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Plumbing Engineer®

A TWB Publication

February 2010

2009 APEX® AWARDS FOR PUBLICATION EXCELLENCE

New!
Plumbing Engineer's
Lead Free Report
See Page 32

High-rise Building Design

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Also Inside...

- Hot Water Recirculation
- Fire Sprinkler Design
- Re-Greening of Commercial Buildings
- Ron George on Haiti

FINALLY

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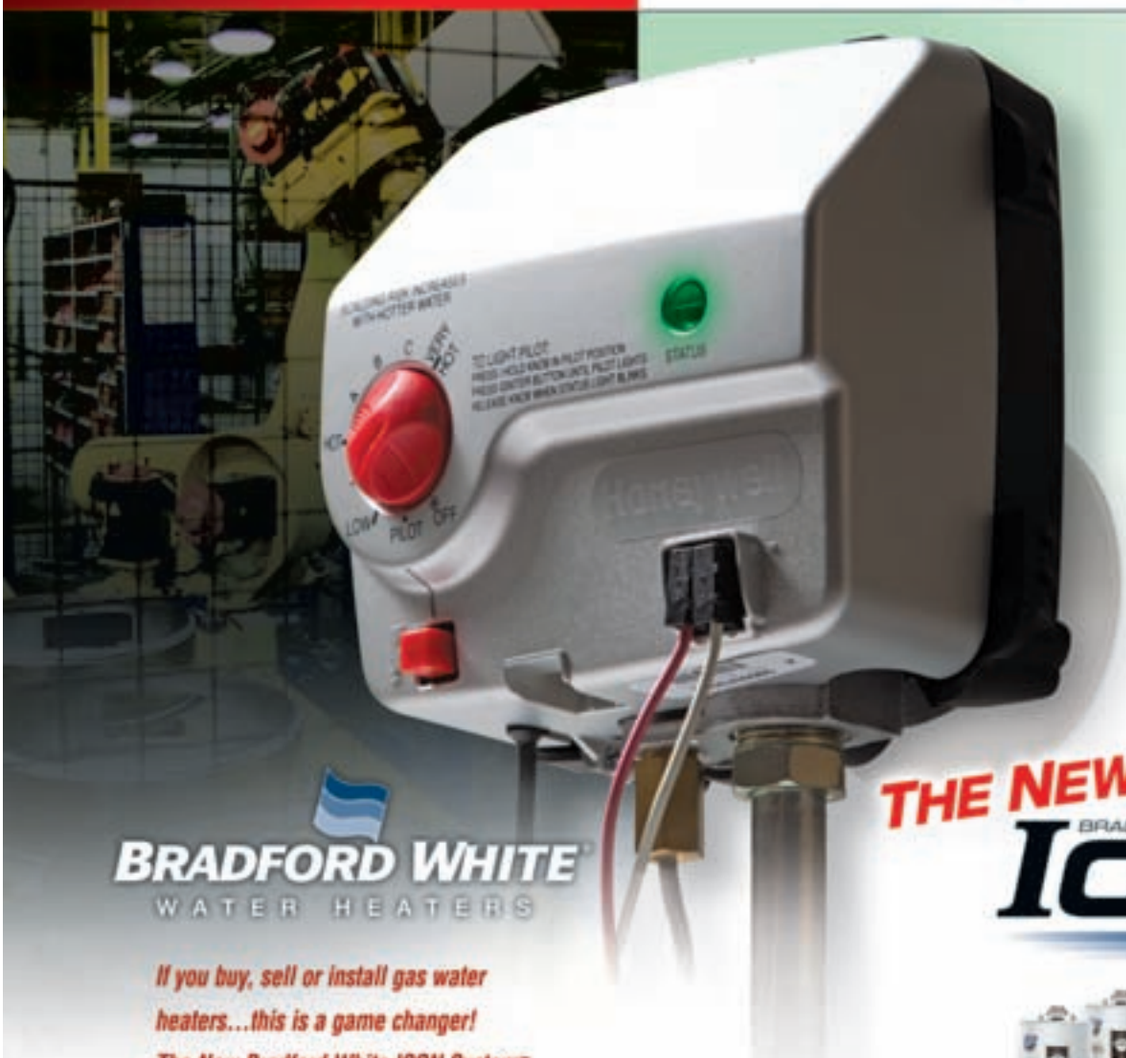

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Safety Is Our Shared Responsibility!

- IMPORTANT - Standards Update!

If you are specifying Plastic ADA Trap Covers that refer to ASTM D635 for *Insulation Material Flammability*,

BE ADVISED:

In 2006 ASTM updated their standard ASTM D635-06 to state that under the International Building Code (IBC) this test is limited to Light-Transmitting Plastics Only and is not applicable to any other plastic materials used in construction.

Since ASTM D-635 test is limited to light-transmitting plastics only and also lacks a smoke test, this test is not applicable for plastic insulation and pipe covering materials that are used or installed under the IBC (International Building Code).

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School Fire Statistics

- ***An average of 6,300 structural school fires per year***
- ***The leading area of fire origin of structural school fires is the lavatory***
- ***Plastics ranked second as materials first ignited in school structural fires***

-The U.S. Department of Homeland Security and the U.S. Fire Administration Report on School Fires, August 2007, Vol 8, Issue 1 findings.

Eliminates Potential Liability!

Meets Mandatory Accessibility Laws (ADA) & Mandatory Building Code (IBC) Material Fire/Smoke Rated Test Standards

Accessiblity Requirements:

ADA 4.19.4 Exposed Pipes and Surfaces. Hot water and drain pipes under lavatories ***shall be insulated*** or otherwise configured to protect against contact. There shall be no sharp or abrasive surfaces under lavatories. (ICC/A117.1 sec. 606.6 and ADAAG 606.5).

Building Code Requirements:

IBC Chapter 11 Accessibility sec,1101.2 Design. Buildings and facilities shall be designed and constructed to be accessible in accordance with this code and ICC A117.1.

IBC Chapter 7, sec. 719.1 Thermal and Sound Insulating Materials...Where a flame spread index or a smoke-developed index is specified in this section, such index shall be determined in accordance with ASTM E 84.

Chapter 7, sec. 719.7 Insulation and covering on pipe and tubing. Insulation and covering on pipe and tubing shall have a flame spread of not more than 25 and a smoke-developed index of not more than 450.

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Volume 38, Number 2, February 2010

Plumbing Engineer
A TWB Publication

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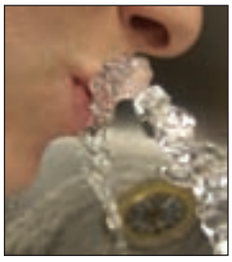
Hot Water Recirculation in High-Rise Buildings

A growing trend and buzzword in the industry is the emphasis on turning "green." **Story on page 28**

A Proactive Approach to Fire Safety During Construction

When is the most efficient time to put a sprinkler system in service? **Story on page 30**



The Lead Free Report

Plumbing Engineer introduces this valuable, bi-monthly report on the issues of lead free facing this industry. **Story on page 32**

The Re-Greening of Commercial Buildings

It's time to re-examine the overall health and efficiency of commercial high-rise buildings. **Story on page 34**

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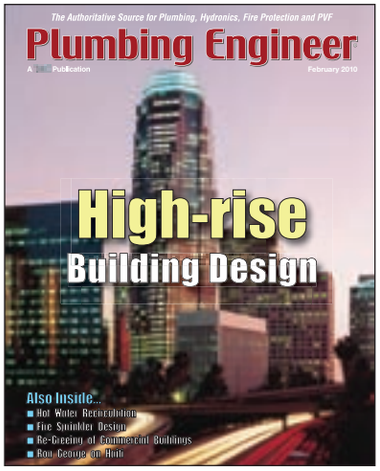

High-rise "health" is important to any commercial building design. This issue examines fire safety, codes, hot water recirculation and and overall system efficiency.

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Don't risk non-compliance. Products from the McWane family of companies are guaranteed to be American-made and stimulus-package-compliant.

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Circle 3 on Reader Reply Form on page 37

Editor's Letter

Can you really gauge an economy on the mend by trade show attendance?

Let me just say that I am a big proponent of industry trade shows. Everyone needs to circle their calendars and attend at least one to two this year. I just returned from the AHR Show in Orlando and I thought it was a better-than-expected show in terms of networking, new product roll-outs and overall traffic numbers based on a comparison from last year's show. Still, the show looked down a bit from years past. Nonetheless, being at this latest trade show got me thinking: Does better trade show attendance reflect a rise in the economy? "We believe there is a direct correlation between the overall attendance at the show and the state of the economy. Larger cities like Chicago, for instance, are more conducive for international visitors," said Dennis F. Kloster, executive vice president and general manager, International Environmental Corporation.

At my many booth visits throughout the show, it was unanimous that this year's AHR Show was better than last and it was better than anyone had expected. And those who made the trip to the International Builders Show the week before were of the same mindset. "Perhaps this is a good indicator of things to come and attendance is representative of an uptick in the economy," I heard over and over again.

According to PR released from the AHR show, "Signs of a recovering economy was a key view from many interviewed as to the main reason for the record breaking number of attendees at the 2010 AHR Expo. Nearly 45,000 attendees and exhibitors filled the aisles during the three-day AHR Expo. The record-breaking attendance figures brought a tremendous crowd of contractors, engineers and other industry professionals to the show to see the newest and most innovative HVAC/R products."

John Barba, residential training/trade program manager, Taco, Inc., said, "Overall, the AHR was better than last year, when no one knew what to make of the economic crisis. With 2009 over, I noticed more traffic, and the heating customers who came all the way to Orlando were serious customers. Last year's show seemed 'light,' in terms of traffic, but the economic crisis was still new and folks may have been wary of spending money to attend a trade show. This year was noticeably better because we've been living with the economy for a year and have adjusted to it."

Some didn't see it quite the same way, however. According to Thomas C.E. Gervais, international sales manager for LAARS Heating Systems Co., "Booth traffic was lighter than in previous years, as I recall, but there was a steady presence of attendees at the booth. My view is that there were not many consulting engineers, at least not many that I talked to in comparison to previous years. Contractors mostly seemed to be from the Southeast, but there was varied attendance from wholesalers in terms of their geographic home base. I think it was clear that attendance was lower due to challenging sales/mood from 2009."

