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Editor's Letter

Jim Schneider, LEED AP, editorial director
editor@plumbingengineer.com

The New Normal

During the last couple of months, I've had the opportunity to get out and visit several plants and meet lots of folks in the industry. I've been consistently impressed with the ingenuity, innovation and dedication I've seen from everyone working in the plumbing and hydronics business. There is a real pride and belief in the work that's being done and it's been a pleasure to get to know the industry and folks that make it tick.

When I talk to people about the state of business, the overall consensus is that things are a little better now than they were a year or two years ago, but they're not getting better fast enough. This is where anxiety comes into the picture. Some believe the November election will either save or doom the U.S. economy, and others fear a Eurozone collapse could spark a global recession. Still others worry that maybe this is as good as it's going to get, wondering aloud: "Is this the new normal?" This is a term I've heard a lot, but what exactly does it mean? The question I've been asking myself is: "What was the old normal?"

Some consider the peak of the housing boom to be the old normal, but I don't think that's a realistic benchmark. Those were great times for many, but it was a bubble and not sustainable. For others, the mid- to late-90s and the era of the post Cold War tech boom was the old normal. But under the microscope, those were far from perfect times, either. There were booms and busts, political gridlock, a government shutdown and no shortage of uncertainty.

This is not to say that we don't live in extraordinary times. The housing collapse of 2008 has proven to leave a much bigger crater than anyone at the time suspected and the stubborn persistence of high unemployment has been a terrible drag on the entire economy. But no era is without challenges. People fight on. I constantly hear financial analysts say that companies are afraid to invest or hire because they fear instability. Maybe that is to some degree true, but does any "normal," new or old, really hold true stability? There is always uncertainty and the most successful people and firms are the ones that prepare and adapt.

In all the office and plant visits I've made in the last couple of months, I didn't see anyone sitting on their hands waiting for a mythical time of "normal." I saw companies investing in new technology and products and doubling down on their commitments to their employees and customers. It's that kind of spirit that drives successful companies through any kind of normal, new or old. ■

Correction

The August 2012 issue of *Plumbing Engineer*, which features PE's 2012 Boiler Report, incorrectly displayed an image of a water heater on its cover. We sincerely apologize for this error and regret any confusion it may have caused. We have taken action and instituted editorial procedure improvements to prevent this kind of oversight in the future.

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Industry News

IAPMO CEO testifies before U.S. Senate

WASHINGTON — IAPMO Group CEO GP Russ Chaney was invited to testify before a key U.S. Senate subcommittee, where he said that the federal government should consider taking a more active role in helping the private sector move toward a more water- and energy-efficient future. Speaking before the U.S. Senate Committee on Energy and Natural Resources Subcommittee on Water and Power, Chaney provided an overview of the codes and services IAPMO offers, including the Green Plumbing and Mechanical Code Supplement — the nation's first green construction code — that help jurisdictions throughout the nation with the implementation of their green building and water-efficiency programs.

Chaney said that IAPMO was recently invited to join the United States Water Partnership, whose goal is "to ensure sustainable and equitable water management that benefits our people and our environment through improving access and quality of service for water, sanitation and hygiene; advancing integrated water resource management; increasing efficiency and productivity of water use and improving governance through stronger public and private institutions, policies and processes."

IAPMO also chairs the Water and Energy Efficiency Topical Committee of the National Institute of Building Science's Consultative Council, Chaney added, and is collaborating with ASTM International on solar thermal technologies in support of the Environmental Protection Agency's Heat Metering standardization project. Despite the accomplishments of IAPMO and the nation's other standard- and code-developing organizations, he told the subcommittee, more needs to be done to address our water and energy needs.

Chaney outlined numerous steps the federal government could take, including incentives for state and local governments to adopt and properly enforce comprehensive green plumbing codes, for building owners who voluntarily have their buildings audited and implement their results and for state and local governments to require water utilities to conduct independent leakage audits and report the results along with a plan for the repair and updates.

"Much is known about the needs of our aging water infrastructure, and it is critically important that these issues be addressed," he said. "According to the American Society of Civil Engineers, our water infrastructure rates a grade of D-minus with over seven billion gallons of potable water a day wasted due to leaking water infrastructure."

Chaney also called for the EPA to take the lead in the development of uniform national non-potable water-quality standards applicable to various permissible utilizations of non-potable water and for the federal government to develop a comprehensive and coordinated water strategy to meet the nation's needs. "While we will always be able to use the incredible ingenuity of the American people to find alternate sources of energy as our needs and circumstances evolve, we must recognize that there simply is no substitute for water," Chaney said. "We rely on access to safe, clean water every day."

BlazeMaster system achieves enhanced UL listing

HASTINGS, MICH. — Viking Corporation has received a new, expanded UL listing for its BlazeMaster® line of CPVC piping products, which allows for exposed piping installations in basements with composite wood joists, commonly called TJI® joists.

These enhanced listings can provide significant cost savings for residential fire sprinkler systems. Previously, when sprinklers were installed in an unfinished basement with composite wood joists, a layer of drywall was required to cover the CPVC piping network. Alternatively, metallic pipe could be used in these applications. With this new UL listing, provided certain conditions are met, Viking's CPVC piping system can be installed exposed, without the need for additional drywall protection. The result is a lower total installed cost for residential sprinkler systems.

These new listings also allow for exposed CPVC riser installations in NFPA 13R and 13D residential systems. Viking has updated its "Installation and Design Manual" for BlazeMaster® CPVC systems with two special addendums that outline the specific construction and installation requirements that must be met, including requirements for ceiling heights, joist depths, sprinkler K factors and temperature ratings.

The updated installation instructions can be found at vikinggroupinc.com/literature/viking_plastics.

Omega Flex named Vendor of the Year by N.B. Handy Company

EXTON, PA. — Omega Flex Inc., an international producer of quality engineered flexible metallic products, was named Vendor of the Year by N.B. Handy Company's HVAC division. The award is given to the supplier who receives the highest aggregate score across approximately 20 measurements of quality, including growth, lead times and fill rates. This is the first full year in which OmegaFlex worked with N.B. Handy.

Established in 1891, N.B. Handy Company services commercial and residential contractors in HVAC and roofing throughout the mid-Atlantic and southeastern United States. The company is a member of Affiliated Distributors, a community of more than 500 independent distributors and manufacturers spanning seven industries and two countries.

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More Industry News on page 12

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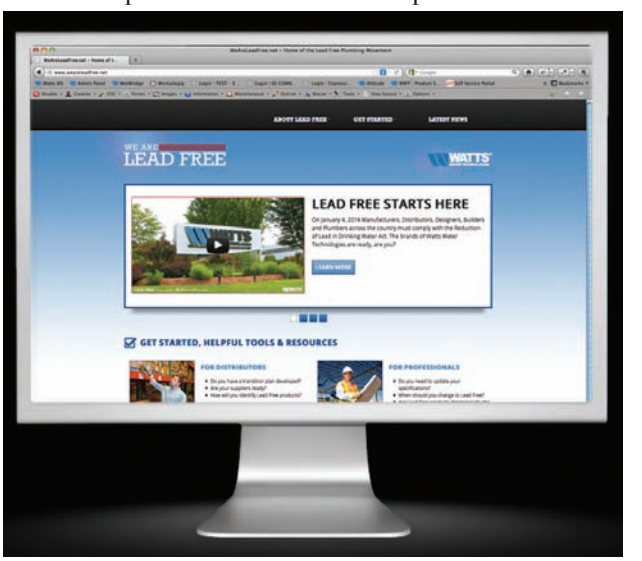
Industry News

Continued from page 10

ery, finance, service and growth," said Sam Meeks, vice president, vendor management and procurement.

Watts updates website

NORTH ANDOVER, MASS. — Watts Water Technologies has updated its WeAreLeadFree.net website with helpful information about the new federal lead free law. The updated site includes in-depth information on



both state and national lead free laws, a guide for distributors and industry professionals on making the change and other helpful resources.

The WeAreLeadFree.net website has been a resource on lead free plumbing since launching in 2009 to support the California and Vermont lead free changeover. Visitors to the updated site can learn about the most recent lead free news and can also download Watts' "Preparing for Lead Free Compliance" white paper.

Froet Industries LLC congratulates K Ross and Company

K Ross and Company, as a result of their hard work and diligence, has achieved for the second consecutive year the Froet Industries Rep of the Year Award.

Franklin Electric acquires Cerus Industrial

BLUFFTON, IND. — Franklin Electric Co. Inc. completed the acquisition of 100 percent of the outstanding stock of Cerus Industrial Inc., based in Hillsboro, Oregon. Cerus designs, manufactures and distributes motor controls, motor starters, contactors, protection devices and variable frequency drives to a wide range of distributor and original equipment manufacturers in North America who serve three primary markets: HVAC, industrial motor

Continued on page 14

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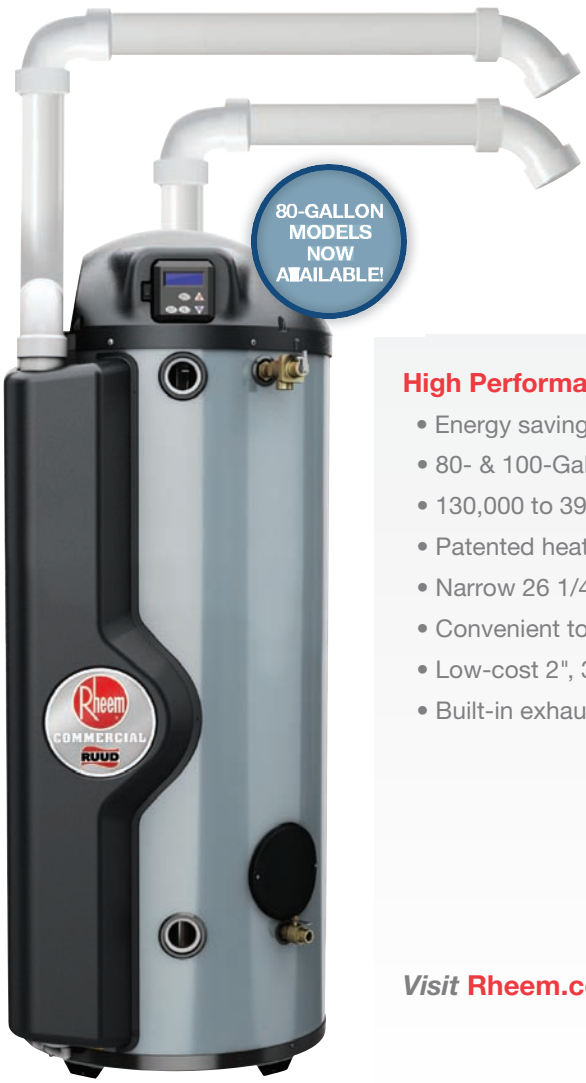

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Continued from page 12

sales and service and pumping systems. 2011 sales for Cerus were approximately $14.0 million.

Franklin Electric has agreed to pay $25.7 million in an all cash transaction. The Company believes Cerus will be accretive to 2013 earnings per share.

TYCO introduces design services

LANSDALE, PA. — Fire protection design solutions are now available from Tyco Fire Protection Products (TYCO). The company's Design Services Group has the ability to prepare a residential sprinkler system design based on customer-supplied construction plans and an easy-to-complete online request form.

The package includes a cost-effective, code-compliant sprinkler and piping plan, hydraulic calculations, fluid delivery time (FDT) calculations for dry systems, material takeoff quantity list, technical data sheets for all components and an installation guide for Blazemaster® CPVC pipe and fittings; bringing the residential construction industry a one-stop resource for fire protection design services.

The Design Services Group is available via telephone, during and after installation to provide ongoing technical assistance for your system. The group also offers hydraulic calculations, solution water transit time calculations for foam systems, dry system fluid delivery time (FDT) calculations and conversion of AutoCAD drawings to BIM 3D models for contractors, installers and consulting engineers for fire protection projects.

Visit www.tyco-fire.com to request a design proposal.

GreenBuildTV goes live

LAKE GENEVA, WIS. — GreenBuildTV (GBTV) has launched a new website providing green-minded builders and consumers with a variety of innovative products, systems and building concepts. Visitors to the site will be able to explore various projects, following every step of the building process through detailed documentation via videos, journals and photos.

GBTV's first foray into commercial projects is the innovative Green Leaf Inn, the first net zero energy hotel being built in North America. Designed to be a comfortable luxury retreat as well as a demonstration model of green technology and design, the Inn will include a remodeled section containing three suites, an eating area, a commercial kitchen and laundry and a completely new building with 16 hotel suites, Welcome Center, conference

Continued on page 16

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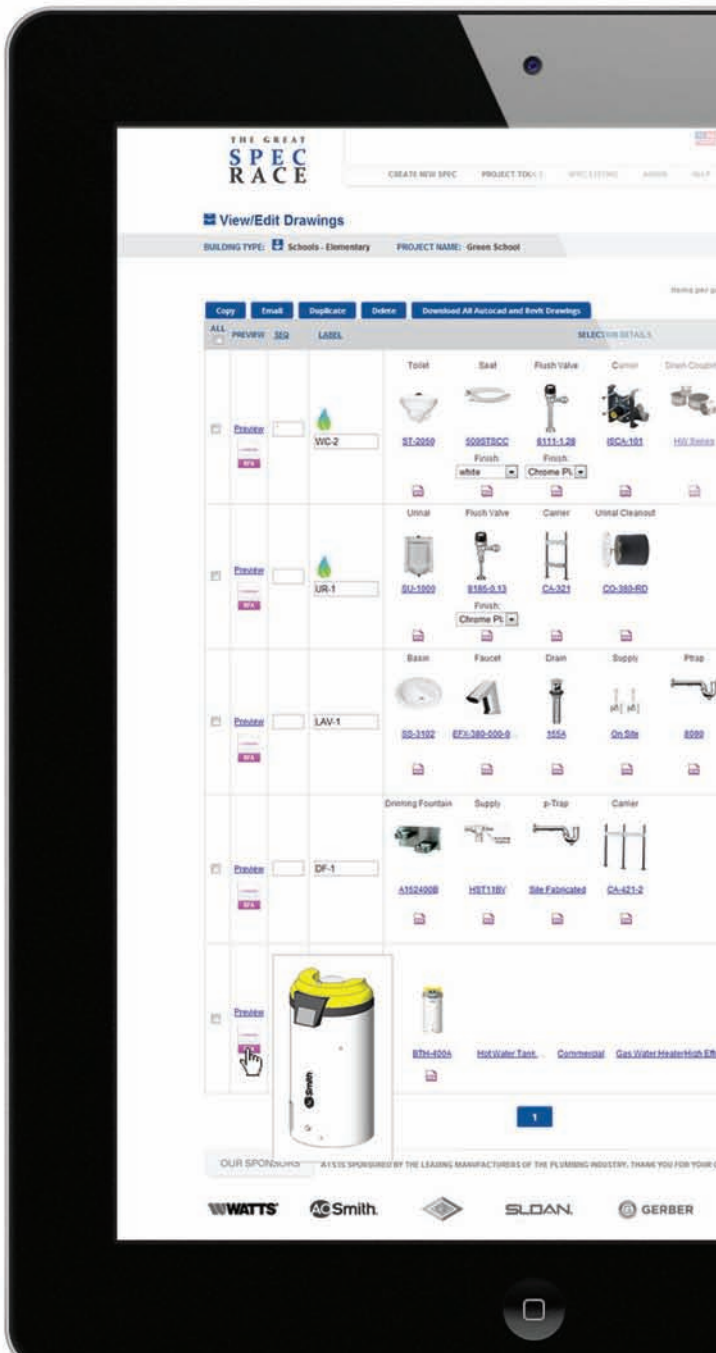

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facilities and massage suites.

Visitors can learn about the installation of a metal roof, find out about the state-of-the art aerobic wastewater treatment system or just come along to a meeting with a local furniture maker. The website also includes an extensive Green Directory of sustainable building products and services; a Learning Center, a resource of topical information via white papers, videos and tutorials and the GBTV blog, with discussions and tips on everything from insulation to water conservation.

Other projects currently online include a business expansion/remodel and a residential remodeling.

Visit www.greenbuildtv.com and follow them on Facebook and Twitter. ■

Boiler Report

Marathon International
www.wallhungboilers.com

Company History: Founded in 1866, Baxi is Europe's second largest manufacturer of heating products, producing 4,000 boilers per day at its 1 million square-foot plant in Bassano, Italy. Over the past four decades, Baxi has mastered wallhung technology, like the 98 percent EE, low NOx Baxi Luna HT line for North America, featuring a series of a compact, kitchen cabinet-sized heating appliances for residential and commercial applications (up to 4 million BTU/hr). Proven, reliable performance underscores Baxi's commitment to quality, safety and environmental protection. Baxi Luna was the first truly packaged and combination heating and domestic hot water wallhung boiler in the North America. In addition to modulating, condensing product, Baxi product in North America also includes a strong solar-compatible, non-condensing boiler line for high temperature applications, high output aluminum designer radiators and towel racks, solar water heating systems, and dual coil indirect tanks, from 50 to 525 gallons.

