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AHR EXPO 2022

Big show returns to Vegas amid concerns, but industry confidence still high for new year. More on [pg. 14](#)



**New COVID-19
Guidance for
Large-Diameter
Ceiling Fans**

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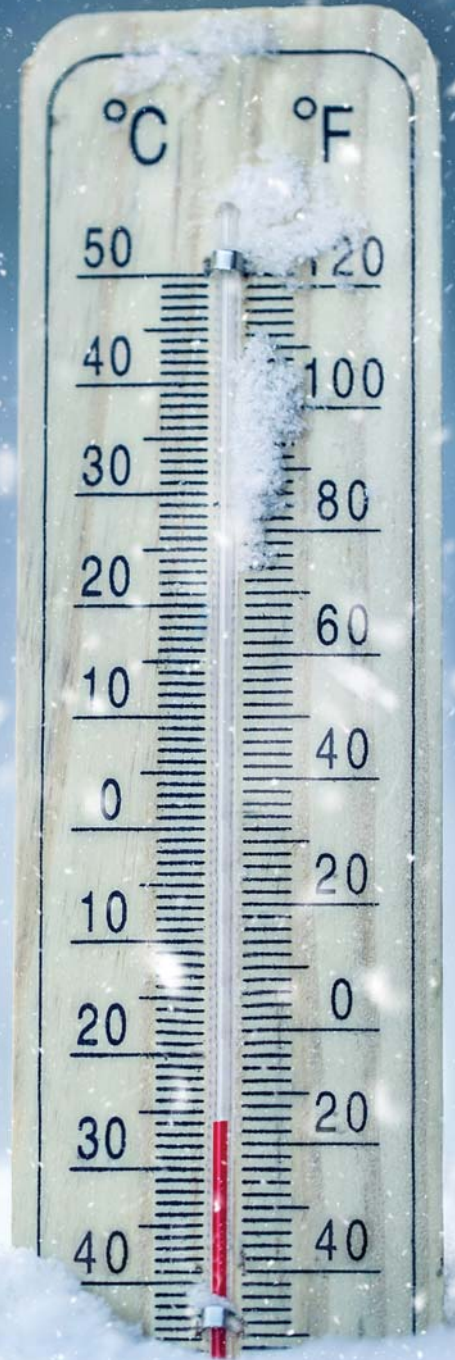
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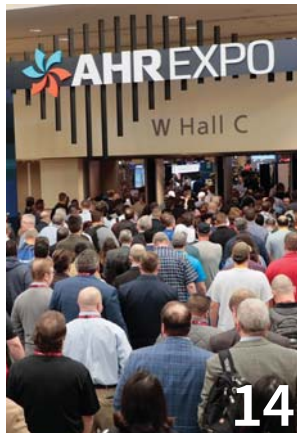
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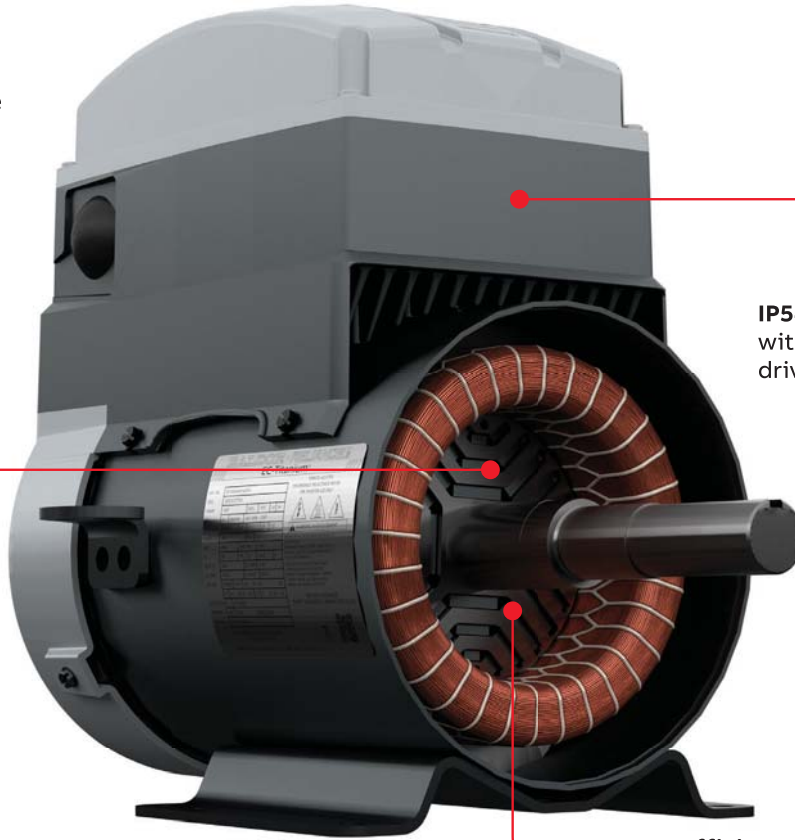
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Let Deadly Fires Be a Wake-Up Call

As our industry reconnects in some form or another at AHR Expo, we are all thrilled to have the big show back, albeit altered. Granted, there is still a sizeable cloud over the proceedings again this year, with the Omicron variant of the Coronavirus pandemic still filling hospitals across the U.S.

But the hosts, exhibitors, attendees, and ASHRAE Winter Conference presenters, etc., all seem determined to make this event as safe and as valuable an experience as possible.

After last year's cancellation of AHR Expo due to COVID-19, so many of us are desperate to see each other face-to-face again that multiple vaccinations, boosters, frequent testing, and N95 masks now seem like a small price to pay for this overdue reunion.

But battling the virus with ingenuity isn't the only story in the news as we start the new year.

In early January, just four days apart, two horrendous apartment fires in Philadelphia and Bronx, NY, killed a combined 29 people, including 16 children, leaving residents and local officials reeling. According to the National Fire Protection Association (NFPA), the two fires are among the nation's 10 deadliest since 1980. The dozen who died in Philadelphia represented that city's highest fire death toll in a century.

"The horrific residential fires in Philadelphia and the Bronx thrust fire and life safety in the U.S. into the spotlight," wrote NFPA President **James Pauley**, in a Jan. 19 blog. "And while the stories out of these two cities are absolutely heartbreaking, the collective, heightened interest in the protection of people and property that we've seen among policymakers and the public may be somewhat encouraging – if it prompts needed changes and more awareness."

The three-story brick row homes in Philadelphia and 19-story, 120-unit apartment building in the Bronx were both public housing complexes for low-income families. Investigators believe the Philadelphia fire was started by a five-year-old playing with a lighter near a Christmas tree. According to Associated Press, the building actually had 13 tamper-resistant, 10-year detectors, all of which had passed inspection in May 2021.

In the Bronx, investigators say that a malfunctioning space heater sparked a fire on lower floors of the 50-year-old building. The blaze was contained, but an open door to a stairwell let smoke spread quickly through the building. "These recent tragedies present a stark contrast to the fire progress that has been documented over the last four decades," noted Pauley. "(But) home fires have become more deadly as home fire escape times have dramatically decreased – due to a variety of factors. Combustible building materials and synthetic contents in homes burn hotter and faster. The danger of fire is compounded by open floor plans that are prevalent in newer homes and the lack of sufficient fire safety measures in older buildings."

Technology can help. Johnson Controls is among firms now aiming to raise the profile of life, safety issues after these tragedies.

"When building managers are thinking of ways to future-proof their buildings to guarantee ongoing safety for occupants, fire safety systems should be a major factor in their plans," says **Tracy Long**, vice president and general manager of fire protection services at Johnson Controls. "All systems, including fire, need to be connected and digitally enabled to provide insights that support safe, future-ready buildings."

But there are other hurdles, too.

"The biggest obstacles we see, time and again, are over-confidence and complacency," added Pauley. "The reduction in most fires over the years has led policymakers and citizens alike to erroneously think that fire is no longer a significant issue in our country. There is a prevailing mindset that tragic incidents like these happen to other people, in other communities... Until, of course, it happens to them."



Rob McManamy
Editor-in-Chief

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2023

2022

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Economic Growth, Stability Tantalizingly Near

After two years of relentless anxiety, AEC finally seems poised to regain its groove, barring significant pandemic setbacks, predicts panel of industry economists.

Forecast season returned in full force this winter, buffeted by a maelstrom of new and continuing challenges, from inflation spikes and supply chain woes to political divisions and labor shortages. Oh, and of course, we can't forget the 800-lb gorilla in the mix, our terrible two-year-old Coronavirus pandemic — set to start its third year this March — along with the manifold health and safety concerns it continues to generate.

Factoring *all* of that into the many predictions for 2022, the prevailing mood of major economists who follow U.S. design and construction closely is still mercifully positive, as reflected in the latest, semi-annual American Institute of Architects

(AIA) Consensus Construction Forecast, released Jan. 19.

“The market is expected to see a healthy rebound, with spending increasing by 5.4% this year before accelerating to an additional 6.1% increase next year,” said AIA chief economist **Kermit Baker**, PhD. “Architecture is one of the few industries where payrolls have already surpassed their pre-pandemic high, so meeting future staffing needs is a challenge that most firms will need to confront.”

That is a quality problem to have, of course, and one that still bodes well for new projects across the board.

“Construction remained resilient and persistent throughout the year in the face of these difficult issues,” added **Richard Branch**, chief

economist for Dodge Construction Network. “While these challenges will remain in 2022, the industry is well-positioned to make further gains, fed by a growing pipeline of nonresidential projects waiting to break ground and the infusion of money directed towards infrastructure.”

Specifically, the Consensus Forecast is most optimistic this year for industrial and manufacturing construction, which it expects to climb 9.4% in both 2022 and then by another 8.4% in 2023. Individual forecasts vary widely in specific categories, however.

For instance, in the industrial category, Moody's Analytics is predicting a very strong, 29.4% surge this year, while FMI Corp. is forecasting a 12.2% increase. On the flip side,

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Consensus		Estimated	Forecast	
		\$	% Change	
		2021	2022	2023
Dodge Construction Network	Nonresidential Total	–	5.4	6.1
IHS Markit	Commercial Total	–	4.7	5.3
	Office	–	0.8	3.6
Moody’s Analytics	Retail & Other Commercial	–	7.5	4.9
FMI	Hotel	–	-0.4	13.5
	Industrial Total	–	9.4	8.4
ConstructConnect	Institutional Total	–	4.4	6.0
	Health	–	6.2	6.0
Associated Builders and Contractors	Education	–	3.5	6.1
	Religious	–	-1.1	1.2
Wells Fargo Securities	Public Safety	–	-1.3	5.6
Markstein Advisors	Amusement & Recreation	–	7.7	6.0

Dodge actually expects manufacturing projects to dip by 3.5% in 2022, before bouncing back in 2023 with a rise of nearly 9%.

For its part, Dodge’s forecast for 2022 is particularly bullish on commercial construction (+16.5%), hotels (+17%) and office buildings (+11.5%). Overall, it expects nonresidential construction to climb by 9.9% in 2022.

Describing 2021 as “the rollercoaster year that changed construction forever,” Dodge president & CEO **Dan McCarthy** noted, “The past year has taken the construction industry through hills and valleys — and the waves may well remain for the foreseeable future. The data continues to anticipate a healthy level of construction in 2022... (But) construction teams will not be free of the challenges of 2021: high material costs, unpredictable supply issues, aging construction labor force, volatile weather patterns, rapid adoption of new innovations transforming how we design, source and build things.”

Painfully aware of all such mitigating factors, our industry’s largest trade groups remain upbeat about prospects both near term and long term. But they are under no illusions.

“Contractors are, overall, very optimistic about the outlook for the construction industry in 2022,” said **Stephen E. Sandherr**, chief executive officer for Associated General Contractors of America (AGC). “While contractors face challenges this year, most of those will be centered on the need to keep pace with growing demand for construction projects.”

“The last two years were increasingly unpredictable, due in large part to the Coronavirus and public officials’ varied reactions to it,” added AGC chief economist **Ken Simonson**. “But, assuming current trends hold, 2022 should be a relatively strong year for the construction industry.”

On Jan. 11, Associated Builders and Contractors released its latest

Construction Confidence Index (CCI), based on a year-end member survey. The new CCI readings for sales, profit margins and staffing levels all increased, indicating expectations of growth over the next six months.

“Demand for construction services in America remains strong,” said ABC chief economist **Anirban Basu**. “Contractors have been upbeat about sales and employment prospects for months. What changed in December is that a growing fraction of contractors now believe that profit margins will rise during the next six months despite rising costs due to labor shortages and volatile materials prices.”

ABC’s Construction Backlog Indicator (CBI) actually slipped a bit in December, but it still finished the year higher than the previous December. Member firms in the Midwest and West also reported more activity for the year than their ABC counterparts in the Northeast and South.

“Backlog fell in the infrastructure category, but activity in that category is

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set to heat up in 2022 as federal infrastructure funds tied to the Infrastructure Investment and Jobs Act of 2021 (IIJA) begin to flow,” added Basu. “Backlog in the heavy industrial category also declined on a monthly basis, but over the past year, backlog in this segment has climbed dramatically as manufacturers attempt to address goods shortages and more CEOs consider bringing some of their supply chains back to America. Industry backlog could be negatively impacted by elevated steel and other materials prices, with some projects cancelled and others redesigned to shift away from intense steel use.”

“Despite it all, our economy’s ability to overcome the pandemic has been admirable,” said Moody’s chief economist **Mark Zandi**, writing in his own new report, *Time to Heal*. “If everything sticks roughly to our baseline script, it will have taken less than three years for the economy to fully recover from that first blow of the pandemic. It took a decade for the economy to recover from the global financial crisis. This is testament to the dedication of our healthcare providers and other frontline workers; the ingenuity of our pharmaceutical industry and medical technology; the massive collective response of federal, state and local governments; and the resilience of the American economy and people.”

