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December 2010

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Hot Water Balancing

Inside this issue

- 2010 Internet Usage Survey
- Safety and Low Flow Showerheads
- Product Application: Rainwater Harvesting

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*Average per year

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Plumbing Engineer
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FEATURES

2010 Internet Usage Survey

This exclusive Internet Usage Survey reveals the online habits of today's busy engineer.

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Hot Water Balancing

It is a requirement of any plumbing system with more than one hot water return path.

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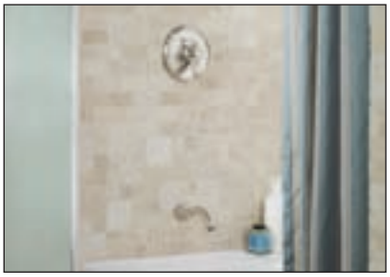

Safety and Low Flow Showerheads

Knowing the type of valve that is behind the shower wall could have an influence on purchase-making decisions.

Story on page 46

COLUMNS

INDUSTRY NEWS & OTHER DEPARTMENTS

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Editor's Letter

John Mesenbrink, editorial director
editor@plumbingengineer.com

Moving past the patchouli – the progress of efficient systems

While attending the latest Greenbuild show in Chicago I got to thinking of how popular the show really is. In a time where trade shows are dying off, Greenbuild continues to thrive. Why? Does the word "green" attract the granola people and tree huggers in droves? Well, not at this show. Professionals among the ranks of plumbing and mechanical engineers, architects, designers, builders and contractors filled the aisles. Manufacturers and service offerers of energy efficient products, water conservation and carbon footprint-reducing mechanisms were on hand to show off their wares. Throw in a big-name keynote draw — Colin Powell — and you have a recipe for success. Past show attendance numbers have proven the show to be a success, and although this year's numbers are still being processed, the exhibitors at the show that I spoke with were pleased with the turnout and target audience. Make sure you catch the Greenbuild show next October 4-7 in Toronto.

Breaking down LEED green

During the last 10 years or so, the green movement has been one of the hottest topics, culminating into a multi-billion dollar industry in and of itself. But with success comes imitation, and what is now widely-known as the oversaturation of "green" in the marketplace. How do you truly know what is green and what isn't? What governing body, or bodies, are legislating over this? There are organizations such as EPA's WaterSense and ENERGY STAR to provide guidelines on energy efficiency and water conservation, for example. But perhaps the largest group, and most relative to a plumbing engineer's specs for a more efficient structure, is the U.S. Green Building Council and its LEED accredited program. In fact, recently, the total footprint of commercial projects certified under the USGBC's LEED Green Building Rating System surpassed one billion square feet. Another six billion square feet of projects are registered and currently working toward LEED certification around the world.

"This achievement demonstrates the transformation of the way we design, build and operate buildings," said Rick Fedrizzi, president, CEO and founding chair, USGBC. "Not only does green building contribute to saving energy, water and money; it also creates green jobs that will grow and energize our economy."

The milestone is a testament to the global effort to meet USGBC's vision that buildings and communities will regenerate and sustain the health and vitality of all life within this generation. LEED is the preeminent program for the design, construction and operation of high-performance green buildings.

"The impact of these one billion square feet can be seen in communities around the world," said Peter Templeton, president of the Green Building Certification Institute, the certifying body for LEED projects. "The use of LEED represents a growing global commitment to improving our built environment for future generations."

Since it was first introduced to the marketplace in 2000, more than 36,000 commercial projects and 38,000 single-family homes have participated in LEED. By consuming less energy, LEED-certified buildings save money for families, businesses and taxpayers, reduce greenhouse gas emissions and contribute to healthier environments for residents, workers and the community. ■

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Industry News

Solar to shine at 2011 AHR Expo

WESTPORT, CONN. — Solar products, trends and technologies and their role in the HVAC/R marketplace will take center stage at the 2011 AHR Expo in Las Vegas, January 31 – February 2.

In addition to many new solar products on display, there will be more than a dozen seminars focused on solar topics, as well as demonstrations of solar technology, provided throughout the three days of the world's largest HVAC/R exposition and conference.

"Solar is one of the fastest-growing segments of the many sustainable technologies featured at the show," said Clay Stevens, president of International Exposition Company, which produces and manages the AHR EXPO. "At least 54 companies we know of will be featuring solar products. ASHRAE and other leading industry organizations have created special solar educational sessions for AHR Expo, and the UA Green Trailer will be providing ongoing solar demonstrations."

On the educational front, ASHRAE will be offering 10 solar-focused sessions, ranging from a forum on "The Role of Solar and Other Renewable Energy Sources in Strategic Energy Planning" to several seminars on such topics as Integrating Solar and Hydronic Heating for Residential and Small Commercial Systems. In addition, the International Energy Agency (IEA) will be conducting a Solar Cooling Workshop.

For more information regarding the AHR Expo in Las Vegas, visit www.ahrexpo.com.

ECR International, National Grid and Suny College of Environmental Science and Forestry announce partnership

UTICA, N.Y. — ECR International™ , a designer and manufacturer of hydronic and HVAC equipment, announced its partnership with National Grid and the State University of New York College of Environmental Science and Forestry (SUNY-ESF) to install a freewatt® plus home energy system into the SUNY-ESF College Residence, home to College President Cornelius B. Murphy, Jr.

The announcement was made at a news conference on Tuesday, Nov. 9, at the College Residence near the SUNY-ESF campus. Halco Plumbing & Heating, based out of Phelps, N.Y., installed the system. Installation of freewatt plus was driven by the SUNY-ESF Climate Action Plan.

"We are pursuing a variety of sustainable energy technologies as part of the College's efforts to become carbon neutral by 2015," said Michael Kelleher, SUNY-ESF director of renewable energy systems. The Climate Action Plan uses a combination of renewable energy projects, sustainable construction, energy conservation and managed forestland to achieve the carbon neutral goal. "ECR is excited to help SUNY-ESF achieve its sustainability goals," said Mike Paparone, ECR president and CEO. "By installing the freewatt plus system, the home's annual environmental impact can be reduced by up to 6,000 pounds or more of greenhouse gases."

Liberty Pumps holds annual rep meeting at ASPE

Liberty Pumps held its annual rep council meeting in conjunction with the ASPE show in Philadelphia. Council members include: Front row – Charlie Fletcher of Delco Sales in Calif., Nev. and Hawaii; Scott Cooper of Cooper New England Sales in Conn. and N.H.; Steve Sutter of Hodes & Sutter Inc. in Mo.

Back row – Randy Waldron, VP of sales/marketing, Liberty Pumps; Charlie Pongratz of GT Gordon & Associates in Wash.; Tony Bruno of Triumph Sales in Pa.; Charlie Cook, president of Liberty Pumps.

Not pictured – Chuck Schwabe, national sales manager, Liberty Pumps.

NFPA Conference & Expo to participate in U. S. DOC program

LISLE, ILL. — The 2011 NFPA Conference & Expo has been selected to participate in the U.S. Department of Commerce's (DOC) International Buyer Program, which brings together international buyers and U.S. firms by promoting leading U.S. trade shows in industries with significant export potential. The program is designed to assist exhibiting companies whose goal is to sell in the

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Industry News

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global marketplace.

As a participant, NFPA Conference & Expo will be promoted around the world through U.S. Commercial Service offices, and U.S. trade specialists will recruit and lead buyer delegations to the event.

"This program will expand the global reach of our event and effectively energize teams of trade promotion specialists into bringing qualified buyers and potential channel or JV partners to the show floor," said Marc Rosenstock, managing director of ROC-NFPA LLC, the event producer.

As part of the program, an on-site international business center will provide export counseling, market analysis and matchmaking services by country and industry experts from the U.S. Commercial Service.

St. Louis City residential redevelopment project breaks ground

ST. LOUIS — Silver-plated shovels were plunged into the ground on October 15 to commemorate the start of construction on north St. Louis City's $41 million Arlington Grove residential redevelopment project. The Arlington Grove project symbolizes a much-needed revitalization for the neighborhood. Many individuals and organizations are involved in the project, including the following: Friendly Temple Church, neighborhood residents, driven

alderman Jeffrey Boyd, developer McCormack Baron Salazar, KAI Design & Build (serving as the architect, M/E/P engineer, general contractor and building information modeling coordinator on the project), the City of St. Louis, the Associated General Contractors of St. Louis and the St. Louis Housing Authority. Thanks to their efforts, positive change is just around the corner.

Plans for the area include 112 mixed-finance, mixed-income rental units in garden apartments, townhouses, semi-detached housing, a new mixed-use building and rehabilitation of the historic Arlington Elementary School for a total gross residential square footage of 162,000 and 5,000 square feet of commercial/retail.

Environmentally friendly features incorporated into the development's design and construction include Energy-Star labeled and water-conserving appliances and fixtures, solar panels, water management techniques during construction, high-efficiency HVAC systems, recycling of content materials and reduction of heat-island effect through highly reflective roof shingles and pervious paving. Construction on the project is expected to be completed in spring 2012.

Grundfos to establish global competency center

OLATHE, KAN. — Grundfos Pumps Corp. recently announced that it would create a new global business development "competency center" devoted to the residential groundwater market at their North American headquarters in Kansas. Establishing this competency center complements the global production relocation to North America of the Grundfos Groundwater products, submersible motors (MS402) and the award winning submersible products (SQ/SQE/SQ Flex). Grundfos submersible pumps (SP) are already produced in Fresno, Calif.