As far as the trade show/economy debate, perhaps a more in-depth comparative analysis is needed. But let's face it, we are not out of the woods yet. "The state of our industry for 2010 should be flat to slightly better than it was in 2009. We are largely dependent on the aggressiveness of institutional lending as there are a large number of projects just waiting on funding," said Kloster. ■

PLUMBING ENGINEER
(USPS 567-950)
ISSN 0192-1711

PLUMBING ENGINEER (USPS 567-950) ISSN 0192-1711 is published monthly by TMB Publishing Inc., 1838 Techny Court, Northbrook, IL 60062. Phone (847) 564-1127, Fax (847) 564-1264. Magazine is free to those who design and specify plumbing/piping systems in commercial, industrial, institutional and governmental buildings; as well as government officials and plumbing inspectors. Subscription rates for U.S. and Canada: $50 for one year, $90 for two years. Other countries: $300 per year. Periodical postage paid at Northbrook, IL, and additional mailing offices. POSTMASTER: Change of address should be sent to ***Plumbing Engineer***, 519 E. Briarcliff Rd, Bolingbrook, IL 60440. Material and opinions contained in contributed articles are the responsibility of the authors, not of TMB Publishing Inc., *Plumbing Engineer* magazine or its Editorial Advisory Board. The publisher cannot assume responsibility for any claims made by advertisers. **Volume 38, Number 2.** *Plumbing Engineer* is microfilmed by University Microfilms, Ann Arbor, MI, and indexed by Engineering Index Inc. Publications Mail Agreement No. 41499518. Return Undeliverable Canadian Addresses to PO Box 503, RPO West Beaver Creek, Richmond Hill ON L4B 4R6

Plumbing Engineer
A TMB Publication

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NEW

Introducing the LV980 Series from Leonard, the leader in temperature valves.

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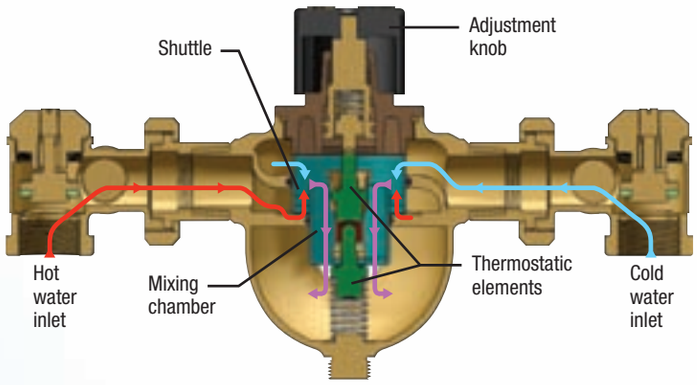

The LV980 Series valves, designed for responsive control to temperature and pressure fluctuations, provides an extra measure of control. Built for durability and certified to the stringent performance requirements of ASSE standard 1017, Leonard's new LV980 Series' paraffin-based technology delivers optimal control for domestic hot water systems.

Along with bi-metal solutions, Leonard's valves give plumbing engineers "integrated control" for all their water tempering design needs. Before your next project, be sure to visit **www.leonardvalve.com** or call our free technical support hotline at **888-797-4456**.

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Circle 4 on Reader Reply Form on page 37

Industry News

Plumbing Engineer opens another communications channel between readers and advertisers

NORTHBROOK, ILL. — Brad Burnside, publisher of *Plumbing Engineer*, has announced a new communications vehicle that will foster product inquiries and response between readers and advertisers. Called www.plumbingengineer-resource.com, the website will afford advertisers the opportunity to post their literature free of charge. Readers will benefit by gaining immediate and direct access to product literature that is relevant to their interests. Brown will utilize advertising within Plumbing Engineer to drive readers to this hub.

"*Plumbing Engineer* reaches consulting, specifying and design engineers nationwide. Its readers design and specify mechanical systems in commercial, institutional, municipal and industrial applications. These systems encompass plumbing, hydronic, solar, piping and fire protection market segments," said Burnside.

The new channel — www.plumbingengineer-resource.com — will help readers communicate directly with advertisers for their literature and documentation.

"We are looking for opportunities to help our advertisers sell their products and services," Burnside said. "Plumbingengineer-resource.com is another channel to accomplish this. Our readers can go directly there to request literature, and a professional fulfillment company — MarketNet — will take care of the rest. It's seamless.

"Advertisers continually seek the 'value' of advertising, and we have to tie in the circulation to that justification, and more," Burnside added. "Some of that 'more' is this channel wherein the readers can respond to advertisers directly in one place."

Some additional facts to consider:

Affinity Research LLC interviewed more than 60,000 magazine readers: On average, more than half took or plan to take action as a direct result of exposure to specific print ads.

Reader action levels were similar for both paid and nonpaid readers. It is this "action" that this new channel will capture.

Although Internet usage has grown faster than other media channels, there are still more people using magazines than the Internet! In fact, magazines are used 14% more than the Internet, according to MRI Spring 2005 and 2009 studies.

The integration of print and Internet is ongoing and irresistible. Publishers have to embrace both channels.

For more information, contact: MarketNet Division, Interline Creative Group, at 847 358 6884. Advertisers in *Plumbing Engineer* may go to www.plumbingengineer-resource.com to submit materials.

Burj Khalifa uses Charlotte Pipe's cast iron

CHARLOTTE, N.C. — When an architectural wonder chooses Charlotte Pipe's cast iron soil pipe and fittings that says something. Especially when that structure is the Burj Khalifa, the world's tallest building.

The Burj Khalifa is impressive. It is more than 2,700 feet high and can be seen from 60 miles away. It's more than twice the size of the Empire State Building. The top of the Burj Khalifa has a public observation deck and shop, and there is a 160-room hotel that will occupy the lower part of the tower. There are also more than 1,000 apartments, 49 floors of office space and 58 elevators that can travel 10 meters per second.

Permabond® Engineering Adhesives' LH056 added to FGG/BM/CZ System Compatible Program

CLEVELAND — The Lubrizol Corporation announced that Permabond® Engineering Adhesives' LH056 is chemically compatible with FlowGuard Gold®, BlazeMaster® and Corzan® CPVC piping systems and has been added to the FGG/BM/CZ System Compatible Program.

Permabond LH056 is used to seal metal pipes in sprinkler systems, which may also contain CPVC piping. It creates a complete and reliable seal that cures to a solid plastic. Permabond products are sold worldwide through authorized distributors. For information, please contact Permabond at 800-640-7599 or visit www.permabond.com.

UW-Madison offers process piping course

MADISON, WIS. — The of University-Madison, Department of Engineering Professional Development will offer a course on "Process Piping Systems Design and Operation," March 1-5, 2010.

The course will benefit professionals working with process piping systems in facilities for the food processing, pharmaceutical and similar industries requiring clean piping systems.

Participants will explore process piping systems design and operation, fluids other than clear water, process pumps and their selection, flow measuring devices, control valves, and industrial filters and industrial heat tracing. For further information, visit http://epdweb.engr.wisc.edu/WEBL140.

More Industry News on page 10

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Circle 5 on Reader Reply Form on page 37

Industry News

Continued from page 8

Elkhart Brass to hold pricing

ELKHART, IND. — Elkhart Brass Manufacturing Co., Inc. announced that Elkhart's 2010 product pricing will remain at the 2009 level. The 2009 price list will be updated to reflect new product offerings, but will not contain any price increases.

Updates to the 2010 price list will include: the new Sidewinder EXM product line, several new Unibody actuators and accessories, the oscillating 3890 nozzle, plus several other product additions. Elkhart's most recent price list and catalog are always available electronically through the Elkhart Brass website, www.elkhartbrass.com.

AKF Group announces the launch of 'In Posse LLC'

PHILADELPHIA — AKF Group LLC announced the formation of In Posse LLC, a subsidiary company focused on green buildings and offering a broad range of services including Sustainable Design, Building Analysis, LEED consulting and LEED Commissioning. The new company will complement and support the entire spectrum of AKF market sectors and will provide services either independently or jointly with AKF.

In Posse — Latin for "In Potential" — was formed by Robert Diemer, founding partner, and a dedicated group of professionals within AKF Group who believe passionately in the future of the planet and are committed to exploring innovative solutions to sustainability.

As an increasing number of corporations and institutions adopt sustainable practices in the design and operation of their buildings, many are seeking more progressive ways to balance the social, economic, and environmental impact of their business decisions by partnering with companies who share their values. These clients are looking for sustainable design and consulting services that support their mission and reflect their organizational values. In response to this growing need, AKF has built on its existing expertise in sustainable design to form In Posse.

For more information, please visit www.in-posse.com.

Movers

AHRI names CEO

ARLINGTON, VA. —At its recent meeting, the AHRI Compensation Committee promoted AHRI president Stephen R. Yurek to the position of chief executive officer. His new title, effective as of January 1, 2010, will be president and CEO.

Sloan Valve names executive director of marketing


Davenport

FRANKLIN PARK, ILL. — Sherry Davenport has been appointed executive director of marketing for Sloan Valve Company. The announcement was made by John Aykroyd, vice president of business development.

Watts promotes LaCroix


LaCroix

NORTH ANDOVER, MASS. — Watts Water Technologies, Inc., announced that Chad LaCroix has been appointed to serve as the national market manager for its Watts brand brass & tubular products.

HTP names vice president, engineering


Stephens

EAST FREETOWN, MASS. — Heat Transfer Products (HTP) president Dave Martin announced the appointment of Phillip W. Stephens to the newly created position of vice president, engineering. A licensed professional engineer, Stephens will oversee all research, design, development and testing activities for HTP products, reporting directly to Martin.

MEA JOSAM

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Mea-Josam's Pro-Plus product line is manufactured using glass-fiber reinforced polyester (GRP) pressed from sheet molding compound (SMC), which is a composite of polyester resin, mineral fillers and glass fiber mats. SMC is a tried and tested GRP material that results in a product that is 70% lighter than polymer concrete and yet 1.5 times stronger than polymer concrete. Additionally, SMC/GRP has greater compressive, flexural and tensile strength and less thermal expansion properties than either polypropylene or high density polyethylene.

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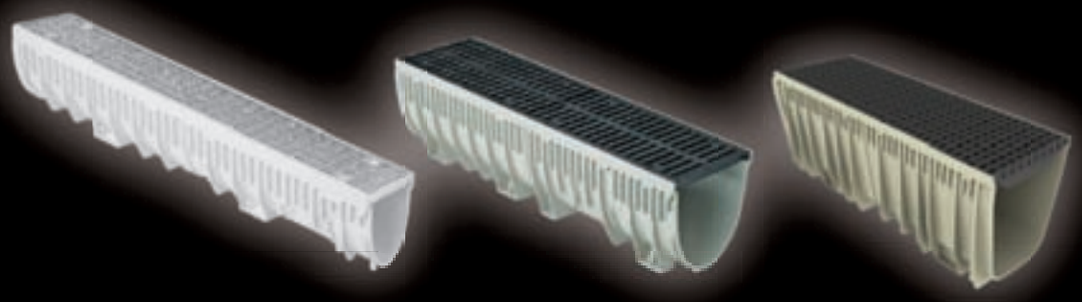
The Mea-Josam line of trench drains are available in either ½ meter or full meter lengths, with or without slope and in 4", 8" or 12" nominal widths. Mea-Josam's grate offering includes steel, HDPE, ductile iron and polymer suitable for load class ratings A through E. With the patent pending STARFIX securing system, securing grates has never been as fast or as simple. All of the different grates can be secured and removed quickly and easily with a single hand movement and without the use of bolts or special tools.



