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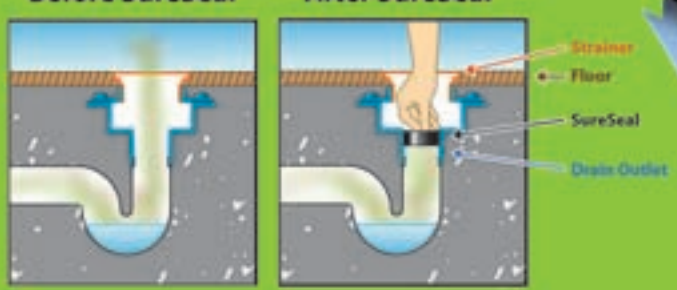

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Plumbing Engineer
A TWB Publication

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Viega's ProPress® was installed at Kansas City's LIVESTRONG Sporting Park for use in domestic water, condensate drains and indirect food service drain applications.

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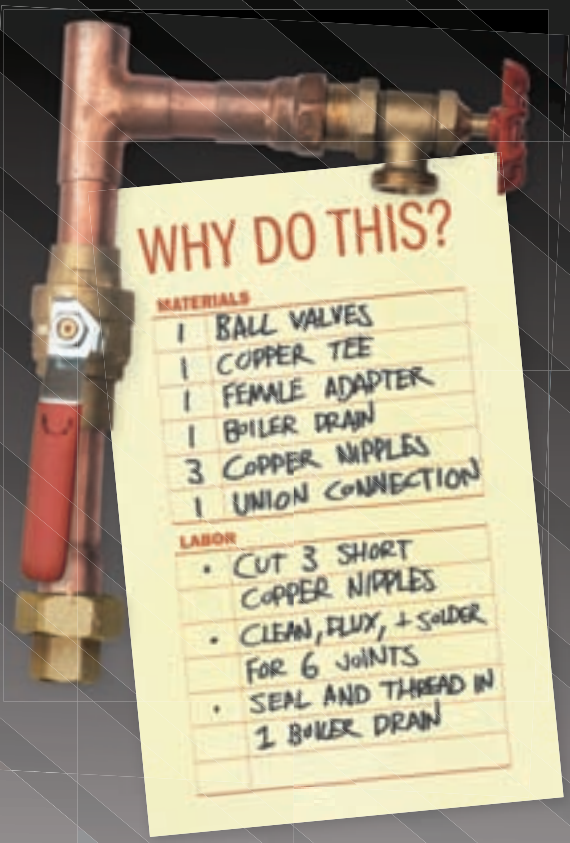

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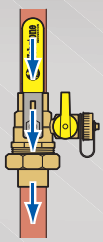
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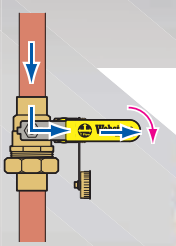
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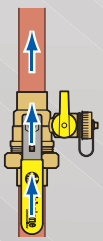
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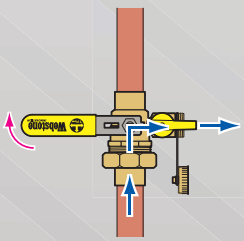
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Editor's Letter

John Mesenbrink, editorial director
editor@plumbingengineer.com

Plumbing Engineer
A TMB Publication
The Official Publication of ASPE

Winds of change

Change for the better! Here inside the offices of TMB Publishing Inc., we are very excited to announce that *Plumbing Engineer* and ASPE have forged a partnership in which *PE* will become the official publication of ASPE effective March 1, replacing ASPE's *Plumbing Systems & Design*.

ASPE's involvement within the these pages can only bolster the editorial integrity of the magazine; the quality of the contributed technical content will be invaluable to our readers.

"This new partnership combines the technical quality readers have come to expect from ASPE with the extensive and long-standing publishing expertise TMB has earned by serving the plumbing engineering community for over 40 years," said Jim Kendzel, MPH, CAE, ASPE executive director. "TMB's leadership in the plumbing engineering market ensures that ASPE's technical content will reach a wider audience of plumbing engineers, designers and specifiers, leading to greater exposure of the ASPE brand and, ultimately, to increased value to subscribers."

Under the agreement, TMB will publish *Plumbing Engineer* in association with ASPE and will provide a subscription to the magazine to all ASPE members free of charge. ASPE will contribute the resources of its current authors and columnists as well as provide technical review of articles.

In a message to APSE's members, ASPE president William Hughes conveyed that the decision to cease publication of ASPE's *Plumbing Systems & Design* magazine and join with TMB Publishing was the result of a deliberate and carefully thought-out process that took more than one year and included input from chapter presidents, affiliate organizations, industry experts and others.

Plumbing Engineer's long-standing position — more than 40 years — as the authoritative source for plumbing, hydronics, fire protection and PVF, coupled with its extended circulation, makes the decision to partner an obvious choice.

I would like to thank for your continued readership, and I really think you'll enjoy the new partnership! ■

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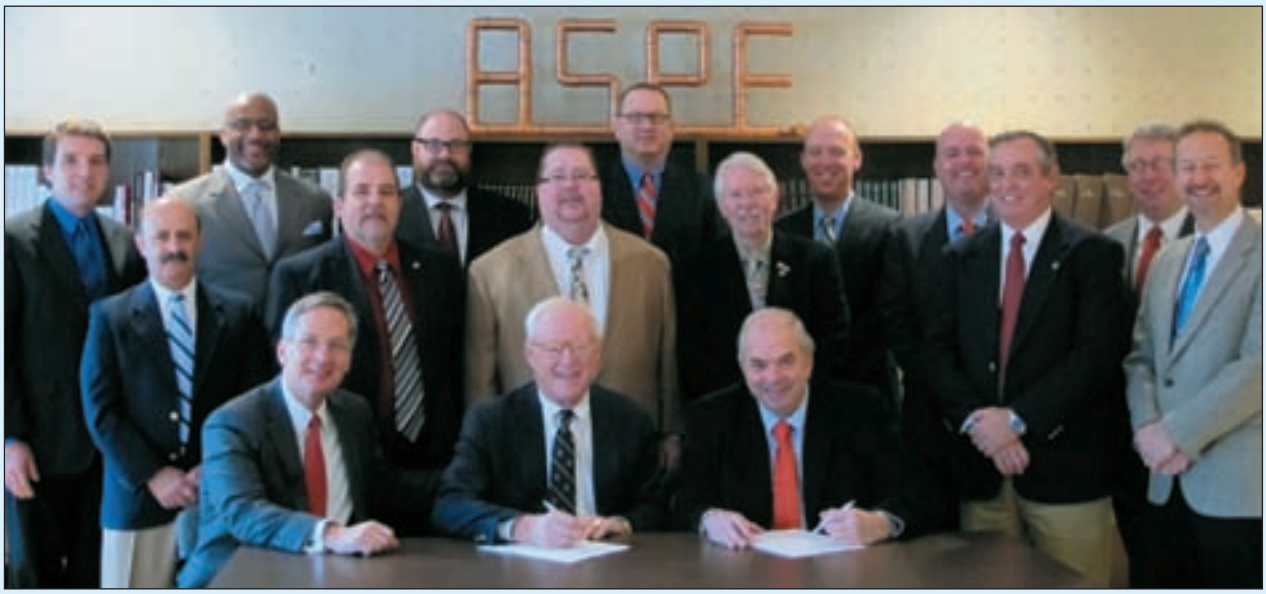
Industry News

Plumbing Engineer to become official publication of ASPE

CHICAGO — The American Society of Plumbing Engineers (ASPE) announced that it has signed a publishing partnership with TMB Publishing Inc., in which TMB's renowned monthly magazine, *Plumbing Engineer*, will become "The Official Publication of ASPE" effective March 1 and will replace ASPE's publication, *Plumbing System & Design*.

Advertisers and other interested parties are encouraged to contact Brad Burnside, publisher of *Plumbing Engineer* at brad@tmbpublishing.com to obtain additional information related to this exciting new partnership.



Janaury 20, 2012 marked this momentous occasion where TMB Publishing Inc. partnered with ASPE to become the official publication of ASPE. Tom Brown, owner of TMB Publishing (front, center), signs the official documents with William Hughes, president, ASPE (front, right). ASPE executive director, Jim Kendzel (front, left) oversees the signing.

"This new partnership combines the technical quality readers have come to expect from ASPE with the extensive and long-standing publishing expertise TMB has earned by serving the plumbing engineering community for over 40 years," said Jim Kendzel, MPH, CAE, ASPE executive director. "TMB's leadership in the plumbing engineering market ensures ASPE's technical content will reach a wider audience of plumbing engineers, designers, and specifiers leading to greater exposure of the ASPE brand and ultimately, increased value to the subscribers."

Tom Brown (r), and Jim Kendzel make the ASPE partnership official with a handshake.

"I am thrilled to again be partnering with ASPE to help publish quality technical articles for the plumbing engineering community," said TMB owner Tom Brown. "*Plumbing Engineer* and its readers can only benefit from the wealth of knowledge and expertise ASPE and its members will bring to the publication."

About ASPE

ASPE is the only professional organization devoted to the training and certification of plumbing engineers and designers. ASPE and its 6,200 worldwide members are dedicated to protecting the health, welfare, and safety of the public through the dissemination of technical data and through educational seminars and technical publications to expand the base of knowledge among plumbing engineers, designers, contractors, code officials, inspectors, and manufacturers. For more information, visit ASPE.org.

About TMB Publishing Inc.

TMB Publishing Inc., a leading publisher of business-to-business magazines, continues to serve the specific informational needs of the key players in plumbing, hydronic, heating and the mechanical industry. Its market-leading publications include:

- *Plumbing Engineer* — The authoritative source of professional and technical information for those involved in the design and specification of plumbing systems.
- *The Wholesaler* — The leading source of news, trends, developments and management how-to for wholesalers and distributors in the plumbing, heating, air conditioning and industrial piping marketplace.
- *Phc News* — The plumbing, hydronic and mechanical contractor's definitive source for product information and applications, with a focus on improving job performance and business operations. For info, tmbpublishing.com.

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Industry News

Continued from page 8

American Standard appoints new president and CEO

PISCATAWAY, N.J. — The board of directors of American Standard Brands announced the appointment of Jay D. Gould as president and chief executive officer of the company, a leading North American manufacturer of branded bath and kitchen products serving both the residential and commercial markets, including the new construction and remodeling markets.

"We are excited to have Jay take the helm of American Standard," said Tom Taylor, chairman of the board of directors. "He brings tremendous experience in enhancing companies' leading market positions and creating value by leading with a focus on growth, innovation and brand development."

Before joining American Standard, Gould was president of the Home & Family group of Newell Rubbermaid. Taking an innovative, consumer-driven approach to building demand, he significantly increased revenues for the company's Levolor, Calphalon, Rubbermaid and Graco brands throughout the economic downturn. Prior to Newell Rubbermaid, Gould held senior executive roles at the Campbell Soup Company, the Coca-Cola Company, and General Mills Inc., where he helped drive the growth of world class brands such as Coca-Cola, Pepperidge Farm and Minute Maid.

"American Standard is an iconic brand with tremendous potential to inspire do-it-yourself consumers and to partner with professionals," said Gould. "The company successfully weathered the challenging business environment over the past several years, emerging as an even stronger business and now prepares for a more assertive growth agenda. That agenda will certainly build on American Standard's heritage of products with great design and industry-leading performance."

Gould succeeds Don Devine, who led the successful turnaround of American Standard Brands and is leaving the company to pursue other interests. Under his leadership, the company completed the strategic mergers of American Standard, Crane Plumbing, Eljer Plumbing, Safety Tubs and Decorative Panels International. The turnaround effort resulted in sustained profitability and a new capital structure for the company.

"While Don has done an outstanding job in building and repositioning the company, Jay will lead the next phase of the company's development, which will focus on growth," Taylor said.

RPA membership ratifies move to IAPMO

ONTARIO, CALIF. — The RPA (formerly known as the Radiant Panel Association Inc.) has officially joined the International Association of Plumbing and Mechanical Officials (IAPMO). The move, along with an official name change to the Radiant Professionals Alliance, was

formally and officially ratified by RPA membership by a strong majority of affirmative votes on Dec. 5,2011.

"The foremost concern of RPA members is their membership status," said RPA president Dorothy Biggs. "IAPMO has assured us that the anniversary dates of all RPA memberships will be recognized, will remain intact for all subsequent renewal purposes and will immediately entitle every member to the multitude of benefits associated with RPA and to the structure of IAPMO."

Members can also be assured that all of RPA's publications and reference materials will continue to be available, including training manuals, home study tools, DVD seminars, the Webinar series, the RPA Standard Guidelines and the certification program, including all written tests for the various levels from field technician to designer. Publications that members enjoy will continue without interruption, and new products and projects are being planned for the near future.

GP Russ Chaney, IAPMO CEO, anticipates that RPA members will find IAPMO to be unparalleled in its management skill, delivering service excellence with reliability and responsiveness.

Fire hazards of hoarding covered in *NFPA Journal*

WASHINGTON — The latest issue of *NFPA Journal*, the official magazine of the National Fire Protection Association (NFPA), explores the hazardous relationship between hoarding and fire safety in the cover story, "The Dangers of Too Much Stuff."

The story depicts how first responders, especially the fire service, are teaming up with human service professionals to tackle safety issues related to compulsive hoarding. A study conducted in Australia in 2009 quantifies how fires in "hoarding houses" are fiercer and more expensive to fight than other kinds of residential fires.

Sharon Gamache, director of NFPA's high risk outreach programs, discusses the fire dangers associated with compulsive hoarding. In a video interview, she also details several resources first responders can use when dealing with someone with a hoarding issue.

Former A. O. Smith CEO Thomas Dolan dies at age 84

MILWAUKEE — Thomas I. Dolan, who served as chairman and chief executive officer of A. O. Smith Corporation from 1984 until 1989, died on Dec. 25 at the age of 84.

