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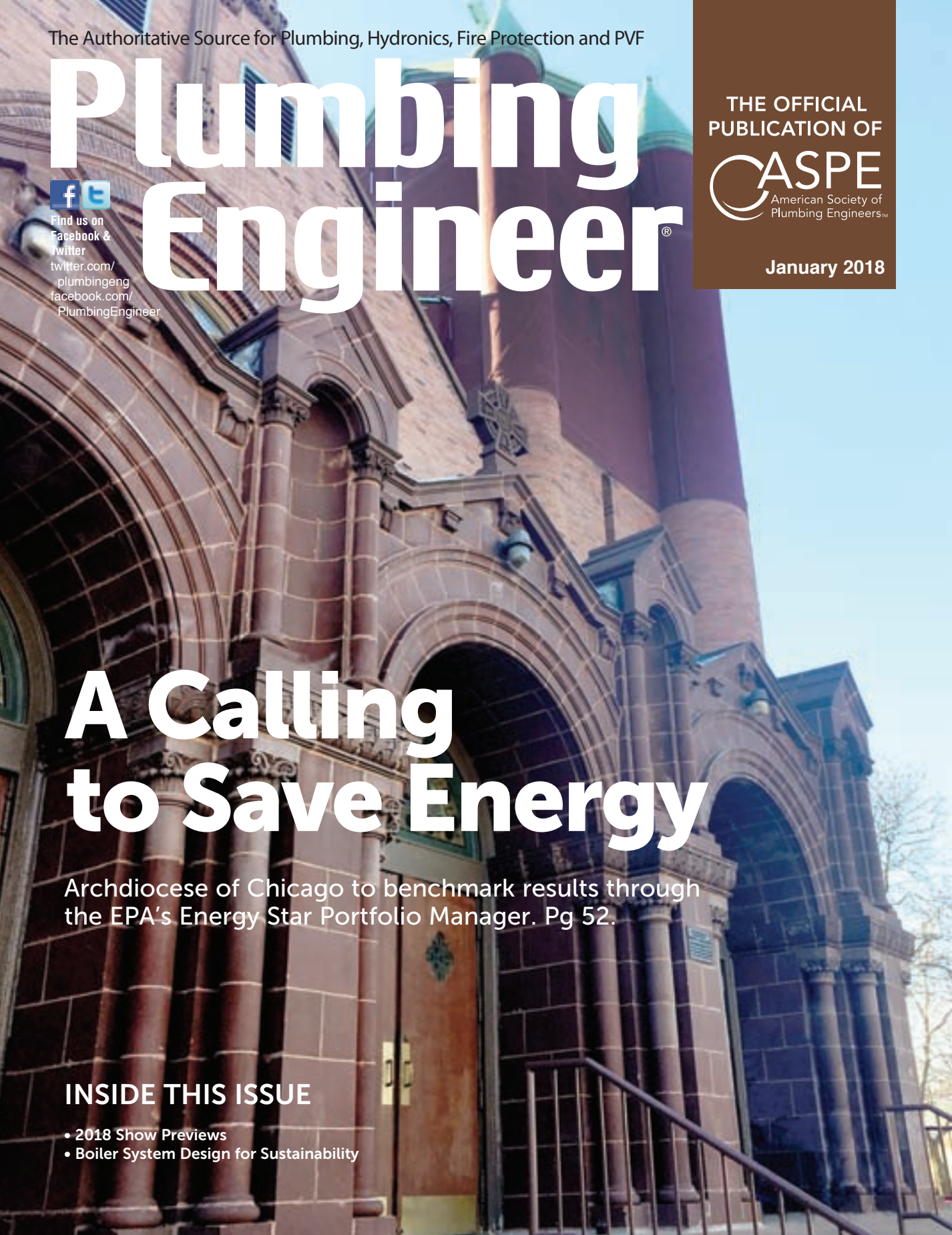

A Calling to Save Energy

Archdiocese of Chicago to benchmark results through the EPA's Energy Star Portfolio Manager. Pg 52.

INSIDE THIS ISSUE

• 2018 Show Previews
• Boiler System Design for Sustainability

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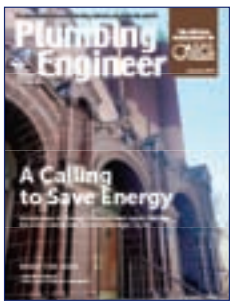

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Volume 46, Number 1, January 2018

INSIDE THIS ISSUE

FEATURES

52 **Archdiocese of Chicago's Energy-Saving Plan**
Strategy aims to save energy, and be the country's first archdiocese to benchmark results through the EPA's Energy Star Portfolio Manager.

60 **Boiler System Design**
Thinking of the system as a whole is the best approach to improving boiler sustainability.

74 **Let's Talk HVACR**
The ASHRAE Conference and AHR Expo will be a hub for the most innovative products, and technologies in 2018.

77 **Kerry Stackpole: A Closer Look**
With new beginnings for PMI, the CEO/executive director defines his role and objectives for 2018, and beyond.

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Be sure to check out **www.PHCPPros.com** for the latest news delivered throughout the day.

The views and opinions expressed in this issue's articles are those of the contributors and do not necessarily reflect a position of Plumbing Engineer, TMB Publishing Inc., or ASPE.

ASPE REPORT

18 FROM THE PRESIDENT'S PEN
20 MONTHLY NEWS

COLUMNS

6 **Editor's Letter**
Change leads back to us.

24 **FPE Corner**
What do you do about sloped ceilings when designing for storage protection in warehouses?

28 **Code Classroom**
Finding the balance in design that prevents both Legionella bacteria and scalding.

40 **Plumbing & Heating Thoughts**
Partial lead line replacements can cause more problems than doing nothing at all.

44 **The Future is Now**
You'd be wise to follow the money trail when deciding on the big energy-efficiency trends for the New Year.

DEPARTMENTS

8 Industry News
82 Classifieds
82 Ad Index

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Editor's Letter

Sharon J. Rehana, Editor
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Change Leads Back to Us

Happy New Year! I'm sure by now many of you have made resolutions and are in the midst of planning their execution and maintenance. As with any new year, most of us have set goals to do better, or perhaps gain something tangible. Something to show for our efforts and perseverance throughout the year.

Most years, I make a promise to myself to learn something new. Be it in a classroom, or by talking to someone more knowledgeable – I aim to learn something and use it in a meaningful way.

This year, I promise to learn more about you, the engineers and designers who influence the water efficiency, sustainability, energy, fire protection, and pollution systems of our society. I would love to have the opportunity to talk to you about your concerns, and goals for the coming year. If you're interested in helping me achieve my goal, I'd love to hear from you!

But, as you can see below, I'm not the only one looking to learn something new this year.

ASPE seeks continuing education opportunities, and new BOD

ASPE is compiling a list of non-ASPE sponsored courses in plumbing system design offered by universities, colleges, community colleges, organizations, or companies, possibly as part of an associate's degree in HVAC or a continuing education program. If you know of any courses in your local area, please send the information to Donna Novickas at dnovickas@aspe.org.

Also, presentation proposals for the 2018 ASPE Convention & Expo, which will be held Sept. 28 – Oct. 3 in Atlanta, are due Jan. 15. In addition to plumbing system design topics, ASPE is looking for contractor-related presentations and sessions by our industry partners. If you have an idea, submit it soon!

Last, but certainly not least, ASPE is calling on members in good standing to apply for one of the 12 elected positions on the 2018-2020 ASPE Board of Directors. The application package and a guide to the nominating process can be found at aspe.org/MembersOnly. We encourage anyone who is qualified to submit an application and to get involved.

Code changes are upon us!

Mark your calendars for the next cycle of code changes. First on the radar is the International Code Council (ICC) code changes that were due on Jan. 8, 2018. Hopefully you got them in on time. ICC will post the proposed changes online around Feb. 28, 2018. The Committee Action Hearings, where the technical committee for each code will hear the changes, are scheduled sometime between April 15-25, 2018. The approximate dates of the code hearings will be published with the proposed code changes in February. The complete schedule for the code cycle is published on the ICC website at www.iccsafe.org. ●

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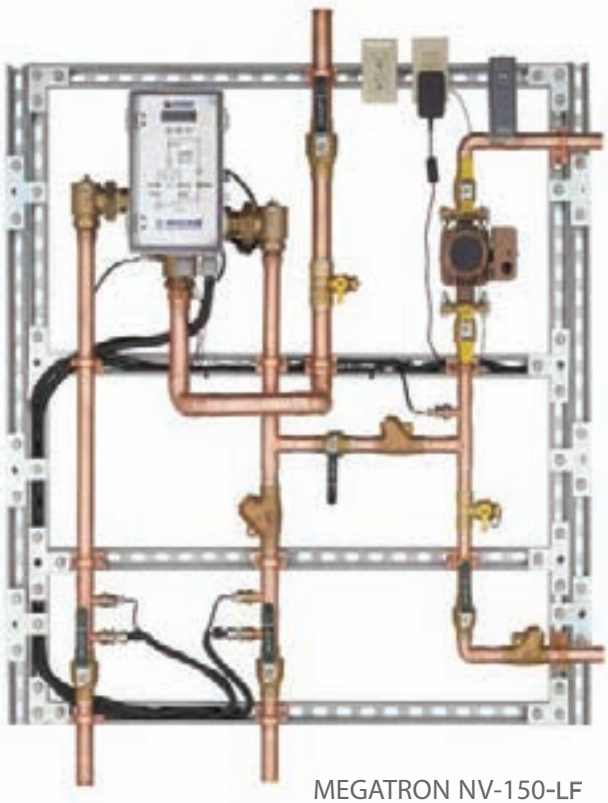

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Industry News

One More Step

The partnership between the International Code Council (ICC) and Residential Energy Services Network (RESNET) has been the catalyst for substantial progress in the Water Efficiency Rating (WER) Index.

RESNET Executive Director Steve Baden has announced that the technical guidelines were finalized and that nearly all the task force work had been completed.

The one exception being the Rater Training and Qualification Requirements Subcommittee, which is tasked with establishing the training requirements for both existing HERS Raters to conduct WER Index ratings, as well as other previously unaffiliated professionals. The remaining work of the Rater Training & Qualification Subcommittee is expected to be completed this fall, and RESNET plans to conduct a limited field verification to ensure that the rating system works smoothly.

Baden noted, "Our intention has always been to develop the technical guidelines within this framework to both serve as the basis for the rating procedures, as well as to form the basis of a candidate American National Standard (ANS)." This is the same process that was used in the development of the Home Energy Rating System (HERS) Index.

Visit www.iccsafe.org

Spartan Bioscience Announces World's First Onsite Legionella DNA Test

Spartan Bioscience announced the product launch of the Spartan Legionella Detection System. It is the first onsite DNA test for Legionella and it can detect and quantify Legionella bacteria in 45 minutes.

"Onsite Legionella DNA testing is the first practical way to monitor and prevent Legionella outbreaks in buildings," said Paul Lem, M.D., CEO of Spartan Bioscience. "With widespread testing, there is the potential to basically eradicate Legionnaires' disease."

The system consists of a coffee-cup-sized, portable DNA analyzer called the Spartan Cube and a single-use disposable test cartridge. The system is the winner of the 2018 AHR Expo Innovation Award for Indoor Air Quality, as judged by the American Society of Heating, Refrigerating and Air-Conditioning Engineers.

When labs test for Legionella, they do so by putting water samples in a Petri dish, then waiting 10 to 14 days to see if bacterial cultures grow. According to Canada's Spartan Bioscience, which is the manufacturer of the

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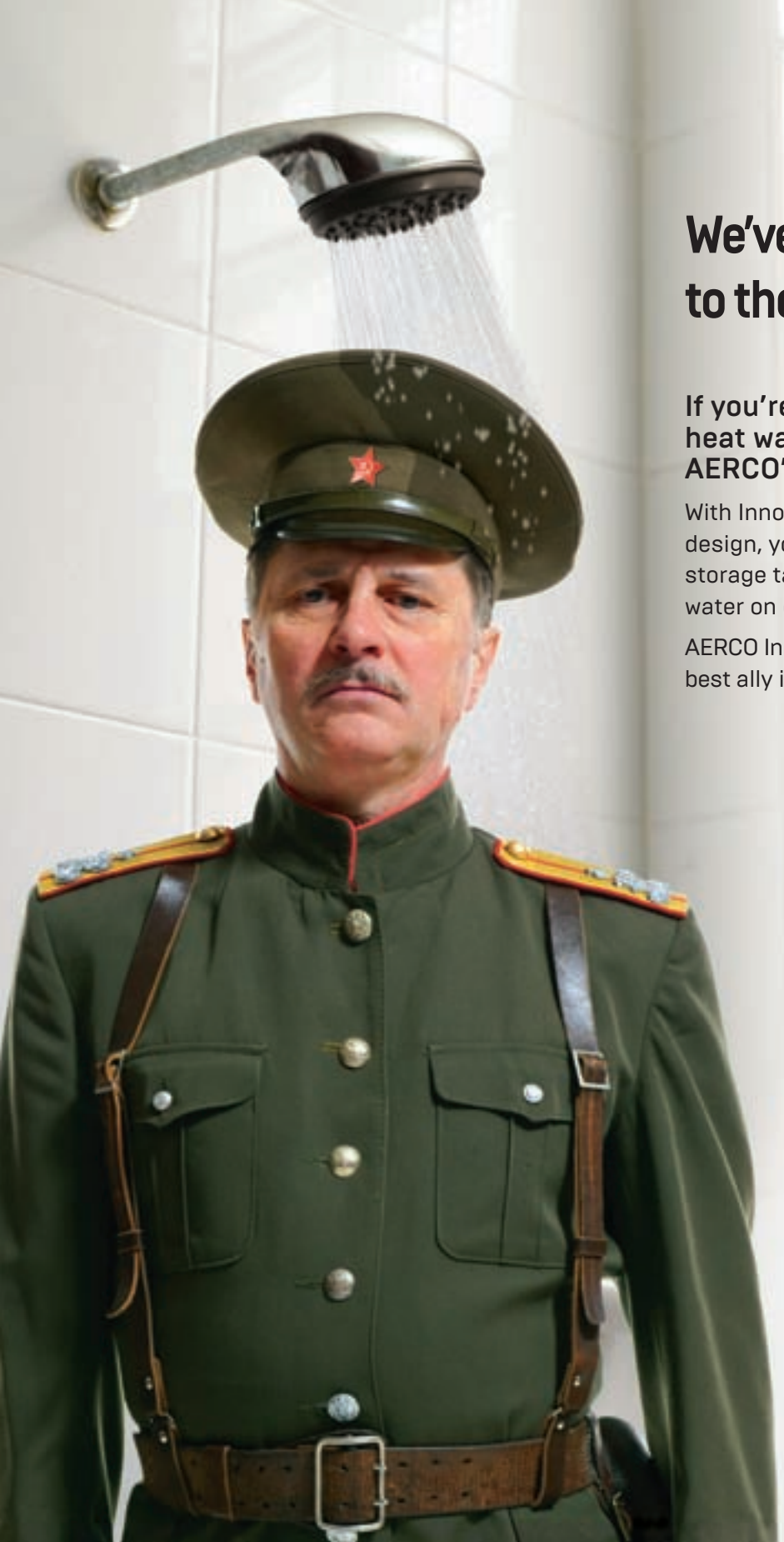

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cube, Legionella populations can reach outbreak levels in just seven days. Additionally, the company claims that lab culture testing can underestimate actual Legionella levels by a factor of 10 or more.

Globally, there are hundreds of thousands of office towers, hospitals, hotels, shopping malls, and other large buildings at risk for infection by Legionella. Weekly testing with the Spartan system can detect Legionella bacterial growth early and allow cleaning and decontamination of the cooling tower before Legionella reaches dangerous levels to human health.

Due to the limitations of Legionella bacterial culture testing, cities that have implemented mandatory testing with this method continue to have outbreaks of Legionnaires' disease. For example, New York City implemented mandatory testing regulations in 2016, but has had several fatal outbreaks in 2017.

Spartan has developed the first onsite Legionella DNA test to solve the problems of using lab-based bacterial culture. The technology is based on a highly-accurate Nobel-Prize winning chemistry called quantitative Polymerase Chain Reaction (qPCR) and it is designed to meet the objectives of ISO/Technical Standard 12869:2012: "Water quality–Detection and quantification of Legionella spp. and/or Legionella pneumophila by concentration and genic amplification by quantitative polymerase chain reaction (qPCR)."

Visit www.spartanbio.com.

Eemax Announces January Training Dates at New Innovation Learning Center

Eemax recently celebrated the grand opening of a new 7,000-square-foot Innovation Learning Center at the company's corporate headquarters in Waterbury, Connecticut. A hub for training, creative exploration, and water heating education, the Innovation Learning Center will serve as a collaborative space for engineers, manufacturer's representatives, wholesalers, and plumber/contractors in the Northeast and nationwide.

"This center is not just about showing PowerPoint slides," said Kevin Ruppelt, vice president and general manager, Raypak and Eemax. "It is about having a robust, hands-on training experience where our customers can see, touch, troubleshoot and repair units. It's about more than just products. It's about the whole integrated event of learning, networking and team building."

The company has announced the following dates for training in January:

For the plumber/contractor: Jan. 22

Whether you're a "lone wolf" servicing individual homeowners or part of a "pack of plumbers" hunting down commercial projects, the Eemax plumber/contractor one-day training class is a hands-on teardown, rebuild,

and troubleshooting experience that builds confidence and familiarity with the Eemax residential and light-commercial products. Tradespeople that know Eemax electric tankless products know how to solve hot water solutions that others cannot fix.

For the specifying engineer: Jan. 25

In this one-day class, specifying engineers will learn about the problem-solving qualities of Eemax Electric Tankless Water Heaters and how to design functional and efficient water heating solutions. Eemax heater sizing and selection for hand-washing, commercial/industrial water heating, and tepid water solutions using advanced calculation tools and worksheets give the engineer a solid foundation to specify Eemax hot water products in a variety of projects.

For the wholesaler: Jan. 26

The counterperson and outside salesperson is often the local expert called upon to help solve water heating problems encountered by plumbers and contractors alike. But does your staff know and understand the best Eemax product to offer? Our one-day wholesale distributors class gives your inside and outside salespeople exposure to all Eemax product, plus sizing exercises and an understanding of common problems seen in the field.

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Code Council Applauds SMART Rebuilding Act

The International Code Council supports bipartisan House Resolution 4455, the Supporting Mitigation Activities and Resiliency Targets for Rebuilding Act or SMART Rebuilding Act, sponsored by Congressmen Jeff Denham (R-Calif.) and Mike Capuano (D-Mass.). This bill aims to help communities rebuild stronger and recover more quickly after natural disasters by incentivizing communities to build replacement structures to the most up-to-date building codes available.

Working in partnership with the BuildStrong Coalition, the Code Council has advocated for the adoption of the latest building codes and met with dozens of Congressional members and their staffs to highlight the importance of pre-disaster mitigation. Buildings constructed to updated codes incorporate the latest technology and provide the safest, most resilient structures for families and communities.

"Guided by our members, our mission and our new subsidiary, the Alliance for National & Community Resilience, the Code Council is leading the way with other partners like the BuildStrong Coalition, the American Institute of Architects and the National Institute of Building Sciences to foster safer buildings and more resilient communities here in the U.S. and around the globe," said ICC Chief Executive Officer Dominic Sims, CBO.