For full details on the Mea-Josam Pro-Plus trench drain system contact your local representative or visit www.JOSAM.com.

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Circle 7 on Reader Reply Form on page 37

Designer's Guide

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

Measuring drainage flow

Many years ago I had a project where my client was required by the township to meter their sewage flow before connecting to the municipal sewer. At first this did not seem like a big deal, but the more I thought about it, the more I wondered, "How in the world are we going to meter the sewer?"

Given that this was in the early 90s, before the proliferation of the Internet, the resources for researching this were few and far between. After pulling out my old college text books, I stumbled across a device for measuring open channel flow in a civil engineering text called a Parshall flume.

In the early 20th century, an irrigation engineer with the USDA, named Ralph Parshall struggled with the measurement of irrigation stream flows. Over a period of years, he eventually developed the Parshall flume in 1922. This simple but effective device is ideal for measuring open channel and drainage flows. These flumes are available in a wide variety of sizes from 1 inch to 50 feet wide, produce little resistance, are not subject to blockages, and are the most widely used type of flume today for channel and drainage flow monitoring installations.

The flume consists of three sections: a converging section with a level floor; a throat section with a downward sloping floor; and a diverging section with an upward sloping floor. This results in flow at critical velocity through the throat, and a standing wave in the diverging section. Flow can then be calculated and monitored quite easily as a function of the throat width and upstream depth. The calculation for determining flow is:

$Q = 4WH^n$ where $n = 1.52W^{0.026}$

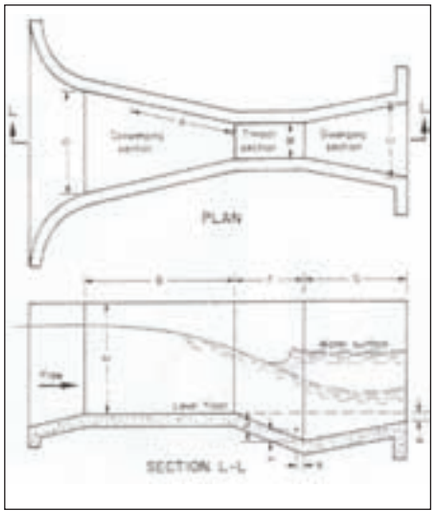
Q is flow in CFS

W is throat width in feet

H is entry depth in feet

The point of measurement of the entry depth H is critical and is a function of the particular flume design.

Parshall flumes can be purchased with an ultrasonic transducer located at the critical point for measuring H. This information can then be fed into a recording device that will calculate, monitor, and cumulate flow data.



Parshall flume configuration (USDA-SCS 1965).

A subcategory of the Parshall flume is the Palmer-Bowlus flume, which is frequently used for temporary monitoring of sanitary flow applications. Its design is simpler and lends itself to manhole installation, but I would guess it is not as accurate as the Parshall flume, explaining its more limited use.

The geometry of these flumes is designed to force the occurrence of a critical flow through the throat. Downstream of that is a short section of super-critical flow followed by a hydraulic jump, much like that which occurs at the base of a drainage stack when it turns horizontal. If the ratio of the outlet depth to the inlet depth exceeds 70 percent, the flow has reached a submerged condition called transmission submergence. In such a state, the downstream flow will affect the upstream flow, making the flow measurement inaccurate. This flow condition should be avoided. If it cannot be avoided, submerged flow calibration curves can be used to correct the flow values.

Parshall flume with inlet/outlet connections (image courtesy of Plasti-Fab, Inc.)

The flume design does not allow for any dead-water regions where debris can accumulate, making it ideal for sanitary flows. However, the smaller sizes of 1" and 2" would be unwise to use as debris might then block the throat. A 3" Parshall flume can be used to measure flows from 15 to 830 gpm, while larger sizes go up from there.

Palmer-Bowlus flume sanitary manhole inserts (image courtesy of Plasti-Fab, Inc.)

As a sample calculation, consider a 4" flume with a 3" depth at inlet point H. The calculated flow rate would be:

$$n = 1.52 \times 0.33^{0.026} = 1.48$$

$$Q = 4 \times 0.33 \times 0.25^{1.48} = 0.17 \text{ CFS}$$

$$Q = 76 \text{ gpm}$$

What's remarkable about these flumes is that they have not changed in their design since 1922, and they remain the industry standard for monitoring sewer, storm and irrigation flows. Certainly the electronics for recording flow levels has improved greatly in that time, but the flume itself remains unchanged, which is not unlike many aspects of our plumbing industry.

Even though I have only had cause to use this device once in 25 years, with the advent of LEED I can see them being used more frequently. LEED has a point category regarding measurement and verification. It also has a point category for reducing sanitary flow rates below baseline values. I would imagine that if one wanted to couple these two point categories, a manhole flume would be required in order to perform the necessary measurements. However, that particular detail is yet to become a subject on any of my LEED projects.

***Timothy Allinson** is a senior professional engineer with Murray Co., Mechanical Contractors, in Long Beach, Calif.*

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Circle 8 on Reader Reply Form on page 37

Code Update

By Ron George, CIPE, CPD
President, Ron George Design & Consulting Services

Codes and Standards are Important!

Haiti Earthquake Stirs Many Organizations into Action: The recent earthquake in Haiti will go down as one of the deadliest in history. No one knows how many people have been injured or killed at this time. Haitian officials estimate that thousands have died. Estimates go as high as 200,000 deaths, but as of a just a few days after the earthquake, there was no confirmed death toll. At the time of this writing, there are still many buildings and outlying areas that have not been searched. The population of Haiti is about eight and a half million people (8,429,006 in 2007). Port Au Prince is the capital and is the largest city in Haiti, and recent estimates place the Port Au Prince metropolitan area'' population at between 2.5 and 3 million people. For a comparison, the 2007 U.S. census data shows approximate populations for comparatively sized US Cities: Los Angeles — 3,834,340; Chicago — 2,836,658; Houston — 2,208,180; Philadelphia — 1,449,634; and Dallas — 1,240,499 people. Imagine an earthquake leveling a city the size of Los Angeles. Port Au Prince is located within a few miles of the earthquake epicenter and pictures show the lateral ground movement leveled just about every building in the city. Many buildings were concrete or masonry construction with very little reinforcing. Many people died instantly from non-reinforced buildings collapsing on top of them. Many others were injured and will likely die because of a lack of proper medical care. Many more will likely die from disease and unsanitary conditions over the next few months and years. Some will not die as a direct physical result of the earthquake, but there will most likely be deaths from the earthquakes indirect consequences that destroyed the plumbing and sanitary facilities. Most of the buildings and plumbing systems have been destroyed. Water treatment facilities and waste treatment facilities were few and far between, but public water faucets allowed people to get clean water and the facilities and infrastructures serving many of these were destroyed. Since the utility infrastructure is not functional, many people will likely get sick from cuts and abrasions in unsanitary conditions and from drinking unsanitary water. Water purification equipment will be very important for them.

The most deadly earthquake in history was on Jan. 23, 1556 in Shansi, China where it is reported that approximately 830,000 people were killed. The second deadliest earthquake was on December 26, 2004 near Sumatra where an underwater earthquake caused approximately 283,106 deaths from the earthquake and seismic wave (tsunami). The Haitian Earthquake will likely come close to this number as body counts increase and as people die from the resulting poor conditions in the aftermath.

The rebuilding effort

When countries rebuild, it is important to build the new structures to resist the forces that a future earthquake can impose on the buildings to prevent future deaths and destruction. The model building codes have minimum requirements for seismic design, including reinforcing, which provides health and safety for building occupants. Following a model building code such as the ones in the United States will surely reduce the number of deaths in future earthquakes.

We need to use this as a wake-up call for the United States. There are many major cities in the United States that are built on or near major fault lines. These cities have many multistory buildings that were built before seismic code requirements required earthquake resistant construction for seismic zones. We need to work with local government jurisdictions and government agencies like the Federal Emergency Management Agency to plan for a similar type of natural disaster in the U.S. In seismic zones, we should make sure we have available heavy equipment portable water treatment equipment, medical supplies and properly trained people and resources for such an event here. The International Code Council has pledged to use its relationships with the United Nations and work with politicians to help rebuild the devastated nation and reduce future fatalities, injuries and property damage from earthquakes and other natural disasters in Haiti. The assistance will likely include building safety expertise, code books, plan review and inspections.

The strongest earthquake ever to strike North America was on March 27, 1964 in Anchorage, Alaska. It was a 9.2 magnitude earthquake centered 80 miles east of Anchorage, followed by a seismic wave (tsunami) 50 ft. high that traveled 8,445 miles at 450 mph. The Anchorage earthquake killed 117 people. In 1964, the population and the number of buildings in Alaska pale in comparison the number of buildings and the population today. Eight of the top 10 earthquakes in the U.S. occurred in the state of Alaska. The next largest earthquake occurred near St. Louis on the New Madrid fault in 1812. It registered a 7.9 magnitude and there was another earthquake near this fault in 1811 that registered a 7.7 magnitude. It is ranked as number 17 on the list of U.S. earthquakes. Many of you may remember the earthquake that occurred during the 1989 World Series television broadcast in the San Francisco bay area of California on Oct. 17, 1989. The earthquake measured 7.1 in magnitude killed 67 people mostly located on the double-decker bay bridge that collapsed. There were more than 3,000 people injured in that earthquake. The San Francisco bay earthquake of 1989 and the one from 1906 do not even make the top 25 list of earthquakes in the U.S. More than 100,000 buildings were damaged or destroyed in the 1989 earthquake, and just about the entire city of San Francisco was destroyed by the fires that followed the 1906 earthquake. The Haiti earthquake will probably rank in the top three or four of the deadliest earthquakes of all time.