Dolan joined A. O. Smith as a senior vice president in 1980 after a 30-year career in the home appliance industry. He was responsible for the company's consumer products division, which included residential and commercial water heaters, as well as the former A. O. Smith Harvestore Products Company subsidiary. In 1981, he was

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named head of all major product divisions of the company and the following year was elected president, chief operating officer and a member of the company's board of directors.

In July 1984, Dolan was elected chairman and chief executive officer of the company, succeeding Lloyd B. Smith, the great-grandson of the founder of A. O. Smith, the second non-Smith family member to lead the company. He was chief executive officer of the company until 1989 and chairman of the board until 1992. He remained a member of the board of directors until retiring in 1996.

"Tom Dolan led A. O. Smith during one of the most challenging periods in its history," chairman and chief executive officer Paul W. Jones said. "The country was suffering through back-to-back recessions, and the domestic automotive industry (at the time A. O. Smith's largest business) was going through an extensive restructuring. Tom not only returned the company to profitability; he created the foundation for our subsequent success and growth."

While in Milwaukee, Dolan was active in a number of community organizations, serving as a director of the Medical College of Milwaukee, a corporation member of the Milwaukee School of Engineering, a member of the board of the Metropolitan Milwaukee Association of Commerce, and as a member of the Greater Milwaukee Committee. In 1987, he served as campaign chairman of the United Way of Greater Milwaukee.

He also was a director of the First Wisconsin National Bank (now US Bank), a trustee of Northwestern Mutual Life Insurance Company, a member of the executive committee of the Machinery and Allied Products Institute, a council member of the International Executive Service Corps, a member of the Society of Automotive Engineers, the Business Roundtable and the Business Council.

Prior to joining A. O. Smith, Dolan spent 30 years with White Consolidated Industries or its predecessor companies. He rose from an entry-level engineer to become president of the company's Kelvinator subsidiary before being named a senior group vice president of White Consolidated. In his last position at White Consolidated, he was responsible for a portion of the company's appliance operations including refrigerators, air conditioners, freezers, laundry equipment, gas and electric ranges.

Dolan was a graduate of the University of Michigan with a degree in industrial/mechanical engineering.

IAPMO, Brazilian government sign MoU

ONTARIO, CALIF. — The International Association of Plumbing and Mechanical Officials (IAPMO) has signed a Memorandum of Understanding (MoU) with the Brazilian government that calls for the two to work together in developing codes, standards, training, product evaluation and compliance services for the South American nation.

The agreement with the Associação Brasileira pela Conformidade e Eficiência de Instalações (ABRINSTAL), a public-private partnership consisting of construction trade groups in Brazil, was announced at an industry awards event in Sao Paolo, Brazil, on Nov. 7. More than 800 people attended the event, including Allen Inlow, IAPMO's senior director of business and product development.

All of Brazil's code development will be done through the government offices that house the construction industry associations in Sao Paolo. The codes will first be implemented in the state of Sao Paolo, followed by the state of Rio de Janeiro. Officials have indicated that the first code to be developed is a natural gas code for Brazil, which will be crucial in averting additional major disasters such as those that have occurred since a large natural gas deposit was discovered several years ago just off the Brazilian coast.

Inlow also attended an intense series of meetings with government and industry offices. The meetings covered such key topics as natural gas code requirements, plumbing and sanitation, mechanical HVAC/R and solar design, installation and maintenance requirements. Brazilian officials also indicated that they plan to implement measures from IAPMO's Green Plumbing and Mechanical Code supplement with their codes.

More Industry News on page 14

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EXCLUSIVE PATENT PENDING TECHNOLOGY

Continued from page 12

Alumnus commits $25 million to university

HOUSTON AND WARMINSTER, PA. — Sam Houston State University has received a $25 million pledge from Pennsylvania-based Therm-Omega-Tech Inc. to support the university's engineering technology components within the current industrial technology program and to establish a new engineering technology program. The pledge is the largest gift in the university's history.

Therm-Omega-Tech founder Frederick Pirkle graduated from SHSU with a Bachelor of Science degree in industrial arts in 1970 and a master's degree in industrial technology in 1974.

"Sam Houston State University students who are getting a technical education are learning skills for life," Pirkle said. "Those technical skills are critically important for America in today's world. Americans are hard workers, and we're smart workers. I want the students who are touched by this gift to be inspired to contribute to the success of this country and to be leaders in the world."

"We are truly honored and deeply grateful for Mr. Pirkle's generosity to and vision for his alma mater," said SHSU president Dana Gibson. "This remarkable and unprecedented gift is an investment in the future of Sam Houston State University and will enhance the university's ability to provide opportunities for students to gain invaluable knowledge and experience in industrial technology."

Spirax Sarco revitalizes HVAC steam system software

BLYTHEWOOD, S.C. — Spirax Sarco's HVAC Solutions has been rebranded with the new name Steam DesignPro to meet the demand of mechanical engineers, designers and contractors in the HVAC market. The software was created as a visual design tool through an easy, drag-and-drop method for designing and modeling HVAC steam systems.

The intuitive Windows®–based software allows for easy modeling of steam generation, steam distribution, steam utilization and condensate-handling systems. The program automatically performs many of the engineering calculations and design tasks that HVAC professionals currently accomplish manually, including head loss and static pressure calculations, pipe and duct sizing, data recalculation, component insertion, full psychrometric calculations and equipment type changes on the fly.

In addition, Steam DesignPro supports compiling of equipment schedules based on the Spirax Sarco catalog.

Minimal training is required to use this software, and one can reuse designs from job to job.

Webstone expands website

WORCESTER, MASS. — Webstone's website, www.webstonevalves.com, features a newly expanded Technical Resources section. In addition to providing access to specification and submittal sheets, the site now includes product renderings in both Visio (vsd) and jpg formats. Customers who wish to specify and integrate Webstone products into their design plans can easily select and download their desired format.

BrassCraft Manufacturing offers Spanish-language website

NOVI, MICH. — BrassCraft Manufacturing has launched a new Spanish-language website, appealing to the growing number of Hispanic plumbing professionals among the company's customer base across the country. The site may be viewed at www.brasscraft.com by clicking the Español link at the top of the page.

The new site features the same rich content and functionality as the BrassCraft.com English-language website, including detailed product information, document and video libraries, sales and technical support, and the company's nationwide Dealer Locator utility

Fulton expansion completed

PULASKI, N.Y. — Fulton Companies has announced the completion of construction on its major facility expansion project. "The $10.5 million expansion features production efficiencies that are already allowing for increased response to customer demands," said Mark Hilton, Fulton's vice president of manufacturing. "The new facility will also provide the opportunity to expand Fulton's product lines."

The expansion's manufacturing

space is now fully functioning; office space transitions have begun and are expected to be completed in the first quarter of 2012. An additional $3.5 million will be spent to complete project interior and equipment needs. Guests will be encouraged to visit and see firsthand the cutting-edge building features for heating and cooling, lighting and customized energy recovery.

The facility's innovative features include the following:

Heating. A heating system for the office space features a 12-zone, in-floor radiant hydronic system. When there is a need for heat in this space, waste heat from either the factory's research and development facilities or its manufacturing processes is assessed and used. This unique recovery feature will make a significant impact on the energy costs and efficiencies of the building.

Cooling. The office space is divided into 43 zones with a state-of-the-art chilled beam system mounted in the ceilings to efficiently distribute cooling to the building occupants. Cooling towers are incorporated to manage the energy balance of the overall system. For example, when waste heat exceeds the energy required by the system, excess energy can be sent to the cooling towers. The system also has the potential to utilize gas absorption heat pumps and retention ponds as an energy source. ■

2012 election predictions

By Mark Riso

People say that predicting American politics is like predicting the weather. I guess that's so, but it's easy to predict rain when the economy is weak and unemployment is high. The key to political analysis is to study why it's raining and what it will take to make it sunny.

Carrying the weather analogy another step, what we have in Washington, D.C., right now is a political tornado, and it's not necessarily all about politics. What we are seeing on Capitol Hill (and with the administration) is a true clash of economic ideology, which is not entirely unhealthy. That's not surprising, considering that Congress currently is composed of a Democratic-controlled Senate and a Republican-controlled House (with the Tea Party influence).

We've all heard the phrase, "Don't shoot the messenger." Well, politics is all about shooting the messenger, and people will view their elected officials as the messenger. What will happen next year, and what the American people will see in the elections, all has to do with political exposure. When the economy is weak and unemployment high, the most politically exposed messengers are the elected officials. With that in mind, let's look ahead at what could happen in this national election year.

The Republican nomination will go to the candidate who best conveys a positive image rather than a negative one. Sounds like common sense, but with a nation that needs answers to very serious problems, the candidate who presents a real economic plan as opposed to a political strategy, will win.

Predictions for 2012

United States Senate. Expect the Senate to go Republican, not because of a strong Republican message, but because more Senate Democrats are politically exposed during a weak economy.

United States House of Representatives. Because the dynamics of political exposure is a very real political dynamic, expect the Democrats to pick up seats in the House, although the House will remain in Republican control. Again, political exposure will carry the day and, in this case, the House Republicans are more politically exposed.

United States presidency. As for the presidency, the presidential election for 2012 will be more about President Obama's performance evaluation than about any candidate the Republicans can nominate. There isn't much rocket science to this and certainly no magic. The question will be: "Do you believe you are better off today than you did when President Obama took office?" Pretty simple stuff to understand and the basis of any election.

It's no secret that the central issue is the economy, and tied into that issue is the unemployment rate. With President Obama's approval rating in the low- to mid-40 percent and with unemployment hovering at 8.5 percent (slight drop for the last quarter), President Obama has his work cut out for him. History tells us that there will have to be another drop in unemployment in the beginning of the next quarter and that the president will have to bring his approval rating into the high 40s in the next quarter in order to be re-elected.

Typically, there is talk about challengers to an incumbent when approval ratings are low. In this case, there won't be any challenger to President Obama coming from the Democrats; not that challengers aren't thinking about it, but the reality is that there isn't anyone who (if they succeed against the president and take the nomination) wants ownership of this economy.

As for whom the Republicans will nominate; if the economy stays weak and the unemployment rate stays high, any of the Republican candidates can beat President Obama. What is most interesting about the Republican field, though, is that the "hardliners" are doing very well. The prototypical politician is giving way to candidates who are committed to true conservatism.

What is also very interesting is that "positive" messaging is making a comeback. The Republican nomination will go to the candidate who best conveys a positive image rather than a negative one. Sounds like common sense, but with a nation that needs answers to very serious problems, the candidate who presents a real economic plan as opposed to a political strategy, will win.

I hate quoting movies and using clichés, but I will close with one: "We have serious problems to solve, and we need serious people to solve them." The American people are being faced with critical decisions in the 2012 elections. If the wrong people are elected, this nation is in tremendous trouble. Be sure to take the time to study the issues and candidates before casting your vote. American people, this one's on you. ■

Mark Riso *is Plumbing-Heating-Cooling Contractors Association (PHCC) government relations director.*

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Designer's Guide

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

Minimum DFUs and drainline carry

It's amazing how, after being in this business for 27 years, there are still code issues that come up that I've never heard of, even once, in all those years of designing projects. Granted, 15 of those 27 years were spent in NYC using an entirely different code from the one I have used for the past 12 years, but it still amazes me when new issues arise. Sometimes issues are a function of code change or an interpretation on the part of the local authority; that is to be expected. But when an issue is raised based on a code provision that has existed for many years, unnoticed by yours truly, well, that just shines my shoes.

Case in point: At the end of Chapter 7 of the UPC (Sanitary Drainage) is Part II — Building Sewers. By definition, the building sewer starts two feet outside the building and extends to the public sewer. I find it curious that the break point between the building drain and the building sewer, which should coincide with the break point between the plumbing system and the civil utility, is a two-foot dimension per code, whereas all the construction contracts are based on a five-foot dimension. Regardless, I have never paid much attention to Part II of Chapter 7, because it really applies to the civil engineer more than it does to you and me. In fact, it makes me wonder why Part II of Chapter 7 even exists, since it addresses civil scope rather than plumbing scope. Interestingly, there is no similar section in the IPC.

Anyway, the other day an associate here in my office came back from a meeting and asked me where in the code it defines the minimum number of fixture units required for a drainage line; I answered that, "It doesn't." Well, in due course, that same engineer pointed out to me Table 7-8 (in Part II of Chapter 7) that defines maximum and minimum fixture unit loading for building sewers size 8" through 12". Oddly, the maximum fixture unit values should, but don't, agree with the values in Table 7-5, the sanitary waste and vent sizing table. For example, Table 7-5 limits the fixture units of an 8" horizontal drain at 2% pitch to 2,640, whereas Table 7-8 allows 3,900 fixture units outside the building. Why the difference?

As mentioned, Table 7-8 also defines the minimum DFUs for drain lines while 7-5 does not. The 8" drain example above would require at least 275 DFUs connected to it, otherwise it is considered oversized and, in this age of attention to dry drains, this aspect of the code seems to be getting more attention. Table 7-8 also addresses pipe slopes of 1% and 0.5%; the flatter the pipe, the greater the minimum number of DFUs, which makes sense.

On the project where this was raised as an issue, there was an existing 8" building sewer that was to be utilized for a lesser "post-renovation" DFU load than previously served. The inspector picked up on this and suggested that the 8" pipe would have to be dug up in the street and replaced with a smaller line. This represents a great deal of work for the sake of reducing a pipe size. Note that all that was required by code, based on the renovated building's load, was a 4" building sewer.

An idea came to mind for a solution to this troublesome problem. The existing 8" building sewer made a straight shot from the basement of the building to the public sewer connection. My suggestion, unconventional as it may be, was to jet the existing 8" pipe clean and use it as a conduit to run a new 4" drain rather than dig up the street. In theory, this could be done by sliding 10-foot lengths of no-hub down the length of the 8" pipe. Rollers might be needed to get it all the way through, and the void between the two pipes would have to be sealed in some fashion at the point of connection to the sewer, but this would surely be easier than digging up a very busy major street for a considerable distance.

