

# HPAC

SEPTEMBER/  
OCTOBER 2023  
www.hpac.com

HEATING / PIPING / AIR CONDITIONING

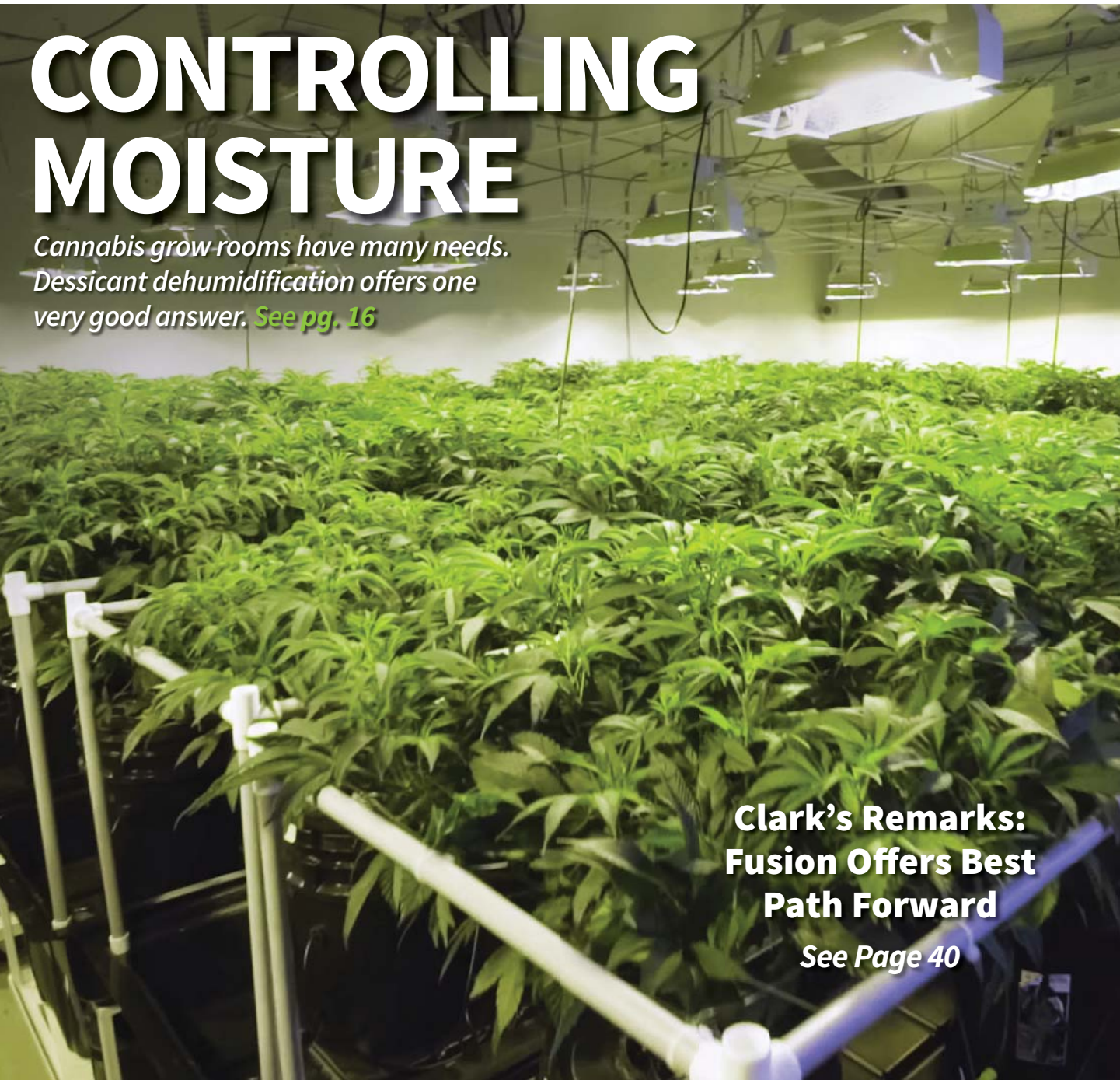
# Engineering®

## CONTROLLING MOISTURE

*Cannabis grow rooms have many needs. Dessicant dehumidification offers one very good answer. See pg. 16*

**Clark's Remarks:  
Fusion Offers Best  
Path Forward**

*See Page 40*



## **Digital Edition Copyright Notice**

The content contained in this digital edition (“Digital Material”), as well as its selection and arrangement, is owned by Endeavor Business Media, and its affiliated companies, licensors, and suppliers, and is protected by their respective copyright, trademark and other proprietary rights.

Upon payment of the subscription price, if applicable, you are hereby authorized to view, download, copy, and print Digital Material solely for your own personal, non-commercial use, provided that by doing any of the foregoing, you acknowledge that (i) you do not and will not acquire any ownership rights of any kind in the Digital Material or any portion thereof, (ii) you must preserve all copyright and other proprietary notices included in any downloaded Digital Material, and (iii) you must comply in all respects with the use restrictions set forth below and in the Endeavor Business Media Privacy Policy and the Endeavor Business Media Terms of Use (the “Use Restrictions”), each of which is hereby incorporated by reference. Any use not in accordance with, and any failure to comply fully with, the Use Restrictions is expressly prohibited by law, and may result in severe civil and criminal penalties. Violators will be prosecuted to the maximum possible extent.

You may not modify, publish, license, transmit (including by way of email, facsimile or other electronic means), transfer, sell, reproduce (including by copying or posting on any network computer), create derivative works from, display, store, or in any way exploit, broadcast, disseminate or distribute, in any format or media of any kind, any of the Digital Material, in whole or in part, without the express prior written consent of Endeavor Business Media. To request content for commercial use or Endeavor Business Media’s approval of any other restricted activity described above, please contact the Reprints Department at (877) 652-5295. Without in any way limiting the foregoing, you may not use spiders, robots, data mining techniques or other automated techniques to catalog, download or otherwise reproduce, store or distribute any Digital Material.

NEITHER Endeavor Business Media NOR ANY THIRD PARTY CONTENT PROVIDER OR THEIR AGENTS SHALL BE LIABLE FOR ANY ACT, DIRECT OR INDIRECT, INCIDENTAL, SPECIAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OF OR ACCESS TO ANY DIGITAL MATERIAL, AND/OR ANY INFORMATION CONTAINED THEREIN.

# Introducing: Clean, Outdoor Air



Greenheck's model KSQ roof supply fan is designed, engineered and tested to be the performance leader. Multiple intake and discharge configurations provide application flexibility with a mixed flow wheel that improves airflow and efficiency while reducing sound and footprint. Introduce more clean outdoor air into your application with the KSQ.



**Specify with Confidence. Specify Greenheck.**

©2023 Greenheck



# EnviroKIT™

## Make it Simple. Make it Quick.

### A Sustainable Retrofit Solution for Vertical Stack Fan Coil Applications

Visit [iec-okc.com/EnviroKIT](http://iec-okc.com/EnviroKIT)  
to learn more.





## COVER STORY

### Latent Loads Matter: HVAC for Cannabis Grow Facilities

Desiccant dehumidification is one of the most cost-effective, efficient, and sustainable options for grow room climate control.

By David Schurk

## FEATURES

### 26 How to Maintain Constantly Evolving Smart Buildings

Modern building systems must support devices from yesterday, today, and tomorrow. Here are some best practices for how to make that all work.

By Brian Meyers & Chris Gist



### 28 CDC: Fewer Than Half of U.S. Schools Have Improved Ventilation

New research shows that most K-12 schools have not yet used federal pandemic relief earmarked for IAQ upgrades. But it's not too late to act.

By Joe Kalman



## DEPARTMENTS

### 8 Editor's Notes

Flying Taxis and Busy People

By Rob McManamy

### 22 HPAC On The Air

Climate Challenge Accepted,  
with Ginger Scoggins

By Rob McManamy

### 34 New Products

### 40 Clark's Remarks

Fusion Likely Best Path to Clean  
Nuclear Energy

By Larry Clark

## BOILER SYSTEMS ENGINEERING

### 30 BOILER 2024: Keynote Announced, Tours Set for Denver Event

ABMA releases details for next May's big event at the Gaylord Rockies Resort and Convention Center. Registration set to open in late September.

By Shaunica Jayson

## NEWS & NOTES

### 10 Soft Landing More Likely, Industry Remains Confident

As autumn arrives, the U.S. economy continues to exhibit more strength with less and less fear of those dire predictions.

By Rob McManamy

### 14 Model State Indoor Air Quality Act Proposed

Johns Hopkins researchers are urging states to create legislation aimed at improving IAQ in public spaces—and offering them the tools to do so.

By Aleya Rentz and Aliza Rosen

**HPAC Engineering** (USPS Permit 464-930, ISSN 0039-0895 print, ISSN 1930-8957 online) is published 6x a year (Jan/Feb., Mar/Apr, May/June, Jul/Aug, Sep/Oct, Nov/Dec) by Endeavor Business Media, LLC, 1233 Janesville Ave., Fort Atkinson, WI 53538. Periodical postage paid at Fort Atkinson, WI, and additional mailing offices. POSTMASTER: Send address changes to HPAC Engineering, PO Box 3257, Northbrook, IL 60065-3257. SUBSCRIPTIONS: Publisher reserves the right to reject non-qualified subscriptions. Subscription prices: U.S. (\$111.25); Canada/Mexico (\$123.75); All other countries (\$148.75). All subscriptions are payable in U.S. funds. Send subscription inquiries to HPAC Engineering, PO Box 3257, Northbrook, IL 60065-3257. Customer service can be reached toll-free at 877-382-9187 or at HPACEngineering@omeda.com for magazine subscription assistance or questions.

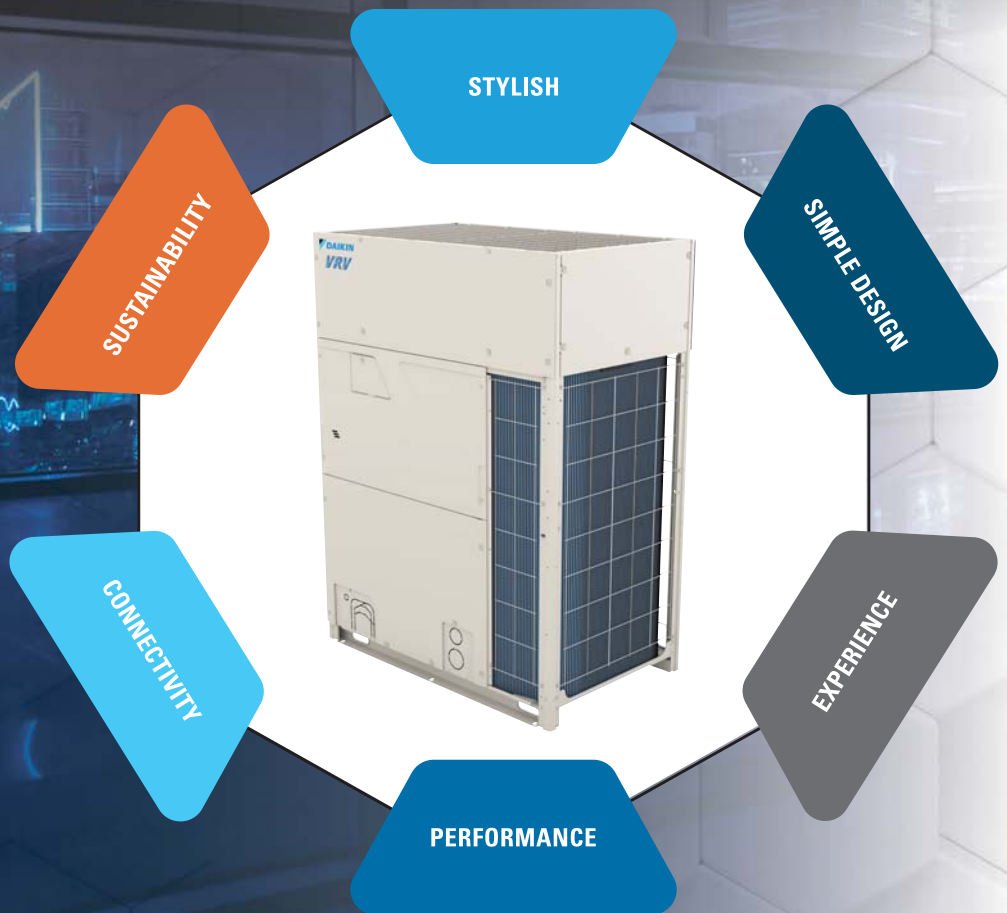
Printed in the USA. Copyright 2023 Endeavor Business Media, LLC. All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopies, recordings, or any information storage or retrieval system without permission from the publisher. Endeavor Business Media, LLC does not assume and hereby disclaims any liability to any person or company for any loss or damage caused by errors or omissions in the material herein, regardless of whether such errors result from negligence, accident, or any other cause whatsoever. The views and opinions in the articles herein are not to be taken as official expressions of the publishers, unless so stated. The publishers do not warrant either expressly or by implication, the factual accuracy of the articles herein, nor do they so warrant any views or opinions by the authors of said articles.



# VRV EMERION

From the world's #1 air conditioning company, discover a new level of *Air Intelligence!*

Daikin continues its tradition of providing localized HVAC solutions for the North American market with a completely reengineered VRV lineup. The new VRV EMERION offers new features and benefits with major improvements in design, performance, installation, maintenance, connectivity, and sustainability compared to previous models.





# Reduces Set Up Time, Increases Efficiency



Get the right pump for your application with the Taco 1911ecm™ & 1915ecm™ high-efficiency ECM pumps.