A welcome perspective, indeed. Our industry may not be out of the woods yet, of course. But after all that we have been through these last 24 months, it is well worth reminding ourselves that, sometimes, there is victory in just still being in the game. [HPAC](#)

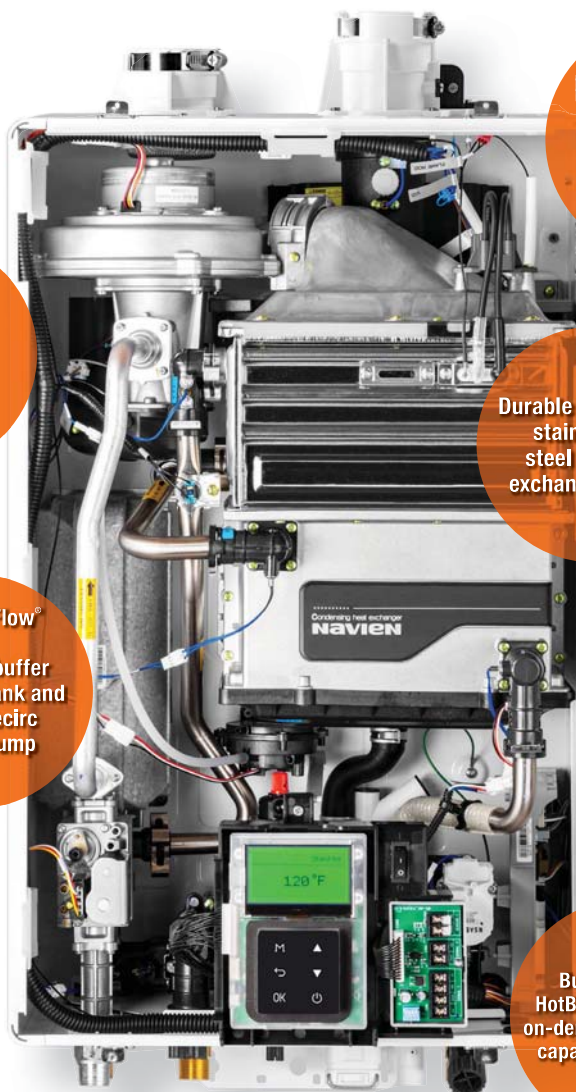
Construction Confidence Index			
Response	December 2021	November 2021	December 2020
CCI Reading			
Sales	66.3	65.2	56.6
Profit Margins	57.4	50.9	48.6
Staffing	64.6	62.5	56.3
Sales Expectations			
Up Big	11.5%	12.8%	5.6%
Up Small	53.6%	52.1%	47.5%
No Change	25.1%	19.7%	21.7%
Down Small	8.2%	13.8%	18.2%
Down Big	1.6%	1.6%	7.1%
Profit Margins Expectations			
Up Big	2.7%	2.7%	5.1%
Up Small	45.4%	31.9%	24.7%
No Change	33.3%	39.4%	35.4%
Down Small	15.8%	18.6%	29.3%
Down Big	2.7%	7.4%	5.6%
Staffing Level Expectations			
Up Big	7.7%	4.8%	2.5%
Up Small	53.0%	50.0%	39.9%
No Change	31.1%	37.2%	40.4%
Down Small	6.6%	6.4%	14.5%
Down Big	1.6%	1.6%	2.5%
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Construction Backlog Indicator					
Response	December 2021	November 2021	December 2020	1-Month Net Change	12-Month Net Change
Total	8.2	8.4	7.3	-0.2	0.9
Industry					
Commercial and Institutional	8.5	8.7	7.3	-0.2	1.2
Heavy Industrial	7.7	9.9	4.2	-2.2	3.5
Infrastructure	7.3	8.6	8.9	-1.3	-1.6
Region					
Middle States	8.2	8.1	6.2	0.1	2.0
Northeast	7.5	7.7	7.9	-0.2	-0.4
South	9.0	10.2	8.3	-1.2	0.7
West	8.4	8.0	6.7	0.4	1.7
Company Size					
< \$30 Million	7.6	7.7	7.0	-0.1	0.6
\$30-\$50 Million	8.7	8.9	7.2	-0.2	1.5
\$50-\$100 Million	11.3	10.2	8.5	1.1	2.8
>\$100 Million	10.7	15.0	10.0	-4.3	0.7
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Supreme Court Upholds Stay on Vaccine Mandate

Ruling 6-3, the high court's conservative majority sent OSHA's COVID-19 Vaccination and Testing Emergency Temporary Standard back to the lower court for decision on merits.

In a highly anticipated and controversial 6-3 decision, the U.S. Supreme Court on Jan. 13 temporarily struck down the Biden Administration's plan to implement a new COVID-19 Vaccination and Testing Emergency Temporary Standard. The ETS was set to go into effect in February for all businesses with 100 or more employees.

Even as new Coronavirus cases continue to surge nationwide via the new Omicron variant, the high court reinstated a lower court stay on the U.S. Department of Labor's Occupational Safety and Health Administration (OSHA) ETS that had been issued Nov. 5. President **Joe Biden** had announced the new ETS in September in response to the then-surging Delta variant.

Among the plaintiffs who had opposed the federal mandate was Associated Builders and Contractors, which filed one of the emergency appeals in December that led to this week's ruling. "ABC is pleased that the Supreme Court blocked OSHA's ETS," said **Ben Brubeck**, ABC vice president. "We are proud to have played an important role in preventing OSHA from causing irreparable harm to the construction industry."

He added, "This is a big win in removing compliance hurdles for our industry, which is facing multiple economic challenges, including a workforce shortage of 430,000, rising materials prices and supply chain issues. ABC continues to support vaccinations and encourages members to use its COVID-19 vaccination toolkit to keep workers safe on jobsites."

On Nov. 9, ABC and its Alabama chapter had filed a petition for review with the U.S. Court of Appeals for the 11th Circuit against the OSHA ETS.

ABC filed an emergency appeal to the Supreme Court to stay the ETS on Dec. 20. That came after the U.S. Court of Appeals for the 6th Circuit had ruled in support of the mandate on consolidated cases Dec. 17.

In their majority opinion, the high court's conservative justices wrote:

"Although Congress has indisputably given OSHA the power to regulate occupational dangers, it has not given that agency the power to regulate public health more broadly.

“ OSHA will (still) do everything in its existing authority to hold businesses accountable for protecting workers. ”

—Secretary of Labor Marty Walsh

Requiring the vaccination of 84 million Americans, selected simply because they work for employers with more than 100 employees, certainly falls in the latter category."

In their dissent, the high court's three liberal justices answered:

"In the face of a still-raging pandemic, this court tells the agency charged with protecting worker safety that it may not do so in all the workplaces needed. As disease and death continue to mount, this Court tells the agency that it cannot respond in the most effective way possible. Without legal basis, the Court usurps a decision that rightfully belongs to others."

In a separate 5-4 ruling also issued by the Supreme Court, it lifted

injunctions that had been issued against the CMS vaccination mandate applicable to health care institutions and their suppliers and contractors.

For his part, U.S. Secretary of Labor **Marty Walsh** said this:

"I am disappointed in the court's decision, which is a major setback to the health and safety of workers across the country. OSHA stands by the Vaccination and Testing ETS as the best way to protect the nation's workforce from a deadly virus that is infecting more than 750,000 Americans each day and has taken the lives of nearly a million Americans..."

"OSHA promulgated the ETS under clear authority established by Congress to protect workers facing grave danger in the workplace, and COVID is without doubt such a danger... We urge all employers to require workers to get vaccinated or tested weekly to most effectively fight this deadly virus in the workplace... Regardless of the ultimate outcome of these proceedings, OSHA will do everything in its existing authority to hold businesses accountable for protecting workers."

Added President **Joe Biden**:

"As a result of the Court's decision, it is now up to States and individual employers to determine whether to make their workplaces as safe as possible... I call on business leaders to immediately join those who have already stepped up – including one third of Fortune 100 companies – and institute vaccination requirements to protect their workers, customers, and communities..."

"We have to keep working together if we want to save lives, keep people working, and put this pandemic behind us," he said. [HPAC](#)

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Letter from AHR Expo Show Management

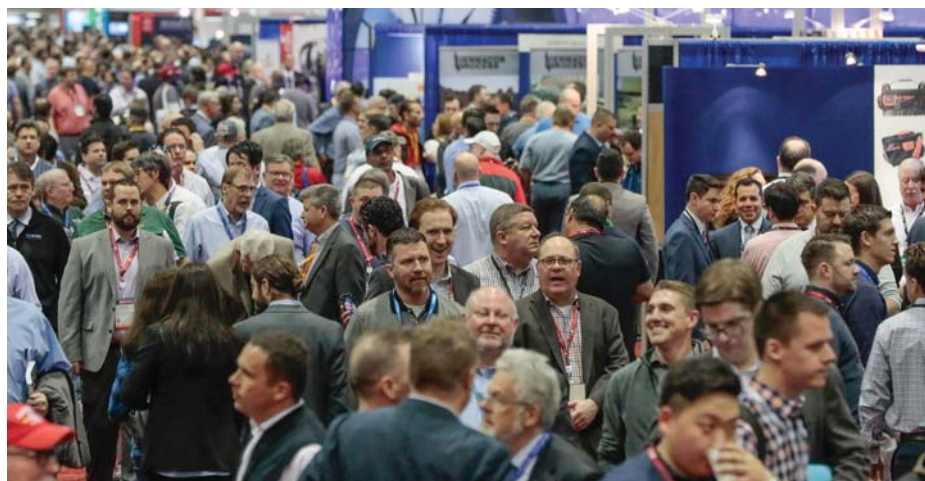
As our industry's largest event neared, organizers sought to reassure attendees and exhibitors that all precautions were being taken, and that all systems were still "go".

This message was posted Jan. 4 and sent to all AHR Expo 2022 exhibitors and registered attendees...

The AHR Expo Show Management is excited to welcome you back to the Show floor in less than one month for the 2022 AHR Expo! We understand there are concerns regarding the status of the Show given the recent COVID-19 developments. We want to assure you that the AHR Expo **will** take place January 31 - February 2, 2022 at the Las Vegas Convention Center (LVCC). As we countdown to the Show, our numbers remain strong - with more than 1,650 exhibitors (including 300+ international companies) ready to go!

We remain dedicated to providing a successful Show for our exhibitors and attendees alike, with safety top of mind during the experience. *Please note the following reminders:*

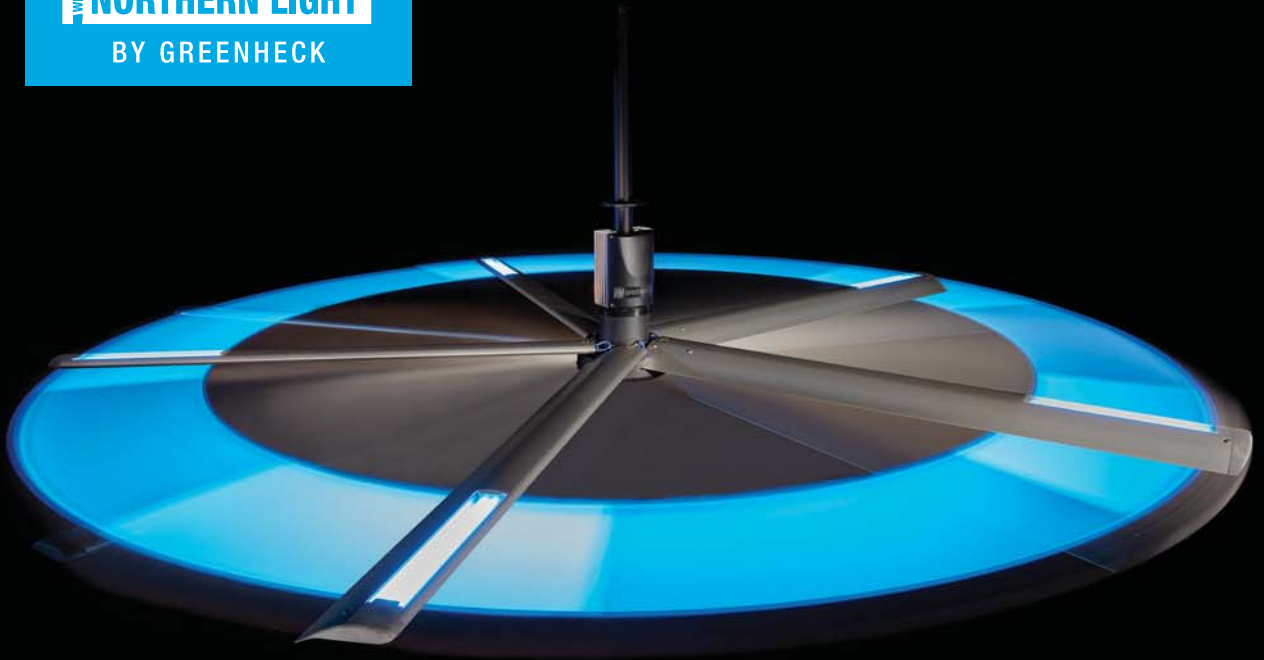
- We are confident in the policies in place, including required masking, increased ventilation in the convention hall, and a Global Bio-risk Advisory Council (GBAC) Star



AMPLIFY™

WITH **NORTHERN LIGHT®**

BY GREENHECK



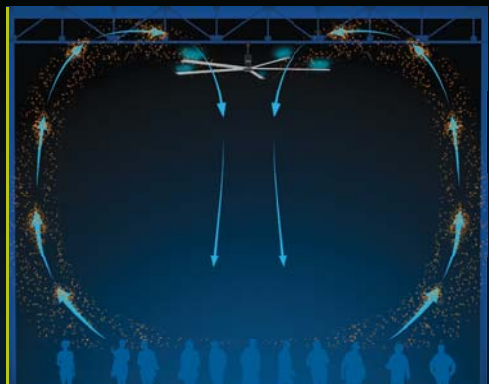
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Overhead fans combined with strategically-placed UV-C lighting to inactivate airborne pathogens.

AMPLIFY™ overhead fans with patented Northern Light® technology combine engineered air movement with the air cleaning benefit of UV-C lighting making it the right selection for inactivating airborne pathogens.

- Northern Light UV-C technology installed toward the tip of each fan blade where the majority of air movement occurs to maximize pathogen inactivation.
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AMPLIFY with Northern Light — That's Innovation Applied.



UV-C lights positioned where majority of air movement occurs creates a larger inactivation zone.

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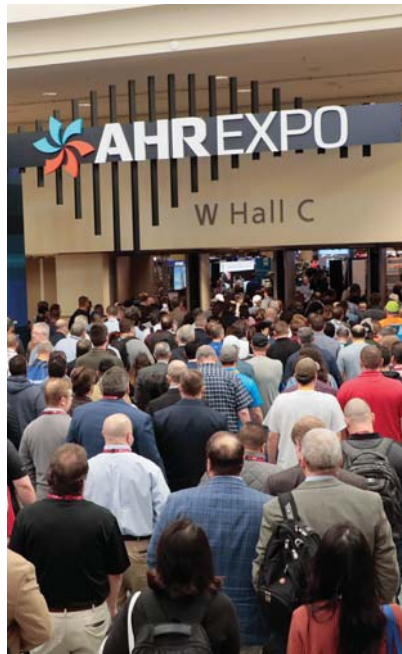
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Accreditation safety rating; as well as guidance from our ASHRAE colleagues who continue to write the standards for best practices;

- Attendees will be required to wear masks in all indoor spaces, including inside exhibitor booths, classrooms and presentation areas, bathrooms, shuttle buses and any other indoor spaces while at the Show. Masks will also be required in and around Las Vegas in restaurants, casinos, events and other shared spaces according to guidelines in place by Clark County and the city of Las Vegas;



- Anyone experiencing symptoms of illness should seek medical attention and not attend the Show;

- For international travelers, we will have testing for return flights available on-site via our vendor partnership with OnMed. Reservations are required and you can find more detailed information at www.ahrexpo.com/international-travel.