I was excited about this creative solution to an unusual problem, but as it turned out, it proved to be unnecessary. The design engineer was able to adjust the drainage fixture units by increasing the ejector pump flow rate and associated fixture units in order to get the DFU load above the minimum requirement for an 8" pipe. So, in the end, this oddball code section was circumvented out of necessity; but this begs a bigger issue.

Taking this concept one step further, neither the UPC nor the IPC dictate minimum number of fixture units for drains within a building, but maybe they should.

Let's use the IPC as an example. If there is a private toilet room (WC and lav) sitting on a grade slab far from any other fixtures, most of us would run the buried drain as 4" at 1% slope for myriad reasons, even though the code allows it to be 3". With today's 1.28 gpf water closets, the 4" drain is guaranteed to have frequent blockages, because the carry capacity of the pipe (in terms of distance) isn't very far with so little drainage flowing through it.

If the code were to be reinterpreted to say that the pipe size maxima listed in Table 710.1 also represent the minima for the next larger pipe size, then the drain in the example above would have to be 3" rather than 4".

Reducing drain pipe size does increase drainline carry. Studies have been done by ASPE, EPA Water Sense and others, but the most informative data I could find on the subject was a report by the Canada Mortgage and Housing Corporation. In general terms, reducing the drain serving a water closet from 4" to 3" will increase drainline carry by 25%. But since the 4" cast iron drain serving a 1.28 gpf toilet was found to have a drainline carry of just 12 feet or so, we are only talking about an increase to 15 feet. This, in and of itself, will not make a world of difference.

Drainline slope has a more dramatic effect on carry distance than diameter. Increasing the slope of a given pipe from 1% to 2% will increase carry distance approximately 100%. The combined effect of changing a 4" pipe at 1% to a 3" pipe at 2% will increase carry distance about 200%. Further, changing the pipe from cast iron to PVC will increase carry distance another 200%. So, while I could not find any data specifically stating this, the net effect of changing a drain from 4" cast iron at 1% slope to 3" PVC at 2% slope should increase carry distance from about 12 feet to a theoretical 96 feet, give or take. This is a significant difference, and something worth considering for unique design applications, especially for the small toilet room out in left field that will be subject to frequent blockages. ■

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Code Classroom

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

Code requirements for drainage system cleanouts

When designing sanitary or storm drainage systems, it is important for the design professional to think about how the drainage system will be maintained. For a long time, the plumbing codes have had requirements for the location and size of openings in the drainage pipes to allow drain cleaning machines to have access to the drainage piping. These access points are called *cleanouts*.

Plumbing system design professionals should take care to route the drainage piping to allow for cleanouts to be installed at appropriate intervals and to allow access without disrupting the building. Underground building drains, for example, can be routed in corridors or aisles so that cleanouts do not end up covered by casework, cabinets, machinery or equipment that would need to be removed for access to the drainage system. In some cases, drains can be offset to rise up in walls to avoid cleanout covers in high traffic areas.

When drains serving floors above grade require cleanouts, consider the spaces on the floor below where the drainlines change direction. Try not to locate cleanouts in ceiling spaces over sensitive equipment. Cleanouts and drains should be routed to avoid being over food preparation areas, hospital operating rooms, computer rooms or other critical areas.

If the drains must be in the ceiling over sensitive areas, remember that, if there is a blockage, when a plumber removes the cleanout plug, sewage can drain out of the backed up drain and cause damage and possibly the spread of disease and other pathogens to areas below. If cleanouts are over sensitive areas, and if there is no way to avoid having pipes in the ceiling, consider using drain pans under the drains. Also, the designer should discuss with the owner the possibility of turning the cleanouts up to terminate in the floor or in a wall on the floor above.

Plumbing system design professionals should take care to route the drainage piping to allow for cleanouts to be installed at appropriate intervals and to allow access without disrupting the building.

Drains should be routed far enough away from walls and obstructions that the drain cleaning machine can gain access if needed. Generally, a distance of about three feet from a cleanout to any obstruction or wall is required. Access to drainage cleanouts is becoming more important, as various states have proposed water conservation legislation that will phase in over the next few years and that mandates lower flow rates for various plumbing fixtures. As water flows are reduced, and as waste is diverted away from drainage systems for graywater systems, drainline blockages will increase, and the need for cleanouts will increase.

Two code organizations in the United States develop model codes for adoption by states or local jurisdictions. The International Code Council (ICC) develops and maintains the International Plumbing Code (IPC), and the International Association of Plumbing and Mechanical Officials (IAPMO) develops and maintains the Uniform Plumbing Code (UPC). Various states also develop and maintain their own state codes; however, I am not covering those codes in this article.

Following is the language from these two model plumbing codes that deals with cleanouts for drainage systems.

2012 International Plumbing Code - Cleanout requirements:

IPC - Section 708 Cleanouts

IPC - 708.1 Scope.
This section shall govern the size, location, installation and maintenance of drainage pipe cleanouts.

IPC - 708.2 Cleanout plugs.
Cleanout plugs shall be brass or plastic, or other approved materials. Brass cleanout plugs shall be utilized with metallic drain, waste and vent piping only and shall conform to ASTM A 74, ASME A112.3.1 or ASME A112.36.2M. Cleanouts with plate-style access covers shall be fitted with corrosion-resisting fasteners. Plastic cleanout plugs shall conform to the requirements of Section 702.4. Plugs shall have raised square or countersunk square heads. Countersunk heads shall be installed where raised heads are a trip hazard. Cleanout plugs with borosilicate glass systems shall be of borosilicate glass.

IPC - 708.3 Where required.
Cleanouts shall be located in accordance with Sections 708.3.1 through 708.3.6.

IPC - 708.3.1 Horizontal drains within buildings.
All horizontal drains shall be provided with cleanouts located not more than 100 feet (30 480 mm) apart.

IPC - 708.3.2 Building sewers.
Building sewers shall be provided with cleanouts located not more than 100 feet (30 480 mm) apart, measured from the upstream entrance of the cleanout. For building sewers 8 inches (203 mm) and larger, manholes shall be provided and located not more than 200 feet (60 960 mm) from the junction of the building drain and building sewer, at each change in direction and at intervals of not more than 400 feet (122 m) apart. Manholes and manhole cov-

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Code Classroom

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ers shall be of an approved type.

IPC - 708.3.3 Changes of direction.

Cleanouts shall be installed at each change of direction greater than 45 degrees (0.79 rad) in the building sewer, building drain and horizontal waste or soil lines. Where more than one change of direction occurs in a run of piping, only one cleanout shall be required for each 40 feet (12 192 mm) of developed length of the drainage piping.

IPC - 708.3.4 Base of stack.

A cleanout shall be provided at the base of each waste or soil stack.

IPC - 708.3.5 Building drain and building sewer junction.

There shall be a cleanout near the junction of the building drain and the building sewer. The cleanout shall be either inside or outside the building wall and shall be brought up to the finished ground level or to the basement floor level. An approved two-way cleanout is allowed to be used at this location to serve as a required cleanout for both the building drain and building sewer. The cleanout at the junction of the building drain and building sewer shall not be required if the cleanout on a 3-inch (76 mm) or larger diameter soil stack is located within a developed length of 10 feet (3048 mm) of the building drain and building sewer connection. The minimum size of the cleanout at the junction of the building drain and building sewer shall comply with Section 708.7.

IPC - 708.3.6 Manholes.

Manholes serving a building drain shall have secured gas-tight covers and shall be located in accordance with Section 708.3.2.

IPC - 708.4 Concealed piping.

Cleanouts on concealed piping or piping under a floor slab or in a crawl space of less than 24 inches (610 mm) in height or a plenum shall be extended through and terminate flush with the finished wall, floor or ground surface or shall be extended to the outside of the building. Cleanout plugs shall not be covered with cement, plaster or any other permanent finish material. Where it is necessary to conceal a cleanout or to terminate a cleanout in an area subject to vehicular traffic, the covering plate, access door or cleanout shall be of an approved type designed and installed for this purpose.

IPC - 708.5 Opening direction.

Every cleanout shall be installed to open to allow cleaning in the direction of the flow of the drainage pipe or at right angles thereto.

IPC - 708.6 Prohibited installation.

Cleanout openings shall not be utilized for the installation of new fixtures, except where approved and where another cleanout of equal access and capacity is provided.

IPC - 708.7 Minimum size.

Cleanouts shall be the same nominal size as the pipe they serve up to 4 inches (102 mm). For pipes larger than 4 inches (102 mm) nominal size, the size of the cleanout shall be not less than 4 inches (102 mm).

Exceptions:

1. "P" trap connections with slip joints or ground joint connections, or stack cleanouts that are not more than one pipe diameter smaller than the drain served, shall be permitted.

2. Cast-iron cleanout sizing shall be in accordance with referenced standards in Table 702.4, ASTM A 74 for hub and spigot fittings or ASTM A 888 or CISPI 301 for hubless fittings.

IPC - 708.8 Clearances.

Cleanouts on 6-inch (153 mm) and smaller pipes shall be provided with a clearance of not less than 18 inches (457 mm) for rodding. Cleanouts on 8-inch (203 mm) and larger pipes shall be provided with a clearance of not less than 36 inches (914 mm) for rodding.

IPC - 708.9 Access.

Access shall be provided to all cleanouts.

***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.*

The rest of Ron Georges' code column can be found online at www.plumbingengineer.com.

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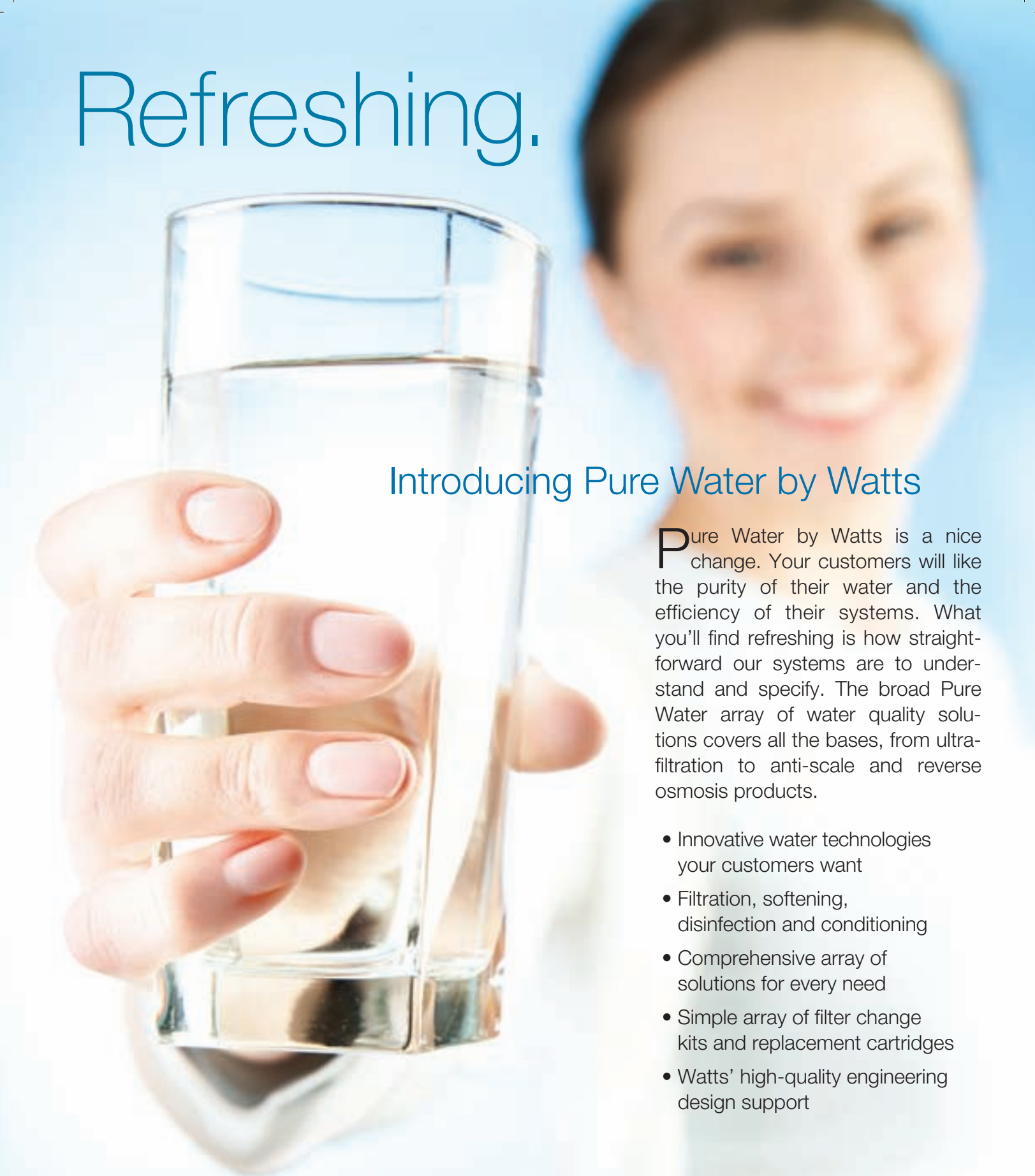

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Modern Hydronics

BY Dan Foley, owner, Foley Mechanical Inc., Lorton, Va.

The cold, hard truth about snowmelt systems: What they didn't tell you in class

Washington, D.C., is not exactly the Arctic Circle, but we have installed a surprising number of snowmelt systems over the years, everything from walkways and front steps to a 28,000-sq.-ft. driveway and parking pad. I have approximately 40 systems installed over the past 20 years.

We typically get three or four snowstorms a year and a good ice storm every couple of years. Two years ago, we had the epic two- and three-foot dumps one week apart that practically shut down the city. While hardly a necessity, these systems do come in handy several times a year.

Our clients choose snowmelt systems for several reasons. Steep driveways are one. Another client had a heart condition that did not allow him to exert himself shoveling snow. We had a doctor that had to be able to get out of his driveway in any weather condition. Most often, we install it under driveways that would be difficult to plow or shovel; cobblestone, brushed aggregate, stamped concrete and limestone drives are among several that come to mind.