Company News: Marathon International, the exclusive distributor of Baxi products in North America, is working diligently with Baxi engineers to launch a new generation of high efficiency, eco-sensitive Baxi heating and renewable energy solutions for introduction in the United States and Canada this coming year. A high efficiency condensing, self-calibrating wallhung boiler, with 7:1 turndown ratio, is being field tested in 20 strategic locations throughout the continent. Plus, field testing of the new Baxi Luna SAT integrated submetering system for multi-suite properties, featuring a central Baxi commercial boilers plant and individual metering boxes in each unit, is delivering high efficiency performance together with precise metering of each suite's heating and cooling, as well as hot and cold water use.

Market Forecast: As a pioneer of compact, packaged wall-hung boiler technology, Baxi has proven over the past three decades that smaller appliances can have a bigger and more positive impact, producing significant fuel savings and cost savings, while freeing up valuable living space and reducing greenhouse gas emissions. As housing starts pick up, proven, compact, high efficiency heating appliance installations by trained and certified contractors will continue to grow exponentially. As new and proven technology emerges, the winners will be those businesses and individuals who put learning before earning.

Helping the Customers: Continuous learning and dedicated after-sales support are at the heart of Marathon International's commitment to assuring Baxi quality, safety and environmental protection throughout North America. A password-protected section of www.wallhungboilers.com provides Baxi Certified provides Baxi partners — contractors, specifying engineers and architects, exclusive regional distributors and representatives — with 24/7 access to technical information and sales support tools, including an online product catalog. In the online training section, Baxi contractors can access the popular series of animated and interactive Baxi product installation training, maintenance and certification presentations for both the condensing and non-condensing boiler lines. After studying the presentation of a given line, Baxi contractors may now take an online certification test — building competence, confidence and reputation of business partners who are also committed to continuous learning. To learn more, visit www.wallhungboilers.com.

The fully modulating Baxi Luna HT 380 combination heating and domestic hot water boiler is CSA, ASME (H-Stamp) and Energy Star certified, achieving up to 98 percent energy efficiency. This whisper-quiet boiler saves valuable living space, while reducing fuel consumption from 35 to 60 percent, and CO and NOx emissions by up to 90 percent vs. less efficient heating equipment. It also produces domestic hot water of 3.9 gallons per minute with an 80-degree temperature rise.

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ASPE REPORT

AMERICAN SOCIETY OF PLUMBING ENGINEERS

From the President's Pen

William F. Hughes Jr., CPD, LEED AP, FASPE
2010-2012 ASPE PRESIDENT
aspepres@aspe.org

Summer is quickly coming to an end, and I hope that everyone had the opportunity to enjoy some time off for rest and relaxation with your family and friends. Plenty has been going on with ASPE this summer, especially regarding the 2012 ASPE Convention & Exposition in Charlotte, North Carolina this October. This year's Convention & Exposition will have lots to offer those who attend.

The ASPE Convention & Exposition is open to everyone within the plumbing industry, so spread the word and let everyone you know that this is an event they cannot miss, especially if they are within driving distance of Charlotte. ASPE has various incentives in place for those planning to attend, so visit aspe.org/expo or, even better, contact the ASPE chapter in your area and coordinate with them to take advantage of the incentives being offered. The early bird registration rate ends September 14; now is the time to register and start getting ready for this premier event.

I am proud to announce that this year's keynote speaker is Kyle Petty, an auto-racing icon, champion of philanthropy, and one of the most popular personalities in all of sports. For more than three decades as a driver, owner, and media commentator, Kyle has put his heart and soul into doing what a Petty does best: compete with class and raise the game of everyone around him. All attendees are invited to join us before the Exposition opens for Kyle Petty's keynote address on October 29. See the Convention ad in this issue for more information.

The industry's top manufacturers will be showcasing their latest products and technologies at the free Exposition. With more than 350 interactive exhibits, you will get hands-on experience with the newest plumbing design technologies, and product engineers will be on-site to answer all of your questions about the products you will be specifying. Those who register for the full Convention also can take advantage of the 30+ technical education sessions that offer CEUs, the Sunday night party at the NASCAR Hall of Fame, and the Tuesday Banquet.

What are you waiting for? Register now at aspe.org/expo.

Other ASPE News

ASPE recently received some fantastic news: we received a grant from the National Science Foundation to collaborate with the City College of San Francisco to develop a course curriculum and certification program for plumbing engineering design technicians.

Another item that I would like to bring to your attention is an e-mail chain between some ASPE members about plumbing engineers and professionalism. What I personally got out of their comments was that ASPE members are passionate about and dedicated to plumbing engineering and believe in the importance of our profession within the construction industry. However, we need to be our biggest promoters. For example, when we are at a meeting and are referred to as the "plumbers," we need to correct the situation and say that we are "plumbing engineers" or "plumbing system designers." This is not to take away from the plumbers and plumbing contractors installing our designs; we all are part of a team and need to work together. Designing and installing quality, safe, and efficient plumbing systems to suit the needs of our clients is what we all are trying to achieve. Following are some of the important discussion points and opinions from the e-mail discussion:

Many plumbing engineers and designers are concerned with the status of our profession in relation to other professionals involved in the design and construction of buildings. The positions of

these involved plumbing professionals regarding how we can get more respect and recognition from others and the public at large vary, and some positions are controversial. A main role of ASPE should be to help us spread to the general public and other professionals our mission and contributions to the development of civilization. We all have to agree that plumbing design is not just following the codes. Plumbing design for today and for the future requires adequate engineering education. Changing the perception of other professionals and the general public about plumbing engineering will be a long and difficult task. A few individuals can't do it alone. We need the support of the entire ASPE organization.

As ASPE president, I totally agree with the above statements and hope that we can start a committee to further develop programs and topics to be presented to the members and to the entire profession. If anyone also agrees with these statements, please contact me so that we as a Society can start developing programs and promotional materials to further enhance ASPE and the plumbing engineering profession. ***ASPE***

Read, Learn, Earn

Now you can submit your answers online to receive instant CEUs!

Do you find it difficult to obtain continuing education units (CEUs)? ASPE's popular Read, Learn, Earn program now offers the option to submit your answers online to receive instant pass/fail notification.

Just go to **aspe.org/readlearnearn** to download the current article and then click on the appropriate link to take the test. If you earn a grade of 90 percent or higher on the test, you will instantly be notified that you have logged 0.1 CEU.

ASPE is recognized as an approved provider and sponsor of CEUs and PDHs throughout all 50 states for registrations and licensing requirements. ASPE CEUs also may be used for Certified in Plumbing Design (CPD) recertification requirements.

Tests are valid for one year, so you can earn up to 1.2 CEUs by successfully passing each test. (You can only receive one credit per test.) The cost is free for ASPE members and $35 per test for nonmembers.

New ASPE Members

Atlanta Chapter
Mark Gerard Azarraga, GE
Susan J. Freed
Stephen W. Huff

British Columbia Chapter
Connor R. Burns, GE

Central Florida Chapter
John Paul Horan
Michael A. Studney, PE, GE

Central Indiana Chapter
Brian Keith Lowe
Tyler Mulkins

Central Texas Chapter
Michael J. Salinas
Broc Thiele

Charlotte Chapter
Tracie Monfort

Chicago Chapter
Travis A. McKnight
Brian Matthew Salem

Dallas/Ft. Worth Chapter
Dary John Santos

Denver Chapter
Richard Cisneros
Cedric Nathaniel Green, GE

Eastern Michigan Chapter
Mark H. Drow
Scott Michael Morgan

Houston Chapter
Shane Emil Pechanec

Kansas City Chapter
Dan Blake

Los Angeles Chapter
Erin Ford
Robert Anthony Galaviz
John Richard Rush

Member at Large
Joshua Lee Catlett, PE
Charles E. Thomas
Rafael Enrique Watson, PE

Minnesota Chapter
Randy Gary Smith

Montreal Chapter
Pierre Guy Charette, P.Eng

New Orleans Chapter
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Mike Wilkinson

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Phoenix Chapter
John Armstrong

Rochester Chapter
Angelo Anthony DiCiaccio
Marcial Morales Jr.

San Francisco Chapter
Mario Mendoza, PE

Southern Nevada Chapter
Bill Laub

Wisconsin Chapter
Ryan Paul Imbach, GE

Correction to July CPD Recipients Article

In the article "Congratulations New CPDs!" in the July ASPE Report, Adrian Enache, PE, CPD, of the New York City Chapter and a senior associate at Cosentini Associates in NYC, was inadvertently left off the list. We apologize for the oversight. Congratulations Adrian!

From the Executive's Desk

Jim Kendzel, CAE, MPH
ASPE EXECUTIVE DIRECTOR
jkendzel@aspe.org

Attention plumbing engineers: we deserve respect!

In his column this month, ASPE President Bill Hughes mentions a recent e-mail dialogue among ASPE members related to the profession of plumbing engineering. Since I have been with ASPE, I have noticed an underlying message in these discussions: "the plumbing engineer is not given the respect they deserve." I have given this a significant amount of thought and am taking this opportunity to put those thoughts in writing. I hope that my thoughts initiate further dialogue and that you take Bill up on his offer to actively participate in a group discussion about this issue so we can better formulate a clearly defined reason for why plumbing engineers deserve a high level of respect. Then we can better communicate that reason throughout the communities we serve and hopefully define a path for continually improving plumbing engineers as professionals to increase that level of respect going forward.

My first question is: how are the terms "plumbing engineer," "professional," and "respect" defined? Whenever I try to tackle a big issue, I always try to focus first on understanding the terms being used in the dialogue and then try to ensure that everyone has the same understanding of the meaning of those terms. Without a common language, the conversation will go on forever without a clear consensus or agreement.

The ASPE dictionary defines a plumbing engineer as "a **professional skilled** in the design and specification of plumbing systems" (emphasis added). Webster's defines a professional as "characterized by or **conforming to the technical or ethical standards of a profession**; exhibiting a **courteous, conscientious, and generally businesslike** manner in the workplace" (emphasis added). On Wikipedia, I found the following definition for professional (emphasis added):

"The main criteria for professional include the following: **Expert and specialized knowledge** in a field in which one is practicing professionally. Excellent manual/practical and literary skills in relation to profession. **High-quality work** in (examples): creations, products, services, presentations, consultancy, primary/other research, administrative, marketing, photography, or other work endeavors. **A high standard of professional ethics, behavior, and work activities** while carrying out one's profession. The professional owes a higher duty to a client, often a privilege of confidentiality, as well as a duty not to abandon the client just because he or she may not be able to pay or remunerate the professional. Often the professional is required to put the interest of the client ahead of his own interests. Reasonable work morale and motivation. **Having an interest and desire to do a job as well as holding a positive attitude toward the profession** are important elements in attaining a high level of professionalism. **Appropriate treatment of relationships with colleagues**. A professional is an expert who is **master in a specific field**."

Since the term "ethics" was raised in the Wikipedia list of characteristics, I reviewed the ASPE Voluntary Code of Ethics, which I paraphrase below. I encourage you visit aspe.org/codeofethics to read the full document.

Plumbing engineers and designers shall endeavor to protect the environment and the safety, health, welfare, and property of the public; perform services only in the areas of competence; act as trustworthy and fiduciary agent for each employee or client; avoid misrepresentation; seek no favors or issue public or professional statements for personal aggrandizement; and continually improve their professional ability and maintain professional competency.

Finally, I looked up the term "respect" in Merriam-Webster and found it to be defined as "an act of giving particular attention; high or special regard; the quality or state of being."

I believe that plumbing engineering is truly a profession based on a high level of skill, knowledge, and training with prescribed ethical practices that deserves the highest level of respect from the plumbing engineers themselves, the plumbing community, other engineering specialties, and most importantly the public that we protect. Remember, respect starts from within and how we present ourselves. If you have a high regard for your profession, conduct yourself based on the codes and standards of that profession, conduct yourself in a professional manner, and continually work to improve your knowledge and skills, you will gain the respect of those around you. Let's keep the dialogue going.

Young Engineers: We Need Your Help

Did you know ASPE has almost 1,000 members who are under the age of 35? If you are under the age of 35, a member of ASPE, and interested in helping set the future direction of ASPE, then we are looking for you! ASPE Director of Membership Stacey Kidd and I will be putting together young engineer/designer focus groups via conference call to discuss what you would like to see ASPE be in the future and how we can better meet your needs today. If you are interested and want to participate, contact Stacey at skidd@aspe.org. Also, please be sure to attend the young engineer breakfast being held at the 2012 ASPE Convention & Exposition in October. We will be talking about what we have learned from the focus groups and setting plans to better serve you. Now is the time to come off the sidelines and enter the game. You will not regret it! ASPE

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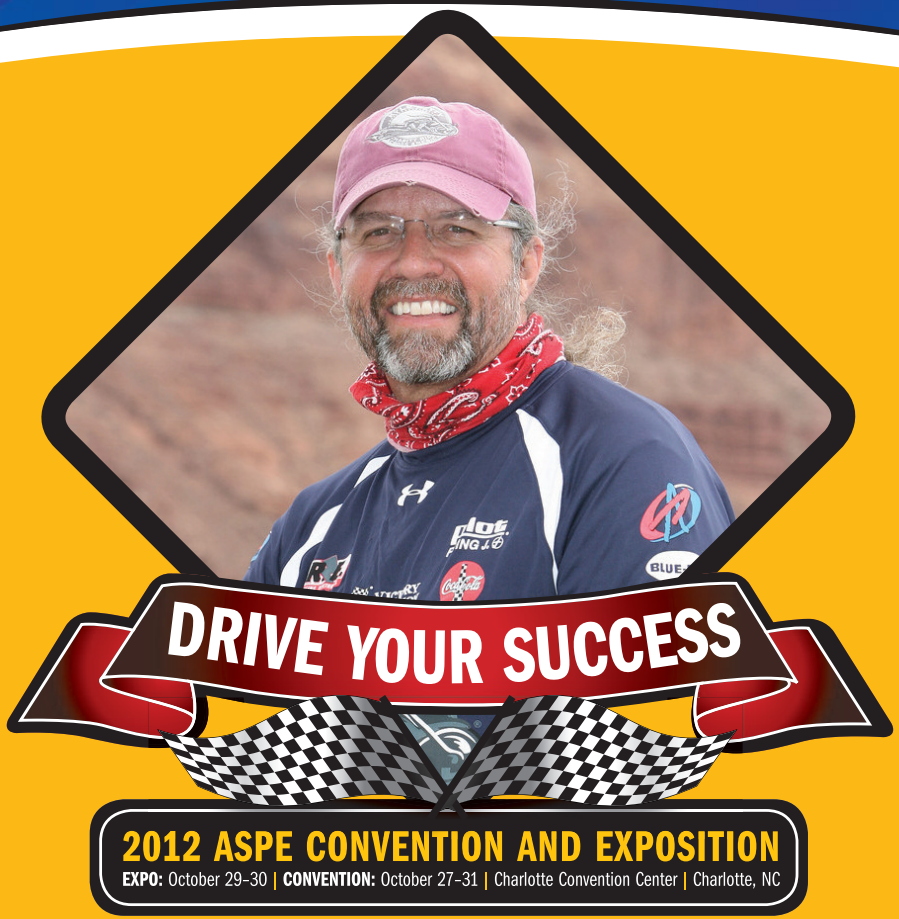

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After listening to Kyle Petty speak, you will understand how to compete with class and raise the game of everyone around you. You do not want to miss this inspirational address.

Register online today at aspe.org/expo.
All 2012 Exposition attendees are invited to the keynote address.

Remember: Registration for the Exposition is free!

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New ASPE Chapter Formed in Evansville, Indiana

At its July 2012 meeting, the ASPE board of directors approved the formation of a local satellite chapter in Evansville, Indiana. The Evansville Satellite Chapter was sponsored by ASPE's Central Indiana Chapter and will be under its jurisdiction until the satellite petitions the board of directors to become an independent chartered chapter. The Evansville Chapter is the first satellite chapter in ASPE's Region 2, which includes Michigan, Indiana, Ohio, Kentucky, West Virginia, and western Pennsylvania and New York. The idea for the chapter was conceived several years ago as ASPE members working in southern Indiana found it difficult to attend the Central Indiana Chapter's monthly meetings and events. The Evansville Chapter's first official meeting will be in September and will consist of an evening celebration dinner with members from the Central Indiana Chapter. For more information, contact Interim Chapter President Larry Fox at LFox@dvpe.net.

2012–2014 ASPE Board of Directors Candidates and Proposed Bylaws Amendments Announced

ASPE members may review the candidates' biographies at aspe.org/BODcandidates and the proposed bylaws amendments at aspe.org/ProposedBylaws. Voting will take place at the 2012 Business Meeting during the ASPE Convention & Exposition in Charlotte, North Carolina.

ASPE Awarded NSF Grant to Fund New Plumbing Technician Certification Program

In collaboration with the City College of San Francisco, ASPE will develop a plumbing design technician course curriculum and certification program using the Advanced Technological Education grant funded by the National Science Foundation. The goal of the program, called PIPED (Program in Plumbing Engineering Design), is to produce a model curriculum in plumbing engineering design that can be implemented in two-year colleges throughout the country and increase the number of qualified engineering technicians to meet workforce demand. The three-year grant started August 1 and will be shared between ASPE and CCSF. CCSF is the official sponsor of the program, and former ASPE Grants Manager Donna Novickas will be the principal investigator. Past ASPE President A. Calvin Laws, PE, CPD, FASPE, will help develop the course material. For more information, contact Donna at dnovickas@aspe.org. ***ASPE***

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- **Range:** Up to 98% thermal efficient, Baxi Luna is ideal for new construction or retrofit applications – from in-floor radiant, heated towel racks and snow melt systems to forced air with a hydronic air handler. In addition to heating-only models, Baxi offers a combination heating and domestic hot water boiler, the first of its kind in North America. The modulating, condensing Baxi Luna HT 380 satisfies a heat load up to 113 BTU/hr, fully modulating to 32 MBTU/hr. The unit prioritizes to domestic hot water demand, producing endless hot water at a rate 3.9 gallons per minute (ΔT80 F) – enough for two concurrent showers.