We also continue to work with the LVCC, Clark County and the city of Las Vegas for the latest updates on policy while at the Show.

We continue to be encouraged by the energy from our attendees and exhibitors. The AHR Expo is the industry's kick-off to business and networking in the New Year and we are looking forward with optimism for a successful 2022. Our industry continues to play

a vital role in our ability to fight the pandemic as well as set the course for the health, safety and efficiency of our buildings of the future. Now more than ever, we need to come together.

Sincerely,
AHR Expo Show Management

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Boiler Maintenance Schedule



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What's New? What's Next? Industry Leaders Look at the Year Ahead

As AHR Expo returns to Las Vegas, we check in with several HVACR thought leaders to see what they expect from 2022.

By Rob McManamy

Two years ago, our annual “What’s New? What’s Next?” prognostications were blown up by the Coronavirus pandemic, which arrived in the U.S. just weeks later, on the heels of AHR Expo 2020 in Orlando.

A year ago, this forward-looking feature was similarly undercut by the massive uncertainties stemming from political upheaval in Washington and a still-raging pandemic that had forced the cancellation of AHR Expo 2021.

This year, of course, we make no guarantees, but hope the third time is a charm as we hear from nine of you about the year to come.

Of note, as you read through these comments, you’ll see several common threads that reflect proactive crisis management, from COVID-19 to supply chain snafus, and continuing commitment to growing priorities like enhanced indoor air quality, next-generation recruitment, energy efficiency, changing codes and regulations, remote technologies and decarbonization.

And of course, all of these concerns, in one form or another, are also helping to drive innovation in ways we might not have even imagined just 20-plus months ago. (As an example, just ask yourselves how many Zoom calls you had ever participated in *before* March 2020!)

WHAT DOES YOUR ORGANIZATION EXPECT TO SEE IN 2022?

JOHN HAZEN WHITE, JR.,
Owner and Executive Chairman
Taco Comfort Solutions

My takeaway from 2021 is that most companies learned to adapt to unfolding crises. Healthy manufacturers paced themselves through a devastating, long-term pandemic, coupled with a supply chain crush. Some, however, have struggled irreparably through these challenges. As we head into 2022, knowing that there will be many influences on our business and the markets we serve – some routine, and likely some new and unforeseen – we must adapt to shifting influences, again. A key driver now is the need to manage through transitions in the workforce.

A few years ago, we saw the beginning of what’s since grown into a very large, very substantial exodus from the workforce, many of them skilled and loyal Baby Boomers, now moving quickly into retirement. In many

instances, this has been fueled by the pandemic.

Here at Taco Comfort Solutions, we’ve enjoyed a stable workforce for many years. Now, we need to transition toward new employees. This requires the need to earn and win their interest, trust and confidence. It can and should be a healthy transition – one in which we as an employer must stay attuned to new people, new needs and interests. At the same time, we must maintain and properly communicate our own, long-standing cultural values and good ethics.



John Hazen White Jr.

JEFF DREES
*Executive
Vice President
Daikin Applied*

The “Great Resignation” isn’t just a clever catchphrase. Talent is definitely scarce, and we’ll see a renewed emphasis on education and training, for engineers and other professionals, in 2022 and beyond, as a result. This is especially critical as more building owners and operators look to solve problems in their facilities with software and systems.

The push to digitize building technologies has immense value. However, it’s not the be all to end all. Having people with the skill set to interpret information and solve problems in real-time is critical. The two halves make a whole. It’s the combination that will allow the industry to address pressing issues like IAQ and decarbonization.

Product design training is the foundation for success. But it needs to be supplemented with systems and application training — particularly true as governing bodies such as ASHRAE introduce new standards to advance occupant health and sustainability. Educating engineers on the means to apply those standards is essential.

How that instruction is delivered will continue to evolve as well. It’s important to meet people where they are. So online training will grow and become more sophisticated, which we’re already witnessing with the introduction and expansion of virtual reality-based (VR) education.

JOHN GALYEN
*President
Danfoss North America
Former chairman
Air-Conditioning,
Heating, and Refrigeration
Institute (AHRI)*

Technologies alone won’t get us there. We also need the right incentives, policies and regulations.

Last summer’s report from the Intergovernmental Panel on Climate Change and the recent news that U.S. greenhouse gas emissions increased over 6% in 2021 have amplified the sense of



Jeff Drees

urgency on climate change. Together, we need to actively work to reduce our carbon emissions. To achieve our decarbonization targets, we will need to increase our use of electricity and other clean power sources, particularly in buildings and transportation. This is where we can have the largest impact.

But we can’t get there without energy efficiency. Energy efficiency should be our first fuel. There are proven — yet under-deployed — technologies that can help us reach our carbon reduction targets. Variable-speed technology, which allows HVACR systems to adjust to building demands and ensure efficient and reliable operation, can be applied to residential and commercial heating and cooling systems and yield up to 30% efficiency.

Lowering greenhouse gases and achieving net-zero carbon emissions will also require us to deploy new heating and cooling technologies to support the growth in heat

“ Energy efficiency should be our first fuel. There are proven — yet under-deployed — technologies that can help us reach our carbon reduction targets. ”

—John Galyen, Danfoss North America

pumps and heat recovery and reuse. The next generation of heat exchangers, including micro plate and micro channel, enable HVACR systems to operate more efficiently, reduce the size and refrigerant charge of the equipment and save energy.

Indoor air quality is the top concern for building owners post-COVID. Dedicated Outdoor Air Systems (DOAS) use outdoor air and variable-speed technologies to introduce fresh air and reduce particles in indoor air to keep occupants healthy. Variable-speed technology allows them to adjust their capacity to match the demands of the building, under a wide spectrum of outdoor air temperature and humidity, improving IAQ and efficiency, while maintaining comfort.

JEFF WILLIAMS
*President, Global Products
Johnson Controls*

As we face the twin crises of the pandemic and climate change, technology is more critical than ever. We must rethink how buildings operate, and Johnson Controls has the technology today to help its customers navigate this global effort. The 2022 AHR Expo will bring together a collection of our latest



LENNOX IAQ
Building Better Air

With Lennox' factory owned distribution network, unmatched in the HVAC industry, you can expect comprehensive personalized support straight from the manufacturer, direct feedback into product development, and an exceptional customer experience. Lennox consistently delivers **the most innovative and highest quality** HVAC solutions engineered with **performance** for the end-user and **serviceability** for the technician.





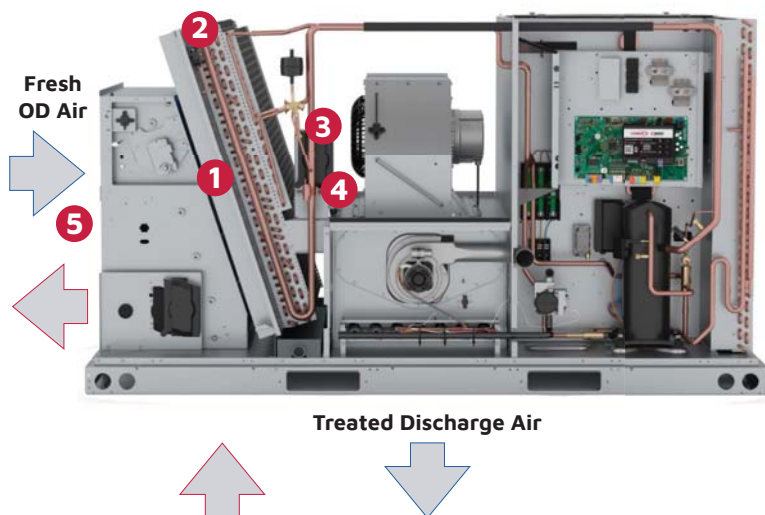
ULTIMATE IAQ SYSTEM



Introducing the Ultimate Indoor Air Quality system as part of the Lennox Commercial Building Better Air initiative. With the ability to remove 99% of the virus that causes COVID-19¹ from the air², Lennox has developed a rooftop unit that can help commercial businesses improve the health of their building.

Using a factory installed combination of MERV 16 filters and UVC Germicidal lamp, the Ultimate IAQ system has been third-party tested to show 95% single pass efficiency rate³ with a 70% virus reduction rate⁴ after five minutes and 99% reduction after 30 minutes.

BUILDING THE ULTIMATE IAQ MACHINE



- 1 High Efficiency Filtration**
Up to MERV 16 Filters remove 95% particles down to .3 Microns
- 2 Humiditol™+**
Efficient control of RH% using modulating components
- 3 UVC Germicidal Light**
Reduces biological contaminants from coils and drain pan surfaces
- 4 Bipolar Ionization**
Targets certain contaminants in the air stream
- 5 High Performance Econ**
Dilute indoor contaminants by bringing fresh air into the space

^[1] When used properly with other best practices recommended by CDC and others; commercial filtration and UVC lights can be part of a plan to reduce the potential for airborne transmission of COVID-19 indoors. ^[2] Removal efficiency based on third party testing results using MS-2 bacteriophage (ATCC 15597-B1). Bacteria representative of virus-sized particles like SARS-CoV-2, the virus that causes COVID-19. April 2021. ^[3] Single Pass testing conducted at 3rd party facility with 750 CFM moving through an air tunnel ^[4] Recirculating testing conducted at 3rd party facility in 1007 Cu.ft. chamber with airflow moving 6 Air Changes per Hour (100 CFM).



and most advanced products that help create smarter, healthier and more sustainable spaces around the world.

Buildings account for an estimated 40% of U.S. emissions. To achieve global decarbonization, it's critical to improve building energy efficiency, deploy more environmentally sustainable products and electrify building end uses like heating. Johnson Controls is committed to driving continual advancements in HVAC technology that enable a more sustainable future while ensuring compliance with government regulations, including the U.S. Dept. of Energy (DOE) 2023 energy efficiency standards and the industry's low-GWP refrigerant transition. (For product details, visit www.johnsoncontrols.com/media-center/news/press-releases/2022/01/06/2022-ahr-expo.)



Jeff Williams

MICK SCHWEDLER, P.E.

President, ASHRAE, 2021-2022

Our technical focus is on IEQ, resilience, and decarbonization – which is a newer direction for us, but of great importance. We have a new ASHRAE Task Force on Building Decarbonization now that was really patterned after our (ongoing) ASHRAE Epidemic Task Force that was formed for the pandemic.

We now have over 100 global experts available today on decarbonization and our goal is not just to put the technical information out there, but to make it usable. We have signed on to the new COP26 commitments, but the real measure of success will not be on paper. It will be in actually reducing emissions.

So, the Task Force on Building Decarbonization is working on providing that practical, day-to-day guidance that allows the building owners, working with their designers and construction and operations teams, to reduce the emissions. And one thing that's easy to forget is that if you reduce energy use, you will automatically reduce carbon emissions, too. That will be a big part of the work that



Mick Schwedler

“As we face the twin crises of the pandemic and climate change, technology is more critical than ever. We must rethink how buildings operate.”

—Jeff Williams, Johnson Controls

the new task force does. (To listen to our recent podcast with Mr. Schwedler, visit www.hpac.com/members/podcasts/article/21180315/hpac-on-the-air-planting-roots-with-ashraes-mick-schwedler.)

MICHAEL IVANOVICH

Senior Director,
Global Affairs
AMCA International



Michael Ivanovich

Following the recent completion of our 2021-2024 strategic plan, AMCA is preparing to engage in ventilation and indoor-air-quality standards and guidelines expected to stem from COVID-19-related design and operational challenges. This is new territory for AMCA, as its advocacy historically has been focused on the specification of AMCA-certified products, as well as on severe-duty louvers, fire and smoke dampers, and fan efficiency.

AMCA additionally is preparing its members in North America for continuation of California and U.S. Department of Energy rulemakings for commercial and industrial fans and blowers, engaging in utility incentive programs, bolstering its Certified Ratings Program for stronger worldwide enforcement, building out its learning management system for professional-development-hour-eligible in-person and online education, and updating key testing and rating standards for fans.

Lastly, AMCA is also developing new standards for rooftop-equipment wind loading and for sound performance of large-diameter ceiling fans.

AMCA is optimistic that businesses generally will establish a new “normal” in 2022, given that people are learning to live with the virus and supply chains seem to be improving. A good sign of things to come is that, despite the Omicron

flush of infections, the AHR Expo and ASHRAE Winter Conference are occurring in 2022, albeit with lower in-person attendance and hybrid meetings. In essence, 2022 may turn out to be what we were expecting from 2021.

CARL A. PINTO, JR.,
Senior Director, Marketing
Bradford White Corp.

Despite myriad challenges we continue to face as a direct result of the pandemic, the onslaught of national, state and local regulations with regard to product efficiencies, building codes and requirements, and energy resources will present certain manufacturers with some their most significant challenges and opportunities in 2022.

For example, right now, several locations throughout the U.S. are enacting a variety of electrification-related regulations to reduce or eliminate the utilization of natural gas. On other fronts, we have states working to preserve fuel choice by enacting regulations to disallow local restrictions on gas utility services.

As manufacturers like Bradford White prepare to address these changes, we will be challenged on everything from product development and manufacturing to sales and distribution. And even the regulatory environment has not escaped the pandemic's reach, with significant national, state and local regulations being shaped around vaccines and other measures to contain COVID-19.

FRANK WINDSOR
President
Rinnai America Corp.

We have seen tremendous growth in the gas water heating market over the last seven years, growing from about 8% to about 18% in market share. With this trajectory in mind, our corporate headquarters in Japan, together with our leadership group in Peachtree City have named North America as a major growth vehicle for the company.



Carl A. Pinto



Frank Windsor

The increasing demand for more energy-efficient appliances, as well as the current issues facing our economy, including supply chain backlogs and rising material prices, has created a scenario where our aggressive strategy will help to meet the increasing demand for both residential and commercial offerings in the current macro market climate. Prioritizing Rinnai's commitment to creating a healthier way of living, the company will drive sustainable, profitable growth, by developing new product technology, supporting innovative leadership, and becoming a talent magnet for the industry.

We have also committed to continually improving operational excellence and are meeting rising demands by constructing a manufacturing facility right in our backyard in Griffin, GA, which opens in 2022. These approaches combined will provide our customers with the innovative, quality products they need, promptly.