World Plumbing Day

At its annual meeting in Centurion, South Africa (October 22-23, 2009), the World Plumbing Council confirmed details of the first ever World Plumbing Day, which will be cele-

Continued on page 18

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What Does "Domestic" Mean To You?

do-mes-tic [dəˈmes-tik]

1 : of, relating to, or originating within a country and especially one's own country

2 : produced in or indigenous to a particular country

3 : Indigenous to or produced or made within one's own country; not foreign, native: domestic goods

4 : Apollo Valves

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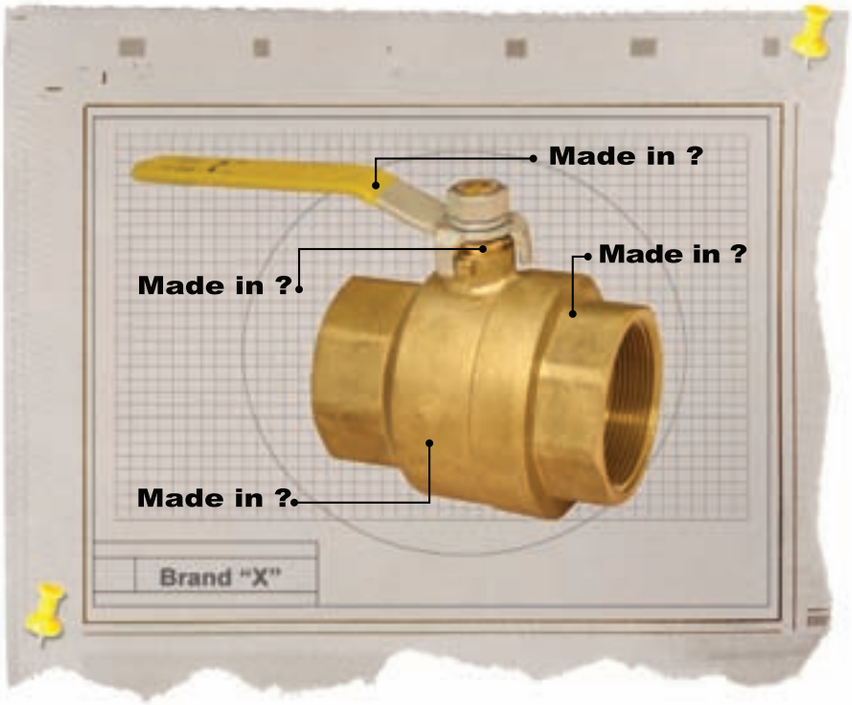

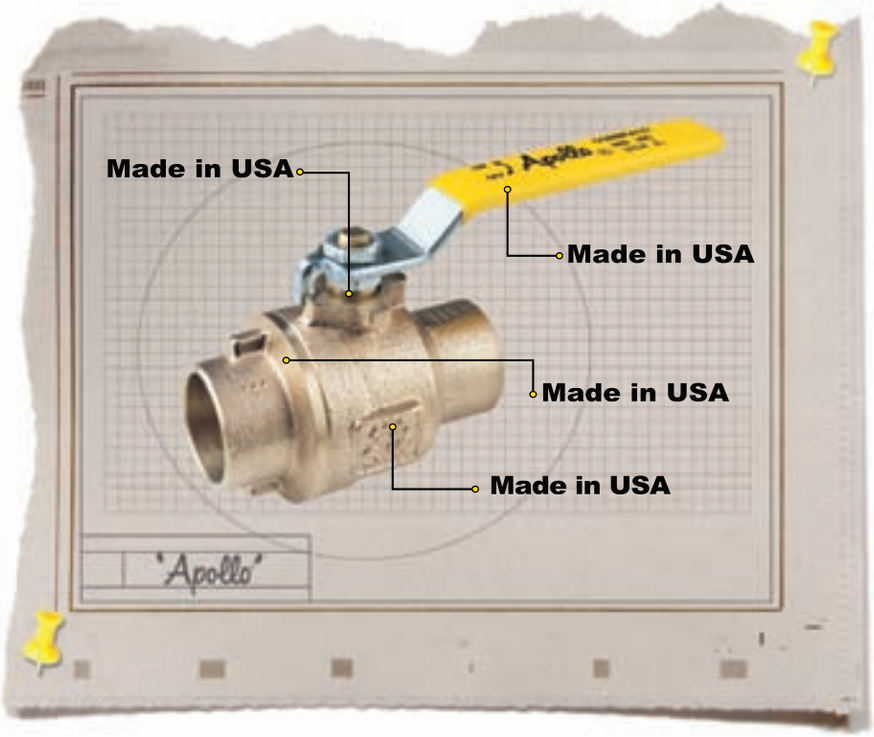

Code Update

Continued from page 14

brated on March 11, 2010. With the theme "Plumbing-Vital to Global Health," plumbing organizations throughout the world will be invited to undertake a range of activities with the aim of raising awareness of the important role played by today's plumbing industry.

A logo for the day was designed by young Indian graphic designer Anuja Khokhani of Ahmedabad, India. Her father publishes *Indian Plumbing Today* Magazine. I was present at the Indian Plumbing Association Conference in Hyderabad, India when she received an award for designing the logo which illustrates four key elements with which plumbing is associated; water, health, energy and environment. It is hoped that the logo will be used widely, drawing awareness to the fact that plumbing is far more important than many people in both developed and developing countries realize.

WPC Chairman, Robert Burgon, will launch the first World Plumbing Day at a press conference in Beijing, China in conjunction with the ISH China exhibition, organized by the World Plumbing Conference's special industry partner Messe Frankfurt. Burgon said, "Our hope is that on World Plumbing Day, the world will come to realize that plumbing is essential in protecting both the health of our people and the health of our planet. Where countries have developed plumbing systems, the role of our industry is often taken for granted. In developing countries, many people have yet to discover the real difference that plumbing can make. The World Plumbing Conference hopes that newspapers and all other forms of media will help many more people to understand that our industry is a key player in so many aspects of a healthy society." Burgon continued, "There are already international days for many important causes, some of which are relevant to plumbing, but this will be the first time that plumbing has been marked in such a way. As our logo says, we hope that on March 11 everywhere, starting in 2010, there will be far greater understanding of the role of our industry." For more information see the World Plumbing Day Website at: http://www.worldplumbingday.org/.

The remainder of Ron George's article can be found online at www.plumbingengineer.com.

Ron George *is president of Ron George Design & Consulting Services. He has served as Chairman of the International Residential Plumbing & Mechanical Code Committee. He is active in plumbing code and plumbing product standard development committees with ICC, IAPMO, ASSE, ASME, ISEA and ASTM. His company specializes in plumbing, piping, fire protection and HVAC system design and consulting services. He also provides plumbing and mechanical code consulting services and he provides investigations of mechanical system failures and litigation support. To contact Ron, w-mail: rgdc@ron georgedesign.com.*

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This two-day event will provide participants with an opportunity to view presentations and engage in timely discussions on how the water utility, manufacturing, engineering and trade industries have found solutions through emerging technologies in the water efficiency, plumbing and mechanical industries.

This event is a follow-up to the overwhelmingly successful inaugural Emerging Technologies Symposium that was held in Chicago in August of 2008 and is designed to provide a portal for IAPMO's partners to display and demonstrate their innovative solutions to water and energy efficiency related needs and regulatory development. Presentations and panels will discuss emerging trends, practices and products.

IAPMO is seeking sponsors, presenters and panelists to participate in the symposium; especially experts in the following fields:

- Water Quality, Sanitation and Health
- Water Reuse
- Water and Embedded Energy
- Solar, Geothermal and other renewable technologies
- New Technologies in Fat, Oil and Grease (FOG) Discharge Mitigation
- Other topics as suggested by participants

GOALS OF THE EMERGING TECHNOLOGY SYMPOSIUM

- Provide outstanding networking opportunities to meet experts in the fields of water and energy efficiency.
- Expose participants to emerging products and practices.
- Exchange views on new trends in the industry.
- Share ideas and approaches on bringing emerging technologies to market
- Discuss innovative green plumbing and mechanical concepts
- Provide a vision for a more efficient future for plumbing and mechanical systems.

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FPE Corner

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

Consider the user

Who are the users of the fire protection systems we design? The building owner or tenant may come to mind, but in my view, the most important user is the firefighter. They will likely be the first on the scene of a fire incident and are expected to interface with building fire protection systems. As designers of fire protection systems it is important for us to understand the needs of the firefighter and help to make their interaction with these systems as simple and as effective as possible.

Most of these considerations deal with the location of equipment. The key word is "accessible." The applicable codes and standards require that important system components be accessible and unobstructed but do not clearly define these terms. It is up to the authority having jurisdiction to make that determination. Is a sprinkler control valve located such that a stepladder is required to access it considered accessible? The timely closing of a control valve after a fire may substantially reduce additional damage from water. Sometimes as designers, when faced with architects whittling away at space dedicated to mechanical equipment, the easy choice is to leave the user with a less than ideal situation. Designers should try to consider the firefighter responding to the building at 2:00 a.m. with a job to do under very stressful conditions.

In terms of system control valves, they should be within reach or at least operable by someone standing on the floor. The annex notes in NFPA 13, 2010 edition provide the following guidance:

"A.8.16.1.1.1 A water supply connection should not extend into a building or through a building wall unless such connection is under the control of an outside listed indicating valve or an inside listed indicating valve located near the outside wall of the building. All valves controlling water supplies for sprinkler systems or portions thereof, including floor control valves, should be accessible to authorized persons during emergencies. Permanent ladders, clamped treads on risers, chain-operated hand wheels, or other accepted means should be provided where necessary.

Outside control valves are suggested in the following order of preference:

(1) Listed indicating valves at each connection into the building at least 40 ft (12.2 m) from buildings if space permits.

(2) Control valves installed in a cutoff stair tower or valve room accessible from outside

(3) Valves located in risers with indicating posts arranged for outside operation.

(4) Key-operated valves in each connection into the building."

Control valves for both sprinkler and standpipe systems must be provided with identification signs. These signs must indicate the function of the valve and what it controls. The "what it controls" should be as descriptive as possible, particularly in the case of sectional or floor control valves, or where a valve room contains several sprinkler valves serving various parts of a building. It would not be adequate to identify such valves simply as "Sprinkler Control Valve". More specific information is needed such as "9th floor Wet Pipe System" or "Preaction Sprinkler Zone 3."

It is recommended to provide exterior access for fire protection valve rooms and fire pump rooms. Signage is needed to ensure these locations are readily identifiable to first responders.