- **Quality and Safety:** Baxi Luna is CSA and Energy Star approved. The boiler's nickel chrome stainless steel pre-mix burner (AISI 316L) bears the ASME H-Stamp.

Other Baxi residential boiler built-in safety features include: electronic, gradual ignition (no open flame); flue high limit, central heating high limit, fan pressure and differential pressure switches; flame sensing electrode; back flow prevention; circulator pump with integrated air vent; expansion tank; automatic self-diagnostics; frost protection and a Legionella prevention function.

Baxi Luna wallhung boilers are only available through Baxi-Certified Plumbing and Heating Contractors who are supplied by authorized regional Baxi Distributors. The manufacturer is committed to quality and safety and, therefore, does not authorize the sale of Baxi units directly to consumers or over the Internet.

www.wallhungboilers.com

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Designer's Guide

Timothy Allinson, P.E., Murray Co., Long Beach, Calif.

Prefab on steroids

In July, I was fortunate enough to take a trip to Cincinnati for a two day peer group meeting orchestrated by FMI, the Management Consulting Corporation. The peer group consisted of seven mechanical contractors of similar size as my own firm. Its purpose was to provide a forum to discuss industry trends, successes, failures, lessons learned and so on. The meeting was hosted by Grote/T.J. Dyer (aka Dyer), a Cincinnati-based mechanical firm.

After spending the morning discussing peer group business, Dyer took us on an afternoon site visit to see one of their projects, Mercy Hospital of Cincinnati. What was unique about the Mercy project was the fairly extensive use of prefab; it was very interesting to see its installation in the field.

Fig. 1: Corridor ceiling module. Note that corridor studs have been installed on the left side of the corridor but not yet on the right.

As anyone who has designed and seen a hospital built knows, the most congested aspect of the job is usually the corridors. This is true not only from a design standpoint but also from a physical installation standpoint. Once the corridor walls are framed with studs, all of the trades need to travel down the corridors with their materials, tools and so on. This all has to happen while the trades are working overhead, often one on top of the other, getting all the duct, mechanical pipe, conduit, cable tray, water pipe, med gas and so on into the corridor ceiling. Then sheet rock has to be installed above the ceiling line for a one-hour rating, and all of the penetrations through that sheet rock have to be fire-rated and inspected. In seismic areas, the seismic bracing needs to be inspected as well. All the while, the trades are trying in vain to travel through the corridors. It's a frustrating process on any hospital job, to say the least.

On the Mercy Cincinnati project, Dyer came up with a unique solution to this problem. They took the lead in designing a prefabricated corridor ceiling system that was built off-site and installed simply and quickly after being delivered to the site.

Dyer rented a nearby warehouse and created 40-foot lengths of corridor ceiling sections, using a tube steel frame to support the general construction as well as all of the utilities. The sides of the frame included the rated sheet-rock walls, and the base of the frame included the track for the corridor studs. The corridor ceiling space was completely finished in every respect. Pipes and ducts were insulated and labeled. Wall penetrations were fire-caulked. Each 40-foot length included fittings necessary to connect the lengths together once the sections were hoisted into place using screw jacks. Even curved corridor sections were prefabricated in straight lengths that were disguised above the corridor ceiling, hiding the fact that they weren't actually smooth curves. The results were nothing short of remarkable in the time and money this execution saved the project. Plus, the tradesmen benefited greatly from being able to work on the ceiling components at table height in a comfortable warehouse rather than having to work overhead exposed to the summer heat.

When the ceiling modules were shipped to the jobsite they were stacked two-high, four per truck, and lifted by crane onto their respective floors. From there they were lifted and bolted into position, connected end to end, and branch stub-outs were connected to the patient room piping, ductwork and conduit.

Fig. 2: Rear side of a PIVOTek toilet module, piping exposed but not yet insulated.

In addition to the prefabricated corridor ceilings, the patient toilet rooms were prefabricated by PIVOTek, a sister company to Dyer. Toilet modules are built in PIVOTek's fabrication shop, complete, ready to ship to the jobsite. All they require is field water and waste connections, power, ventilation and exhaust, as well as a sprinkler head. Everything else is included as part of the pod — walls, floor, ceiling, drain, tile, accessories and even toilet paper on the toilet roll.

In order for the module's tile floor to lie flush with the structural slab, PIVOTek produces a form for the slab

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Fig. 3: Interior of a nearly finished PIVOTek hospital pod. Note the trench style shower drain specific to this installation.

pour that creates the necessary concrete recess and has all of the necessary slab penetrations preset in the appropriate location. Once the slab is poured, the toilet module can be delivered to the jobsite and rolled into position with a pallet jack. The pod is left "under wraps" until it is time to complete the wall construction around the module to prevent damage from the elements and other construction-related hazards. Planning can be critical, since space above the module is limited by the floor-to-floor height of the project. Hospitals tend to be more generous with space and less access-critical, while hotels sometimes will have only a few spare inches above. In fact, if modular toilet construction is being considered for a project, it is important to make the decision early on, since the process can affect the layout of the toilet room and associated utilities.

Most of us have seen the YouTube videos of tall buildings being constructed in China in record time using extensive prefabrication. There is no doubt that prefabrication carries major benefits, but it is not without its challenges, especially in this country. The PIVOTek modules are not fabricated using union labor; this can be a real challenge to their application on location-specific projects, some unions being stronger and more restrictive than others. These union issues need to be addressed in advance in order to use the prefabrication process successfully. ■

Timothy Allinson *is Vice President Engineering with Murray Co. mechanical contractors in Long Beach, Calif. He is licensed in both mechanical and fire protection engineering in various states and is LEED accredited. He can be reached at laguna_tim@yahoo.com.*

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Code Classroom

Ron George, CPD
President, Plumb-Tech Design & Consulting Services, LLC

Plumbing code and industry news

Conferences and conventions

Two important industry events are coming up in the coming months. First, the 83rd annual IAPMO Education and Business Conference takes place Sunday, Sept. 23 through Thursday, Sept. 27, at the Westin Diplomat in Hollywood, Fla. Visit www.iapmo.org to learn more.

The following month, from Saturday, Oct. 27 through Wednesday, Oct. 31, the ASPE Convention and Exposition will be held at the Charlotte Convention Center in Charlotte, N.C. (The Exposition will be held Oct. 29 and 30.) This is the only industry event designed to showcase innovations in plumbing system design specifically tailored to plumbing engineers, designers, design/build contractors and specification professionals. For details, go to www.ASPE.org.

ASSE donates to ASPE Research Foundation

The American Society of Sanitary Engineering (ASSE) has made a generous donation to the American Society of Plumbing Engineers Research Foundation Inc. (ASPE RF) to help fund the research and study of the growth, accumulation and detachment of biofilm and planktonic bacteria in both electronic and automatic faucets.

The question of whether electronic faucets are more or less sanitary than manual faucets when all other variables are controlled has arisen from a field study conducted by Johns Hopkins Hospital. The ASPE RF, in conjunction with Montana State University Center for Biofilm Engineering (CBE), plans to assess biofilm and opportunistic pathogen growth in both manual and automatic faucets under identical flow conditions, based on realistic use patterns, in a controlled laboratory environment over a four-month period.

The data from these tests will help to develop a timeline of bacterial growth within these faucets and provide empirical data relative to whether the faucet valve plays a significant role in bacterial loading. This data will be essential for the future research of system variables that play a role in biofilm growth and could ultimately lead to empirical-based recommendations for improvements in faucet design and maintenance. If you would like to support or contribute to this research, visit www.aspe.org.

My two cents on the manual versus automatic faucet issue

I am a member of the ASSE product standards committee and the ASSE seal control board, and I applaud the ASSE donation to the ASPE Research Foundation. The Johns Hopkins study raised a lot of eyebrows and caused quite a bit of discussion in the plumbing industry. There were also many discussions with Legionella experts that serve with me on ASHRAE committees that are working on Standard 188 and Guideline 12, which are intended to reduce Legionella bacteria in building water systems. We discussed the code requirement for significantly lower flow rates mandated for infrared or metering type faucets verses manual faucets.

I did a quick calculation based on the following assumptions: The faucets are mandated to have 0.5 gpm per faucet, with a maximum total flow of 0.25 gallons of mixed water per cycle. This equates to a maximum cycle length of about 30 seconds. My experience has been that most faucets do not flow for the maximum allowable flow or volume and that plumbers or facility staff set the timers closer to about 10 seconds or less. I have been in airports and hotels where the faucet timers are set to just spit enough water to wet your hands; I end up doing a version of the "Hokey Pokey" dance, putting my hands "in" and "out" of the fixture to try and get water to wash my hands.

My experience is that most people will not take the extra time for multiple cycles. If excessively low flow rates are combined with low or diminished use, the chlorine will dissipate over a relatively short time and be ineffective at controlling bacteria levels in branch piping.

With about 10 seconds, the total mixed flow is probably less than 0.0833 gallons per cycle. When you account for the hot water flow, which is generally about 50 to 75 percent of the mixed water flow rate, the actual flow volume per cycle is about 0.04 gallons per cycle. (This is probably just a few ounces of hot water per cycle.) The resulting poor flow rate does not allow enough hot water into the hot water mains, branches and fixture branches to keep the chlorine levels up.

My experience is that most people will not take the extra time for multiple cycles. If excessively low flow rates are combined with low or diminished use, the chlorine will dissipate over a relatively short time and be ineffective at controlling bacteria levels in branch piping.

This is yet another example of an issue associated with mandating lower flow rates on plumbing systems, in which water conservation proponents are using simple water savings calculations without proper research into

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- NSF/ANSI 61 (Toxicity)
- NSF/ANSI 42, 53, 55, 58 (Water Filtration Products)
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the effects on the system. If this is true, the health and safety of the staff and patients are jeopardized by water conservation efforts. As I have said before, health and safety should be more important than water conservation.

2012–2014 International Code Council (ICC) code development schedule.

The International Code Council (ICC) family of codes has grown to the point that it has become increasingly more difficult to hold the code change hearings in a two-week block. Holding all of the code hearings in one block, with two consecutive tracks of hearings going on at the same time created a time crunch and a logistical challenge. The code hearings were going until almost midnight and resuming at 7 a.m. to try to keep them on schedule. Keeping to the schedule was especially important because people will often purchase airfare and make hotel reservations to come in and speak on a specific code change.

If controversial issues in the codes caused a lot of testimony, the hearings would slip back, sometimes by more than a day. Code committee volunteers ended up being on the dais for code hearings for several days, sometimes listening to and voting on code changes for more than 16 hours per day. This went on for up to two weeks, requiring ICC staffers to work long hours. It was very stressful for everyone.

A committee was formed to try to streamline the hearings. Time limits were placed on testimony, allowing three minutes for someone to speak on each code change. When a controversial issue came up, there might be dozens of people waiting to speak. The committee suggested breaking the code changes into different code hearing tracks held in different years. Initially, there were two groups with two tracks each; with the introduction of the swimming pool and spa codes and the green codes, the ICC board of directors approved a third group. Each group will have the usual deadlines for submission of code changes, publication of the proposed code changes and code hearings, as well as deadlines for publication of the results of the code hearings, for comments on the results of the code hearings and for final action code hearings at the annual meeting.

The Plumbing and Mechanical codes have been in group A for the past two code cycles. This means that the previous code is barely on the street, and that the ink is still wet in the code books when the code changes for the next three-year cycle are due. This makes it hard to submit

code changes in a timely fashion.

I would like to see ICC move the green codes to group A and move the Plumbing, Mechanical and Fuel Gas and Private Sewage Disposal codes to Group C. The Green codes generally do not deal with health and safety issues; they deal with sustainability and energy conservation. I'm sure that most of you would agree that water conservation and energy savings are not as important as the health and safety issues covered in the Plumbing, Mechanical and Fuel Gas codes. This change would provide ample time for use of the code and allow timely submission of code changes that address health and safety issues. The following information shows the breakdown of the codes into the various code groups and information about deadlines for each group of codes.

2012 – ICC Group A codes include: International Building Code (IBC), International Fuel Gas Code (IFGC) International Mechanical Code (IMC), International Plumbing Code (IPC), International Private Sewage Disposal Code (IPSDC)

The ICC Group A code cycle is already under way. Code change proposals were due in January and initial code hearings were held in Dallas in the spring. Final action hearings are scheduled to take place October 24 – 28, 2012, at the Oregon Convention Center in Portland. Proposed code changes and the public comments to those changes, along with the Final Action Hearings agenda, will be posted on the ICC website by September 10, 2012.

2013 – Group B codes and admin sections of all codes include: International Performance Code (ICCPC), International Existing Building Code (IEBC), International Energy Conservation Code (IECC), International Fire Code (IFC), International Property Maintenance Code (IPMC), International Swimming Pool and Spa Code (ISPSC), International Residential Code (IRC), International Wildland-Urban Interface Code (IWUIC), International Zoning Code (IZC).

Code changes are due January 3, 2013.

2014 – Group C code: International Green Construction Code (IgCC). Code changes are due in January 2014.

IAPMO – Uniform Plumbing Code news:

UPC and UMC code development timeline for 2015

Continued on page 32

continued from page 31

code cycle

- May 10 – 11, 2012, Technical Committee meetings (via teleconference)
- September 3, 2012, Call for proposals
- September 23 – 27, 2012, IAPMO annual Education and Business Conference
- January 3, 2013, Deadline for submission of proposals
- March 25, 2013, Distribute proposals to committees (ROP monograph)
- April 29 – May 3, 2013, Technical Committee meetings
- May 17, 2013, Initial ballot to Technical Committee
- May 31, 2013, Receipt of initial ballots, circulation of comments
- June 14, 2013, Final closing date for ballots, including receipt of vote changes based on recirculated comments
- August 23, 2013, Distribution of Report on Proposals (ROP)
- September 3, 2013, Call for comments
- September 29 – October 3, 2013, IAPMO annual Education and Business Conference, Assembly Consideration Session
- January 3, 2014, Deadline for submission of comments
- March 24, 2014, Distribute comments to committees (ROC Monograph)
- April 28 – May 2, 2014, Technical Committee meetings
- May 12, 2014, Initial ballots to Technical Committees
- May 19, 2014, Receipt of initial ballots, circulation of comments
- May 30, 2014, Final closing date for ballots, including receipt of vote changes based on re-circulated comments
- August 7, 2014, Distribution of Report on Comments (ROC)
- September 14 –18, 2014, IAPMO Annual Education and Business Conference, Technical Meeting Convention
- September 22, 2014, Ballot of Technical Committees on membership amendments from floor; two-thirds vote of approval required from the Technical Committee
- September 29, 2014, Receipt of initial ballots, recirculate comments to Technical Committee members
- October 6, 2014, Final closing date of ballots and receipt of vote changes based on recirculated comments
- November 12 – 14, 2014 Standards Council meeting
- December 10, 2014, Deadline for notification of intent to file written petition to the board of directors
- January 26, 2015, Board of directors meets to address petitions

IAPMO proposal

On Friday, July 20, 2012, The ASSE board received a presentation by IAPMO CEO Russ Chaney and President Dan Daniels. IAPMO proposes to absorb ASSE into its group of business entities, to be designated the ASSE National Chapter of IAPMO.

The ASSE board and IAPMO representatives participated in a several-hour discussion to explore the idea and its impact on ASSE members, staff and assets. The primary question for the ASSE board is whether such a change would better serve the ASSE mission of "Prevention rather than cure," protecting the health and safety of the public through better plumbing.

ASSE International President Donald R. Summers Jr. signed a letter of intent from IAPMO on July 20, 2012; now the process of negotiating a legally binding agreement by which the two nonprofit entities will merge is underway. Don Summers notified the ASSE staff of this development on Saturday, July 21, 2012, and via ASSE legal counsel (also in person) at the Westlake office on Monday, July 23, 2012.

The letter of intent is not a legally binding document. Summers said. "You may think of it as a proposal,"he explained. "ASSE is now engaged to join with IAPMO. Continuing the analogy, the marriage license itself has not been signed but is now under negotiations." ■

Ron George *is president of Plumb-Tech Design and Consulting Services LLC. He has served as chairman of the International Residential Plumbing & Mechanical Code Committee. Visit www.Plumb-TechLLC.com, email Ron@Plumb-TechLLC.com or phone 734/755-1908.*

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FPE Corner

Samuel S. Dannaway, PE, FSFPE
President, S.S. Dannaway Associates Inc., Honolulu

The state of sprinklers in Hawaii or why engineers should …

On lists of the most ethical and honest professions, you will find that engineers consistently rank very high; usually in the top 10. Nurses typically top these lists.