DOUG BOUGHER
Director,
Residential & Light Commercial Sales
LG Electronics USA Air Conditioning Technologies

Overall, the HVACR market, especially residential, is strong as manufacturing and contracting organizations alike have adjusted to selling and training within a pandemic world. Considering that behaviors have shifted, market segments are now different, with hospitality and office segments within the commercial market stalling, while residential has grown tremendously.

Given that the pandemic has put a larger focus on indoor air quality (IAQ) via outside air requirements, filtration, and/or purification, LG is poised to continue pushing growth in IAQ. Additionally, with electrification and decarbonization becoming increasingly important as more states consider measures aimed at fossil fuel reducing guidelines, we foresee heat pump technology to continue growing as a preferred solution.

LG will continue making this a key focus, as well. Lastly, HVAC is a relationship-driven business, so the most important discussions continue to revolve around growing our relationships with customers. For LG, this looks like promoting customer and partner engagement and aligning product innovation with industry trends. [HPAC](#)



Doug Bougher

Measure Water Consumption With Zero Straight Run Requirements

In building design, HVAC and plumbing applications, flow measurement tools do more than quantify water usage. They also help optimize system performance, control costs, meet regulatory compliance and maintain safety. High accuracy flow meters are critical in meeting these goals. However, installing certain metering technologies isn't necessarily a straightforward process.

Meters often require a specified amount of straight run upstream and downstream to deliver these accuracies—sometimes five to 10 or more pipe diameters of straight pipe before and after the meter. Meeting these requirements can result in expensive modifications and extensive downtime for installation.

In applications where adequate straight run is not available or achievable, controls contractors and other key stakeholders are opting for the ModMAG® M2000 Electromagnetic flow meter from Badger Meter to reduce installation time and cost with zero straight run required.

Impressive Performance in Applications With Tight Spaces

Electromagnetic flow meters are known for managing critical flow applications, improving accuracy and meeting the demands of challenging liquid conditions. Out of the box, the M2000 meter delivers accuracies of $\pm 1\%$ with zero straight run requirements or $\pm 0.2\%$ with appropriate straight run. Additional benefits include:

- Repeatability of $\pm 0.1\%$
- No pressure drops
- Horizontal to vertical up
- Full pipe measurement
- Display rotation of 90°



The M2000 meter has been validated by the Netherlands Measurement Institute (NMI) to OIML/MID for sizes 2 to 12 inches, assuring it is a suitable solution in tight applications with no space or budget for modifications.

Additionally, the meter has no moving parts or strainer requirements, minimizes meter vault size and is suitable for potable water, well water, reclaimed water, wastewater and water-based solutions.



Selecting a High-Performance Meter for Your Tight Applications

When selecting a metering technology, there are many considerations to take into account, including flow rates, line sizes, meter location, materials of construction, connectivity and certifications.

Oftentimes, building design, HVAC and plumbing applications are complexly designed with limited space for meter installation. This rules out meters that require a certain number of straight pipe lengths upstream or downstream as the space simply is not available. Additional challenges include close proximity to pumps, valves and other devices, as well as IP68 requirements for permanent immersion or underwater installation of metering equipment.

Rather than completing expensive modifications or remodeling the application entirely, facilities engineers can deploy the M2000 meter efficiently without significant downtime or modifications. Common applications include:

- ✓ Water consumption
- ✓ Chiller/boiler make-up and blowdown
- ✓ Sub-metering or cost allocation
- ✓ Water or wastewater treatment
- ✓ EPA water use/discharge reporting

Whether you're designing a new facility or retrofitting an existing application, electromagnetic flow meters like the M2000 meter can eliminate the need for redesign to meet straight run requirements. Learn more at badgermeter.com/precision.



Badger Meter

KEEP YOUR OPERATIONS FLOWING.

Glycol and Hot or Chilled Water · Cooling Towers · Energy Sub-Metering

At Badger Meter, we know hydronic system applications are rigorous and have strict flow measurement requirements. Flow meters are essential to maintain long-term accuracy, reliability and repeatability within those applications. We offer a wide variety of metering technologies—from ultrasonic, electromagnetic to positive displacement flow meters. Badger Meter has the proven tools and expertise to help you manage your critical resources and keep your operations flowing.



Badger Meter

**Discover how our flow meters can
improve operational efficiencies in
your hydronic system applications:**

www.badgermeter.com/HPAC



New COVID-19 Guidance for Large-Diameter Ceiling Fans

A 12-month study by AMCA and an international team of scientists, engineers, and researchers focused on aerosol transmission of airborne pathogens in large industrial spaces.

By MICHAEL IVANOVICH, AARON GUNZNER, and SCOTT ARNOLD, AMCA International

Numerous studies of air-flow and performance characteristics of circulating fans have been undertaken.^{1,2,3,4,5,6} Relatively few, however, are focused on aerosol transmission of airborne pathogens in large industrial spaces, a shortage all the more noticeable during the coronavirus disease 2019 (COVID-19) pandemic.

To contribute to and improve the body of COVID-19-prompted guidance for the operation of circulating fans, Air Movement and Control Association (AMCA) International commissioned numerical-simulation studies of airborne-particle and aerosol transmission with large-diameter (greater than 2.1 m [7 ft]) ceiling fans (LDCF).

The focus of the studies was warehouses in the U.S., in which LDCF commonly are used for comfort cooling and destratification. The results also are applicable to many industrial facilities.

• *Note: This article first appeared in the 2021 edition of AMCA inmotion.*

To promote integrity in the design and execution of the research and ensure that the conclusions drawn from the study are valid, AMCA assembled “industry” and “science” teams (**Table 1**). Consisting of representatives of several AMCA member companies, as well as members of the AMCA staff, the industry team provided expertise in the application and performance of products, while the



SCIENCE TEAM			
Name	Title	Affiliation	Project role/contribution
Liangzhu (Leon) Wang, PhD, P.Eng.	Associate professor, Department of Building, Civil, and Environmental Engineering	Concordia University	Principal investigator
William P. Bahnfleth, PhD, PE	Professor, architectural engineering Chair, ASHRAE Epidemic Task Force	The Pennsylvania State University	Science-team leader
Edward A. Nardell, MD	Professor, departments of Environmental Health and Immunology and Infectious Diseases	Harvard T.H. Chan School of Public Health	Infectious diseases and study of ceiling fans for control of infectious diseases
Jovan Pantelic, PhD	Research scientist, building science	Well Living Lab Inc.	Infectious diseases
Paul Raftery, PhD	Professional researcher	Center for the Built Environment, University of California, Berkeley	Ceiling-fan modeling
Geoff Sheard, DSc	President	AGS Consulting LLC	Computational-fluid-dynamics modeling and fan engineering
Pawel Wargocki, PhD	Associate professor, departments of Civil Engineering and Indoor Environment Chair, ASHRAE Epidemic Task Force Science Applications Committee	Technical University of Denmark	Indoor-air-quality expertise
INDUSTRY TEAM			
Michael Ivanovich	Senior director, global affairs	AMCA International	Project manager
Eddie Boyd	Chief executive officer	MacroAir Technologies	LDCF performance
Marc Brandt	Director, domestic industrial	Hunter Industrial	LDCF performance
Thomas Catania, Esq.	Board member	Institute for Energy Innovation	Regulatory communications
Aaron Gunzner	Senior manager, advocacy	AMCA International	Staff liaison
Mark Stevens	Executive director	AMCA International	Member relations
Christian Taber	Principal engineer, codes and standards	Big Ass Fans	Warehouse model, LDCF modeling
Mike Wolf, PE	Director, regulatory business development	Greenheck Fan Corp.	Regulatory communications

TABLE 1. The science and industry teams for AMCA's LDCF research.

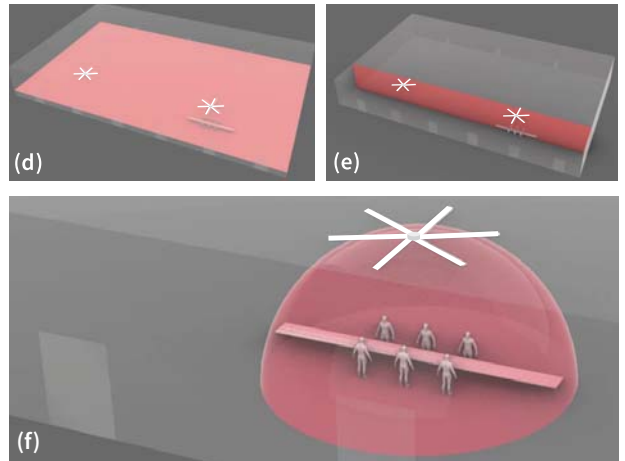
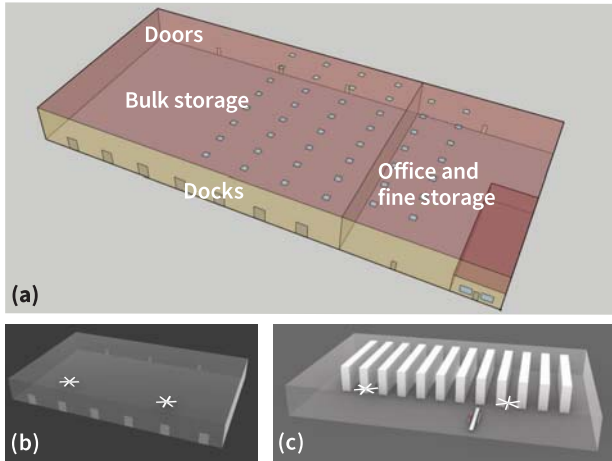


FIGURE 1. (a) DOE warehouse commercial reference building; (b) computational-fluid-dynamics (CFD) bulk-storage model with two LDCF; (c) CFD model with racks; (d) whole-warehouse-breathing-zone horizontal plane; (e) vertical plane; (f) working zone.

science team, made up of authorities in infectious diseases, indoor-air quality, fans, and computer modeling, including two leading members of the ASHRAE Epidemic Task Force, advised on the project setup and reviewed the intermediate and final results. Because COVID-19 infection rates are poorly understood and varying with mutations, the study focused on particle concentrations as an indicator of exposure risk.

Following is a high-level summary of the project's findings and resultant guidance. For information on the simulation methodology, setups, assumptions, validations, and results, see the final report, *AMCA COVID Guidance for UNDUCTED Fans – Modeling Ceiling Fans*, prepared by Liangzhu (Leon) Wang, PhD, P.Eng.; Senwen Yang; Runzhong (Alvin) Wang; Mohammad Mortezaadeh, PhD; Jiwei Zou; and Chang Shu of Concordia University.

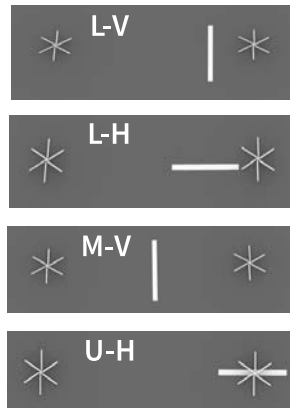
The Building

Based on the U.S. Dept. of Energy (DOE) commercial reference building for warehouses (Figure 1a), the warehouse in the study measured 100 m (330 ft) long by 46 m (150 ft) wide by 8.5 m (28 ft) tall, with two AMCA-certified 6.1-m- (20 ft) diameter ceiling fans installed 36.6 m (120 ft) apart in the bulk-storage area (Figure 1b). The warehouse was modeled with (Figure 1c) and without racks, with the racks oriented to provide the most beneficial airflow performance across most aisles. Simulation results are reported mostly at the whole-warehouse-breathing-zone horizontal plane (Figure 1d), at the vertical plane crossing the two LDCF centers (Figure 1e), and inside the working zone (Figure 1f).

The warehouse was assumed to be located in Chicago. Simulations using the DOE's EnergyPlus whole-building energy-modeling program were performed to determine air and surface temperatures during winter and summer, respectively.

Packing-line location

M = middle; L = left;
U = under; V = vertical;
H = horizontal



Worker location

D = double row;
S = single row;
6 = 6 ft; 3 = 3 ft

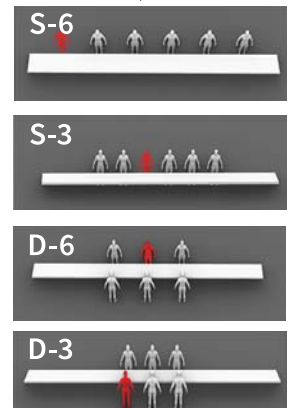


FIGURE 2. Parametric case scenarios. The person colored red is the infector.

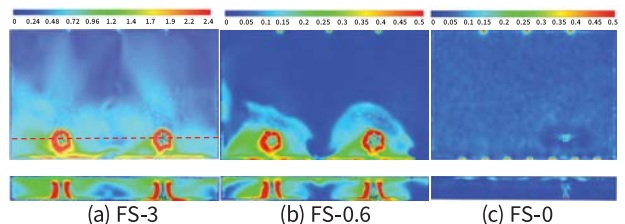
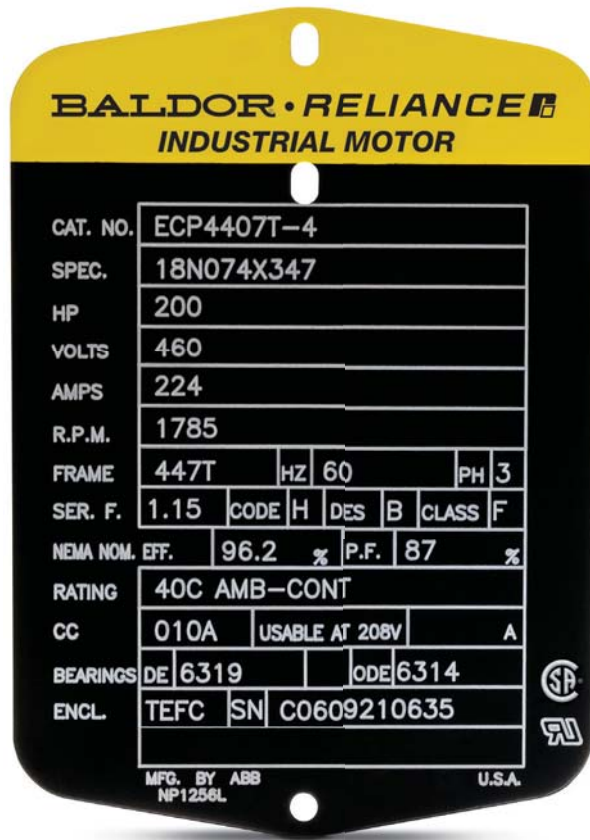


FIGURE 3. Steady-state airflow distribution for a selected case of U-H-D-3 at three fan speeds, meters per second. The dashed line is the location of the vertical plane.