- Intuitive pump interface allows for quick start-ups
- Class-leading efficiency
- Constant speed, constant pressure, or proportional pressure modes
- BMS 0-10Vdc; 2-pump operation
- NSF/ANSI 61 & 372 Commercial Hot certified
- Heating, cooling, and potable water applications
- 1911ecm: 425W, 50 feet max head, 105 GPM max flow
- 1915ecm: 650W, 65 feet max head, 120 GPM max flow

**Taco**  
Comfort Solutions®  
A Taco Family Company



# COMMERCIAL INSTALL?



## **We'll Make Sure You're Ready for Anything.**

No matter the application, we've got a Built to be the Best® product to fit the job at hand. With innovative features, which now include exclusive Microban® antimicrobial product protection, you can feel confident about the performance and reliability of every install when you choose Bradford White.



**BRADFORD WHITE**<sup>®</sup>  
WATER HEATERS  
Built to be the Best<sup>®</sup>



**FOR THE PRO**  
Join Now.



Microban<sup>®</sup> antimicrobial product protection helps prevent the growth of bacteria, mold and mildew that may affect the product. The built-in antimicrobial properties do not protect users or others from disease-causing organisms. Microban<sup>®</sup> is a registered trademark of Microban Products Company. ©2023, Bradford White Corporation. All rights reserved. BWHPEN0923

**EDITORIAL  
 ADVISORY BOARD:**
**William G. Acker**  
 Acker & Associates

**William P. Bahnfleth, PhD, PE**  
 The Pennsylvania State  
 University

**David W. Bearg, PE**  
 Life Energy Associates

**Don Beaty, PE, FASHRAE**  
 DLB Associates Consulting  
 Engineers

**Lawrence (Larry) Clark,  
 QCP, GGP, LEED AP+**  
 Sustainable Performance  
 Solutions LLC

**Peter D'Antonio, PE, CEM,  
 LEED AP**  
 PCD Engineering Inc.

**Kenneth M. Elovitz, PE, Esq.**  
 Energy Economics Inc.

**Thomas Hartman, PE**  
 The Hartman Co.

**Asif Kadiani, PE, CEM**  
 Murphy Co.

**John H. Klote, PE, DSc**
**Valentine A. Lehr, PE,  
 FASHRAE**  
 Lehr Consultants International

**Mark S. Lentz, PE**  
 Lentz Engineering  
 Associates Inc.

**Joel N. Orr, PhD**  
 Orr Associates International

**J. Jay Santos, PE**  
 Facility Dynamics Engineering

**Andrew J. Streifel, MPH**  
 University of Minnesota

**James P. Waltz, PE,  
 CEM, ACFE**  
 Energy Resource Assoc. Inc.

**Michael K. West, PhD, PE**  
 Advantek Consulting

**Ron Wilkinson, PE, LEED AP**  
 Wilkinson Commissioning  
 Management

**Gerald J. Williams, PE,  
 LEED AP**  
 8760 Engineering LLC

# Flying Taxis and Busy People

**A**s I was preparing this latest missive, I heard on the news that the State of Ohio had just signed a deal Sept. 18 with Joby Aviation Inc. to build a \$500-million factory in Dayton OH for the manufacture of air taxis.

Wait, what? Yes, another staple of science fiction is now on the verge of becoming reality.

Small, “electric vertical takeoff and landing” (eVTOL) aircraft could soon be in use alleviating traffic in metropolitan areas across the U.S. and around the globe. At least that’s what the manufacturer promises.

“When you’re talking about air taxis, that’s the future,” Ohio Gov. **Mike DeWine** gushed to The Associated Press on Sept. 18. “We find this very, very exciting.”



**Rob McManamy**  
 Editor-in-Chief

So exciting, in fact, that the state has committed up to \$325 million in incentives to support the project. As designed, the electric planes would hold up to five passengers and a pilot, and basically hop from

rooftop to rooftop, landing atop parking garages and other flat surfaces.

I bring this up here not to endorse or scoff at the idea of urban air taxis. But just to acknowledge that innovation is happening all around us every day, in areas most of us are not even thinking about. And that gives me real hope that we may yet solve our planet’s most vexing and worrisome problems before it’s too late.

Of course, change happens at its own pace. I remember 50 years ago this fall attending a college football game in Annapolis MD between Navy and the Air Force Academy. To the crowd’s amazement, the halftime show included a Harrier jet landing vertically on the field and then taking off. As a youngster, I was in awe. But to my surprise, I never saw that technology again, except in movies. Now, an updated form of

it could be around every other downtown corner by 2028, if not sooner.

Despite the delay, that reassures me that we as a species, and as an industry, still have the capacity to right wrongs and to correct course for the next generation, eventually even led by that next generation.

In my last *Editor’s Notes*, I quoted new ASHRAE President **Ginger Scoggins**, who later joined us as a guest for a new episode of *HPAC On The Air*. (See the transcript of our conversation on p. 22.) “**If you want something done, give it to a busy person,**” she mused on the podcast, acknowledging that her professional plate is incredibly full.

But toward that end, the theme of her presidential year is “*Challenge Accepted: Tackling the Climate Crisis.*”

With that in mind, this fall in Washington, ASHRAE is co-hosting *The 2023 Decarbonization Conference for the Built Environment*, a significant, multi-stakeholder event co-sponsored by the American Institute of Architects (AIA), the Association of Physical Plant Administrators (APPA), the Building Owners and Managers Association (BOMA), and the International Facility Managers Association (IFMA). The idea is finally to get all of these groups on the same page, and to leverage their combined resources, including more than 200,000 combined members, to jointly address the existential crisis of our time.

The conference goal is “to discuss the design, construction, ownership, and operation of facilities targeted for reduced or neutral impact on the environment with respect to carbon footprint. A primary objective is to enhance the knowledge base in North America on decarbonization efforts... (It) will focus on educating attendees on methods to decrease carbon emissions, both embodied and operational, in order to reduce the impact of buildings on the climate crises.”

Of course, all of the attendees and presenters are “busy people.” But that also means they are aware and motivated. So, I feel confident that if they give each other important tasks to do, they will get done. And that will truly benefit us all.

# *Leaders in factory engineered systems.*



## EPS

### *Engineered Pump Systems*

Grinder Systems  
Solids Handling Systems  
Effluent Systems  
Simplex  
Duplex  
Triplex  
Quadplex

Order a Liberty EPS and you'll get the assurance of the complete system arriving to the job-site with factory matched components - pump, panel, basin, internal piping, guide rails, floats - all from one source. With an almost unlimited number of basin and panel options - we can customize a system for your specific application.

#### **Need it fast?**

Specify a pre-designed system from Liberty! Pre-designed systems are available and ready to ship in 24 hours. Consult factory for more information on our pre-designed packages.

### **X-Series™**

Explosion-proof models available for hazardous locations!



# **Liberty Pumps®**

A Family and Employee Owned Company

**800-543-2550**  
**[www.LibertyPumps.com](http://www.LibertyPumps.com)**

Copyright © Liberty Pumps, Inc. 2023 All rights reserved.

# Soft Landing More Likely, Industry Remains Confident

*As autumn arrives, the U.S. economy continues to exhibit more strength with less and less fear of those dire predictions.*

After nearly a year of doom and gloom, with many seeing recession around every corner, and the Federal Reserve Bank seemingly obsessed with taming inflation — no matter the cost— the U.S. economy still has not succumbed.

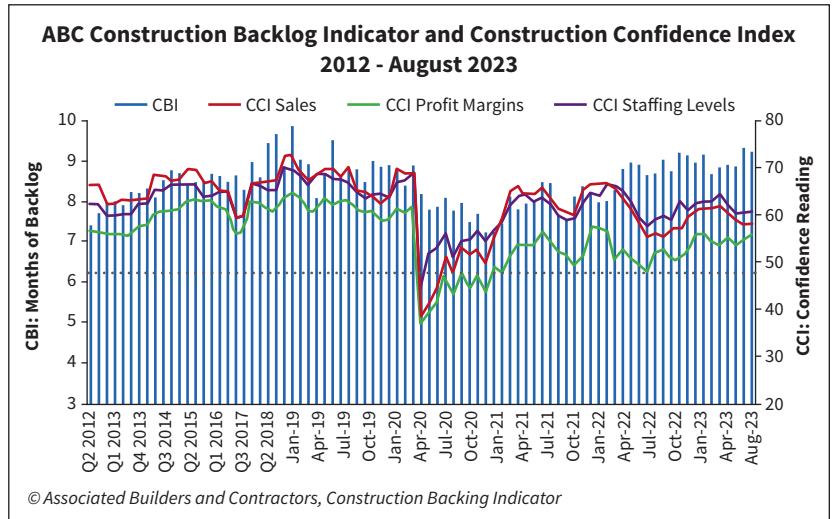
On the contrary, as AEC firms this fall start focusing more attention on 2024 planning and industry analysts prepare their forecasts for later this year, the darkest clouds appear to have lifted. (Provided the U.S. can avoid a budget stalemate and government shutdown in October, of course.)

“Almost all the available evidence suggests that the U.S. economy is achieving what many economists had thought impossible — a soft landing in which inflation returns to acceptable levels without a recession,” said economist **Paul Krugman** on Sept. 15.

Three days earlier, **Anirban Basu**, chief economist for Associated Builders and Contractors (ABC) gave his own assessment. “There’s no sign of a construction recession in the near term. If anything, contractors are more upbeat, as policy and technology shifts along with economic transformation, are creating substantial demand for improvements and growth in America’s built environment.”

Basu made his comment after ABC released its latest monthly Construction Backlog Indicator (CBI), which declined slightly to 9.2 months in August. The measure was down by just 0.1 month, according to an ABC member survey done between Aug. 21 and Sept. 6. Still, the reading is 0.5 months above the August 2022 level.

“Backlog continues to be at the upper end of historic levels, with the infrastructure category registering



Construction Backlog Indicator					
	August 2023	July 2023	August 2022	1-Month Net Change	12-Month Net Change
<b>Total</b>	<b>9.2</b>	<b>9.3</b>	<b>8.7</b>	<b>-0.1</b>	<b>0.5</b>
<b>Industry</b>					
Commercial & Institutional	9.5	9.8	9.1	-0.3	0.4
Heavy Industrial	7.7	5.2	7.4	2.5	0.3
Infrastructure	10.2	8.2	8.2	2.0	2.0
<b>Region</b>					
Middle States	8.4	8.1	7.2	0.3	1.2
Northeast	8.8	9.6	8.0	-0.8	0.8
South	11.4	10.6	10.9	0.8	0.5
West	8.3	8.9	9.1	-0.6	-0.8
<b>Company Size</b>					
<\$30 Million	8.4	8.7	7.8	-0.3	0.6
\$30-\$50 Million	10.8	11.0	10.0	-0.2	0.8
\$50-\$100 Million	12.8	12.9	13.1	-0.1	-0.3
>\$100 Million	13.8	10.6	13.9	3.2	-0.1

© Associated Builders and Contractors, Construction Backing Indicator

substantial gains in backlog in August,” Basu noted. “That suggests that a growing number of public works projects is poised to break ground.”

ABC’s Construction Confidence Index (CCI) reading for sales, profit margins and staffing levels moved

higher in August. All three readings remained above the threshold of 50, indicating expectations of growth over the next six months.

“While a plurality of contractors expects only small improvements in sales, profit margins and staffing over



NOT ONLY ARE WE  
**MADE IN AMERICA –**



WE HELPED  
**BUILD**

**AMERICA.**

**CHARLOTTE**  
PIPE AND FOUNDRY COMPANY

Since 1901, we've been manufacturing the highest-quality pipe and fittings right here in the USA by people such as maintenance mechanics **Daniel Furr** and **Matthew Early**. As a fifth-generation family-owned business, we're still making the products that protect the health of the nation while supporting the plumbing contractors and engineers who choose them.

Learn more about our commitment  
at [BehindCharlottePipe.com](https://www.behindcharlottepipe.com)



Producer Price Index, August 2023			
	1-Month % Change	12-Month % Change	Change Since Feb. 2020
<b>Inputs to Industries</b>			
Inputs to Construction	1.5%	-0.2%	40.7%
Inputs to Multifamily Construction	1.0%	0.8%	38.7%
Inputs to Nonresidential Construction	1.5%	0.2%	41.5%
Inputs to Commercial Construction	0.9%	0.1%	41.1%
Inputs to Healthcare Construction	0.9%	0.1%	40.5%
Inputs to Industrial Construction	1.4%	1.9%	36.7%
Inputs to Other Nonresidential Construction	1.7%	0.1%	41.7%
Inputs to Maintenance and Repair Construction	1.7%	-0.7%	38.9%
<b>Commodities</b>			
Adhesives and Sealants	0.0%	2.8%	33.8%
Brick and Structural Clay Tile	0.0%	6.4%	24.8%
Concrete Products	0.6%	8.7%	32.2%
Construction Machinery and Equipment	0.0%	6.0%	26.5%
Copper Wire and Cable	-3.3%	3.2%	28.8%
Crude Petroleum	-5.9%	-12.5%	66.5%
Fabricated Structural Metal Products	-0.7%	-1.5%	51.8%
Gypsum Products	-0.7%	-0.8%	41.0%
Hot Rolled Steel Bars, Plates, and Structural Shapes	-0.5%	-9.7%	55.3%
Insulation Materials	-0.3%	2.3%	37.1%
Iron and Steel	-2.5%	-10.3%	60.6%
Lumber and Wood Products	-0.4%	-9.4%	25.3%
Natural Gas	-5.3%	-77.7%	27.9%
Plumbing Fixtures and Fittings	0.3%	2.3%	18.2%
Prepared Asphalt, Tar Roofing and Siding Products	1.9%	3.2%	39.4%
Softwood Lumber	-1.3%	-18.0%	16.3%
Steel Mill Products	-0.6%	-14.8%	75.0%
Switchgear, Switchboard, Industrial Controls Equip.	1.5%	6.7%	37.4%
Unprocessed Energy Materials	-5.0%	-40.6%	72.9%

Source: U.S. Bureau of Labor Statistics

the next six months, even incremental improvement is remarkable in the context of tightening credit, higher project financing costs and lingering fears of recession,” added Basu.