Visit www.iccsafe.org.

Armstrong's Donation Improves 17,000 Lives

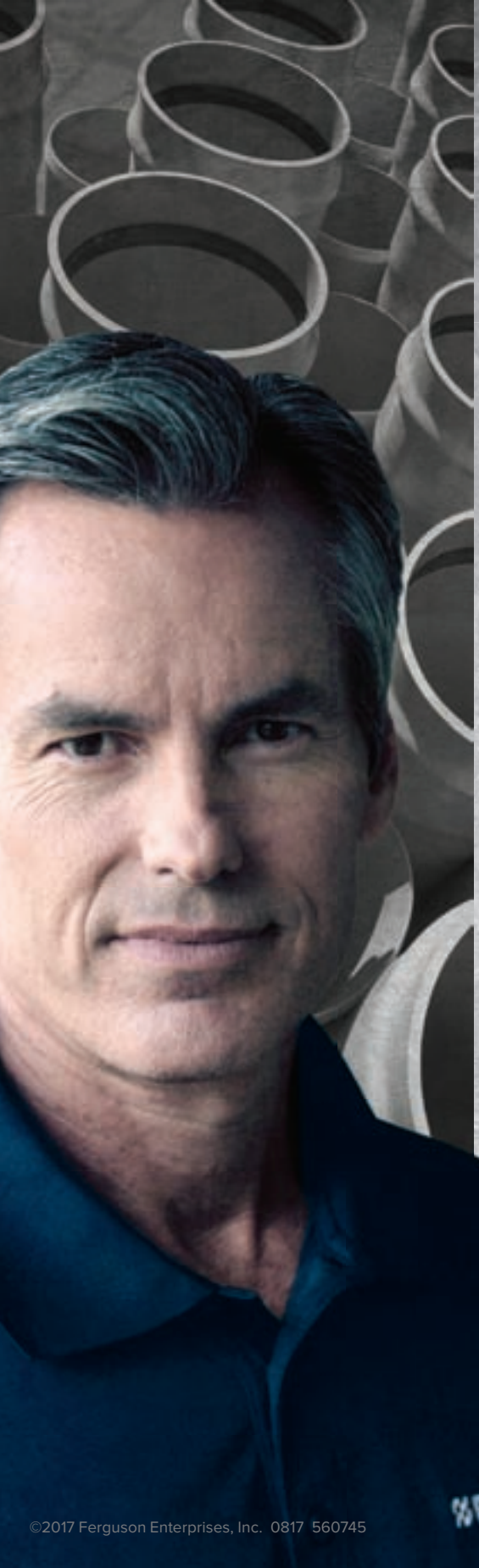
WaterAid Canada has informed Armstrong Fluid Technology that its recent donation helped bring water and sanitation to 17,000 girls and boys at 20 schools across Ethiopia, Kenya and Uganda.

WaterAid Canada is dedicated to transforming the lives of the poorest and most marginalized people by improving access to safe water, sanitation and hygiene worldwide.

To help WaterAid achieve its goals, Armstrong created an employee recognition program in 2016 named Rising Stars that consisted of an international talent show to raise money for the charity.

These employee initiatives generated $5,000 in contributions, which was matched with an additional $5,000 from Armstrong. The Canadian government added another $30,000 in matching funds to bring the total donation to $40,000.

Visit www.armstrongfluidtechnology.com



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ICC Unveils New Resources to Promote Code Officials

The International Code Council launched a new online resource, the Value of the Code Official toolkit. This toolkit helps government officials, Code Council members and others build awareness for the code official's significant role within their communities.

Code officials review plans and conduct inspections to guarantee every building constructed follows the community's codes and standards. Structures constructed in accordance with updated building codes are more likely to withstand disasters, saving lives and reducing the cost and time needed for rebuilding. The most widely utilized and adopted set of building safety codes in the U.S., the International Codes, result in the highest level of building safety in the industrial world.

This new resource also encourages students and young professionals to join the industry's pipeline of qualified professionals.

According to a 2014 study, the building industry will experience a loss of 80 percent of the existing skilled workforce over the next 15 years. Retirements combined with a growing demand for skilled labor make the booming construction industry a tremendous opportunity for young adults entering the workforce.

"The Value of the Code Official toolkit builds on the Code Council's innovative work through the High School Technical Training Program, the Military Families Building Safety Program and our other Safety 2.0 programs," said Code Council Board President Jay Elbettar, P.E. "In the wake of the recent destructive hurricane season and widespread California wildfires, we continue to highlight the critical role of the code official in creating safe buildings and resilient communities."

Value of the Code Official toolkit includes: Talking points, presentation slides with notes for the presenter, a flyer for electronic and print distribution and a video "Code Officials: Building Safety Today for a Stronger Tomorrow."

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Alice A. Martin, Chief Revenue Officer, NIBCO, Dies at 61

Alice A. Martin, 61, of Elkhart, Indiana, passed away peacefully at home surrounded by her family on Dec. 10 after a courageous battle with cancer.

Alice was born March 16, 1956 in Carlock, Illinois, to the late John Alfred and Alice Ann (Dohrs) Stauffer. A graduate of Bloomington Normal High School, she received her Bachelor's Degree in education and psychology with high honors from Eastern Illinois University and her MBA from the University of Illinois. She began her career at the Continental Illinois Bank where she served as a banking officer from 1980 until 1984.

On May 12, 1984, Alice married Rex Martin at the First Presbyterian Church in Elkhart. She then joined her husband at NIBCO and served in a variety of positions, most recently as chief revenue officer, a position she has held since 2015. She was also on the Board of Directors since 2000 and served as the vice chairman of the Board since 2002, lead director of the Board from 2003-2005 and chief people officer from 2005-2015.

She is the loving wife of 33 years to Rex and the loving mother to two daughters: Ashley Martin and Alexis (Shawn) Martin-Klose, both of Elkhart. Also surviving are four brothers; John Stauffer, Paul (Marcia) Stauffer, David (Diane) Stauffer and Dan Stauffer, all of Bloomington, Illinois.

Alice served as the president and co-founder of the Rex and Alice A. Martin Foundation, a charitable foundation headquartered in Elkhart which donates to major projects for children. Celebrating its 16th year, the foundation has funded the NIBCO Water & Ice Park in downtown Elkhart, the Martin Skate Park I and Martin Skate Park II on the west and east sides of Elkhart, respectively. Additionally, the foundation has contributed significantly to the renovation of the Lerner Theatre and to the construction of Indiana University at South Bend facility, both in downtown Elkhart. Other projects include the purchase of the soon to be completed Children's Garden at the Wellfield Botanical Gardens in Elkhart and, along with three other donors, the purchase of the Havilah Beardsley House on Main Street in Elkhart.

She served on more than 30 local, regional and state charitable Boards of Directors and has been honored many times for her leadership and philanthropy. Recently, she was honored by Premier Arts with the Arthur J. Decio award and also by the Elkhart Chamber of Commerce with its 2012 Businesswoman of the Year award. She has also received the "Sagamore of the Wabash" award, which is Indiana's highest honor. Alice has also been named the Lewis S. Armstrong award recipient for Business Acumen by Indiana University, South Bend. She has also received awards from the University of Illinois, WNIT Public Television, Rotary International, Lions Club International, the United Way and the National Association for the Advancement of Colored People. Public Broadcasting honored her at its national convention with its National Leadership Award and the Indiana House of Representatives and Senate passed a joint resolution of commendation in her honor.

Alice served on the Advisory Board for Indiana University at South Bend and on the Advisory Board for the Business College at the University of Notre Dame. A champion of women's rights, Alice also founded the Women's Leadership Group at NIBCO. An avid global traveler, Alice was proud to have visited more than 70 different countries. She was a huge patron of the arts and had an infectious laugh which often caused others to join in with her.

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Mitch Clemente, CPD, FASPE, 2016–2018 ASPE President
aspepres@aspe.org

The New Year may only be a few weeks old, but ASPE is already working out the details for what will be a very eventful and exciting 2018. This is a Convention & Expo year for ASPE, which is very exciting, but many more events are being planned before we can even begin to think about packing our bags and heading to Atlanta in September. Continuing education programs are a top priority for the Society, and this year is no different than those of the past. Many new and different webinars and workshops will be available this year. January starts off the 2018 Webinar Series with a presentation on PEX plumbing systems, which is free for our members thanks to the generosity of the Plastics Pipe Institute. We also are hosting a two-day Basic Plumbing Design workshop at ASPE's office in Chicago later this month. Check out the ASPE website at aspe.org for more information on these and future educational opportunities.

The Finance Committee also kicks into gear around this time of year in preparation for the January Board of Directors meeting. The committee is comprised of a few Society Board members including me, VP Technical David E. DeBord, CPD, GPD, LEED AP, ARCSA AP, CFPS, FASPE, VP Education Chris Graham, CPD, FASPE, and Treasurer Jim Zebrowski, PE, CPD, FASPE. With our Executive Director/CEO Billy Smith, FASPE, and Staff, the goal is to develop a conservative, yet realistic, two-year draft budget for 2018–2020. The purpose is to look back at the past two years to see how the Society performed and develop new ideas and goals to improve our financial position going forward. The Finance Committee has completed the draft budget, and I thank them for their due diligence in helping develop a fiscally responsible plan. This draft budget will be presented to the Society Board of Directors for their review and comment. The Board's responsibility is to review the draft budget and then fine-tune the numbers. Believe me, plenty of spirited discussions will take place during this part of the meeting, but I can guarantee that we will focus on making this Society more financially stable, while we trim any excess expenditures wherever we can. The draft budget will then go through a few revisions before it is presented for approval during the second-quarter Board meeting in April.

The 2018 Convention & Expo in Atlanta is not until late September, but the Education Committee has already started discussing the technical education program for this event. Putting together the tracks and ses-

continued...

Congratulations New CPDTs!

ASPE is pleased to announce that the following individuals earned their Certified Plumbing Design Technician (CPDT) designation last October: Donovan Aguirre Rivas, CPDT, Joshua Bolton, CPDT, Shane Brant, CPDT, Mitchell Burnaugh, CPDT, Francisco Chaidez Leon, CPDT, Bill Cheek, CPDT, Jacob Cicero, CPDT, Jason Dodge, CPDT, Joseph Greene, CPDT, Jason Haigh, CPDT, Nathan Heitzinger, PE, CPDT, Darren Horsfield, CPDT, Chris Huisman, CPDT, Daniel Johnson, CPDT, Jasmine Kinard, CPDT, John Klapper, CPDT, Mark Koenig, CPDT, Rudy Luna Jr., EIT, CPDT, Christopher Macal, CPDT, Yolanda Mashni, EIT, CPDT, Brett McQueen, CPDT, Randall Merkel, CPDT, Sean Mooney, CPDT, Murtaza Naqvi, CPDT, Matthew Panzer, CPDT, Chad Peterson, CPDT, Lydia Ramsey, CPDT, Camilo Rodriguez, CPDT, Joe Thottupuram, CPDT, Brittainy Tidwell, CPDT, Israel Villanueva, CPDT, and Jenny Whitlock, CPDT.

New Board Reports and Education Committee Newsletter Are Now Available

At aspe.org/BODnewsletter you can learn what ASPE's Board of Directors' members have been doing, including region updates and reminisces from the 2017 ASPE Technical Symposium. At aspe.org/EducationalProgramsTools you can find the Fourth-Quarter 2017 Education Newsletter, which includes articles from members about their experiences in Montreal at the ASPE Technical Symposium as well as information on the 2018 CPD Exam and the Basic Plumbing Design workshop in Chicago.

Do You Know About Any Plumbing Engineering/Design Courses in Your Area?

ASPE is compiling a list of non-ASPE sponsored courses in plumbing system design offered by universities, colleges, community colleges, organizations, or companies, possibly as part of an associate's degree in HVAC or a continuing education program. If you know of any courses in your local area, please send the information to Donna Novickas at dnovickas@aspe.org.

ASPE Report
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Monthly News from the American Society of Plumbing Engineers

sions for the Convention is no easy task. It takes numerous meetings and input from all members of the committee and the Staff to be successful. The committee did an excellent job developing the 2017 Technical Symposium seminars, which received great reviews, and their goal is to make the Convention sessions even better. Just to give you an idea of what this committee does, they meet every other week through the month of April to talk about and plan the education program for the Convention. They discuss the latest trends and hot topics in the industry to develop the tracks and session topics and then reach out to potential speakers. The Education Committee plays a very important role in developing these sessions, and I would like to thank them for their hard work and efforts in creating the programs for each of you, the members of ASPE.

The Membership Committee has also been getting together on a regular basis. They meet once a month to talk about many different ideas and potential programs to retain and grow our membership. This committee then takes those ideas that are brought to the table and, along with the Staff, develops a plan to implement those that they believe will benefit the Society. Recent discussions have included outreach programs to local universities to create more Student Chapters. The committee is also working on some ideas to improve the Chapter Officers Resource Page on our website (aspe.org/ChapterOfficers). The Resource Page is a great tool for all Chapter Officers. This is where they can find the latest information on membership, educational resources, training videos, and many how-to documents. If you are a Chapter Officer, please take a few minutes to check it out. You will probably find some information that will help you in your role, and don't be afraid to check back often as we update the site on a regular basis.

January 31st is a very important date on ASPE's calendar. This date represents the deadline to apply for the Alfred Steele Scholarship and also the deadline to nominate someone to be considered for the Kenneth G. Wentink College of Fellows. Hopefully those wishing to participate in either of these programs are wrapping up their documentation, as the end of the month is near.

Speaking of the Alfred Steele Scholarship, I would like to briefly touch on the person for whom the scholarship is named. I never had the opportunity to meet Mr. Steele, but he was a visionary and pioneer in advocating education and professional development for plumbing engineers and designers. His mission is still relevant today, as ASPE is proud of the educational programs we make available for our members. I touched on a few of the educational opportunities that will be available this year, and they are all in the spirit of what Mr. Steele was advocating for plumbing engineers and designers. Hopefully you will take advantage of these and many other member benefits.

In closing, I wish you the best for a healthy and prosperous New Year, and I am looking forward to seeing you at an ASPE event later this year.

New ASPE Members

Atlanta Chapter
Asis Llorens
Parth Patel
James Reeves

Baltimore Chapter
Mike Clough
Mike Fullem
Nikita Patel
Lance David Reynolds, PE

Boston Chapter
Joseph P. Durning, PE
Chad Oscar Hill
Ryann Elizabeth Ingve
Sabrina Randall
Andrew Paul Sciaba

British Columbia Chapter
Kevin Joseph Chicquen, P.Eng.
Robert Frederick Hewitt

Buffalo-Niagara Chapter
Thomas A. Herberger

Capital Region NY Chapter
Andio Caasi Laureta

Central Florida Chapter
Kyle Bowen

Central Indiana Chapter
Mark D. Reed

Central Ohio Chapter
Christian Matthew Rowe

Charlotte Chapter
Eric Jason Harvell
Andrew M. Tripp, PE

Chicago Chapter
Kristopher George Magle
Joshua Stelter
Jeff Stevens

Cleveland Chapter
Kim A. Metzger

Connecticut Chapter
Chris Anderson
Jason Thomas Bielesz
Andrew James Danna

Dallas/Ft. Worth Chapter
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Sidney Breon Royal
Matthew Strong, PE
Mark Jerome Young

Denver Chapter
Kalib Ainsworth
Patrick Ellis Carttar

Eastern Michigan Chapter
Brenda A. Pesmark, PE
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Nashville Chapter
Matthew Hitt

New York City Chapter
Carmine Adames
Vince Armenti
Ramiro Esteban Baldeon
Judaline Cassidy
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Jakob Reece Dassinger

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Dirk Richard Rowe

Overseas Chapter
Humberto Farina

Philadelphia Chapter
George Early Wells, PE

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Farhad Akhundzadeh
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James William Kennelly, PE
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Justin Mark Ramm, PE

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Washington, D.C. Chapter
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Erick Kubotani

Western Michigan Chapter
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Wisconsin Chapter
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Evan Keith Donnell McSorley

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Deadline to Apply for the Alfred Steele Scholarship Is January 31

The Alfred Steele Scholarship is open to Student members of ASPE and the sons/daughters of ASPE members. Applicants must have a 3.0 GPA or higher and be enrolled in, or plan to attend, an engineering program at a college or university on a full-time basis. Go to aspe.org/SteeleScholarship for more details and to apply.

Have You Checked Out Our New Store?

At aspe.org/aspemerch you have one convenient spot to purchase ASPE promotional items and giveaways such as apparel, drinkware, office supplies, backpacks, and more. ASPE Young Professionals, Women of ASPE, and CPD and CPDT items are available as well.

College of Fellows Nominations Are Due 1/31

To nominate a member for this lifetime honor, visit aspe.org/fellows or contact Stacey A. Kidd (skidd@aspe.org) for more information. Inductees will be announced at the 2018 ASPE Convention & Expo.

AST Joins ASPE's CEU Provider Program

Applied System Technologies is now approved to offer ASPE continuing education units for its "Energy Efficiency in Compressed Air System Designs" course. To find contact information for Applied System Technologies and all of our CEU Providers, go to aspe.org/ceuproviders.

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WHY THE PLUMBING INDUSTRY'S ELITE CHOOSE TO EARN THE

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"The CPD credential will add value to your resume and your company."

That's according to Nikki R. Probert, CPD, GPD, one of the hundreds of plumbing engineers who has recognized the professional benefits of the Certified in Plumbing Design (CPD) credential offered by the American Society of Plumbing Engineers (ASPE). Yet the CPD credential doesn't just boost your career—it also brings value to your company by reflecting the leadership and advanced design skills of the firm's employees.

SET YOURSELF APART

The CPD is the only international certification program in the plumbing engineering field, and those who maintain the designation are considered to have the highest level of skills in the design and specification of plumbing systems. Employers, clients, and your peers in the industry will immediately appreciate your achievements when they see the CPD designation after your name.

With CPD on your LinkedIn profile, business card, or resume, employers instantly know that you are in the top tier of plumbing engineers, and many employers are quick to reward employees for their accomplishments in achieving and maintaining the credential. Layne Andrew Micek, CPD, GPD, says that "the CPD has allowed me to progress in my company in a rather short time."

Also, the professional recognition afforded by the CPD can help accelerate your career, compared to those without the credential. "The CPD reflects competency in plumbing design and professionalism, and sets one apart from others in the industry, whether it is competing for a project with an owner, architect, or contractor, or competing for promotions in your employment," says Bradley T. Gettel, CPD, GPD, LEED AP.

Sarah A. Balz, PE, CPD, GPD, LEED AP, has had a similar experience. "Clients would see 'CPD' on my business card and ask what it was. It gives me more credit as a designer," she says.

THE GREATEST HIDDEN BENEFIT

Why are CPDs known to have the most advanced skills? Due to the program's recertification requirements, CPDs are continually attending training so they are always the first to know about new techniques, methods, and products. "The continuing education requirement for my CPD recertification keeps me on a monthly schedule of training to stay fresh and up to date on new plumbing technologies," says Probert.

In fact, many CPDs say that the recertification requirement is one of the greatest hidden benefits of the program, in that it forces you to stay at the forefront of the industry through continuing education. "It is worth the time and effort for how it impacts my career," Gettel says.