Scenarios

A variety of arrangements and locations of the packing line relative to the ceiling fans and workers were simulated (Figure 2). The U-H-D-3 (packing line directly under



The sign of reliability

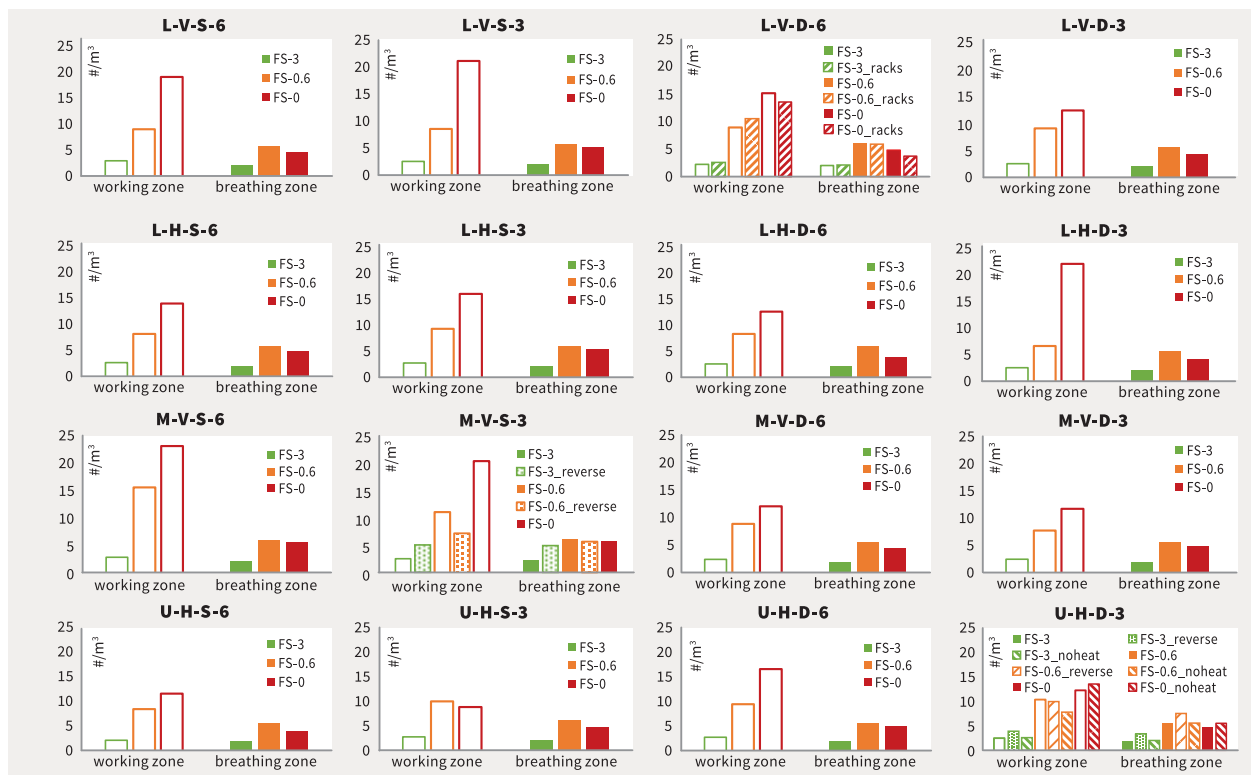
For more than 100 years, ABB has developed a reputation for marketing, designing and manufacturing the most reliable industrial electric motors available. Azima, Inc. confirmed this in their Reliability Rating Report in which they stated that “ABB produces the majority of models scoring highest for reliability in 2018.”

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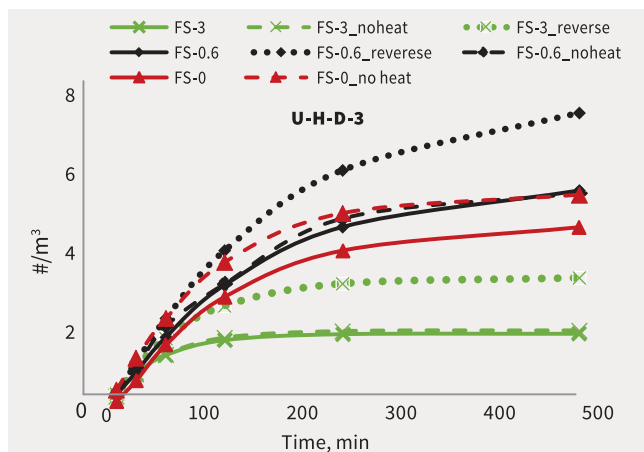
the right-side fan and oriented horizontally, two rows of workers 0.9 m [3 ft] apart) combination in Figure 2 is the scenario used for most of the discussion.

Figure 3 shows steady-state airflow distribution for a case of U-H-D-3 at three air speeds exiting the fans (i.e., average air speeds through the area swept by the fan blades): 3 m/s (10 fps) (100-percent fan speed) (FS-3), 0.6 m/s (2

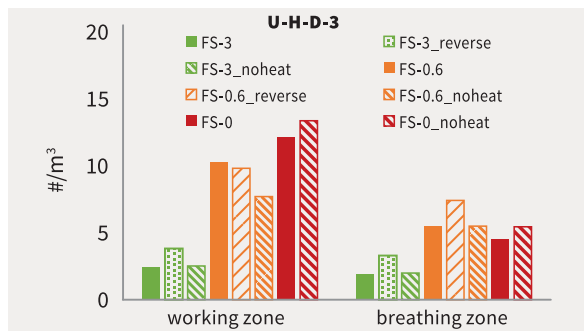
fps) (20-percent fan speed) (FS-0.6), and 0 m/s (0 fps) (fans off) (FS-0). When the fans blow air downward at FS-3 and FS-0.6, circular high-speed regions form below the fans, with lower-speed cores directly under the fans. FS-3 has an air speed exiting the fan of 3.0 m/s (591 fpm), and most of the warehouse seems well-mixed, especially in the horizontal plane. FS-0.6 shows low speed at the horizontal



(a)



(b)



Notes:
 • Best case: FS-3 (green line) = full speed (3 m/s [10 fps]) in downward direction
 • Worst case: FS-0.6 (black dotted line) = 20-percent speed (0.6 m/s [2 fps]) in upward direction

(c)

FIGURE 4. (a) Working-zone and whole-warehouse-breathing-zone concentrations at the end of eight hours; (b) transient concentrations; (c) concentrations at the eighth hour for U-H-D-3. “Noheat” indicates a simulation with thermal-buoyancy-driven flow disabled, while “reverse” indicates fan direction was reversed.

breathing-zone plane everywhere except close to the fans, indicating less air mixing in the whole warehouse than with FS-3. When the fans are off, most air speed is less than 0.2 m/s (0.7 fps), and, aside from airflow through open doors and docks, the thermal plumes account for most of the local airflow from the worker group.

Conclusions

Based on 223 parametric CFD simulations—each with 14.6 million grids and an average of six hours of computing time for airflow calculations and eight hours for transient-particle models—the following major conclusions were reached:

- Of the options (speed, direction) for operating the fans, running the fans at the highest feasible speed to produce downward flow consistently yielded the best performance;
- Operating the fans at maximum speed generated high air speeds in occupied zones, which is not always practical, as it may cause thermal discomfort amid cold indoor conditions. Where lower air speeds are preferred, 3 m/s (10 fps) with reverse flow is a good option, though not as good as 3 m/s (10 fps) with downward flow;

- Reversing fans at high fan speed (e.g., 3 m/s [10 fps]) reduces performance compared with running fans at high fan speed with downward flow;

- Reversing fans at low fan speed (e.g., 0.6 m/s [2 fps]) may reduce whole-warehouse air speed and, thus, lower diluting effect, increasing the whole-warehouse concentration at the breathing zone;

- Idealized thermal-plume assumptions had a substantial impact on results for the FS-0 cases. In the real world, occupant movement, passing traffic, and the like disrupt thermal plumes, making them less effective at transporting particles emitted by occupants to the upper region of a space. In other words, the FS-0 cases may underestimate particle concentrations in the region near occupants;

- Both dilution and deposition were the major mechanisms by which high fan speeds reduced particle concentrations near occupants.

Figure 4a shows breathing-zone and working-zone concentrations for a variety of fan speeds and scenarios, with figures **4b** and **4c** focusing on U-H-D-3.

To better understand the impact of fan speed, the researchers conducted simulations of the fan speeds 0.9 m/s (3.0 fps) (30-percent fan speed), 1.2 m/s (~4.0 fps)

Water filter optimizes heat transfer efficiency

PROBLEM:

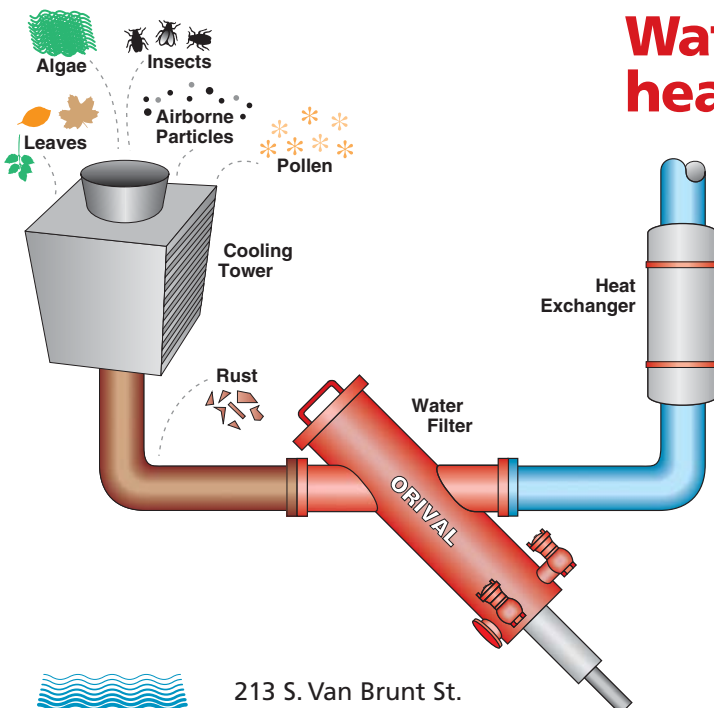
Airborne dust and debris, microbiological growth, pollen and other materials collect in cooling towers. Combined with calcium carbonate, magnesium silicate, rust, iron chips, scale and other corrosion by-products, they reduce heat transfer efficiency.

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- Elimination of unscheduled downtime for maintenance.
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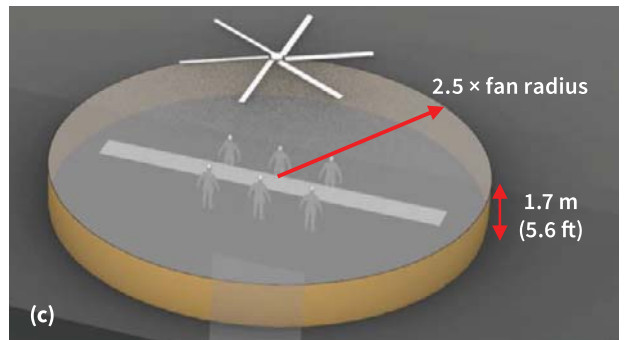
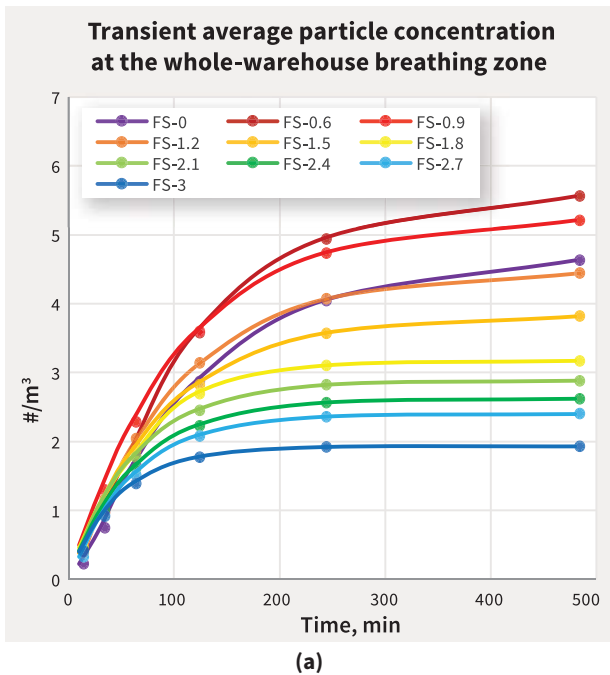
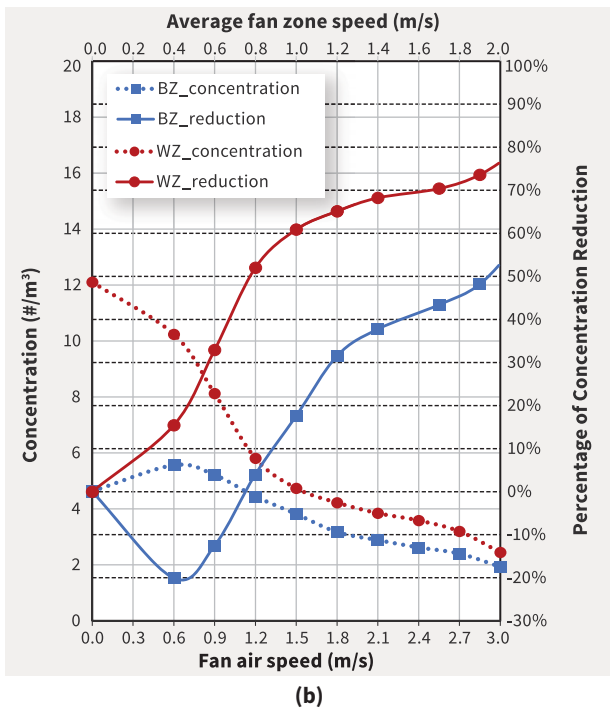


FIGURE 5. (a) Transient breathing-zone concentration, (b) eighth-hour breathing-zone and working-zone concentrations and relative concentration reduction (baseline: FS-0), and (c) the cylindrical shape of the “fan zone” (radius: $2.5 \times 3.05 \text{ m} = 7.6 \text{ m}$ [25 ft]) for the fan-velocity analysis of U-H-D-3.