Fire department connections for fire sprinkler and standpipe systems should be located in areas that are accessible and convenient. They should be located where they will not be affected by exposure from the building fire, convenient to fire department vehicle access, and convenient to a fire hydrant. The fire department connection must have signage to identify its function, and those connections which serve only a part of the building must be identified as to what is served by the connection. The location of the inlets must be such that firefighters can readily attach hose with clearance for use of tools. NFPA 14, Standard for Installation of Standpipe and Hose Systems, 2007 edition contains the following requirements regarding the location of fire department connections for standpipe systems:

"6.4.5.1 Fire department connections shall be visible and recognizable from the street or nearest point of fire department apparatus accessibility or on the street side of buildings.

6.4.5.1.1 Fire department connections shall be located and arranged so that hose lines can be attached to the inlets without interference from nearby objects, including buildings, fences, posts, landscaping, vehicles, or other fire department connections.

6.4.5.2 Each fire department connection shall be designated by a sign having letters, at least 1 in. (25.4 mm) in height, that reads "STANDPIPE."

6.4.5.2.1 If automatic sprinklers are also supplied by the fire department connection, the sign or combination of signs shall indicate both designated services (e.g., "STANDPIPE AND AUTOSPKR," or "AUTOSPKR AND STANDPIPE").

6.4.5.2.2 A sign also shall indicate the pressure required at the inlets to deliver the system demand.

6.4.5.3 Where a fire department connection services multiple buildings, structures, or locations, a sign shall be provided indicating the buildings, structures, or locations served.

6.4.5.4 Fire department connections shall be located not more than 100 ft. (30.5 m) from the nearest fire hydrant connected to an approved water supply.

6.4.5.4.1 The location of the fire department connection shall be permitted to exceed 100 ft. (30.5 m) subject to the approval of the authority having jurisdiction.

6.4.6 Fire department connections shall be located not less than 18 in. (457 mm) nor more than 48 in. (1219 mm) above the level of the adjoining ground, sidewalk, or grade surface."

It is strongly recommended that designers confirm the proper location with the fire department authority having jurisdiction (AHJ) as local codes, standards, or policies may

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Fire Protection

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have different requirements. The Honolulu Fire Code requires fire department connections to be located within 20 feet of a fire apparatus access road. Department of Defense fire protection criteria1 requires fire department connections to be located within 150 feet of a fire hydrant.

Fittings for fire department connection inlets and standpipe hose valve outlets must be compatible with hose couplings used by the fire department and located to allow connection of hose and uses of tools. NFPA 14 requires hose valves be located at the intermediate stair landing between floors. However, there may be cases where the fire service prefers they be located on the floor landing, so it is advisable to consult with the fire department plan reviewers on this item.

Regarding the use of pressure reducing or pressure regulating valves on standpipe systems, where possible design to avoid the use of these devices. Where they cannot be avoided, specify valves that easily can be adjusted in the field. Specifications must require installers to provide training to the fire service on their use, and final acceptance testing must be performed to prove these valves are operating properly.

Fire protection during construction is an oft overlooked, but a very important design consideration. Both the IBC and NFPA 14 contain requirements to provide temporary or permanent standpipe systems for certain buildings under construction. NFPA 14 leaves it up to the AHJ as to when an operable standpipe would be required (another reason to talk to the fire department). The IBC requirements are more specific. At least one working standpipe riser shall be provided for buildings four or more stories in height and a working outlet must be available within one floor of the highest point of construction. The IBC similarly requires buildings under demolition that have standpipe systems to maintain the standpipe system operable up to no less than one floor below the top of the building.

There are some excellent resources out there that can help you familiarize yourself with the needs of the fire service in this area. The free publication Fire Service Features of Buildings and Fire Protection Systems from the Occupational Safety and Health Administration, Department of the Labor, can be downloaded at http://www.osha.gov/Publications/fire_features3256.pdf. This document was written by Mathew Chibbaro, PE, a Fire Protection Engineer with OSHA, who is also an active volunteer firefighter.

Another good resource would be *NFPA 13E Recommended Practice for Fire Department Operations in Properties Protected by Sprinkler and Standpipe Systems*, 2005 Edition. This document will help you gain some understanding of the fire service perspective when dealing with sprinkler and standpipe systems.

And finally it bears repeating, meet with the fire department AHJ to discuss their requirements and needs and how these can included in the design. ■

1. UFC 3-600-01 Fire Protection Engineering for Facilities, 26 September 2006 Change 1, 14 July 2009

***Samuel S. Dannaway**, PE, is a registered fire protection engineer and mechanical engineer and past president and a Fellow of the Society of Fire Protection Engineers. He is president of S. S. Dannaway Associates, Inc.*

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Solar Solutions

Bristol Stickney, technical director, Cedar Mountain Solar Systems, Santa Fe, N.M.

Warm-floor solar heating for concrete pools

Solar pool heat

Solar pool heating is already a much larger industry in the United States than solar home heating. Swimming pools can require a tremendous amount of heat depending upon the climate, and so pool owners always seem to be receptive to the solar heating option since a swimming pool can often double or triple their home heating bill.

The most common solar pool heating systems use unglazed plastic solar heat collectors, where water from the pool itself is circulated through the plastic collectors when it is sunny, using the filter pump as the solar collector circulator. This type system (unglazed direct) can be seen on the plastic collector websites, such as Fafco, Heliocol, Technosolis and others. (For a complete list of unglazed pool collectors certified in the United States, see the SRCC Web pages.)

Unglazed direct solar pool collectors are appropriate only for climates that do not freeze or for seasonal applications where water is drained from the collectors during times of freezing weather. In our climate (Santa Fe, New Mexico), they are considered seasonal systems, intended to extend the outdoor swimming season by providing solar heat only throughout the spring, summer and fall.

The second most common solar heated pool system applications use glazed flat plate collectors that heat the pool indirectly through an external heat exchanger. This allows the solar collector system to remain in operation all year round, even during freezing weather. In our region, the collectors are typically filled with pressurized propylene glycol mixture which feeds the hot side of the pool heat exchanger, and pool water is circulated on the cool side of the heat exchanger most often pumped by the pool filter pump. This type of system (glazed indirect) is popular with solar heating indoor pools that are used year round.

A third way of solar pool heating has emerged over the past decade that few people have ever heard of, but has become my preferred solar heating system for pools. That is the "warm floor" solar pool heating system. Concrete pools and hot tubs that are constructed on-site are made of the same elements as a slab-on-grade "radiant heated floor"; concrete, remesh and rebar in contact with the earth. Sometimes, with a little collaboration with the pool builder, some insulating material can be added around or beneath the concrete shell. When PEX hydronic heat tubing is tied to the remesh and embedded in concrete shell of the pool, you then have a direct solar heat exchanger as shown for a hot tub under construction in Figure 19-1. This type of system is a simplified version of the glazed indirect approach, but because the concrete shell of the pool is heated directly by solar hydronic fluid, I think it qualifies as a glazed direct solar heating system.

Electrical power advantage of pool floor heat

I designed my first warm floor pool more than 10 years ago for a custom home project near Santa Fe that presented many solar heating challenges to overcome. It was an off-grid enabled home that required extreme electrical efficiency. When grid power was not available, all electrical systems transferred automatically to photovoltaic (PV, solar electric) battery power. The house was large (more than 8,000 square feet) and so required a large array of solar heat collectors just for space heating. The remote location required propane deliveries as the only conventional backup heating fuel. Because of a sprawling site layout, the heat collectors had to be mounted over 200 feet from the house, and the outdoor lap pool was another 100 feet or so from the house. There was also an outdoor hot tub that required solar heat located about 100 feet in a different direction.


Figure 19-1

To save on electricity, I designed the entire hydronic heating system — including the pool and hot tub solar heat — around DC circulators that use a fraction of the pumping power of typical pumping systems available at that time. All the supply and return tubing diameters (as well as most of the embedded floor tubing) were up-sized to reduce the pumping power required to deliver hydronic heat. The solar collector circulators were directly powered by PV panels, so that solar heat collection did not require any grid power or any battery power. The 200-foot run out to the collectors (18 panels, 4' × 10'), required two solar circulator pumps each powered by its own 150 watt PV panels. The ground mounted collectors can be seen in Figure 19-2.

By putting 3/4-inch PEX (instead of the typical 1/2") into the concrete shell of the pool, I calculated that the daily solar heat provided to the pool could be delivered to the floor of the pool using a DC circulator rated just under 20 watts. I used the same approach for the remote hot tub and each floor heating zone in the house. The electrical controls for each circulator were designed so that DC power was consumed only when hydronic heat was being delivered. No wasted electricity was consumed by zone valves and transformers, since these were eliminated by using the DC equip-


Figure 19-2

Continued on page 26

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Solar Solutions

Continued from page 24


Figure 19-3

ment powered by the solar electric batteries. Since the inside surface of the pool shell serves as the water side of the solar heat exchanger, the filter pump is not required when delivering solar heat to the pool water. Heat delivery happens by natural means of conduction, convection and radiation from within the concrete shell of the pool, which drastically reduces the electrical consumption while heating the pool.

The pool with the solar heated warm floor described above can be seen under construction in Figure 19-3 and in its finished form in Figure 19-4.

Other useful advantages

By using warm floor solar pool heating we gain a number of additional benefits. The solar heating equipment becomes completely separated from the conventional pool mechanical equipment. There does not need to be any plumbing or electrical connections between the solar equipment and the pool mechanical systems. The conventional gas backup boiler can be set to provide a minimum water comfort temperature for the pool user, and the solar heat boosts that temperature when ever it can, within a reasonable comfort range under its own separate temperature control. When ever the solar heat provides a temperature higher than the boiler set-point the boiler will respond normally by turning off the gas. In this way, the pool guy has his own domain and the solar guy has his. There is no question about who is responsible for what equipment and what warranty belongs to whom.


Figure 19-4

A cool solar collector is a happy solar collector. You can see this in the collector efficiency graphs included in some of my earlier articles. When circulating warm hydronic fluid through the shell of a pool, is tends to cool off much more than when running through the hot side of an external indirect heat exchanger. This cooler fluid, when returning to the solar collectors, results in higher solar thermal efficiency for the collectors, which translates to more solar heat per day delivered to the pool.

The home heating system described above was one of the

most complex solar combi-systems I ever designed. (A combi-system combines solar heat collectors, DHW, space heat and other multiple heat sources and multiple heat loads into one system.) As I have mentioned before, solar heat dissipation is always a concern with these systems. There is always a possibility that, at some time during the year, the large solar heat collectors will provide more heat than is needed by the heating loads. A swimming pool provides an ideal place to dissipate extra solar heat, since free heat for the pool is almost always welcome.