Photo 1: This snowmelt innovation runs Multi-Cor PEX vertically down the steps and forms the bends such that the entire step is covered. ***Photo Credit: John Abularrage***

Mostly, we install these for clients because they want them and have the means to pay for them. No question, it is (for the most part) a luxury that the majority cannot afford. There are exceptions to this, such as commercial jobs, but most of our jobs fall into the luxury category. They are expensive to install and consume huge amounts of Btu. There is nothing "green" about a snowmelt system. Even on our largest residential projects, the snowmelt boiler or boilers dwarf those that heat the home.

I have made every mistake you can make designing and installing these systems and have learned from these mistakes. Hell hath no fury like a homeowner who just paid big bucks for a snowmelt system and finds that it doesn't work when it finally snows. The conversation goes something like this: "Hey Dan, get your ass over here and fix your snowmelt system that does not work. And bring your snow shovel!"

Then you spend a couple of hours driving 20 miles an hour through blinding snow to fix the problem. If you are lucky, the equipment is installed in a garage or basement, out of the snow, where you can at least warm up and think straight. If not, you are outside, trying to remember where you installed the snow sensor or lying in the snow, digging down to the cover of manifold boxes or trying to figure out why the boiler is not lighting.

Here is what I have learned from 20 years of installing snowmelt. Insulate the slab. Response time is critical. When snow or ice covers the driveway, you want it gone as quickly as possible. You can debate Class I vs. Class II vs. Class III systems and response time with your client as his driveway resembles the Verizon Center hockey rink. Let me know if your conversation went any better than mine did.

You want the energy of the system directed upward to melt the snow. You do not want to spend the precious Btu heating crushed rock, gravel and earth below the slab, where it does no good. We always specify 2" extruded polystyrene insulation (Dow Blue and Styrofoam Pink are two products we use). Bubble wrap and reflective foil are a waste; use these products at your own peril. You need the R-Value of a good insulation product in this application.

Short loops, large diameter. We typically use ¾" PEX at 9" centers on our driveways. We keep loop lengths at 300'. Ice cold glycol is difficult to pump. I use 5/8 PEX for applications that require 6" o.c. spacing but use shorter 250' loops. I only use ½" PEX on steps, where it is very difficult to get the larger PEX to bend tightly and keep the loops short, 200' or less. These are just guidelines. Each job is different, so doing an accurate design is a requirement. I use three software programs: Wrightsoft Right-Suite Universal, Uponor ADS and LoopCAD. If you are uncomfortable using the software products available, all the tubing manufacturers will assist with design.

To keep loop lengths short, we try to mount the manifolds remotely as close to the driveway as possible. This minimizes the "wasted" tubing leaders to/from the drive. After experimenting with plastic irrigation boxes with mixed results, we have shifted to the concrete vaults used by utilities. Quazite is a good one that we have used for the last few years. Yes, they are heavy and more expensive than the plastic boxes, but they hold up better to the jobsite abuse they will see from the final grading, landscaping and maintenance.

Steps are always a challenge. It is difficult to get the tubing in place, especially when it is cold out and the tubing is stiff. We try to get a loop (two passes) in the tread and a pass of tubing in the vertical riser. It is hard to get tubing close to the leading edge of the step where ice will accumulate. My friend and fellow columnist, John Abularrage came up with

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Continued from page 24

a brilliant innovation where he ran Multi-Cor PEX vertically down the steps and formed the bends such that the entire step was covered (See photo 1).

Boilers. If at all possible, find an indoor location to mount the boiler(s) and pumps. I realize that mechanical space is at a premium. Three of my snowmelt projects have outdoor boilers. I was out on one last year during blizzard conditions. It was dark, cold and snowing sideways. I was lying in a snowbank with a mini Mag-Lite clenched in my teeth trying to read a wiring diagram. This is no way to work on a boiler. We have one current project in progress with an outdoor boiler, but this will be our last. I'm getting too old for this!

In all but the smallest jobs, we have a dedicated snowmelt boiler or boilers. Except for the outdoor boilers, we only use condensing boilers for snowmelt. This elimi-

nates the thermal shock and condensing issues that have to be addressed with non-condensing equipment. Condensing boilers thrive on the low return water temperatures and will operate at peak efficiency in snowmelt applications.

This leads to the issue of "thermally shocking" a snowmelt slab. I imagine that in certain commercial applications, with industrial horsepower boilers and pumps, it is possible. In a residential application with a properly sized boiler, it is all but impossible. It just is not possible to raise the slab temperature fast enough to thermally shock it. The system quickly establishes equilibrium and the temperature rises very slowly.

For example, last winter we installed a system in a 1,400-sq.-ft. residential driveway. The ¾" tubing was installed in a 4" base slab of concrete on 9" centers. Granite cobblestones where then laid into a mortar setting bed. The entire structure was about 10" to 12" thick. I roughly calculated the entire mass at over 100 tons. This mass is a black hole to Btu. With a properly sized boiler and pump, it just is not possible to change the temperature quickly enough to cause thermal shock.

On this job, we installed a 250,000-Btu Triangle Tube condensing boiler. It was piped through a hydraulic separator with a separate boiler and system pump. As an experiment, I turned the system pump off until the boiler cycled off on limit, 155 F in this case. I then turned on the system pump to see what would happen. Within seconds, the boiler temperature dropped enough to kick on the burner. In less than a minute, the boiler temperature was the same as the initial start-up temperature, with no temperature change in the slab.

I can sum up my experience thusly: I want as much heat as possible to flow into the slab as quickly as possible. I have no interest in maximizing efficiency or "saving" energy (there is nothing to "save"). My only goal is to make the snow or ice disappear as fast as possible. With dedicated condensing equipment, it makes no sense to try to temper the supply water temperature.

Controls. Almost all of our systems have a snow/ice sensor tied to an operating control. This will automatically activate the system when snow or ice is present. It will also have a slab sensor to turn off the system when the slab is up to temperature, typically 38-40 F. We also incorporate a "manual on" switch to manually activate the system in the event of a sensor failure or to preheat the slab in advance of an oncoming storm. We use a 12-hour spring wound timer switch to avoid the astronomic fuel bills caused by a system that was accidentally left on (Yes, this has happened to me). I also incorporate a "manual off" or disable switch to kill the entire system if the owner does not want it to operate. A simple three-way toggle switch with "off-auto-on" points would serve the same purpose.

The snow/ice sensors have proven to be the Achilles heel of these control systems. We have seen an unacceptable failure rate of these sensors. One manufacturer had the audacity to inform me that the failure was caused by water getting into the sensor. Really? Memo to manufacturer: these sensors are installed OUTSIDE! We finally found a sensor that would hold up to the elements, made by Caleffi, only to find out it was discontinued. Just my luck. I would be curious to hear what my fellow contractors are using.

We recently completed a system with a networked control system (Uponor CCN). I call these control systems DDC-Lite. It gives you most of the functionality of a commercial DDC system at a fraction of the price. These controls allow remote access, activation and monitoring of the snowmelt system from your office or anywhere with Internet access. I can remotely activate the system in advance of a storm, monitor it to see if it is functioning properly and locate failure points before leaving the shop. A scaled-down version of this system designed specifically for snowmelt systems is on my wish list.

If you are in the snow belt, snow/ice melt systems can be a profitable niche. Design and install them right or you will regret ever taking the job. Done right, and priced accordingly, there is nothing more satisfying than driving by one of your snowmelt projects and seeing a clear, dry driveway, while the neighbors are breaking their backs shoveling their drives. ■

Dan Foley *is president and owner of Foley Mechanical Inc., based in Lorton, Va. FMI specializes in radiant, hydronic and steam systems as well as mechanical systems for large custom homes. He can be reached at 703/339-8030 or at dfoley50@verizon.net.*

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FPE Corner

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

Elevators and sprinklers

Oh, how I long for the simpler days of years past; especially the days when it was not necessary to sprinkler elevator hoistways and elevator machine rooms. Actually, I did not want to get into the pros and cons of providing sprinkler protection for these areas this month. I will use this month's column to look at the code and standard requirements and some of the history behind it. Perhaps there have actually been fire incidents that revealed how correct it is to sprinkler these areas. I would be very interested in your emails about elevator hoistway/machine room fire incidents.

So, what's the big deal? The big deal comes from the provisions contained in *ASME A17.1, Safety Code for Elevators and Escalators*. The 2007 edition contains the following provision. Paragraph 2.8.3.2.2 states:

"2.8.3.3.2 In jurisdictions not enforcing the NBCC (National Building Code of Canada), where elevator equipment is located or its enclosure is configured such that application of water from sprinklers could cause unsafe elevator operation, means shall be provided to automatically disconnect the main line power supply to the affected elevator and any other power supplies used to move the elevator upon or prior to the application of water. (a) This means shall be independent of the elevator control and shall not be self-resetting. (b) Heat detectors and sprinkler flow switches used to initiate main line elevator power shutdown shall comply with the requirements of NFPA 72. (c) The activation of sprinklers outside of such locations shall not disconnect the main line elevator power supply. See also 2.27.3.3.6."

As a result, we have been faced with as many different ways to accomplish this elevator power shutdown as there are authorities having jurisdiction (at least those AHJs not using the NBCC) and elevator inspectors. In my view, it has been an expensive and complicated undertaking. How did we get into this mess?

Let's float back in time, exactly one day after the simpler times ended many years ago. A plan checker in Acme, Idaho, (or was it Frostbite Falls, Minnesota?) was reviewing a fire sprinkler submittal and said, "Hey, these spaces here on the drawing do not have sprinklers, and since those spaces do not have sprinklers, this building does not qualify for all the great advantages given to those that are 100% fully and completely sprinklered." So, after the hoistways and elevator machine room were sprinklered with simple extensions from the wet pipe system, the elevator inspector comes in and says, "Hey, no can do! You must meet this here requirement in ASME A17.1 if you want to put water in your elevators." The rest is history.

What was the justification for the plan reviewer's determination? I went back as far as the 1994 edition of NFPA 13. I will try to find the first appearance of this language and report back next month. This is important, because Frostbite Falls may still be using the 1896 edition.

In the 1994 edition of NFPA 13, the requirements for elevators contain some interesting language. Paragraph 4-13.5.1 requires sprinklers at the bottom of hoistways. There is an important exception, indicating that sprinkler protection was not required if the elevator shaft was 1) enclosed, 2) noncombustible and 3) did not contain hydraulic fluid. Paragraph 4-15.5.3 requires a sprinkler at the top of the

Continued on page 30

SFPE Notes

New specification for PE exam in 2012

The next Fire Protection Principles and Practice of Engineering Examination (PE) exam is set for October 26, 2012. This exam will have a new test specification, which was developed through a professional activities and knowledge/skills study. The study identified the important professional activities and knowledge/skills necessary for competent performance. The five major categories for the exam are:

Fire Protection Analysis – 20%, Fire Protection Management – 5%, Fire Dynamics – 12.5%, Active and Passive Fire Protection Systems – 50%, Egress and Occupant Movement – 12.5%. To see the complete test specification go to www.ncees.org/Documents/Public/Exam%20specifications/PE%20Fire%20Oct%202012.pdf.

James A. Milke is SFPE president

Professor James A. Milke takes office as president of the Society of Fire Protection Engineers (SFPE) for 2012. Milke is a professor and the chair of the Department of Fire Protection Engineering at the University of Maryland.

"At the University of Maryland, Milke has made significant contributions to the profession of fire protection engineering by advancing the science and technology that makes people and property safe from fire," said SFPE engineering program manager Chris Jelenewicz. "He is widely recognized throughout the world for his work in structural fire protection and smoke management systems."

Call for papers – SFPE 2012 annual meeting.

SFPE is now accepting abstracts for educational presentation for its two-day Engineering Technology Conference being held October 15 – 16, 2012, in Savannah, Ga. Deadline for submission is March 30, 2012. For submission guidelines or the most up-to-date conference information, visit http://bit.ly/At0rDh.

For the fifth straight year, Bradford White is the tank water heater brand most purchased by professional contractors. And again, we are the most recommended brand.

"We made the switch to Bradford White almost 15 years ago when we started having problems with another brand. Our reputation depends on the products we recommend so quality and reliability are critical. We couldn't be happier. Bradford White is loyal to the plumbing profession. Their products and people are top notch." ***Kevin and Ryan Carney - Carney Plumbing – Heating – Cooling, Line Lexington, PA***

The results of the 2010 CLEAReport*, an independent water heater study by Clear Seas Research, revealed that product quality, service, technical support, and the fact that Bradford White is not sold in retail stores were the most important factors to contractors when selecting a brand of tank type water heater.

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*Ranking is based on the 2006, 2007, 2008, 2009 and 2010 CLEAReports by Clear Seas Research. Please visit www.clearseasresearch.com for additional information.

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FPE Corner

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shaft but exempts this requirement if the hoistway was noncombustible and if the elevator car materials were in compliance with *ASME A17.1, Safety Code for Elevators and Escalators*, 1993 edition.

When it comes to elevator machine rooms, 4-15.5.2 simply states that "Automatic sprinklers in elevator machine rooms or at the tops of hoistways shall be of ordinary- or intermediate- temperature rating." What is interesting is that this is not a requirement to install sprinklers in the machine room; it simply indicates what the sprinkler temperature rating should be if one chooses to sprinkler the elevator machine room.

The 1996, 1999, 2002 and 2007 editions of NFPA 13 have basically the same requirements. All reference various editions of *ASME A17.1, Safety Code for Elevators and Escalators*. The 2010 edition of NFPA 13 also contains these same basic provisions and added language to allow exemption of sprinkler protection where hoistway shafts were of limited combustible construction (i.e., gypsum wallboard) and a requirement to sprinkler top and bottom of hoistways if the steel elevator belts were coated with polyurethane or other combustible materials.

Though not yet officially published, the 2013 edition of NFPA 13 will maintain the same requirements and have additional provisions that prohibit sprinklers from elevator machine rooms and hoistways for elevators that meet the special design requirements of and are used for occupant evacuation or first responder use. Perhaps we are seeing the beginning of the end of the requirements for sprinklers in elevators and hoistways.