ADD VALUE TO YOUR COMPANY

In addition to the CPD credential enhancing your career, it also strengthens your company's image in the increasingly competitive MEP industry. When potential clients see the CPD after your name, they know your company is dedicated to hiring and supporting the best talent in the profession. When you study for the CPD exam and stay educated through ongoing training, you bring more value to the services your company offers.

"Just studying for the exam itself is a great way to get exposure to all of the many aspects of the plumbing design industry," Probert says.

Micek agrees: "The CPD shows that you are knowledgeable in the industry and can make the decisions necessary to provide the client with a great design for their building."

HOW CAN YOU JOIN THE ELITE?

The CPD exam is held at online testing centers around the world every year. To take the first step toward unlimited career potential, visit aspe.org/CPD.

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Sprinkler Protection

How to address storage under sloped ceilings in warehouses.

By Samuel S. Dannaway, PE, FSFPE

One of the issues that we frequently must deal with for our projects involving sprinkler protection of storage in warehouses is what to do about sloped ceilings.

From Chapter 12, the chapter on General Requirements for Storage, of NFPA 13 2016 edition, paragraph 12.1.2 states:

12.1.2 Ceiling Slope. The sprinkler system criteria specified in Chapter 12 and Chapters 14 through 20 are intended to apply to buildings with ceiling slopes not exceeding 2 in 12 (16.7 percent) unless modified by a specific section in Chapter 12 and Chapters 14 through 20.

Currently, Chapters 12 and Chapters 14 through 20 do not contain any provisions for modifying this requirement. So, what can one do when asked to provide code complying storage sprinkler systems when the slope exceeds 2-in-12.

We can tell the owner or their architect that the ceiling/roof slope must be limited to 2-in-12 or a flat ceiling must be installed below the roof.

Unfortunately, this is another situation in storage protection design where the requirements for the sprinkler system may dictate the architectural/structural building features.

Now if you are using Factory Mutual criteria there are additional options. Table 14 from *FM Data Sheet 2-0 Installation Guidelines for Automatic Sprinklers,* January 2014 indicates that for a sprinkler system using quick response sprinklers or standard response sprinklers and no in-rack sprinklers, the maximum slope can be 10 degrees, which is approximately 2 in 12. For standard response sprinklers with in-rack protection, the maximum ceiling slope can be 20 degrees, approximately 4 in 12. (Ugh, here we go again with another thing forcing us toward in-rack sprinklers). In cases where these slopes are exceeded, paragraph 2.2.1.6 of FM Data Sheet 2-0 gives us two options.

- Option 1: Install a flat ceiling.
- Option 2: If rack storage is present, then protect the storage based on the presence of excessive clearance between storage and ceiling/roof in accordance with *FM Data Sheet 8-9* (more in-rack sprinklers plus horizontal barriers).

You may have to wait awhile, but there is still hope. The Fire Protection Research Foundation (FPRF), the nonprofit research affiliate of NFPA, is looking into the issue. Thus far, the first two phases of the three-phase research project have been completed.

The Phase 1 report, *Protection of Storage Under Sloped Ceilings – Phase, November 2015*, contained the following:

- A survey, which looked at existing storage warehouses to determine ceiling types and slopes as well as, storage commodities, storage arrangement, ceiling heights and clearance heights above storage to ceiling.
- CFD simulations to evaluate sprinkler activation times under unobstructed sloped ceilings.

It was curious to me that in the survey it did not try to identify the percentage of unobstructed versus obstructed ceilings present in storage warehouses.

The Phase 2 report, Protection of Storage Under Sloped Ceilings – Phase 2 – *Full Scale Test Matrix, October 2017* contained:

- CFD simulations for various obstructed slope ceiling configurations, addressing sprinkler actuation times and sprinkler spray pattern distribution.
- Recommendations for a full-scale testing program (Phase 3) aimed at developing design guidance for sprinkler systems.

Sprinklers actuation simulations were performed with two types of sprinklers. A quick response sprinkler with an ordinary temperature rating (QR/OT) and a standard response sprinkler with a high temperature rating (SR/HT).

The reports can be downloaded from the NFPA website. There is also a companion study that contains a little more detail of the simulations. This study, performed by FM Global Research (and available on its website for download) is titled, Numerical Simulations of Sprinkler

SFPE Notes:

Hawaii: The 12th International Conference on Performance-Based Codes and Fire Safety Design will be held in Honolulu, Oahu, April 23–27, 2018. The conference will cover current and future trends in building and fire regulatory systems, the contribution of fire protection engineers to innovative design solutions, and the latest developments in fire modeling and risk assessment. Registration is open. Go to www.sfpe.org to register.

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Activations and Spray Transport under Obstructed, Slope Ceilings, September 2017.

This FM report provides the following conclusions regarding sprinkler activations. Note that in the simulations purlins were perpendicular to the slope run with girders parallel to the slope:

For QR/OT sprinklers, the following observations are made:

• For horizontal ceilings (0°) and purlin depths of up to 0.6 m (24 in.), a marginal increase (maximum 4 s) in the average activation time is observed for the four sprinklers immediately adjacent to the fire source.

• For a ceiling inclination of 9.5° and purlin depths of up to 0.3 m (12 in.), the average activation time for the four sprinklers immediately adjacent to the fire source is similar to that of the case of horizontal ceilings for the same purlin depths. The average activation times are also comparable to those of the 9.5° smooth ceiling.

• For a ceiling inclination of 9.5° and a purlin depth of 0.6 m (24 in.), considerable activation delay is observed for the non-elevated sprinklers when compared to the average activation time for a smooth, horizontal ceiling. This delay may adversely impact suppression performance.

• For a ceiling inclination of 18.4° and purlin depths of up to 0.1 m (4 in.), the average activation time compares favorably with the smooth ceiling results.

• For a ceiling inclination of 18.4° and purlin depths of 0.2 m (8 in.) and larger, considerable delays in non-elevated sprinkler activations are also observed which may affect suppression effectiveness.

• The presence of a ridge marginally affects the activation times of the four sprinklers surrounding the ignition location. Activations near the ridge are also affected with slightly earlier activation times observed on the near ends of the ridge.

• In the presence of the ridge, less skewness of the sprinkler activation pattern towards the elevated side of the ceiling is also observed for reduced sprinkler standoff distance.

For SR/HT sprinklers, the following observations are made:

• At inclination angles >9.5° and a purlin depth of 0.3 m (12 in.), highly skewed activation patterns are observed between the elevated and non-elevated sides. As sprinklers on the non-elevated side do not activate, suppression effectiveness will reduce.

• For an inclined ceiling with the ridge located 6.1 m (20 ft) from the CUP array, significantly more SR/HT sprinklers activate near the ridge compared to a ceiling in absence of a ridge. The effect of the ceiling ridge on the sprinkler activation patterns appears more significant for SR/HT than for QR/OT sprinklers.

From the observations in the FM report, I have come up with my own set of conclusions. (Disclaimer: Assume that I am wrong).

1. For quick response sprinklers, in the case of a maximum 2-in-12 slope with purlins 12-inches deep or less, and for a 4-in-12 slope with purlins 4-inches or less in depth, the current criteria in NFPA 13 is adequate.

2. At some slope greater than 2-in-12, quick response sprinklers may not be effective in controlling the fire if purlins are greater than 24-inches deep. Fortunately, in the type of buildings I deal with purlins are rarely greater than 12 inches deep.

3. For quick response sprinklers, in the case of a maximum 4-in-12 slope with purlins 4-inches deep or less, the current criteria in NFPA 13 may be adequate.

I note that the Phase II report from FPRF did not contain the FM conclusion regarding quick response sprinklers, with a slope of 2-in-12 and purlin depth of 24-inches.

Regarding SR/HT simulations, the FM report indicates that "*for the 2-in-12 and 4-in-12 slope simulations, "none of the sprinklers on the (low side of the slope from the location of the test fire) activate". The report goes on to state that "(for slope ceilings) SR/HT sprinklers would provide a lower suppression performance compared to the QR/OT sprinklers for a given purlin depth."*

It seems to me that what this report is saying is there may be issues with the use of SR/HT sprinklers for ceiling-only sprinkler protection in storage warehouses where the ceiling slopes are 2-in-12 or greater.

The reports do not address standard response sprinklers with an ordinary temperature rating. Would they perform in a more acceptable manner than the high temperature sprinkler? Perhaps this is moot, as given the advantage NFPA 13 gives one for high temperature sprinklers over ordinary temperature sprinkler when using the control-mode-density-application approach, I suppose few warehouses are equipped with ordinary temperature sprinklers.

One of the interesting findings in that came of the CFD simulations on sprinkler sprays was that though NFPA 13 requires sprinkler deflectors to be oriented parallel to the slope of the ceiling, the simulations indicated that sprinklers oriented parallel to the floor resulted in an increase in the "delivered water flux to the commodity." This deflector oriented parallel to the floor will be examined in the full-scale testing.

Let us hope that the results of the Phase 3 full-scale testing provide clarity and a simple way to deal with ceiling slopes greater than 2-in-12. My skeptical side tells me this research has opened a can of worms (ah, ignorance is bliss) and that the standards will be very stringent with slopes greater than 2-in-12, as well as, provide additional requirements for certain conditions where slopes are less than or equal to 2-in-12 (can you say retroactive?). More in-rack sprinklers and horizontal barriers may be on the way. That flat suspended ceiling is looking pretty good now. ●

Samuel S. Dannaway, P.E., FSFPE, is a licensed fire protection engineer and mechanical engineer with bachelor's and master's degrees from the University of Maryland Department of Fire Protection Engineering. He is a past president and fellow of the Society of Fire Protection Engineers. He is vice president of Fire Protection Technology at Coffman Engineers Inc., a multidiscipline engineering firm with over 360 employees across eight offices. Sam can be reached at dannaway@coffman.com.

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Hot Water Systems

A balancing act between Legionella prevention and scald prevention.

By Ron George, CPD

There has been a lot of confusion about how to properly design, install and maintain a domestic hot water system to simultaneously control both scalding hazards and Legionella bacteria growth. Many people mistakenly believe that controlling hot water system temperatures is like a balancing act performed by simply adjusting the thermostat dial on the water heater to somewhere between scalding temperatures and Legionella bacteria growth temperatures. Unfortunately, there is no middle ground temperature. Any temperature that will minimize scalding in accordance with temperature limits in the model plumbing codes will be in the Legionella bacteria growth temperature range. The only solution to this dilemma is to use hot water temperature control valves to keep storage and distribution temperatures above the Legionella growth temperature range and reduce the temperatures at the fixtures to a safe temperature for bathing, showering and washing.

Water heater thermostat accuracy

Many people have made the mistake of assuming the thermostat dial on a water heater accurately controls the outlet temperature that flows from a water heater, but the thermostat does not accurately control the outlet temperature. Using the thermostat on a water heater to prevent scalding is prohibited by the model plumbing codes because the industry knows the thermostat dial on a storage-type water heater is not designed to accurately control hot water coming from a water heater. There are several types of water heaters on the market and the most common is the storage tank type. Other tankless or instantaneous water heater types have their own unique temperature control versus flow challenges that typically result in the use of temperature actuated control valves as part of the equipment, or a tempering valve is required as part of the system design, or the tankless heaters may not be capable of reaching a disinfecting temperature. The thermostat on a storage-tank-type water heater, however, is not designed to accurately control the outlet temperature because it is located near the bottom of the water heater to sense incoming cold-water temperatures and "turn-on" the energy to the heating element or the fuel to the burner.

The thermostats do not sense or control the hot water that accumulates at the top of a water heater. The water heater thermostats are designed in a way that causes an inherent delay in sensing hot water temperature because the heat must flow from the heated water through a boundary layer of water adhering to the thermostat, through the wall of the thermostat, through an air space in the thermostat, and then to a metal rod that expands and contracts to open and close contacts in the thermostat device.

I was told this heat transfer delay causes a lag time and overshoot temperature of about 11 to 15 degrees depending on the manufacturer. One water heater manufacturer's representative told me the technicians in their factory had witnessed temperature lags as much as 18 degrees on some water heater models tested. This thermal delay results in a temperature chart that looks like a roller coaster. The water temperature at the thermostat element drops below the set point before the burner comes on and rises above the set point before it shuts off. This is why two different water temperature tests of a water heater at different times can yield vastly different results even though no adjustments have been made to the thermostat setting.

Stacking

In addition to the above mentioned thermal cycling, there can be stacking of hot water at times when there are intermittent short draws of hot water. Stacking occurs when cold water is drawn into the bottom of the water heater intermittently and causes the burner to cycle on even when the hot water at the top of the heater is well above the desired temperature setting. With each consecutive short draw of hot water and resulting burner cycle, the hot water temperature in the top of the water heater continues to rise and the outlet temperature can be as much as 30 degrees or more, above the thermostat set point. Therefore, the model plumbing codes prohibit the thermostat on a water heater to control the outlet temperature for purposes of scald prevention at fixtures.

What are scalding temperatures?

The scald burn injury studies done many years ago at Harvard Medical School by Dr. Moritz and Dr. Henriques showed that it took approximately 5 to 8 minutes of exposure to temperatures in the range of 120 F for adults to develop a serious, irreversible scald burn. It should be noted that children and the elderly have skin

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that is thinner than the adult male and baby pig skin from the burn injury studies, and therefore they can develop burns sooner than 5 minutes. Because of these studies, recommendations by various code and standard committees use the 120 F temperature as the maximum allowable shower and bathing temperature for bathers to get out of harm's way before a serious scald injury occurs. Code change proposals were submitted during the previous cycle to increase the temperature from 120 F to allow the thermostat on the water heater to be set at 130 F to address both Legionella bacteria growth and scalding concerns without requiring temperature actuated mixing valves in the hot water system. The problem is the code change would have significantly increased the chances of scalding and Legionellosis by operating in a temperature range that would not adequately address either hazard. The proposed code change was unanimously voted down at the model plumbing code hearings. The maximum temperature of 120 F has been established by numerous code and standard industry committees for decades based on the Moritz & Henriques burn studies as the maximum safe temperature to minimize scald injuries in showers, bathtubs and combination bathtub/showers.

Table 1 – Scalding Temperatures

Temp. F	Temp C.	Time to Receive Burn injury for Adult Males
120	40	More than 5 minutes
130	54	20 seconds
140	60	3 seconds
150	66	1.5 seconds

Source: Whirlpool Water Heaters: Installation, Use & Care Guide. 2004

Chemical and other forms of treatment for control of Legionella bacteria.

Commons methods for controlling Legionella bacteria in both cold-water and hot-water distribution systems is by adding supplemental disinfectants to the water. This will maintain water treatment disinfectant chemical residuals at a level that is effective at controlling Legionella bacteria. The most common water treatment chemicals are Chlorine, Sodium Hypochlorite, Chlorine Dioxide, Monochloramines. Other treatment methods include: copper/silver ionization, Ozone and Ultra-Violet Light. These are not chemical treatments, but they are sometimes used in the right applications. If a facility is going to add chemicals or provide any additional physical treatment to treat the water onsite, they may need to register as a water treatment provider with the local jurisdiction. The levels of water treatment chemicals added to the water should be controlled to assure the water treatment chemical residuals do not exceed the safe drinking water act levels and to assure they do not harm the piping system. Many Chlorine-based chemicals can be very corrosive to piping systems if the chemical residuals are too high.

What are some emergency disinfection methods for hot water systems that are contaminated with Legionella bacteria?

Emergency disinfection methods are typically used when a plumbing system tests positive for Legionella bacteria or if a case of Legionellosis has been attributed to someone who was in or around the building and resulting tests of the plumbing system are positive.

Flushing

Flushing is simply flowing lots of water through all parts of the plumbing system to assure any stagnant areas of the plumbing system have been adequately flushed with fresh,

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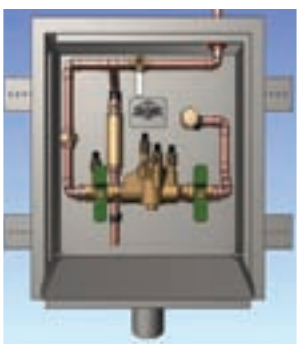

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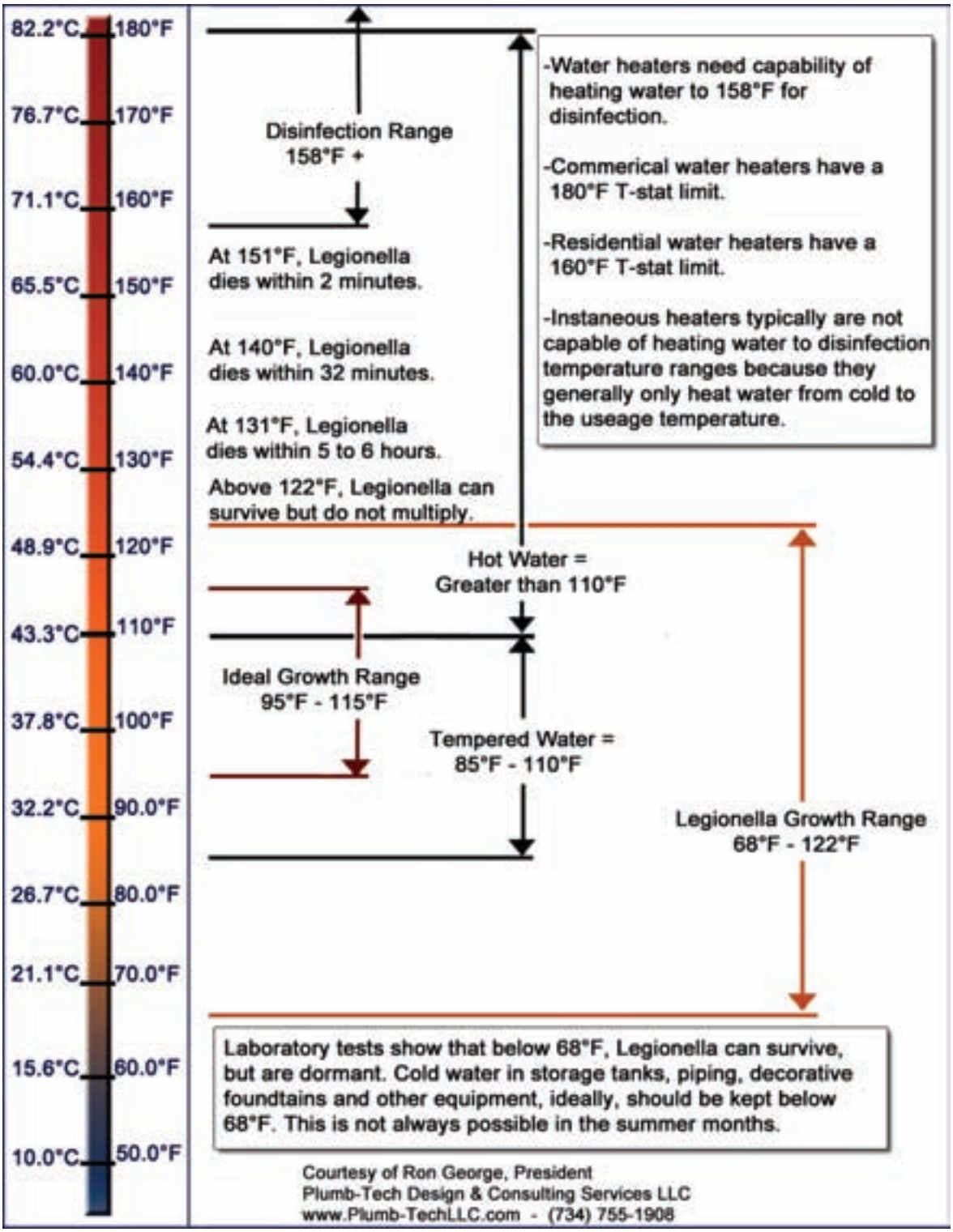

Figure 1 – Legionella Bacteria Growth Temperatures
Source: www.legionellaprevention.org

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treated water from the municipal water supply. It is important to verify that the municipal water supply has an adequate water treatment residual to control Legionella bacteria growth. Testing of the source water supply may be necessary as part of a building water management plan designed to control Legionella and other organisms that may grow and colonize in a building water distribution piping system.