On April 26, 2012, the Honorable Governor of the State of Hawaii, Neil Abercrombie, signed into law Senate Bill 2387 "Relating to Fire Sprinklers." The law became effective on July 1, 2012. The text of the entire bill is as follows:

A BILL FOR AN ACT RELATING TO FIRE SPRINKLERS. BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF HAWAII:

SECTION 1. Chapter 46, Hawaii Revised Statutes, is amended by adding a new section to be appropriately designated and to read as follows:

"§46- Fire sprinklers; residences. No county shall require the installation or retrofitting of automatic fire sprinklers or an automatic fire sprinkler system in:

(1) Any new or existing detached one- or two-family dwelling unit in a structure used only for residential purposes; and

(2) Non-residential agricultural and aquacultural buildings and structures located outside an urban area; provided that this section shall not apply to new homes that require a variance from access road or fire fighting water supply requirements."

SECTION 2. New statutory material is underscored.

SECTION 3. This Act shall take effect on July 1, 2012; provided that on June 30, 2017, this Act shall be repealed.

In spite of strong opposition by all four county fire chiefs and the NFPA, the bill passed, and sprinklers are now illegal in Hawaii, at least in one- and two-family dwellings. Fortunately, the Hawaii fire chiefs and their State Fire Council were able to get the bill modified to allow them to require sprinklers as an alternative to constructing costly water supply and road improvements for new homes located in areas remote from water supplies and roads meeting fire code requirements.

The law is similar to other statewide legislation enacted in Texas, Alabama, Kansas and Arizona. Additionally, as stated in the August 10, 2012 article by Melanie Hicken of Reuters, *New Homes Burn Faster, But States Resist Sprinklers*, "A dozen (state governments) have forbidden statewide building code councils from including the requirement (for sprinklers in homes) in their guidelines."

These efforts are the result of a well-funded, nationwide lobbying effort by the home building industry. The industry is using statewide legislation to head off any efforts by local towns, cities and counties to adopt current editions of the International Building Code and International Residential Code, unless the requirements for sprinklers in one- and two-family dwellings are removed.

Now, before I get too far into my diatribe, I will pause to try to understand the home builder perspective. The housing industry, arguably, is still trying to shake itself free from the worst downturn in decades. It is understandable that the industry would be sensitive to perceived increases in their costs. Unfortunately, in Hawaii new sprinkler requirements come on the heels of a 2011 statewide mandate requiring the installation of solar water heating systems in all new homes. We got beaten to the punch by the greenies.

The (home building) industry is using statewide legislation to head off any efforts by local towns, cities and counties to adopt current editions of the International Building Code and International Residential Code, unless the requirements for sprinklers in one- and two-family dwellings are removed.

Back to my diatribe. What bugs me about all this is the misinformation contained in the justification that home builders are using to dupe legislators (willing to be duped by the highest bidder) into passing this legislation. Written testimony offered by the Building Industry Association of Hawaii on Feb. 23, 2012 before a Hawaii Senate Committee includes the following gem, "Fire sprinklers have not been proven to enhance the safety of occupants."

We in the industry know that this is untrue and that sprinklers are saving lives in homes every day. Also, the home builders, while lobbying our highly intelligent legislators, conveniently omit the fact that a major justification for the IRC sprinkler requirement was to allow builders to use increased lightweight building construction materials in home construction. You know, those lightweight products, like I-beams made of two 2 x 4's connected by a thin web of plywood that fail under the weight of a firefighter seven minutes into a fire exposure.

A report by the International Society of Fire Service Instructors and Eastern Kentucky University's Fire and

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FPE Corner

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Safety Engineering Technology Program, which studied 117 firefighter fatalities between 1996 and 2009, found that lightweight construction was found as a factor in 17 firefighter fatalities occurring in 12 separate fire incidents. Ten of those incidents were in residences. Of note is that the average age of the structures was 12.1 years. This tends to argue against another piece of commonly used homebuilder misinformation as exemplified in the BIA-Hawaii testimony, that "Fire sprinklers in new homes will not make them safe."

And guess what? These lightweight construction products, in addition to being cheap, are sustainable and green (unless, of course, they are involved in a fire). Sprinklers enable the use of these kinds of products to reduce the cost of home construction. They were used as partial justification to head off efforts from concerned public safety groups, including firefighter unions, to ban the products from residential codes because of their poor performance in fires.

Now the homebuilders and, I need to add, the major trade unions involved, are coordinating a highly successful nationwide campaign to use the government to backdoor the codes so they can have their cake and eat it too. Mind you, the codes are national consensus standards that represent the industry standard of care.

This method of attacking the codes is disturbing and, hopefully, will not become a model for others who cannot get their way through the legitimate standards-making process.

If you look up lists of the most ethical professions, you will find that engineers consistently rank very high on the list, usually in the top 10. That is why engineers should use their voices to present the truth to those in most need of it.

By the way, regarding that list of professions, can you guess the profession that always dwells in the bottom 10 percent? ■

***Samuel S. Dannaway**, PE, is a registered 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 past president and a Fellow of the Society of Fire Protection Engineers. He is president of S. S. Dannaway Associates Inc., a 15-person fire protection engineering firm with offices in Honolulu and Guam. Sam can be reached via email at SDannaway@ssdafire.com*

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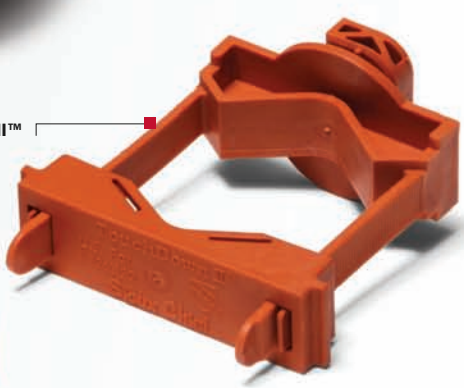

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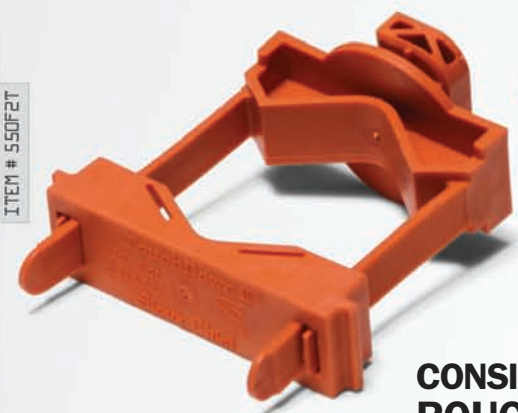

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Sioux Chief

Sustainable Design

By Winston Huff, CPD, LEED AP BD+C

Toilet: The king of water efficiency?

Is the toilet still the king of water-efficiency programs, or is its reign about to end? For more than 40 years, reducing the amount of water used in a toilet has resulted in significant water savings for facilities and municipal water districts, but how long can the toilet continue to help cities save water? In the future, will the toilet be able to achieve the dramatic water reductions that are needed?

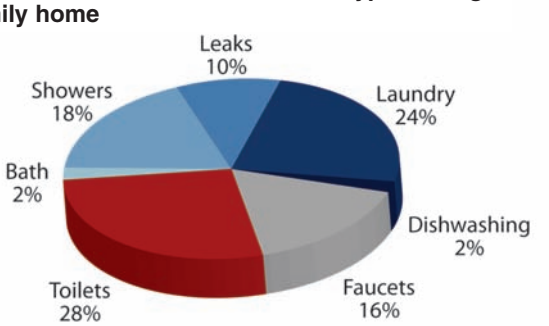
Toilet rebate programs

Many cities facing water challenges are responding by implementing toilet rebate programs. For example, earlier this year New York City announced a rebate program to replace approximately 800,000 3.5 gallon-per-flush (gpf) toilets with high-efficiency models.

Why did New York City start this program? The NYC Department of Environmental Protection (DEP) is responsible for providing safe drinking water to more than eight million people each day. Fortunately, the city's water requires very little treating or pumping because it is collected in protected watersheds in the mountains of Upstate New York and is gravity fed to the city via a complex tunnel and aqueduct system. However, a portion of the Delaware Aqueduct Rondout-West Branch Tunnel is leaking and will have to be repaired. While this work is done, the flow of available water to the city will be drastically reduced.

In anticipation of the aqueduct being shut down, the New York City DEP has implemented a Water for the Future initiative to reduce the city's overall water consumption by five percent by 2020; a major component of the initiative is the Toilet Replacement Program. Under the program, owners of residential buildings will receive a rebate toward the cost of high-efficiency toilets (1.28 gpf or less) that replace older, less efficient toilets. According to its website, the DEP estimates that the program will reduce water consumption by three percent over the next seven years. On an average day, the city uses approximately one billion gallons of water, so a three percent reduction would save 30 million gallons per day. The program is scheduled to begin in 2013, and the vouchers are expected to be valued around $125, which is intended to cover the cost of the new toilet.

Figure 1: Indoor water use in a typical single-family home



Source: Aquacraft, for the American Water Works Association Research Foundation

The city estimates that in 2011 residential consumption was 75 gallons of water per person per day. Toilets represent about 28 percent of that total (see Figure 1). Comparing these figures with other studies shows that New York City is pretty close in their estimates.

In this column in March 2012, I reported on a case study from the Sonoma County Water Agency called "High-Efficiency Plumbing Fixture Direct Install Water Savings Analysis" by Koeller and Company. Their data reported on the effect of replacing fixtures with water-efficient versions. In 2009–2010, the Sonoma County Water Agency in Northern California created and managed a water conservation program encompassing the replacement of older water-using fixtures and fixture fittings with new high-efficiency products in both domestic (residential) and nonresidential applications. Qualified, licensed plumbers were used to install all items, which included toilet fixtures, urinals, showerheads and faucet aerators.

One part of the study showed that when 3.5 gpf residential fixtures were replaced with 1.28 gpf versions, the average water savings was 41.8 gallons per toilet per day (see Table 1). The Sonoma study showed that replacing commercial fixtures can result in even greater savings.

New York City has a rich history of reducing water usage with a toilet rebate program. When the Clean Water Act lowered the required flow to 1.6 gpf toilets in the early 1990s, the city initiated a similar program, which ran from 1994 to 1997, replaced 1.3 million toilets and helped save 90 million gallons of water per day. Since then, the city has seen a decline in water usage by approximately 30 percent, even though the population has increased.

Some concern surrounds the use of low-flow fixtures, specifically that they will have to be flushed twice for every use, thus negating the water savings. However, MaP testing and WaterSense certification have made a difference in the industry. This testing has improved the performance of 1.28 gpf fixtures compared to the 1.6 gpf fixture of the 1990s. The New York City rebate program requires WaterSense-labeled fixtures to reduce the problems that may have occurred in the earlier programs before WaterSense was in existence.

Poticrete?

Replacing 800,000 toilets with high-efficiency toilets sounds like a good idea when considering water issues, but what about the solid waste issue? Disposing of this many porcelain fixtures will create a landfill issue.

In response to this problem, the city is developing a program to reuse the porcelain for foundations, road beds or pavement. This is not unusual; most cities realize that

Continued on page 40

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Continued from page 42

offering incentives without having a plan in place for old toilets can result in toilets sitting on the side of the road. For instance, Bellingham, Washington, makes what they call poticrete (a combination of potty and concrete) out of old porcelain fixtures. The fixtures are ground up and used as aggregate in sidewalk cement. Most major toilet manufacturers also have active programs to recycle old fixtures into new products.

TABLE 1 WATER SAVINGS BY TOILET WHEN REPLACED WITH 1.28-GPF VERSION

Category	Number of Properties	Number of Toilets Replaced	Average Water Savings per Toilet, gallons per day
Residential			
Replace 1.6 gpf	17	19	27.1
Replace 3.5 gpf	165	504	41.8
Commercial			
Replace 1.6 gpf	8	335	25.8
Replace 3.5 gpf	45	235	102.8
Combined			
Replace 1.6 gpf	25	354	25.9
Replace 3.5 gpf	210	739	61.2
Total	235	1,093	49.8

Source: "High-Efficiency Plumbing Fixture Direct Install Water Savings Analysis"

Other benefits

While not mentioned in many of the toilet rebate programs, they can result in other benefits, such as decreased flow in municipal wastewater systems and small septic systems. Many cities are facing combined water and sewer system overflows; reducing the wastewater flows in these systems can decrease the instance of overflows.

Wastewater systems use large amounts of energy to pump and treat waste; New York City has reported that 17 percent of the greenhouse gas (GHG) emissions from city buildings is from water and wastewater systems. Thus, reducing the volume of water in water distribution systems and wastewater systems will also reduce the amount of energy used and GHG emissions produced by these systems.

In the early 1990s, New York City also expanded a program to install water meters in buildings. As in other cities, water rates were not based on usage but on a complex formula that could include the amount of building street frontage. The meter program and the toilet program were the major pieces of an overall water conservation effort that remains to this day.

While the toilet rebate may be "king" in water-efficiency programs now, in New York it is not alone. The water meter program is scheduled to be expanded to include more properties and to enable users to access their water usage data on a regular basis. Studies have shown that when customers reap the financial benefits of water savings, they are more likely to initiate water-saving programs in their buildings. The New York City DEP is also working on a leak notification program that will use information from the meters to proactively alert customers to potential water leaks on their property.

Although toilet rebates are more frequently becoming part of water conservation programs, when looking at total populations and the amount of water that is processed in water treatment facilities, U.S. cities still use more than 100 gallons per person per day. This is a significant amount compared to other cities around the world, so more needs to be done. ■

***Winston Huff**, CPD, LEED AP, is a project manager, plumbing fire protection designer, and sustainable coordinator with Science Interactive (scienceinteractive.net) in Nashville. He serves as an ASPE representative on the ICC Green Construction, Energy, and Water Code Development Committee and was on the U.S. Green Building Council's Water Efficiency Technical Advisory Group for v3.0. He was the founding editor of Life Support and Biosphere Science and has served as its editor-in-chief. He also is editor of Me Green You Green (megreenyougreen.com), a LEED credit databank.*

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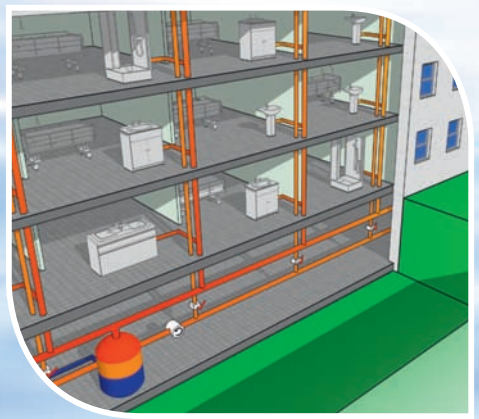
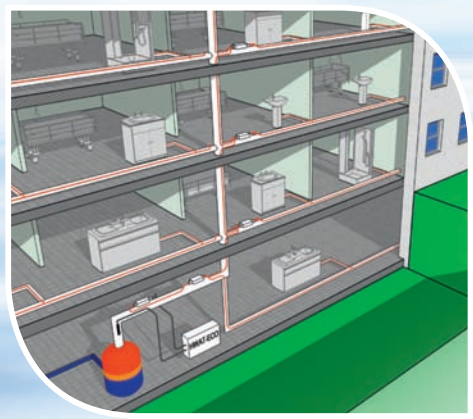


Recirculation system



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Solar Solutions

Bristol Stickney, chief technical director, SolarLogic LLC, Santa Fe, N.M.

Bristol's Six Principles for Good Solar Hydronic Design

#50: Case study: solar combi with "radiant" swimming pool

One of the most popular uses for "extra" solar heat in summer is heating a swimming pool. This is especially easy to accomplish when the hydronic solar heating system is constructed using a primary-loop configuration as recommended many times in this column. (Archives and links to past articles can be found on the websites of TMB Publishing and SolarLogic LLC.) A pool or spa can be treated much like any other heating zone and, in a number of systems in recent years, the pools have been connected the same way as any other radiant-heated floor.

"Radiant" pool examples

Take a look at the pools shown in the photos in Figure 50-1 (A, B and C). These were installed by professional pool builders using standard in-ground concrete shells that were site-built. They are located near Pecos, Taos and Galesteo, New Mexico, respectively. What you cannot tell from the photos is that they all contain PEX tubing in the floors and walls of their concrete shells. The tubing was installed by wire-tying it to the re-mesh in the pool shell just before the concrete was poured. This allows the concrete shell to be heated hydronically, the same way radiant concrete warm floors are heated. It just takes a little extra planning and coordination with the pool construction people.

Figure 50-1A: Solar 'Radiant' Pool 2003

Figure 50-1B: Solar 'Radiant' Pool 2005

Figure 50-1C: Solar 'Radiant' Pool 2006

In all three of these examples, I designed the heat distribution to the pool floors in much the same way as the solar heated concrete floors in the nearby buildings. Zone valves, zone pumps and two-stage thermostat controls were employed to allow solar heat or boiler heat to warm the shell of the pools, under the control of the owners, in much the same way as the other radiant floors are controlled by room thermostats.

All of these pools are attached to larger heating systems with similar design features often described in this column. They all use large multiple banks of flat plate solar collectors as their primary heat source. They all use primary-loop heating system configurations that include domestic hot water tanks, heat storage tanks, backup gas boilers (propane) and multiple zone valves and circulators for space heating, in addition to the "radiant" pool heat zones. The systems in photos A and C are seasonal pools in off-grid locations, so they are connected to the glycol side of the solar combisystem primary loop, in the same way that an ice-melt zone is connected.