After reviewing these editions of NFPA 13, it is my conclusion that sprinklers are not required within elevator machine rooms by NFPA 13. Also, in most cases, the exceptions permit one to avoid sprinklers in hoistways complying with ASME A17.1. Please let them know in Frostbite Falls, Minnesota.

Next month we will look into elevators and sprinklers a little more. ■

***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. He can be reached via email at SDannaway@ssdafire.com.*

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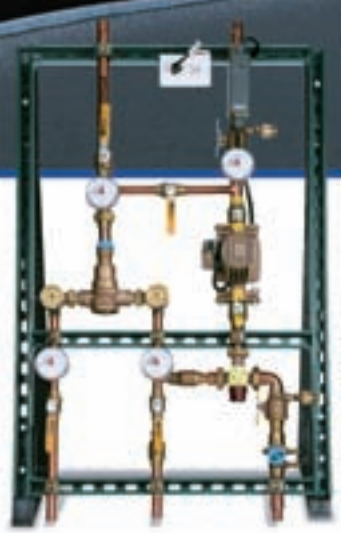

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Circle 20 on Reader Reply Form on page 49

Solar Solutions

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

Bristol's Six Principles for Good Solar Hydronic Design

Flagship solar combisystem controller: SLIC

In December of 2011, my company, SolarLogic LLC, reached a major milestone in solar heating control. At the MREA annual solar heating conference in Milwaukee, we announced the release of our Flagship solar home heating design and control system and demonstrated it to the solar professionals there. Figure 43-1 shows the control box and a hands-on display with a home heating simulator used for demonstration and training. For the past three years, we have been working quietly on a new way to design, deploy and control solar combisystems. Our intention is to take the guesswork out of solar heating design and control, so that even a complex solar hydronic combisystem can be deployed rapidly and controlled in a standard and predictable way by any qualified heating professional.

Figure 43-1

This has involved development of a software design package known as the SolarLogic Assisted Solar Heating Design (SLASH-D) and an all-inclusive heating system controller called the SolarLogic Integrated Control (SLIC). After several years of research and development, testing in our hydronic heating lab, Beta testing in solar homes in diverse locations, writing software for both design and control, acquiring four U.S. patents and packaging all this into a single control box, we have now released the fruits of this work for use in solar heating projects. The most recent product offering is known as the SLIC Generation II. It provides smaller buildings (less than 10,000 sq ft) with the benefits of a commercial energy management and control system, but without the high software and hardware costs common to those custom installations. Here is a brief summary of how it works.

SLASH-D (SolarLogic Assisted Solar Heating Design)

As the name implies, this design software is intended to assist a solar heating professional to design a whole-house solar combisystem by using a standard piping configuration that is compatible with a standard control strategy. The SLASH-D requires a minimum amount of information about the job, such as the heated square feet, the number of zones and the size of the DHW hot water load. The heating load of the house is quickly estimated, based on the weather/location and either the known heat loss from the house or an automated estimate of heat loss based on the type of construction (poor, average, well-built).

The program will then suggest the number of collectors and a recommended tilt based on the desired level of solar heat contribution (low, medium, high). The user can change the number, size and tilt of the collectors and watch the monthly fuel savings change in response. The program displays piping diagrams of all primary and secondary plumbing and suggests a list of parts, and the diagrams change in response to the users input. Many outputs and recommendations have an "override," so more experienced users can try other alternatives quickly.

All the piping and components are compatible with the SLIC control system. In fact, once the basic layout of the heating system has been accepted by the owner and installer, the output files from the SLASH-D design process become the input files for the SLIC controller, so that it "knows" what components are in the heating system without any further programming by the installer at startup. The system files can be provided to the SLIC on its built-in removable SD memory card or transferred to it directly through a network connection.

The SLASH-D is intended to take the guesswork, the "special solar knowledge" and the seemingly endless plumbing variations out of the design process for smaller solar heated buildings (less than 10,000 sq ft). It also automates the process of creating a sophisticated control system that is matched to the needs of the solar heating installation from its very inception.

SLIC (SolarLogic Integrated Control for solar combisystems)

The SLIC control replaces the need for all conventional controls commonly found in a hydronic heating system along with all the common solar controls. So, for example, in one recent installation, the solar heating system was originally designed with a conventional control system using eight Venstar 1045 two-stage room thermostats, one Taco SR504 switching enclosure with four pump relays, one Taco ZVC404 room thermostat/zone valve controller, one Taco ZVC406 thermostat/zone valve controller, one Tekmar 155 solar differential thermostat, two Tekmar 152 set point controllers, many relays and many sensors. During installation, this parts list was abandoned and replaced with one SLIC control box and eight SolarLogic room thermostats. All the pumps, sensors, thermostats and zone valves are wired directly to a single point of control.

Continued on page 34

TABLE 43-1: **Functions Provided By the SLIC Control System**
(abbreviated list)

Solar Heat Usage Controls	
Solar only –	Shuts off boiler when solar is hot enough. Allows direct usage of solar heat to bypass storage tanks. Up to 3 separate banks of collectors are allowed.
Backup only –	Continuous boiler operation can be allowed.
Solar preheat –	Solar heat (direct or from storage) can feed the boiler.
Heat dissipation –	Circulation is provided to prevent collector overheat.
Circulator choice –	Solar circulator pumps can be AC or PV powered.

Solar Domestic Hot Water Controls (DHW)	
Low limit aquastat –	Maintains a minimum "shower" temperature
Solar heat storage ON –	Puts solar heat into the DHW or alternate tank
Solar heat storage OFF –	Stops circulation to the DHW or other tank when required
Heat storage transfer –	Allows heat stored in solar tank to be transferred to DHW
High limit OFF –	Prevents DHW or other tank from getting too hot
Low limit priority –	More heat to DHW and less heat to house when needed
Solar heat source low limit –	Waits for a certain solar temperature before ON

Solar Heated Warm Mass Floor Zone Control (using SolarLogic thermostats)	
Room "target" temperature control -	Provided by knob on room thermostats
Boiler low limit –	Boiler allowed when solar heat is not enough
Minimum comfort temperature –	Boiler off when minimum room is reached
Solar heat banking allowed –	Solar heat storage into the mass floor ON
Maximum comfort temperature –	Solar heat storage into the floor OFF

Continued from page 32

When all the wiring makes a home run to a single box and all the terminals are clearly labeled, the installation becomes much easier.

The SLIC can control solar and backup heat sources over 10 heating zones, domestic hot water, heat storage tank, both a pool and spa and ice-melt. It uses a Vortex flow meter to calculate Btu solar contribution, monitors both glycol pressure and boiler water pressure and offers a pH meter to monitor the state of the glycol. The built-in software control algorithms incorporate our experience from hundreds of solar heating installations spanning the past 30 years. Basically, the software does what I would do if I were in the boiler room watching over the system.

From the user's point of view, it is easy to operate by simply turning the room thermostats up or down. But, internally, it makes sophisticated energy-priority decisions that mimic multiple differential thermostats and two-stage set point thermostats working in concert. Datalogging is built into the system, which records everything happening to the heating system continuously at over 200 data points in data files that are compatible with spreadsheet display. The owner, the installer or SolarLogic technical support have the capability to inspect the performance (past or present) and diagnose or adjust the system remotely. This eliminates call-backs and has proven to be practical, useful and informative, especially for fine tuning the balance between comfort and efficiency for the solar homes where the earliest systems have been installed.

The control system can be accessed from any computer, either plugged into the SLIC directly via an Ethernet switch, over the local area network (LAN) in the house or over the Internet. Access is protected by passwords and other security measures. A typical view of a SLIC display page is shown in Figure 43-3 which shows room thermostat details as an example. Display pages can be tab-selected and displayed on any computer from any location (with the right password and a connection to the network) and used for remote scrutiny and adjustment.

Table 43-1 shows an abbreviated list of the control functions built into the SLIC control system. All of them are adjustable through software for optimizing the performance of the house. Features that are not needed are simply turned off by the system software at the time of installation. ■

Other Standard Features and Capabilities Built Into the SLIC System

- Larger heat storage tanks with management of heat in and heat out
- Baseboard zones or other zones with no thermal mass
- Pool or spa solar heating (similar to a low temp. solar water tank)
- Solar-only switch for each room, DHW or the whole house heat
- Freeze protection in solar-only mode (runs the boiler to maintain 45 F)
- Night tank cooling through the solar panels
- Night floor cooling through the solar panels or other radiator panels
- Solar overheat dissipation using pools, ice melt zones or other heat sink
- Control to allow additional collector cooling "fins" or panels
- Web interactive temperature settings can be operated from any remote computer.
- Datalogging and Btu measurement for recording system performance and energy flow

Getting Into the Mix

By Peter Kraut, P.E.

A thermostatic mixing valve tempers hot water down to a lower temperature by:

a. Passing through a chilled water heat exchanger
b. Isentropic expansion
c. Adding cold water

If you guessed "c" you're correct! It probably wouldn't surprise you to hear that most plumbing designers would answer this correctly. Why is it then that so much trouble stems from these little devices? Like any other engineered system, the proper design and specification of a mixing valve requires an understanding of how it works. What must follow is a careful analysis of how it will work under varying conditions.

Let's take the example of a small apartment building with 30 units. Since most model codes require thermostatic mixing valves on hot water systems serving bathtubs, a central mixing valve at the source might be a good choice. Water can be stored at 140 degrees Fahrenheit and blended down to 120 degrees for delivery to the fixtures. Using the lever rule and assuming 60 degree cold water, 25% cold water would be blended with 75% hot water:

$$(0.25 \times 60^{\circ}F) + (0.75 \times 140^{\circ}F) = 120^{\circ}F$$

When everybody is showering, the operation is quite simple, but what about at night when the circulating pump is trying to move water through the valve. Remember, the volume of the system is fixed. If there is no water being drawn out and you must add 1 gallon of cold water for every 3 gallons of hot water that passes through the valve, where does the water go? An improperly detailed hot water return is a common error in the design of hot water systems. Most manufacturer's suggest a solution similar to figure A.

In this illustration, a large percentage of the returning tempered water would enter the "cold" side of the mixing valve, while a small percentage of the returning tempered water would travel through the water heater and enter the "hot" side of the mixing valve. The ball valve is used to balance this flow. Alternatively, some manufacturers direct the returning tempered water to a return water connection on the thermostatic mixing valve so it is important to follow their installation instructions carefully. Note that only circulated water that passes through the mixing valve would be configured as such. If a separate 140 degree loop was circulated back to the heater, it could join the cold water feed to the heater in the traditional method. It is important not to mix returning hot water of differing temperatures as this creates temperature spikes in the return

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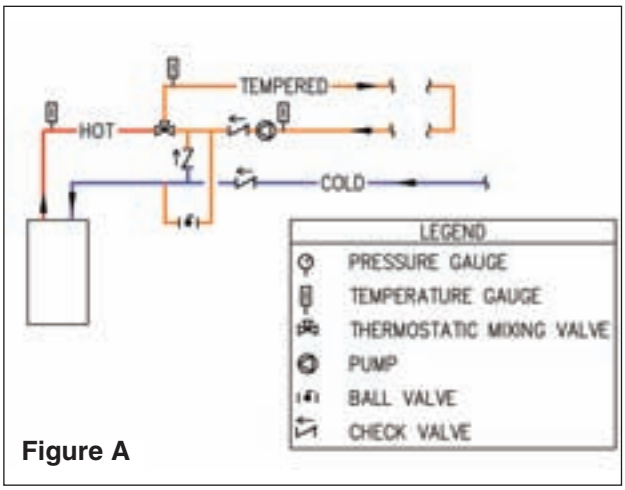

Figure A

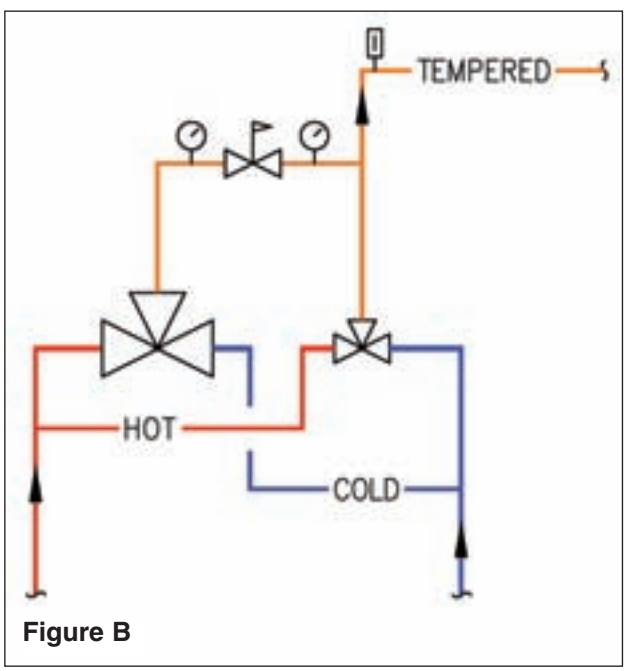

Figure B

Mixing Valves

Continued from page 35

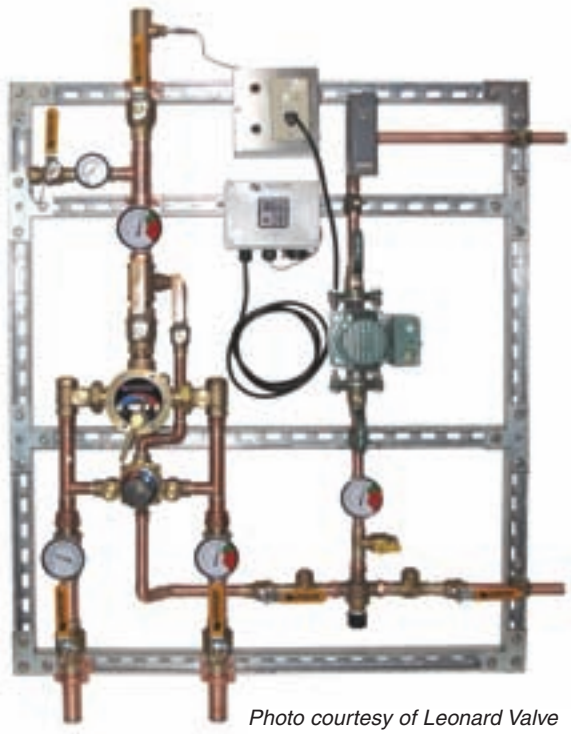

Photo courtesy of Leonard Valve

and may lead to temperature control issues in the supply.