### Inflation Down, But Still Concerning

Financing costs, of course, mean interest rates, and the Federal Reserve Bank has spent the last 18 months raising those rates 11 times, from near zero in March 2022 to 5.5% this July. The goal, of course, has been to bring the U.S. core inflation rate down to 2.0%. As a result, inflation has dropped from a post-pandemic high of 8.5% early last year to 3.2% this August.

Despite that relatively rapid progress, however, at press time, most still expected the Fed to raise interest rates again in late September.

Speaking at the Fed’s annual symposium Aug. 25 in Jackson Hole, WY, Fed Chairman **Jerome Powell** was poetically opaque in his latest assessment.

“We are navigating by the stars under cloudy skies,” he said. “At upcoming meetings, we will assess

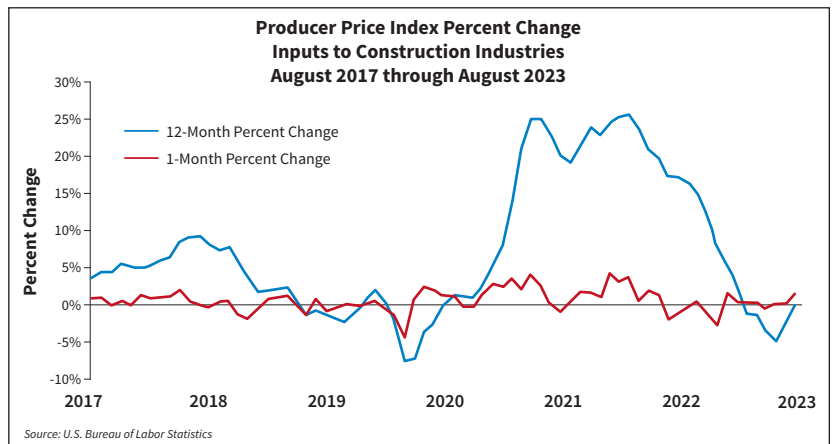
our progress based on the totality of the data and the evolving outlook and risks... Restoring price stability is essential to achieving both sides of our dual mandate. We will need price stability to achieve a sustained period of strong labor market conditions that benefit all... We will keep at it until the job is done,” Powell concluded.

Looking specifically at the construction industry, the price of materials and services used in nonresidential construction increased 1.1% from July to August, driven by an extreme jump in diesel fuel costs, according to data from the U.S. Bureau of Labor Statistics (BLS), and analysis by Associated General Contractors of America (AGC).

“The steep climb in diesel prices since July is a reminder that construction cost worries have not gone away,” said AGC chief economist **Ken Simonson** on Sept. 14. “An even greater challenge for most contractors is finding enough qualified workers to complete the many projects available to work on.”

The producer price index (PPI) for diesel fuel, which covers the selling price at the terminal rack or refinery, soared 34.6% from mid-July to mid-August, the largest one-month jump since 1990. Simonson noted that retail diesel prices have continued rising since then and have climbed 77 cents per gallon in the past 10 weeks.

Overall, the 1.1% monthly increase in construction input costs was the largest





Federal Reserve Bank

*Fed Chair Jerome Powell spoke in Jackson Hole in late August, stating that he remains committed to reducing core inflation.*

since January, Simonson pointed out. In contrast, the index for new nonresidential building construction—a measure of the bid prices contractors said they would charge to erect a set of new structures—edged up just 0.2% in August.

He noted that both indexes posted relatively mild year-over-year changes: 0.1% for inputs and 4.0% for bids.

Prices for most major construction inputs other than fuel were stable or declined in August, according to BLS.

Indexes for cement and architectural coatings such as paint were flat. There were decreases of 0.2% in the index for plastic construction products, 0.5% steel mill products, and 0.4% for gypsum building materials. [HPAC](#)



# WORK SMART

GET MORE DONE IN LESS TIME.

Take the guesswork out of configuration and diagnostics for hundreds of service calls with the innovative White-Rodgers Connect app and universal heating controls. No more fiddling with dipswitches, counting flashing LEDs or looking up fault codes. White-Rodgers Connect is preloaded with OEM default settings to save you time on installation. With more cross references than any other supplier, you can carry less and replace more.

Configure | Diagnose | Troubleshoot from your smartphone.



LEARN MORE

**COPELAND**

**WHITE-RODGERS**

©2023 Copeland LP | All rights reserved | The Copeland and White-Rodgers logos are trademarks and service marks of Copeland LP or one of its affiliates. | R-5773



# Model State Indoor Air Quality Act Proposed

*Johns Hopkins researchers are urging states to create legislation aimed at improving IAQ in public spaces—and offering them the tools to do so.*



Johns Hopkins Bloomberg School of Public Health

By ALELYNA RENTZ and ALIZA ROSEN,  
Johns Hopkins Bloomberg School of Public Health

**O**pen any weather report for your area, and in addition to temperature and humidity levels, you'll also find the current outdoor air quality. But what about when you enter a school, an office building, a hospital, or a grocery store?

How do you know what that building's air quality is? The air we breathe directly impacts our health and well-being. While air quality outdoors is monitored and regulated by the federal government, that's not the case indoors—where the average American spends at least 90% of their time.

Experts from the Johns Hopkins Center for Health Security are calling on states to create legislation aimed at improving indoor air quality in public spaces—and giving them the tools to do so through the new Model State Indoor Air Quality Act, published Aug. 17.

## What's Contaminating Our Indoor Air?

Many infectious diseases, including COVID, flu, RSV, and measles, spread through airborne transmission, which occurs much more easily in indoor environments.

"But there are a lot of other things that are in the air too, that are really unhealthy for you," explains **Gigi Gronvall, PhD**, an associate professor of Environmental Health and Engineering and a senior scholar at the Center for Health Security.

Indoor air quality can be polluted by a range of sources, including mold, radon, carbon dioxide, particulate matter, chemicals in cleaning products, off-gassing from building materials and furnishings, and even outdoor air pollution. In fact, the concentration of some pollutants indoors is two to five times higher than outdoors.

## How the Air We Breathe Can Help or Harm us

The pandemic made clear the role of ventilated, clean air in preventing the spread of COVID, and research shows

*Alelyna Rentz is a marketing specialist for the Johns Hopkins Bloomberg School of Public Health. Aliza Rosen is a digital content strategist in the Office of External Affairs at the Johns Hopkins Bloomberg School of Public Health.*

**Fieldpiece**

**BUILT TOUGH FOR ANY HEATING JOB**

**COMBUSTION ANALYZER HC CAT85**



Accurate measurement of O<sub>2</sub>, CO, CO<sub>2</sub>, live draft pressure

Flue probe with HydroCycle™ pump - automatically separates and returns water to the flue

SensorVault™ technology prolongs sensor life

Built-in dual port manometer

Job Link® System App integration

Job Link

Learn more at [www.fieldpiece.com/combustionanalyzer](http://www.fieldpiece.com/combustionanalyzer)

Facebook Instagram YouTube LinkedIn

that improved air filtration and ventilation can also increase employee performance and productivity as well as improve test scores and teacher retention rates.

Repeated exposure to poor indoor air quality (IAQ), on the other hand, has been proven to:

- Lead to respiratory diseases, heart disease, and cancer;
- Exacerbate asthma symptoms;
- Increase student and teacher absenteeism, disrupting the learning process and student performance.

“It’s not something we should be ignoring,” says Gronvall. “If you breathe poor air, you’re not going to do as well, you’re not going to think as well.”

### What States Can Do

The Model State Indoor Air Quality Act (MSIAQA) was developed by the Center for Health Security in partnership with legal experts. It provides a legal framework for states and localities to implement legislation that will result in improved IAQ in public buildings by:

- Setting up state advisory councils to set standards appropriate for states’ needs;
- Requiring that indoor air quality be measured and the results posted publicly;
- Setting up a system for people to report health impacts potentially caused by bad air and for the state to investigate these reports and order necessary fixes.

It outlines best practices for how state and local governments can:

- Make sure legislation is actually enforced;
- Have authorities test IAQ and publish reports in buildings—not unlike restaurant health inspections;
- Educate the public about IAQ and the many benefits of clean air;
- Allow experts to determine what levels of indoor pollution are and are not acceptable;
- Incentivize building owners to maintain clean air in their properties.

### Why We Need Consistent Regulation

While federal law regulates outdoor air pollution, “there is little federal legal support to protect peoples’ health through improved IAQ or to incentivize IAQ improvements,” reads the preface of the act. As a result, IAQ measures that have been put in place at the state, tribal, and local levels are not comprehensive or consistent.

“It’s really a patchwork,” says Gronvall, noting that some policies address only certain pollutants, like radon or secondhand smoke, and only certain spaces, like schools. The MSIAQA, she says, “offers a way to regulate more than just one thing or more than one environment.”

“Everyone deserves healthy indoor air,” says **Paula Olsiewski, PhD**, a contributing scholar at the Center for

Health Security and co-lead of the Center’s IAQ project team. “This model act gives states the tools to ensure that the air in public buildings is safe for people to breathe, whether the most urgent concern is airborne diseases, wildfire smoke, or asthma.”

### What You Can Do Right Now

Individuals don’t need to wait for state or federal regulation to clean the air in their own spaces. A few simple changes can improve air quality in homes and offices:

- If your home has an HVAC system, installing a higher efficiency filter, such as a MERV 13, will greatly improve filtration;
- People whose homes use natural ventilation rather than central air conditioning can create DIY portable air cleaners simply by attaching a MERV 13 filter to a box fan made in 2012 or later (window units don’t work);
- Run a portable HEPA air cleaner continuously in a room where people are gathered to keep house guests or coworkers safer;
- Consider installing a carbon dioxide detector to make sure your home has optimal air ventilation. [HPAC](#)

## EVERGREEN TELEMETRY

**Faster.  
Easier.  
Safer.**


### 250psi Water Pressure Module

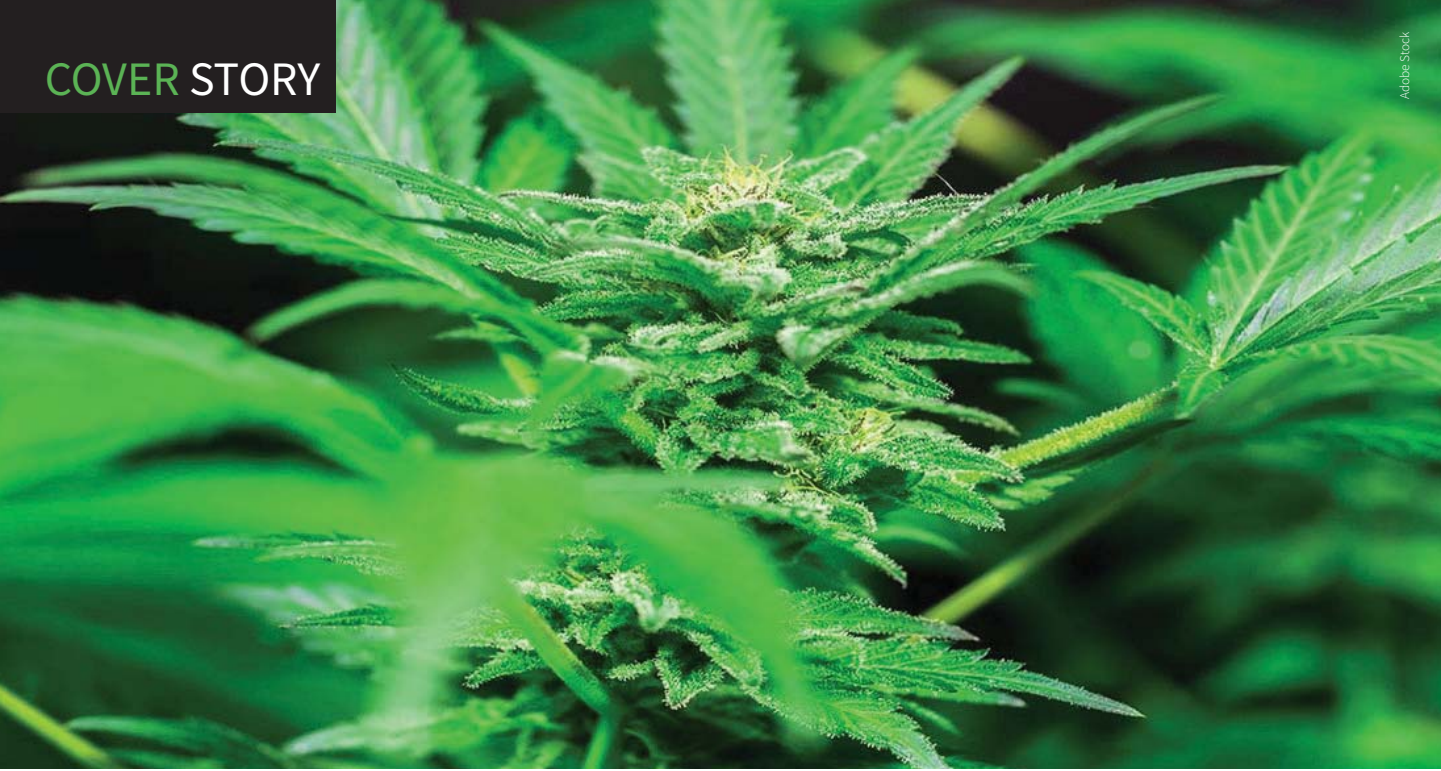
Compact and Lightweight!