High-temperature heat & flush

High temperature heat and flush is often done to kill Legionella and other bacterial organism growth in the hot-water distribution and circulation system. This method is often done improperly, and some plumbing systems are incapable of performing a heat and flush disinfection. If high temperature heat and flush is to be used, the minimum temperature of 158 F is required to thermally disinfect the entire plumbing system. The temperature loss in the system needs to be accounted for and this is not always done by novice maintenance personnel or inexperienced remediation professionals. Many failed thermal disinfections occur where the facility operators simply set the water heater thermostat to the disinfection temperature and do not take into account the temperature drop in the system.

There are new system components on the market that make it practically impossible to thermally disinfect the hot-water distribution systems because of temperature actuated balancing valves on the hot water return piping, as well as other thermal limiting or mixing devices in the hot-water distribution system.

In a hotel facility that I investigated, that had a prior Legionella problem, the building maintenance personnel decided to disinfect their system with hot water at 150 F. Figure 1 (On page 32) shows with the water set at 150 F, the Legionella bacteria should be killed in just over 2 minutes. However, looking at the hot-water return temperature in this large facility, there was a 37-degree temperature drop during peak usage hours and a 42-degree temperature drop during off-peak hours. (The hot water distribution and recirculation system was poorly designed.) This created a condition where the hot water was leaving the water heater at 150 F and returning at 108 F during off-peak hours when the heat and flush operation was performed. The hot-water system was only capable of heating to 160 F because of the heating water heat exchanger. The system was incapable of heating the water in the entire system to a disinfecting temperature because of poor system design. When the temperature was dropped back down to the normal system operating temperature of 122 F, the return temperature would fluctuate between 80 F and 85 F based on the usage in the building. If 158 F is required in all parts of the plumbing system, and the hot-water circulation system is designed for a 20-degree temperature drop from the water heater outlet to the hot water return after the circulating pump, then the water heater outlet temperature should be 178 F. There are other ways to make sure a proper heat and flush can be performed for a building with somewhat lower water heating capabilities. Looking at the chart, Legionella begins to die at 131 F, but it takes 5 to 6 hours at 131 F. So, if the hot water return temperature is maintained for more than 6 hours and slightly above 131 F, the hot-water main circuit should be disinfected, however, the branches and dead legs will not be disinfected. A complete survey of the piping in the building should be performed to identify all branches and dead legs, and water would need to be flowed from each branch for a period of time sufficient to kill the bacteria in the biofilm. Remember, bacteria buried in a biofilm may be insulated from the water temperature flowing in the piping, so additional time flowing at a given temperature would be required to assure killing bacteria buried deep in biofilm and the underlying scale and calcium build-up on the pipe walls.

The flow rate through each branch should be for at least 25 percent more time than shown in the chart in Figure 1, in order to effectively kill bacteria within the scale and biofilm.

For example:

Water flowing from a fixture at 140 F requires about 32 minutes to provide a kill of all Legionella bacteria in laboratory test samples. Adding 50 percent to the 32 minutes means the water would need to flow for about 48 minutes at 140 F (140 degrees = 32 minutes from Figure 1 x 1.5 = 48 minutes).

Large scale flushing test example 140 F: If a large institutional facility has 1,200 fixtures and the water heater has a 20 gallon per minute instantaneous flow capacity, you could flow about 20 fixtures at a time, and they would need to each flow 1 gallon per minute for at least 20 minutes. The hot water system in the building would need to be raised up to assure the return temperature is 158 F, and at least 158 F or higher hot water temperature would need to be flowing from the flushing fixtures for the specified time period. This process could take well in excess of 60 hours while requiring numerous staff to supervise the flushing operations that will most likely take 2 days or so to complete. This would expose building occupants to scalding temperatures during this time period. Many water heaters will not have that kind of heating capacity and/or temperature capability. When planned out, the high-temperature heat and flush option does not work in many buildings because the shear scope and complexity of the high-temperature heat and flush operation can lend itself to cutting corners and cheating on manual disinfection test reports. Digital recording of temperatures with electronic mixing valves tend to eliminate this human factor from the equation.

Large scale flushing test example 151 F: The minimum recommended flushing temperature in the guideline is 158 F, however if flushing at a slightly lower temperature is done because of the temperature or flow limitations of a water heater, water flowing from a fixture at 151 F requires about 2 minutes to provide a kill of all Legionella bacteria in laboratory test samples. However, the minimum flow time from each fixture for thermal disinfection is discussed in ASHRAE Guideline 12, and the minimum required emergency, high temperature thermal flushing of fixture branches can be as much as 20 minutes at 158 F. As the temperatures go lower, the length of time for flushing

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needs to be longer. Using the method above, with 151 F water flowing from the fixture outlet and adding a percentage to the recommended flushing time of 20 minutes, it could take well over 30 minutes to kill Legionella bacteria embedded deep in a biofilm and scale build-up on the wall of a hot water piping system. The chart in Figure 1 shows a 2-minute kill, however, industry standards require a 20-minute minimum flushing at the disinfection temperature at 158 F.

Hyper-chlorination

Hyper-chlorination, also known as chemical shock, is the use of chemical disinfectants such as chlorine or chlorine dioxide for a relatively brief period. (For example, 1 hour to 24 hours at concentrations above maximum levels permitted for potable water.) The objective of hyper-chlorination or chemical shock is remediation of hot and cold potable water systems colonized by Legionella. Typically, the chemical disinfectant is introduced upstream of the area to be treated and is distributed throughout the building potable water system, with sequential flushing of the disinfectant through every fixture for several minutes. Because chemical shock uses chemical concentrations above the maximum levels permitted for potable water, adequate precautions should be taken to prevent use of the water during the chemical shock period and to protect occupants that may be exposed to water with high chemical concentrations. You should notify the occupants of the building prior to implementation of the chemical shock process. Some building use patterns may allow chemical shock treatment to be scheduled when occupancy is low.

The objective of hyper-chlorination or chemical shock is remediation of hot and cold potable water systems colonized by Legionella. Typically, the chemical disinfectant is introduced upstream of the area to be treated and is distributed throughout the building potable water system, with sequential flushing of the disinfectant through every fixture for several minutes.

Corrosion and other damage can occur to plumbing system components and piping with increases in disinfectant concentration, time, temperature and the frequency with which chemical shock or hyper-chlorination is performed.

Component manufacturers often provide the maximum chemical concentrations to which their products can be exposed. Treatment with higher concentrations may cause damage and invalidate manufacturers' warranties. High chemical concentrations and durations can damage the plumbing system, and with increased oxidation or corrosion of the plumbing system, it can make future efforts to treat Legionella colonization more difficult.

Hot-water system design to control Legionella bacteria growth and scalding

The proper way to design a domestic hot-water system to control Legionella and scalding, in that order, would be to store the hot water at about 140 F to 150 F. That temperature will kill Legionella bacteria or pasteurize the water in the storage tank and distribution piping system. Then, the proper design would use a digital mixing valve that will deliver hot water to the distribution system at 134 F plus or minus 1 degree and record the temperatures continuously. The circulating pump size/flow rate and hot-water system insulation thickness should be designed with the recirculation piping limiting the flow velocity to a maximum of 3 feet per second at a 10-degree temperature drop in the circulated loop so that the hot-water return temperature is at or above 124 F. The reason for a minimum of 124 F hot water return temperature is because in the new ASHRAE 188 standard, Legionellosis: Control of Legionella in Building Water Systems, suggests a hot water distribution temperature no less than 122 F. If you look at Figure 1, Legionella bacteria stops growing about 122 F. A safety factor should be applied to assure the temperatures do not drop into the growth temperature range below 122 F. With 124 F selected as the minimum hot water return temperature, the 124 F hot-water return water returns after the circulating pump where there should be a gauge to monitor the lowest temperature in the hot-water distribution and circulation system. The hot-water return pipe should then split and go to the cold-water inlet of the mixing valve and the cold-water inlet of the water heater. The 124 F hot-water return water mixes with 140 F hot water from the water heater in the digital mixing valve where it constantly monitors and records the system temperatures to deliver 134 F hot water to the distribution system. This is a relatively close temperature margin and some types of thermostatic mixing valves would have trouble mixing when hot water return temperatures get close to the delivery temperature. This is where digital mixing valves perform very well.

Recent discussions related to hot-water system temperature controls

During several recent industry meetings dealing with control of organisms like Legionella bacteria in building water systems, many people seemed to have misunderstandings about how plumbing systems work. I heard comments from people that said, "you need to set the water heater thermostat to 158 F degrees and flow water from all the fixtures for a 20-minute period to disinfect the hot water system."

It is important to note, if you need 158 F for disinfection, the water temperature setting at the water heater must be approximately the same number of degrees higher than 158 F as the hot-water return temperature is below the hot-water distribution temperature.

I have also heard comments that said, "the code official or health department requires that we set our water heater at 110 F or 120 F to prevent scalding." I pointed out that in most cases the plumbing code does not specifically address hot water storage or distribution temperature. And

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in a few isolated cases, health departments make mistakes and mandate language that creates a health and safety hazard because most health officials do not understand how plumbing systems work. There are some that have mandated low temperatures to try and protect people from scalding, by mandating storage temperatures in the Legionella bacteria growth temperature range. If they would have simply stated the maximum temperature flowing from a shower is 110 F, the limit stop on the shower valve could be set to limit the hot water temperature to 110 F. Instead, they

Water conservation is causing lower flows in water utility mains and building water distribution piping. These lower flows cause water to take longer to arrive at the end of the system.

apparently tried to address buildings where there are old non-code tub/shower valves and they mandated low storage temperatures instead of mandating updating the shower valves to code-compliant ones with maximum temperature limit stop adjustments that are set to 110 F.

Another guy said, "my code requires me to store and deliver hot water at 120 F. So, the return temperature is always going to be between 100 F to 110 F." I then explained to him that there is no place in the plumbing code that addresses a maximum temperature in the storage or distribution system, except for a requirement for combined heating and domestic hot water systems to have a mixing valve set to a maximum of 140 F. The guy then started to mention sections in the plumbing code and health code requirements that address maximum temperature of the water required in the hot water storage tank and piping. He was pointing to the section on showers and bathtubs. I pointed out to him that section 4 of the model codes is fixture and fitting requirements and addresses maximum hot water delivery temperatures from the fixture and it does not address storage or distribution temperatures.

During my 40-year career, I have witnessed many domestic hot-water systems that were designed, installed, or maintained poorly. As part of my forensic investigation work, I have investigated many scald incidents, Legionnaires disease outbreaks, and poorly performing or failing plumbing systems.

Energy conservation

There is no justification for energy or water conservation programs that allow inadequate system performance and contribute to health and safety issues.

An electrician at Queensland Hospital told the news agencies that a state government energy efficiency program may have increased the risk of Legionella bacteria living in the water supplies of homes and businesses across Queensland, Australia.

The Welsley hospital has had its hot water temperatures limited to 45 C, (113 F) in line with Queensland regulations designed to prevent patients from scalding themselves. The Brisbane electrician who worked for the state government's now defunct Climate Smart Program said anyone who used that service would have had their hot-water system temperatures reduced to 50 C (122 F) to save energy.

He said electricians warned the government at the time that lowering the temperature would encourage harmful bacteria growth, but the warning was ignored.

"Part of the direction given was to turn down all the hot water systems all over Queensland down to 50 C (122 F)," the man, who did not want to be named, said. "Anybody that had the Climate Smart service had the temperature of their hot-water system reduced from 65 to 70 C (149 F – 158 F) down to 50 C (122 F)."

This was an example where an energy conservation program was potentially deadly. I believe energy and water conservation should take a back seat to health and safety.

Water conservation

We seem to be in a water conservation limbo contest with competing green design standards and water and energy conservation programs trying to squeeze every drop of water down to an undetermined minimum flow in order to gain points for a plaque to hang on the wall in a building and save a few drops of water. How low can they go? Water conservation is causing lower flows in water utility mains and building water distribution piping. These lower flows cause water to take longer to arrive at the end of the system. Current ultra-low-flow fixture flow rates are about 20 percent of the overall water flow rates prior to the Energy Policy act of 1992. This causes significantly lower flows where in the past, it would take days for water from the treatment plant to reach the ends of the distribution system. Now, it takes weeks for water to reach the ends of the distribution system. This allows water treatment chemicals to dissipate to undetectable levels well before reaching the end of the water distribution system and then there are no water treatment chemical residuals to fight-off bacteria and organisms growing in the biofilm of our water distribution pipes.

Recently, Drexel University and Purdue University were awarded EPA grant money to study and report on the effects of water conservation programs on water quality.

In addition to water quality issues, water conservation is also causing drain line transport issues with lower and lower flow rates. Our drain pipes look like rivers during a drought; there is not enough water in the river to float the boats. At a recent industry meeting where water conservation activists made a proposal to further reduce the flow rates for various fixtures, I made a plea to stop the madness of percentage flow reduction every code cycle to save water. Saving water will mean nothing if the water we save goes to nut farmers in the desert who are extracting millions of gallons of water every day to water trees. What we need to also do is pay for research to determine what are the minimum sustainable flow rates for various pipe sizes. We have issues with drain line transport of solids, high-tensile strength toilet paper, baby wipes, adult wipes, feminine products, etc. We need to fund more research through the Plumbing Efficiency Research Coalition (PERC) to know what are the sustainable minimums. ●

Ron George, CPD, is president of Plumb-Tech Design & Consulting Services LLC. Visit www.Plumb-TechLLC.com.

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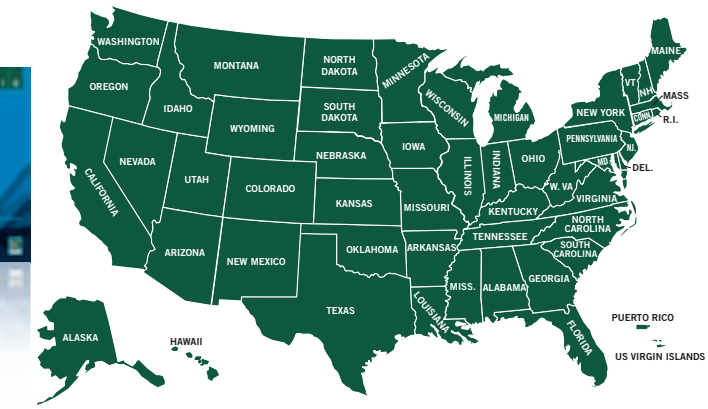

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Getting the Lead Out, But at What Price?

Partial lead line replacements, while common practice, can end up putting more lead in drinking water than doing nothing at all.

By Steve Smith

Michigan Gov. Rick Synder wants to replace every underground lead water service pipe in his state within two decades. In the process, his administration is giving a common, but risky lead pipe replacement practice another look.

Here's the issue: State officials plan to give communities 20 years to replace an estimated 500,000-plus lead service lines in a state with the third-most lines in the U.S. The Synder administration is doing this hand-in-hand with a promised rule that Michigan's "action level" for lead in drinking water would gradually drop to 10 parts per billion (ppb) by 2024. That would be stricter than even the federal threshold of 15 ppb, embedded in the EPA's Lead and Copper Rule, which the governor has called "dumb and dangerous."

Synder originally outlined his plan back in April 2016 as a mea culpa for his administration's role in the Flint water crisis. By now, we all know how lead leached into Flint's drinking water from old lead lines leaving residents to drink and bathe with bottled, and, later, filtered water. Public health experts also blame the switch to improperly treated Flint River water with a local outbreak of Legionnaires' disease that killed 12.

Here's the rub: Under the draft rules, utilities would fully replace all lead service lines at their expense, though the cost would be passed along to customers. A homeowner could decline to allow the replacement of the private portion of the pipe, which is typically between the house and sidewalk.

But that's a shift from an earlier plan to prohibit partial replacement of lead lines. Eric Oswald, director of the Michigan's Drinking Water and Municipal Assistance Division, had told the AP beforehand that "the ultimate goal here is to get lead out of the system" by pushing municipalities to replace the old lead pipes running from water mains to houses or else face "difficult" new operational rules including stricter sampling requirements.

Here's the problem: Digging and jackhammering around lead pipe will naturally jiggle lose bits of rust and scale inside the pipe. Those lead-laden pieces will flake off into the tap water for a time.

That's one part of the process that most would consider, at least an acute, short-term problem that could be dealt with through proper filtration inside the home.

However, there's a much bigger chronic problem that results when the utility replaces half of the old lead service line with brand-new copper pipe.

Swapping one out for the other sounds like a reasonable "bit-by-bit" approach. But maybe not. Researchers have found that removing just part of a lead line can actually make lead exposure worse.

Last January, engineers from Virginia Tech, published their findings from a four-year simulation study that looked at the long-term impact of partial lead line replacements on drinking water.

Under moderate and high water flow rates, pipe containing lead and copper released considerably more lead into the water supply than pipes made from lead alone.

The research, co-authored by Marc Edwards, a professor at Virginia Tech who helped uncover the cause of the Flint water crisis, assessed the impacts of three different water service lines:

- Using 100 percent lead throughout.
- Partially replacing half the copper upstream from the remaining lead pipe (this is the conventional method).
- Partially replacing half the lead upstream from the remaining copper pipe.

Elevated lead from corrosion worsened over time for the 50 percent copper configurations with 140 percent more lead released at 14 months. At high flow rates, all of the samples collected from the conventional partial configuration exceeded health safety thresholds, compared to none for samples collected from 100 percent lead pipe.

It all comes down to a natural enemy of metals — corrosion. All metals corrode when exposed to water and oxygen. It's just a matter of time. But the process accelerates when two different metals are joined together. As a result, "galvanic" corrosion effectively produces an unfortunate battery of sorts with electrons moving from one metal to the other through the conductive water. Over time, this breaks down one metal at the expense of the other. And in a battle between lead and copper, lead is always the loser.

Big picture

Michigan legislators, of course, aren't alone in picking through a host of issues since ownership of drinking water service lines is split between public water agencies with access to public funds and a lot of private property owners with access to none.

Let's review, in particular the lead issue, from the top down.

The Safe Drinking Water Act gives the EPA federal authority to set drinking water standards. Most potential contaminants are regulated by limiting their amount in drinking water.