To understand the next issue, one must understand how the valve adjusts to varying inlet temperatures to produce a constant outlet temperature. When hotter water enters the valve, a thermostat within the valve expands, throttling down the hot water inlet while simultaneously opening the cold water inlet. When colder water enters the valve, the thermostat contracts creating the opposite effect.

Another common error in the design of hot water systems is in the sizing of the mixing valve. In most cases, the valve is not the same size as the pipe; it is smaller. Hot water pipes are generously sized to meet the velocity requirements of copper pipe. Unfortunately, an oversized thermostatic mixing valve will not react quick enough to regulate temperatures under low flow conditions. Conversely, an undersized thermostatic mixing valve will create a significant pressure drop in your system. Therefore, the valve must be sized to meet both the highest and lowest anticipated flow rates. The manufacturer's data will provide the correct solution. Occasionally, two valves are needed as shown in figure B.

In this diagram, a large thermostatic mixing valve is used to handle the high flows while a small thermostatic valve is used to handle the low flows. Note that the high flows must pass through a pressure reducing valve before joining the tempered water. This pressure reducing valve

is used to ensure that the low flows pass unrestricted through the small valve until the pressure drop is greater than the pressure drop created by the pressure reducing valve. At that time, water will flow through both valves. The maximum flow through the system is then equal to the sum of the flow through the two valves. Most manufacturers provide a packaged system that includes valve necessary for adjusting and balancing the system.

If a circulated loop is required, the high/low system in Figure B can be substituted for the thermostatic mixing valve in Figure A. At this point, however, the piping may become confusing to the plumbing contractor. To remedy that problem, manufacturers also provide pre-assembled, tested systems with pumps. One such example is the picture to the left.

Thermostatic mixing valves that control the maximum temperature to a fixture or group of fixtures must meet the standards outlined in ASSE 1070. It should be understood that when either the hot or the cold water supply is cut off, the valve defaults to a closed position and the flow of water is stopped. For this reason, a thermostatic mixing valve designed for domestic water use should never be used for emergency eyewash and shower systems. Those fixtures must be specified with a thermostatic mixing valve certified to ASSE 1071 standards. These valves will stop the flow of water when the cold supply is lost, but continue the flow of water when the hot supply is lost.

Most model codes also require thermostatic mixing valves at public lavatories. If these are the only fixtures requiring protection, small point-of-use valves are an easy, inexpensive option. Many of these can handle up to 5 gallons per minute so designers are tempted to use only one to sever a battery of lavatories. Think twice before doing this. A quick check of the volume in the uncirculated fixture supply often reveals unsatisfactory delivery times.

In troubleshooting an installation for a hotel in Orange County, the contractor checked everything mentioned above. Nevertheless, he was unable to get a water temperature out of the valve hotter than 108 degrees Fahrenheit. The drawings and calculations were double checked. Many experts were called in to no avail. Ultimately, the valve manufacturer's engineer was contacted and he simply pointed out that under the decorative cover, there was a tiny screw to adjust the hot water limit stop; a safety measure designed to adjust the mechanical range of the dial. Oops. ■

***Peter A. Kraut**, P.E., is a licensed Mechanical Engineer in 23 states. He founded South Coast Engineering Group, near Los Angeles, California in 2001. He can be reached via email at pkraut@socoeng.com.*

2012 boiler & water heater forecast – flat

Plumbing Engineer offers its Boiler & Water Heater Report, where boiler manufacturers are candid about their company, products and the boiler market forecast. The players in the water heater manufacturing industry have spoken. The overwhelming consensus when talking about the 2012 boiler and water heater forecast — flat.

"We expect the market in 2012 to be much like the market in 2011. Total units will be flat to slightly up (<2%). Commercial will continue to be stronger than residential with growth in the 3-4% range," said Bruce Carnevale, vice president of sales and marketing, Bradford White.

The manufacturers appear in no particular order.

Harsco Industrial, Patterson-Kelley

www.harscopk.com

Skid-mounted fabricated systems are available for both space heating and domestic water heating needs. Fabricated systems are turnkey solutions, offering single source responsibility with all components engineered to perform together and maximize efficiency while minimizing risk. Individual components are factory mounted on a skid, piped and wired together to be delivered as a complete package.

Trends: Commercial boiler equipment is leaning heavily toward high efficiency condensing systems. It's being directed by "green technology" and by energy costs. Many installations are actually being driven by "cost of ownership," which includes energy cost and maintenance, as well as first cost.

Company News: At a Harsco Industrial, Patterson-Kelley rep council meeting in 2011, it was concluded that many of the next generation of HVAC personnel — from consulting engineers to equipment sales engineers — had, at best, a course in thermodynamics in college. The question became "How do we train the next generation in our industry in the basics?" "What's a boiler?" "What is a water heater?" "How do you apply it, size it, etc.?"

HI-PK has developed what it has dubbed "Commercial Boiler — 101" and "Commercial Water Heater — 101." It covers from "What is a btu?" to "What is a condensing boiler/heating system, as well as instantaneous and semi-instantaneous water heater?" It also includes piping basics, as well as application basics. It's geared to the commercial size systems, but can be applied to residential as well. We are building a foundation for an ongoing educational process.

Specifying Energy Efficiency: Educate yourself. Present the value of products and offerings; even though the initial cost may be higher, they can realize long-term savings. Emphasize return on investment as well as payback period.

Weil-McLain

www.weil-mclain.com

Company News: Loaded with a winning combination of features, Weil-McLain introduces the WM97+ Boiler. The WM97+, is a wall-mount boiler that comes in 70,000 and 110,000 BTU input models, both at a AFUE rating of 97%. The WM97+ offers a unique condensing stainless steel heat exchanger, built in boiler circulator and a built in primary secondary option.

A.O. Smith

www.hotwater.com

All residential and commercial models offer improved flow rates for increased water delivery.

Trends: Due to uncertainty around the Federal tax credit program we've seen more of a focus on local and state utility incentives, which are typically based on energy star ratings. A. O. Smith continues to see increased interest in water heating options beyond standard product in increased energy efficiency and better performance of products.

Company News: A.O. Smith offers a comprehensive line of conventional and condensing tankless water heaters. All residential and commercial models offer improved flow rates for increased water delivery and a digital interface for simple programming — along with a 12-year limited warranty. A.O. Smith's condensing tankless line features energy factors up to .91. Plus, all residential models are energy star® qualified and are eligible for a federal tax credit.

In addition to the product training courses, A.O. Smith launched an extensive tankless training program. The company also has recently launched a complete package of contractor-focused tools designed to help our contractors with things that are important to their business such as marketing and sales based tools.

Water Heating Market Outlook: The overall market will remain relatively flat to 2011 in most categories, with some growth in high efficiency categories.

Specifying Energy Efficiency: Always be educated on the variety of new water heating options available (hybrid, heat pump, solar, condensing technologies) and the value of each technology. Another tool is to be familiar with the national and local utility incentives for high efficiency products.

Navien America

www.navienamerica.com

Company News: ASME certified combination of condensing boilers and tankless water heaters is a complete line of Combi Boilers — Model Numbers are CH 240 ASME with 199,000 Btus, CH 210 ASME with 180,000 Btus, and CH 180 ASME with 150,000 Btus — are offered in both Natural Gas and Propane fuel applications. All of the units are condensing and can be vented using 3" Schedule 40 PVC pipe in most application. Navien America.

Bradford White
www.bradfordwhite.com

The OnGuard RMT™ - Water Heater Management System is a remote monitoring technology and service available for commercial and residential gas powered water heaters. OnGuard RMT™ combines proprietary hardware, alert status notification, 24/7 factory-based technical support and fast service dispatch.

Trends: The total water heater market for 2011 — when all the data is compiled — will be flat to slightly down compared to 2010. Commercial will be up about 2.5%. Energy Star requirements for gas water heaters were increased from a .62 to .67 Energy Factor (EF) in 2011. The higher EF product is more complicated and more expensive. Coupled with lower rebates, we expect less demand for Energy Star water heaters. Solar thermal water heaters for residential have not gained much traction in the market. Again, rebates at the state level have all but gone away. Several major players in the solar market have pulled out. Standard controls on residential gas products have more feature content since the introduction of the Bradford White ICON System. Others have followed with similar technology. For the first time in many years, it appears that the overall tankless water heater market will not grow in 2011, however, there continues to be a shift from standard efficiency to high efficiency.

Water Heating Market Outlook: We expect the market in 2012 to be much like the market in 2011. Total units will be flat to slightly up (<2%). Commercial will continue to be stronger than residential with growth in the 3-4% range.

American Water Heaters
www.americanwaterheater.com

Company News: American Water Heaters recently rolled out a newly designed fleet of gas water heaters. The new line features an advanced gas valve design with electronic controls and LED indicators.

This improved design offers many advanced features including:

New Electronic Gas Valve: New high-tech gas control is a self-powered gas valve that uses a thermopile to generate the power needed to operate the control. No external power source is required. With fewer moving parts and internal components, the valve optimizes performance through improved temperature control and accuracy.

LimeFighter® Inlet Tube: Thanks to proven technology, the inlet tube features water jets that redirect incoming cold water into the tank, creating turbulence, which helps prevent and reduce lime build-up.

Brass Drain Valve: The corrosion-resistant valve contributes to improved reliability.

PEX-Lined Nipples: The PEX-lined nipples are specifically designed for water heater apps. They prevent build-up in the waterway, allowing for maximum flow.

Heat Trap Inserts: The heat trap inserts help retain heat in the tank, reducing operating costs.

These enhancements are included on all American Water Heaters standard conventional-vent residential gas models under 75,000 BTU input.

Rheem Manufacturing Co.
www.rheem.com

The 29-gallon XR90 Extreme Recovery Gas Water Heater delivers more hot water, faster and more efficiently than a standard 50-gallon gas water heater, assuming the latter has an input of a 40,000 Btu per hour and an Energy Factor of 0.58. The Rheem XR90 costs approximately 17 percent less to operate annually: only $261 versus $315 per year for a standard 50-gallon gas model — based on U.S. Department of Energy annual operating cost figures.

Trends: A greater need for energy efficient water heaters. Thanks to national and local tax incentives and utility rebates enacted in recent years, homeowners are more knowledgeable about the benefits of energy efficient appliances such as lower utility costs and decreased impact on the environment. That said, the elimination of federal and local tax credits in 2011 hindered consumers' ability to purchase some of these efficient products and, unfortunately, we don't expect to see many national and local tax incentives in 2012 for energy efficient water heaters. Therefore, it will important for manufacturers to offer higher efficiency products with proven payback stories. These products must be made available at price points that are comfortable for today's homeowner, and the products should easily drop-in for standard efficiency products.

With that, manufacturers will also continue developing products that meet key government regulations such as California's new legislation, which states that all residential and commercial gas water heaters with inputs equal to or greater than 75,000 Btu/h must meet a NOx emission limit of 14 nanograms per Joule of heat output. In 2012, contractors and distributors can expect to see some new Rheem residential and commercial products that facilitate significant energy savings.

In addition, from Rheem's standpoint, we know that 2012 will facilitate even more introductions of truly integrated solutions that have the ability to meet the market demand for high efficiency and short paybacks. Since Rheem is the only company in North America manufacturing full lines of heating, cooling, water heating and pool/spa heating products, we're the best qualified to develop these highly efficient integrated systems.

For example, in January, Rheem will launch the new Rheem H2AC Packaged Rooftop Unit™ with eSync Integration Technology™ . This industry-first system provides air conditioning and water heating for restaurants. It works by leveraging the heat removed from the HVAC system — which would normally be rejected into the atmosphere — as a source for hot water.

Market Forecast: In 2011, the water heating market saw some signs of improvement, but it still was a tough environment for plumbers, contractors and wholesalers. We expect that 2012 will present us with a similar business climate.

Consumer demand is the primary driver for residential product development. In 2012, Rheem expects consumers to search for energy efficient solutions at price points that meet their budgets. The commercial sector will continue to see replacement activity and Rheem expects most of the growth to come from energy efficiency upgrades.

PB Heat, LLC
www.peerlessboilers.com

PB Heat will be introducing a new Peerless® PureFire® model that will be applied in the 1.5M MBH and larger boiler market segment. This boiler will offer higher heating and hot water generating capacities while featuring reliable controls and dependability.

Trends: The big news for 2012 is the changes in the efficiency regulations that were adopted a few years ago and now will come into law in 2012. The new regulations affect both residential as well as commercial products. In summary here are the new regulations:

Commercial Boilers — Effective March 2, 2012

• Hot water boilers — gas fired — Greater than 300MBH and less than 2.5MMBH — minimum 80% Thermal efficiency

• Hot water boilers — oil fired — Greater than 300MBH and less than 2.5MMBH — minimum 82% Thermal efficiency

• Steam boilers — gas fired — Natural draft -Greater than 300MBH and less than 2.5MMBH — minimum 77% Thermal efficiency

• Steam boilers — gas fired — non-natural draft -Greater than 300MBH and less than 2.5MMBH — minimum 79% Thermal efficiency

• Steam boilers — oil fired — Greater than 300MBH and less than 2.5MMBH — minimum 81% thermal efficiency

• Hot water boilers — gas fired — greater than 2.5MMBH — 82% Combustion efficiency

• Hot water boilers — oil fired — greater than 2.5MMBH — 84% Combustion efficiency

• Steam boilers — gas fired — greater than 2.5MMBH — natural draft — 77% thermal efficiency

• Steam boilers — gas fired — greater than 2.5MMBH — non-natural draft — 79% thermal efficiency

• Steam boilers — oil fired — greater than 2.5MMBH — 81% thermal efficiency

Residential Boilers — Effective September 1, 2012

• Gas Hot Water — Minimum AFUE — 82%. Constant burning pilot systems will no longer be allowed and must be equipped with an automatic means of water temperature adjustment.