Conveniently view wireless readings on the Wrist Reporter screen

- High and Low Gauge
- Differential Pressure

**Now available with optional inches of w.c.!**  
(Firmware updates available for existing modules)





# Latent Loads Matter: HVAC FOR CANNABIS GROW FACILITIES

*Desiccant dehumidification is one of the most cost-effective, efficient, and sustainable options for grow room climate control.*

By DAVID SCHURK, DES, CEM, LEED AP,  
CDSM, CWEP, SFP, CIAQM, CHC,  
Innovative Air Technologies

**E**ffectively controlling cannabis grow facilities has never been more important. As competition among growers increases — with demand and profits now plateauing — optimizing HVAC system design can help producers cut their costs, remain profitable and reap the fruits of their labor.

Grow facilities have different rooms for various stages of the

cannabis plant life cycle. These grow spaces require varied sensible and latent setpoints, along with different lighting schedules. Often, this necessitates the installation of independent or dedicated pieces of HVAC equipment to do the job right.

When calculating HVAC loads for grow facilities, moisture is always the driving load source.

Adding the sensible cooling and latent dehumidification loads together is a common error made when designing environmental control systems for cannabis grow facilities. According to a 2020 article in *ASHRAE Journal*,

engineers rarely consider the fact that the plants often act as their own mini-evaporative coolers.

Plant transpiration is defined as a plant's physiological loss of water in the form of water vapor, through various processes including evaporation from surfaces of leaves, flowers, and stems. A plant's transpiration rate will liberate about 70% of its total irrigation water back into the air.

Because plant transpiration (along with evaporation from the watering process) creates an evaporative cooling effect, space sensible heat is converted to latent heat, adding

---

*David Schurk is Director of Applied Engineering Markets for Innovative Air Technologies in Covington, GA. He has over 40 years of experience in the design and analysis of heating, ventilating, and air-conditioning systems for a variety of market sectors, with a special focus on healthcare and aerospace environmental control and air quality. He can be reached at [david@dehumidifiers.com](mailto:david@dehumidifiers.com).*

moisture to the air while reducing the overall sensible load and temperature of the room.

### Getting the HVAC Loads Right

Sensible Heat Ratio (SHR) is defined as the percentage of an HVAC unit's capacity that goes towards sensible cooling at a given set of conditions for a given piece of equipment or space. For a cannabis grow room, it is calculated by dividing the sensible cooling load requirement, in btu's per hour, by the total (sensible + latent) cooling load.

Most conventional packaged or split system DX or chilled water equipment will perform most effectively when operating at (or above) an 80% SHR. In cases where humidity control needs to drive HVAC system operation, SHRs may be well below 80%. This results in the necessity for "colder" cooling coil temperatures in order to condense more moisture

from the air. This can easily tax conventional refrigerant-based cooling systems beyond their ability to properly dehumidify the air, or even remain fully operational.

It is also important to understand that any HVAC unit operating on a demand signal from a space thermostat will provide dehumidification as a

**“ When calculating HVAC loads for grow facilities, moisture is the driving load source. ”**

byproduct of the run time required to sensibly cool the room. If space sensible loads are quickly satisfied, the run time required to properly dehumidify the air may not be met. Independent space dewpoint temperature monitoring and control, with the ability for the HVAC system to respond accordingly, may be critical to successful grow cycles which will produce the best results.

### Decoupling Space Latent Loads

ASHRAE member Dr. Nadia Sabeh, PhD, PE, president of Dr. Greenhouse, Inc., Sacramento CA, suggests that after determining the required grow room conditions, the next step is to identify equipment that can meet both the sensible and latent loads.

This can be a real challenge because much of the conventional residential and commercial HVAC equipment available is not built to handle both load components effectively.<sup>1</sup> For many grow rooms, the SHR can be less than 0.50, which is beyond the capabilities of such equipment.

Dr. Sabeh says she has seen a lot of HVAC equipment undersized for latent



Large desiccant dehumidifier ready for installation.

Courtesy of Innovative Air Technologies



IAT — 75REC	IAT — 150REC	IAT — 300REC	IAT — 600REC
75 CFM	150 CFM	300 CFM	600 CFM

*Decoupling sensible and latent loads is paramount to performance.*

loads. Plants generate a lot of moisture in the room and, if not controlled properly, the humidity will continue to rise, creating risks for mold growth and condensation on cool surfaces. It is therefore important to select HVAC equipment that can function to meet both temperature and humidity set-points independently.

This helps avoid loss of humidity control, especially when lights are off and SHR has been cut even further.

### The Desiccant Difference

To some, desiccant dehumidification may appear to be as foreign or as strange as an extra-terrestrial landing on Earth. But this isn't the case, so we will here and now dispel the notion that it is anything other than a truly efficient and effective source for indoor grow room environmental control.

First and foremost, solid desiccant dehumidification performs independently of any space sensible cooling requirement, and its operation is not impacted by the resulting SHR of the space. This sets desiccant technology distinctly apart from more conventional dehumidification approaches and provides many advantages well worth considering.

Desiccants are hygroscopic materials having a high affinity for moisture and serve to maintain a state of dryness. They eliminate humidity from the air to create and sustain a moisture-free environment.

Desiccant-based dehumidification transfers water in its vapor phase

(molecularly) from the air to the surface of the dry desiccant. This occurs due to the desiccant's low surface vapor pressure. In essence, desiccants do not condense moisture from the air, nor do they become wet in the way a conventional refrigerant-based cooling coil would.

“ Solid desiccant dehumidification systems work on the principle of adsorption, not condensation. ”

Because of this, desiccant dehumidification is not impacted by low refrigerant temperatures and cold coil surface temperatures that can frost or freeze evaporators, resulting in ice-blocked coils and nuisance equipment trips or failures.

Another tremendous benefit of a dry desiccant is that it will not promote the growth of mold and other microbial contaminants, like wet cooling coils and drain pans can.

### Desiccant Dehumidification's Value Proposition

In traditional refrigerant-based HVAC air conditioners, a chilled cooling coil reduces the temperature of the air, which in turn condenses water vapor into liquid, thus dehumidifying that

air. To deeply dehumidify the air, its temperature must be reduced below the required dewpoint temperature of the space in order to maintain proper relative humidity.

It is commonly known that if deeply dehumidified air is required, it must be over-cooled and then reheated back-up to a warmer temperature more favorable with proper plant management. In addition, this type of dehumidification equipment will fail to provide dewpoint temperatures much below 50°F and will “miss the mark” when lower space SHR's are a result of diminished sensible space loads.

Solid desiccant dehumidification systems work on the principle of adsorption, and not condensation. This positions desiccants with an ability to convert the latent heat removed from the air into sensible heat, liberated to the airstream as a natural byproduct of the moisture removal process. That both warms and deeply dehumidifies the supply air and provides this energy as a free source of recovered heat.

This makes desiccant dehumidification not only very efficient, but also allows it to function independently of space sensible cooling loads, those which are required by DX or chilled water systems in order to cool effectively and remain running.

In its *Applications Engineering Manual* chapter entitled “Dehumidification in HVAC Systems” (December 2002), Trane, a global manufacturer of DX and chilled water HVAC equipment, suggests that when space loads or process



# Nothing Rhymes With **Orange.**

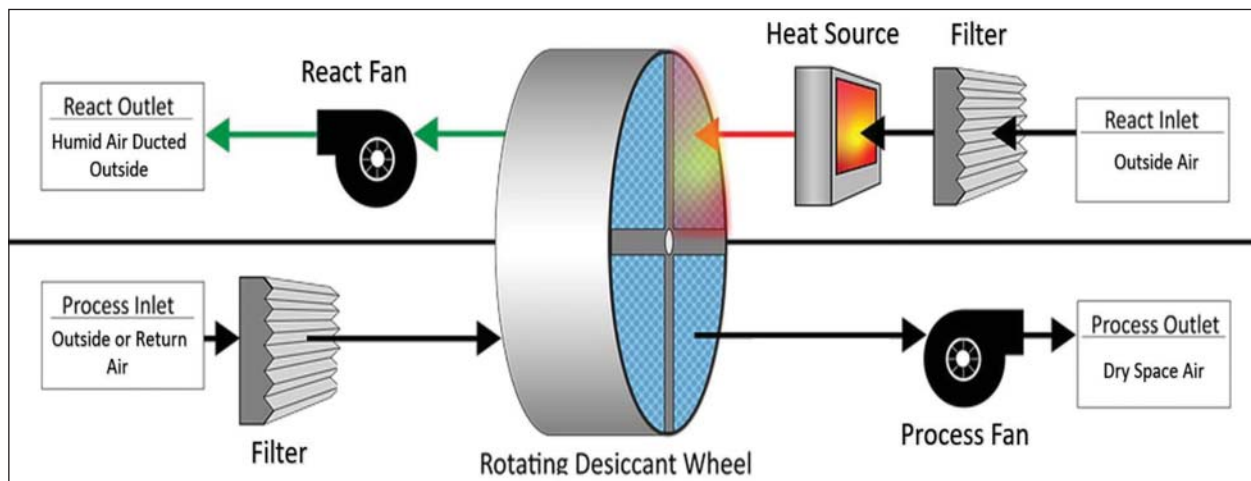
*The Neuron is one of a kind.*

Guaranteed to replace any comparable unit without a tank. Or external equipment.

[intellihot.com](http://intellihot.com)



**Intellihot**  
Endless Hot Water



*Solid desiccant dehumidification unit flow diagram.*

requirements dictate that stringent dew points be provided and maintained, moisture adsorption is preferred for dehumidification, and desiccants may be the only viable solution.

Solid desiccant dehumidification technology can outperform all others, particularly when grow operators are looking to overcome some of the shortcomings of conventional refrigerant-based HVAC equipment.

Such times include:

1. During the “lights-out” mode when space-sensible loads are drastically reduced, and conventional DX or chilled water systems struggle to remain functional;

2. When the facility is influenced by high dehumidification loads and conventional DX or chilled water systems fail to provide the necessary dewpoint temperatures;

3. When DX or chilled water coils frost-or-freeze trying to achieve the colder temps, leaving air conditions required to remove enough moisture from the air;

4. In grow spaces where the SHR falls below 0.80 due to high plant transpiration rates;

5. In grow facilities where energy-efficient LED lighting has been installed, lowering space-sensible loads, and reducing the run time of DX or chilled water units;

6. In cold weather climates, or conditions where the addition of space heat

may be necessary while also providing dehumidification. In this case, the latent heat of adsorption (added to the supply air) is used as recovered heat energy;

7. In grow room operations where space dewpoint temperatures below 50°F may be necessary to ensure proper plant growth and outcome.

### Conclusion

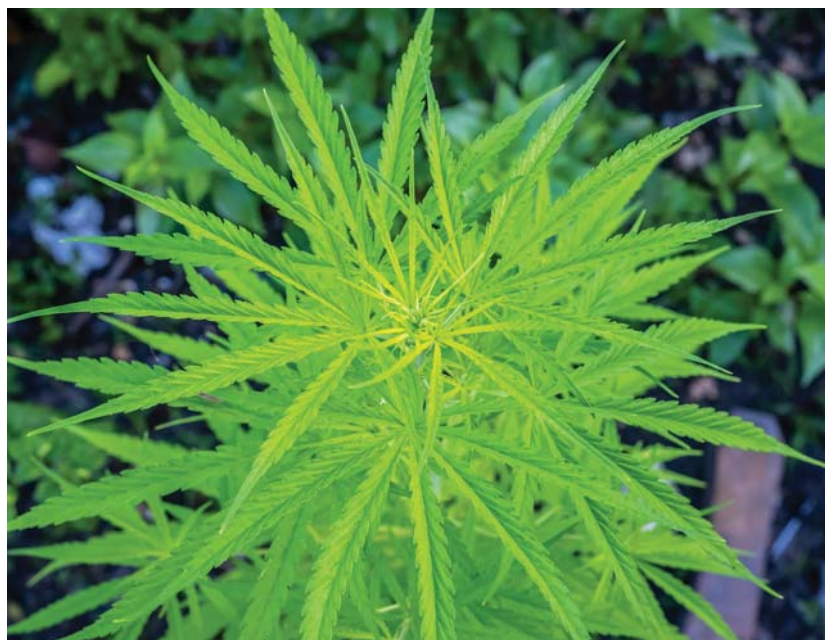
Solid desiccant dehumidification performs independently of any space sensible cooling requirement, and its operation is not impacted by the resulting SHR of the space. Solid desiccant

dehumidification is both simple and thermodynamically eloquent, making it one of the most cost-effective, efficient, and sustainable options a cannabis grow owner or operator can choose.