This approach specifies maximum contaminant levels allowable in treated water, and compliance is solely under

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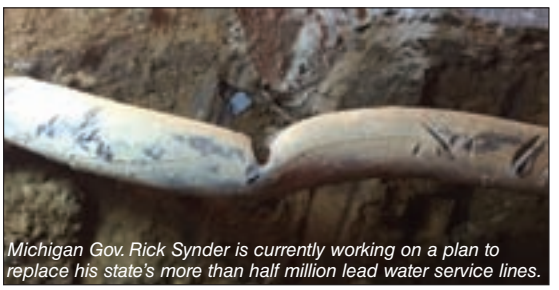
the control of municipalities because municipalities have direct control over the sources of contaminants through local treatment, storage and distribution.

Current interpretations of state laws, however, often prohibit water municipalities from spending municipal resources on private plumbing, thereby limiting their abilities to replace lead sources on private property.

Within this constraint, the EPA enacted the aforementioned Lead and Copper Rule to prioritize monitoring, customer notification, and select municipal interventions that are designed to reduce the public's exposure to lead in drinking water.

The Lead and Copper Rule, which has been undergoing a re-write for over a year and may get an update this year, requires drinking water agencies to annually monitor the amount of lead at their customers' faucets. Water agencies are required to prioritize sampling water in homes more likely to have lead. If more than 10 percent of these samples exceed the action level, municipalities are required to notify and educate customers, attempt water treatment techniques that may reduce lead leaching into drinking water, and monitor both drinking water supplies and lead at customers' faucets.

If ongoing monitoring demonstrates that more than 10 percent of customers continue to exceed the action level, water agencies are required to annually replace 7 percent of publically owned lead service laterals until monitoring indicates lead sampled at customers' faucets falls below the action level.



Michigan Gov. Rick Synder is currently working on a plan to replace his state's more than half million lead water service lines.

Ground level

Finally, at the literal ground level, finding these decades-old lead service lead lines is a big problem. Records describing the installation were probably scribbled down on pencil on an index card and filed away akin to an old-school library card catalog.

When water agencies do initiate a lead line replacement, EPA rules require the agencies to notify customers and provide them with ample time to coordinate replacing the privately owned portion, if they wish.

But digging up a lawn and landscaping just to have a new water line buried beneath the front yard isn't on many people's wish list. It's no surprise that most property owners opt not to replace their portion of lead lines when given the choice.

While a partial line replacement remains common practice, at least one Michigan town we read about is replacing the entire lead service lines.

In Grand Rapids, city officials decided it was worth it for the city to cover the costs of full lead line replacements.

Homeowners aren't likely to balk when the replacement cost is one number. To date, Grand Rapids says it has spent about a half a million dollars in public funds to replace more than 200 private lead lines. Only one homeowner refused. (And for the time being, we'll set aside the whole matter of public funds paying the full freight. For more, see "Free Lunch, No Such Thing As.")

In Dearborn, however, the city is still sticking with partial lead replacements, but implementing a robust program, featuring ads and social media, to warn residents what they are getting or, rather, not getting. The program also includes sampling water before and after the work, recurring water flushing as well as free bottled water.

Meanwhile at the state level, Synder has said he would implement some of his plans through administrative rule making, while others would need legislative approval.

Oswald said banning partial replacements is "not feasible" due to property rights issues, but he added there would be "very tight controls" if a homeowner refuses to let a lead line be fully replaced. ●

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Energy Trends in 2018

Decipher the clues and follow the money.

By BF Nagy

Many years ago on New Year's Day, I received a phone call from a client who said, "I'm calling to tell you that the party's over and it's time to clean up the mess." I thought we were being fired (we weren't) and also that it was a pretty cool new-year metaphor.

For some, the start of another year is a time for resolutions, self-reflection and perhaps, a strategic review for the future. Maybe we want to live better lives — spend time with family, be healthy, safe, kind and gentle. Or, become a little more prosperous and get ahead of those ever-looming bills.

In terms of business strategy for mechanical people, we might want to think about ways to benefit from key mega-trends. If we learned anything at AHR and GreenBuild in 2017, it was that the question is no longer, "Are energy efficiency and intelligent systems here to stay?" Instead it's, "How soon will world domination be complete?"

Of course, planning your strategy is no simple thing. The mega-trends are made up of a disorganized complex of mini-trends, technologies, public pressures, government interventions and big money commitments. It can feel like you have to be a brilliant detective to figure out where we are going in the year ahead.

Follow the money

Famous detectives like Sherlock Holmes, Hercule Poirot, and Lieutenant Columbo, all rely on one tactic more often than any other: They follow the money. As we head into 2018, what the money people in the construction world are saying should serve as clues on which technologies are about to be murdered.

"Evidence does not lie…It's not influenced by emotion or prejudice. It's not confused by the excitement of the moment." – Gil Grissom, CSI

Evidence: According to Research and Markets, U.S. shipments of heat pumps are expected to hit $5.5 billion by 2022, achieving the fastest growth among solutions in the air conditioning sector. Persistence Marketing Research says that tankless water heaters will experience at least 5 percent growth worldwide every year for the next 5 or 6 years, with North America growing even faster. RNR Market Research is predicting that ductless products will make up 15 percent of the HVAC market, and others have suggested twice this amount. GTM Research says that in the past 10 years, solar has experienced an average annual growth rate of 68 percent. It employs 260,000 Americans, reached 1 million installations in 2016 and will hit 2 million in 2018. Morgan Stanley says the demand for electricity storage (which cements the technical capability of renewables) is expected to grow from under $300 million a year to as much as $4 billion in the next 2-3 years.

Evidence: The International Energy Agency (IEA) reports that investment in energy efficiency increased by 9 percent reaching $231 billion in 2016. Most of it, $133 billion, went to the buildings sector. The IEA also says that for the first time, the electricity sector moved ahead of oil and gas in 2016, becoming the largest recipient of energy investment. The biggest share was in new renewables-based power capacity, at $297 billion. This money stretched further than usual, creating 35 percent more power capacity thanks to lower costs and technology improvements for solar and wind. At the same time, investment in upstream oil and gas fell by more than 25 percent.

Apparently, the money people in the building and power industries are voting with their wallets for clean, efficient, intelligent technology.

"Well she was shot in the head so unless she tripped and fell on a bullet, it wasn't an accident." – Kate Beckett, Castle

Wells Fargo

A couple of months ago, Curt Radkin told me that his organization's increasingly green approach is no accident. "Sustainability and the environment is quite simply good business." Radkin is a senior vice-president for Wells Fargo, one of the biggest banks in the U.S. I asked him about funding specifically for green building projects and he said that since 2012 the bank has provided more than $70 billion in financing for green businesses and projects.

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Also, more than 8 percent of all wind and solar PV energy generated in the U.S. came from projects owned completely or in part by Wells Fargo. He said that all the major banks were now highly active in energy efficiency and sharing best financing practices for both retrofits and new construction.

It's good to find a senior bank executive willing to make these kinds of statements, because although green building extras and retrofits pay for themselves more quickly these days, a common complaint in the industry is that financing the up-front cost is not always easy. Banks, investors and other financiers can be very demanding and it has been said that in the past, they have generally ignored the operational savings created by energy-efficient systems, presumably because they are hard to reliably document.

"For me, it is truth. I want always truth." – Hercule Poirot

Investors Confidence Project (ICP)

"The energy savings that are used to build the business case might need to be better verified," says Matt Golden, North American director of the ICP. "It's because every building is different, so it can be hard to do due diligence with the complexities some projects present. We're trying to help with that."

His organization seeks to certify green building projects as "investor-ready" through a well-structured program that includes preliminary energy audits, peer review by third-party engineering firms, a requirement that all project budgets include mechanical system commissioning, and so on. Banks and investors love this kind of standardization. They seem a little interested in LEED, but LEED doesn't connect properly to cost savings.

Johnson Controls

When a church in Stamford, Connecticut wanted to convert from oil to gas heat, and install variable-flow hydronics, a VAV air handling unit, a new BMS, outdoor hot water temp re-set, and more efficient motors, it contacted Johnson Controls Inc. In this case, JCI acted as an energy services company and a credentialed ICP Project Developer, performing an ASHRAE Level II energy audit, and the other steps in the ICP process.

They brought in Sustainable Real Estate Solutions (SRS), a software developer that has embedded the ICP methodology into its platform to streamline technical review, documentation, and project optimization. The church got its funding through a Property Assessed Clean Energy (PACE) model, and will recover its $700,000 investment in about 15 years, by saving more than $44,000 per year on utility costs.

At the risk of putting non-financial people (including this writer) to sleep, it's important to talk a little more about the instruments and other details that are making it easier for banks to finance green building technologies.

The banks & DOE are taking green buildings mainstream

Does anybody care? "More than 5,000 people have used our new Navigator tool in just one year," says Joe Indvik of Rock Creek Consulting, who helped develop a website for project managers for the U.S. Department of Energy (DOE). "When Morgan Stanley, Citi, Wells Fargo, and Bank of America become more involved, that means we're going mainstream. These organizations are like huge cargo ships that move slowly, but when they turn, they create a big wave."

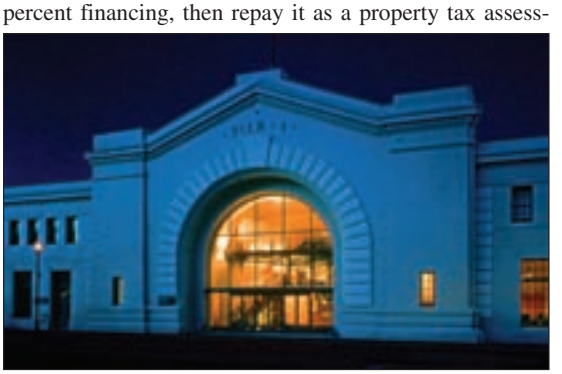
The website describes some old and some new creative financing models being used by banks and others for green projects. It provides case studies on green buildings, with specifics about the deals.

Brenna Walraven, CEO at Corporate Sustainability Strategies in Anaheim, California worked with Indvik on the project. She emphasizes two of the most popular newish models, namely Energy Service Agreements and PACE. "PACE has now been enabled in 30 regions compared with just two jurisdictions five years ago," Walraven says.

PACE

One of the projects Indvik talks about is Pier 1 in San Francisco. When building owner Prologis wanted to reduce its energy load, recommission the HVAC system, add occupancy sensors, LED lights and solar panels; it also hired Johnson Controls. JCI did the upgrades, financing the project through a PACE program accommodated by the State of California and GreenFinanceSF, which managed the deal.

PACE funds can be used for energy efficiency and renewable energy upgrades. Property owners receive 100 percent financing, then repay it as a property tax assess-



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ment for up to 20 years. PACE does two key things: it eliminates upfront costs for the energy upgrade, and it connects the loan to the property (and is transferable). Building owners don't need to think about when they might sell the property, while they evaluate the energy initiative.

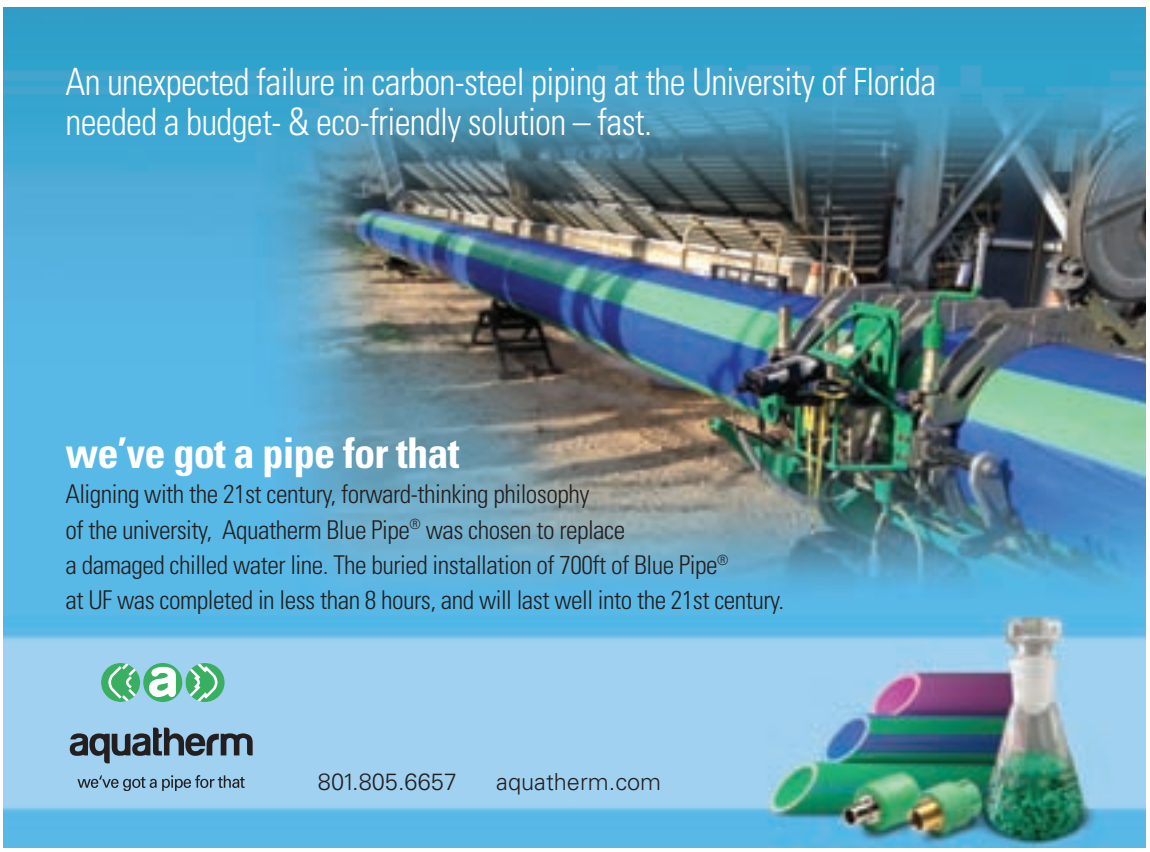
ESAs

Energy Service Agreements (ESAs) are also becoming popular. The Kuakini Medical Centre, a 212-bed hospital in Honolulu, Hawaii needed $5.8 million to build a new chiller plant, add some boilers, boosters, fire pumps, VFD air handlers and modern lighting. It eliminated worry with the help of an ESA. With this model, the hospital pays monthly for the new plant and its maintenance, which technically, is initially owned by an outside company.

This other legal entity receives up-front financing from a bank and contracts separately with a mechanical contractor to do the install and also to do regular service and maintenance during the life of the deal. Projected energy savings are guaranteed under the agreement and are used for monthly payments adjust so that the hospital is cash flow positive and risk free throughout the project period. It also has an option to purchase the equipment at the end of the 20-year term. Given that the retrofit saves about $1.1 million on annual electricity and power (5.5-year payback), everybody wins under the ESA finance model.

"Uh, One more thing...There are a couple of loose ends I'd like to tie up. Nothing important you understand…but it's your perfect alibi that's gonna hang ya." – Lieutenant Columbo

If it all sounds a little too perfect to say that the banks are suddenly very friendly with modern technology, your little gray cells are performing well. Indvik acknowledges that it's still looking mostly at creditworthiness of projects. And although the investor-ready certification and some of



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the special financing structures discussed here are helping it warm up to energy savings in business cases, if you look closely, you'll see that it is mostly still doing what we expect our banks to do — insulating itself from a lot of the risk. It uses limited liability shell companies, and lien waivers, but it DOES lay out cash for more and more deals.

On the other hand, Wells Fargo could be described as going beyond and actually sipping the Kool-Aid. It's not just talking the talk. It's also dancing the 'dab' or the 'Quan' or the 'whip' as it were.

The Wells Fargo Foundation has established a $30 million program co-administered by the DOE's National Renewable Energy Laboratory (NREL), to develop sustainable building technologies.

"We've saved 40 percent on energy, 65 percent on water (a billion gallons) and about 50 percent on waste since 2010"

The program helped a start-up called Whisker Labs develop peel-and-stick energy submetering technology that reduces meter costs by 90 percent. The sensor is applied to the outside of a circuit breaker, permitting simple, non-invasive information collection by non-technical people. After initial evaluation at NREL, the product was pilot-tested at a Wells Fargo bank branch in Aurora, Colorado. Later, Whisker Labs was bought out by a large backer with good development resources.

Wells Fargo has also completed 600 renovation projects to existing Wells Fargo bank branches and other buildings, involving about 27 million square feet. "We've saved 40 percent on energy, 65 percent on water (a billion gallons) and about 50 percent on waste since 2010," Radkin says. The company installed LED lighting, solar panels, and hundreds of new irrigation systems with mini-weather stations that transmit information wirelessly to a controller, ensuring that foliage is neither over-watered nor under-watered for prevailing conditions. And it switched to more drought-tolerant shade plants. Some 24 percent of the building portfolio is now certified under LEED EBOM, and about 15 branches have solar panels on the roof.

"It's elementary my dear Watson." – Sherlock Holmes

Some of you might say it's painfully obvious that banks would be looking for ways to get involved in the full-on economic energy disruption of the century. But for anyone who is still grappling with energywise and digital heating, cooling and refrigeration technology, please set your fears aside and get committed. There may be difficulties with some of the new ways, but as a new year and a new era begin, there are many reasons to be courageous and hopeful.

Courage and hope in 2018

Business for mechanical designers and trades is growing relatively quickly in most regions and there are more than a few ways to quickly expand your expertise into newish technological areas and thus improve your professional prospects. State and municipal regulations and incentives are driving a lot of business. You can quickly learn about these and use this knowledge to add revenue. Energy retrofit opportunities, although sometimes challenging, are numerous and growing. With better modelling, smaller, smarter equipment and increasingly efficient tools and vehicles, it should be possible to plan for greater productivity and the benefits that come with it.

Better modelling software and improving compatibility is also making the entire process easier and more professional. You can use intelligent design processes to distinguish yourself. Solutions that save energy, save water or use environment-friendly refrigerants are multiplying and they are more proven than ever before. New electronic equipment is usually easier to master than it appears, providing a simple path to add to your value as a leading-edge expert.

As cleaner, energy-saving systems become the norm they are less expensive compared to older systems, making it possible to save your customers money, help our planet, and increase your own business, all at the same time.

It may be that in 2018 we should consider recommending more heat pumps and variable speed equipment that can save customers about half or more of their energy, tankless water heaters that can save about one third, and solar thermal or geothermal systems, that when they apply, save even more.

"It's like, everything really is two ways: the way we all pretend it is and the way it really is." – Dexter Morgan

We might also consider that today on this planet we will push 28 million tons of CO2 into the air. Tomorrow we will add another 28 million, and again the day after, and so on. Today we will also dump 700,000 tons of toxic waste, plastic and sludge into our oceans, lakes and rivers, totaling 240,000,000 tons or more, during 2018.

If you've been piecing together the clues, you'll guess that what I'm trying to say is that the party's over; so, let's resolve to start cleaning up the mess, because it will help with our self-reflection. It will help us have a prosperous and very happy new year. Cheers! ●

BF Nagy specializes in sustainable technology solutions, government energy initiatives and modern economics. He writes for magazines, journals and clean tech organizations all over the world. He recently completed 15 years of expert interviews for a book that will be published during 2018.

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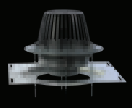

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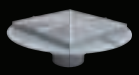

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Archdiocese of Chicago's Energy-Saving Plan

Strategy aims to not only save energy, but also be the country's first archdiocese to benchmark results through the EPA's Energy Star Portfolio Manager.

