

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JUNE

Jun 23–24
National Joint Adjustment Board
Portland, OR

OCTOBER

Oct 24–27
2021 SMACNA Annual Convention
Maui, HI

DECEMBER

Dec 5–7
Council of Chapter Representatives
Dana Point, CA

2022

Mar 1–2
Partners in Progress Conference
Las Vegas, NV

Mar 13–17
Business Management University
Tempe, AZ

Mar 15–16
Collective Bargaining Orientation
Dallas, TX

2022

Mar 15–18
Financial Bootcamp
Tempe, AZ

Apr 3–6
Project Managers Institute
Raleigh, NC

May 1–3
Planning Your Exit and Business Valuation Program
San Diego, CA

Jun 5–7
Council of Chapter Representatives
Charleston, SC

FUTURE SMACNA CONVENTIONS

Sep 11–14, 2022
2022 SMACNA Annual Convention
Colorado Springs, CO

Oct 15–18, 2023
2023 SMACNA Annual Convention
Phoenix, AZ

Oct 27–30, 2024
2024 SMACNA Annual Convention
Palm Desert, CA

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