• Gas Steam — Minimum 80% AFUE — Constant burning pilot systems will no longer be allowed

• Oil Hot Water — Minimum 84% AFUE and must be equipped with an automatic means for adjusting water temperature

• Oil Steam — Minimum 82% AFUE

Note: Oil systems equipped with a hot water coil for domestic hot water production are exempt from these regulations.

All residential hot water boilers must be equipped with an automatic means of adjusting temperature. This new regulation will necessitate the introduction of new controls on hot water boilers. The new controls will automatically adjust the water temperature of the boiler to changes in the building heat loss and will result in energy savings vs. current boiler offerings.

Market Forecast: While the market may have been somewhat depressed, we have seen signs of recovery and much optimism on the part of consumers who are now spending at much higher levels on durable goods.

Stiebel Eltron Inc.
www.stiebeleltron.com

The Accelera® 300 Heat Pump Water Heater can extract up to 80% of its energy requirements from the energy in the air around it. Compressor and fan consume only 1kWh of electricity to generate the heat equivalent of 3 – 5kWh.

Trends: In spite of the fact that the federal government tax credits for new solar thermal installations are in place through 2017, there has been some backpedaling with regard to the federal tax credits for Energy Star certified heat pump water heaters. These credits were reduced considerably in 2011, and as far as we can determine, the credits will be eliminated in 2012. The tax credits make a significant difference in promoting consumer demand. Thus, the federal government seems to be sending mixed signals in their promotion of new energy saving water heating products. Incentives and tax rebates at the state and local levels are facing cut-backs as well, since most of these budgets are under stress.

Company News: Stiebel Eltron, Inc. is planning on introducing two new products in 2012. A new high-speed hand dryer, which will shorten drying time considerably. Also, Stiebel Eltron, Inc. will introduce a new line of CNS wall-mounted convection space heaters.

In light of the destruction suffered in Vermont from tropical storm Irene, Stiebel Eltron is offering greatly discounted pricing on water heating equipment in order to help the people of Vermont cope with the lingering effects of the storm.

Market Forecast: The short term over the last few months has shown an overall flattening in the hot water heating business, in spite of some monthly ups and downs. Stiebel Eltron is, however, optimistic that the longer term will bring increased tankless, heat pump and solar equipment sales for the year 2012.

Laars Heating Systems
www.laars.com

Company News: Mighty Stack volume water heater combines the Mighty Therm 2 boiler with an 80-gallon storage tank resulting in 199, 300 and 399 MBH sizes fueled by natural/propane gas. With less than 10 ppm NOx emissions, the sealed-combustion Mighty Stack offers 83% thermal efficiency and meets low lead requirements. Key assets include its small footprint, a removable upper boiler section for easy handling, common venting and up to 50 feet of Category I or III venting. Mighty Stack can be installed inside or outside. Standard components include tank aquastat, pressure relief valve, hot surface pilot ignition and an integral induced-draft fan to allow for either horizontal or vertical venting.

Lochinvar Corp.
www.Lochinvar.com

The ARMOR X2 combines stainless steel heat exchanger technology with modulating/condensing combustion to deliver thermal efficiencies as high as 96 percent. Available in models with 1.0, 1.3 and 1.5 million Btu/hr inputs, ARMOR X2 offers an efficient, advanced solution for a wide range of commercial applications.

Trends: Energy Star products will continue to gain more ground as people are more aware of high fuel costs. We don't expect to see a great deal of new products on the water heating side introduced within the industry for the next few years. 2015 will bring a number of new water heating products related to the next round of NAECA efficiency changes.

Company News: In 2012, Lochinvar is expanding our technical service and application training at Lochinvar University as well as adding additional field training opportunities for our customers to attend in their local market.

Market Forecast: The hot water market will remain flat in 2012. The economy is still stagnant and will not change until after the election as companies will avoid new investments until they are sure of the political direction of the country for the next four years and the resultant impact on business costs.

Specifying Energy Efficiency: The installer can use two principles. They can stress the fuel savings that high efficiency products bring. This will relate to most people as it directly affects the pocketbook. A simple cost/payback analysis can be effective. The second is the "green" aspect — the natural resources saved by utilizing high efficient products.

Utica Boilers
www.uticaboilers.com

Company News: Utica Boilers announces the H2O Series, a complete line of stainless steel indirect water heaters, storage tanks, dual coil solar tanks and buffer tanks. H2O is constructed of durable 316L stainless steel and manufactured in the USA for Utica dependability. With a wide range of sizes from 30- to 115-gallon capacities, the H2O features stainless steel dip tube, thermoplastic jacket and a low pressure drop. Top connections allow for easy installation.

State Water Heaters
www.statewaterheaters.com

Company News: The Premier® high efficiency gas water heater's patented air intake system turbocharges the combustion process to produce the highest efficiency available for a standard atmospheric product. The Premier installs with the same gas, water and venting connections as a standard model, but it operates well above the standard efficiency with an Energy Factor of .70, making the Premier high efficiency gas water heater ENERGY STAR® qualified.

Raypak
www.raypak.com

The new modulating or stage fire VERSA IC™ fully integrates temperature control, ignition, safety and individual fault monitoring. Field upgradable. Raypak's unique Cold Water Protection control function is now built in; simply add the appropriate 3-way valve or variable speed pump. A Modbus communications port is standard for continuous monitoring, trending, and trouble shooting.

Trends: A shift in systems design toward integrated control platforms that perform all command and control functions for single and multiple boilers from one location, boiler mounted in the boiler room or on the boiler(s). For multiple boilers, they manage energy saving hybrid systems, too. These new controls usually maintain two-way communications with building BMS.

Another product innovation is the capability of some condensing boilers to be applied directly to separate and open systems, for DHW and pool heating. Corrosion resistant waterways need no isolating heat exchanger. Combined with high recovery boilers that run only on demand, the result is the lowest possible return water temperature. For hydronic heating — without the need for heat exchangers in an indirect system design — the lowest possible outdoor reset temperatures — often below 100 degrees F — can often be attained.

The latest hot water system innovation is a much greater utilization of simple, user-friendly ICPs that control everything: system command, tracking, safety, fault monitoring and profiling, plus communication with building BMS.

The expectations of the long promised and advertised, but seldom achieved, 95%+ efficiency can be expected to occur most of the time in real world applications, not just the test lab. These are equipment-based energy saving opportunities available to system designers even before alternative energy is considered. A particularly dramatic energy usage reduction in mid range and milder climates has been experienced so far when they are incorporated. All new commercial DHW and pool systems should be designed for initial, or later, integration of any renewable energy source that is available, or may become so later. This includes solar, geothermal, waste heat recovery, etc.

Market Forecast: For 2012, we look forward to a continuing slow recovery in the commercial hot water market. The macro trends mentioned earlier will accelerate rapidly, as well as the integration of renewable energy approaches.

Specifying Energy Efficiency: For replacement and design build installers, research and stay current on the details of local codes, available rebates, government incentives, LEED and any other cost-reducing information you can share with your clients. They are no longer just price-shopping customers.

Revisiting 'Homes of the Future'

Rainwater system prompts LEED Platinum Certification

In 1933, the Tennessee Valley Authority (TVA) constructed a model community, Norris, Tennessee, as part of the Norris Dam project. The series of small homes served as the archetype for modern and efficient living in that time period. Over the course of the last two-and-a-half years, 50 University of Tennessee-Knoxville students have been reviving the spirit of the old town by building the new Norris House.

"The project began in fall of 2008 to commemorate the TVA's 75th anniversary and is a 21st century reinterpretation of the original series of Norris homes," said research specialist and UTK architectural alumnus, Samuel Mortimer.

The Norris House is the largest design/build project ever conducted by UTK students. The home aspires to become one of only seven certified LEED Platinum homes in Tennessee. To accomplish this rating, many factors come together, lending to the project's resolved focus on sustainability.

Over the last two-and-a-half years, 50 University of Tennessee-Knoxville students have been building the new Norris House, complete with a plumbing system, reverse osmosis system, greywater distribution system and solar domestic hot water system.

"As unique and ingenious as the whole project is, the heart and soul is the Brae rainwater collection system," said Scott Robinson, owner of Scott's Plumbing in Knoxville.

"About 80 percent of the roof's surface area is used to collect rainwater," said Mortimer.

From the roof, the water goes through a series of prefilters before entering an above- ground, 400-gallon storage tank. When the "house tank" reaches capacity, overflow runs into a 200-gallon tank below the garden. The garden tank is equipped with a hand pump to supply water to the landscape and a vegetable garden sized to grow enough produce for two people.

The average annual rainfall on campus is 54 inches per year. At that rate, and with the roof area that feeds the catchment tanks, the system collects nearly 21,000 gallons annually. With water saving fixtures, calculations show that, with two inhabitants, annual water use for the home is 16,500 gallons, well below the harvesting system's capability.

According to Robinson, the system that was installed during the home's construction — technology supplied by BRAE, a Watts Water Technologies subsidiary — harvests more rainwater than Norris House occupants typically use. Scott's Plumbing, with the help of the UTK team, also installed portions of the home's plumbing system, a domestic water solar thermal panel and a greywater distribution system. The way the system is set up, rainfall usually exceeds the use of stored rainwater and simply flows out onto a terraced spillway, watering the gardens.

The spillway is made up of five multilevel flower beds, each containing hearty local plant species.

"Landscape architecture majors helped design the overflow beds," said Mortimer. "They carefully selected plant species that can not only handle being inundated with water but also thrive in a drought-like condition."

"It's very important to keep the greywater from entering the sterile city water," said Robinson. "The students worked to shed light on the safety of using a greywater distribution system as well as a rain collection system. The town of Norris was rightfully concerned about greywater entering the landscape."

Since the greywater system is experimental, both the city of Norris and the design team wanted a fail-safe alternative so, with the flip of a valve, the system can be easily diverted to serve the city sewer.

Norris House greywater is collected from the bathroom sink, shower and washing machine. It is piped underground and enters the landscape through a perforated canister buried in a large bed of mulch and soil. The bed is sized to hold approximately 150 gallons of greywater before saturating and is also planted with native plants that were selected based on anticipated greywater volume.

"The UTK team worked closely with the Tennessee Department of Conservation and the Norris Water Commission to ensure health and safety," said College of Architecture and Design assistant professor Tricia Stuth. "The city manager worked on ordinance revisions that were ultimately passed by the city council. The building permit allows systems to operate for one year, under the oversight of the UTK team, and data collected will be used to support making the temporary permits permanent."

The 768-square-foot home will provide verifiable technical data to demonstrate the viability of residential rainwater collection and use. The project was initiated as an entry into the EPA's People Prosperity and the Planet (P3) competition, a national competition that encourages students to propose "solutions to real world challenges involving the overall sustainability of human society."

The first of four phases was a research and design period, funded by a $10,000 grant from the EPA. Ultimately, UTK's team was chosen as one of six winners from among 40 teams, and the EPA granted $75,000 to the project.

In phase two, students began their collaboration with Clayton Homes, manufacturer of modular homes. Together, they established goals, targeting a LEED for Homes Platinum rating. Some students collaborated with Clayton Homes during the design phase. Others prepared the physical site in Norris. Another team began work on various components of the building's interior for later installation. During the fall 2010 semester, phase three construction began.

"The students always bring a fresh perspective to things that we do every day," said Andy Hutsell, Clayton Homes designer. "They're passionate about their work, and they'll be much better equipped when they go out into the world because of the Norris House experience."

Now, in the midst of the "demonstration and evaluation" phase, the college's chair of the Master of Landscape Architecture program and his wife will live in the home. Energy consumption, temperature, relative humidity, water use and water quality will be measured. At the end of the evaluation period, the home will be up for sale; proceeds will be used as seed money for the next project.

The home aspires to become one of only seven certified LEED Platinum homes in Tennessee. To accomplish this rating, many factors come together, lending to the project's resolved focus on sustainability.

From the standing seam alloy roof to the reclaimed oak flooring, the home is a prime example of what LEED construction should be. With a super-tight, heavily insulated building envelope, the structure loses very little energy to the outside world. Every square inch that could be insulated, was insulated. Foundation block cores were filled with Perilite as the building footprint started to take shape. Inside the foundation walls, two inches of rigid insulation was used, and the foundation rim was sprayed with Icynene.

"We decided to use advanced framing techniques, which results in a 17 percent reduction in lumber and substantially more insulation," said Mortimer. The 24-inch stud bays are filled with thick batting insulation. On the outside of the walls, one-inch rigid insulation curbs any thermal bridging across the two-by-six studs. The ceiling rafter bays and gable ends were also filled with batting insulation, and sheets of half-inch rigid

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Rooftop solar panels supplies hot water to an 80-gallon tank inside the home.

insulation were hung before the drywall was installed. The outside of the building is clad with Atlantic white cedar. Double-pane, low-E coated, argon-filled windows also limit energy transfer.

"We calculated the home's heat loss at 17,442 Btu," said Mortimer, "or 19.5 Btu per square foot. The blower door test yielded .04 ACH, the lowest score ever verified by our green-rater."

A four-by-eight foot Enerworks solar-thermal panel on the roof supplies hot water to an 80-gallon tank in the home. A 1.5 gpm electric instantaneous water heater supplements the solar-heater water when necessary.

Heating and cooling the home is achieved through the use of a multiple-head mini split system. The building has one traditional bedroom as the first zone, a "swing space" that can be used as a second bedroom and a kitchen. Each of the three zones calls for a separate air handler; all are connected to a single, multi-zone condensing unit. As an addition to the HVAC system, the new Norris House has an energy recovery ventilation (ERV) system in the sealed crawlspace under the building. Depending on the season, the ERV either pre-cools or pre-warms incoming fresh air.