By Steve Smith

Chances are if you were born within shouting distance of the corner of 45th and Lowe in Chicago's Canaryville neighborhood, you were baptized at St. Gabriel Catholic Church, founded in 1888, and buried by Thomas McInerney's Sons Funeral Home, located just down the street, established in 1873.

And at some point in the 1930s, some members of the parish witnessed contractors piping two towering cast-iron Kewanee boilers, some 15 feet high, so big, in fact, the mechanical room had to be built brick by brick around the boilers.

For more than 80 years, those boilers chugged along on coal, fuel oil and natural gas to supply heat for the church, a three-story grade school, rectory and convent.

But three years ago, the steam system breathed its last BTU.

"What I try to do when I approach a project like this is to look at it holistically and consider the whole system," says Jacob Preciado, construction manager for facilities and construction at the Archdiocese of Chicago. "I always tell the pastors, I'm here to change out this boiler once in my lifetime."

Crews chopped up the boilers and rolled two steel Hurst boilers right straight through the mechanical room's door. Once installed, the boilers produced a full head of steam in 20 minutes that took the old pair two hours to do and cut the parish's annual fuel bill and other related operating expenses by as much as 40 percent in the first year of operation.

The boiler retrofit at St. Gabriel was completed three years ago. Since then, Preciado says three other church properties are in the process of retrofitting their heating systems, mostly old-school hydronics, but also HVAC, too.

Meanwhile, the retrofit work is part of an ongoing initiative for the archdiocese to become the country's first to monitor energy consumption in all its 2,471 buildings — churches, schools, offices and multi-family housing.

Jacob Preciado, construction manager for facilities and construction for the Archdiocese of Chicago, inside the mechanical room at St Gabriel.

Old and new

Of course, it's not just the new boilers that are adding up to big savings. The parish's new heating system is outfitted with up-to-date burners and control packages that can better supply warmth to six zones.

There are even new controls right on the radiators throughout the parish. Plus, anyone with a smart phone or computer handy can control the heat thanks to web-enable thermostats.

Preciado has been at the diocese's administrative office for the past eight years, but he definitely knows the inside of a mechanical room, too. After high school, he went

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through the apprentice program at the International Union of Operating Engineers Local 399 and has also worked at Chicago-based contractor, Hill Mechanical.

"I used to be the guy who would troubleshoot heating equipment, do the maintenance, take it apart and put it back together," Preciado says. "It's easier for me to understand what we have out there and how to fix it and how to address it and work together with contractors and pastors."

The old system at St. Gabriel was centrally located and was basically switched on in October and switched off in April.

"There are still a lot of heating systems at parishes that operate that way," he adds.

The old Kewanee boilers had to be massive since they held all the system water — thousands of gallons. Crews took out the old vacuum pump and old zone valves, lined the masonry chimney with steel, added a new vacuum pump, installed a better zone system and a couple of condensate return pumps throughout the system, and put in a boiler feed tank for chemically treating system water.

"The zone valves control certain areas of the school where we added averaging sensors as well," Preciado explains. "It helps balance the school temperature as well as the church."

That way the system doesn't overheat the church Monday through Friday when the elementary school is in session. Likewise, on weekends, there's no need to heat the school.

In addition to cutting energy costs, the retrofit projects always work with the local utilities to get rebates.

An estimated 28 percent of parishes have participated in the utility rebate programs. Chicago parishes have received more than $1 million in rebates from Chicago utility Peoples Gas since 2011. Suburban parishes have earned $183,000 in rebates.

Benchmarking

Reducing energy waste requires that all forms of energy be regularly measured and tracked. Measuring and tracking can establish a baseline from which to calculate improvements to operations.

As work wrapped up at St. Gabriel, Archbishop Blase J. Cupich said that the archdiocese would be the first in the country to monitor its buildings' energy use, water consumption and greenhouse gas emissions through the EPA's Energy Star Portfolio Manager, an online benchmarking tool.

The EPA developed the energy performance rating

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These two cast-iron Kewanee boilers provided heat for the St. Gabriel parish for 80 years.

system for several commercial and institutional building types. These ratings, on a scale of 1 to 100, provide a means for benchmarking the energy efficiency of specific buildings against the energy performance of similar facilities. Energy Star energy performance ratings have been incorporated into some green buildings standards, such as LEED for Existing Buildings. Earning a rating of 75 or above is also the first step toward achieving the Energy Star for a building.

At the time, Archbishop Cupich said the church was making a commitment to following the pope's encyclical, which took on climate change and environmental sustainability. (For more, see our sidebar.)

Much of the benchmarking legwork remains up to David Singler, energy and sustainability associate for the archdiocese's real estate department.

It's been a busy first year on the job for Singler.

"Being able to benchmark and track our energy is critical," Singler says. It's also paramount to a Chicago ordinance that took effect a few years ago. As of Aug. 1, 2015, the ordinance mandated benchmarking through the EPA system for all commercial and municipal buildings larger than 50,000 square feet and residential buildings larger than 250,000 square feet.

Singler says 18 church properties fell under the new law and are benchmarking their environmental footprints.

Since the archbishop's pronouncement, Singler is currently working on a more systemic, individual approach to benchmarking parishes such as St. Gabriel. Considering the age and scope of church property over a geographic area of 1,411 square miles, the process will take time

The new heating system saved the parish 40 percent in energy costs in its first year of service.

to implement. Just how many meters are there in almost 2,500 buildings? And not many of them are smart meters.

"At the archdiocese level, we can only do so much," Singler explains. "It's not just the benchmarking, as important as that is, but having it on the local level and being able to continuously track performance so everyone can understand what is happening. A lot of time, it's up to the parishes to take the action and know to work toward correcting inefficiencies."

On a portfolio this size, the lesson learned is that it's best not to try to do it all remotely. Instead, Singler plans to conduct the benchmarking in stages and make sure the accounts are set up correctly.

When we caught up with Singler by phone, he was just walking into the Lakeshore Campus of Loyola University Chicago to discuss a possible partnership with the univer-

The mechanical room was built around the original boilers so they had to be chopped up to get them through the doorway.

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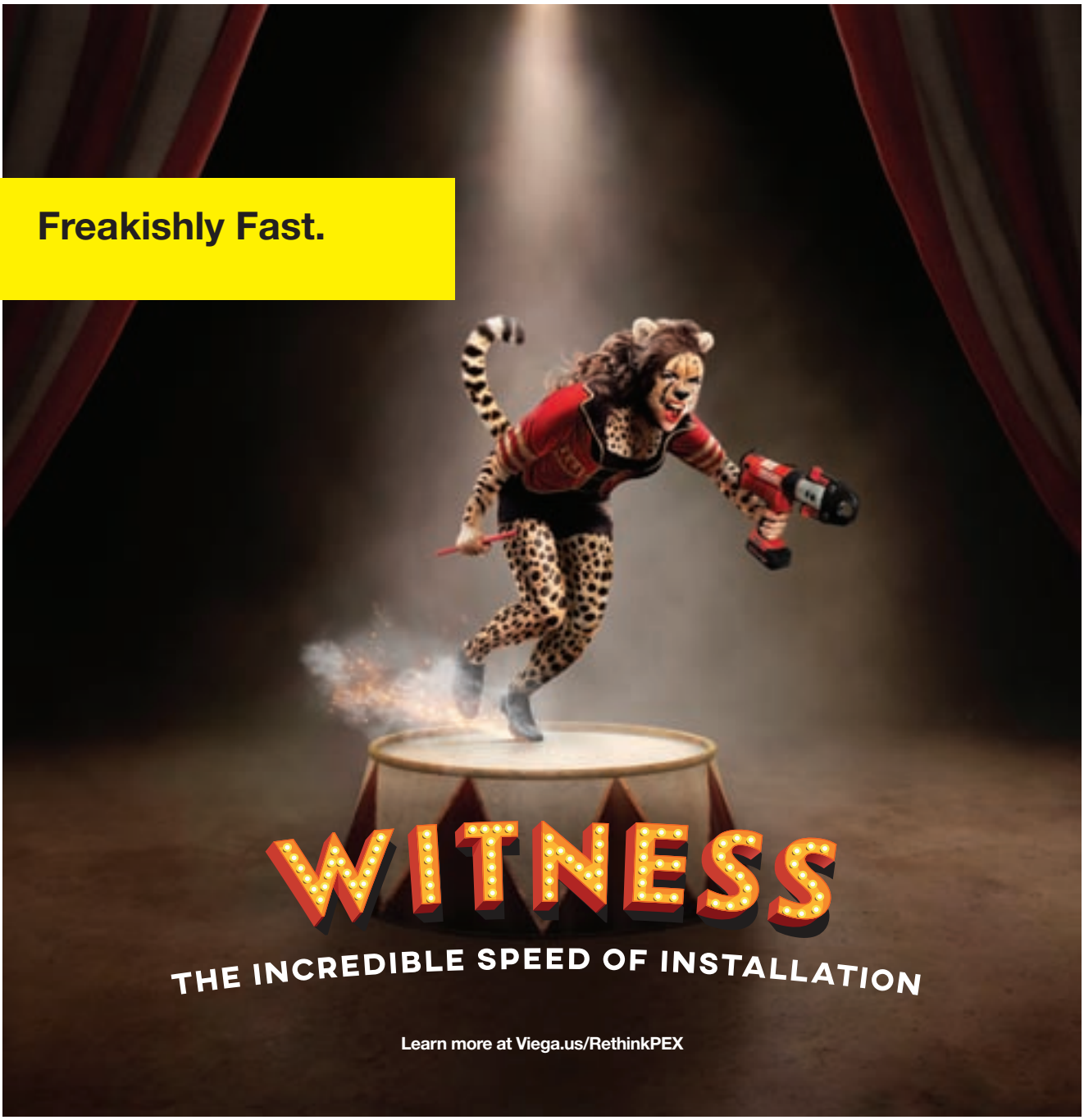

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A crew installs a steel liner inside the masonry chimney.

sity's Institute of Environmental Sustainability to provide support to help the parishes benchmark and track energy use.

In the meantime, some buildings in the archdiocese are already eco-friendly. For example, the field operations center for Resurrection Cemetery has been heated with a solar thermal system since 1978.

Old St. Mary's School was built in 2011 with green building in mind from the start. Solar panels on the roof help generate electricity for the school. In the summer months, when school is out, the building receives an average of 40 percent of its energy from the panels.

In addition, St. Joseph College Seminary, completed in 2012, holds a LEED Gold certification.

But that still leaves plenty of considerably older buildings to update.

"A lot of our older churches within the city have central plants," Preciado says. "If we can get move from central plants to each building having its own heating system, that's what we're trying to move toward."

If he can't separate a central system, Preciado will look to add zone valves and better controls in order to gain better control of the system.

"There are some parishes and projects in which we do as much as we can," Perciado explains. "Sometimes we try to phase the project in so we'll do the main steam boilers. Then, perhaps, adopt a more simplified control system. Instead of multiple zone valves we might just have one for the school with just enough averaging sensors to divide and control it."

Much depends on budgets since these projects are paid for by the parishes.

"No two parishes are the same," Preciado sums up. "A system like the one at St. Gabriel might not work at another parish." ●

'We Have This Earth on Loan.'

Most of our stories on energy retrofits have to do with the basics of saving money with the latest in efficient equipment and sophisticated control technology. And St. Gabriel's new heating system is certainly like all those others.

But the Chicago archdiocese's retrofit plan comes, naturally, from a higher source.

In 2015, Pope Francis delivered the Roman Catholic Church's first-ever encyclical on the environment — most notably, on climate change.

"The climate is a common good, belonging to all and meant for all," he wrote.

Catholics regard encyclicals, or official papal letters, as authoritative teachings on a particular subject. They're meant to instruct as well to inspire action among the flock.

In his letter, the pope said a "very solid scientific consensus indicates that we are presently witnessing a disturbing warming of the climatic system."

The pope called for people to make changes to combat this warming or at least the human causes that produce and worsen it.

"We have this earth on loan," Archbishop Blaise J. Cupich later said at the press conference when he announced his benchmarking plans with the EPA.

"Those who do not think religious organizations should have an opinion on climate change misunderstand the purpose of the former and the mortal dimension of the latter," the archbishop added. "We are called to care for those sickened by pollution, house those displaced by environmental calamities and heal the spirits of those, especially our youth, who are disheartened by a world where human survival is now in question."

Cupich said he hopes the undertaking will inspire others in and out of the church to take similar measures.

"We have to set an example that it can be done, and it must be done, if we are to fulfill our sustainability goals," he said. "Let's be honest. This entire effort to protect the environment for future generation will involve very difficult choices in the future. However, these choices will be less difficult if we all do what we can now to protect our common home."

Operations will thank you.

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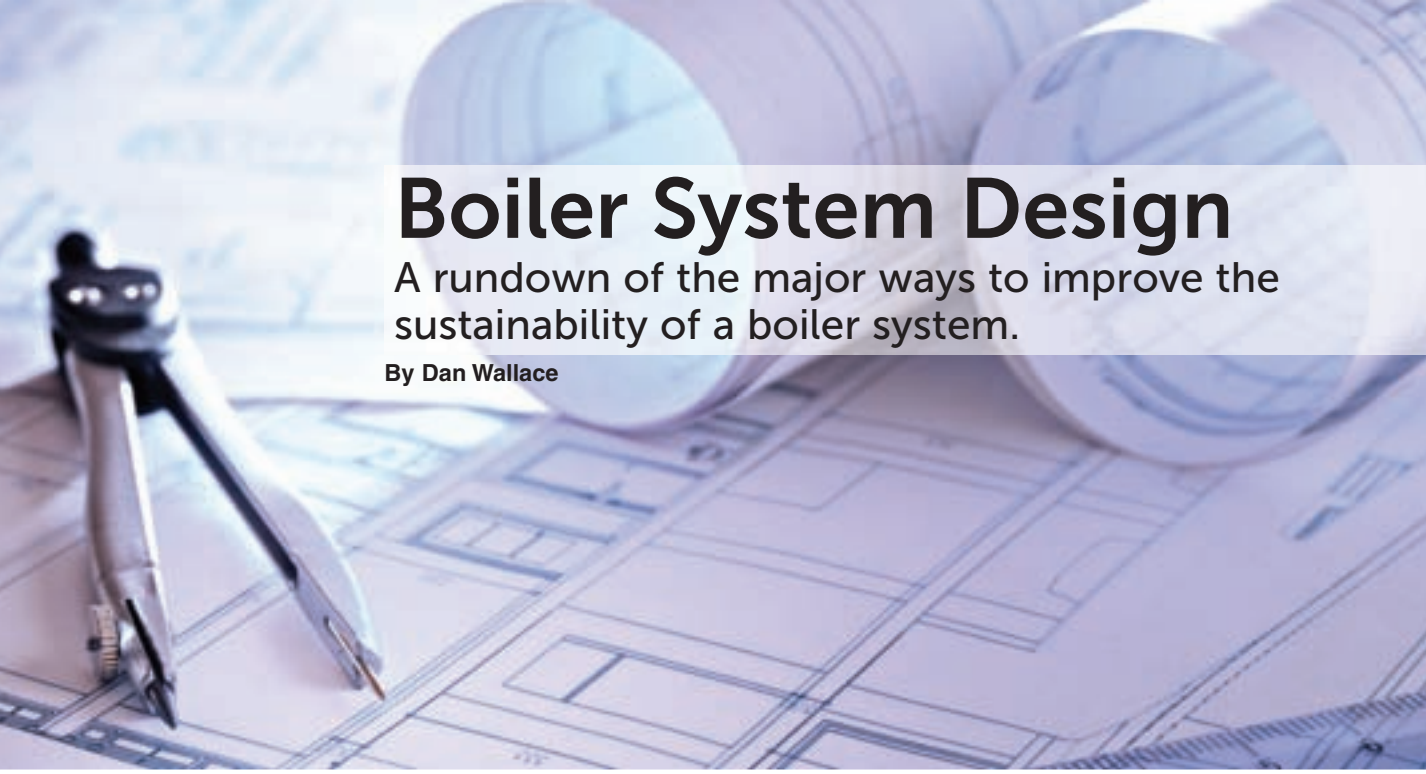

Boiler System Design

A rundown of the major ways to improve the sustainability of a boiler system.

By Dan Wallace

The idea of sustainable boilers may seem odd at first glance. Boilers have been around for a long time and the technology is very mature. There are many boilers on the market, but, the differences between them are relatively small. Changing boilers is unlikely to yield large sustainability gains.

However, if we expand our focus to boiler systems, things become more interesting. Viewing the totality of the system applies to plumbing engineers as they are really systems engineers. That said, choosing the right components for the boiler system can have a dramatic impact on efficiency, emissions, and overall sustainability.

A few key components have an outsized effect on sustainability: the fuel source, the burner, and the control system. What's more, there have been exciting breakthroughs in each of these technologies recently.

Fuel source

Perhaps the biggest contributor to the overall sustainability of a boiler system is the fuel source. Different fuels have different emissions profiles and inherent efficiency limits. These differences can be ameliorated to some degree by burner and controller technology. Still, all things being equal, natural gas will burn cleaner than coal or heavy oil.

But if we're talking about sustainability, emissions don't tell the whole story. Natural gas, heavy oil, and coal are all non-renewable fuel sources. In the long run, this means these fuels are unsustainable in an important sense. Sustainable fuel means renewable fuel. For practical purposes, that means biofuel.

Traditional biofuels

Currently the most popular biofuels are solid-mass fuels such as wood chips or pellets. Aside from being inherently more sustainable than non-renewable fuels, switching to solid-mass biofuel can bring impressive reductions in CO_2 and nitrous oxide (NOx) emissions. Switching to solid-mass biofuel generally requires replacing the entire boiler system, including controllers, burners, pumps and boilers. For large institutions, this can mean upfront investments of $10 million or more. Additionally, storing wood chips or pellets requires a large amount of space. For many, these considerations make solid-mass biofuel either impractical or cost-prohibitive.

Liquid wood

In the past, solid biofuel was the whole story, but there is an alternative: liquid wood or bio-oil. In a process known as pyrolysis, wood heated in the absence of oxygen can be converted from a solid into a liquid. The basic chemistry has been understood for more than 100 years, but until recently the product couldn't be burned in a commercially viable way. However liquid wood is now available (particularly in the Northeast through a major supplier in Canada) and priced competitively to natural gas or oil.