When heating a pool through the floor, the heat source is at the bottom of the pool where you might expect the coldest water to settle. When the filter pump is not running, the water temperature in the pool will tend to stratify: hot water rises upward and cool water settles to the bottom. In a pool with a warm floor, water temperature tends to de-stratify even without the filter pump mixing it. A pool filter pump is generally an energy hog, requiring hundreds and often thousands of watts to operate. If it is required to run during solar pool heating, the parasitic efficiency loss can be substantial.

Over the past 10 years I have been involved with about a dozen site-built concrete pools and hot tubs that are solar heated. Some are indoors, some are outdoors. About half have employed external indirect heat exchangers and the others have been "warm floor" pools and tubs. I prefer the performance and simplicity of the warm floor systems. Building them successfully takes cooperation and collaboration with the pool builder. When it comes to structural concerns and functional details, the pool guy has the final word on the pool construction.

The DC hydronic control system briefly described above was patented by myself and Allan Sindelar, of Positive Energy in Santa Fe and originally called the SETH (Solar Electric Thermal Hydronic) control system. Brand names, organizations and manufacturers are mentioned in these articles only to provide examples for illustration and discussion and do not constitute any recommendation or endorsement. ■

***Bristol Stickney**, partner and technical director at Cedar Mountain Solar Systems in Santa Fe, N.M., has been designing, manufacturing, engineering, repairing and installing solar hydronic heating systems for more than 30 years. He holds a Bachelor of Science in Mechanical Engineering and is a licensed Mechanical Contractor in New Mexico. He is the chief technical officer for SolarLogic LLC and is involved in training programs for solar heating professionals. Visit www.cedarmountainsolar.com for more information.*

In this series of articles, I have been making the case that the key ingredients for solar/hydronic design and installation can be divided into six categories, listed below, roughly in order of their importance.

1. RELIABILITY
2. EFFECTIVENESS
3. COMPATIBILITY
4. ELEGANCE
5. SERVICEABILITY
6. EFFICIENCY

The success of any solar hydronic home heating installation depends on the often-conflicting balance between any of these six principles. Finding the balance between them defines the art of solar heating design.

Hot Water Recirculation in High-Rise Buildings

A growing trend and buzzword in the industry is the emphasis on turning, 'Green'

Pumping systems are contributing significantly to the success of this trend through the use of alternative applications including variable frequency drives, water heaters with minimal or no storage, and innovations such as incorporating expansion tanks and jockey pumps in pressure booster systems to maximize off-peak performance.

Hot water recirculation pumps are being applied to systems in order to decrease the unnecessary "dumping" of cold water, and the resulting convenience coupled with water savings, both offer significant benefits to the user. Such recirculation pumps typically have fractional horsepower motors and run constantly. In a typical 2- 3-story hospital or school building, recirculation works well because the circulators only have to overcome friction losses in the piping and function simply as closed loop pumps.

However, in a high-rise building, the issue is more complicated. A typical 26-story high rise building may have three recirculation pumps and hot water heaters at the top of the building in a down-feed style supply. Water is boosted from the basement to the top of the building, and in the illustration shown in Figure 2, pressure of 38 psi must be maintained at the top. This forces the water through PRVs in each lower zone in order to avoid excessive pressures at the fixtures. The pump must act not only as a recirculation pump but also as a pressure booster. Pump P3 in Figure 1 would be sized around 15 GPM @ 210 FT to overcome friction losses and the static height of the building, and it must be capa-

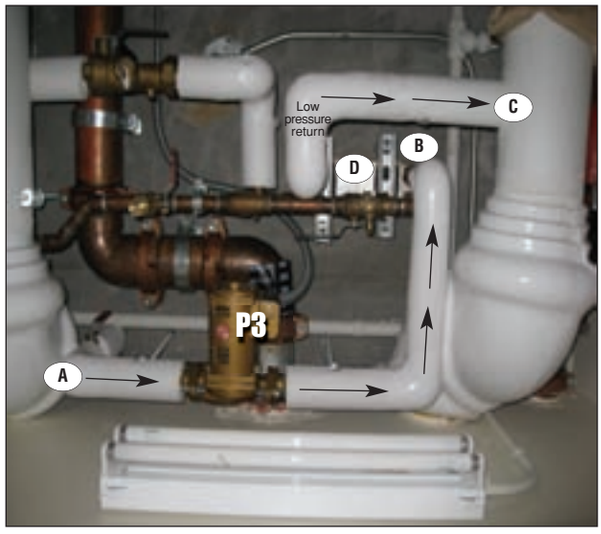


Figure 1: Note that the photo above is a view looking up at the ceiling — the pump (P3) is installed with motor shaft in the horizontal orientation.

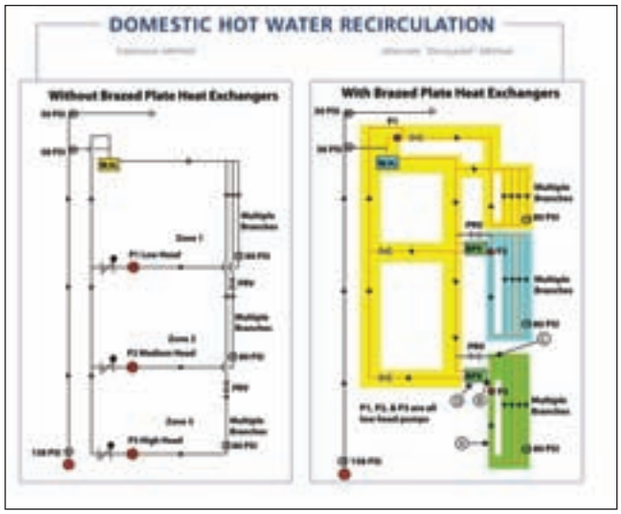
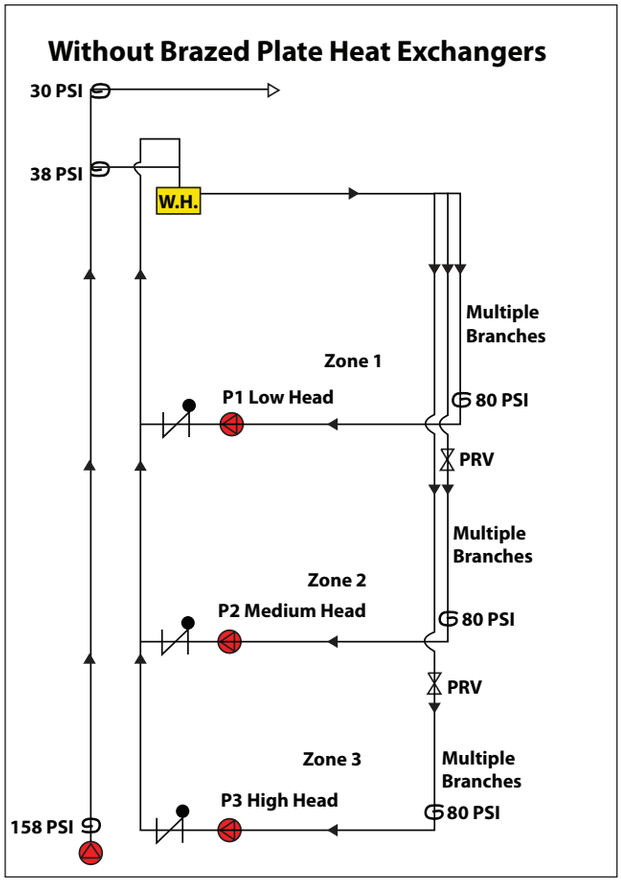
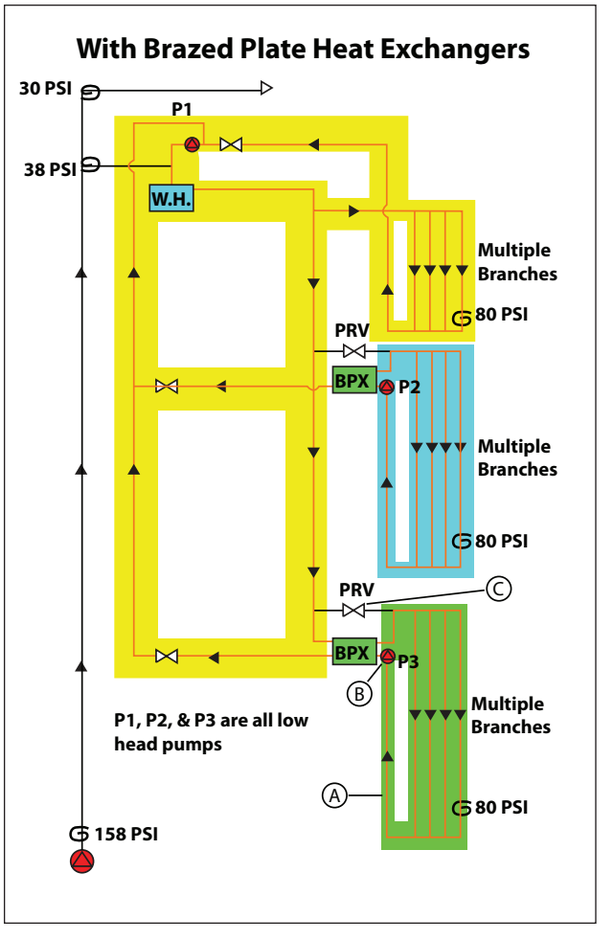