Desiccant-based systems are utilized in critical environments where indoor relative humidity must be maintained below 45%, and in fact, can perform to more stringent requirements of less than 1% RH, if necessary. [HPAC](#)

### References

1. ASHRAE Journal, *Load Calculations for Cannabis Grow Facilities*, April 2020.



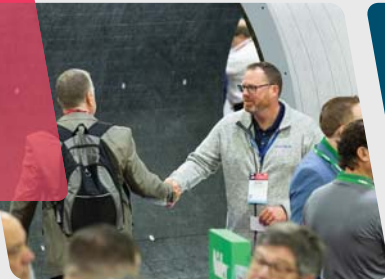
*As the cannabis grow market matures, technologies are evolving to keep pace.*



JAN 22-24, 2024

# Knowledge, Access, Expertise

The event for HVACR  
professionals



CO-SPONSORED BY



Register for free at [ahrexpo.com](http://ahrexpo.com)



# Climate Challenge Accepted, with Ginger Scoggins

*We sat down with ASHRAE's new president to discuss the extraordinary amount of important new initiatives now underway or currently in the works for next year.*

In this episode, *HPAC 'On The Air'* welcomes mechanical engineer **Ginger Scoggins**, since June the new 2023-24 President of the American Society of Heating Refrigeration and Air-Conditioning Engineers, or ASHRAE. Ms. Scoggins is a principal at Engineered Designs Inc., in Cary, NC, and past chair of ASHRAE's Building Headquarters Ad Hoc Committee. She also led ASHRAE's delegation to the United Nations' COP26 Climate Change Conference in Glasgow in late 2021. She first appeared here on this podcast early last year to help recap that event.

*What follows is an edited transcript of our conversation in early September...*

**HPAC:** *Ginger, welcome back to HPAC 'On The Air.'*

**Ginger Scoggins:** Thanks, Rob. Happy to be here.

**HPAC:** *Now, when you assumed ASHRAE's top slot in June, your inaugural speech set the theme for your presidential year with this title: 'Challenge Accepted, Tackling the Climate Crisis.' Could you please summarize for our listeners why you chose that theme and what steps you've already taken to make that a reality?*

**Ms. Scoggins:** So, the whole purpose of that theme is to talk about the fact that ASHRAE is accepting the challenge of educating our members on how to address climate change. Buildings contribute close to 40% of all global greenhouse gas emissions. And that's not just operational carbon. That's embodied carbon lifecycle, carbon of buildings. So, our members need to get on board with the fact that decarbonization and



electrification of buildings is what's going to be needed to address the climate crisis moving forward.

We've got tons of things in the works now to get our members on board and educated and ready to address this challenge. So, the whole purpose of the theme is to say that we're ready, and we're doing it.

**HPAC:** *You talk about getting all members on board, but those members are everywhere. Could you just tell us a little bit about how your recent international experience with COP 26 and 27 has shaped your approach to this subject, now that you're leading an international organization? How do you spread the word so far and wide that all your members in chapters are, indeed, on board, as you say?*

**Ms. Scoggins:** So, we have chapter conferences for all of our regions. We have 15 regions, and I've been recently to Region 14, which is Europe and Region 13, which is Asia. And this

month, I'm going to South America. And then Sri Lanka, for our region-at-large, which has 30 chapters in multiple countries. So we're trying to spread the word with all of the information ASHRAE has available to help our members, now more than 50,000.

As we know, most of the planet's coming growth is going to be in the Global South. The Global North is going to be fairly stagnant in terms of new buildings. It's mainly the renovation of existing buildings, that's the problem here.

But in the South, with new buildings, getting them out of the gate to be designed with low- to zero-carbon initiatives is the goal. Over 20% of our members are international, so trying to make sure that everybody knows what's available from ASHRAE to help them in this arena is the goal.

**HPAC:** *Now, the work of ASHRAE's new Task Force on Decarbonization and the recent Epidemic Task Force has really put the Society on the frontlines of*



## CHALLENGE ACCEPTED: Tackling the Climate Crisis

### View the Top 10 Ways For You to Decarb



To see this Top 10, go to: <https://www.ashrae.org/technical-resources/free-resources/consumer-center#top10>.

*unprecedented current events. Never before has ASHRAE been in such a pivotal role of global influence at such a critical time. So how has the climate crisis and the pandemic changed the way ASHRAE approaches its work? Where once things may have seemed more academic, do you feel there is more daily urgency now? More gravitas, as it were?*

**Ms. Scoggins:** Well, you are certainly right about that. I mean, who could have imagined that the two things that ASHRAE is most known for, which is indoor air quality and energy conservation, would come to a head with the pandemic and the climate crisis at almost the exact same time? But these are the areas where we shine. This is what our members do.

So, we're fortunate to have industry experts on both topics who can do what needs to be done to make sure that we address the issues, and we address them in a timely way. Yes, everything feels much more urgent. We are trying to operate at the speed of business and not the speed of ASHRAE, which in the past could have been a little bit slower than it needed to be.

Look at our new Standard 241 that came out for pathogen mitigation. That was quick. Roughly just four months from start to issuance. A very quick standard. That is a record.

Our new Whole Life Carbon Standard 240P also went from conception



Ginger Scoggins

to public review in four months, but it takes some time to get those public review comments back. That's an ANSI standard, so it's a little bit more rigorous of a process. Standard 241 was not an ANSI standard yet, but the plan is to make it that way in the future.

*HPAC: It strikes me that the last three ASHRAE presidents we have interviewed here, and now you, as well, all have come in at an especially compelling and vital time for our industry and the world, really. That must forge a bond. So, are you consulting with the most recent prior presidents, to share insights and ideas on how to operate in what is essentially a period of extended crisis management?*

**Ms. Scoggins:** Yes. Of course, every president in ASHRAE has a little bit different focus, but we still try to make these terms so that they kind of build on each other, so that we don't lose momentum from one to the next. You don't want to turn a ship in one direction, and then have the next person come in and turn it around in a different direction. Our goal is to continually have it turning in the right direction.

*HPAC: With such compelling issues driving much of the Society's work, has that helped to inspire more enthusiasm from young engineers and newer members? I understand that has been a priority for you, as well. Could you please speak a bit about the society's ongoing Diversity, Equity and Inclusion efforts, and what other initiatives are underway to reach out to young engineers?*

**Ms. Scoggins:** Yes, we're fortunate. We have a very, very strong Young Engineers in ASHRAE Committee. They're called the 'YEA Committee', and they are very passionate. One of my goals was to develop a 'Decarbonization Challenge' this year, and we turned that over to the YEA Committee and they developed the framework of the Challenge for our regions and our chapters.

That just went 'live' in August, where people can apply for a grant of up to \$10,000 for a decarbonization effort in their area, and ASHRAE will



**LENNOX VRF®**  
Customized comfort  
made easy and efficient



**WATCH NOW**

consider supporting it. (Deadline for applying is November 30.)

As I said, young folks are so passionate. But if you just talk to them about designing HVAC equipment, they will yawn. If you talk to them about saving the planet, however, and climate change, and all of the difference they can make in the building services, building sciences area, that makes a big difference in getting them involved.

Regarding our D.E.I. effort, that is ongoing and it will always be ongoing. We have a D.E.I. subcommittee to the board of directors that is working on incorporating diversity, equity, and inclusion throughout all of our committees, and all of our chapters and regions. So, they're doing a really good job, I would say.

***HPAC: Coming back for a moment to the Decarbonization Challenge and those grants, how many grants are available and how much money is involved?***

**Ms. Scoggins:** They are available to all chapters in all regions, and we've allocated \$50,000. So, applicants can win a grant, from \$1,000 to \$10,000, depending on what you're trying to do with your decarbonization project.

So, we've got applications open on our website now and people are going to apply. The YEA Committee will select the winners and then let people know at our upcoming Winter Conference in Chicago next January. Then, the winners will be able to report on what they've done at our annual meeting in Indianapolis next summer.

***HPAC: Aside from the headline-grabbing work that we've already mentioned, what are some of the other work that ASHRAE is involved with right now that our readers might be interested in? What should we keep an eye out for in the months ahead?***

**Ms. Scoggins:** Well, we have just recently taken over the **MEP 2040**

**Challenge**, which was launched by the Carbon Leadership Forum. It challenges engineers to design zero carbon buildings, (targeting) operational carbon by 2030, and embodied carbon by 2040.

ASHRAE also just won a grant from the U.S. Dept. of Energy for almost \$3 million, along with several partner organizations. As part of that, we have four states that we've partnered with to train the state inspectors on new energy codes and energy reduction. Of course, we also have a good delegation going to COP 28 in the United Arab Emirates at the end of November.

Before that, we also have our Decarbonization Conference coming to Washington DC this October, which is big. And that's getting sold out, which is fantastic. Then next spring, we've got an international decarbonization conference planned for Madrid in April. That is still in the planning stages.

There's just a lot going on, Rob.

***HPAC: I'll say. You certainly have a full plate. Thanks so much for outlining all of that. My last question is really about time management. As a principal and founder of your own firm in North Carolina, how do you balance the time away from your business when you're in a top leadership role of a global society like this? And this is really a three-year commitment, from being president-elect to serving as past president next year. Could you tell us a little bit about that experience and how the reality so far may have differed from what you expected?***

**Ms. Scoggins:** What's the saying? "If you want something done, give it to a busy person." So, it's good. I'm actually very fortunate that, at my business, I've got some good partners who are picking up my slack. Hopefully, they won't boot me out after this year. We'll see. But they're doing a great job, so I'm able to not be in the office as much.



United Nations

On the global stage, Scoggins (second from left) led ASHRAE's delegation to COP 26 in Glasgow in 2021.

Even so, with all the Zoom calls, like what we're doing here for your podcast, and all of the emails and texts, and now Wi-Fi everywhere, too, you can truly work from anywhere these days. So, I actually don't find that I miss a beat most of the time.

Sometimes I do, of course. But most of the time, I really don't. And now you can work on planes too, so you don't really ever get away from it.

**HPAC:** Yes, that reminds me of another turn of phrase I heard during the pandemic: "You're not working at home anymore. You're living at work."

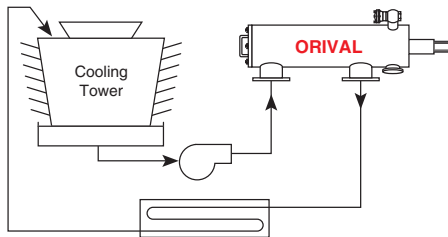
**Ms. Scoggins:** That's right. We really can't disconnect anymore, can we? **HPAC**

To listen to previous 'HPAC On The Air' podcasts, please visit our *Members Only* page.

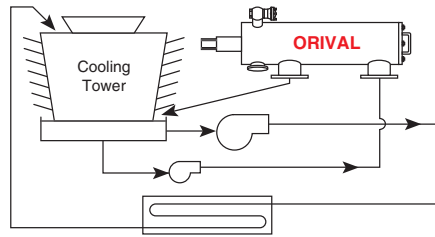
## FILTRATION TRENDS

# New Filtration Technology Keeps Cooling Tower Water Clean

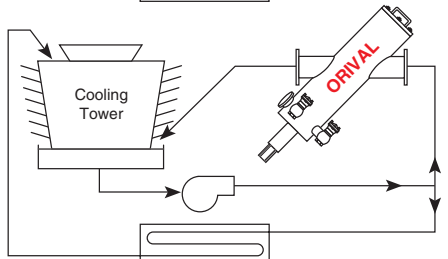
Typical **Full Flow** filtration using existing pump.



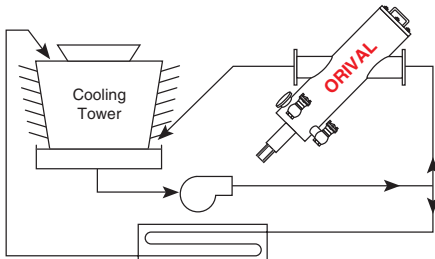
Typical **Side Stream** filtration of basin using a recirculating pump.



Typical **Side Stream** filtration using a booster pump.



Typical **Side Stream** filtration using existing pump.



[www.orival.com](http://www.orival.com)

**E**very cooling tower has its unique dirt conditions, space constraints and other special characteristics. Filtration systems must take these into account in order to maintain particle free water.

Orival filters are versatile enough to meet these criteria. They remove a wide range of dirt down to micron size, of any

specific gravity, even lighter than water. Typical examples include: airborne particles, microbiological growth, bugs, sand, scale, algae, rust, etc.

Line pressure powered, they permit use of the existing cooling tower pump, lowering initial system cost. The fully automatic self cleaning cycle takes

seconds and does not interrupt flow.

Reclaim units recirculate rinse water making filtration a zero discharge operation. For more information and system design assistance, contact: Orival, Automatic Self-Cleaning Filters, 213 S. Van Brunt St., Englewood, NJ 07631. (201) 568-3311, (800) 567-9767, Fax: (201) 568-1916.

# How to Maintain Constantly Evolving Smart Buildings

*Modern building systems must support devices from yesterday, today, and tomorrow. Here are some best practices for how to make that all work.*

By BRIAN MEYERS & CHRIS GIST,  
Trane Commercial HVAC Americas

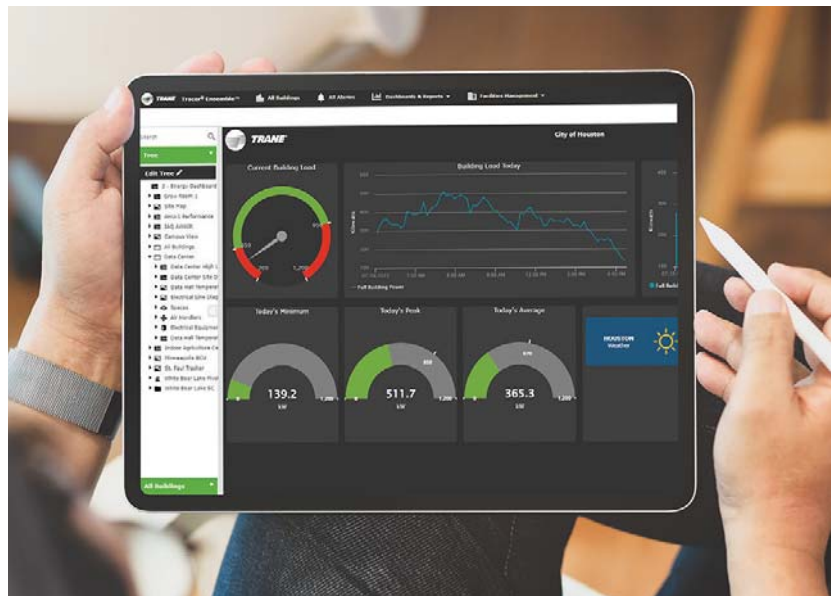
**W**hen we look at the future of building systems, it is no longer static. Owners now expect access to the latest building data, automation, and technology.