The competency center will concentrate on business development and product development, which until now had been located at the parent company's worldwide headquarters in Bjerringbro, Denmark. In addition, Grundfos will look to add additional engineering and business development resources for the submersible pump lines in Kansas.

IAPMO R&T designated certification body for ENERGY STAR

ONTARIO, CALIF. — IAPMO R&T, one of North America's premier product certification agencies, is now an EPA-recognized certification body to the ENERGY STAR® product labeling system. A joint program of the U.S. Environmental Protection Agency and the U.S. Department of Energy, ENERGY STAR-qualified products help con-

More Industry News on page 12

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Industry News

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sumers save money and protect the environment through energy efficient products and practices.

Manufacturers wishing to promote the energy saving benefits of their products by labeling them as ENERGY STAR-qualified can apply to do so now through IAPMO R&T, long recognized as a leader in third-party certification for its efficiency and commitment to customer service.

On January 1, 2011, qualifying manufacturers will be able to display their IAPMO R&T certified ENERGY STAR qualification for the following products:

- Appliances (clothes washers, dishwashers, water coolers, refrigerators and freezers);
- HVAC equipment (boilers, room air conditioners, central air conditioners and air source heat pumps, residential water heaters, furnaces, residential ceiling fans and residential ventilating fans);
- Commercial food equipment (dishwashers, fryers, griddles, hot food holding cabinets, ice machines, ovens, refrigerators, freezers and steam cookers);
- Battery charging systems (BCSs); and
- Roof products.

Mansfield Plumbing hosts plumbing engineers

PERRYSVILLE, OHIO — In October, Mansfield Plumbing Products invited plumbing engineers and contractors from across the state to spend a day at its Perrysville, Ohio, plant. The company's Ohio facility is estimated to be the largest producer of sanitary ware in the United States, manufacturing more than two million pieces each year.

Mansfield president Jim Morando welcomed the group and gave a company overview before attendees toured the facility. A working lunch followed, during which Mansfield's marketing department presented the company's commercial-product offering.

Lochinvar mourns death

LEBANON TENN. — Bruce Morgan, district sales manager for Lochinvar Corporation in the western Michigan territory, passed away unexpectedly on November 2, 2010, while attending an ETNA Supply event. An integral member of the Lochinvar family since 2006, Bruce received the company's prestigious Salesman of the Year Award in 2008 and was recognized for Outstanding Sales Achievement in 2007 and 2009.

Bruce began his career in the industry in 1972, earning his master plumbers license, working as a mechanical contractor and owning his own business, Flagel & Morgan, from 1978 to 2006. Upon joining the Lochinvar team, Bruce brought with him an extensive knowledge of all things related to boilers, water heaters, hydronics and plumbing.

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Circle 9 on Reader Reply Form on page 49

Designer's Guide

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

Unexpected problems

The other day I got a call from Peggy, a woman who found my name by searching the Internet about the subject of hot water circulation. She e-mailed and then called to discuss her domestic water woes in her newly renovated home.

Problem No. 1 was her concern over varying hot water temperatures at different fixtures in her home, specifically, at the master bath versus at the kitchen sink. The water at the master bath was noticeably hotter than that in the kitchen.

To help me understand the problem, Peggy described her hot water system. She had a repiped circulated system

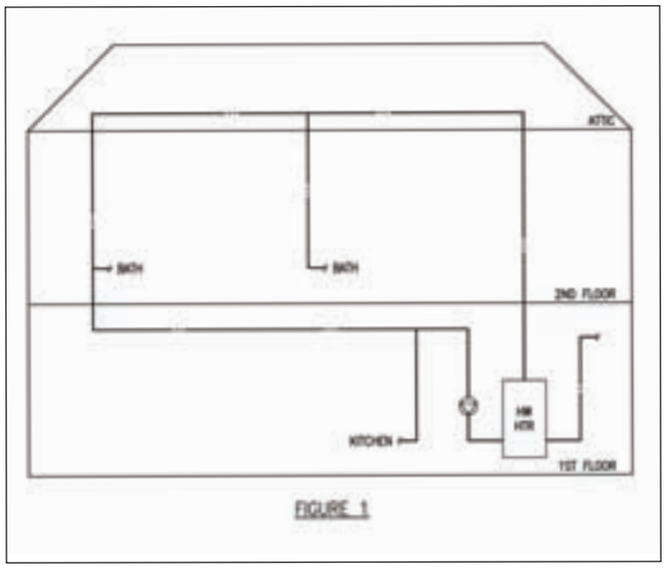

FIGURE 1

that ran water supply through the attic to the second floor fixtures and then dropped downstairs to feed the kitchen, prior to returning to the water heater. Note that the original piping system was run underground, as is very common in housing tracts here in So Cal, with distribution in walls up to the fixtures. This old abandoned system had been prone to slab (underground pipe) leaks, hence the repipe.

Peggy's system had a circulation pump on the hot water return, but she found that the system would circulate naturally, even with the pump off, due to the fact that hot water rises as colder water sinks. She preferred this natural circulation to running the pump, but she found that, with the pump off, the hot water upstairs became excessively hot.

I explained the concept of water heater stratification and the fact that, without the pump on, the top of the heater would get hotter and the bottom relatively colder, as the thermostat was fooled by minimal water movement. This stratification was probably exaggerated by the fact the heater was at least 12 years old and there was surely calcification at the bottom of the tank. Peggy agreed that, with the pump running, the hot water was more uniform, but this still didn't resolve the issue of cooler water in her kitchen.

She asked whether it was bad practice to supply the kitchen from the tail end of the return line: I told her no, that shouldn't make a difference. I explained that the new kitchen faucet might have a temperature-limiting stop that could be improperly set, allowing too much cold water to blend with the hot. Peggy said that she had read about this and had tried turning off the cold water below the sink, but that hadn't helped. Clearly she was a diligent and proactive woman.

Next, I asked whether the remodeled shower had a separate volume and temperature control with a diverter for a hand shower. She said that it did, so I explained that some shower valves were capable of creating a cross connection if the diverter is used to shut off the water while the volume control remains open. This cross connection would allow a blend of hot and cold water to pass through the valve to the water circulation line. Peggy said that she would investigate this but then mentioned an even more important issue — the circulation line had no check valve after the pump. She asked whether this could cause a problem. I told her that it certainly could.

Figure 1 shows the basics of Peggy's hot water system. Note the absence of a check valve after the circ pump. You can see that hot water for the kitchen would likely flow in reverse from the water heater to the kitchen, especially with the pump not running, since this is the path of least resistance. This means that the kitchen would receive colder water from the bottom of the heater, plus a tepid bypass from the cold water make-up to the heater.

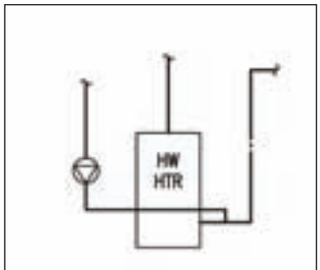

FIGURE 2

In Figure 2 you can see that, in this arrangement, with no check valve and the circ pump off, the kitchen would receive almost entirely cold water directly from the cold water supply to the heater. With the circ pump running, hot water would be more likely to come from the circulated supply rather than from the water heater make-up, due to the pressure from the pump. Peggy is going to have this problem corrected by adding a check valve after the circ pump. She also plans to replace her old water heater.

Problem No. 2 was a bit more unusual. As stated, Peggy's original installation had cold water piping located underground. The repipe had cold water in the attic. When this was first installed, in the winter, there were no problems. Come summertime, Peggy found that the cold water

Continued on page 16

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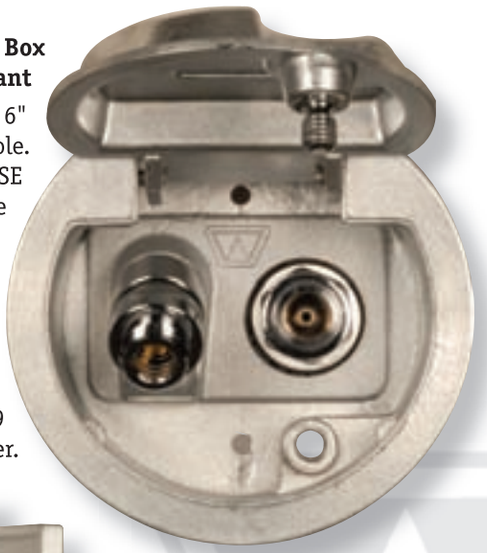

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would run hot, at around 115 F, for many minutes before it cooled down to a more typical So Cal 60 degrees.

> Problem No. 1 was her concern over varying hot water temperatures at different fixtures in her home, specifically, at the master bath versus at the kitchen sink.

This was an unanticipated problem caused by the cold water piping being in the attic. The attic itself is above the second floor ceiling insulation, so the temperature may easily rise to 115 F during a summer day. Of course, with the space at that temperature, the cold water temperature will also rise during periods of no use. So, instead of waiting for hot water to arrive at her sink or shower, Peggy has to run water and wait for cold water to arrive; water cool enough to shower or drink or wash vegetables. Quite ironic, actually, because this is the reverse of the stereotypical hot water delivery problem.