Liquid wood behaves essentially like traditional fuel oils

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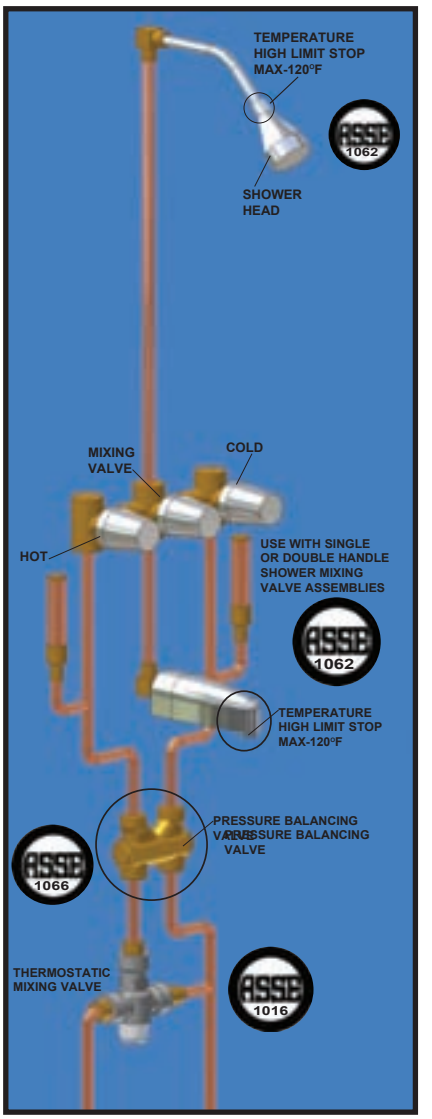

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in the boiler tank. As a result, retrofitting existing boiler equipment is typically all that's required to burn liquid wood. This is a cost-effective way to dramatically decrease conversion costs compared to other biofuels (in some cases by a factor of 10). In addition, storage needs are not substantially different from traditional fuel sources. Liquid wood does require some equipment upgrades because it must be burned at very specific temperatures and pressures. Engineering companies struggled for many years to get these systems right, but they are now available and commercially viable.

Aside from being 100 percent renewable, liquid wood has another major benefit: it is vastly more carbon-efficient than traditional fuel sources. This is because the CO_2 emissions of burning liquid wood are largely offset by replanting the trees used to produce the fuel. On average, liquid wood is 88 percent more carbon-efficient than petroleum fuels and 81 percent more carbon-efficient than natural gas.

Any institution looking to reduce its overall carbon footprint should be looking seriously at liquid wood fuel for its boiler systems. Indeed, several New England universities have made the switch and are reaping the benefits.

Burners

Although important, carbon-dioxide is just one among many harmful components of boiler emissions. Another major sustainability consideration is nitrous oxide (NOx) emissions. NOx is responsible for "smog" in the air we breathe, and is a well-understood and documented public health threat. Because of these well-known risks to public health, the EPA has set National Ambient Air Quality Standards for NOx concentrations in the atmosphere. Alarmingly, recent studies have shown that more than 50 percent of U.S. counties do not meet these standards, constituting a major public health threat.

To combat the problem, state agencies have been setting tighter and tighter regulations on NOx emissions. California has been the most aggressive and currently has some of the strictest regulations in the country. While most states are moving more slowly, the trend is clear: ever-tightening requirements on NOx emissions.

NOx concentrations from older natural gas burners already don't meet regulations in many states, and many newer burners are unlikely to meet tighter regulations we expect in the future. To meet these emerging standards, many facilities will be forced to replace older burners. Replacing a burner, however, is expensive, and there is a major concern: if a new system is installed to meet new regulations at, say, 20 parts-per-million (ppm) NOx, what happens if standards tighten to 14 ppm a few years later?

Ultra-low NOx burners

One solution is to opt for an ultra-low NOx emissions burner. Many of these burners can achieve emissions around 9 ppm — more or less the theoretical physical limit. Presumably, states won't ever require NOx emissions lower than physics allows! So, this approach certainly will future-proof a boiler system. But there are downsides. Because

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lowering NOx emissions means using more electricity and a drop in system efficiency, operating at the theoretical lower limit can be substantially more costly than required by current regulations.

Additionally, most low-NOx burners are so-called "diffusion systems," requiring flew-gas recirculation (FGR). FGR requires more flow to fans, and can mean a substantial increase in both electrical and horse-power requirements (which, of course, means higher costs).

An alternative to FGR systems are "lean premix" systems. Unfortunately, these systems have downsides of their own. Their burner heads are generally made of a fragile, metal fiber mesh. These heads have a high failure rate as the mesh easily clogs. Additionally, they require air filters that must be regularly changed. In practice, routine maintenance gets missed. As a result, actual NOx emissions rise, putting the systems at risk of violating regulations.

Configurable NOx emissions burners

There are new burners that ameliorate all of these problems. Cutting-edge lean premix systems use solid stainless-steel heads and don't require air filters. This means less maintenance and more reliable operation at specified NOx levels. Additionally, these burners have NOx emissions that can be configured on the fly. That means that a facility can set burners to meet current NOx levels, confident in the knowledge that should regulations tighten further, getting in compliance simply means a minor reconfiguration to its existing system.

Control system

We have looked at two major components of boiler systems and their impact on sustainability: fuels and burners. There is another, easily overlooked component: the system controller. When married with proper fuel- and air-flow regulators, the controller's job is to make sure that fuel- and air-flows are matched to maintain the correct fuel-to-air ratio at all times. This ensures accurate and repeatable combustion control.

Manufacturer-quoted efficiency and emissions statistics for burners assume correct fuel-to-air ratio. Those in charge of boiler systems are often surprised to find that their outdated controller cannot reliably maintain this fuel-to-air ratio, and that their systems are in fact operating at lower efficiency or with worse emissions than expected.

As a result, the first and simplest step to improving sustainability is often upgrading to a modern controller. In fact, many facilities should be thinking about new controllers anyway: the once standard Siemens/Moore 352 and 353 controllers reached official end-of-life in October of last year.

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A simple solution is to look at a modern, programmable loop controller that can serve as a drop-in replacement for those old Siemens controllers. Look for features like SD card slots and retentive memory to make maintenance both easier and less frequent. Remember — actual maintenance tasks are often missed, so systems that require minimal maintenance are more likely to be operating to spec.

Besides simple loop controllers, there is an interesting new option: flexible systems controllers. A flexible systems controller is decentralized. Each component in the system has its own independent logic controller. Additionally, the best of these new systems connects each component with two redundant cables. This eliminates the single-point of failure concerns in centralized logic controllers.

More importantly for the present discussion, it makes maintenance and troubleshooting far simpler. Each component can have its own touch screen that can access and control any other component in the rest of the system. Technicians can conveniently monitor and fix issues from anywhere. This means more reliable and maintainable operations, which translate into sustainability gains.

Systems controllers have come a long way in the last few years, and with them the potential for increased sustainability, along with lower costs due to increased efficiency.

System design is king

Changing the fuel source, burners, and systems controllers are the three major ways of improving the sustainability of a boiler system, however a boiler system is more complex than these three elements. There are pumps, day tanks, regulators, and myriad of other components. Efficiency and sustainability improvements can be had at every point. Thinking of the system as a whole is the best approach to improving boiler sustainability.

Finally, because each of these components is part of a system, the best approach may not be to find a parts manufacturer to supply particular components for upgrade. In many cases, it can be far more effective to work with an engineering firm that also manufactures parts. A firm that itself specializes in system design can best advise on which components might best be upgraded in a particular system and what other changes such an upgrade might require. ●

Dan Wallace is the vice president of Research and Development at Preferred Utilities Mfg. Corp., which is an engineering-based manufacturer of products for commercial, institutional, industrial and nuclear power facilities based in Danbury, Connecticut.

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Where the Home Starts

The 2018 International Builders' Show aims to help builders connect the dots.

By Kyle Milnamow

This year in Orlando, the International Builders' Show (IBS) will revolve around the idea that "All Homes Start Here."

Each year, the National Association of Home Builders (NAHB) brings together manufacturers and suppliers to network and learn about the newest products and latest methods that could help their businesses.

"It's a combination of everything really. Our intention is to try and provide a comprehensive offering. Respect to not just exhibits, but to education that will help builders be more successful. Certainly, technology plays a big role in that — whether it's technology in the business or the technology involved in what our builders are building."

IBS will take place at the Orange County Convention Center, Jan. 9-11, in conjunction with the Kitchen & Bath Industry Show (KBIS). The exhibit floor for the 2018 show is "just shy" of 600,000 square feet, with 1,400 exhibiting companies displaying their innovative products.

With so many different categories, it may be hard to find everything you're looking for, so IBS has made it easier by sectioning off areas focused on specific products.

One segmented area is nextBUILD, which will be located in the West Hall and will focus on technology.

"It's not just about widgets or siding or windows. It's also about technology and services and products that could help you run your business better," says Geoff Cassidy, senior vice president, Exhibitions and Meetings for the NAHB.

nextBUILD will highlight the latest advancements in home and business technologies that will help companies grow in the future.

Also taking place in the West Hall, making its return to IBS after being introduced last year is the Cedia Technology Solution Pavilion. While nextBUILD will focus on technology that will help businesses, Cedia is for people who are looking for technology specifically in their homes.

"Technology is expanding and changing every year that technology-oriented products are introduced within the home," Cassidy says. "The connected home has almost become the expectation for today's consumers, providing more technology when you turn the key and walk into the home for the first time. Those are the products builders need and want to see and begin to understand more. Find out what those options are."

The West Hall will also feature the High Performance Building Zone, where attendees can get the latest on best practices for improving efficiencies throughout the home.

In the South Concourse, attendees will be able to check out the DCW Outdoor Living Pavilion, featuring the latest outdoor and backyard products, and IBS Live, which will step inside the home and discuss the future housing products, processes and people. The South Concourse will also feature the all-new Impact Design Pavilion. Powered by ASID, this area will feature brands showcasing products and services focused on health wellness and sustainability within the design industry.

IBS will also offer outdoor exhibits with 16 additional exhibitors and an additional 13,000 net square feet. The highlight of the area will be the Professional Builder's Show Village, with three manufactured homes. The Show Village's homes are targeted toward different income levels and life stages: the Atrium Home, LaBelle Home and Modern Home.

When people want to step away from the latest products, they can take advantage of the educational opportunities with eight different themed education tracks taught by industry professionals. The tracks include, 55+ Housing; Home Technology and Performance; Business Management and Operations; Custom Building and Remodeling; Design, Land Development and Community Planning; Financial Strategies, Market Forecast and Legal; Multifamily House; and Sales Marketing and Customer Focus. All together, there will be more than 100 building knowledge sessions and a little more than 140 education seminars.

While technological advancements will be on display across the show room floor and discussed during the sessions, IBS also has one that could fit inside your pocket — your very own show app. Cassidy says that it is becoming a more standard operating procedure for shows to have their own app.

The app allows users to digest information in two ways. First, attendees can register as a guest. In this mode, they can scout information on programs, events, exhibitors and start to get a sense of when and where things are happening. Cassidy says this mode "takes the website and makes it more accessible."

For a more comprehensive experience, users can register their last name and conference ID number into the app. By

doing so, the show can send you real-time alerts while in Orlando. Those alerts will help keep attendees connected to things going on last minute. In this mode, users can also favorite exhibitors they want to see and create their own conference schedule. A new feature in the registered section of the app will also give you the ability to find out when the next shuttle bus will be arriving at your hotel, if you are a part of the show's hotel block.

Aside from the technology, the heart of this show still centers around networking.

Centrals, which are rooms that will host roundtable discussions and product tours focused on a specific area in the home building industry, are a big component of the networking at the show. Centrals to choose from are: 55+ Housing Central; Custom Building Central; Design Studios; Multifamily Central; Remodelers Central; and Sales Central.

Another networking opportunity, which debuted at last year's conference, is the Production Builders Executive Club. This is where some of the largest production builder company executives can meet and talk.

IBS will kick off with the opening ceremonies on Jan. 9. Everyone will have the chance to hear from National Football League Hall of Famer Terry Bradshaw.

This isn't Bradshaw's first time at IBS.

"We have great experience with Mr. Bradshaw," Cassidy says. "He is a very fun, dynamic and engaging speaker. He works very hard to make his message relevant to our audience. That is all within the context of his experience and his Hall of Fame career. We're very excited to have him kick off our time in Orlando in an energetic and fun way."

That same night will be the IBS House Party at Mango's Tropical Café. More than 1,500 people will be in attendance for this portion of the show, which has quickly sold out.

After all the seminars and product displays are wrapped up, IBS will host the IBS Spike Concert, which honors Spike Club Members — a recruiting/membership development program within the NAHB — and the NAHB directors that helped put the show together. The show will close right where it kicked off, with the band Chicago playing for members of the building community.

"We start with a bang with the opening ceremonies on Tuesday morning and end with a bang Thursday evening. Send everyone home with good thoughts of what they learned and experienced," Cassidy says.

To learn more about the International Builders' Show, visit www.buildersshow.com. ●

By Kyle Milnamow

Discover KBIS

Warm weather and hot trends are in store for the kitchen and bath event of the year.

For more than 50 years, the National Kitchen and Bath Association (NKBA) has showcased the latest industry products, trends and technologies at the Kitchen & Bath Industry Show (KBIS). This winter, hundreds of manufacturers will head to Orlando for the show that will combine warm weather, new products and endless learning opportunities.

"The NKBA is the leading trade association for the kitchen and bath industry," says Brian Pagel, senior vice president, Emerald Expositions. "KBIS, as a platform, is an extension of the association's ongoing efforts to provide tools, research, certification, trends, networking and highly engaging content for all industry professionals."

The event, which works alongside the International Builders' Show (IBS), Jan. 9-11, serves kitchen and bath designers, dealers, architects and remodelers.

A new speaker will kick off KBIS this year. Editor of *Interior Design* magazine, Cindy Allen, will share her knowledge on trends in the remodeling industry.

"We're very excited to have Cindy Allen as our keynote speaker this year," Pagel says. "Our designers are excited for the opportunity to hear her speak, and for the chance to talk with her during the meet-n-greet afterwards. Like only Cindy can, she'll be bringing an electric energy to the show. In her address headlined 'Pop Goes the Future: Top Trends Bursting onto the K&B Scene,' she'll cover topics critical to the future of the kitchen and bath remodeling industry, including key design and business directions likely to impact the industry in the year."

Attendees will also have their first chance to see the all-new, year-long initiative from NKBA, the Global Launch Pad. The new global pavilion will feature kitchen and bath brands from the United Kingdom and Continental Europe.

"Our kitchen and bath design community is global. I'm proud of our organization for driving the collaboration between the U.S. market and the UK and European markets. After attending Design Week in the UK last year, it is obvious that there is sincere interest in the U.S. market for both exhibitors and attendees wanting to be a part of KBIS," says Suzie Williford, vice president of industry relations for the NKBA.

Plenty of events will make a return to KBIS after last year's show as well.

For the second year, NKBA will co-host a fundraiser with the TV show, "This Old House." Attendees will have the chance to experience live cooking demonstrations and can enter for a chance to win a trip for two to the set of "This Old House." Even if they don't win the experience, attendees can visit the show's crew, who will hang around the KBIS Backyard, a showcase for outdoor living.

But that's not the only thing that will take place in the KBIS Backyard.

The Backyard will feature two Fireside Chats that focus on outdoor kitchens and how to think about designing outdoor residential spaces.

Though KBIS's outdoor events are sure to inspire, there will be many more indoor opportunities for attendees to take part in. The showroom floor alone will showcase more than 600 brands. Each day, the floor will open for eight hours, allowing plenty of time for attendees to speak with exhibitors one-on-one and see the products up close.

For example, both the Impact of Design Pavilion Powered by ASID and Design Milk X Modenus Talks Lounge, will host programming and small events throughout the show.

The Impact Design Pavilion, stretching across 2,500 square feet, will allow attendees to learn about products that will impact human health, wellness and environmental stability.

The Design Milk C Modenus Talks Lounge will feature three full days of programs that will teach attendees about connecting on social media, design trends, and more.

KBIS offers timely learning for everyone — at any professional stage.

"All of our KBISNeXT stage programs, as well as the conversations taking place in the Design Milk X Modenus Talks stage, cover hot topics in the industry now, each with the purpose of helping kitchen and bath professionals think strategically about their business and/or career path," Pagel says. "The business of design is one of the most asked about topics from our audience. Our goal is for all design and construction professionals — whether veterans of the industry or young members jumping head first — leave KBIS with insights, knowledge and connections they can immediately put into place and leverage after the show."

With a numerous amount of programs and products over a short, three-day period, attendees may have trouble seeing everything they want. KBIS recognized this issue and has offered a few solutions to make sure kitchen and bath industry members get the most out of the event.

"KBIS is the major industry event for the kitchen and bath industry, which means attendees need to plan ahead to get the most out of their experience. We have in-depth content up on KBIS.com to help attendees plan their route. With detailed a stage program and pavilion listing, attendees can be sure to experience the topics that are most critical to their business success in 2018. And, we're always told how vital the KBIS 2018 app is for attendees trying to see and experience it all," Pagel says.

If attendees still have questions going into the conference, KBIS has posted updated information on its website. Pagel also points out that organizers are "here to answer questions and make sure all attendees have an incredible KBIS experience."

This year's show, which has grown from the last, is destined to impress.

"KBIS has seen tremendous growth in recent years, and this year's show looks to continue on that track," Pagel says. "We're looking forward to a successful KBIS 2018."

To learn more about KBIS, visit www.kbis.com. ●

By Kyle Milnamow

Simply the Best

AquaMotion's Aqua-Flash is recognized as 'most innovative plumbing product'.

Each year at the AHR Expo, companies show off innovative and original products in categories such as: building automation; cooling; green building; heating; indoor air quality; plumbing; refrigeration; software; tools and instruments; and ventilation. Each category produces a winner, selected by a panel of third-party ASHRAE member judges, who base their votes on innovative design, creativity, application, value and market impact.

This year's winner in the plumbing category was AquaMotion's Aqua-Flash Recirculation System, which provides hot water comfort to all faucets. It can save up to 15,000 gallons of water from being dumped down the drain every year for a family of five. The system helps save on utility and sewer costs, and helps reduce the water shortage.

To learn more about the Aqua-Flash, we talked to Hans Kuster, president of AquaMotion, and learned about the features that users can benefit from when using the product.

Kyle Milnamow (KM): In your own words, what makes the Aqua-Flash Recirculation System the most innovative plumbing product on the market?

Hans Kuster (HK): The design features ease of installation. You only need a wrench and 10 minutes under the sink. The Aqua-Flash valve does not require batteries or power. It features a 3/8-inch compression nut that threads onto the hot angle stop; one hose threads onto the bypass outlet and connects to the ¾-inch tee, which threads onto the cold-water angle stop. The sink hoses thread directly onto the valve and tee. This simple process saves on labor cost and installation time, which contributes to value and market impact.

Our valve also has an all metal design using lead-free bronze and stainless steel. We calibrate the special alloy coil to deliver constant hot water while bypassing a minimal amount of tempered water to the cold side. The valve closes when hot water is drawn. Our water passage is more than double the typical .080-inch, which helps prevent plugging up due to calcium build-up and provides a longer life. Because of this design feature, we do not need screens that can easily plug up.

Another reason why this product is unique is that it can be used with tankless heaters. The pump installs below the tankless in the hot line. We provide a ¼-inch bypass connection in the pump housing to connect to the cold side to keep the tankless in a ready state at all times. This is more efficient and less costly than installing a small hot water tank.

KM: How long has AquaMotion spent designing the system?

HK: Four years ago, we designed an under-sink system that won an AHR 2015 award; a proven system that installs under the sink and uses the cold water supply line as a return. It does require power for the pump.

We invented the Aqua-Flash to have a system that does not require power under the sink. The project started about three and half years ago. This now gives us a complete line of recirculation systems for any application, all designed and built in the U.S.

KM: On the AquaMotion website, the Green ECO-cartridge is described as the heart of the circulator. What makes this cartridge so important?

HK: All the moving parts in a water-lubricated pump are contained in the stainless cartridge. I wanted to design a pump that was green, recyclable, sustainable and cost-effective. Our cartridge is the only one that can be pulled apart, flushed and reinstalled.