(40-percent fan speed), 1.5 m/s (5.0 fps) (50-percent fan speed), 1.8 m/s (6.0 fps) (60-percent fan speed), 2.1 m/s (7.0 fps) (70-percent fan speed), 2.4 m/s (8.0 fps) (80-percent fan speed), and 2.7 m/s (9.0 fps) (90-percent fan speed) (Figure 5). This modeling was limited to the U-H-D-3 arrangement.

Table 2 summarizes airflow characteristics of the modeled fans for a variety of speeds with the U-H-D-3 arrangement.

Guidance

Based on these conclusions, the guidance in Table 3, which combines particle-concentration considerations with thermal-comfort constraints, was developed. It is intended primarily for building operators and other individuals with control over the operation of fans in large, sparsely occupied spaces.

Summary

Building operators and other individuals with control over the operation of fans in large, sparsely occupied spaces are encouraged, where feasible, to operate fans with doors and/or windows open, as they will increase ventilation airflow through the openings. Additionally, they are advised to avoid locating occupants immediately downstream of each other for extended periods and to operate fans at the highest feasible speed while maintaining occupant comfort. The simulations showed a notable reduction in concentration at high fan speeds (e.g., summer conditions) and only a slight reduction in concentration close to the fan (e.g., within two fan diameters), with no practical difference outside of that region, at low fan speeds.

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- **simplifies** startups and maintenance
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Fan-speed label	Fan speed	Fan speed	Air speed exiting fan	Airflow exiting fan	Average air speed at side surface ¹	Average fan-zone ² air speed	Maximum air speed in fan zone
	(% max. rpm)	rpm	m/s (fpm)	m ³ /s (cfm)	m/s (fpm)	m/s (fpm)	m/s (fpm)
FS-0.6	20	16	0.6 (118)	18 (38,400)	0.2 (39)	0.4 (79)	1.0 (197)
FS-0.9	30	23	0.9 (177)	27 (57,600)	0.3 (59)	0.6 (118)	1.3 (256)
FS-1.2	40	31	1.2 (236)	36 (76,800)	0.4 (79)	0.8 (157)	1.7 (335)
FS-1.5	50	39	1.5 (295)	45 (96,000)	0.5 (98)	1.0 (197)	2.2 (433)
FS-1.8	60	47	1.8 (354)	54 (115,200)	0.6 (118)	1.2 (236)	2.5 (492)
FS-2.1	70	55	2.1 (413)	63 (134,400)	0.7 (138)	1.4 (276)	2.9 (571)
FS-2.4	80	62	2.4 (472)	72 (153,600)	0.8 (157)	1.7 (335)	3.4 (669)
FS-2.7	90	70	2.7 (531)	82 (172,800)	0.9 (177)	1.9 (374)	3.8 (748)
FS-3.0	100	78	3.0 (591)	91 (192,000)	1.0 (197)	2.1 (413)	4.4 (866)

¹The side of the cylinder of the fan zone colored by yellow in Figure 5c.

²A cylinder around the fan center at a height of 1.7 m (5.6 ft).

TABLE 2. Fan air speed and airflow rate in the fan zone for a case of U-H-D-3.

Location of most occupants	Summer	Winter
Close to the fan(s)	Operate the fan(s) downward at high speed.	Operate the fan(s) at the highest speed that does not cause discomfort in either forward or reverse direction, whichever was used prior to the pandemic. ¹
Far from the fan(s) ²	Operate the fan(s) downward at high speed.	Operate the fan(s) at the highest speed in either forward or reverse direction, whichever was used prior to the pandemic. ³

¹Simulations show slightly lower concentrations with reverse flow than with forward flow at a given low speed, but this is based on a much smaller number of simulated scenarios (two as opposed to the 16 for a typical forward-direction scenario) and is a small effect given simplifications and assumptions in the model. For simplicity, retaining the pre-pandemic direction is advised—unless reversing the fan allows for substantially higher fan speeds while avoiding draft at the occupied level.

²At locations more than three fan diameters from the center of a fan the majority of the day.

³Although simulations show a slight increase in average whole-warehouse-breathing-level concentration with fans at low speed as opposed to off, the distribution is far more uniform across the entire warehouse (i.e., no “hot spots”). Based on feedback from the science team, this homogeneity likely is a net advantage, as more mixing (i.e., dilution) is beneficial for times when workers who may be far apart for much of the workday meet and interact more closely. Lastly, the still-air results depend highly on model assumptions and simplifications (e.g., plume effectiveness, lack of local mixing, the presence of racks, etc.), and this small difference could be an artifact of those.

TABLE 3. AMCA LDCF guidance. Note: The green/yellow/red color coding is an approximate indicator of how clear the effect was in the simulations.

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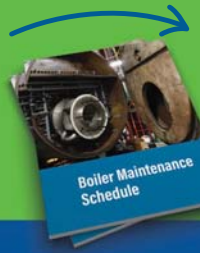
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All employed at AMCA International, **Michael Ivanovich** is senior director, global affairs; **Aaron Gunzner** is senior manager, advocacy; and **Scott Arnold** is manager of industry content. [HPAC](#)

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Pros and Cons of Heat Pumps

Heat pumps are popular on projects that aim to be carbon free, but they also come with significant limitations.

By KENNETH M. ELOVITZ, P.E., Esq.,
Energy Economics, Inc.,
Newton Centre, MA

Heat pumps are a popular system choice on projects that have a goal of being carbon free at the point of utilization. They are often advantageous in applications where recovered heat can be used, such as to heat perimeter zones.

At the same time, heat pumps are not a panacea and cannot correct underlying problems. Heating and cooling loads are the same regardless of system type. So, for example, heat pumps cannot solve mismatches between installed capacity and loads. Heat pumps also cannot fix zoning problems like having interior and perimeter rooms on the same zone

SAVINGS POTENTIAL

The idea of using recovered heat to replace a separate heat source suggests a potential for energy savings. But Simplified Energy Analysis^[1, 2] may show that heat pumps will not necessarily save money or energy.

Simplified Energy Analysis method is a bin calculation that assumes the load for each zone varies linearly between a diversified peak cooling load in the highest temperature bin to a peak heating load in the lowest temperature bin.

The diversified load calculation is similar to a peak load calculation for design, but the diversified calculation uses average solar gain based on percent possible sunshine instead of peak day solar heat gain. It also recognizes that internal heat gains offset heat loss through the building envelope during occupied hours.

Two systems were modeled in five cities, each with distinct climates: Boston, Kansas City, Houston, Phoenix and Portland, OR. Here's how they were compared:

- Rooftop VAV with 100% outside air economizer for free cooling (except no economizer in Houston because the economizer did not save energy) and perimeter hot water baseboard heat from a gas fired hot water boiler;
- Ground source heat pumps with a loop pump but no cooling tower or supplementary heater and an energy recovery ventilator that delivers a constant ventilation air quantity during

occupied hours. A traditional water source heat pump with a cooling tower for heat rejection or a boiler for supplementary heat would have higher energy use.

- Table 1 (p. 40) lists key equipment characteristics for the systems modeled;
- Table 2 (p. 40) lists the part load factors used in the calculation for fan and compressor load reduction;
- Table 3 (p. 42) summarizes projected HVAC system energy use for a ground source heat pump system compared to rooftop VAV in five U.S. cities.

The resulting data gives rise to several key observations:

1. In all five climates, the heat pump system uses considerably fewer BTUs at the site than the VAV system. The ratios range from 36% in Kansas City to 51% in Houston. The BTU savings at the site result primarily from the heat pump heating coefficient of performance (COP) of 3.6, compared to less than 1.0 for a gas boiler. The differences are big enough that even a traditional water source heat pump system with cooling tower and electric boiler might use fewer BTUs at the site than a rooftop VAV system;

A member of HPAC Engineering's editorial advisory board, the author is both a mechanical and electrical engineer, as well as in-house counsel for Energy Economics, Inc., a consulting engineering firm based near Boston MA. He can be reached at ken@energyguys.com.

Lync Engineered System Solutions

Engineered solutions that provide safe, reliable domestic hot water, mitigate risks of waterborne pathogens, and simplify planning and installation to deliver maximum efficiency and ROI will be on display by Lync, a Watts brand (North Hall – N9926) during AHR 2022. Headlining the solutions from Lync are the world's first Hot Water Wellness Solution – Element® Q – and Aegis®, North America's first commercial CO₂ heat pump water heaters.

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Aegis addresses emerging decarbonization and renewable energy initiatives. The heat pump water heater offers high-temperature production for space savings, as well as higher capacities than most commercial offerings. Remote operation of the heat pump water heaters can be done through a building automation system (BAS).

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You can also visit www.lyncbywatts.com or contact order@lyncbywatts.com.



2. Despite using many fewer BTUs, the annual energy cost for the heat pump system is considerably higher in all five cities. The increased cost ranges from 9% in Houston to 42% in Portland. The ratios make sense because Houston is cooling dominated, so the city gets little benefit from the lower cost/BTU of natural gas compared to electricity. The cost differentials would increase with a traditional water source heat pump system;

3. In Boston and Kansas City, the heat pump system source BTUs are only a few percent more than the rooftop VAV source BTUs. However, in Portland, the heat pump system uses 41% more source BTUs than the rooftop VAV system. Therefore, as long as an appreciable amount of electricity comes from fossil fuel sources, all electric systems are not likely to reduce source energy use or carbon equivalent.

The energy use projections show that when considering a heat pump system for energy savings, it is important to define how those savings will be measured. Lower site energy use does not necessarily translate into lower operating cost or lower source energy use/carbon equivalent.

VARIABLE REFRIGERANT SYSTEMS

Variable Refrigerant Flow (VRF) or Variable Refrigerant Volume (VRV) systems are increasingly popular for high efficiency, all electric heat pump applications. Newer products overcome some of the obstacles that previously limited the use of these systems, which can now provide heat down to single-digit outdoor temperatures. Also, ducted fancoils with fans that can accommodate pleated filters and distribution ductwork are now available.

One remaining hurdle is that VRF and VRV system equipment, piping, and controls are specific to each manufacturer. With conventional split systems, engineers can readily use a Brand C, J, or T condensing unit with an air handling unit from just about any manufacturer. However, at this time, it is not possible to use a Brand M fancoil on a Brand D VRF or VRV system, either new or as a replacement. The controls will not communicate, and the piping might not be compatible.

VRF and VRV systems are not always backwardly compatible. If a compressor fails in a 10-year old conventional system, it often makes economic sense to replace the entire condensing unit. Equipment design changes might preclude the option to replace an entire VRF or VRV outdoor unit instead of replacing the compressor -- the electronics and controls of the new outdoor unit might not be compatible with the old fancoil units.

Some engineers are unsure about compliance with ASHRAE Standard 15, *Safety Standard for Refrigeration Systems*, and Mechanical Code section 1103, when applying variable refrigerant flow systems.

ASHRAE Standard 15 limits the volume refrigerant in a system when a leak could discharge refrigerant into

Table 1	
Key Equipment Characteristics	
Heat pump and ERV heating COP	3.6
Heat pump and ERV cooling EER	13.4
ERV effectiveness	65%
ERV supply and exhaust fans	0.72 kW
wLoop Pump	0.54 kW
Rooftop VAV compressor	0.81 kW/ton
Rooftop unit supply fan	3.5" TSP

Table 2		
Part Load Factors		
% Load of CFM	VFD Fan % Power	Unloading % Power
0%	0%	7.2%
10%	1%	7.2%
20%	2%	14.4%
30%	4%	22.1%
40%	9%	31.0%
50%	17%	40.5%
60%	28%	50.8%
70%	41%	61.7%
80%	57%	73.6%
90%	80%	86.4%
100%	109%	100.0%

an enclosed space. In a system with multiple evaporators connected to one outdoor unit, a leak in one evaporator could discharge the entire system refrigerant volume into a single space. For the R-410A refrigerant commonly used in the VRF systems, the limit is 25 pounds of refrigerant per 1,000 cubic feet of space volume. That limit keeps the refrigerant concentration below 130,000 ppmv in case of a major refrigerant leak.

Refrigerant volume varies with system size, number of fancoils, and piping length, but 3½ to 4 pounds/ton of refrigeration capacity is a reasonable estimate. At 3¼ pounds of refrigerant/ton and a 15-ton system, the smallest enclosed space would have to be at least 2,250 cubic feet in volume (250 square feet for a 9-foot ceiling) to meet the 25 pounds/1,000 cubic feet limit, without special provisions like emergency ventilation.

Some engineers rely on dilution by outside air from mechanical ventilation (such as a heat recovery ventilator) to increase the allowable refrigerant volume because dilution air would keep the refrigerant concentration below the 130,000 ppmv limit. An ASHRAE official interpretation (15-2007-3) disagrees on the basis that the ventilation

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Table 3

Energy Use Comparison: Rooftop VAV vs. Water Source Heat Pump

	Boston	Kansas City	Houston	Phoenix	Portland, OR
ROOFTOP VAV					
Cooling kWh	11,729	13,347	24,063	17,485	11,726
Heating therms	1,446.9	1,400.1	183.9	430.5	682.1
Site MBTU/year	184,721	185,563	100,517	102,726	108,231
Source MBTU/year	264,012	274,560	249,265	212,296	183,679
Electric cost/kWh	0.1691	0.1078	0.0756	0.1081	0.0898
Gas cost/Thm	1.171	0.684	0.880	0.791	0.972
Annual cost	\$3,678	\$2,396	\$1,981	\$2,231	\$1,716
WATER SOURCE HEAT PUMP					
Heat pump cooling/heating	12,167	12,097	18,019	16,329	13,575
ERV cooling/heating	1,989	2,110	2,647	1,376	1,305
ERF fan (occupied hours only)	4,123	4,129	4,126	4,123	4,128
Heat pump unoccupied heating	7,074	6,931	1,061	2,554	3,828
Loop pump occupied	1,246	1,548	1,547	1,546	1,548
Loop pump unoccupied	2,532	2,445	1,239	2,209	2,807
Total kWh	29,131	29,260	28,639	28,137	27,191
Site MBTU/year	278,387	279,620	273,686	268,888	259,848
Annual cost	\$4,926	\$3,154	2,165	3,042	2,442
Gas/electric source energy	264,012	274,560	249,265	212,296	183,679
All electric cost	278,387	279,620	273,686	268,888	259,848
All electric increase	14,376	5,060	24,421	56,592	76,169
Gas/electric cost	\$3,678	\$2,396	\$1,981	\$2,231	\$1,716
All electric cost	\$4,926	\$3,154	\$2,165	\$3,042	\$2,442
All electric increase	\$1,248	\$758	\$184	\$811	\$726
Electricity cost from US Energy Information Administration Electric Power Monthly for June 2021 www.eia.gov/electricity/monthly/epm_table_grapher.php?t=epmt_5_6_a, retrieved 9/8/21					
Gas cost from US Energy Information Administration Natural Gas Monthly for August 2021 www.eia.gov/naturalgas/monthly, retrieved 9/8/21					
Source: Energy factors from EPA Energy Star Portfolio Manager					
	Natural gas	1.05			
	Electric grid	2.80			
HtPmp site BTU/VAV Site BTU	38%	36%	39%	45%	51%
Cost HtPmp over VAV	134%	132%	109%	136%	142%
HtPmp source/VAV source	105%	102%	110%	127%	141%

system could be off (or failed) at the time of a refrigerant leak. The general consensus seems to be to use smaller systems when rooms are small to adhere to the Standard 15 refrigerant volume limits.