Figure 2



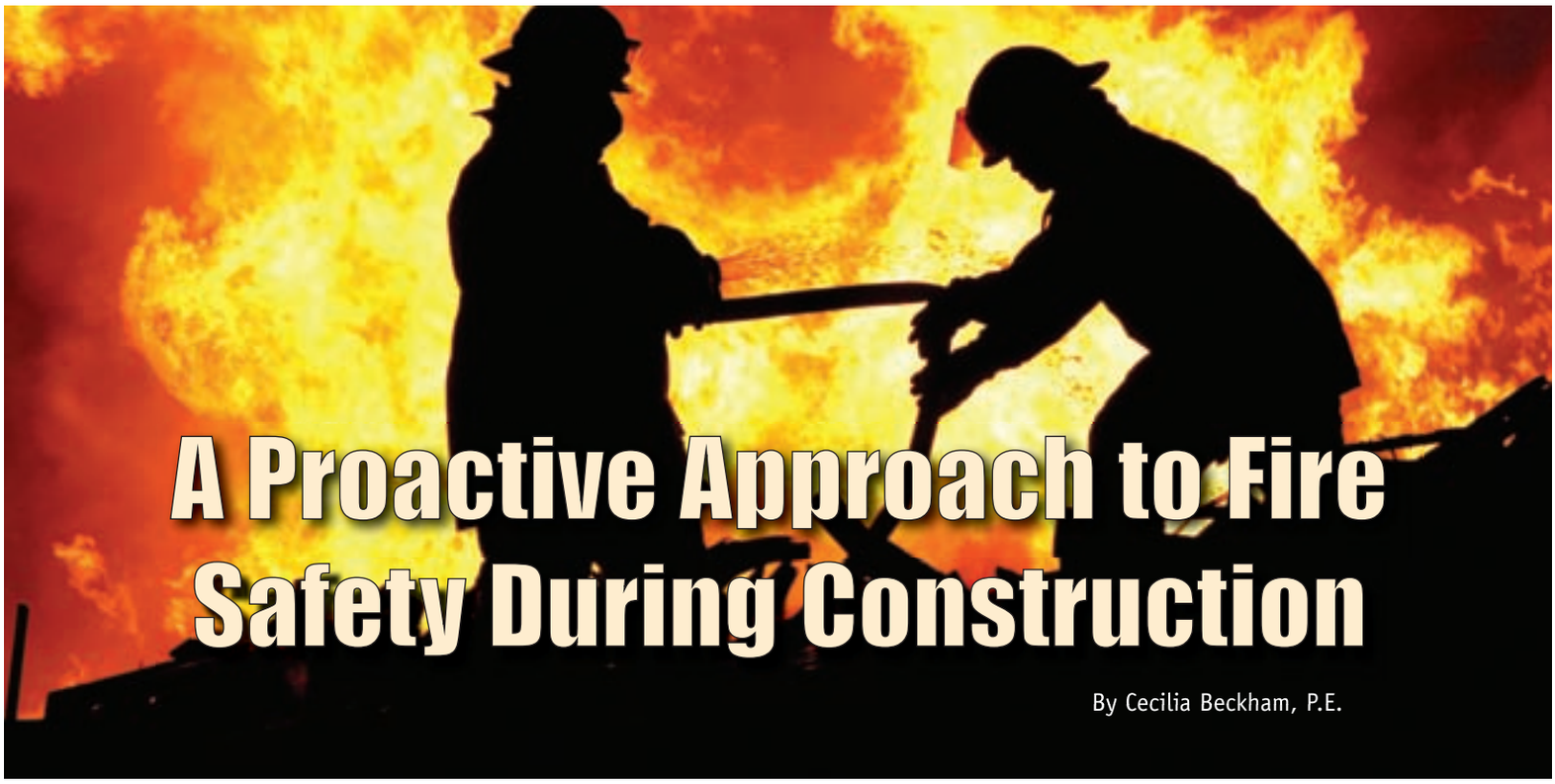
ble of pumping potable water but the standard 175 psi seals become marginal and pump efficiency at this low flow is poor at best.

One way to separate the negative effects of the PRVs is to 'decouple' the recirculation loop, and this can be



done with brazed plate heat exchangers, which provide a cost effective solution to the issue. We can save operating horsepower by using a low-head (pressure) pump instead of a high-head pump. The initial cost of a small single-wall brazed plate heat exchanger and the low-head pump is comparable to the cost of a high-head pump. Each isolated group does need its own tank, isolation and balancing valves, but the balancing act is simplified since we don't have to try to balance multiple high-pressure pumps on various floors with each other. We can even run the secondary zones with aquastats. The net effect is a more efficient and quieter running plumbing system.

To illustrate a more efficient and quieter running plumbing system, see the drawings, left, above. One shows the traditional method of piping a domestic hot water recirculation system, and the other shows an alternate system using a "decoupled" approach. De-coupled recirculation offers significant benefits and should be considered for greener high-rise building applications. ■



A Proactive Approach to Fire Safety During Construction

By Cecilia Beckham, P.E.

Fires can occur in buildings still under various stages of construction, and also when the construction is complete but not yet turned over to the owner. Fires occurring on construction sites can result in loss of life and substantial property loss. An estimated 4,800 construction site fires occur annually and result in millions of dollars in property loss a year. Additionally, there is always a safety risk to the responding fire departments in a fire event.

A contributing factor in these losses is that the fire suppression systems are not functioning at the time of the fire. Some examples of fires that occurred during construction are:

• A luxury apartment complex in Reno, Nevada, under construction was largely destroyed by a fire on July 2009.

• At the 520-foot Mandarin Oriental in Beijing, China, a fire broke out in February 2009 due to a firework display. The fire resulted in damages greater than US $588 million.

• In May 2009, the Dynetech Centre in Downtown Orlando, a high-rise building, was damaged by fire. There were no working sprinklers inside the building because they were being installed.

• In January 2007, a fire broke out in the 35-story Jumeirah Lake Towers in Dubai. Two workers died as a result of the fire that was caused by flame welding.

• The Al Nasr Twin Towers construction site in Qatar was twice hit by fire in 2006. Both were believed to have been caused by the use of flammable materials and a failure to store and handle them safely. At both times, the fire sprinkler systems were not yet operational.

• In March 2007, a fire that broke out in a tower under construction on Sheikh Zayed Road was caused by flammable building products stored haphazardly on the building's top floor. The fire sprinkler systems were not yet operational.

Fires that occur on construction sites during various stages of construction are commonly caused by welding, improper storage of hazardous and combustible materials, accumulations of combustible waste material, dust and debris, electrical problems, on-site smoking and arson.

The installation of a fire sprinkler system has proven that the systems are an effective method for controlling the spread of fire and reducing the loss of life and property. Having an operational fire sprinkler system as early as possible in the construction process is crucial to protecting the property, and in some cases, life.

Fire sprinkler systems are typically tested and inspected in two stages: rough inspection and finish inspection. During the rough inspection, the system is hydrostatically tested under pressure to ensure that the system has been correctly installed with no water leaks. Once accepted and approved by the Authority Having Jurisdiction (AHJ), the water supply control valve is typically turned off, rendering the fire sprinkler system non-functional. The system is typically left out of service until construction within the building is nearly complete and the fire alarm monitoring system has been installed.

So the question becomes, "When is it the most efficient time to put a sprinkler system in service?"

The straightforward solution would be to activate the sprinkler system immediately at the time of installation. However, this is usually not the case, largely due to issues such as improper coverage of fire sprinklers due to incomplete construction (walls, ceilings) and possible construction damage to the fire sprinklers.

There is also the liability of an accidental discharge involved in activating the fire suppression systems in the early stages of construction. During construction, damage to the fire sprinkler system can be caused by multiple contractors working on the project. At times, failure of the system due to damage may not occur immediately and may occur after several hours, resulting in major water damage. Without proper monitoring by the fire alarm system, the fire sprinkler system could fail without any notification.

However, with proper pre-planning and taking a proactive approach to the fire safety during construction, one

can take preventive measures to ensure minimal loss of property and life. It is important that at the start of any project that there is open communication between the owner, owner's design representative, the insurance company and the AHJ to determine the project issues that impact an early operational mode of sprinkler system. It is also important to note that the AHJ must be willing to accept any temporary design required to allow for early sprinkler protection. All costs and risks should be discussed between all parties.

One possible solution would be to install a fire sprinkler system on a phase-to-phase basis in a predetermined area. For example, in a high-rise building each floor may be considered a separate phase. Temporary, low-cost brass fire sprinklers would be installed in one phase and the system would be hydrostatically tested and left in service. While the temporary sprinklers are not aesthetically appealing, their sole purpose would be to activate in a fire in that area during construction. As the construction for each phase nears completion, the temporary sprinklers could be carefully removed and the final sprinklers would be installed. The removed temporary fire sprinklers could possibly be reused in the following phase depending on the sprinkler condition and the construction schedule. Additionally, in order to provide an adequate level of supervision for the fire sprinkler system, a permanent fire alarm system main riser or a temporary circuit and control panel could be installed to allow for temporary monitoring to the water flow and tamper switches. Final sprinklers and a permanent final fire alarm system can be installed in accordance with the overall construction schedule.

This proactive work does require additional cost for the extra work and equipment. However, this additional work can be defined as an "alternate cost" in the bid documents and the cost can be seen up-front. This would allow the owner to weigh the insurance cost savings during construction, the dollar loss incurred as a result of construction delays caused by fire damage, and the loss of property against the cost of the additional temporary work.

Ultimately, a property owner will choose between the risks that one is willing to take against a fire occurring and the cost to effectively prevent a fire from causing severe damage. As fire protection professionals, we have a responsibility to reduce the risks to life and property. ■

***Cecilia Beckham**, P.E. is a senior consultant based in the Los Angeles-area office of Rolf Jensen & Associates, Inc., a global leader in fire and life safety consulting. She can be reached at 714-257-3555, or at cbeckham@rjagroup.com.*

Plumbing Engineer's LEAD FREE REPORT

In September 2006, California became the first state in the nation to pass a "lead free" plumbing law, followed by Vermont in 2008. Several other states are considering similar legislation. Enacted as an amendment to the state's Health and Safety Code, California's Assembly Bill 1953 stipulated that as of Jan. 1, 2010, "any pipe or plumbing fitting, or fixture intended to convey or dispense water for human consumption" introduced into commerce within California would be limited to a "weighted average lead content of the wetted surface … of not more than 0.25 percent."

Many companies had already started selling products manufactured using a proprietary "lead free" alloy, or more commonly, by licensing an existing alloy such as Eco Brass, which was developed in response to a tightening of the drinking water lead leach restriction in Japan that took effect in 1993.

Section 116875 of California's Health and Safety Code is now in effect, with manufacturers still encountering considerable uncertainty in terms of how the law will be interpreted and enforced. They are under a great deal of pressure to get the answers and information they need to get products to market while protecting themselves from exposure to penalties and/or litigation.

Certification has proven a sticky issue as third-party certification bodies jockey for the manufacturers' business. Some claim that certification to Annex G of NSF/ANSI Standard 61, which regulates the amount of lead in products that come into contact with drinking water, satisfies the requirement. Others point to language differences between the new law and Annex G and contend that certification to one does not ensure certification to the other. Information provided by IAPMO. For more information, www.iapmo.org.

ASSE introduces lead content program

WESTLAKE, OHIO — The American Society of Sanitary Engineering has introduced a new Lead Content Certification Program which is now being offered for new and current ASSE listings. ASSE's Lead Content Certification Program is launched with the purpose of verifying products as having ≤0.25% percent maximum average lead content.

The ASSE Lead Content Certification Program allows manufacturers applying for ASSE listings and manufacturers with current ASSE listings to demonstrate their compliance to new regulations, as well as demonstrate their concern for the public's health and safety. For more information, www.asse-plumbing.org.