A word about "radiant"

It seems natural and convenient to call these "radiant" heated pools. After all, the same construction technique is used on concrete floors, and they are known as radiant floors. But, while warm floors really do transfer most of their heat by thermal radiation to the room, the same is not actually true for pools. The heat from the warm wall of a pool is transferred to the adjacent pool water mostly by natural convection. Strictly speaking, this is not thermal radiation or radiant heating. This is not the first misnomer of its kind; the fin-tube hot water baseboard is commonly called a radiator, when it, too, is really working by natural convection of the room air. So, in that spirit, I suppose the term radiant pool is allowable.

Side benefits of radiant pool tubing

As the solar heating designer or installer, it is a good idea to keep your equipment separate from the pool mechanical equipment. In conventional solar pool heating systems this is not possible, since it is common to have a filter pump that provides flow for the conventional pool boiler and the solar heat, as well as the filter system. This presents a grey area of responsibility when something requires maintenance. The pool guy may attempt to shut down or restart the solar heat after servicing the filter or the solar guy might alter the filter system or its valves or controls when servicing the solar heating equipment.

When PEX tubing is embedded in the shell of the concrete pool, the pool equipment is positively separated, literally, by a wall of concrete, from the hydronic heating equipment. The solar guy has his hydronic equipment, and the pool guy has his filter system. The only coordination needed is when the pool filter has its own boiler. The filter-boiler must be set to a (low) temperature that is compatible with the (higher) temperature range provided by the warm shell of the solar heating system.

Continued on page 44

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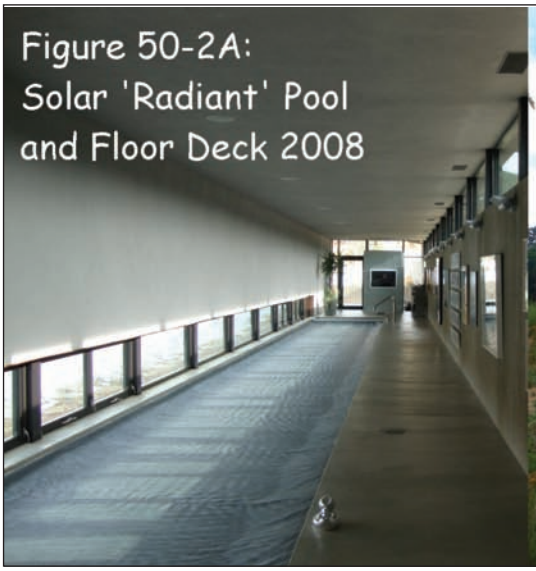

Case study: indoor pool upgrade

Let's take a closer look at one of these pool systems. Figure 50-2 shows an indoor and outdoor photo of a solar combisystem near Santa Fe, installed around 2008. This summer (2012) we had the opportunity to design the modification and upgrade of the piping and control system. The new control system is a SolarLogic Integrated Control (SLIC) that includes continuous data-logging and Internet connectivity as standard features. This allows us, for the first time, to observe and record the performance of an existing radiant-heated pool in real time.

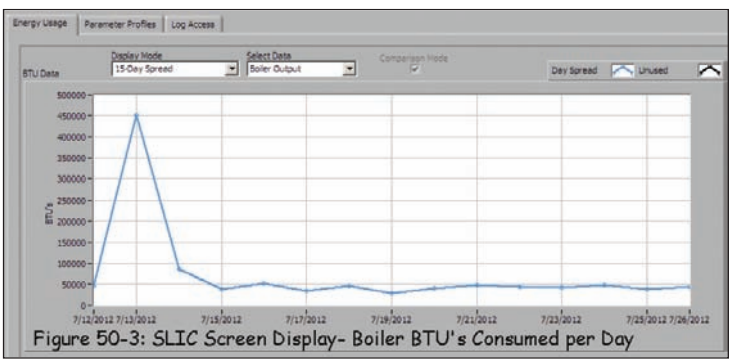

Figure 50-3: SLIC Screen Display- Boiler BTU's Consumed per Day

Heating system description

The solar heat collectors seen in Figure 50-2B are connected with a glycol loop to a heat dump zone (similar to an ice-melt zone) and a flat plate heat exchanger. The heat exchanger allows solar heat to pass into the building, where a primary loop full of water connects all the heating equipment inside. This includes a Lochinvar Mod/Con boiler, a DHW heat exchanger tank, two radiant floor zones and the pool floor zone. The primary-loop piping is configured to allow any heating source (solar or boiler) to heat any heating load (pool, floors and DHW) directly, under the control of the SLIC control system. (This is similar to the Combi 101 system configuration often mentioned in this column.)

The owner of the pool requested that the water temperature never drop below 81°F. The target temperature was set in the control system in a range of 82° to 84°F. The controls only allow the boiler to fire from 82° to 82.2°F, to maintain a comfortable low-limit in the pool. Solar heat is allowed to heat the pool as high as 84°F in summer. A pool cover that helps to cut down on heat loss and evaporation when the pool is standing by is kept in place most of the time. The two other floor heat zones are turned off for summer.

A flow meter and numerous thermistor sensors built into the control system allow direct measurement of heat flow (in Btu) in or out of anything connected to the primary loop. A sample display can be seen in Figure 50-3 showing Btu usage of the propane boiler during the first two weeks of normal operation.

Propane gas usage

Around the middle of July, the upgrade was complete, and normal pool operation began. Fig. 50-3 shows the gas heat used to raise the pool one degree on July 13 and 14, as we dial-in the desired comfort temperature in the pool.

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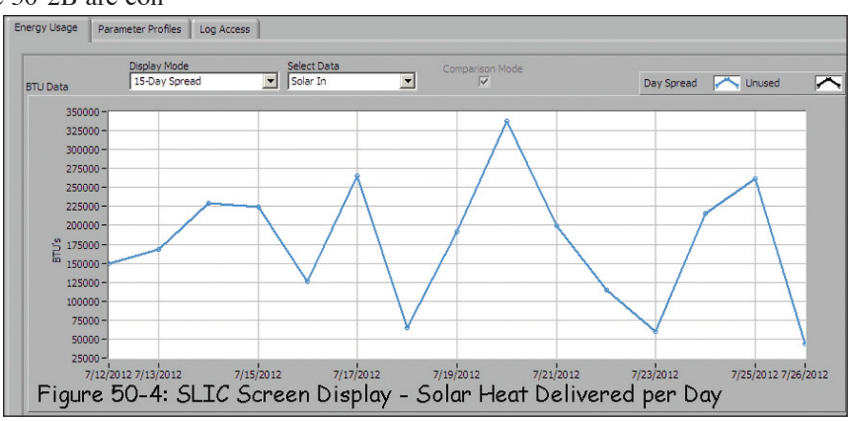

Figure 50-4: SLIC Screen Display - Solar Heat Delivered per Day

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This adjustment was made remotely over the Internet connection to the SLIC control box. The Btu data shows that a one- degree rise in the pool (from 81.2 to 82.2 F) consumed 473k Btu over a 6.5 hour period. This is the rough equivalent of 5.5 gallons of propane. The average heat delivery rate into the shell of the pool was 73k Btu/hr from the boiler during this period. This defines the size of the fuel savings that we are trying to offset with solar heat.

After the pool temperature is set, the only boiler heat seen on the Btu display is less than the 50k Btu/day required to make up heat to the DHW that is mostly being drawn out by the instant hot water recirculator. The low fuel consumption day after day throughout the rest of the month indicates that all of the pool and much of the DHW are being heated by the solar collectors.

Solar heat contribution

The solar heat delivered to the building is measured and recorded the same way that gas heat is recorded. Figure 50-4 shows the daily total solar heat recorded during the same period in July. These records show that typical solar heat (going mostly to the shell of the pool) amounts to around 175k Btu/day and can be seen to jump up above 325k Btu on the most sunny day during that time. The temperature data (not shown) for the pool confirms that this is enough solar heat to maintain the desired temperature range in the pool as the temperature increases from day to day, slowly but steadily. This pool appears to be able to function on "solar only" for weeks at a time, and we expect substantial and consistent propane savings as a result.

Final notes

The solar heated radiant pool combisystem case study described above was originally designed and installed (and was recently upgraded) by AM Energy Inc. in Santa Fe. Thanks to Peter Page and AM Energy for a successful upgrade in this building. ■

Bristol Stickney *has been designing, manufacturing, repairing and installing solar hydronic heating systems for more than 30 years. He holds a Bachelor of Science in Mechanical Engineering and is a licensed mechanical contractor in New Mexico. He is the chief technical officer for SolarLogic LLC in Santa Fe, N.M., where he is involved in development of solar heating control systems and design tools for solar heating professionals. Visit www.solarlogicllc.com for more information.*

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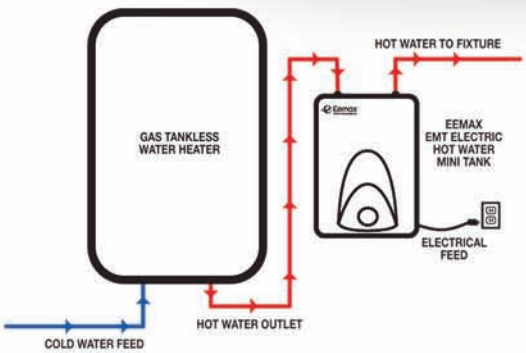

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Engineer's Notebook

Joseph V. Messina, CPD

Cryogenic Storage Systems

Cryogenic gas is any gas in a liquid form at or below -20°F (-29°C). The following discussion covers cryogenic liquids used in laboratories and light industrial applications, not cryogenic storage systems for gases used in healthcare facilities. Gases usually stored as cryogenics are nitrogen, argon and oxygen. Gases less commonly stored in bulk, but available, are carbon dioxide, hydrogen and helium.

Cryogenic storage systems have a few basic components. The storage tank contains the gas in a liquid form; the vaporizer turns the liquid into a gaseous form when necessary; and the piping conveys either the liquid or the gas to the point of use.

Codes and standards are very important to know and follow when designing a cryogenic storage system. The following codes and standards are most commonly used:

- UL 644: Standard for Safety for Container Assemblies for LP-Gas
- ASME Boiler and Pressure Vessel Code
- NFPA 55: Compressed Gases and Cryogenic Fluids Code
- NFPA 99: Health Care Facilities Code
- ASTM G88: Standard Guide for Designing Systems for Oxygen Service
- ASME B31.3: Process Piping Code

Storage

Two types of tanks are generally used to store cryogenic liquids: bulk storage tanks or dewars. Large bulk tanks are comprised of a tank inside of a tank, which allows them to be highly insulated with pearlite or another high-efficiency insulation in a vacuum. These tanks can be installed either horizontally or vertically. While horizontal tanks are slightly smaller and lighter, vertical tanks are the most common installation because they occupy less site area than a horizontal tank. Also, vertical tanks have less tank area in which the liquid can vaporize while filling, and it is very important to keep the stored liquid in that state as long as possible. All capacities are given in gallons of water. All tanks are ASME rated, and manufacturers provide similar sizes, with the smallest tank typically being 300 gallons. See Table 1 for common tank dimensions. Cryogenic storage tanks can be bought, but they are generally leased from the supplier.

TABLE 1 TYPICAL BULK CRYOGENIC STORAGE TANK DIMENSIONS

Nominal Capacity, gallons	Diameter	Height	Working Pressure, psig	Nominal Tare Weight, lb	Normal Evaporation Rate, %/day LOX*
315	4'-0"	8'-1"	250	2,600	0.90
525	4'-0"	11'-1"	250	3,600	0.55
900	5'-0"	11'-7"	250	5,500	0.40
1,500	5'-6"	15'-0"	250	9,100	0.35
1,500	5'-6"	15'-8"	150	10,800	1.50
1,500	5'-6"	6'-6"	150	11,000	1.50
3,000	8'-0"	16'-7"	50	14,900	0.17
3,000	8'-0"	16'-7"	250	20,360	0.50
3,000	8'-0"	16'-4"	250	17,340	0.17
6,000	8'-0"	9'-0"	250	34,500	0.30
6,000	8'-0"	27'-0"	50	19,900	0.15
9,000	9'-6"	30'-9"	250	53,500	0.26
9,000	9'-0"	30'-9"	250	51,300	0.10
11,000	9'-6"	35'-7"	75	34,900	0.10
11,000	9'-6"	35'-7"	250	65,900	0.25
11,000	9'-6"	35'-7"	250	60,000	0.10
13,000	10'-0"	36"-7"	72	41,000	0.10
13,000	10'-0"	36'-7"	250	68,300	0.10
13,000	10'-0"	36'-7"	250	74,100	0.25

* LOX = liquid oxygen
Source: *Pharmaceutical Facilities Handbook*

Regarding the site location of the tank, there must be enough space for the delivery truck to get as close to the tank as possible. This is because the operator must vent gas from the hose connection of the truck to the storage tank by means of a manual vent before filling can start. While filling the tank, the operator must adjust the pressure in the tank. To be able to do this, it is important that the tank have two connections: one to the top of the tank in the vapor space and the other at the bottom of the tank in the liquid. Filling the tank from the bottom will compress the vapor at the top, increasing the pressure. Filling from the top of the tank will lower the pressure because some of the vapor will condense and turn back into a liquid, reducing the volume of vapor. A level gauge must be installed on the tank so the operator can see when the tank has reached a set level.

Dewers are used to store small amounts of cryogenic gases for individual laboratories. They are insulated tanks that can be used either in the lab or outdoors if space is an issue. Dewers can be manifolded together if larger storage capacities are required. Like the bulk storage tanks, dewers can be bought or leased.

The amount of liquid stored is based on the volume of the liquid used between the scheduled deliveries. The schedule represents the length of time between deliveries preferred by the supplier and the deliveries preferred by the client. The suggested time between deliveries can range from once every two weeks to once every month. The delivery truck can only hold a certain amount of liquid by law.

Sizing a Storage Tank

Let's look at how to size a cryogenic storage tank. You must first know the amount of cryogenic liquid that will be used each day, shift or work week. If past information is not available, you can calculate the expected usage based on the total number of outlets and/or connected

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equipment, such as liquid nitrogen freezers or other lab equipment. You will need to know the amount of gas used by each and the duration each day that those pieces of equipment are used. Another way to get usage information is to contact the supplier to find out the delivery schedule and prices. They can also help you determine the size of the tank, but you should try to keep it as small as possible by maintaining a reasonable supply between deliveries. A common time between deliveries is usually two weeks, but once a month is not uncommon. Delivery drivers typically prefer to go back to their base office with an empty truck. If one customer didn't take the total load, a driver often will go to the other customers to top off their tanks until the truck is empty.

TABLE 2 CONVERSION OF 1 GALLON OF LIQUID TO GAS*

Liquid	Gas, cubic feet/gallon
Argon	112
Carbon Dioxide	92
Helium	100
Neon	95
Nitrogen	93
Oxygen	115

* At atmospheric pressure
Source: *Pharmaceutical Facilities Handbook*

The actual usable capacity of the storage tanks is calculated by multiplying the proposed usage per day by the number of days between deliveries. The conversion from gallons of liquid to cubic feet of gas is different based on the gas being used (see Table 2). Add 25 percent to the actual usable capacity to allow 15 percent for the empty volume used as vaporization space above the high allowable liquid level when the tank is full and 10 percent additional volume of liquid gas that is in the tank but not to be used (considered a reserve capacity). This 10 percent represents a two-day reserve supply of liquid in the tank after the low level alarm is reached to allow the supplier time to make a delivery. Therefore, select the volume of the storage tank and then add 25 percent.

Vertical tanks should be installed on a concrete foundation. The strength of the concrete should be a minimum of 3,000 pounds per square inch (psi), and the concrete should be reinforced with wire mesh for a small foundation or rebar (bottom and top) for a large foundation. The foundation should be a minimum of 6 inches larger than the tank diameter. If a vaporizer is included, the foundation should be able to handle its size as well. The foundation should sit on a 6-inch layer of crushed stone or gravel. For a quick estimate of the total weight the foundation must support, multiply the tank capacity in gallons by 15. This is a good rule of thumb. It is best to get a structural engineer involved in designing the foundation, but for a quick answer the tank foundation thickness should conform to the minimums in Table 3.

TABLE 3 STORAGE TANK FOUNDATION THICKNESS

Capacity, gallons	Thickness, in.
Less than 900	12
1500 to 3000	15
6000 to 9000	18
11,000	21
13,000	24

Source: *Pharmaceutical Facilities Handbook*

Another option for the plumbing engineer is to allow the supplier to size, design and install the tank based on the performance specifications. By doing this, it becomes the responsibility of the supplier to size the storage system. In many cases, the installation of the storage tank is paid for by the supplier, with the client being charged a rental fee. The supplier will be able to provide their requirements and the information needed to do the design.

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For large horizontal tanks, a pier should be located 8 feet from each end of the tank. Smaller tanks have piers located 2 feet from each end. The piers should extend 2 feet below the frost area of the region where the tank is being installed. Vertical tanks are fastened to the foundation by bolts that secure the legs of the tank to the concrete. The bolts should be supplied by the manufacturer of the tank and installed by the contractor. One very important item to add to the specification is that the contractor shall install the tank per the manufacturer's requirements and under their supervision.