CONCLUSIONS

Ground source, traditional water source, or VRF/VRV, heat pumps offer advantages that engineers can consider when selecting a system. Cost of energy and source energy use/carbon equivalent might not be among them.

Any all-electric HVAC system can be carbon free at the building, but all electric systems are not truly carbon free if any of the electricity that runs them comes from fossil-fueled generation. **HPAC**

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2. Kusuda, T and Sud, *Update: ASHRAE TC4.7 Simplified Energy Analysis Procedure*, ASHRAE Journal, July 1982, 33-39.



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‘BOILER 2022’ Finally At Hand for End-Users

PODCAST: ABMA’s first-ever conference & expo for the boiler supply chain is almost here. Event organizers explain why that’s such a big deal.

By Rob McManamy
Editor-in-Chief

It’s been more than two years since the American Boiler Manufacturers Association (ABMA) first contemplated a new trade show exclusively for the boiler supply chain. At that time, an advisory committee was formed and a date was set for BOILER 2021, to be held in Dallas last fall.

“But then COVID happened,” recalls **Shaunica Jayson**, ABMA’s director of marketing and the point person for making the new event.

Like so many best laid plans at so many organizations all over the world last year, ABMA’s schedule was completely upended by the Coronavirus pandemic which still persists, of course. As a result, the new conference and expo was pushed into the new year, renamed BOILER 2022, still set for Dallas, but timed for this spring.

For more details, we spoke with both Shaunica and ABMA Advisory Committee Chairman **Eric Graham**, of Webster Combustion Technology, about the extraordinary effort that has gone into keeping BOILER 2022 on track. Suffice to say, the fits-and-starts journey has been a memorable lesson in resilience for all involved.

What follows is a partial transcript of our January podcast. For the full show, go to HPAC.com:



HPAC: Thank you both for joining us at this exciting time for ABMA. First off, Shaunica, let’s start with you. Please tell us a bit more about BOILER 2022, its genesis and how it is different from other ABMA events, including the annual meeting this January.

Shaunica: Hi Rob, thanks for having us... Traditionally, all of our annual events, and we have two per year, have been members-only meetings. But BOILER 2022 is different because it will be our first inaugural event that is focused exclusively on the boiler supply chain. Over the past few years, ABMA has shifted its emphasis from being strictly an association of manufacturers of boilers and boiler-related products to an association focused on the entire boiler supply chain.

Part of our shift had already included more engagement with end-users of our products, with things like the launch of our podcast series, *Inside the Boiler Room*, plus special editions of our newsfeeds and *Boiler Weekly* newsletters. We’ve also repositioned our magazine, and some of the releases of our new publications and whitepapers. So, it was really time for us to take that next step forward to facilitate direct engagement with our end-users, and offer education on products and services, like insulation, operations and maintenance.

Overall, we are super-excited about BOILER 2022, and right now we’re looking at over 70 exhibitors, and we hope, 750 attendees, who will all be joining us for two action-packed days and 10 dedicated expo hours.

HPAC: Eric, as chair of the event's Advisory Committee, please explain how the show has come together and how your committee has helped to shape the user experience?

Eric: Well, we've been talking about this show for quite a while, so we are really anxious to get it going. We came up with the advisory committee almost two years ago now, and we've got 15 to 20 industry people working on it. It's a great mix of some very experienced people, like myself, and some who are newer to our industry. They give us some great perspectives on what we want the show to be, and what kind of value we can bring to our exhibitors and our attendees.

We wanted something that would be totally focused on the boiler room. So we formed subcommittees, and one was focused on the "member experience". We want our exhibitors to have a great experience, to make it easy for them to be there and show all their products. We wanted educational content, too, so we needed keynote speakers, and workshops, forums, etc. And then we have end-user engagement, which is extremely important. We need to get end-users there, whom our members and exhibitors can engage with at their booths and during the show. They're really our main focus.

Our last subcommittee is focused on arranging tours and student engagement there in Dallas. So we'll be leading tours to some local facilities and having students come in to learn more about our industry and visit with people at the show. We really want to showcase our industry and let them see all the opportunities it provides to have a great career.

Shaunica: That should be exciting. We are always about the next generation, and getting them to be more aware of the boiler industry and learning more about our association and what our industry has to offer.



BOILER 2022 Advisory Committee members: (From top left) Dustin Divinia, Scott Lynch, Grant Grothen, Jennifer Guerrero, Marissa Francis, Rocky Bahramzad, Eric Graham, Bob Langstine, Bill Testa, Alex Taylor, Bryan O'Toole, Joel Amato, Shaunica Jayson, Andrew Eklind. Not pictured: Tim Shippy, Cathy Coseno, Steve Kemp, Sam Moskosky, Brian Norris. (For company affiliations, go to BOILER2022.com.)

Eric: Yes, there are a lot of opportunities... for engineers, sales, trades people, welders, designers, drafting, etc. Just a lot of possibilities that we want them to be aware of.

HPAC: Now, due to the pandemic, this special event had to be postponed and rescheduled. Could you please tell us a bit about the challenges that presented to ABMA and how you have managed to overcome them?

Shaunica: Yes, ABMA originally announced "BOILER 2021" as a new event in January of 2020. So it was originally scheduled to take place in October 2021. But then Covid hit. And we all know how that goes.

So, by November 2020, we had decided to reschedule the event to April 2022. We had surveyed our ABMA membership and the message we got back from them was really clear: to move our inaugural conference and expo. And I think that was the really best decision for our members, our exhibitors and everyone in the boiler supply chain

HPAC: Eric, ABMA says it does not want BOILER 2022 to be a one-off. How do you envision it in the years ahead?

Eric: We really want to make this show something that we can consistently build on, and that will bring a lot of value, especially to our exhibiting members. But we only have one shot at making a good first impression, which we definitely want in Dallas. We are already planning our next show for May 2024 in Colorado. As I've said, we want to engage end-users and bring in engineers, facility managers, boiler operators, etc.

We go to a lot of shows, and it's easy to get lost in some of the bigger shows, where you might have 2,000 exhibitors, but only 70 or so from our industry. So, our idea is to give these folks a much more focused experience where it ends up being worth it for them perhaps to skip one of their other shows, and to replace it with ours.

HPAC: Eric, Shaunica, thanks for your time. We look forward to seeing you both at BOILER 2022. **HPAC**



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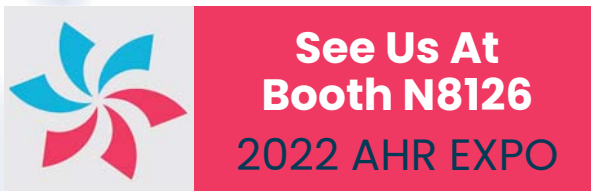
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565 Thermoplastic Butterfly Valve

The 565 Thermoplastic Butterfly Valve from GF Piping consisting of high-performance plastic components that include PVDF disc with fiber-reinforced polyamide housing and EPDM or FKM seals, making it ideally suitable for pressures up to 232 psi and temperatures ranging from 14° F to 176° F. Available in sizes from NPS 2 through 12 (DN50-300), the valve is 60 percent lighter than a comparable metal valve, allowing a single technician to safely and easily handle it during installation. The new valve comes in the same installation length as metal valves so that retrofitting requires no additional work on the pipes or new designs.

GF Piping Systems



NEXUS-LP Discrete Valve Controller

The NEXUS-LP Discrete Valve Controller from SVF is an integrated solution with switches, sensors, pilot and spool valve in a

single platform. Suitable for use on rotary applications for double-acting or spring-return actuators. 5/2 aluminum spool valve, anodized and polyester-coated. Single pilot-actuated with manual operator, 2 in. x 1/2 in. NPT conduit entries, and NAMUR and ISO 5211 adjustable bracket mounting, and NEMA 4/4X, IP67 certified.

SVF Flow Controls

PKA Wall-Mounted Indoor Units

Two new PKA models, 12 KBTU/H and 18 KBTU/H, are

now available as part of the P-Series lineup for residential and commercial single-zone applications. Engineered to provide peace of mind to the building owner and occupants, the new models operate at near whisper-quiet sound levels as low as 34 dB(A). They offer a sleek, compact design with simple installation ideal for light commercial spaces, including churches, classrooms, day-care centers, small offices or equipment rooms.

METUS



Fume Hood Exhaust Blowers

Fume hood exhaust blowers, from HEMCO. This complete line of belt- and direct-drive exhaust blowers are chemical resistant and available in standard and explosion proof models. HEMCO blowers are designed to operate effectively and efficiently to remove hazardous fumes from a fume hood. Blowers are epoxy coated steel, belt or direct drive blowers with adjustable discharge and weather covers from 250 cfm to 2000 cfm. PVC belt or direct drive blowers ranging in size from 230 cfm to 1600 cfm. A wide selection of ventilation accessories including ducting, filters, and components are available.

HEMCO



RPK-EXT External Pump Kit

The RPK-EXT External Pump Kit from Noritz is a separate, add-on component to 26 Noritz residential tankless water heater models. The new kit is engineered to perform critical functions in a closed-loop, pump-assisted, hot water recirculation system. Using a sensor to monitor the hot water line, the circulator automatically shuts off once the preset temperature is reached. Using a dedicated return line, it also sends water that has been sitting in the hot water line back to the tankless water heater for reheating and recirculation. The RC-9018M commercial remote control has customizable run times to match hot water usage needs. It comes pre-assembled with a wiring harness for quick and easy connection to the tankless unit.

Noritz

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New Navien NFC-H high capacity fire tube combi-boilers

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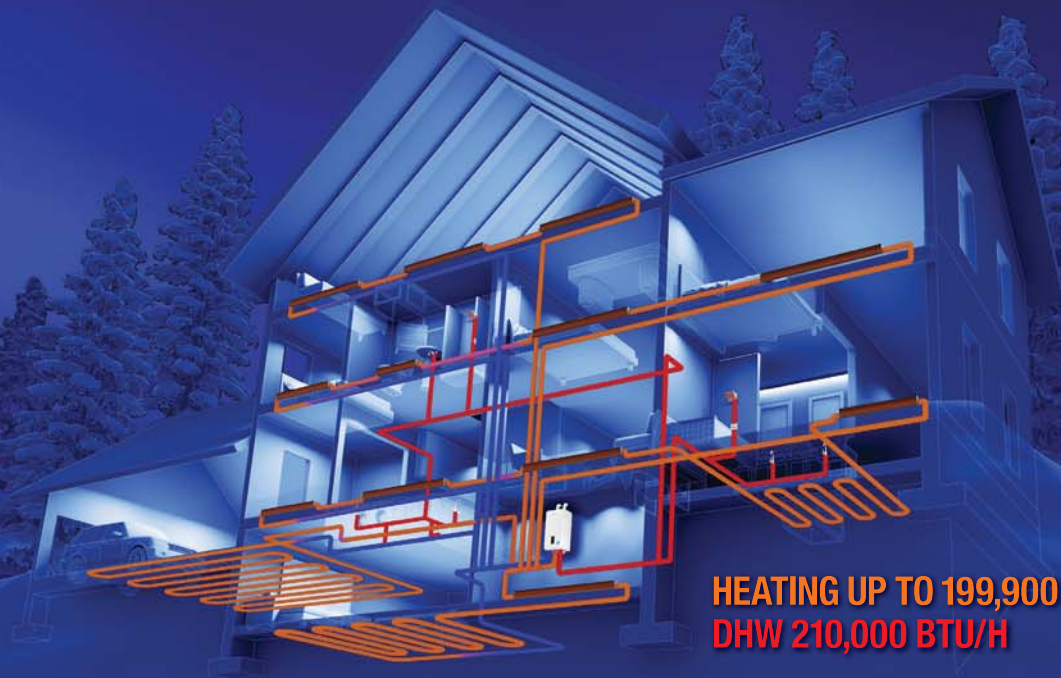
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Rinnai America Corp.



Copper, Stainless-Steel Press Technology

Copper, Stainless-Steel Press Technology from Merit Brass features shorter lay lengths, easily identifiable markings on the fitting to ensure proper application installation, and no burn permit is required because no anti-fire measures are needed. CopperPress has a patented visual leak before press ring and is available in 1/2 in. to 4 in. The stainless-steel line is available in the highly corrosion-resistant 316L. Available in IPS 1/2 in. to 2 in., the IsoTubi-USA brand mates with schedule 5 or 10 stainless-steel pipe.

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Everlast Elevate Electric Water Heater

The Everlast Elevate Electric Water Heater from HTP combines energy efficiency, durability, and maximum comfort in one easy-to-install package. The residential water heater delivers the same comfort homeowners expect from water heaters ranging in size from 55 gallons to 100 gallons from a 55-gallon platform. An adjustable thermostat paired with an ASSE 1017-certified mixing valve allows for safe and consistent temperature at the faucet while elevating the total amount of hot water available by safely turning the thermostat up to store water as high as 170° F. 316L stainless-steel construction allows the water heater to store more thermal energy without the risk of premature failure due to corrosion.

HTP



NPN-120E NONCONDENSING TANKLESS WATER HEATER

The NPN Noncondensing Tankless Water Heater from Navien is available in separate natural gas and liquid propane configurations for outdoor-only operation. NPN-120E provides 4.2 gal. per minute at 45° F temperature rise and stays in-line with the rest of the NPN series at 0.81 UEF. It offers NaviTech technology that includes a stainless-steel heat exchanger and an advanced stainless-steel burner with a very low NOx level. These units have recirculation control built into their circuit boards and are designed with a pin-to-pin matching configuration for easy retrofit installations. Additional features include Wi-Fi remote control capability with NaviLink, low noise levels for quiet operation, and a space-saving and lightweight design.

Navien

Magnaclean CMX Filters

Magnaclean CMX Filters from Adey deliver adaptive filtration for removing damaging magnetic and nonmagnetic debris from small to large commercial and industrial hydronic heating, chilled and steam systems. Each 316L stainless-steel side-stream model provides 4-in-1 filtration capabilities through a combination of powerful magnets, filter cartridges and needlefelt bag filters and acts as a chemical feed/dosing pot.