So, would I have thought of these problems and avoided them? Possibly not. The use of a check valve in a single loop hot water circulation system is traditional, but I think check valves in HWC systems are frequently overused. In this case, however, due to the tepid water backfeed, the necessity for a check valve was crucial. And would I have thought about the heat in the attic warming up the cold water? Probably not. The ideal place to run the cold water piping would be through the joists of the second floor construction, but, with an existing home, it is much easier to put the pipes in the attic. It's always easier to learn these lessons from others' mistakes, without having to learn them firsthand. ■

Timothy Allinson *is a senior professional engineer with Murray Co., Mechanical Contractors, in Long Beach, Calif. He holds a BSME from Tufts University and an MBA from New York University. He is a professional engineer licensed in both mechanical and fire protection engineering in various states, and is a LEED accredited professional. Allinson is a past president of ASPE, both the New York and Orange County Chapters. He can be reached at laguna_tim@yahoo.com.*

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Code Classroom

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

Fuel gas codes address dangers associated with purging of fuel gas pipes

On June 9, 2009, a ConAgra food production facility in Garner, North Carolina, experienced a catastrophic natural gas explosion that caused four deaths, three critical life-threatening burn injuries, an amputation and other injuries that sent a total of 67 people to the hospital.

The explosion caused serious structural damage to the approximately 87,000-square-foot packaging and warehouse area of the Garner plant, including wall and roof collapse, which caused the deaths and serious injuries. 37% of the roof area experienced collapse and 60% either collapsed or was so heavily damaged that it was unstable.

Following extensive testimony and public comment, the U. S. Chemical Safety Board, the agency investigating this incident, approved urgent safety recommendations on gas purging safety at a public meeting in Raleigh, North Carolina. The recommendations, which were approved as presented by the staff, urged the National Fire Protection Association (NFPA), the American Gas Association (AGA) and the International Code Council (ICC) to strengthen the model fuel gas code provisions on the purging of fuel gas piping systems.

Following is a partial list of recent fuel gas explosions related to purging operations that have led to multiple injuries and deaths:

— 1997. Explosion at a fitness center in Cary, N.C, severely burned two people and injured four others.

— 2005. Explosion and fire at a Triumph Food facility in St. Joseph, Mo., killed one worker and injured 19 others.

— 2005. Explosion and fire in a school in Porterville, Calif., burned two plumbers.

— 2007. Explosion at a hotel in Cheyenne, Wyo., severely burned two plumbers.

— 2008. Explosion and fire at the San Diego Hilton hotel injured 14 workers, several of them critically.

— 2009. Explosion and fire at a ConAgra Food facility in Garner, N.C., killed five and seriously injured 67.

— 2010. Explosion and fire killed five and seriously injured 27 at a Kleen Energy power plant in Middletown, Conn.

When new fuel gas piping is put into service, or when existing piping is returned to service after a long service interruption, it is typically necessary to purge the lines of air.

These explosions all occurred when workers were purging fuel gas lines during construction.

The NFPA develops widely recognized consensus fire protection codes and standards. Another family of building codes is published by the International Code Council (ICC) and includes the 2009 International Fuel Gas Code (IFGC). Both codes address some safety guidance and requirements for the installation and operation of fuel gas piping and equipment, but there is room for improvement.

The NFPA, through an emergency revision to the NFPA 2009 code, prohibited the use of natural gas to purge gas pipelines. This prohibition is a result of the explosion and fire at the Kleen Energy power plant. The Chemical Safety Board concluded that the purging, or blowing-out of debris, from the natural gas piping system, using natural gas instead of an inert gas, led to the accident in Connecticut. In view of these findings, the CSB appealed to standards and regulatory bodies such as OSHA, AGA, ICC, IAPMO and NFPA to amend the codes that regulate natural gas piping and operations.

The fuel gas safety codes require that new piping installations be pressure-tested with air or an inert gas such as nitrogen or carbon dioxide prior to being placed into operation. The inert gas is required for pressure testing because, if there is a leak, it could cause an explosion or fire. The inert gas pressure test requires purging of the gas mains during the introduction of natural gas in order to start up the mechanical equipment. Purging is commonly done by one of two methods: fuel gas is used to directly displace the air or inert gas is used to displace the air and then fuel gas is used to displace the inert gas.

During their investigation of one of the incidents, the CSB discovered serious dangers that can arise during fuel gas purging operations; they highlighted some key issues that the agency recommends for improving safety in the workplace.

Purging new or existing gas piping into buildings can be highly hazardous due to the possible accumulation of gas above the lower explosive limit (LEL) and the associated danger of fire and explosion. LEL, also known as the lower flammable limit (LFL), is defined as *"that concentration of a combustible material in air below which ignition will not occur."* See the NFPA document titled, *"Recommended Practice for Handling Releases of Flammable and Combustible Liquids and Gases, NFPA 329 (2005).*

Purged gases should always be directed to a safe location outdoors, away from people and ignition sources. This can be done using either a temporary hose or piping or permanently installed vent pipes, depending on the facility design. Hoses should be grounded so that the flow of gas in a vinyl, plastic or rubber hose does not build up a static electricity charge that could be a source of ignition.

Purging indoors should only be done in limited circumstances, where purging outdoors is not possible. In such cases, all non-essential personnel should be evacuated from the area, well away from a possible blast zone; all ignition sources should be controlled or eliminated, even those significantly downwind of the discharge location

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and ventilation should be adequate enough to maintain the gas concentration well below the LEL at all times.

Workers should never rely on their sense of smell to detect releases of fuel gases. Although an odorant is typically added to fuel gases to warn workers and consumers of releases, the perception of odor is highly subjective and varies from one person to another. People also become desensitized to odor during prolonged exposures. New gas pipes and containers can condense the odorant out of the fuel gas, especially if the new gas is allowed to sit in the pipe for a long period of time before use and if the piping goes through daily temperature changes. The pipe walls will continue to absorb the odorant until they become saturated This creates a condition known as "odor fade." Odor fade is also common in new piping systems when the new piping is not saturated or pickled with odorant.

Plumbing and mechanical trade schools, contractors, utility companies and large facility owners should include training on the problem of odor fade in new gas piping systems.

Combustible gas detectors should always be used to monitor the gas concentration exiting the purge hose during purging operations. To provide the most accurate information about combustible gas levels, sampling should be conducted continuously at the discharge location. Personnel involved in gas purging operations should be fully trained and knowledgeable about safe gas venting practices, and they should be properly trained in the use of the gas detectors.

The 2009 edition of the National Fuel Gas Code, NFPA 54, ANSI Z223.1 Chapter 54-15 defines a piping purge as *"to free a gas conduit of air or gas, or a mixture of gas and air."* The 2009 National Fuel Gas Code and the 2006 International Fuel Gas Code both require that piping beyond specified lengths be purged with an inert gas based upon the nominal pipe size.

In jurisdictions where the NFPA 54 National Fuel Gas Code is adopted it applies to the installation of fuel gas piping systems, appliances, equipment and related accessories. This code addresses the following issues:

• Coverage of piping systems shall extend from the point of delivery to the appliance connections. For other than undiluted liquefied petroleum gas (LP-Gas) systems, the point of delivery shall be considered to be the outlet of the service meter assembly or the outlet of the service regulator or the service shutoff valve where no meter is provided. For undiluted LP-Gas, the point of delivery shall be considered to be the outlet of the final pressure regulator, exclusive of line gas regulators, in the system. The maximum operating pressure shall be 125 psi (862 kPa).

Exception No. 1: Piping systems for gas — air mixtures within the flammable range are limited to a maximum pressure of 10 psi (69 kPa).

Exception No. 2: LP-Gas piping systems are limited to 20 psi (140 kPa), except as provided in 5.5.2.

• Requirements for piping systems shall include design, materials, components, fabrication, assembly, installation, testing, inspection, operation and maintenance.

• Requirements for appliances, equipment, and related accessories shall include installation, combustion and ventilation air and venting.

Tentative Interim Amendment addresses purging

In response to the explosions mentioned earlier, a Tentative Interim Amendment, TIA 09-3 (SC 10-8-22/TIA Log #984R) was processed by the NFPA 54 Technical Committee on the National Fuel Gas Code and issued by the NFPA Standards Council in August 2010. The Uniform Plumbing Code and the Uniform Mechanical Code technical committees also recently discussed TIAs addressing new safety requirements for purging operations with indoor fuel gas piping systems, and we are awaiting the outcome of their review.

A TIA is tentative because it has not been processed through the entire standards-making procedures and interim because it is effective only between editions of the standard. A TIA automatically becomes a proposal for the next edition of the standard; as such, it then is subject to all of the procedures of the standards-making process.

The NFPA's August 2010 TIA called for the following revisions to NFPA 54, Section 8.3. (There is supplemental information in the appendix for items with an asterisk*.)

8.3* Purging requirements. The purging of piping shall be in accordance with 8.3.1 through 8.3.3.

8.3.1* Piping systems required to be purged outdoors. The purging of piping systems shall be in accordance with the provisions of 8.3.1.1 through 8.3.1.4 where the piping system meets either of the following:

1. The design operating gas pressure is greater than 2 psig (14 kPa).

2. The piping being purged contains one or more sections of pipe or tubing greater than 2 in. and exceeding the lengths in Table 8.3.1.1.

8.3.1.1 Removal from service. Where existing gas piping is opened, the section that is opened shall be isolated from the gas supply and the line pressure vented in accordance with 8.3.1.3. Where gas piping meeting the criteria of Table 8.3.1.1 is removed from service, the residual fuel gas in the piping shall be displaced with an inert gas.