Vaporization

Bulk gases that are stored as a liquid but need to be converted to gas prior to being used pass through a vaporizer. Most vaporizers don't have any moving parts and use ambient air to warm the cryogenic liquid as it passes through the finned tubing. Aluminum is the most common material used to make vaporizers. If a high-purity gas is required, stainless steel should be used. As mentioned above, the vaporizer should be installed as close to the storage tank as possible, usually on the same pad. The size of the vaporizer is selected based on the standard cubic feet per hour required, the type of cryogenic liquid to be vaporized, and the lowest outside temperature for the region in which it is located. If a large volume of gas must pass through a vaporizer, the addition of heat obtained from steam, electricity or fuel gas may be required. Sizing charts can be obtained from the manufacturer, most of which have proprietary methods for sizing vaporizers.

The information provided in this article gives you the basics needed to size a cryogenic system and the terminology to discuss the system with a manufacturer. However, to make it easier and to ensure that the client is getting the best system, it is always good practice to consult with the manufacturer and let them review your calculations and design. ■

References

Michael Frankel, Pharmaceutical Facilities Handbook, American Society of Plumbing Engineers, 2004.

***Joseph V. Messina**, CPD, is the section manager of plumbing engineering for HDR Architects Inc. in Atlanta. He has more than 30 years of experience specializing in plumbing and fire protection system design for instructional, research and medical facilities.*

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THE 10-SECOND RACE

Better Eyewash Stations Reduce Injury

By Imants Stiebris, BS, MBA and Steven H. Miller, CDT • All photos courtesy of Speakman Company

Chemical eye burns don't stop burning. Unlike an impact or abrasion, where damage is done in an instant, chemical burns keep on doing harm until the hazardous substance is removed from the eye. Minimizing injury is, therefore, a race against time. That's why the standard for eyewash stations (ANSI Z358.1-2009 American National Standard for Emergency Eyewashes and Shower Equipment) dictates that they must be accessible within 10 seconds of places where accidental exposure may be expected.

This means that an eyewash station must be easy to get to at a time when the accident victim may be unable to see well and may be panicked. It must be easy to operate quickly under those difficult conditions, and it must work reliably when needed.

One logical solution is to place the eyewash station at a sink, a place where anyone familiar with the room will naturally turn in such an emergency. Several "faucet-mount" products that add eyewash heads onto existing faucets have been offered. However, they could present safety hazards involving delays in activation and the danger of scalding water being delivered to the eyes. Newer, specially designed combination products feature both eyewash and faucet functions that work independently. These integrated units solve the safety problems posed by faucet mounts.

Background

According to the U.S. Department of Labor Bureau of Labor Statistics, 27,450 workplace non-fatal eye injuries that resulted in days out of work were reported in the U.S. in 2008. Of those, about 10 percent were from chemical burns. There were undoubtedly many more exposure injuries that did not result in days of lost work, probably because they were treated quickly in eyewash stations.

Chemical burns get worse the longer they go untreated. Acid burns typically only damage the surface of the eye, but serious damage to the cornea can cause blindness. Alkali burns are often more damaging because they can penetrate and harm internal eye structures as well. As long as the harmful substance is in contact with the eye, the chemical reaction can continue. Worse, the damage may be increased by the natural, instinctive response of closing the eye, which traps the burning agent against the eye surface.

Emergency treatment for chemical exposure is to flush eyes immediately and extensively with either water or a prepared eye-flushing solution. The ANSI standard requires that eyewashes be able to deliver 15 minutes of continual flushing to both eyes simultaneously at a minimum of 0.4 gpm. (Eye/face washes must deliver a minimum of 3.0 gpm.) It specifies tepid water for eye flushing, defined as being between 60° and 100° F. It requires eyewash stations to be located within ten seconds' travel time from any location where exposure may occur. The equipment must be able to be activated within one second or less and must stay on without requiring use of the operator's hands.

To ensure that eyewash is in working order when needed,

it must be tested once per week. An eyewash station must be equipped with covers that prevent dust or debris from entering the spray heads (which point straight up), and the covers must remove automatically when the device is activated. This is usually accomplished with plastic dust caps that are popped off by the pressure of the activated wash.

These performance standards, with their emphasis on time and ease of operation, strongly suggest other considerations for the designer. The eyewash station should be placed where a person in mid-emergency will find it quickly and easily. It must be operable without mistakes or confusion in a moment of crisis. The flushing action should be effective but comfortable (such as is achieved by aerated spray heads) to encourage using it for the extended flushing period that's recommended. It should be easy to test, simplifying compliance with the testing requirements.

Examples of locations where exposure may be expected to occur include any lab handling fluids or powders of an alkaline or acidic nature, areas where medically contaminated substances are handled and maintenance areas or closets where cleaning products are mixed or dumped.

The real world

The unfortunate truth is that real-world eyewash installations often fall short of these safety goals. In many labs, the eyewash station is not well located, not well marked and difficult to find. Moreover, a free-standing station requires a bucket (and probably additional cleanup) for weekly testing, which may deter testing from actually being performed as often as required.

An attempt to improve this situation was made with the introduction of faucet-mount devices that attach to existing faucets. This places eyewash stations in locations where people will reflexively turn in an emergency: the sink. It saves money, because the unit does not have to be individually plumbed in. It saves space along the walls where a freestanding station would mount and on the floor where space must be left for the eye injury victim to stand. It also makes it quick and easy to test, because the sink catches the water.

However, add-on devices pose safety challenges in actual installations. Because they are dependent on the operation of the faucet's hot and cold valves, there is always the potential that an injured person could activate the hot instead of the cold, presenting a scalding danger. To remedy this, users are often advised to make the eyewash the primary function of the device and disable the hot supply. This configuration limits the utility of the faucet because hot water for washing has been eliminated and faucet operation has become secondary.

Dedicated combination units

A newer improvement over add-on devices are dedicated dual-function faucet/eyewash units, such as the Speakman SEF 1850 Eyesaver series. These are standard laboratory faucets with built in, independently operating eyewash stations. They use a standard plumbing supply, but eyewash function is controlled without use of the faucet valves and is activated by a single pull on a dedicated, well-marked lever. They comply fully with the ANSI standard and are

Eyewash stations are often badly marked, difficult to find and difficult to operate in a panicked state, causing them to fall short of the real safety goal of treating eye burns quickly.

made in a variety of configurations for different sink types.

A key benefit of the dual-function approach is the independent water supply to the eyewash function, so there is never a danger of hot water being delivered for eye flushing. This independent supply can either be from a specially controlled tepid water source or from the cold water inlet if it meets the temperature requirements. In circumstances where the chemical reaction of the expected exposure is accelerated by flushing fluid temperature, a medical advisor or industrial hygienist should be consulted about optimum temperature for the application.

From a design perspective, combination units have all the virtues of faucet-mount add-ons: they take no additional space, require no additional location to be plumbed and have the benefit of a sink to catch water in testing and in use.

From a safety perspective, they resolve the negative issues of faucet mounts, because they are functionally equivalent to a dedicated eyewash station. They may actu-

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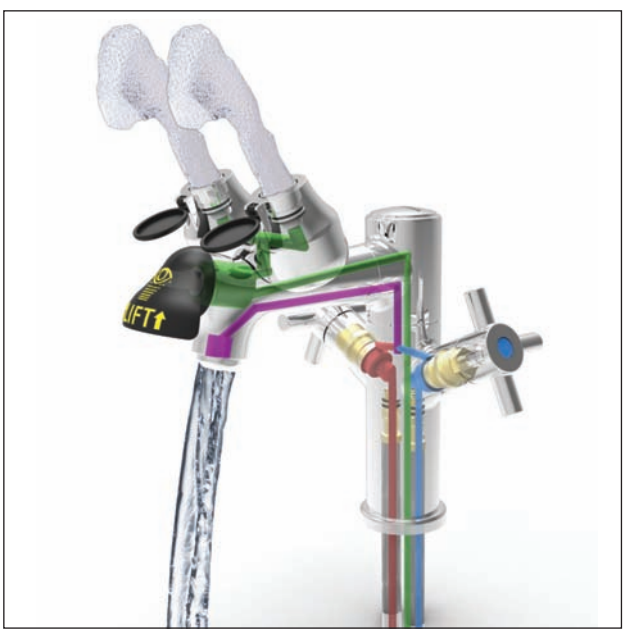

A safe dual-function unit has an independent plumbing supply to the eyewash function (green), which operates from its own activator handle without use of the faucet valves. The faucet valves get normal hot (red) and cold (blue) supply, which they mix in the faucet neck (purple). There is never a danger of scalding water being delivered to the eyes.

Eyewash stations

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On this dual-function eyewash/faucet, the faucet function is pedal-operated. The eyewash operates independently using the activation lever marked "PULL."

ally improve overall safety versus a free-standing station by avoiding the creation of slippery floors around the station when the eyewash is in use. The newest dual-function units also offer aesthetic improvements over more traditional lab-style faucets, providing a look that may be more compatible with contemporary design.

Case Study: Veteran's Administration Hospital, Minneapolis

In 2009, the Veteran's Administration (VA) Hospital in Minneapolis ordered an upgrade of all their eyewashes and drench showers. The four-story, 1.5 million-square-foot facility, completed in the late 1980s, includes numerous laboratory facilities. The upgrade was needed to meet the newer requirements for tepid water flushing. The existing eyewashes were not plumbed for tepid water. Many were faucet-mounted adaptations using the hospital's cold-water supply.

Dual-function eyewash/faucets were selected to replace existing faucets in a variety of configurations. Counter-mounted units included both five-inch and eight-inch high goosenecks, some with dual handles and some with single-lever controls for the faucet functions. Wall-mounted units, where both valves and faucet neck protrude horizontally from the wall above the sink, were also required in some locations. Some even had foot-pedal operation for the faucet function. In some instances, where the existing faucet was made by the same manufacturer as the new dual-function unit, they were able to replace only the faucet neck with a dual-function neck, reducing materials and plumbing costs.

In addition to 128 faucet/eyewash dual-function units, emergency swing-out and swing-down eyewashes were installed in some locations. Free-standing emergency shower/eyewash combination units were also installed. In areas where the building's hot water supply could not reliably deliver tepid water as required, heaters were added. Temperature for the tepid water supplies is controlled by thermostatic mixing valves.

Curt Wentz of Wentz Associates in Minneapolis, the engineer who designed the upgrade, noted that a significant factor in the selection of the dual-function units was "the flexibility to use the fixture for normal washing and for emergencies."

Pamela Russell Demaster, occupational safety manager for the hospital, notes that, "People should be wearing their personal protective equipment, specifically proper eye protection, if they're following the applicable OSHA safety standards, but it would be terrible if someone were exposed and there was no functioning eyewash." ■

***Imants Stiebris, BS, MBA**, is Director of Global Safety Sales for Speakman Company, a 143-year-old, family-owned business that is an industry leader in design and manufacture of plumbing fixtures for safety applications. Stiebris is chairman of the International Safety Equipment Association's (ISEA) ANSI Z358.1 Shower & Eyewash Product Group (the body responsible for maintaining and publishing the standard), and was a member of the organization's board of trustees from 2004–2007. He can be reached by e-mail at istiebris@speakmancompany.com*

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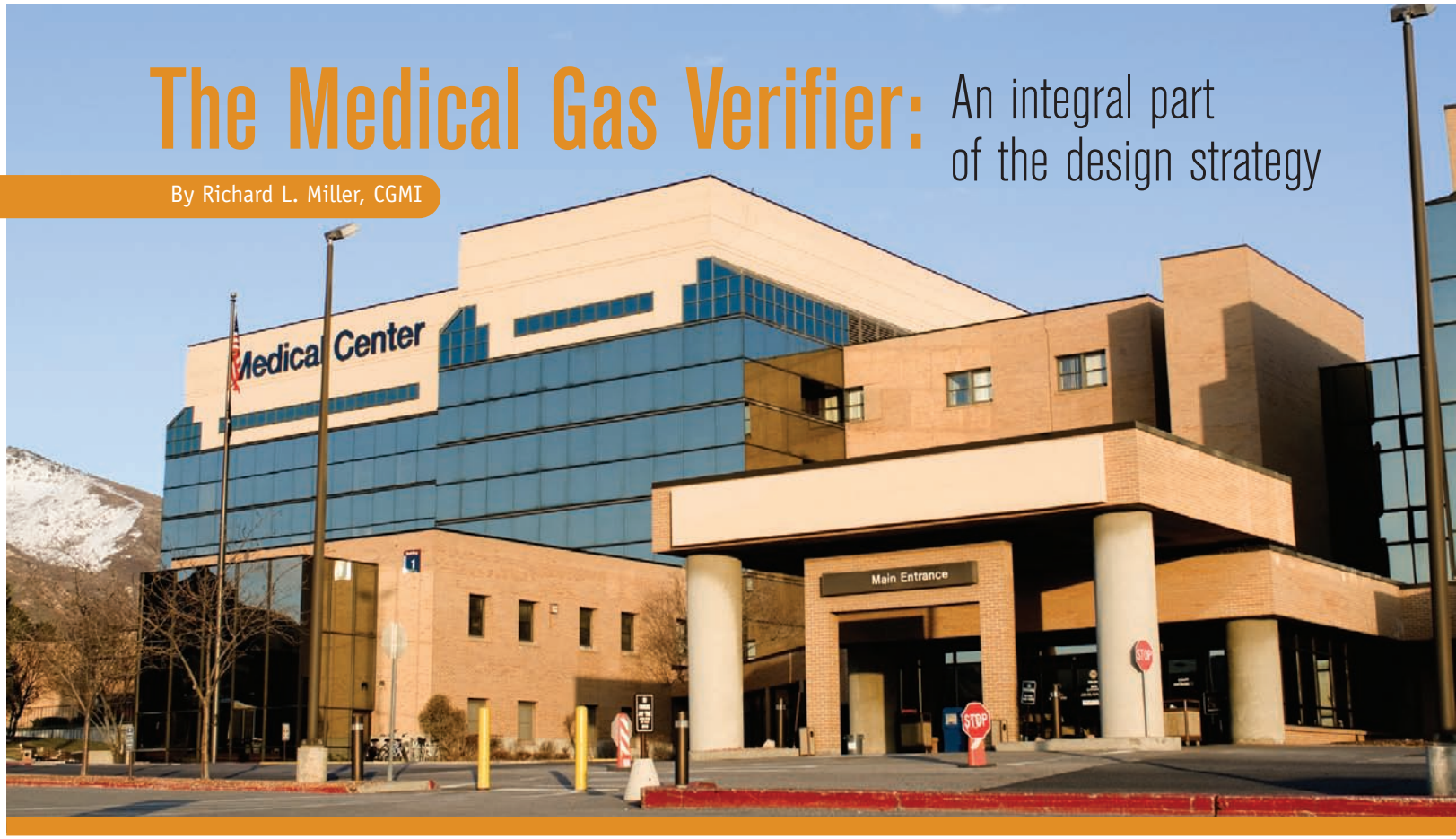
The Medical Gas Verifier: An integral part of the design strategy

By Richard L. Miller, CGMI



I am fortunate to have been involved in the healthcare industry for 30 years; during this time I have worked in hundreds of healthcare facilities on thousands of medical gas system projects. I am extremely proud of the trajectory our industry is taking.

Before the bid

Considering the title of this article, I must ask what role the medical gas verifier played on your last healthcare facility project. Did you involve the verifier from document review through inspection and completion, or did you just require the installing contractor to hire a verifier for final testing?

Medical gas projects start with the design team consulting with the owner to define their specific needs. Plans are drawn and sent through an approval process and, if the project is funded in part by state or federal monies, the state inspectors will be involved. These inspectors are known as the authority having jurisdiction (AHJ). At this point everyone "assumes" the plans are complete and accurate.

The next phase is accepting bids and approving the contractors that will build the project. These contractors typically bid only on what is on the plans so, if the plans are lacking, what happens to the completed work? An important adjunct to the plans is the bid specification, a document in which the design team offers specific guidance. One of the statements commonly found in specifications that I find most interesting is this: "Work shall meet all applicable codes and standards." This seems to a catch-all for designers who are afraid they left something out. When it comes to medical gas system specifications, you also typically find this statement: "All work shall be performed by contractors who are competent, qualified and experienced in making such installations." Good luck trying to quantify competent, qualified, and experienced.

Over the years, I have met most project designers at the end of a project, after I found something wrong. This is not the best time to start a relationship. Forgetting one area alarm at the start of a project can cost as little as $2,500 to rectify. If the same problem is found at the end of a project, and you have to open the casework, the cost can easily exceed $20,000. With today's pace of construction, owners do not easily tolerate these costly changes. However, if the medical gas verifier truly has an integral relationship with the design team, many mistakes can be caught prior to the job being released.

Codes and standards

Minimum design requirements for medical gas systems are found in NFPA 99: Health Care Facilities Code. (The 2012 version has been upgraded from a standard to a code for clarification and easier enforcement.) In the early 2000s, a document was developed by the American Society for Sanitary Engineering to define the professional qualifications of all the interests involved in a medical gas project. The ASSE 6000 series document is broken into several subcategories to define the roles in a project:

- ASSE 6005 Medical Gas Specialist is a credential based on 24 hours of classroom instruction on the requirements of NFPA 99. This credential is ideal for anyone involved in medical gas design. Project managers and bid estimators would also see value in this training.
- ASSE 6010 Medical Gas Installer requires a 32-hour course of instruction covering installation requirements and documenting the installer's ability to braze piping.
- ASSE 6020 Medical Gas Inspector is a 24-hour course with similar instruction to the ASSE 6005 credential and is targeted at anyone who will be involved in the physical inspection of the piping project. Ideal candidates are the AHJs, contractors, designers, verifiers and hospital personnel who will perform hands-on inspections.