Throughout the project, goals set by the student team were consistently met. "UTK has never done anything like this before, especially on this scale" said Mortimer.

"The Norris House project was real-life work experience that's invaluable to the students who've been involved," said Mary French, a College of Engineering grad student. "I'm really glad I had the opportunity to participate."

Watts also supplied a complete reverse osmosis system for the New Norris House project. Only recently installed, treated water is still undergoing testing. Potable water from the rainwater harvesting system is the goal. ■

Circle 23 on Reader Reply Form on page 49

Viega ProPress® will LIVESTRONG® in Kansas City

By Amy Williams

U.S. Engineering, in Kansas City, Mo., has installed Viega ProPress® copper in the new LIVESTRONG Sporting Park in Kansas City, Kan. The $200 million, 365,000-square-foot stadium seats 18,500 people for soccer games and 25,000 people for concerts and is one of the most technologically advanced stadiums in the United States. The park's first game was held on June 9, 2011.

Construction on the LIVE**STRONG** Sporting Park began on April 1, 2010, starting with the underground work. Aboveground piping work began in June 2010. Viega ProPress, in sizes 1/2" to 2 1/2", was installed for use in domestic water, condensate drains and indirect food service drain applications.

ProPress offers the unique Smart Connect feature, which allows installers to identify unpressed connections immediately during pressure testing. This provides additional safety and time savings, helping installers finish their work on time or ahead of schedule.

ProPress offers the unique Smart Connect feature, which allows installers to identify unpressed connections immediately during pressure testing.

Michelle Land is the senior project manager for U.S. Engineering, a mechanical contractor that works on commercial and industrial projects, including stadiums and office buildings. "ProPress is pretty much our company standard," Land said. "We use it company-wide. The Smart Connect feature helped us make sure all our connections were secure."

U.S. Engineering chose to use ProPress because of its easy installation and safety features. "ProPress is easier to install in the field," Land said, "and you have no risk of starting a fire, as you do when you solder. We really

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LIVESTRONG Sporting Park

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Fans enjoy a soccer match on a summer evening at the Livestrong Sporting Park facility.

like it. We've tried competitors' systems, and we like Viega ProPress better."

According to Land, U.S. Engineering actually finished their work earlier than anticipated. "ProPress certainly made it easier to maintain the schedule," she said.

Founded in 1893, U.S. Engineering believes that the more they put into a project, the more their customers will receive from it. They offer preconstruction and fabrication services, as well as other services, such as mechanical construction and commissioning. They provide a high level of service, and their years of experience make them a leader in the industry.

LIVE**STRONG**, founded by cyclist Lance Armstrong, has been helping to improve the lives of people affected by cancer since 1997.

Viega ProPress is the smart, secure method of joining copper tubing. And with Viega's patented Smart Connect feature, you can be certain that you are providing the most secure, highest-quality installation in the industry.

LIVE**STRONG**, founded by cyclist Lance Armstrong, has been helping to improve the lives of people affected by cancer since 1997. Portions of all stadium revenues, including ticket sales and concessions, are donated to fund LIVE**STRONG**'s programs. ■

*LIVE**STRONG**® is a registered trademark of the Lance Armstrong Foundation*

Product News

SCS® Dial-a-Time pump control

SCS time adjustable pump control allows the end user to dial in the desired pumping duration with a built-in eight-position dial, offering choices from seconds or minutes to suit the needs of any particular application. The SCS switch replaces conventional float switches and is a must have in confined space applications. This unit will operate any pump up to 1 hp or 16 FLA. **SEEwater**.

Circle 100 on Reader Reply Form on page 49

QuickTurn frost-free hydrants

The popularity of QT hose bibs, sillcocks and hydrants and the superior quality and performance of Arrowhead's patented Arrow-Breaker® frost-free hydrants with integrated (built-In) anti-siphon vacuum breaker technology have now come together. The new Arrowhead QuickTurn™ series features easy on/off (QT) operation without letting go of the handle, better flow control than other QT hydrants and Arrowhead's exclusive "no-leak" O-ring bonnet. **Arrowhead Brass**.

Circle 101 on Reader Reply Form on page 49

Bathroom accessories

Accessories sets that are part of new, coordinated bathroom collections include an 18" towel bar, a towel ring, two robe hooks and a toilet paper holder. A separate option of just the towel bar and towel ring is also available. **Speakman Company.**

Circle 102 on Reader Reply Form on page 49

290-series, 3/4 hp. effluent pump

290-series effluent pumps from Liberty Pumps feature a one-piece, cast iron motor housing and base, stainless steel rotor shaft and permanently lubricated upper and lower ball bearings. The 290-series boasts pumping heads to 48 feet and maximum flows to 83 gpm. With a 1½" discharge and ¾" solids-handling capability, the new series is available with power cord lengths of 10', 25', 35' and 50' (depending on model). Now backed by Liberty's three-year limited warranty. **Liberty Pumps**.

Circle 103 on Reader Reply Form on page 49

Quality faucets for healthcare industry

Priced affordably, these dependable and durable faucets are ideal for most applications in independent healthcare locations:

- 420-CP faucet combines solid brass construction with a time-tested ceramic mixing valve.
- E-Tronic® 40 sensor operated faucet features above-deck electronics for dependable operation. The dual-beam infrared sensor responds quickly to provide a precise amount of water when a user is present.
- 802-665CP metering faucet has a one-piece, solid brass body with water-conserving metering. Operates with a simple push of the handle and shuts off automatically, based on an adjustable operating time of two – 15 seconds.
- 895-317CP gooseneck faucet is versatile, with convenient wristblade handles ideal for multiple locations — wash stations and restrooms. Can be upgraded with different handles and spout any time without having to replace the entire faucet. **Chicago Faucets**.

Circle 104 on Reader Reply Form on page 49

Grooved couplings, fittings and butterfly valves

Smith-Cooper International stocks a full line of UL listed and FM approved grooved couplings, fittings and butterfly valves. They are stocked from 1" to 24", either painted or galvanized; each fitting, coupling, valve, bolt and gasket is marked with the SCI diamond logo for traceability. **Smith-Cooper International**.

Circle 105 on Reader Reply Form on page 49

Letters to the Editor

The Science of Mixing Valves

Dear Editor,

We have read with interest the article by Peter Gobis III in the December issue of *Plumbing Engineer*. We are concerned over what we believe is erroneous information that may create confusion for your readers.

In quoting the IPC, the author notes, "Multiple (gang) showers supplied with a single-tempered water supply pipe shall have the water supply for such showers controlled by an approved automatic temperature control mixing valve that conforms to ASSE 1069 or CSA B125, or each shower head shall be individually controlled by a balanced-pressure/ thermostatic or combination balanced-pressure/thermostatic valve that conforms to ASSE 1069 or CSA B125 and is installed at the point of use."

The reference to ASSE 1069 in this instance is incorrect and should be noted as ASSE 1016. But that is only part of the picture; the quote is corrected for the current IPC 2012 edition and is from ICC Section 424.4 as intended for Multiple Showers.

In addition to ICC/IPC 2012 Section 424.4 on multiple shower heads, ICC/IPC 2012, Section 424.3 outlines the need for water temperature management in household applications where individual control valves are also governed by ASSE 1016. Hundreds of shower valves are certified to ASSE 1016 today and are readily available in the market. These control valves have become necessary to safely implement federally mandated water conservation levels. Reducing the water flow on an older shower head can result in serious scalding if not done in concert with the appropriate valves. This is a critical point, as more builders performing retrofits look to comply with rating systems that promote water conservation.

Reducing the water flow on an older shower head can result in serious scalding if not done in concert with the appropriate valves.

We hope this helps to clarify the points in this article.

Sincerely,

Len Swatkowski
Technical Director
Plumbing Manufacturers International

Len,

Thanks for pointing that out. Yes, there certainly is a typo in that section and the second reference to 1069 should state 1016. Article states, "or combination balanced-pressure/thermostatic valve that conforms to ASSE 1069 or CSA B125…" This should be 1016.

— Peter Gobis III

Factory Mutual data sheet 2-0

Sam,

As always, great to read your articles; they're always very informative and interesting. I recently was designing some sprinkler system inspection, testing and maintenance documentation for three local pulp mills in Prince George, B.C. So, rather than just working with NFPA 25, I was also working with FM Data

Letters continued on page 50

Classifieds

Advertiser Index

Plumbing Engineer
A TME Publication

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February 2012

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Letters to the Editor

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Sheet 2-81. As you discussed in your article, I do appreciate the straightforwardness in regards to the FM documentation, as well as the inclusions within the FM system.

One interesting comment in regards to the FM data sheets, of course, though not technical, is that they are free of charge, which is an added incentive for some organizations that I work with that use them as reference materials only.

Again, thanks for all your great discussions. I look forward to the future articles.

Season's Greetings to you and yours and all the best in the New Year.

Cheers,

Alan Kavanaugh, CRM, CCPI
Risk manager
Member NFPA & ASTM
Suncorp Valuations - Valuations and senior loss control consultant
AK Risk Management & Loss Control

Water hammer issues

In the 3rd Edition of Frankel's book, *Facility Piping Systems Handbook*, page 6.106, Fig 6.44 shows the Minimum Excavation Dimension for Pressure Water Main Tapping. My question is: Is a thrust block required on the main at the tee off for the tapping? i.e., Is a thrust block required on the main on the opposite side of the valve?

Page 6.114, Fig 6.52 gives the location of thrust blocks. They all show flow against the thrust block. In the case above, we have flow away from the thrust block. In the event of the valve closure, will there be any water hammer effect that would warrant the placement of a thrust block at the tee?

Are there any other reasons why a thrust block would be required at this location?

While Fig 6.53, page 6.116 gives Typical Thrust Block Dimensions, which is appreciated, can you also provide the procedure for arriving at the dimensions of the thrust blocks with a sample calculation or indicate where such may be found?

Thank you for your assistance now and in the past.

Ramdeo Maraj, CPD
ASPE member

Water hammer travels back through the water main in the opposite direction of the flow of water. It is always a good idea to provide joint restraints at all changes in direction to minimize the possibility of the pipe joint separating.

The size of the surface bearing area of the thrust block is based on the compressive strength of the soil and the worst case calculated thrust force possible. See figure 6.53 in the book.

— Ron George

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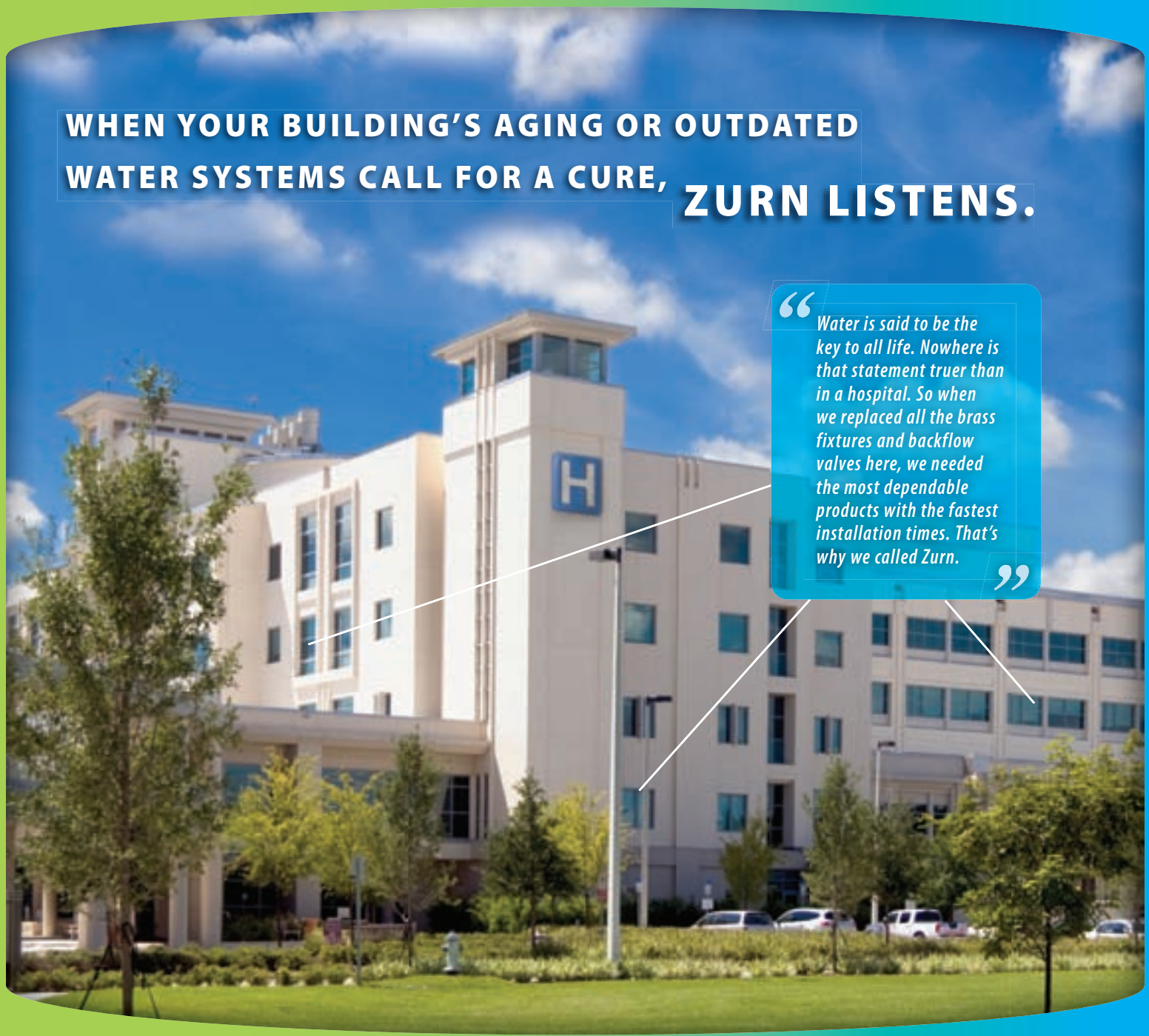

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