Table 8.3.1.1 Size and Length of Piping

Nominal Pipe Size (in.)	Length of Piping (ft)
2 ½	> 50
3	> 30
4	> 15
6	> 10
8 or larger	Any length

For SI units: 1 ft = 304.8 mm.

8.3.1.2* Placing in operation. Where gas piping containing air and meeting the criteria of Table 8.3.1.1 is placed in operation, the air in the piping shall first be displaced with an inert gas. The inert gas shall then be displaced with fuel gas in accordance with 8.3.1.3.

8.3.1.3 Outdoor discharge of purged gases. The open end of a piping system being pressure vented or purged shall discharge directly to an outdoor location. Purging operations shall comply with all of the following requirements:

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1. The point of discharge shall be controlled with a shutoff valve.

2. The point of discharge shall be located at least 10 ft (3 m) from sources of ignition, at least 10 ft (3 m) from building openings and at least 25 ft (7.6 m) from mechanical air intake openings.

3. During discharge, the open point of discharge shall be continuously attended and monitored with a combustible gas indicator that complies with 8.3.1.4.

4. Purging operations introducing fuel gas shall be stopped when 90% fuel gas by volume is detected within the pipe.

5. Persons not involved in the purging operations shall be evacuated from all areas within 10 ft (3 m) of the point of discharge.

8.3.1.4* Combustible gas indicator. The combustible gas indicator used during purging operations shall be listed and shall be calibrated in accordance with the manufacturer's instructions and recommended schedule. The combustible gas indicator used for pipe discharge monitoring shall numerically display a volume scale from 0% to 100% with a resolution of not greater than 1% increments.

8.3.2* Piping systems allowed to be purged indoors or outdoors. The purging of piping systems shall be in accordance with the provisions of

8.3.2.1 where the piping system meets both of the following:

1. The design operating pressure is 2 psig (14 kPa) or less.

2. The piping system being purged is constructed entirely from pipe or tubing of 2-in. nominal size or smaller, or larger pipe or tubing with lengths shorter than specified in Table 8.3.1.1.

8.3.2.1* Purging procedure. The piping system shall be purged in accordance with one or more of the following:

1. The piping shall be purged with fuel gas and shall discharge to the outdoors.

2. The piping shall be purged with fuel gas and shall discharge to the indoors or outdoors through an appliance burner not located in a combustion chamber. Such burner shall be provided with a continuous source of ignition.

3. The piping shall be purged with fuel gas and shall discharge to the indoors or outdoors through a burner that has a continuous source of ignition and that is designed for such purpose.

4. The piping shall be purged with fuel gas that is discharged to the indoors or outdoors, and the point of discharge shall be monitored with a listed combustible gas detector in accordance with 8.3.2.2. Purging shall be stopped when fuel gas is detected.

5. The piping shall be purged by the gas supplier in accordance with written procedures.

8.3.2.2 Combustible gas detector. The combustible gas detector used during purging operations shall be listed and shall be calibrated or tested in accordance with the manufacturer's instructions and recommended schedule. The combustible gas detector used for pipe discharge monitoring shall indicate the presence of fuel gas.

8.3.3 Purging appliances and equipment. After the piping system has been placed in operation, appliances and equipment shall be purged before being placed into operation.

Revise the Appendix "A" of NFPA 54 section A.8.3 to read as follows:

A.8.3 The process of purging gas piping of fuel gas or charging gas piping that is full of air with fuel gas must be performed in a manner that will minimize the potential for a flammable mixture to be developed within the piping. Also, a significant amount of flammable gas should not be released within a confined space. Natural gas and propane suppliers add a distinctive odor to their gas to aid in its detection. However, when a new system is brought into service and un-odorized gas is detected, the company supplying the gas should be contacted to inform them of the situation and to determine what action should be taken.

A.8.3.1 Paragraph 8.3.1 describes the characteristics of gas piping systems that are required to be purged only to the outdoors. The criteria were selected to distinguish between piping systems located in industrial, large commercial and large multifamily buildings from those located in light commercial and smaller residential buildings. The gas piping systems installed in industrial, large commercial and large multifamily buildings are considered to be larger more complex systems for the purposes of defining their purging requirements. Because of their larger pipe volumes or potential for higher flow rates, these systems require procedures to ensure that large volumes of fuel gases are not released indoors and that flammable mixtures do not occur within the piping itself. Installers of these complex systems deal with considerably more variables that may result in a higher potential for discharge of large gas volumes during purging operations.

> When new fuel gas piping is put into service, or when existing piping is returned to service after a long service interruption, it is typically necessary to purge the lines of air.

Specific occupancy categories such as industrial, manufacturing, commercial and large multifamily were not included in the fuel gas code. U.S. building codes define these occupancies for the purpose of construction and safety requirements. There is no general relation between the occupancy types, as defined by the building codes, and the size of gas piping system to be installed in that occupancy. The gas piping size and operating pressure are based on the nature of the piping system and gas appliances to be installed and are not dependent upon a building's occupancy type or classification.

A.8.3.1.2 It is recommended that the oxygen levels in the piping be monitored during the purging process to determine when sufficient inert gas has been introduced. The manufacturer's instructions for monitoring instru-

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ments must be followed when performing purge operations.

A.8.3.1.4 Combustible gas indicators are available with different scales. For purging, it is necessary to use the percent gas in air scale and to follow the manufacturer's operating instructions. The % LEL scale should not be used, as it is not relevant to purging.

A.8.3.2 The criteria were selected to describe typical gas piping systems located in light commercial and smaller residential family buildings. Gas piping systems installed in these buildings are considered to be smaller and less complex systems for the purposes of defining their purging requirements. Installers have familiarity with purging these systems and the potential for discharge of large gas volumes during purging operations is low. Also see A.8.3.1.

A.8.3.2.1 Where small piping systems contain air and are purged to either the indoors or outdoors with fuel gas, a rapid and uninterrupted flow of fuel gas must be introduced into one end of the piping system and vented out of the other end so as to prevent the development of a combustible fuel/air mixture. Purging these systems can be done either by using a source of ignition to ignite the fuel gas or by using a listed combustible gas indicator that can detect the presence of fuel gas.

Following is an excerpt from the 2009 International Fuel Gas Code text addressing purging of fuel gas piping systems:

406.7 Purging. Purging of piping shall comply with Sections 406.7.1 through 406.7.4.

406.7.1 Removal from service. Where gas piping is to be opened for servicing, addition or modification, the section to be worked on shall be turned off from the gas supply at the nearest convenient point and the line pressure vented to the outdoors or to ventilated areas of sufficient size to prevent accumulation of flammable mixtures. The remaining gas in this section of pipe shall be displaced with an inert gas as required by Table 406.7.1.

TABLE 406.7.1 — Length of Piping Requiring Purging with Inert Gas for Servicing or Modification

Nominal Pipe Size (inches)	Length of Piping Requiring Purging
2 1/2	> 50 feet
3	> 30 feet
4	> 15 feet
6	> 10 feet
8 or larger	Any length

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

406.7.2 Placing in operation. Where piping full of air is placed in operation, the air in the piping shall be displaced with fuel gas, except where such piping is required by Table 406.7.2 to be purged with an inert gas prior to introduction of fuel gas. The air can be safely displaced with fuel gas provided that a moderately rapid and continuous flow of fuel gas is introduced at one end of the line and air is vented out at the other end. The fuel gas flow shall be continued without interruption until the vented gas is free of air. The point of discharge shall not be left unattended during purging. After purging, the vent shall then be closed. Where required by Table 406.7.2, the air in the piping shall first be displaced with an inert gas, and the inert gas shall then be displaced with fuel gas.

> Combustible gas detectors are going to be required for any contractor working on a fuel gas system.

TABLE 406.7.2 — Length of Piping Requiring Purging with Inert Gas Before Placing in Operation

Nominal Pipe Size (inches)	Length of Piping Requiring Purging
3	> 30 feet
4	> 15 feet
6	> 10 feet
8 or larger	Any length

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

406.7.3 Discharge of purged gases. The open end of piping systems being purged shall not discharge into confined spaces or areas where there are sources of ignition unless precautions are taken to perform this operation in a safe manner by ventilation of the space, control of purging rate and elimination of all hazardous conditions.

406.7.4 Placing appliances and equipment in operation. After the piping system has been placed in operation, all appliances and equipment shall be purged and then placed in operation, as necessary.

These are very important issues that need to be taught to the installing contractors in the trades to make sure that they are aware of the odor fade issues and the dangers associated with purging operations. Combustible gas detectors are going to be required for any contractor working on a fuel gas system. Stay tuned for a flurry of code change proposals on this subject during the next round of code hearings for the International codes, the uniform codes and the NFPA 54 Fuel Gas Code. ■

Ron George *is president of Ron George Design & Consulting Services. He has served as Chairman of the International Residential Plumbing & Mechanical Code Committee. To contact Ron, write to him at rgdc@ron georgedesign.com.*

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FPE Corner

Samuel S. Dannaway, PE,
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Pressure regulation in standpipe and sprinkler systems

The need for concern about the use of pressure regulating devices in fire protection systems was highlighted by a February 1991 fire at the One Meridian Plaza in Philadelphia, Pa. The fire burned virtually uncontrolled from the 22nd floor to the 29th floor, where it was stopped by activation of 10 sprinklers installed on the 30th floor. Three firefighters were killed in this high-rise fire.

The major contributing factor to the fire was the lack of complete sprinkler protection, but another significant factor was the inability of the fire service to obtain adequate pressure for hose streams due to improperly set pressure regulating standpipe hose valves. NFPA issued an Alert Bulletin in May 1991 requesting fire departments to check all systems with pressure regulating devices. .