As a result, modern building systems must support devices from yesterday, today, and tomorrow. So let's explore considerations for maintaining continuously evolving smart buildings to achieve optimal results.

According to the Building Services and Research Information Association (BSRIA), "only 1-2% of commercial buildings [today] deploy truly cutting-edge smart technologies with fully integrated products and services." So, with global revenue attributed to building automation systems (BAS) expected to increase a total of 4.5% compounded annually over the next 10 years, there is immense opportunity to deliver greater connectivity and intelligence to the existing built environment.<sup>1</sup>

Smart buildings, of course, leverage connected technologies and intelligence to continually optimize performance.

Today, engineers are increasingly relied upon as strategic collaborators



guiding decision-making through the design and implementation of a smart building solution. But with every building at a different point in its lifecycle and owners having a variety of goals, knowing where to start can be challenging.

So, an engineer can best support the evolution of a smart building when an owner's strategic needs and business goals are well understood. From there, a tailored approach can be created to keep the budget, timeline, and current environment at the forefront of a proposed solution.

With that in mind, it is time to stop talking only about the advances of smart building technology, and to start talking about the outcomes the smart building can and will achieve.

Many factors influence building system decisions, from market trends like energy efficiency and decarbonization, to technology trends like cloud services and cybersecurity. Everyday demands tied to productivity, lack of skilled labor, and to meeting financial and ESG goals must be factored in. Consider multiple angles and chase

*Brian Meyers is the System Controls Portfolio Leader for Trane Commercial HVAC Americas, based in White Bear Lake, MN. His primary responsibility is the management of current generation Tracer Building Automation Systems. Meyers also serves as a subject matter expert on topics including HVAC applications, system/protocol integration, internet connectivity and cybersecurity.*

*Chris Gist is the Unit Controls Portfolio Leader for Trane Commercial and leads the organization's efforts on new controls product development and the introduction of technological enhancements across Trane's HVAC portfolio. He has worked more than 22 years in energy services and controls.*

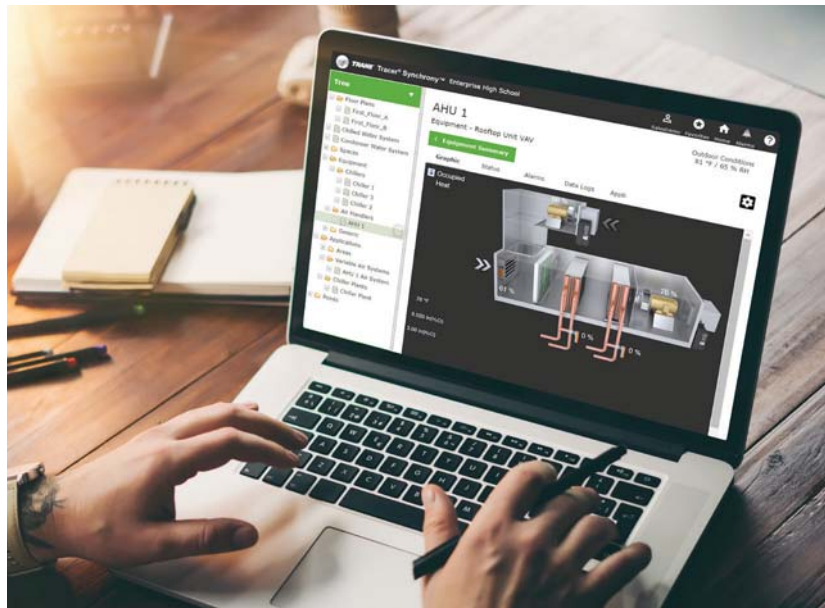
outcomes, as opposed to chasing technologies. An engineer's goal should be to design a system that supports devices from yesterday, today, and tomorrow.

## Integrating Many Technologies

It is common now for buildings to have controls and equipment from different vintages and a variety of building communication protocols. So integration flexibility is key.

Integration flexibility accommodates the use of existing technologies and paves the way for more smart building growth in the future. It enables data-driven decision-making and serviceability. Designing a system with robust, open, standard protocol communications like BACnet Secure Connect can lay the groundwork for future technology growth and support the process by following IT best practices.

Additionally, leveraging both wired and wireless technologies can simplify implementation and connect to existing infrastructure — without pulling new wire. Together, these create an infrastructure that is reliable, cost-efficient, and easy to upgrade, while also allowing for the secure deployment of IoT devices and cloud connectivity without IT security dependence.



Most facilities are managing many priorities, such as meeting codes, standards, guidelines, energy efficiency goals, and following local legislation. As a result, automation is required to coordinate the mechanical HVAC and other complementary systems. Taking a phased approach with a proper system design will support automation and optimization, without requiring everything in the building to be replaced.

So, it is vital to work with a dependable contractor to help balance these inputs and deliver consistency.

Of course, while an engineer can design the most optimal system, it is eventually handed off to the operator for daily use. So, operators must understand the system and its complexities to achieve optimal performance. Toward that end, comprehensive help, training, documentation, and system safeguards can improve daily operations and minimize inefficiencies.

System maintenance is the last piece to the puzzle for maintaining a continuously evolving smart building.

Complex systems need ongoing hardware and software updates by trained technicians to benefit from evolving technology. Informing owners about the expectations and best practices for responsibly managing their assets will set them up for long-term success and build a trusting relationship. A reliable maintenance plan with a trusted service partner will keep the system that you designed in operation for years to come.

As technology rapidly evolves, keeping a pulse on smart building trends and advances will help you deliver the best outcomes on projects and provide the best results for your customers. [HPAC](#)

## References

1 *Guidehouse Insights Market Data on Building Automation and Controls.*



# CDC: FEWER THAN HALF OF U.S. SCHOOLS HAVE IMPROVED VENTILATION

*New research shows that most K-12 schools have not yet used federal pandemic relief earmarked for IAQ upgrades. But it's not too late to act.*



That pandemic recovery legislation was designed to help address academic learning loss, prepare schools for reopening, and enhance IAQ by ventilation testing, repairing and upgrading projects. However, based on the new figures from the CDC, more school districts still need to focus on the quality of air their students and teachers breathe.<sup>5</sup>

## Just a Matter of Time

Many schools have been slow to spend the windfall of federal aid because of the time-consuming process of hiring contractors and meeting state and/or federal requirements. Recognizing this, the U.S. Department of Education has offered to consider spending extensions beyond the late 2024 deadline for obligating the federal relief dollars.

According to the CDC report, just 34% of districts said they had used the funding to upgrade their HVAC systems, while about 28% installed in-room air cleaners, and 8% said they invested in germicidal UV-C.

The most frequently reported ventilation strategy, maintaining continuous airflow in school buildings, was also the least expensive to implement and was reported by approximately one-half (50.7%) of school districts. Advanced strategies such as installing and using in-room air cleaners and germicidal UV-C technology were reported less frequently.

The fact that more schools did not implement the four ventilation

By JOE KALMAN, UV Resources

**D**espite billions of federal dollars made available in response to the pandemic, most K-12 school administrators in the U.S. still have not improved school building ventilation, according to a recent CDC report, “*Ventilation Improvements Among K-12 Public School Districts.*”

Released in April, the report reviewed the last five months of 2022 and found that fewer than half of the 8,410 school districts surveyed had implemented ventilation upgrades recommended by the U.S. Centers for Disease Control and Prevention

(CDC) and the U.S. Environmental Protection Agency (EPA) to mitigate COVID-19 transmission.<sup>2,3,4</sup>

Researchers examined four specific recommended ventilation strategies:

- Maintaining continuous movement of air supply or airflow;
- Replacing or upgrading HVAC systems;
- Installing in-room air cleaners with HEPA filters;
- Installing germicidal UV-C devices.

The federal government allocated \$190 billion to help schools recover from the COVID-19 pandemic — more than four times what the U.S. Education Department spends on K-12 schools in a typical year.

*Joe Kalman is director of sales for UV Resources and Steril-Aire and has worked in executive sales leadership and corporate strategy for more than 35 years. He works with leading facilities management companies and HVAC engineers and has written about air quality, how to leverage ROI from germicidal UV-C, and HVAC sustainability issues. He may be contacted at [joe.kalman@UVResources.com](mailto:joe.kalman@UVResources.com).*

strategies studied suggests that — despite billions in federal dollars— the complex issue of air quality requires more evidence-based guidance.

## Decision-Makers Need Guidance

Germicidal UV-C, for example, enjoys decades of scientific performance efficacy and is endorsed by the CDC's Ventilation in Buildings guidance and the U.S. Department of Education's Ventilation in Schools and Childcare Programs.<sup>6</sup> Further, research shows that operating an upper-room UV-C system in an occupied classroom can disinfect up to 96% of airborne viruses, which is as effective as increasing the ventilation rate more than five times.<sup>7</sup>

Despite this evidence and scientific data, UV-C technology was the least common engineering strategy in the CDC survey. Still, it was reported slightly more often among school districts in the South and in rural areas.

The most likely explanation?

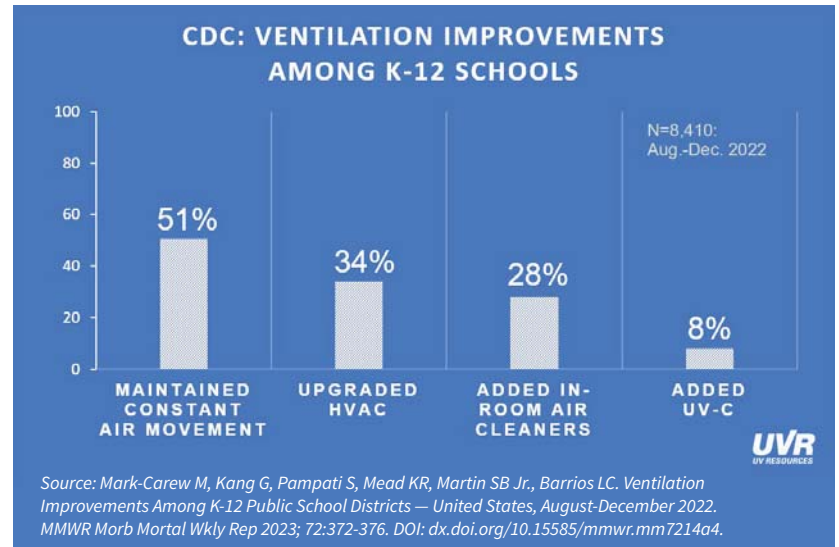
School administrators are not facility engineers. Even if school officials recognize the importance of air quality and ventilation, they must first hire an HVAC expert to audit their system and recommend specific improvements. Then, they must find a means to independently evaluate the suggested upgrades, convince their administrative board, and apply for state funding.

## IAQ = Improved Academics

To help put school air quality in perspective, nearly 90% of classrooms have ventilation rates below recommended minimum standards.<sup>8</sup>

Researchers with the international Lancet COVID-19 Commission found that adequate ventilation and air quality improve students' health, concentration, attendance, and even academic performance:

*"In addition to decreased airborne infectious disease transmission, research shows that ventilation and air cleaning improvements are likely to lead to improved academic performance (in particular reading and math*



*performance), fewer missed school days for students, higher scores on cognitive function tests, and many benefits for teachers including decreased respiratory symptoms, increased teacher retention, and improved morale.”<sup>9</sup>*

This fall, as K-12 students, teachers and administrators return to class, many resources are still available for completing these vital upgrades to school ventilation systems. So, I urge all of you reading this — engineers, facility managers, and parents — to attend local school board meetings and to urge administrators to take advantage of this unprecedented opportunity. They truly can improve the national climate for learning, for generations to come. **HPAC**

## References

1. Mark-Carew M, Kang G, Pampati S, Mead KR, Martin SB Jr., Barrios LC. Ventilation Improvements Among K-12 Public School Districts — United States, August-December 2022. *MMWR Morb Mortal Wkly Rep* 2023;72:372-376. DOI: [dx.doi.org/10.15585/mmwr.mm7214a4](https://doi.org/10.15585/mmwr.mm7214a4);
2. Centers for Disease Control and Prevention. COVID-19: Ventilation in buildings. Atlanta, GA: US Department of Health and Human Services, CDC; 2021. Retrieved from [www.cdc.gov/coronavirus/2019-ncov/community/ventilation.html](https://www.cdc.gov/coronavirus/2019-ncov/community/ventilation.html);
3. EPA. Indoor air quality tools for schools action kit. Washington, DC: U.S.

Environmental Protection Agency; 2022. From [www.epa.gov/iaq-schools/indoor-air-quality-tools-schools-action-kit](https://www.epa.gov/iaq-schools/indoor-air-quality-tools-schools-action-kit);

4. Centers for Disease Control and Prevention. COVID-19: Ventilation in schools and childcare programs. Atlanta, GA: U.S. Department of Health and Human Services, CDC; 2022. Retrieved from [www.cdc.gov/coronavirus/2019-ncov/community/schools-childcare/ventilation.html](https://www.cdc.gov/coronavirus/2019-ncov/community/schools-childcare/ventilation.html);

5. *IBID.*, 1.