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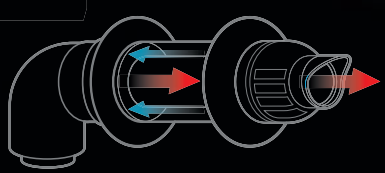
RU98i

RU80i



Concentric structure allows hot exhaust to exit through polypropylene venting, while fresh air enters through the outer layer.

THE BETTER QUESTION IS: Why anything else?

Unlike our competition, we choose polypropylene venting for our condensing tankless water heaters. Our reasons are clear: Not only is polypropylene the safest, most reliable material for the application—able to withstand exhaust temperatures of up to 230° F (110° C)—it's also easy to install. The venting components snap together with no glue or cure time.

It's the perfect example of our commitment to delivering solutions you can be confident in. So why do we use polypropylene? Because to us, the absolute best option is the only option. Learn more at www.rinnai.us/contractor

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Rinnai®
TANKLESS WATER HEATERS

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• ASSE 6030 Medical Gas Verifier involves a 32-hour course of instruction available after a two-year internship. It is tailored to the people who will perform verification, inspection and testing on the project, to ensure by a documented procedure that all applicable requirements of NFPA 99 have been adhered to and system integrity has been achieved or maintained. Complete documentation from the verifier is required prior to the healthcare staff releasing the systems for patient use.

• ASSE 6040 Medical Gas Maintenance is a 32-hour course of instruction for personnel who maintain these systems; the ideal candidates are hospital maintenance personnel and field service technicians. NFPA 99 (2012) has an updated list of the routine maintenance services that are required to keep the medical gas delivery system functioning efficiently.

• ASSE 6050 Medical Gas Instructor is a 40-hour course of instruction developed for the people who teach and credential the above. The instructor will develop and deliver the proper training, tailored to the specific user's needs.

If you start with a good understanding of NFPA 99 requirements and require that all involved in the project are credentialed to the appropriate standards, you can look forward to a smooth project. I also recommend that you use ASSE 6030 verifiers who have upgraded their credential through the Medical Gas Professional Healthcare Organization (MGPHO). Specify MGPHO CMGV as the verifier on all of your projects. The MGPHO website (mgpho.org) contains an excellent online forum to help answer your questions about medical gas.

What does a medical gas verifier do?

The verifier is responsible for inspecting and testing all new piped medical gas systems, additions, renovations, temporary installations or repaired systems to ensure, by a documented procedure, that all applicable provisions of NFPA 99 have been adhered to and system integrity has been achieved or maintained.

Medical gas inspectors are required to maintain a log book that contains records of site observations and test results. Test and inspection reports also are required as the project progresses. The verifier shall personally witness the various tests and record and verify the results of any tests performed by the installer, including:

- Visual inspection of brazed and welded joints
- Inspection of all welded test coupons
- Initial blowdown and pressure test
- Cross-connection tests
- Standing pressure and vacuum tests
- Piping purge test
- Final verification report

In addition to verifying that certain documents are on file at the jobsite, such as the building permit, shop drawings and manufacturers' literature, the medical gas verifier shall confirm the following:

- Proper handling and installation of materials and supports
- Use of proper piping materials and joining methods
- Labeling and identification
- Proper purge procedure
- Installation of manifolds, medical vacuum sources, medical compressed air sources, bulk medical gas supply sources and alarm panels

Verification testing

Before testing begins, the verifier must record certain information about the medical gas and vacuum systems, including the location of source equipment, zone valves, all outlets and inlets, alarm panels and the emergency oxygen supply connection.

The verifier performs and documents the following tests on all medical gas and vacuum source equipment and distribution systems, using either nitrogen NF or the system gas. The source gas typically is used on small projects when using nitrogen NF is impractical.

- Standing pressure test for positive pressure gases
- Standing vacuum test for vacuum systems
- Verification tests for cross-connections, including individual pressurization, pressure differential, shutoff valve, master, area, and local alarms, piping purge, final tie-in, operational pressure and medical gas concentration
- Medical air purity test for compressor systems
- Labeling of system components
- Medical air compressor system test
- Medical gas supply source tests
- Medical/surgical vacuum systems test

Testing equipment

The equipment the verifier uses includes the following:

- Pressure gauges/transducers cleaned for oxygen service with an accuracy of ±1.5 pounds per square inch gauge (psig) or better for pressures up to 100 psig and ±3 psig for pressures from 100–300 psig
- Vacuum gauge/transducer with a range of 0–30 inches of mercury (in. hg) and an accuracy of ±1 in. hg
- Direct-reading flow meter/flow sensor with an accuracy of ±3 percent (or better) of the full-scale reading of the gauge/indicator

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What is a medical gas?

The term medical gas can be used to describe any of the following:

- Oxygen, used to support or supplement patient respiration
- Medical air, used for mechanical ventilation, respiratory treatments, and neonatal support
- Nitrous oxide, used as a relative analgesia and for anesthesia support
- Carbon dioxide, used for insufflation (blowing a powder, vapor, or gas into a body cavity)
- Medical surgical vacuum, used to remove bodily fluids from patients
- Helium, used for perfusion (injecting fluid into a blood vessel)
- Support gases, including nitrogen to drive tools and instrument air for any medical support purpose

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• Gas/vacuum-specific adapters

• Oxygen analyzer with a range of 0–100 percent and a rated accuracy of ±3 percent or better

• Nitrous oxide analyzer with a minimum range of 95–100 percent and a rated accuracy of ±1 percent or better

• Nitrogen analyzer with a minimum range of 95–100 percent and a rated accuracy of ±1 percent

• Carbon dioxide analyzer for low-level CO2 with a range of at least 0–600 parts per million (ppm); for 99 percent or better with a minimum range of 95–100 percent and a rated accuracy of ±3 percent; and for carbon dioxide and oxygen mixtures shall have a range of 0–1 percent CO2 greater than the maximum CO2 level and a rated accuracy of ±3 percent

• Carbon monoxide analyzer with a range of at least 0–20 ppm and a rated accuracy of ±1 ppm of CO or better

• Analyzer for total hydrocarbons (as methane) with a range of at least 0–100 ppm and a rated accuracy of ±1 ppm total hydrocarbons or better

• Analyzer for halogenated hydrocarbons with a range of at least 0–5 ppm and a rated accuracy of ±1 ppm total hydrocarbons or better

• Dew point analyzer with a range of at least -76°F to 68°F (-60°C to 20°C) and shall read within a rated accuracy of ±5°F (±3°C) (or better) pressure dew point and read the dew point at 50 psig

• A pressure-tight metal or plastic device that holds a filter element in the proper position for sampling and large enough to permit the flow of 100 liters per minute (3.5 scfm) through the proper filter

• Clean, environmentally stabilized, pre-weighed, 0.45-micron filters pre-weighed on a microbalance accurate within 0.1 milligrams

I enjoy nothing better than a smooth project from start to finish. That is why I have dedicated the last 10 years to training and consulting with all of the players, from equipment manufacturers to designers and owners. Many design firms and contractors are now specializing in healthcare construction, and this specialization is a considerable aid to these complex projects. I hope you will consider the verifier an integral part of this process. ■

***Richard L. Miller, CMGI**, is president of Medical Gas Training & Consulting LLC, a company focused on advancing medical gas system projects. He is a founding member, former president, and current vice president of Credentials of the Medical Gas Professional Healthcare Organization, and he is certified by this organization as a Credentialed Medical Gas Verifier. He also holds credentials from National Inspection Testing Certification Corp., meeting the requirements of ASSE 6010: Medical Gas Installer, ASSE 6020: Medical Gas Inspector, ASSE 6030: Medical Gas Verifier and ASSE 6050: Medical Gas Instructor.*

Taco's Opens Its Innovation and Development Center

New facility is designed to serve as a living laboratory for the HVAC industry

One year and two months after Taco broke ground on a major building project designed to secure its future in Cranston, R.I., and enhance its competitiveness, the company dedicated the newly completed Innovation and Development Center. Taco president and CEO John Hazen White, Jr. was joined by about 150 HVAC industry guests, including major manufacturing representatives, trade press and contractors for the event.

The Taco Innovation and Development Center, which consists of a two-story, 24,037 square-foot addition to the

The Taco Innovation and Development Center represents an investment in education and professional development.

current building, is the centerpiece of Taco's Master Infrastructure Plan. The Center is a state-of-the-art learning and training environment, complete with new classroom spaces, conference room and a business center, as well as functional labs for testing and teaching.

The Center utilizes, displays and provides a hands-on learning environment for the HVAC industry's best equipment and systems for comfort, efficiency and sustainability. The HVAC products and systems are visible throughout the entire facility, creating "living laboratories" that allow close-up viewing, hands-on learning and teaching.

The Innovation Center project, along with office area renovations now underway within the existing building, provides the space Taco needs to grow, remain competitive and stay in Rhode Island, where the company has been operating since 1942. With its sustainable attributes, the new Center earned LEED Gold certification from the U.S. Green Building Council.

A tour group learns about the functions of wall-mounted Taco iWorX controllers in the mechanical room.

"The new Taco Innovation and Development Center is a wonderful showcase for our industry, where members of our professional community will learn about the latest technology and applications our industry has to offer. It's also an enriching environment where Taco employees will continue to increase their knowledge and enhance their personal and professional lives through training and education classes and programs," commented Taco President and CEO John Hazen White, Jr., the third member of his family to operate the company since 1920. "With the building now operational, we look forward to begin sharing this amazing facility." ■

Project Team

Architect: Baker Design Group, Inc., Boston, *www.bdg-inc.com*
Contractor: Shawmut Design and Construction, Boston, *www.shawmut.com*
MEP and Fire Protection: AKF Group, Boston, *www.akfgroup.com*
Structural Engineer: Odeh Engineers, Providence, R.I., www.*odehengineers.com*
Civil Engineer: Woodard and Curran, Providence, *www.woodardcurran.com*
Sustainability: The Green Engineer, LLP, Concord, Mass., *www.greenengineer.com*
Code Consultant: Hughes Associates, Inc., Boston, *www.haifire.com*
Lighting: Available Light, Salem, Mass., *www.availablelight.com*

LEEDing the Way

The LEED Gold certified Taco Innovation and Development Center boasts numerous sustainable features, including:

- Enhanced building envelope performance
- Rooftop solar thermal
- Reflective roofing
- Electric vehicle charging station
- Water-efficient landscaping
- Rooftop energy recovery systems
- Advanced lighting controls
- Taco iWorx building automation
- Taco LoFlo technology
- Taco Load Match technology
- Active and passive chilled beam system
- BTU energy metering
- Indoor air quality monitoring and control
- Storage and collection of recyclables

Down the Drain: New technology raises drainage to a loftier place

By John Vastyan

Here in North America, plumbing engineers, installers and design professionals alike see every type and variety of plumbing challenge. Most plumbing pros will readily admit that commercial drainage systems can present some of the toughest challenges. When it comes to higher-end residential or commercial installations, there are typically few choices to make selecting the right solution for plumbing, process, wash down or exterior surface drainage: ductile iron, PVC, copper and nickel bronze are the usual candidates. New technologies are forcing their way into the mix for designers, specifiers and installers. Enter über-versatile stainless steel and plastic technologies.

It only makes sense, as new products are rushing in to improve all facets of building performance — from hydronic efficiency to water use, re-use and backflow prevention — that drainage technologies advance as well. But given its behind-the-wall, under-the-floor status, the drain is often last on the list for specifier consideration.

"A recent entry onto the drainage stage has been the introduction of stainless steel systems," said Derrick Lundy, drains product manager, Watts Water Technologies (Canada) Inc. According to Lundy, a wide variety of extremely durable, aesthetically pleasing drainage pipe, fittings and trim have entered the global market, many of which got their start in Europe.

One of the most unique facets of the new facility's construction was the specification for 8,000 lineal feet of stainless steel drainage piping

For example, Blücher, a Watts Water Technologies company, is recognized as a leading global manufacturer of stainless steel drainage systems for applications ranging from residential bathrooms to large industrial facilities. The company's product range includes standard and customized floor drains, drainage pipes and channels, all in stainless steel to ensure high quality flow characteristics with minimal maintenance.

Commercial + industrial use

Hospitals, hotels, shopping malls and airports all benefit daily from the performance of stainless steel drainage solutions. Properly treated, low-porosity stainless steel has a uniquely smooth surface that guarantees excellent hygiene and resistance to bacteria-laden biofilm.

"Stainless steel is also a strong, durable and chemical-resistant material," added Lundy. "Due to excellent material properties, with stainless steel, the weight of a drainage system can be reduced by more than 75 percent compared to cast iron; this contributes to ease of installation. Stainless steel is also entirely recyclable and non-toxic, making it an environmentally friendly solution, also favored by the USGBC for LEED certification."

Stainless steel drainage systems are also ideally suited for use in the food and beverage industries as well as pharmaceutical and chemical plants. Stainless steel floor drains with gas-tight covers, flushing-rim drains, dual-contained drains, pipes and channels provide superior fluid drainage from production areas, labs and clean rooms.

Stainless steel: ideal for hi-temp plumbing

In an interesting and rigorous application, a 164,000-square-foot, three-story, $80 million prison kitchen/warehouse facility is now being built in New Orleans. It will soon have the capacity to prepare 25,000 meals every 12–14 hours if needed. It can also preserve meals in its freezer for up to 45 days.

One of the most unique facets of the new facility's construction was the specification for 8,000 lineal feet of stainless steel drainage piping, chosen because of the resilience and thermal characteristics of the material. "Stainless steel was the ideal material for the job," explained Jamey Logrande, vice president and senior project manager with Metarie, La.-based design engineering firm Huseman & Associates. Experts there were responsible for design of the building's electrical, mechanical, plumbing and fire protection systems.

"With stainless steel, bacterial growth in the drainage system is greatly reduced," added Logrande. "And, of course, the very nature of this building is to assure permanence and durability."

The material chosen by the general contractor, New Orleans-based Woodward Design-Build, was stainless steel pipe supplied by Blücher. "We needed a plumbing system that could routinely move liquids at temperatures of up to 250° to 260°F because of the multiple 300-gallon steam pressure cookers dumping into the waste system," explained Logrande.

"Blücher has optional stainless steel gaskets that are rated for use at temperatures up to 390°F, and we needed to exceed the rated maximum temperatures for cast iron couplings and gaskets — just 210°F — so stainless became our choice for the best material for the job."

The sometimes super-high temperatures of heavy, semi-fluid, cooked goods was a concern, but so was the weight and volume of the mass being drained in the large steel pipes used to transport soups and stews to packaging machines.

"We knew of the need for massive dumping of high-temp

fluid on a regular basis and, with very expensive, very temperature-sensitive food storage spaces below the kitchen, we knew there'd be no room for error," said Logrande. "We can't afford a leak; the result would be catastrophic."

Ships ahoy

According to Lundy, stainless steel sanitary discharge systems have also proven their reliability in more than 10 million lineal feet of piping aboard cruise ships, ferries, luxury yachts, naval vessels, cargo vessels and offshore platforms.

The marine industry relies on the performance of stainless steel drainage solutions at sea, where durability and light weight are essential. Clean and hygienic conditions in cabins, kitchens and sanitary facilities are important elements contributing to efficiency onboard.

Dead-on trench drains

Another example of commercial drainage innovations are new, lightweight, plastic trench drains. Illustrative of the newest technology is Watts' DeadLevel™ pre-sloped trench drain system. Six- and 12-inch wide by 48-inch long standard sections come with optional ductile iron or polypropylene UV-stabilized frames and talc-filled polypropylene UV-stabilized channels with either four- or six-inch no-hub bottom or end outlets. The system is frame-anchored, IAPMO certified and meets applicable DIN Class load class ratings.

Watts experts tell field pros that, with a simple sketch showing lengths, flow direction and outlets, they can prepare a package or a list of components to complete the required layout.

All piping connections are "no hub," using a mechanical (typically neoprene) coupling to join the cast iron, plastic or other pipe material to the outlet of the drain. Bottom or end connections are made with a standard mechanical coupling. Closed outlets are on the bottom of each channel section and on the end caps. Runs may slope to the center, away from the center, or in multiple directions, with a corner, tee, or cross option made without mitering.

The pre-sloped system is 100 feet (30m) long. If the jobsite demands a longer drain run, the system can be extended using neutral channel sections, or multiple outlets, with an outlet every 100 feet, sufficient in most applications. Systems do not necessarily have to be sloped. In fact, neutral trench runs are frequently installed where the ground is already pitched, or where depth constraints restrict the use of deeper channel sections.

A two-man crew with rebar driver and laser level can easily set 100 feet (30 meters) in less than a day. Cutting is required only to open outlets, trim end caps and to make catch basin or tee connections. Grates are installed before the pour. ■

The Fix Is In: Preventative maintenance can prevent pipe failure

By Alyscia Sutch

COST-EFFECTIVENESS, NON-DISRUPTIVE working time and sustainability are all key concerns when considering how to fix damaged or failing pipe systems.

Downtime, resident displacement and reconstruction are added concerns that should be addressed during the planning process. The cost to fix damaged pipes can be astronomical, especially when the pipes are under tiled floors or behind painted walls.

Pipe systems are often forgotten until there is a problem. Pinhole leaks, corrosion, low flow, root intrusion and infiltration are just some issues that building owners, property managers and engineers commonly run into. Like all tangible objects, pipe systems age and eventually need repairs, but the traditional process of digging up and replacing pipes has more disadvantages than benefits.