It is good fire protection practice to avoid the use of any pressure regulating devices in fire protection water supplies. Obviously, that is often not possible and, fortunately, NFPA standards dealing with water-based suppression systems have incorporated requirements and guidance on their use. NFPA 13, as well as NFPA 14, 20 and 25 define a pressure regulating device as follows:

Pressure Regulating Device. A device designed for the purpose of reducing, regulating, controlling, or restricting water pressure.

Pressure regulating devices include pressure restricting devices, pressure control valves, and pressure reducing devices. NFPA 13 does not define these various subcategories of pressure regulating devices but one can find a definition for them in NFPA 14 as follows:

Pressure Restricting Device. A valve or device designed for the purpose of reducing the downstream water pressure under flowing (residual) conditions only.

Pressure Control Valve. A pilot-operated pressure reducing valve designed for the purpose of reducing the downstream water pressure to a specific value under both flowing (residual) and non-flowing (static) conditions.

Pressure Reducing Valve. A valve designed for the purpose of reducing the downstream water pressure under both flowing (residual) and non-flowing (static) conditions.

From this set of definitions we conclude that there are two categories of pressure regulating devices, the pressure restricting device and the pressure regulating valve. The pressure control valve is a type of pressure regulating valve.

There appear to be no requirements related to pressure restricting devices in NFPA 13, NFPA 14 or NFPA 20. From this I conclude that pressure restricting devices may not be used.

Pressure Regulating Devices in Sprinkler Systems (2010 edition of NFPA 13)

There are several areas in NFPA 13 that contain provisions that apply to pressure reducing valves. The general requirements are:

- A pressure reducing valve must be installed where normal pressure conditions greater that 175 psi can exist.
- Maximum outlet pressure must not exceed 165 psi.
- Pressure gauges must be installed on the upstream and downstream sides of each pressure reducing valve.
- A minimum ½-inch relief valve must be installed on the discharge site of the pressure reducing valve set to operate at 175 psi or less.
- Unless the pressure reducing valve has an integral listed indicating valve, one must be provided on the inlet side.
- There shall be provisions for flow testing downstream of the pressure reducing valve at system demand.

NFPA 13 also requires that the inlet and outlet pressure settings of pressure reducing valves be identified on sprinkler system shop drawing submittals and that pressure losses through the valve must be included in hydraulic calculations and based on normal pressure conditions. One would expect that manufacturer's data verifying these losses be provided as part of the submittal package (This data is required by NFPA 14).

During sprinkler system acceptance, pressure reducing valves must be tested at both flow and no-flow conditions. The standard does not state that the flow must be at system demand. The testing must confirm that the device properly regulates at maximum inlet pressures as well as at normal inlet pressure. Test data must include static and residual pressures at inlet and outlet and flow rates. This data must be recorded on the Contractors Material and Test Certificate. (See Figure 24.1 of NFPA 13.)

Pressure Regulating Devices in Standpipe Systems (2010 edition of NFPA 14)

The current edition of NFPA 14 introduces provisions for express mains, which are mains supplying higher standpipe zones. These mains are permitted to have a maximum working pressure exceeding 350 psi, provided that there are not hose outlets on any part of the main where these pressures are exceeded. This is a helpful provision for the design of standpipes in very tall buildings in that it allows designers to locate the high pressure pumping systems near the ground floor, avoiding the need for pumping up to a fire pump at a higher zone. Pressure regulating devices may be used to avoid providing separate fire pumping in multiple zone systems if several conditions are met. These include:

- The PRD must be capable of isolation for maintenance and repair. The fire department connection must tie into the system side of the PRD outlet isolation valve. A normally-closed bypass line shall be provided around each device.
- The system must be designed such that failure of a single PRD does not allow pressure to exceed 175 to more than two hose valves. This provision will require the designer to put dual PRDs in series.
- The system must be supervised of high-pressure failure of the PRD in accordance with NFPA 72.
- Pressure gauges must be provided at the inlet and out-

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let of the PRD.

Residual pressures for 1 ½-inch hose outlets are limited to 100 psi and, where static pressures exceed 175 psi on the inlet side, the static pressure must be limited to 100 psi.

To facilitate testing, each pressure regulating valve shall be provided with a drain/test riser capable of handling a flow equal to the largest system demand. NFPA 14 contains further requirements for minimum diameters of the drain/test riser. Drain riser inlets must be provided with swivel hose connections compatible with fire department hose. For acceptance testing of systems containing pressure regulating devices, all devices must be tested at design flows to verify that the device is operating and that inlet and outlet pressures are correct.

Author's request: If anyone out there has developed a test setup that can properly measure flows while doing these tests, I would like to hear about it. This is something we struggle with when acceptance testing systems.

The Contractor's Material and Test Certificate for Aboveground Piping form contained in chapter 11 of NFPA 14 has a useful table for recording the pressure regulating valve test data.

Pressure Regulating Devices in Fire Pump Systems (2010 edition of NFPA 20)

Briefly, NFPA 20 does not permit pressure regulating devices to be used to control maximum shutoff pressure to below system ratings. NFPA 20 further prohibits the use of pressure regulating devices in the discharge pipe "except as permitted" by NFPA 20. In an annex note it is clarified that this requirement is not intended to prohibit pressure regulating devices downstream of the fire pump discharge valve. However, there is no actual permission to use the pressure regulating devices found in the body of the standard. From this I gather that it is acceptable to use pressure regulating valves beyond the system discharge valve.

Pressure Regulating Devices in the 2011 edition of NFPA 25

Chapter 13 of NFPA 25 contains requirements of inspection and testing of pressure regulating devices. Of note is that pressure regulating devices for sprinkler and standpipe systems must be full flow tested every five years and partial flow tested (just to check for operation) at least annually. Master pressure regulating devices, those installed to regulate pressures in an entire fire protection system or standpipe zone, shall be full flow tested annually and partial flow tested quarterly.

Don't let the bedbugs bite your fire sprinkler system: dealing with bedbugs poses threat to sprinklers

Now on another note, I thought this item is interesting enough and important enough to include for our readers. From the National Fire Sprinkler Association E-tech Alert Issue Number: 194 issued November 16, 2010, Editor: Russell P. Fleming, PE.

A recent discussion topic at the website of the Los Angeles Area Fire Marshals' Association was the possible danger to sprinklers from the current national resurgence in bedbugs. One of the vendors of remediation efforts had approached the fire marshals asking whether there could be problems in sprinklered occupancies when a room of infestation is treated by heating it to 140 F for a period of four hours.

The obvious answer is yes, there could be a problem. Table 6.2.5.1 of NFPA 13 (2010 edition) limits the use of ordinary temperature rated sprinklers to areas with maximum ceiling temperatures of 100 F. Heat sources used to increase room temperatures can create "hot spots" with temperatures higher than the intended average. Even in cases where the temperatures are never sufficient to activate the sprinklers, the sprinklers can be damaged by the weakening of solder links or the stressing of glass bulbs through repeated bubble disappearance and reformation.

The vendor that approached the fire marshals group noted that their company policy is to drain the system, temporarily replace all ordinary rated sprinklers with high temperature rated sprinklers and then recharge the system prior to heating the room. Following the treatment, the original sprinklers are put back in place. The vendor claimed to be put at a disadvantage, however, from competitors who were simply installing insulated covers over the sprinklers or installing some type of ice-cooled covers during the treatment process.

The potential to damage sprinklers with temporary coverings is a concern. Even in the new allowance to clean sprinklers by means of compressed air or by a vacuum (A.5.2.1.1.2(5) in the 2011 edition), NFPA 25 is not intending that equipment be allowed to actually touch the sprinklers. The manufacturers of proposed temporary covers should be encouraged to seek product listings that would address potential damage issues.

Are there applicable rules? NFPA 25 — *Inspection, Testing and Maintenance of Water Based Fire Protection Systems*, requires that sprinklers be free of foreign materials and have sufficient clearance to equipment (Sections 5.2.1.1.1 and 5.2.1.2 in the 2008 edition). The 2011 edition of NFPA 25 also makes the distinction between system impairments and lesser categories of critical and noncritical deficiencies. Annex E suggests that a violation of Section 5.2.1.1.1, such as having foreign materials attached to or suspended from sprinklers, rises to the level of impairment. This would be especially obvious if it involved sprinklers throughout the premises.

Bedbug treatments involving planned impairments would be required to follow all of the provisions of Chapter 15 of NFPA 25, including the assignment of an impairment coordinator. Special provisions would be applicable if a required system is to be out of service for more than 10 hours in a 24-hour period, such as building evacuation or establishment of an approved fire watch. Special occupancies such as health care facilities may have their own impairments requirements. ■

The investigation report and alert bulletin can be obtained by NFPA members at http://www.nfpa.org/catalog/services/customer/downloadmemberonlypdf.asp?pdfname=fiphiladelphia%2Epdf&src=nfpa.

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Dan Holohan, www.heatinghelp.com

What a year!

Business was off, but you know that already. Just about everyone made less money, but we all made less money together, so it's relative. Oh, and we're all still here. We had more time to spend with our kids and our spouses this year, and that's a good thing. I had more time to exercise and to laugh with friends. Some things, money can't buy.

I didn't worry this year, because I'm 60 years old, and I've learned that worrying never gets you anywhere but sick. Took me a while to figure that one out.