Matco-Norca offers lead free fittings

BREWSTER, N.Y. — Lead free brass fittings are part of Matco-Norca's new lead free product offering, which in addition to these fittings include valves, faucets and plumbing specialty items.

All Matco-Norca Lead Free products are compliant with the new California Health and Safety Code 116875-116880 as well as Vermont's lead free law, both now in effect. Lead Free Brass Fittings from Matco-Norca are certified to contain less than .25% weighted average lead content over wetted surfaces. All Matco-Norca Brass Fittings are UL and ANSI approved.

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The Re-Greening of Commercial Buildings

Fox Mechanical technicians service high-efficiency boilers at a job site in Columbus, Ohio.

Many commercial buildings constructed before the 1960s were heated hydronically, that is: with hot water or steam heat. Forced air systems moved in vigorously during the next several decades. Though, lately – with the rise of ultra-high efficiency hydronic systems and the nouveau popularity of in-floor radiant heat – hydronic systems began a forceful comeback in the 90s.

Current economic woes have yanked the growth curve downward, so most movement in the hydronics industry has returned to replacement and retrofit work. Even though banks have tightened the purse strings on funding for commercial work, there's still a fair amount of "re-green" retrofit work happening now inside commercial buildings nationwide, thanks in part to Federal and state energy improvement incentives.

The three primary areas where system performance and energy improvement changes are being made are these: boiler replacements, pump system retrofits, and piping enhancements, improving flow, system efficiency and offering comfort and convenience in a ways possible only with hydronics.

If your building has an old (20-25+ year) heat plant, it's likely that, even if the system has been routinely maintained, you're losing 10 to 20% of the BTUs produced inside it. And if there are performance issues, it's likely that the old boiler is throwing away a lot more of the heat than that. It's not at all uncommon for older boilers to cough and sputter through many seasons at less than 50% efficiency.

As many boilers reach the end of their useful life, it's common for flue gas condensate acids to corrode exhaust stacks, for combustion chambers and near-boiler piping to deteriorate. So, it may be time for a systemic overhaul. This article will look at the key parts of what that may entail.

Fortunately, there's no better time to replace an ailing boiler — and other system components — than right now.

Some commercial mod-con systems, for example, have the ability to meet peak demand for space heat and domestic hot water simultaneously. A few years ago, at Fantasyland, Canada's largest luxury hotel, a contracting firm replaced several old heating systems with high efficiency Rheos boiler/volume water heater units from Laars. The "modulating" function gradually increases or decreases firing based on the call for heat — a huge improvement over old and wasteful, full-fire, on-off operation.

"The boilers are perfectly suited for the job because their controls monitor the demand for hot water and automatically adjusts each boiler's capacity to meet the required heating load from 1.2 million to 2.4 million BTUs with variability of modulation between 100% and 25% of the input rate," stated the installing contractor.

"They're an 'environmental' win too," he added. "These are among the 'greenest' heating systems on the marketplace with NOx levels of less than 10ppm and low CO_2 greenhouse gas emissions, and offer up to 96% efficiency – a big plus in Canada."

"Another key need was the units we selected would need to have a much smaller footprint than the old boilers; the new boiler's compact size allowed us to install three new units in place of the two older ones," said the building maintenance engineer. "The high efficiency boilers have also reduced the amount of natural gas required to heat the domestic water, lowering energy consumption and operating cost."

Another facet of a hydronic system overhaul may be piping to and from the mechanical room. At Fantasyland Hotel, the new system was designed so that the mechanical room piping also enhanced overall efficiency and operation. Primary/secondary piping system was designed with total serviceability in mind, incorporating bypass piping so that any piece of equipment within the system can be isolated for maintenance without disrupting the supply of hot water on to the hotel. In addition, the installation there was set up with lead-lag redundancy, exercising each of the boilers uniformly and to permit non-disruptive off cycles for preventive maintenance.

Efficiency is key

In the commercial market, we see that "green," (and to some extent, "high performance") hydronic heating and volume water heating depends on the interrelationship of four key facets of the boiler system:

1. System efficiency. How effectively the boiler relates to the total system is determined by its capacity to deliver heat either quickly, or slowly, depending chiefly on the needs of the system and the ability of the boiler to adjust to changes in the system's demand for heat.

According to Joan Mishou, manager of applications engineering, Laars Heating Systems Company, another important factor is more sophisticated controls that sample changes over time and "learn" the responses of the system to changes in conditions such as heating load, outdoor air temperatures, and firing stages of the boiler(s).

Modulating and stage-fired boilers reduce fuel consumption by 'sizing to the load' so that the amount of heat produced by the system precisely matches the need."

Piping and pumping are also key factors in building an efficient system. The most efficient boiler in the world can't make an entire system efficient if the system is not piped and pumped correctly.

But efficiency is only one of the advantages of installing these systems. Application of the boiler can play a more important role. Their tough resistance to thermal shock and the ability to accept low return water temperatures puts them in a category of their own and opens up many new possibilities for hi-volume, cold-start systems.

"One example is a commercial snowmelt system," added Mishou. "A condensing boiler takes very low inlet temperatures in stride — in fact, the lower temperature of incoming water (or a water/glycol mix as is usually the case), the higher the combustion efficiency of the boiler."

2. Combustion efficiency & thermal efficiency. Just a few years ago, combustion efficiency and thermal efficiency were considered to be the most important factor in determining overall system performance. That's not the case today.

According to Mishou, transferring heat from a boiler into a total system — and in just the right amount and at just the right time —– is a truer measure of "green" efficiency and high performance.

3. Emissions. To consider the boiler system "green," the reality of emissions must be taken into consideration.

4. The boiler, in context. Of course, what exists beyond the boiler jacket and near boiler piping will impact overall system performance. Consider circulation, control solutions and heat distribution. New technology and intelligent system design are the key players here.

Pump system retrofits

Does the building have circulatory woes? The solution may involve infinite variables, though — if pumps are old, deteriorating, noisy or otherwise showing their age — it may be time to consider a bigger, better resolution.

Drop-in pump replacements are one thing, designed chiefly to solve an immediate need. Pump and circulator technology has come a long way in the past several years, so a more attractive solution for a building retrofit, especially one driven by a desire to enhance overall system performance and reduce energy consumption, would be to study the option of a pump system overhaul. Very often, new pumps provide quick ROI, and payback, save space, and simplify and improve operation of the pumped system — whether for hydronic heating or cooling, movement of process fluids, or to enhance operation of a large domestic water system.

One of the first considerations should be to look at the impact that variable speed pumps could make. The smart circulators can be set to meet the specific needs of a pumped system rather than — as is often the case with single-speed pumps — pumping furiously to meet the need, exceeding it, then shutting off . . . and for the process to repeat itself over and over again.

Taco, Inc., one of the leading manufacturers of new, state-of-the-art commercial pump systems, offers LoadMatch as one of the best hydronic heat retrofit options available to building owners today. The cost-effective,

Continued on page 38

Letter to the Editor

FPE Article: A Baker's Dozen - Fire Pumps (December – 2009)

Mr. Dannaway.

I always look forward to reading your articles in the *Plumbing Engineer* magazine. The tips and points you provide are always very useful.

One of the main concerns and problems I run into in regard to fire pump testing, and main drain testing for that matter, on sprinkler systems is the location and allowances for flows at full test levels.

I've run into problems with both in regard to test headers or main drains basically being positioned or located in areas incapable of accepting full flows.

So I really enjoyed your Tip no. 6.

I assume you are aware of these, but a number of fire pumps I test throughout the year utilize a flow nozzle, instead of a cow bag or underwriter play pipes. These, of course, work well when we are firing test flows back into holding tanks (gravity) or ponds.

On another note, I live in Prince George, BC, Canada, but I actually graduated from High School at GWSS in Guam.

Thanks for the tips and keep them coming.

Cheers,
Alan K
Alan Kavanaugh, CRM, CCPI
Risk Management Service, A Shumka Group Company

Hafa adai Mr. Kavanaugh,

Thank you for the email and for reading my articles. Safely testing fire pumps with full flow discharge through play pipes or nozzles is always a challenge, thanks for the picture.

I travel to Guam several times a year and have been doing so since my first trip there in 1979.

Aloha, Sam

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single-pipe solution mimics the leading hydronic design used worldwide: primary-secondary pumping (like the design used at Fantasyland Hotel).

The single-pipe LoadMatch system, with its single-pipe primary main, uses terminal units configured with decoupled secondary piping circuits. Maintenance-free wet rotor circulators replace control valves to provide temperature control for each zone. And because the circulators also provide the differential pressure to direct water through the secondary system, there's no need for energy-consuming control valves or Venturi Ts.

And because control valves and balancing valves are eliminated, a single-pipe system also has lower head loss than a conventional two-pipe system; this reduces up-front and replacement costs, saves energy, space and simplifies operation and design.

The piped 'vascular' system

If a building has a two-pipe heating system, this may be the time to consider a single-pipe design retrofit. In the process, consider replacing leaky, corroded, occluded piping with new PEX and EPDM synthetic rubber tubing.

Thousands of miles of copper and steel pipe distribution systems have been replaced with PEX and EPDM tubing. Super durable, flexible, continuous tubing can easily be routed between a source and points of delivery in a fraction of the time it takes to get the job done with metal. And, the material is far less costly.

While you're at it, it may be feasible to extend some of the new "vascular system" heat into floors, walls, ceilings or new, efficient radiant panels. Efficiency of flow, and heat distribution, dramatically improves overall system efficiency + comfort.

If parts of a building are being renovated — especially those where achieving maximum comfort is needed, or where large spaces with great ceiling heights that challenge the best forced air systems — ultra-efficient, low-temperature, radiant heat may be a superb solution.

And, finally, there's the great outdoors. Mother Nature invariably has her way with us during the winter months. One of the best ways to fight back in areas where snow and ice threaten easy passage across driveways, walkways, ramps, stairways and helipads is to install snow melt systems. This involves the embedding of radiant tubing under outdoor surfaces, including concrete, paver bricks, stone, tile and blacktop.

Snowmelt systems can be far less costly than requiring people and equipment to clear and dispose of snow and ice. Automatic snow-melting also reduces the need for chemical melting agents that can kill plants, contaminate waterways, and be tracked into interior floors.

So, with heating, pumping or piping needs inside the building, or outside, or both — there's a reasonable, realistic solution. Return on investment is assured. ■

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5 Wilkins check assemblies use captured springs. There is no need to remove the spring assembly for any service function. Our springs cannot accidently unwind, creating safety concerns like other check assemblies.

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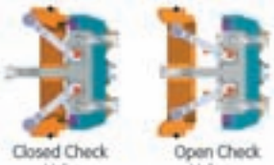

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