Adey



WAGS Valve

The WAGS Valve from Aquaguard is designed to shut off the water supply (plus gas supply for gas-fired heaters) in the event of a water leak from a water heater. It sits in a drip pan under the water heater and is activated when leaking water accumulates to a predetermined level in the pan, dissolving a water-soluble fiber disc. Once activated, the industrial-duty, spring-loaded piston in the valve shuts off the water flow and the gas supply, if so equipped, by breaking a fuse. A red indicator tab pops out to indicate valve activation.

Aquaguard

A promotional advertisement for Fieldpiece featuring a collection of yellow and black diagnostic tools, including handheld devices, a laptop, and a backpack, arranged on a workbench. The text reads: "MEET THE FIELDPIECE FAMILY OF PRODUCTS". At the bottom, it says: "They're tough, versatile, innovative and can handle the demands of working in HVACR." Social media icons for Facebook, Instagram, YouTube, and LinkedIn are shown, along with the website URL www.fieldpiece.com.

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Atmosphaera, with R-32

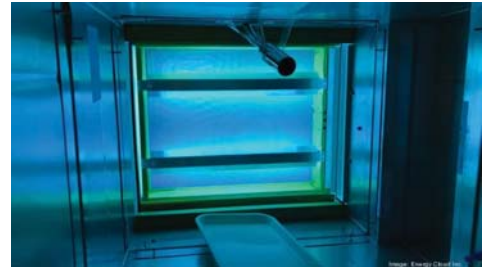
Atmosphaera is the first ductless, single-zone system with R-32 in North America, offering improved efficiency and reduced emissions over R-410A. Now available in the states of Washington, Oregon, and Florida. The system is ideal for spot cooling and heating needs in residential and commercial spaces that require heating and cooling even in extreme ambient temperatures. In addition, Daikin ATMOSPHERA is an effective source of heat to offset old, inefficient furnaces or boiler heating systems.

Daikin

Hummingbird EQ

Hummingbird EQ - Developed with the support of eminent epidemiologists and Black & Veatch engineers, Energy Cloud's new air purification system captures and deactivates airborne COVID-19 virus. Its Air Vaccine technology was independently tested at Biosafety Level 3 laboratories at the University of Southern California. The end product includes photocatalytic oxidation and incorporates UVC light, creating a catalyst with the Titanium Dioxide grid. It also packages particulate filtration, VOC reduction and viral / bacteria reduction all in one compact and efficient box.

Hummingbird EQ



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The Heat2O Heat Pump Water Heater from Mitsubishi Electric Trane produces high volume domestic hot water for commercial facilities in any climate. The all-electric system is highly efficient and environmentally friendly, featuring a COP up to 4.52 powered by natural CO2 refrigerant.

METUS





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The LG Component Solutions Business Unit specializes in compressors and motors optimized for both residential and commercial applications. Designed to fit a variety of needs, LG sources report its compressor products represent the world's best components and achieve world-class energy efficiency and eco-friendly performance. By continually working to optimize design with highly precise machining and assembly, LG Component Solutions Business Unit supplies its partners with the latest in advanced technology.

LG

101M CENTRIFUGAL PUMP

The 101M Centrifugal Pump from Oberdorfer features pump housings and mounting brackets made from cast aluminum or bronze alloy. The rotor is made from stainless steel with a hard chrome plate for improved wear properties. The stator is made from molded Nitrile. The mechanical seal is a carbon and ceramic mechanical rotary-face-type for positive sealing. The turning of the helical shaped rotor within the stationary stator creates a progressing cavity, similar to a moving piston. Liquid is thus displaced, generating a pumping action. Unlike piston pumping, extremely high pressure cannot be created because the stator is flexible. Because of this flexibility, contaminated liquids can be handled.

Gardner Denver/Oberdorfer



Series 200 High-Capacity Vacuum Breaker

The Series 200 High-Capacity Vacuum Breaker from Warren Controls is designed for outdoor tanks in areas where falling temperatures could cause the tank to collapse. The unit opens gradually to admit outside air to relieve the vacuum in the tank, caused by falling liquid levels and condensing steam. This eliminates possible damage. Available in cast-iron, carbon-steel and stainless-steel bodies and seats, the Series 200 is offered in sizes ranging from 2 to 12 in., with a variety of trim and paint options. The valves feature air relief capacities up to 14,280 SCFM of air in the largest size and ANSI Class 300 flanges.

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PD-25 AUTO HANDY

The PD-25 Auto Handy from General Pipe Cleaners combines an automatic feed with your favorite electric drill to create an easy-to-use power drain cleaner. Users can operate the drain tool as a hand tool or a power tool. Remove the turning handle and attach your drill for extra muscle on tough sink, tub and laundry drain clogs. To feed cable, just squeeze the feed lever as the container rotates; to retract cable, reverse drill rotation and squeeze the lever. The tool's miniaturized version of General's power cable feed quickly clears stoppages from 1 1/4 in. to 3 in. diameter lines up to 50 ft. long. The polyurethane drum is designed to withstand the toughest field abuse.

General Pipe Cleaners

6000 LEGIOMIX ELECTRONIC MIXING VALVE

The 6000 LEGIOMIX Electronic Mixing Valve from Caleffi features a three-way ball valve, a three-wire floating control actuator, a controller/user interface with DIN rail mounting bracket, a mixed outlet temperature sensor/probe, a return temperature sensor strap on and a mixed outlet temperature gauge. It offers optional selectable programs for thermal disinfection of hot water recirculation systems to kill Legionella bacteria. Adjustment temperature range is 70° F to 185° F; disinfection temperature range is 100° F to 185° F. The maximum operating pressure is 150 psi.

Caleffi



CORRUGATED TUBING SEISMIC CERTIFICATION

Corrugated Tubing Seismic Certification was granted to OmegaFlex's TracPipe- CounterStrike (fuel gases), MediTrac (medical gases) and DoubleTrac (liquid fuels) corrugated tubing products based on the International Code Council's Acceptance Criteria AC-156 for nonstructural building components. All three Omega Flex products can eliminate all intermediate piping system joints (historically, the leading cause of leakage after earthquakes), reduce installation time, reduce the seismic bracing demand, and lower the final system cost compared to all other traditional rigid metallic piping products. The ICC-ES ESR-4565 report represents the seismic certification by shake-table testing for these flexible piping systems as an alternative to code-prescribed requirements.

OmegaFlex

Commercial Heat Pump Water Heater Line

The Commercial Heat Pump Water Heater Line from Lochinvar consists of 20 models ranging from 25,000 to 250,000 Btu/hr. and have modular installation capabilities up to 2 million Btu/hr. This state-of-the-art product line gives specifying engineers, architects and plumbing contractors additional options to meet energy-savings and sustainability goals when bidding on large commercial properties. These models are designed for use in indoor and outdoor projects and both new construction and retrofit projects. They also offer a variety of options including six air-source, six water-source and eight modular water-source units, all of which feature a maximum 160° F water temperature and an ambient operating range of 40° F to 120° F.

Lochinvar



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ARMSTRONG PROMOTES FISCHER, MARKERT TO NEW LEADERSHIP ROLES

Armstrong Fluid Technology has announced that **Mike Fischer** has been promoted to Commercial Director, Global Building Business, and **Chris Markert** now becomes Commercial Director, USA.

Now reporting directly to CEO **Todd Rief**, Fischer joined Armstrong in 2020 as the Commercial Director for the USA and Latin America, bringing over 30 years of experience from his work with Honeywell, Johnson Controls and Siemens. Immediately prior to joining Armstrong, he was Vice President, Global Service Sales at Honeywell Building Solutions where he led a global sales team responsible for selling software and services.

At Honeywell, Fischer also led the Global Sales Excellence Team for Honeywell's Building Products Business where he introduced a disciplined sales operating system including new sales tools and training. In Armstrong's global sales leadership role, Fischer will be responsible for executing Armstrong's global strategy; enabling the sales organization



Mike Fischer



Chris Markert

to achieve both order and revenue growth targets. Fischer has an MBA from Texas Christian University, and a Bachelor of Science degree from Central Michigan University.

Rising into the role of Commercial Director, USA, Markert is a highly experienced business executive with a 30-year career of extensive global management and sales experience in the HVAC&R industry. His

business experience includes senior management positions with Honeywell International and Johnson Controls, where he had responsibility for major business units in North America, Latin America and the Asia Pacific region.

He has also owned and operated an HVAC&R contracting and service company, as well as an internet start-up focused on technology for the HVAC&R industry. Immediately prior to joining Armstrong, he served as Director of North America Service Sales with Honeywell, managing five regions. Markert holds a bachelor's degree in engineering from the University of Notre Dame. [HPAC](#)

CHARLOTTE PIPE ELEVATES PRESIDENT HOOPER HARDISON TO CEO

In December, Charlotte Pipe and Foundry's board of directors elected **Hooper Hardison** to succeed **Roddey Dowd Jr.** as CEO. Hardison joined Charlotte Pipe in 1988 and has held a variety of sales and management positions with the firm more than three decades.

Dowd Jr. assumed the CEO role from **Frank Dowd, IV**, in 2012 and served in the position for nine years. Dowd Jr. will continue working full-time in 2022 in his new role as Vice-Chairman of the Board. Frank Dowd, IV, will remain as Chairman.

"I am extremely proud to be part of an organization that values hard work, cares about its associates, and gives back to the communities in which we live and work," Hardison said. "It has been an honor to be a part of this great company, and I am excited about our future."

The Board also elected fifth generation Dowd family members **Roddey Dowd, III**, and **Jenner Wood**, as well as **Joseph Pantone**, as vice presidents.



Above, from left, directors William Hutaff, Jenner Wood, Ned Hardison, Roddey Dowd Jr. (vice chair), Hooper Hardison (at right), Frank Dowd IV (chairman), and Roddey Dowd III.

Headquartered in Charlotte NC and founded in 1901, the privately held firm has seven plants across the U.S. where it manufactures cast iron and plastic pipe and fittings for plumbing applications. [HPAC](#)



Hooper Hardison



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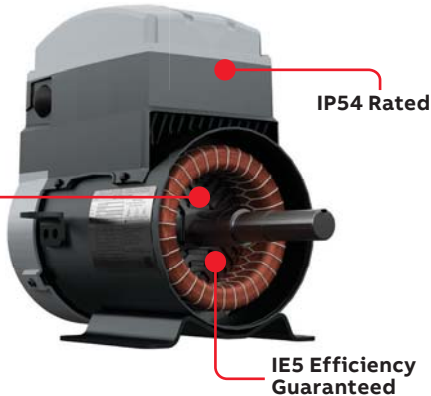



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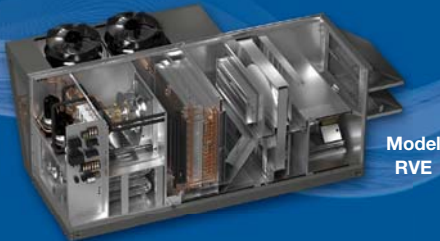


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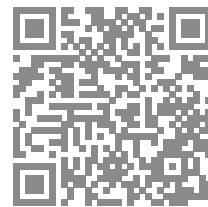


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Larry Clark

A regular contributor to HPAC Engineering and a member of its editorial advisory board since 2012, the author is a principal at Sustainable Performance Solutions LLC, a south Florida-based engineering firm focusing on energy and sustainability. Email him at larry@sustainflorida.com.

The push for electric vehicles (EV) is all over the news these days.

In the U.K., the Government's Net Zero Strategy could force auto manufacturers to significantly increase annual EV sales in order to accelerate the shift to zero-emission passenger cars. According to the U.K. Dept. for Business Energy & Industrial Strategy, the proposed zero-emission mandate for 2024 could result in fines for auto makers who phase out gas and diesel cars too slowly.

Here in the U.S., in spite of the Biden Administration's public support for EV, the Corporate Average Fuel Economy (CAFE) standard was recently revised and rebranded as the Safer, Affordable Fuel-Efficient (SAFE) vehicle standard. But the energy efficiency targets for model years 2021-2026 were substantially lower than those under the 2020 CAFÉ. And the \$7,500 maximum federal tax credit for an EV purchase was left in place (except for Tesla and GM, which sold more than 200,000 EVs), but not renewed.

The real EV policies are being passed at the state level. Since California issued its Low Emissions Vehicles regulations limiting greenhouse gas (GHG) emissions, more than 30% of new U.S. autos now comply. And other states are now considering zero-emission mandates like that issued by CA Gov. Gavin Newsom in his Executive Order targeting 2035. Although total auto sales fell 23% in 2020, likely due to the pandemic, EV sales still improved.

Personally, I knew that EVs were more than just a fad when I saw the Mustang Mach-E!

Granted, there is no question that EV have advantages over gas-powered cars. The largest, of course, is the ability to drive past those gas stations and their rising fuel prices. And they don't directly emit GHG and pollutants, including CO₂, CO, NO_x, particulates, and other unburned hydrocarbons. But are they really as environmentally friendly as the media reports?

After all, EVs still rely on batteries that require energy to produce and toxic components to be disposed of at end-of-life.

Upon launching *Clark's Remarks* in 2013, I wrote about embodied-energy (the amount of energy needed to produce a material). And earlier this year, I specifically addressed the need to include embodied energy in any discussion of a product's sustainability.

There are also some practical considerations to address before we accept EV as the environment's panacea. An article in *Nature* in September 2020 concluded that reaching the 2 deg. C global climate action target with EV, alone, would require replacing more than 350 million vehicles still on the road, consumption of 50% of the U.S. electric energy demand, and excessive amounts of critical materials.

Call me a pessimist, but that's probably not going to happen. Why?

Well, some regions (i.e. Texas) don't have adequate grid capacity without adding millions of EV charging stations, and many Americans live in multifamily buildings that will not easily be converted so that every EV has its own charging station. Although the technology is continually improving, it still takes time to fully charge these vehicles.

Eventually, AAA will probably carry an EV charger. But in the meantime, if you were stranded for hours in one of the multi-car, ice-related accidents over the long Christmas weekend, you had a better chance of getting gas to keep your engine (and heater) running, than to get an EV charge. On the plus side, EV does require less maintenance. But when they do require maintenance it can be pricey.

EV are an obvious part of the climate change solution, but reducing our dependency on personal cars by developing alternate transportation solutions makes a lot more sense.

In South Florida, we now have high-speed rail between Miami, Fort Lauderdale, and West Palm Beach. In 2022, the service will extend to Orlando. It will start carrying passengers in early 2023, and the 235-mile Miami to Orlando ride will be faster than cars, cheaper and more convenient than planes, and safer and more sustainable than either. **HPAC**



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