I got to read more and to think about our business. This was a grand time to think, and I look at it as a gift. There's so much going on in the world, so much to consider. Here's a list of some of the stuff that caught my attention this year:

Efficiency. We got the news that 2009 was the best year ever for efficiency in the U.S. Each year, economists look at how many Btu we used (from all fuels) per dollar of Gross Domestic Product produced. In 2009, it was just 7,290 Btu per dollar, the lowest ever, and the results came largely from our buying more efficient air conditioners and washing machines with smaller tubs. That makes me think that we're going to keep the ball rolling by looking at boilers and motors. There will be good business coming our way. Watch.

Tattletale garbage pails. Last summer a new traffic-light camera here in our town caught me. I was turning left on the arrow and the light quickly went yellow and then red as I was turning. Busted! They sent me the video and the $54 fine, and I paid it. What can you do? Then I read about these new trash cans in Cleveland that contain microchips. The chip can tell whether you're rolling the can to the curb regularly. If you're not, the garbage police show up and root through your trash, looking for those unseparated recyclables. Busted! Why are they doing this? To get more money for the city. There's a business in everything. You just have to open your eyes.

IKEA going geothermal. IKEA is building a new megastore in Denver, and they're going to heat this one with geothermal energy. Ever been to an IKEA? You wander through a maze of furniture (only one way in and one way out) and they give you cheese (or a Swedish meatball) if you make it all the way through. These places are enormous, and IKEA is one of the most eco-conscious companies in the world. They'll make a big deal about their new heating system in the Denver store. People will notice, especially those who still question whether geothermal can work in a place like Denver, where the temperature can swing wildly and suddenly. That's going to be a good thing for all of us.

Solar forced-air furnaces. Nearly everyone in America heats with a furnace, and the sun shines on most days, so when I read about the work that GoSolarUSA Inc. was doing, I sat up a bit straighter. The system they're testing (for both commercial and residential buildings) grabs the heat from the sun, concentrates it and then passes it into the moving stream of air from the ordinary furnaces of America. The result is that these ordinary furnaces burn less fuel. Sounds simple, doesn't it? Why didn't we think of that?

Passive houses. You can heat most of these houses with a hair drier, because they're that well built and that well insulated. The idea started in Europe (What a surprise!) and is now showing up all across America. Most of us are all about promoting high-efficiency heating equipment, but nothing beats starting out with a building that doesn't need that much heat, because it doesn't lose that much heat. The passive house has the potential to change the entire HVAC industry in many ways. Keep your eye on this.

Radiant to radiators. I think that, to truly understand the heating business, you have to look past the borders of the U.S. You have to look to Europe, where everyone has hydronics, and to China, which is a growing powerhouse when it comes to radiators. Last year was a bad year for radiant heating in the U.K. Our British friends were late to arrive at the radiant party, which has been going on in Europe for 30 years. The U.K. had a solid radiant market going, but the tubing was going mostly into luxury homes and do-it-yourself projects. The bottom fell out of this business in 2009. Meanwhile, the Chinese have been making lots of panel radiators. They made 360 million units in 2006 and 460 million units in 2009. They're projecting 510 million units by 2012. Think that's a trend?

Do-it-yourselfer? Want to save a buck? Clean your own boiler, especially if it's a very old boiler and you don't know what you're doing. Start by having the wrong tools. Work alone and don't tell anyone where you are or what you're doing. You'll either save a buck or you'll get to cut off your own arm three days after it gets stuck inside the old boiler. Jonathan Metz of West Hartford, Conn., got to do the latter last summer. The good news is that, after he got on the news (all across the country), a local heating company gave him a new boiler, and they installed it professionally. Great way to save money, eh?

Planned communities. Ah, another Pleasant Valley Sunday, with rows of houses that are all the same. This year brought a couple of stories that caught my eye. One was about a man in a Florida planned community who wanted a white roof instead of a black roof (which everyone else had). His thinking was that a white roof would cut down on his air-conditioning bill. The community board wouldn't allow that, of course. He could have any color roof he wanted, as long as it was black. The other story came from California, where the owner of a home in a planned community installed a great-looking, passive-solar garage door, all with the idea of cutting his heating bill. The board said no because it didn't match the original metal doors that everyone else had. They wanted him to put the old one back. I don't know how this one worked out, but the owner had a wonderful quote, "There are bigger problems in the

Continued on page 34

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Heating Help

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world than my garage door." You think?

Number one in heating! As if we needed another reason to drink more beer. My favorite story to come out of 2010 was the one about turning urine into fuel for our homes. The thinking (at the university level) goes like this: Water contains hydrogen and hydrogen is a fuel.

> All in all, I think it was a very good year to watch and to learn. Isn't it wonderful to live in interesting times?

Urine contains water and is expensive to get rid of because we have to treat it. So why don't we figure out a way to extract the hydrogen from the pee and solve both problems? Hey, I'll drink to that! Stay tuned.

Solar without subsidies. Germany was a big proponent of solar heating, and they did a fine job of promoting the technology and subsidizing its installation. After a while, they declared the market to be mature, up on its feet, healthy, and no longer in need of any help from the feds. They diverted the subsidies to other markets. So what happened? As soon as the crutches came out from under the arms of the solar industry, it collapsed. Think that could happen here?

Show me the money. That's what a lot of builders are saying when it comes to seeking LEED certification. This year brought stories about how there have not yet been enough transactions of LEED-certified buildings to prove that the investment in energy-saving construction is something that will reap a return. On top of this, builders in Washington State took the local government to court. The builders claimed that the local governments are asking for more efficiency than the state demands and that's going to make new homes too expensive. No one asked the folks who would be buying those homes and paying for the fuel how they feel about this. Who cares about them?

All in all, I think it was a very good year to watch and to learn. Isn't it wonderful to live in interesting times?

Here's to 2011! ■

__Dan Holohan__ began his love affair with the heating industry in 1970. Today, Dan writes a monthly column for Plumbing Engineer's sister publication, Phc News. He has written a dozen popular books on subjects ranging from steam heating to teaching technicians. He is well known throughout the heating industry for his entertaining and anecdotal style of speaking.

The views and opinions expressed in this column are those of the author and do not reflect those of *Plumbing Engineer* nor its publisher, TMB Publishing.

Solar Solutions

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

Bristol's Six Principles for Good Solar Hydronic Design

The solar combisystem heat exchanger

In small buildings, solar heated glycol can be easily circulated from solar heat collectors directly through the floors. This provides the best possible heat transfer at the highest possible system thermal efficiency. This has often been done in our area (northern New Mexico), particularly in off-grid hydronic heating systems. It is also often implemented for simplicity as a way of reducing the number of electrical pumps and controls needed to run the heating system.

In larger and more complex hydronic heating systems, however, there is a point at which the cost and difficulty of dealing with large quantities of glycol becomes too impractical, messy or expensive. In most cases, it is standard practice to install a solar heat exchanger to limit the use of glycol only within the solar collector piping, so that the rest of the hydronic system can be filled with water.

In our solar combisystems constructed over the past few years, we have standardized placement of the main solar heat exchanger so that it is part of a primary loop used to connect all of the heat sources to all of the heat loads in the building. The simplest version of this type of system is called the "Combi 101 Check Loop." You can find more details about it, with diagrams, in previous issues of this column. We have also modified this approach in a number of recent solar home heating installations to allow the use of hydraulic separators along with (or instead of) a primary loop, while still using the same control system.

Figure 1

Figure 1 shows a Combi 101 solar heating system installed in a home near Taos, New Mexico. In the photo, the DHW tank (white) is on the left, a condensing boiler backup system is at the lower left (black) and the primary check loop and all the controls are in the center and to the right. A Voyager propane gas backup system is used here, where the DHW tank, with an in-tank coil, and the boiler are one integrated unit, which is also used as the only solar heat storage tank. There are four wall-mounted 4×10 flat plate solar collectors connected through the main solar heat exchanger, which can be seen at mid-height, just to the right of the white tank.

The brazed plate

Figure 2 (page 38) is a clasp of the solar heat exchanger, which is a brazed plate design. This is not your grandfather's shell and tube. A large surface area for heat transfer is folded into a very small rectangular package by stacking stainless steel plates and brazing the edges. The solar heat for this whole house can be delivered through a unit that is about the same size as a large circulator pump.

Stainless steel pipe nipples provide the four required piping connections, two for the glycol side and two for the water side. Counterflow fluid connections are most commonly used, although parallel flow is also possible with this unit with good results. The pressure drop through both sides is very reasonable for commonly used circulator pumps. Our installers added some brass unions and ball valves to allow easy removal and inspection and mounted the unit carefully to allow access to the unions for service with large wrenches on both sides.