However, there are technologies available that can be used as preventative measures against pipe failure. Many plumbing and mechanical companies are adding trenchless technologies to their toolboxes. Pull-in-place structural liners and blown-in epoxy coatings are two pipe lining technologies used worldwide to rehabilitate pipes without destruction. These methods result in less time spent, less mess and lower reconstruction costs.

Pipe lining

It is easy to see the importance of updating pipe systems. Lining companies want to provide cost-effective solutions to owners of buildings and homes, while property owners and managers want a cost-effective way to address their slowly failing infrastructure without destroying their buildings in the process. Old drainpipes can be rehabilitated and become usable again, thereby eliminating the need to remove them and fill landfills with more construction waste.

Pipe lining technology requires no digging or destruction and is an effective, long-term solution for failing pipe systems located both inside and outside of buildings. It can hold up to the structural strength of a new pipe, without the costly digging and replacement repairs.

Pipe liners protect the carried contents from mixing with the metals within the pipes, which can result in decomposition or lead leaching into drinking water. Not only are potable water lines and drain lines being rehabilitated, but the same technologies are used to retrofit vertical applications, roof drains and mechanical systems, including fire suppression and HVAC systems.

Lining companies want to provide cost-effective solutions to owners of buildings and homes, while property owners and managers want a cost-effective way to address their slowly failing infrastructure without destroying their buildings in the process.

Trenchless pipe lining technologies are not new; some of the technologies have been used for decades and have passed the test of time. Since the late 1980s, for example, all of the collection, hold and transfer pipe systems in the U.S. Navy's aircraft carrier fleet have been lined with Nu Flow's blown-in epoxy coating.

Established in 1987, American Pipe Lining (APL)

began in San Diego, Calif., where it worked with the U.S. Navy to develop and later patent epoxy lining technology to protect aircraft carriers, vessels and piping in government facilities. Equipment was developed to apply an epoxy coating to the interior of pipes in place in order to meet the demands of different applications, conditions and environments. This included maintaining pipes at required temperatures for optimal in-place cleaning and coating.

APL, which was acquired by Nu Flow in 2007, later expanded its lining solutions to include applications in the private and domestic piping markets that faced aging potable water systems and poor water quality. This technology is still being used today and is licensed worldwide to rehabilitate residential, commercial, industrial, federal and municipal properties.

Epoxy coating

Epoxy coating restoration of pipe systems is a non-invasive process; epoxy is used to coat the inside walls of pipes without destruction to the interior or exterior surfaces of building structures, hardscape or landscape. Epoxy coating prevents corrosion and leaks and is regularly used in pipes ½ inches to 12 inches in diameter.

A 40-story, state-of-the-art office space in Lower Manhattan, New York, started experiencing chronic failure and multiple leaks due to corrosion in the black iron heating and cooling system. The system consisted of more than 7,200 feet of 1 ½- to 4-inch diameter black iron heating and cooling pipes.

In order to save millions of dollars in reconstruction and asbestos abatement costs and fix the failing system, blown-in epoxy coatings were used to coat the insides of the pipe walls. This long-term solution to eliminate corrosion and erosion can also be used as a preventative measure.

The epoxy coating process begins with an inspection to determine the problematic areas and pipe dimensions. A plan is implemented to minimize disruption and afford the most efficient timeline for work completion. Spot repairs are made to excessively worn joints and fittings. Temporary bypass water piping may be installed. The system is drained and air-dried. After testing for leaks, the pipes are prepared for cleaning.

Pipes are dried with heated, compressed air and a safe abrading agent is blown through the pipe system, removing rust and corrosion byproducts that are collected in a holding unit for disposal. Compressed air is applied once again to remove fine particles.

Conditioned air uniformly distributes the epoxy throughout the pipe segment. Following the coating application, continuous controlled air flows through the pipe to facilitate epoxy curing. After the epoxy cures, valves and couplings are refitted; a final leak test and inspection confirms the integrity of the line. Water quality, volume and flow tests can confirm the functionality of the system.

Structural lining

Structural lining is another technology used to create a structurally sound pipe within the system without removing the existing pipes. Millions of linear feet of drain and lines have been saved using the pull-in-place structural lining process.

Pipe lining prevents toxic heavy metals from leaching into drinking water and prevents leaks and breaks. Each year, leaks cause billions of dollars in water damage.

Most facilities built prior to the 1970s have sewer lines composed of cast iron and clay. The most common problem found with these lines is cracking at the joints, root intrusion and the bottom of the pipe rusting out. Other common problems include calcification in sewer lines and ground movement. Root intrusion is reported to cause 50 percent of all sewer blockages. With the structural lining method, roots are removed and a liner is pulled into place.

The structural lining project begins with mapping the internal plumbing system and camera inspection of drain and sewer lines. A plan is implemented to minimize disruption and afford the most efficient timeline

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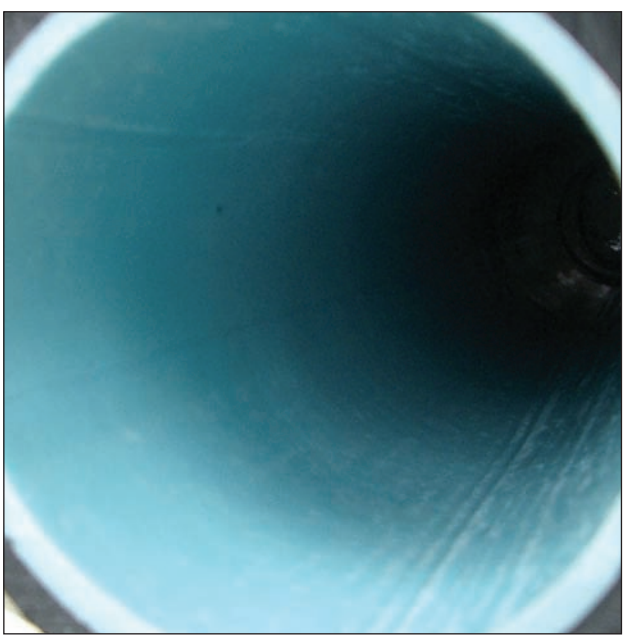

An inside look at a structurally lined pipe, where an epoxy filled liner was used to create a new pipe inside the existing host pipe.

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The use of structural liners can save both time and money over traditional pipe repair methods.

for work completion. Depending on the lining method to be used, pipes may be drained and/or air-dried. After testing for leaks, the pipes are prepared for cleaning.

The next step involves removing roots and calcite in order to return the pipe to its original functioning diameter. Removal methods may include jetting the lines or using pneumatic tools, such as a scorpion cutter. Cast iron pipe may require additional preparation if there is significant corrosion or missing sections of pipe.

With alternatives to traditional pipe replacement available, it is no wonder that many homeowners, property managers and municipalities are turning to trenchless pipe lining to rehabilitate their pipe systems.

Existing access points are used to pull an epoxy-saturated felt liner into the host pipe. This lining method provides the ability to line multiple 45- and 90-degree angles, as well as the option of lining specific sections of pipe without lining the entire length. Once complete, a final leak test and camera inspection is performed.

With alternatives to traditional pipe replacement available, it is no wonder that many homeowners, property managers and municipalities are turning to trenchless pipe lining to rehabilitate their pipe systems. This is also why so many plumbing and mechanical companies are adopting pull-in-place structural liners and blown-in epoxy coating technologies and offering them to their clients. ■

Product News

Plumbing Engineer's Product of the Month

Physical water conditioners

Aqua-Rex recently got UL approval for the larger units in their range of Physical Water Conditioners that provide an alternative to conventional water softeners. Aqua-Rex sells the US version of the widely specified UK Water-King electronic water softener. Aqua-Rex is the first product to be certified in the UL category of "Physical Water Conditioner" under its UK parent company name, Lifescience Products Ltd. The Aqua-Rex WK4 and WK5 units are suitable for all pipe sizes up to 4 inches and 6 inches respectively and are widely used in larger commercial, industrial and residential applications as alternatives to conventional water softeners. Their low cost, ease of installation including retro fit, and zero maintenance make them the ideal choice where conventional softeners might be prohibitive. **Aqua-Rex**.

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Water heater management system

AERCO International introduces a Water Heater Management System (WHM) for its Innovation line of high-performance tankless water heaters that creates significant operational, maintenance, and financial benefits for consulting-specifying engineers. Standard on AERCO's C-More unit controllers, the new WHM optimizes operating efficiencies, eliminates standby losses, increases system reliability through reduced cycling, and tracks daily domestic hot water demands. Designed to sequence up to eight water heaters on the same system, the WHM ensures that all water heaters in the system are operating at maximum efficiency. It monitors firing rate, and opens or closes one motorized valve per unit, as required to meet hot water demand. The all-stainless steel construction maximizes longevity and the corrugated tubes increase heat transfer surface area for optimal thermal efficiencies. **AERCO**.

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Plastic cartridge check valves

These check valves are pre-assembled and 100 percent tested to provide durable drip-tight operation. Available in 12 OD sizes between 3/8

inches and 2 inches for applications up to 200°F and 230 psi. Selected models (CV14FR and CV15FR) come combined with a pressure compensating flow regulator (0.5 to 4 gpm). All units are certified to ANSI/NSF 61. **NEOPERL**.

Circle 102 on Reader Reply Form on page 73

Foot valves

Hands-free handwashing offers today's foodservice kitchens convenience, improved cleanliness standards and water conservation. Fisher Foot Valves provide reliable hands free performance and stand up to the rigorous demands of busy operations. Fisher foot valves have renewable cartridges for ease of maintenance. Anodized cast aluminum pedals are strong, rust-free and lift for easy floor cleaning. **Fisher Mfg. Co**.

Circle 103 on Reader Reply Form on page 73

Pro-Connect Push Expands

Webstone's line of push connect ball valves and fittings includes 6 new designs — Reducing Couplings, Reducing Tees, Reducing Elbows, along with Straight and Angle Supply

Stops. Forged from lead free dezincification resistant brass, and cUPC certified to meet the requirements of AB1953 and NSF/ANSI 61-G. **Webstone.**

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4-oz Squeeze Bottle Lubricant Line

DuPont® has launched a complete line of 4-oz specialty lubricants with Teflon® fluoropolymer for enhanced performance. **DuPont**.

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Product News

Plumbing Engineer's Product of the Month

Heat pump water heater

The Accelera® 300 heat pump water heater can extract up to 80 percent of its energy requirements from the energy in the air around it. Compressor and fan consume only 1 kWh of electricity to generate the heat equivalent of 3 – 5 kWh. Among heat pump water heaters it has the largest capacity (80 gal), highest energy factor (2.51), lowest power input (2.2 kW) and lowest power consumption (1739 kWh/year) as determined by DOE testing. The low power consumption (500 W heat pump only, 2200 W including back-up element) makes the Accelera 300 a viable option for connecting to a photovoltaic system. **Stiebel Eltron**.

Circle 106 on Reader Reply Form on page 73

Boiler reset control

FuelMizer™ outdoor reset switching relay is a microprocessor-based control designed to regulate the supply water temperature of a single boiler, based on the outdoor temperature. With reduced supply water temperatures, substantial energy savings are achieved. The FuelMizer is a boiler reset control and switching relay in one unit. Includes functions such as automatic reset, ratio calculation, warm weather shut-down, minimum boiler temperature settings and boiler differential settings; monitors both boiler and outdoor sensors. Capable of controlling a system or zone valve circulator, as well as over-riding outdoor resets when a DHW tank calls for heat. **Taco**.

Circle 107 on Reader Reply Form on page 73

Steam shower control

The flush mount Modern Recessed series controls are perfect for contemporary as well as classic bath environments. The controls serve as mini command centers for steam shower systems, allowing users to manage functions such as length of steam session, temperature, day clock, Auto PowerFlush™ and the Serenity light & music system. Modern Recessed controls are available in 14 finishes such as polished chrome, polished nickel, polished brass and oil rubbed bronze **ThermaSol**.

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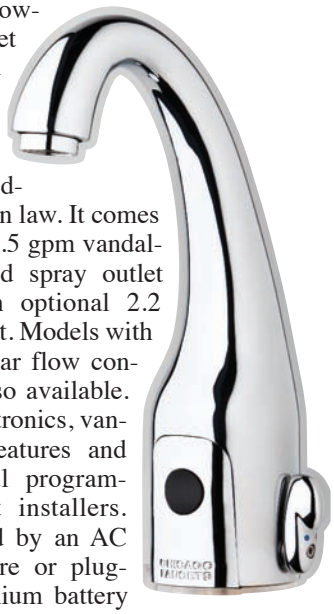
Electronic faucet



HyTronic Curve features a gracefully curved spout cast entirely from ECAST® low-lead brass to meet the current lead reduction requirements as well as the forthcoming 2014 federal lead reduction law. It comes standard with a 0.5 gpm vandal-proof non-aerated spray outlet and includes an optional 2.2 gpm aerator insert. Models with a 1.5 gpm laminar flow control insert are also available. Above-deck electronics, vandal resistance features and simple, powerful programmability benefit installers. May be powered by an AC adapter (hard-wire or plug-in), six- volt lithium battery or the new Self Sustaining Power System (SSPS). **Chicago Faucets**.

Circle 109 on Reader Reply Form on page 73

Motorized valves

Motorized electric ball valves and butterfly valves range from ¼ inches up to 5 inches. Ball valves inventory offers two- and three-way valves with side or bottom load in stainless steel and bronze. Every valve is quality inspected to provide a leak-proof seal. KZ valves are engineered to work with KZ actuators, with ratings of NEMA 6P as waterproof and NEMA 7D as ignition safe. Actuators also exceed the USCG electrical systems standards. These test results add up to longer life, lower maintenance and user and environment protection. **KZValves**.

Circle 110 on Reader Reply Form on page 73

Linear shower drain

The ZS880 stainless steel linear shower drain is a key component in barrier-free or curbless applications. It delivers reliable performance, aesthetic appeal and significant savings in labor. It is customizable for nearly every project; contractors, architects and owners can select from a wide variety of grates, finishes, lengths and outlet configurations. Comes with adjustable anchoring feet and built-in membrane flange. **Zurn Industries**.

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ICU sink and faucet system

ICU faucet delivers hygienic, hands-free operation thanks to the universal Selectronic sensor. A laminar flow device located in the spout base prevents air from being drawn into the water stream, and the plain spout end eliminates areas for lime and debris to collect. Optional auto-purge function allows users to program the faucet to open periodically and purge the faucet and water lines of stagnant water. Vitreous china sink has a permanent EverClean surface, a custom-fit offset grid drain and p-trap with SANIGUARD coating and a sealed overflow. **American Standard**.

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Dual flush siphonic toilet

Approved with an EPA WaterSense® seal, the Subway one-piece toilet is very water-efficient. Dual-flush feature allows a half flush (1.0 gpf) or a full flush (1.6 gpf). Measures 28 3/8 inches (L) x 15 inches (W) x 28 ≤ inches (H) and includes a soft closing seat made of extra strong and durable Duraplast. **Villeroy & Boch**.

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Movers & News

MIFAB announces Easter Regional Sales Manager

MIFAB is pleased to announce the appointment of Paul Lacourciere to the position of Eastern Regional Sales Manager. This appointment will take effect January 1, 2013. During the last four years with MIFAB, Paul has led the development of the BEECO backflow preventer range of products – from the design stage, tooling, sourcing, testing and sales/marketing. Paul will continue to be involved in the BEECO product testing and development in addition to working with MIFAB's Eastern Regional Representatives to help them with BEECO and all of MIFAB's other product lines.

Tigre USA, Inc. Appoints Guilherme Bornholdt Financial Administrative Manager

Guilherme Bornholdt has been named Financial Administrative Manager at Tigre USA, Inc., reporting to Fabricio Rubine, General Manager. Bornholdt was promoted from Senior Accounting Analyst in the Tigre Group Corporate Controlling Department. He previously held accounting and financial positions at Schnieder Electric, Deloitte Touche Tohmatsu and ArcelorMittal – Vega do Sul.

Dave Holdorf Joins Taco's Training Team

Dave Holdorf is Taco's newest trainer. Holdorf will work closely with John Barba, Taco's residential training and trade programs manager. Holdorf is already at work for Taco in the field, offering training at rep, distributor and contractor locations. Holdorf will also assist John Barba at Taco's new world class, state-of-the-art Innovation and Development Center (see p. 63) where industry training is a focal point.

Holdorf has served in the hydronic industry for 15+ years, chiefly focused on radiant business at Uponor. There he served as technical support/ designer, engineering manager, and field technician - supporting installers and distributors with training, designing and troubleshooting. Before his roles at Uponor, Holdorf worked at Radiant Technology, Inc. as manager of technical services.

Holdorf received his B.E. in mechanical engineering from SUNY Maritime College where he worked on steam ships and also received his 3rd Assistant Engineers License with the US Coast Guard.

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Lead-free backflow preventers and water pressure regulators that fit all current footprints and offer the lowest life-cycle cost. Ultra low consumption urinals and sensor operated faucets and flush valves that conserve water and money. When you need to rethink your building's water system from the ground floor up, there's only one name to consider. Zurn. For your next retrofit and replacement project, give us a call. We'll listen.

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Z5798 Ultra Low Consumption Urinal


375XLAR Lead-Free Reduced Pressure Principle Assembly

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