6. CDC Ventilation in Schools and Childcare Programs. Retrieved from [www.cdc.gov/coronavirus/2019-ncov/community/schools-childcare/ventilation.html](https://www.cdc.gov/coronavirus/2019-ncov/community/schools-childcare/ventilation.html);

7. Park, S., Mistrick, R., & Rim, D. (2022). Performance of upper-room ultraviolet germicidal irradiation (UVGI) system in learning environments: Effects of ventilation rate, UV fluence rate, and UV radiating volume. *Sustainable Cities and Society*, 85, 104048. Retrieved from [doi.org/10.1016/j.scs.2022.104048](https://doi.org/10.1016/j.scs.2022.104048);

8. Allen, Joseph, et al., *Lancet, COVID-19, Commission Task Force on Safe Work, Safe School and Safe Travel: Designing Infectious Disease Resilience into School Buildings Through Improvements to Ventilation and Air Filtration*. April 26, 2021. Retrieved from [static1.squarespace.com/static/5ef3652ab722df11fcb2ba5d/t/60a3d1251fcec67243e91119/1621348646314/Safe+Work+TF+Designing+infectious+disease+resilience+April+2021.pdf](https://static1.squarespace.com/static/5ef3652ab722df11fcb2ba5d/t/60a3d1251fcec67243e91119/1621348646314/Safe+Work+TF+Designing+infectious+disease+resilience+April+2021.pdf);

9. *IBID.* 8.



# BOILER 2024: Keynote Announced, Tours Set for Denver Event

*ABMA releases details for next May's big event at the Gaylord Rockies Resort and Convention Center. Registration set to open in late September.*



Denver International Airport



By SHAUNICA JAYSON,  
American Boiler Manufacturers Association

**W**ith expectations already elevated a mile high, ABMA has announced that 82nd Airborne Staff Sgt. **Travis Mills** (U.S. Army, Ret.) will be its **opening keynote speaker** next spring at BOILER 2024 in the Denver suburb of Aurora, CO.

The second ABMA Boiler Technology Conference & Expo, designed for the entire boiler supply chain, will take place May 1-3, 2024, at the Gaylord Rockies Convention Center. It promises to have more exhibitors, more attendees, more networking opportunities, more educational sessions and tours—enough to make it bigger and better than even our successful BOILER 2022 inaugural event.

# BOILER 2024

ABMA Boiler  
Technology  
Conference & Expo  
May 1-3 • Denver, CO



## KEYNOTE SPEAKER

### Travis Mills

Retired U.S. Army Staff Sergeant,  
Recalibrated Warrior,  
Motivational Speaker,  
Actor, Author, &  
Advocate for Veterans & Amputees

General attendee registration for next May will open in late September, so please go to [BOILER2024.com](http://BOILER2024.com) to learn more.

For his part, conference keynote Mills is a “recalibrated” veteran, motivational speaker, actor, author and an advocate for veterans and amputees. He is also the Founder & CEO of the Travis Mills Foundation, formed to benefit and assist post-9/11 veterans who have been injured in active duty, or as a result of their service to America. Notably, Mills documented his story in *The New York Times* best-selling memoir, “Tough as They Come.”

In addition to its exciting keynote news, ABMA also has revealed that there will be two field trips at BOILER 2024, separate boiler room tours at the Gaylord Rockies host hotel, as well as at the massive Denver International Airport. These tours will enhance the attendee experience and offer opportunities to witness two innovative boiler room operations that have been optimized to address energy efficiency goals along with their unique hot water and steam needs. Epic challenges that both facilities have managed to surmount daily.

“We are excited to offer our attendees the opportunity to tour these exceptional



boiler rooms as an enhanced feature for BOILER 2024,” stated **Scott Lynch**, ABMA President & CEO.

### Boiler Room Tour Details

Specifically, the Gaylord Rockies property was built in 2018. Its boiler room is set up to serve an 85-acre resort that includes a 1,501-room hotel, seven food and beverage outlets {with kitchens}, laundry, retail, commercial and convention space, indoor/outdoor recreational park, and

a convention facility that sits on 1.9 million sq. ft.

The boiler room has a heating capacity of over 100 million BTUH and includes four (4) condensing boilers, 6 million BTUH each, w/ low NOx burners; four (4) conventional style boilers, 20 million BTUH each; two (2) steam boilers (for laundry purposes); six (6) 4,000 gallons domestic water storage tanks; CHP plant with two (2) engines of 2.5 MW each, and a heat exchanger, sized for 13 million BTUH transfer.



Gaylord Rockies Resort

*The Gaylord facility processes 18,000 gallons of DHW and 9,000 gallons in kitchens, restaurants, and for public space use.*

Overall, the facility processes 18,000 gallons of domestic hot water (DHW) and 9,000 gallons in kitchens, restaurants, and for public space use.

Built in 1995 and located 25 miles from downtown, the sprawling Denver International Airport (DIA) is the third busiest airport in the world. Its impressive boiler room meets the needs of nearly 70 million passengers per year and over 35,000 employees. The facility includes six (6) hot water boilers, each ranging from 20 to 60 million BTUH, serving all DIA facilities with an area of 6.6 million sq. ft.

Both tours will require registered attendees to sign up prior to arriving on-site. Space will be limited.

## Background on Our Keynote

On April 10, 2012, Staff Sgt. **Travis Mills** of the 82nd Airborne was critically injured on his third tour of duty in Afghanistan by an improvised explosive device (IED) while on patrol, losing portions of both legs and both arms. He is one of only five quadruple amputees from the wars in Iraq and Afghanistan to survive his injuries.

Thanks to his amazing strength, courage, an incredible will to live, the heroic actions of the men in his unit, the prayers of thousands, and all the healthcare providers at the Walter Reed



*Denver's massive airport utilizes an impressive battery of hot water boilers.*

Army Medical Center, near Washington DC, Mills today remains on the road to recovery. Every day is a battle, but he continues to astound friends and family alike with his progress and with his amazing spirit.

In September 2013, Travis and his wife Kelsey founded the Travis Mills Foundation, a nonprofit organization, formed to benefit and assist post 9/11 veterans who have been injured in active duty or as a result of their service to our nation. The veteran and their families receive an all-inclusive, all-expenses paid, barrier-free vacation to Maine where they participate in adaptive activities, bond with other

veteran families, and enjoy much-needed rest and relaxation in Maine's great outdoors.

The Travis Mills Group LLC was also started shortly after, where Mills consults with and speaks to companies and organizations nationwide inspiring all to overcome life's challenges and adversity. His motto: "Never give up. Never quit."

Over the last decade, Mills has appeared on local and national news shows, including Fox News' *Happening Now*, *The O'Reilly Factor*, CNN, and *The Ellen DeGeneres Show*. His story and his work with the Travis Mills Foundation will be an amazing and inspiring kickoff to BOILER 2024. [HPAC](#)

# FACILITIES EXPO

including  MANAGING GREEN BUILDINGS

## WHERE FACILITY CHALLENGES FIND SOLUTIONS

### NORTHERN CALIFORNIA

September 12-13, 2023  
Santa Clara, CA

### NORTH TEXAS

October 4-5, 2023  
Arlington, TX

register for free:  
[facilitiesexpo.com](https://facilitiesexpo.com)

OWNED & PRODUCED BY:





## Hurricane Louvers

Ruskin's hurricane louvers are tested for impact, high-velocity wind-driven rain and pressure to simulate hurricane conditions that are seen along coastal states. The EME6325D hurricane louver (left) has a 6-in.-deep frame with vertical blades, a 38% free area, and a 99% effective ratio for wind-driven rain performance. The EME520MD wind-driven, rain-resistant louver has a 5-in.-deep frame and a 20-degree blade angle, is AMCA-listed for 540 basic protection. Also has a 47% free area, excellent pressure drop performance, low maintenance and high corrosion resistance.

**Ruskin**

## Light Commercial ECM Pumps

Light commercial ECM pumps (1911ecm and 1915ecm) from Taco offer simple yet versatile control options on both circulators: constant pressure, constant speed, proportional pressure, 0-10Vdc and parallel pump alternation. The 1911ecm is a 425 W, self-sensing, close-coupled, mechanically sealed pump that features a high-efficiency volute, ECM motor and an integrated frequency drive. It is easy to install and program, and provides a maximum 50 feet of head and 105 gal./min. The 1915ecm offers all the user-friendly features of the 1911ecm, but in a more powerful package. At 650 watts, it provides a maximum 65 feet of head and 120 gpm.

**Taco Comfort Solutions**



## ProMelt Smart Panel

SunTouch introduces the ProMelt Smart Panel, a snowmelt controller designed to control any size snow melting system. The panel is available in 100 AMP or 200 AMP capacity to operate 120, 208, 240, or 277 VAC snow-melting systems. The panel is enabled with Wi-Fi to control the system from anywhere with the Watts Home app. Compatible with ProMelt mats, cables and sensors. Prewired with ProMelt Smart controller with Wi-Fi (excludes SubPanel). All-in-one design makes for a quicker install.

**SunTouch**

## Duckt-Strip Ductless Mini-Split Cable

RectorSeal is now a master distributor of Duckt-Strip cable for ductless HVAC systems. Duckt-Strip is a ductless power and communications cable offering complete end-to-end conductor isolation that provides power (AC to DC) and control from the condenser to the indoor unit from a single cable. Using a single cable provides HVAC technicians with a faster, safer, and more cost-effective ductless installation than multiple cable applications. Features Rip-N-Strip, a patented technology with grooves designed for easy cable insulation separation and removal. It eliminates the need to use strippers, knives or cutters when installing the cable. All conductors are covered with a gray and yellow PVC jacket that is sunlight resistant, outdoor rated, and direct-buried approved.

**RectorSeal**



## Bio-Air Tool Lubricants

Renewable Lubricants introduces its patented, ultimately biodegradable Bio-Air Tool Lubricants with better natural lubricity than petroleum-based oils but safer for employees and the environment. Lubricants can be fed through an airline lubricator or with a squirt directly into the tool through the quick coupling air connection. Available in 22 and 32 weights, they feature low toxicity and super-high viscosity index. Ideal for rotary and reciprocating air tools such as chipping hammers, impact wrenches, air motors, grinders, reamers, drills, and more.

**Renewable Lubricants**



## Fixture Outlet Boxes

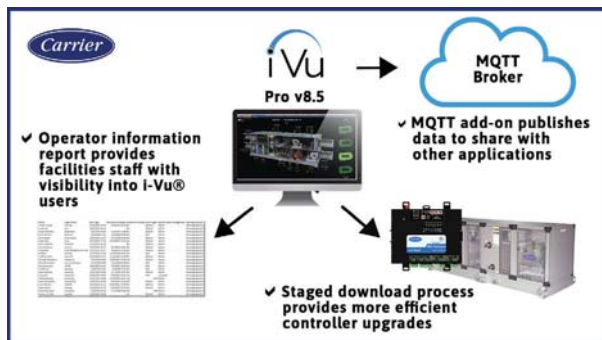
Fixture outlet boxes from HoldRite are designed for use in commercial and residential applications and allow for installation of water supply valves during the rough-in phase. Come with different tail piece designs, making them compatible with different pipe types, including PEX, copper and CPVC. Available with easy-to-screw-on chrome and white paintable escutcheons. Includes threaded protective cover so no additional tools or screws are necessary for installation or removal. Fire-rated and nonfire-rated options available. Include a supply valve with a quarter-turn handle and a 1/4 in. or 3/8 in. threaded compression connection.

**HoldRite/RWC**

## Electric Infrared Product Line

Modine launches its new electric infrared product line. The MEL Series is a high-wattage, commercial-grade, high-intensity electric infrared heater with outputs ranging from 750 to 11,400 watts. The heaters are equipped with a specially designed reflector for optimal radiant heat output with a replaceable tungsten element that provides a fast heat-up time. The unit can be wall-, ceiling- or recess-mounted with optional accessories, making it suitable for a variety of locations ranging from patios, open-air dining, vestibules and many other commercial spaces. Features highly efficient energy transfer, lower mounting heights, and heat and light energy are balanced to reduce glare and provide high output.

**Modine**



## i-Vu Pro v8.5 Commercial Software

Carrier's i-Vu Pro v8.5 software for the i-Vu building automation system delivers an operator information report for added security. It provides facilities staff with visibility into who is using the i-Vu system. The report includes detailed information on operator configuration and security policy compliance. The software includes an efficient staged download process for upgrading controller firmware, splitting the download into discrete steps, which helps reduce downtime of connected HVAC equipment. The optional Message Queueing Telemetry Transport connector add-on enables i-Vu system data to be published to an MQTT broker, a standard component in cloud environments and Internet of Things.

**Carrier**



25-2500 cfm Range  
Fast, Accurate, Easy, Auto-Range and Zero  
Backpressure Compensated Air Balance System  
Automatic Density Correction  
Custom Tops Made to Order



## Shortridge Instruments, Inc.

7855 E. Redfield Road Scottsdale, AZ 85260  
480-991-6744 Fax: 480-443-1267  
www.shortridge.com

## Fan Filter Diffusers

Greenheck's fan filter diffusers are unidirectional diffusers with integrated EC motors and high-efficiency filters that provide ultra-clean air necessary in critical applications or retrofit applications where additional power is needed to overcome filter pressure drop. provide quiet, energy-efficient operation and can be specified with HEPA or ULPA filters, or supplementary MERV-rated pre-filters depending on the application. Model HLC-FPS is a self-contained fan filter supply diffuser, Model HLC-FPR is a ceiling- or wall-mounted fan filter return diffuser, Model HLC-FPI is a ducted inline fan filter unit, and Model HLC-FPC is a fan filter mobile cart available in both recirculation and return/exhaust configurations.