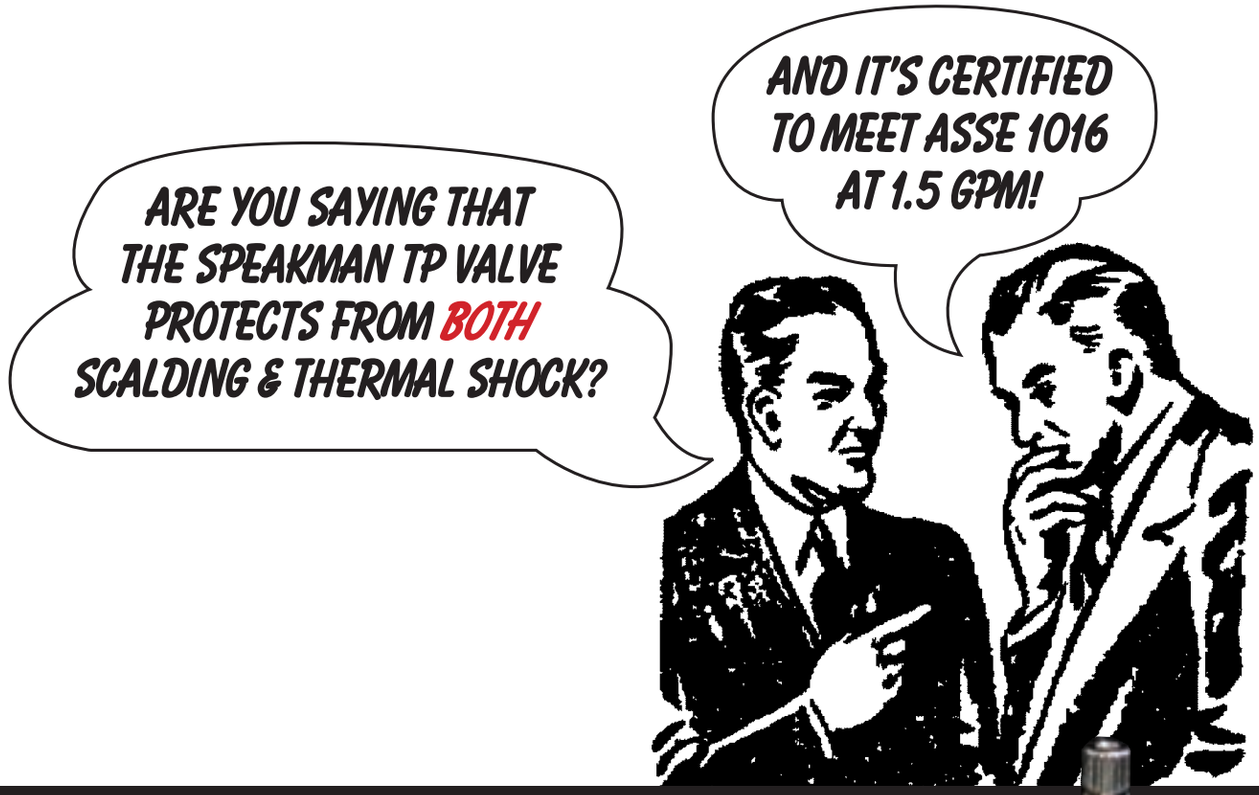
Some practical issues and recommendations

There are a number of practical details that we have learned over the years by using brazed plate heat exchangers in our solar hydronic heating systems:

• When choosing a solar heat exchanger, bigger is better. You will never regret putting in larger pipe diameters, less restrictive flow paths and more surface area for heat transfer whenever you can. So, when faced with a choice of several similar heat exchangers, choosing the one that allows greater heat flow is usually a good idea.

• The water side of a heat exchanger can freeze and break if very cold liquid glycol is allowed to circulate through it in winter. As a minimum precaution, the freeze recirculation setting on the solar control must be turned off and a spring check valve must be installed with the

Continued on page 38



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solar glycol circulator pump.

• The heat exchanger must be mounted so that the air inside can find its way out. Figure 29-2 shows a proper configuration, allowing air to rise up and out of both sides of the heat exchanger. Mounting the unit with all of the pipe nipples facing upward is also an effective approach.

• Model numbers can be confusing from one brand name to another, since some refer to surface area and others refer to number of plates. Be sure you know which is which, especially when changing brands or trying to find equivalents.

• Only clean, recirculating boiler fluid is used in this external heat exchanger, not potable water or fluid from any open system. The potable water DHW tank is solar heated through an in-tank heat exchanger coil filled with boiler fluid (water) that is not susceptible to mineral clogging, sediment or dissolved oxygen.

• Different brand names sometimes offer widely varying prices for virtually identical models. Be willing to compare Flat Plate, Triangle Tube, Crown, Weil-McLain and other brands to find the best price.

Final notes

These articles are targeted toward residential and commercial buildings smaller than 10,000 square feet. The focus is on pressurized glycol/hydronic systems, since these systems can be applied in a wide variety of building geometries and orientations with few limitations. Brand names, organizations, suppliers and manufacturers are mentioned in these articles only to provide examples for illustration and discussion and do not constitute any recommendation or endorsement. ■

Figure 2

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

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.

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Niagara Conservation offers lead-free aerator

CEDAR KNOLLS, N. J. — Niagara Conservation continues to introduce innovations to its ultra high-efficiency water saving product line. For example, Niagara's four new ECONO aerator model have bodies constructed entirely of ABS poly, creating a completely lead-free aerator and providing safe source for drinking water.

Niagara offers two ECONO aerators in 1.0 GPM flow rate in either a bubble (N3601B) or needle (N3601N) spray and the other two ECONO aerators are offered in a 1.5 GPM flow rate — also in both bubble (N3602B) or needle (N3602N) spray. In the bubble spray aerator models from Niagara, air is inducted providing a full, powerful stream that uses less water and the needle spray models offer 18 individual streams with the ideal amount of pressure. All the new Niagara ECONO aerators are featured in a Chrome finish.

Also, the patent-pending POM dual-thread component prevents stripping with no visible threads. In addition, Niagara's patented non-removable pressure compensator provides a constant output of water regardless of pressure and the new aerators come with special install key, which means no tools are required.

Superior Mfg. low lead products certified by NSF

NSF International Certified that the products appearing below conform to the requirements of the Lead Content Certification Program. The following is the listing recorded on May 7, 2010.

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Fort Wayne, IN 46802
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260-456-3596

Facility: Fort Wayne, IN
Component[LL]

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C-50	C-75	MNW-20-150-S	R-150	R-200
RT-1000	RT-500	RT-750	RX	RX-Special
SF-1250-AC	SF-1500-AC	SF-2000-AC	SF-2500-AC	SF-3000-AC
SF-4000-AC				

[LL] Product has a weighted average lead content of <=0.25% and is in compliance with California's Health & Safety Code Section 116875 (commonly known as AB1953) and Vermont Act 193. Product was evaluated using the lead content procedures of NSF/ANSI 61 Annex G only, with the exception that it was not evaluated for compliance with the chemical extraction requirements of NSF/ANSI 61.

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Rainwater harvesting products integrated into green roof building plan

Tacoma, Wash. — Eagle Harbor Mechanical, an MCAA member in Poulsbo, Washington, installed a rainwater harvesting system to help make The Center for Urban Waters Building in Tacoma more sustainable with its water usage. The building is the City of Tacoma's centerpiece for urban water quality and sustainability, so being LEED® certified was a priority.

In order to achieve LEED certification, every source of water usage and consumption was looked at for conservation. The roof has more than 51,000 square feet of working space and was large enough to utilize a rainwater harvesting system for most of the building's water needs. The system could not only handle all of the urinal and toilet water demands; it could also be used to irrigate the green roof that was installed on the building.

Mark Bratonia of Eagle Harbor Mechanical knew that Jay R. Smith Mfg. Co.® could provide him with a package of products that would meet his requirements. Greg Skaggs with Braley-Gray Washington, the local Jay R. Smith Mfg. Co. representative, had worked closely with Mark on other projects, so the two of them really understood the importance of the project. Mark stated, "Braley-Gray really does a good job of servicing their customers. Good factory reps are important; it's the service behind the product that separates them from others. This rainwater harvesting project was different, and I knew that Jay R. Smith would be there until we got it right."

The Center for Urban Waters project has several Jay R. Smith roof drains installed in the green roof. The roof drains convey all of the rainwater collected from the rooftop to the Vortex filters. Two RH9520-06 medium capacity vortex filters are installed directly under the green roof and feed two 36,000-gallon above ground, corrugated, galvanized steel rainwater storage tanks. The two storage tanks are easily seen from the front of the building. Their visibility does a wonderful job of promoting rainwater harvesting and the overall sustainability of the Urban Waters building.

The concept of harvesting rainwater is simple; rainwater is collected from a rooftop. The harvested rainwater is conveyed through the piping to a filter that removes the debris. From the filter, the collected rainwater enters the storage tank through a smoothing inlet. The smoothing inlet prevents the agitation of sediment at the rainwater inlet into the storage tank, and it aerates the water to keep it from becoming foul smelling. The stored rainwater is now ready for use.

Harvested rainwater is extracted from the cleanest part of the tank, just below the surface of the water, using a floating filter and pump. The end result is filtered rainwater that is ready to use for any indoor water applications such as flushing toilets and urinals or for outdoor applications such as irrigation.

Rainwater harvesting not only helps by re-using the water; it also helps eliminate water runoff problems. Large commercial buildings have asphalt parking lots that can create problems during large rain events. Pollutants can be carried down to storm gutters and out to streams and rivers. Because of this, some local municipalities have started levying fines on businesses that have excessive runoff problems. Mark Bratonia mentioned this, saying, "Here in Washington everything runs to the rivers and out to the bays and then to the ocean, so rainwater harvesting really helped us avoid any potential risks."

The re-use of rainwater and the prevention of rainwater runoff that the rainwater harvesting products provided has helped The City of Tacoma apply for LEED platinum certification, the highest rating possible under the LEED ranking system. ■

Stainless steel rainwater harvesting storage tanks help promote sustainability at The Center for Urban Waters building in Tacoma, Washington.