KM: How is the ability to replace the cartridge an advantage in hard water areas?

HK: Calcium build up can happen in hard water areas. A very large Florida contractor told me that in their very hard water areas, stainless pumps do not last more than two to three years; he now buys AquaMotion pumps. By being able to flush at no cost or replace the cartridge gives the pump another full life for about 83 percent less cost than what competitors charge for their non-repairable cartridge.

For a stainless pump that costs hundreds of dollars, it is a good solution. That is what I call sustainability.

KM: How long does the flushable cartridge extend the life of pumps?

HK: We design our pumps for a minimum 10-year life and a minimum of 250,000 cycles. Since the cartridge contains all moving parts, you replace it, and you have a new pump. Normal life expectancy is 10 to 20 years under normal system conditions.

KM: There are many design features that make this product stand out. Which one stands out to you?

HK: We design our motors to be more energy efficient, use less power to do more, and thereby save the user on electricity cost for the next 10 to 20 years. We clad all our rotors in corrosion resistant stainless steel, for cast iron and stainless pumps. This requires only one SKU for the cartridge for stainless, bronze, and cast iron pumps, while competitors use carbon steel rotors, not protected, or simply run their rotors in plastic. No comparison in quality.

Our conventional AM7 heating pump costs only $16 to $18 a year in electricity costs at $ .12 per KW. Most wholesalers or contractors are not fully aware of the savings their customers can achieve with this product. Our stainless recirculation pumps use as little as .26 amps. The reason for our efficiency is based on the experience of our staff with a combined 100 years in pump design. Our pumps and recirculation system designs are unique and state-of-the-art.

KM: Will there be any changes to the system that you can discuss?

HK: We will continue to work on product improvements and extensions. We are planning on introducing other new products at AHR.

KM: What does receiving the AHR Innovation Award mean to AquaMotion, and how will that impact future product lines?

HK: We will get a lot of publicity and hopefully more wholesale and OEM customers. It also proves that as a small company, we can design more innovative products than the market leaders. It will force the industry to improve their products.

Our secret to success is listening to our customers and helping them with product ideas that enhance their market position. We brand name our products with special features and designs for OEM customers who have a strong market presence.

Visit the award-winning AquaFlash and new AquaMotion products at this year's AHR Expo, in Chicago, at booth 6816, on Jan. 22-24.

Visit www.aquamotionhvac.com.

Let's Talk HVACR

The industry comes together for the 2018 ASHRAE Winter Conference and AHR Expo in Chicago.

By Kyle Milnamow

This year, the Second City will play host to the entire HVACR industry with the ASHRAE Winter Conference, taking place Jan. 20-24 at the Palmer House Chicago, and the AHR Expo, taking place Jan. 22-24 at McCormick Place. The conference will provide hundreds of educational sessions and numerous networking opportunities. The expo will host more than 2,000 exhibitors and 65,000 industry professionals.

It's a great way to kick off the New Year.

Having the two events take place in conjunction with one another is a huge advantage for members of the industry.

"The benefit is that ASHRAE members can kill two birds with one stone," says Clay Stevens, manager of the AHR Expo. "They can come to Chicago and not only go to the conference and all the sessions that ASHRAE has to offer, but they can also come to the (AHR Expo) in the same visit and find out what the major manufacturers have to offer."

Manufacturers, and the future, will be a focus throughout the four-day event.

At the McCormick Place, the AHR Expo will showcase exhibitors in three special sections: Building Automation and Control Showcase; Software Center; and Indoor Air Quality Association Pavilion.

The expo will be the hub for the latest and most innovative products in the HVACR community.

"I think what makes the AHR Expo so special are the exhibitors and the fact that they totally focus on our industry," Stevens says. "Some shows have a lot of stuff. It doesn't necessarily have to relate to the main focus of the show, but in our case, all of the exhibitors are HVACR related. Our show is the largest and most comprehensive in the world that is totally focused on HVACR."

The product floor at the AHR Expo will stretch out nearly 11 acres, which were meticulously planned to make it easier for attendees.

"One of the reasons the three products sections were selected is that they are pretty definite. They don't overlap with each other or other categories. The companies that choose to go into those sections are pretty much dedicated to those categories, and it makes it just a little easier for people visiting the show to find the companies they want."

Stevens says it can be beneficial for attendees to visit ahrexpo.com to sort through the products most essential to their business.

"Doing a product search will give you a listing of exhibitors, their booth number, and a little run down on what they are going to show," he says. "Then, you can actually make your own agenda on the website with the companies and products you want to see and the program will provide the best path to take. If you just wander, you are going to waste a lot of time."

The list of exhibitors online, as Stevens notes, will continue to evolve up until the expo. So, attendees should continue to check for updates.

While the exhibitors are the highlight of the expo, Stevens thinks the learning opportunities are the most important.

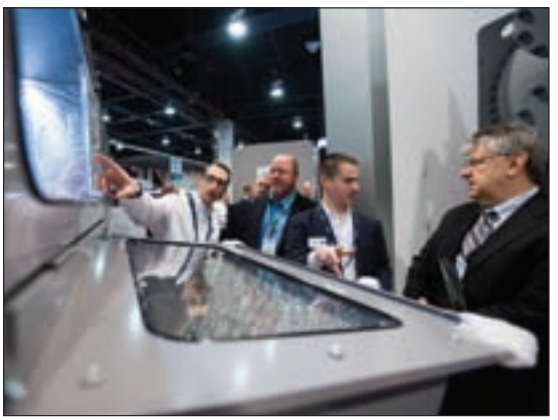
"What I want people to leave with is the knowledge of a new product, technology or method that they have never seen, that will help them accomplish their objectives and become more successful," he says. "The wonderful part about the show is that the industry comes together at one place, at one time, with its very best. When you attend the expo, you can be assured that what you are seeing in the exhibits is the newest and most creative and innovative that there is anywhere. I just hope that people will leave with something they couldn't have found anywhere else, and that will help them."

The AHR Expo will also offer the largest educational program in the history of the event. With more than 120 sessions, attendees can learn about indoor air quality, new refrigerants, health care facilities, and of course, energy efficiency — an old stand-by that Stevens says, "the show has centered on and probably always will focus on."

With the future in mind, the AHR Expo will feature several sessions assigned for entry level positions in building automation and in testing and balancing, teaching the fundamentals. This is the first year the expo will have these types of educational opportunities for up-and-comers in the HVACR industry.

"I think in year's past, maybe, there wasn't so much emphasis on bringing along the new people. Now, I think the industry in general is becoming more aware of the need to attract younger people, people who will ultimately be the future of the industry," Stevens says.

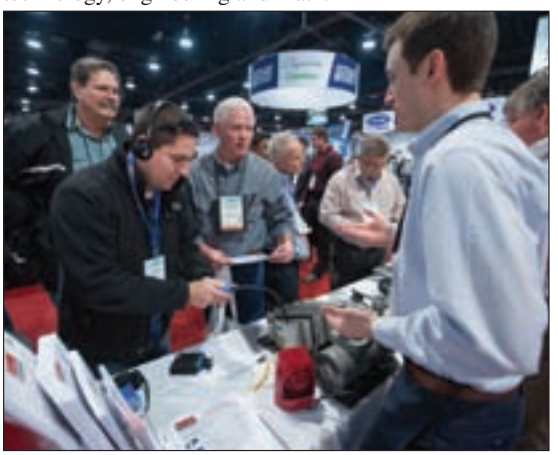
It's not just at the expo that attendees can pick up tips and learn something new; the ASHRAE conference will be a hub for learning as well.



Tracks at the conference offer a variety of opportunities to learn about different parts of the HVACR industry. Topics include systems and equipment; fundamentals and applications; standards, guidelines and codes; earth, wind and fire; tall buildings; modeling throughout the building life cycle; and heat exchange equipment. A main focus throughout all learning areas this year is efficient and resilient design.

"Engineers and designers continue to advance designs to reduce the ecological impact of our built environment on the world around us. It has practically become second nature," says Michael Collarin, chair of the 2018 ASHRAE Winter Conference. "However, and seemingly more so in recent years, the industry has needed to take steps to mitigate the impact of the world around us on our built environment. This is especially the case in our transportation, government, and mission critical arenas, where the loss of critical infrastructure can have severe consequences, including the loss of life. The tracks and programs for the conference will focus on resources to design, build, control, commission and operate facilities and infrastructure that need to not only be efficient, but resilient."

The conference will kick off with a keynote address from Debbie Sterling, founder and CEO of Goldiebox. Sterling is an engineer, entrepreneur and one of the leaders in the movement toward getting girls interested in science, technology, engineering and math.



More than 200 presentations will take place over four days with about 300 speakers sharing their knowledge during the tracks and technical sessions in Chicago.

ASHRAE will also bring together young engineers on day two, where the Young Engineers in ASHRAE (YEA) will have an opportunity to network. There will also be the ASHRAE Learning Institute, with more than 20 courses and two full-day and five half-day seminars that can be applied toward a professional engineering license.

The HVACR industry is known for its strong face-to-face connections, and these shows continue to prove it's a good, if not necessary, place for everyone — manufacturers, designers and others — to really get to know one another.

"One thing about the AHR Expo that makes it unique is that it thrives on face-to-face contact between people who use and specify equipment, and people who manufacture and design the equipment. I think that is unique feature that makes it very valuable," Stevens says.

And what better place than one of the largest melting pots the U.S. has to offer. Chicago has more than a few conferences under its belt. The Windy City has a history of bringing the HVACR community together to learn about the latest and most innovative products and methods being put into place.

"If you were to look at a chart of show attendance and show size over the years, Chicago has always been up there — if not the top," Stevens says. "What makes it work so well is it has great convention facilities; it has great hotels, great restaurants; it's relatively easy to get to; and it's surrounded by a very tight population density."

While Chicago's bright lights may dazzle tourists for most of 2018, for four days in January, the folks of the HVACR industry will be the ones that shine.

Visit www.ahrexpo.com or www.ashrae.org ●

Kerry Stackpole: A Closer Look

The new CEO/executive director for PMI takes a deep dive into all things plumbing-related for 2018.

Kerry C. Stackpole, FASAE CAE

By Sharon J. Rehana

Born and raised in New England, Kerry Stackpole earned his master of education degree from Cambridge College in Cambridge, Massachusetts. Today, he lives just outside of Washington, D.C. with his family, and serves as the new CEO/executive director of the Plumbing Manufacturers International (PMI) association.

Stackpole took the helm of PMI in July of last year, after a very rigorous interview process that lasted three months, and included multiple telephone screening interviews, several face-to-face interviews with the PMI Search Committee, a videoconference, and an expansive discussion with several PMI member company CEOs.

"It was clear from the start," says Stackpole, "that the Search Committee and the CEOs took their work and the responsibility of finding a new PMI chief staff executive very seriously. It was impressive and refreshing to share ideas and explore perspectives with such an incredibly talented group of people."

There were three things that he says PMI does better than anyone else, all of which drew his attention to the opportunity.

"First, says Stackpole, "PMI has a robust regulatory and advocacy program. Our approach leverages a spirit of collaboration with all stakeholders — elected officials, regulatory agencies, standards bodies, and related organizations."

The second thing he says, "is the commitment of PMI members to safe, responsible plumbing. Whether that's donating plumbing fixtures to residents of Flint, Michigan to help assure safe drinking water, or supporting water efficiency through great design, PMI members are engaged."

"And engagement," he adds, "was a key thing that drew me here." Seeing the industry's deep commitment to its own association was invigorating to Stackpole. "PMI members represent more than 90 percent of the plumbing fixtures and fittings manufactured in North America. When an industry stands together like that, great things get done."

With only a few months on the job, Stackpole is certainly ready to get things done. I had the opportunity to ask him a few questions regarding his background, and his plans for 2018 in his new role of CEO/executive director for PMI.

Sharon J. Rehana (SJR): Who is Kerry Stackpole and what should people know about your professional accomplishments to-date?

Kerry Stackpole (KS): I started my association career helping manufacturing executives adapt new and emerging technologies impacting their businesses. Since then, I've enjoyed the challenge and privilege of serving business leaders as CEO of four trade associations representing manufacturers, technology companies, and firms in the financial and small business sectors. I've also had the honor and good fortune of leading advance teams for the White House during the second term of the Obama presidency.

My experience in the plumbing industry comes from my DIY nature. When it comes to home remodeling and repair, I've learned a lot from the consumer perspective, from craftsmen and plumbers who have shared their experience. More recently, I've learned a ton about the plumbing manufacturing industry from PMI members who have invited me into their factories, design studios, offices, and showrooms. It's an amazing and critically important industry by any measure.

When it comes to accomplishments, being able to see the full scale and scope of an industry is enormously valuable in crafting strategies and programs. One of my favorites was the launch of Print Grows Trees, an educational campaign that uses facts to show that print on paper actually helps to grow trees and keep our forests from being sold for development. It was a team effort between association volunteers, industry leaders, and our staff team. While it started out as a regional initiative, the program sparked other industry education efforts and was adopted nationally for the printing industry's Value of Print campaign.

SJR: You've officially been "on the job" for about 5 months now, can you discuss some of your observations of PMI and of the industry?

KS: On my first day on the job, I joined a group of PMI members making visits to legislators and regulators at the California State Capitol in Sacramento. Those couple of days confirmed my first observation about the heavy regulation facing our industry. My second observation was how incredibly innovative our industry is every single day. While heavy regulation and innovation are rarely seen as collaborative concepts, PMI members excel at rising above to deliver thoughtful designs, innovative ideas, and technological breakthroughs across an array of fixtures and

PMI leaders celebrate Pete Jahrling's first year as PMI president at the 2017 PMI Annual Conference. (Left to right) Fernando Fernandez (TOTO); Michael Miller (LSP); Steve Delarge (LIXIL American Standard); Kerry Stackpole (PMI); Chip Way (Lavelle Industries); Pete Jahrling (Sloan); Nate Kogler (Bradley Corp.); Paul Patton (Delta Faucet); Joel Smith (Kohler); and Todd Teter (Moen).

fittings. As an association, PMI and its members benefit from that same innovative approach the dedicated volunteer leaders bring into the organization. I was also fortunate to inherit a very talented professional staff who knows how to leverage the volunteers' ideas and energy to move our agenda forward.

SJR: Can you discuss the challenges faced by plumbing manufacturers in the coming year, and how, in your role as CEO/executive director for PMI, you plan to address them?

KS: Plumbing manufacturers will face growing challenges in the legislative and regulatory environment as state legislatures seek to compensate for shifts in federal regulatory policy and enforcement. Water efficiency and conservation continue to weigh heavily on many jurisdictions. There are important conversations about water safety and aging infrastructure in communities across the U.S. and elsewhere. PMI's role first and foremost is to look to the horizon and be the industry's advocate — sharing ideas and seeking collaborative solutions for issues before they metastasize into something bigger.

With our international network of industry partners, members and volunteers, PMI is extraordinarily well-positioned and proactive on technical issues, codes and standards, and regulatory requirements. Legislators and regulators know they can trust PMI, because we play it straight. That said, every CEO I've ever met knows all too well that accomplishments are something to build on, not rest on. My role is to be certain PMI members, volunteer leaders and staff teams, have the benefit of foresight about what's coming, and ready access to the right resources, for the right measure, at the right time, to proactively address them. No one like surprises.

SJR: Can you discuss the positions of strength for the industry, and how they might impact future goals?

KS: One of the many great things about plumbing manufacturers is their propensity to be "early adopters" of technology that delivers real value to consumers and commercial users of plumbing fixtures and fittings. PMI members are strong supporters of the EPA WaterSense program, which has saved consumers and communities over 2.1 trillion gallons of water since 2006 — 534 billion gallons of water in 2016 alone. The 2016 savings are enough to fill more than 800,000 Olympic-size swimming pools. That's a lot of water savings.

Plumbing manufacturers are applying that same ingenuity to their factories and operations. Whether it's productivity improvements for the factory floor, process simplification, additive manufacturing, elevating customer service response times, product testing, or stoking the fires of workforce development, the industry is engaged across the board. From the perspective of future goals, the rise in process and productivity improvements means continuous workforce and leadership development will be an essential part of sustaining competitive advantage. As race car driver Mario Andretti was fond of saying, "if you think you have everything under control, you're not driving fast enough."

SJR: Can you talk about some of the goals you have set up for yourself in your role as CEO/executive director for PMI? What's the game plan?

KS: Coming aboard at PMI, my goals fall into two buckets. The first is to get acquainted with and explore the needs of our members. What are the things making them successful? What kinds of things are getting in their way? What things do they wish they knew? What strengths and weaknesses do they see in the way our industry operates? Having working knowledge of these things helps fill the second bucket — which is understanding the business of the association. How does PMI add value? Where are PMI's efforts most effective? Where can we do better? What else could we do that we haven't thought of doing? What should we stop doing?

The real goal is identifying the two or three strategic things we can do today — right now — that will fuel industry growth, better position our members' products and services for success in the marketplace, and deliver meaningful insight about what's to come.

SJR: You attended your first PMI conference; what were some of your takeaways?

KS: It was very gratifying to witness the outpouring of respect and gratitude for my predecessor Barbara Higgens at the President's Dinner honoring her retirement from PMI on the first night. The deep-seated appreciation and shared admiration from the members for all that she accomplished during her tenure at PMI was very moving.

I was also struck by the learning mindset of the conference participants. I was impressed with their willingness to take a "deep dive" into technical and regulatory issues.

Former PMI CEO/Executive Director Barbara Higgens and her husband Trey Higgens are joined by industry leaders celebrating her retirement at the 2017 President's Dinner. Front row (seated): PMI President Peter Jahrling; Barbara Higgens and Trey Higgens. Standing (left to right) Mimi Weisberg, and her husband Kerry Stackpole, the new PMI CEO/executive director, Yvonne Orgill, chief executive of Bath Manufacturers Association, and Canadian Institute of Plumbing and Heating General Manager Ralph Suppa and his wife Susie Suppa.

I was delighted to observe conversations during which participants were teaching one another problem-solving strategies for complex technical challenges. I admired the participants open, free-wheeling exchange of ideas, and the willingness to hang tough in difficult conversations. The questions asked at keynotes and briefings were wonderfully candid and very profound. That really stuck out.

SJR: Do you have a short-term plan vs. a long-term plan, and can you discuss the differences?

KS: I do. Let's start with the differences. Short term, it's all about better understanding member needs and wants. Long term, it's all about delivering more value — making our member's more successful every day.

Our short-term plan is to be certain we fully understand members' interests, needs, and wants on an ongoing basis. We'll work to strengthen our collective understanding of the plumbing industry's economic footprint and illuminate the value of our contributions to the economy in a meaningful way. Long term, it's about continuing to strengthen our member value, building the PMI brand, and proactively addressing business, technical, regulatory, and legislative challenges. At day's end, our goal is to assure PMI members thrive, have access to new pathways to success, and are better positioned to deliver the products and services consumers and commercial users need and want in an open and fair global marketplace.

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Dunkirk 53
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www.easyflexusa.com
Eemax 43
www.eemax.com
Ferguson 13
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Heat-Flo Products 10, 11
www.heat-flo.com
Highland Tank 35
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Hoeptner Products 8
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www.iapmort.org
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www.intellihot.com
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www.saniflo.com
SeeWater Inc. 54
www.seewaterinc.com
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SureSeal ..... IFC
www.rectorseal.com
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