**Greenheck Fan Corp.**



## MagicPak All-in-One V-Series

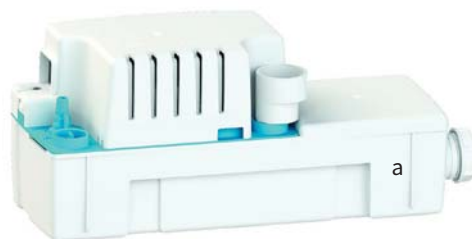
Allied Air Enterprises releases its MagicPak All-in-One V-Series 13 SEER units, available in the U.S. and Canada. Designed as the ideal solution for multifamily dwellings. Property owners can enjoy an all-in-one solution that frees up space for rooftop pools, lounges, dog parks and greenspace without the noise and clutter of traditional HVAC systems. It also offers increased efficiency along with simplified installation and enhanced design freedom. With integrated heating and cooling and built-in features for cold environments, the units' self-contained package eliminates the need for an outdoor unit or additional power supply, refrigerant lines and accompanying installation items. Prewired and precharged, individually metered and controlled.

**Allied Air Enterprises**

## Sanicondens Best Flat

The Sanicondens Best Flat from Saniflo U.S.A. is a lower-profile version of its Sanicondens Best condensate pump, with nearly double the tank volume and capable of serving multiple mechanical systems, up to a total of 500,000 Btu per hour. It combines a condensate pump with pH-neutralizing pellet tray into single, space-saving, environmentally friendly solution for residential and commercial ultra-high-efficiency condensing equipment. Made of a durable polypropylene, the 12-lb. unit may be installed on a level floor surface or wall-mounted, using a plastic mounting guide. The unit can discharge condensate 15 ft. vertically and 150 ft. horizontally — or a lesser combination of these two distances.

**Saniflo USA**



## BitRip Mobile App

BitRip is a free app that tracks any type of physical asset using pre-printed BR Code labels. It easily integrates with existing software workflows; each code stores any data and tracks every scanned location, unlocking field-level visibility. The app is user friendly and provides excellent visibility of building materials, tools and any other assets on a jobsite. They also make it easy to associate warranty or installation information, links to videos, schematics and many other types of data. Download BitRip via the App Store or Google Play.

**BitRip**



### FL 0833 PCK Performance Tape

Avery Dennison's 2023 Core Series Portfolio FL 0833 is a 3.0 mil aluminum foil featuring 2.0 mils of Cold Tough acrylic adhesive specially formulated with antimicrobial additives to inhibit bacteria and mold growth. The 5.0 mil adhesive foil tape offers the ability to be applied in cold temperatures as low as 0° F. It can be used at virtually any temperature and will withstand temperatures as low as -35 °F or as high as 325° F. While designed to be permanent, FL 0833 is highly conformable with adhesive suitable for masking applications. This provides long-term durability and short-term removability (removes cleanly on metal or most plastic surfaces), while offering chemical resistance for harsh applications.

**Avery Dennison**

### ecocirc 20-18, ecocirc+ 20-18 pump line

Bell & Gossett's ecocirc 20-18 is a highly efficient, variable-speed ECM circulator available for both hydronic heating and cooling systems, as well as potable water systems. It features a maximum shut-off head of 20 ft., or a maximum flow of 18 gals/min. The ecocirc+ 20-18 models allow for wireless connectivity directly to a smartphone for full control. With its ability to replace up to 70 pumps currently in the market, the ecocirc 20-18 leaves no concerns for finding a suitable replacement on the jobsite. With seven different product settings, including purge, SP and delta-T. Available in stainless steel or cast-iron construction. With convenient flange-to-flange connection design, installation into any system, including retrofit applications, is easy.

**Bell & Gossett/Xylem**



### Slimduct Lineset Protection Product Line

RectorSeal adds a black Slimduct lineset protection cover to complement the current product-line offerings of white, ivory and brown. Lineset cover systems are designed to protect and conceal exposed ducted and ductless HVAC piping, wiring and drain hoses. The four colors now available are designed to enhance any residential or commercial HVAC installation and provide a professional, finished appearance. Flat bottom channels and elbows hug walls and help to eliminate insect infestation and bird nests. Resistant to fire and severe weather. UV stabilization. With a deeper profile, it provides more room to work and accommodates thicker lineset insulation required by many industry codes.

**RectorSeal**

## HydroData Multimeter®

0-250 PSI Gage & Differential Pressures  
Associated High Side & Low Side Pressures  
-67 to 250 °F Temperature

100 Reading Memory with Sequential Recall  
English & Metric, Auto-Read



## Shortridge Instruments, Inc.

7855 E. Redfield Road Scottsdale, AZ 85260  
480-991-6744 Fax: 480-443-1267  
[www.shortridge.com](http://www.shortridge.com)





Be ready for what's next with AAON Alpha Class.

With proven performance in nearly any climate, AAON Alpha Class is a critical solution that meets the increasing demand for building decarbonization.



α ALPHA CLASS™



**MORE THAN A MANUFACTURER. WE'RE YOUR PARTNER.**



At Bradford White, providing Built to be the Best® products is only part of the story. We're equally dedicated to ensuring you have the support you need:

- For The Pro® Training Academy
- Exclusive distribution through knowledgeable wholesalers
- 24/7 support including our online RightSpec® Product Tools.



©2023, Bradford White Corporation. All rights reserved.

AD INDEX

ADVERTISER	WEBSITE	PAGE NO.
AAON, INC.....	AAON.COM/FIND-A-REP .....	BC
BRADFORD WHITE .....	BRADFORDWHITE.COM .....	6, 7
CHARLOTTE PIPE & FOUNDRY .....	CHARLOTTEPIPE.COM .....	11
CLIMATE CONTROL GROUP.....	CCGI-HVAC.COM/ .....	1
COPELAND.....	COPELAND.COM/EN-US/BRANDS/COPELAND .....	13
DAIKIN COMFORT TECHNOLOGIES.....	VRVEMERION.COM .....	3
EVERGREEN TELEMETRY .....	EVERGREENTELEMETRY.COM .....	15
FIELDPIECE INSTRUMENTS.....	FIELDPIECE.COM/ .....	14
GREENHECK.....	GREENHECK.COM .....	IFC
INTELLIHOT GREEN TECHNOLOGIES INC.....	INTELLIHOT.COM .....	19
INTERNATIONAL EXPOSITION .....	AHREXPO.COM .....	21
LAARS.....	LAARS.COM .....	IBC
LENNOX COMMERCIAL, INC.....	LENNOXCOMMERCIAL.COM .....	24
LIBERTY PUMPS .....	LIBERTYPUMPS.COM .....	9
ORIVAL, INC. ....	ORIVAL.COM .....	25
SHORTRIDGE INSTRUMENTS, INC.....	SHORTRIDGE.COM .....	35, 37
TACO, INC.....	TACOCOMFORT.COM.....	5

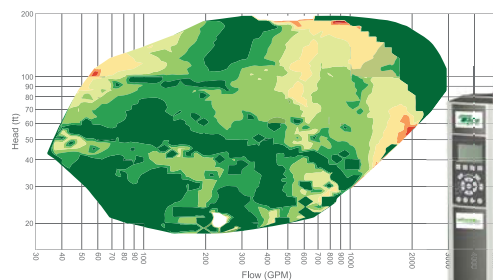


**Base your Basis of Design on Best-in-Class Efficiency**

Taco's commercial pumps offer best-in-class efficiencies that make it easy to meet your project requirements. So start your basis of design with Taco Comfort Solutions.

- Taco FI, CI, KV, and KS Series pumps feature standard NEMA-frame motors for easier serviceability and shorter lead times
- Award-winning Taco Tags provide vital product information, right at your fingertips
- Taco's Oe Package offers 3-30HP ECM-powered pumps, plus SelfSensing VFD's, to optimize system efficiency and savings

Meeting or beating leading competitive pump efficiencies over 84% of the time\*  
Darker green = greater Taco efficiency advantage



\*Taco vertical in-line pump efficiencies vs. leading competitive pump at 1,696 duty points.



www.TacoComfort.com





### Comfort Zone

Greenheck's comprehensive line of Air Terminal Units (ATUs) provide an energy-efficient way to regulate airflow for maximum occupant comfort.

Single duct, fan powered, dual duct, and retrofit ATU models are available.

Specify with Confidence.  
Specify Greenheck.



LEARN MORE  
©2023 Greenheck

## FLOOR OR WALL



ONE BOILER DOES IT ALL

### Introducing LAARS® FT Series Light Commercial Boiler

- 2 models: 399 MBH and 301 MBH sizes
- Up to 10:1 turndown and 95%+ thermal efficiency
- Durable 316L stainless steel fire-tube heat exchanger
- DHW Smart Priority™
- Top and bottom water and gas connections



Learn more today:

[laars.com/CommercialWallBoiler](https://laars.com/CommercialWallBoiler)

©2023 Laars Heating System Co. All rights reserved.

## Electron iE1

The World's First Tankless Heat Pump Water Heater



Efficient heat pump technology paired with the water safety and on-demand features of tankless.



## Ascent™ II Macerating Toilet System

Add a bathroom anywhere!



Adding a bathroom is made easy when no gravity lines are convenient!

### Liberty Pumps®

800-543-2550 - [LibertyPumps.com](https://LibertyPumps.com)

# Fusion Likely Best Path to Clean Nuclear Energy

*As the new film 'Oppenheimer' garners attention, let's revisit last year's significant achievement of nuclear fusion ignition.*



## 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](mailto:larry@sustainflorida.com).

On December 5, 2022, the National Ignition Facility (NIF) at Lawrence Livermore National Laboratory (LLNL) achieved the first-ever controlled nuclear fusion ignition with energy breakeven.

In other words, it produced more energy from fusion than the laser energy required to drive the reaction.

This was a major scientific achievement that resulted from work begun by LLNL scientists in the 1960s, when they hypothesized that lasers could be used to induce fusion in the laboratory. Six decades later, LLNL researchers delivered 2.05 megajoules (MJ) of energy to the target, resulting in a fusion energy output of 3.15 MJ (equivalent to 0.875 kWh).

On July 30, NIF repeated its December ignition and produced an even higher energy yield. For those unclear about the difference between nuclear fusion and nuclear fission, here's a quick primer from the U.S. Dept. of Energy's Office of Nuclear Energy:

*Fission occurs when a neutron slams into a larger atom, forcing it to excite and split into two smaller atoms—also known as fission products. Additional neutrons are also released that can initiate a chain reaction. When each atom splits, a tremendous amount of energy is released.*

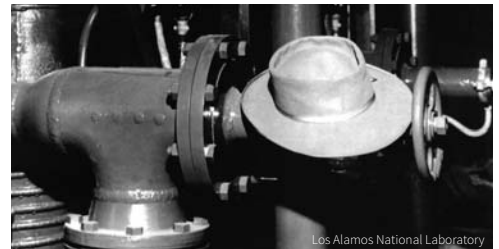
Uranium and plutonium are most commonly used for fission reactions in nuclear power reactors because they are easy to initiate and control. The energy released by fission in these reactors heats water into steam, which is used to spin a turbine to produce carbon-free electricity.

*Fusion occurs when two atoms slam together to form a heavier atom, like when two hydrogen atoms fuse to form one helium atom. This is the same process that powers the sun and creates huge amounts of energy—several times greater than fission. It also doesn't produce highly radioactive fission products.*

The advantages of commercial power reactors based on controlled fusion, rather than fission, are significant. In addition to producing

fewer radioactive products, sea water could theoretically be used as a fuel

Sea water is rich in deuterium (an isotope of hydrogen with a nucleus of one proton and one neutron, double the mass of the nucleus of ordinary hydrogen) – about one atom in 6,420 of hydrogen – or approximately 0.0312% by mass of all the naturally occurring hydrogen in the oceans. According to the International Atomic Energy Agency, the amount of deuterium present in one gallon of water could produce as much energy as the combustion of 300 gallons of oil.



*Oppenheimer's trademark hat at Los Alamos.*

Although conventional (fission) nuclear power plants are, in terms of greenhouse gas emissions, considered green, there are some significant environmental and safety concerns.

The mining and processing of uranium into nuclear fuel is extremely energy-intensive, meaning the emissions based on embodied energy are significant. There are always going to be some radioactive emissions and, even with no accidents or radiation releases from waste disposal operations, there are potential health hazards for workers. And the waste disposal has been, and continues to be, a significant problem.

No one wants spent nuclear fuel, which can remain dangerous for the next 250,000 years, in their backyard! Nuclear power, as we know it today, is also expensive.

So, the idea of fusion – as a clean and economical power source – provides great promise for carbon-free electrification. Hopefully the continuing work at the NIF will be well-funded and strongly supported. And it would benefit all of us to see the fruits of that labor much sooner than later. **HPAC**

# EFFICIENT TO THE CORE

## LAARS® MagnaTherm® FT High Turndown Condensing Firetube Boiler

Give your customers the advantages that come with a superior heat exchanger, up to 20:1 turndown, Laars® Tru Trac® real-time O<sub>2</sub> trim and Laars Linc® easy-to-use touchscreen.

Learn more at  
[laars.com/magnatherm-ft](https://laars.com/magnatherm-ft)



**Built to be the Best®**



- RightSpec Sizing
- Revit and CAD Drawings
- Master Spec



Be ready for what's next with AAON Alpha Class.



With proven performance in nearly any climate, AAON Alpha Class is a critical solution that meets the increasing demand for building decarbonization.

**α** ALPHA<sup>TM</sup>  
CLASS