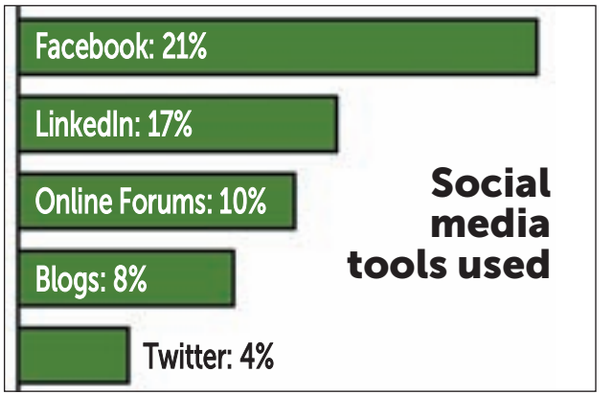
For more information on rainwater harvesting products and green roof drains or to contact your local Jay R. Smith Mfg. Co. representative, visit www.jrsmith.com.

2010 Internet Usage Survey

Welcome to *Plumbing Engineer's* 2010 Internet Usage Survey. We recently conducted an exclusive questionnaire that garnered a tremendous response. The survey gives us a unique view of the Internet habits of today's engineer, and overall online trends. The questions range from work hours spent on the Internet to social networking to RFIs. Nearly 40 percent of the respondents work at a company which has 50 or more employees; nearly 30 percent work at a firm that employs 1-5 people. Here are the results of the 2010 survey:

1. How much time do you spend on the Internet as it relates to work? Eighty-five percent said everyday, of which 35 percent spend an average of 30-60 minutes. Twenty percent spend 1-2 hours online and 16 percent claimed 2+ hours.

2. Where do you go for product/technical information? Manufacturer websites was the resounding winner at a 95 percent response rate. Trade publications and trade publication websites received 65 percent and catalogs garnered 59 percent of the tally.



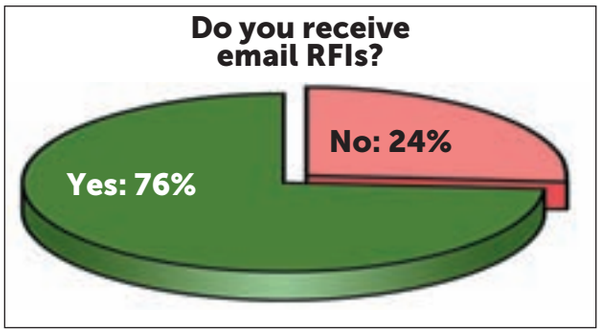
3. Interested in the engineer's purchasing habits over the Web, we asked: **do you make online purchases and do you feel secure making those purchases over the Internet?** Forty-five percent of the engineers surveyed said that do make purchases via the Web. Of those 45 percent, 72 percent claim that they feel secure making online purchases.

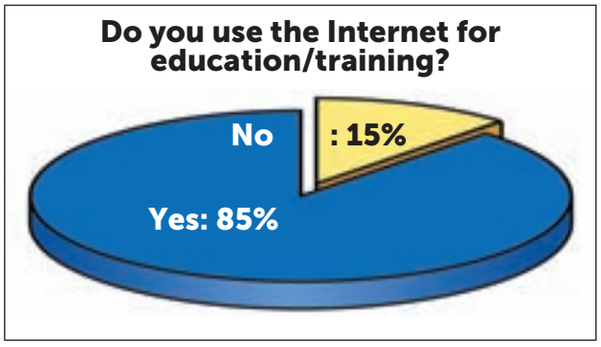
4. Do you use the Internet for project management purposes? A surprising 65 percent do not use the Web for any project management duties.

5. Do you use the Internet for Building Information Modeling purposes? Again, a surprising answer in that 60 percent of those polled claim that they do not use the Internet for BIM purposes.

6. Do you use the Web for education and training? The plumbing engineers in the survey responded that 85 percent of them use the Internet for education and training.

7. Are you currently using social media? Thirty-five percent of those asked currently employ social media. Of the thirty-five percent, 21 percent use Facebook, 17 percent use LinkedIn, 10 percent use online forums and only 4 percent use Twitter. The reasons for getting into social media? Increase brand awareness, build stronger relationships with customers, announce services, improve the customer service experience, network and maintain industry connections, Web meetings, education and all other forms of basic information.





8. Do you receive Requests for Information (RFIs)? Seventy-six percent said they receive RFIs.

9. Do you receive email architectural drawings? Increasing efficiency in their jobs, sixty-three percent of the engineers tallied receive drawings.

10. Do you use the Internet from a mobile device? Less than half (46%) claimed they went mobile. ■

Hot Water Balancing

By Peter Kraut

Hot water balancing is a requirement of any plumbing system with more than one hot water return path. It is typically covered in the specifications or general notes and is the responsibility of the installing contractor, but how is it done? More importantly, is balancing possible with the configuration and components indicated? With commissioning coming to the forefront of design, these questions must now be answered and it is the plumbing engineer's job to answer these questions specifically.

The purpose of balancing is to ensure a ready supply of hot water within reach of each fixture. The pump provides the circulation, but balancing is required to ensure that each riser (or branch) receives its proportional share of hot water. Only then can a fixture expect to see hot water shortly after it is opened. Before determining how much water needs to be circulated, reasonable expectations should be set for hot water delivery times.

It must be understood that the branch from a riser or other circulated loop is a "dead leg." Water does not circulate through this pipe, so over time its heat will be lost. The time it takes to get hot water from a circulated loop to a fixture is a function of the pipe size and the flow rate of the fixture.

In most public installations, there are flush valve water closets which will require 25, 30 and often 35 psi at the fixture. We use this number in our pipe sizing calculation on every job. The lavatory next to the most remote water closet, however, only needs 15 psi. In fact, 35 psi at a lavatory can make quite a splash. Why then do we insist on ¾" branch piping to serve the lavatory? It delivers the excess pressure we don't want and increases our waiting time for hot water.

First, the lavatory has a flow restrictor which reduces the flow to about 0.5 gpm. The faucet manufacturer should be contacted to see how this flow varies with pressure, but let's assume 0.5 gpm at 20 psi. Dividing by 60, we get 0.008 gallons per second. Next, ½" type "L" copper pipe contains 0.012 gallons per foot. Dividing the first by the second, we get 0.66 feet per second. This means that we have to circulate with 15 feet of a faucet to provide a 20 second delivery. Since the drop to the faucet is probably 8 feet, the circulated branch must pass within 7 horizontal feet of the fixture. The volume of ¾" type "L" copper is slightly more than twice that of ½" pipe, making a 20-second delivery impossible without circulating directly overhead or in the wall.

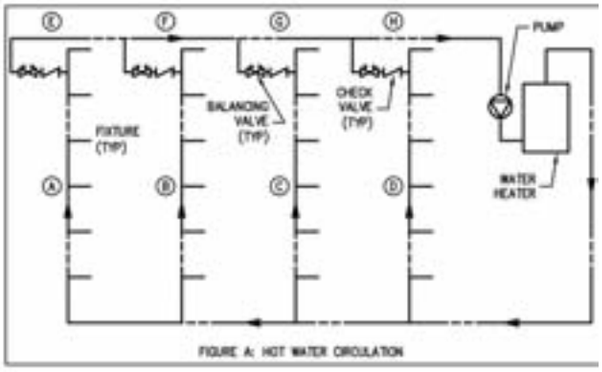


FIGURE A: HOT WATER CIRCULATION

How about showers? First, I would not sacrifice pressure here. With 2.2 gpm flow restrictors, and 103 degree mixing valves, pressure is about the only luxury left in a shower. At almost five times the flow, using ¾" pipe, we can be over twenty feet away from our circulating loop and still have a 20 second delivery time. Remember, unlike lavatories, people don't give up and walk away after 10 seconds.

Table 1: Heat Loss Per Linear Foot

Pipe Size (in)	insulation thickness (in)	heat loss (btu/hr·ft)
1/2"	1/2"	8.8
3/4"	1/2"	10.6
1"	1/2"	12.4
1 1/4"	1/2"	14.2
1 1/2"	1"	9.6
2"	1"	11.5
2 1/2"	1"	13.4
3"	1"	15.3
4"	1"	19.1

Heat loss for 140°F water in 80°F space

Insulation Conductivity = 0.268 Btu·in/(h·ft^2·°F)

Flow rate

The flow rate of the system needs to bring heat back to the system faster than it is lost through the piping. To determine how much heat is lost, the pipe size, insulation value and total length of piping is needed. Heat loss per foot of pipe is typically represented as shown in Table 1. Hot water supply risers should be calculated individually and must include hot water supply and return piping to and from the next riser as well as it's proportional share of the main distribution. This last point has been the cause of failure on many hot water circulating systems.

For example, a simple 6-story riser might include 20 feet of 1½" pipe, 30 feet of 1" pipe and 30 feet of ¾" pipe. The supply and return piping to and from the source amounts to 200 feet of 2" Pipe and 100 feet of 1" pipe shared between 10 risers. The heat loss here would be (20 x 9.6) + (30 x 12.4) + (30 x 10.6) + (200/10 x 11.5) + (100/10 x 12.4) = 1059 btu/hr. The acceptable heat loss must then be calculated. assuming a 10 degree temperature difference between supply and return, the heat loss can be converted into a flow rate using the formula below.

$$Q = \frac{\text{Btuh}}{500 \times \Delta T} = \frac{1236}{500\ (10)} = 0.25\ \text{gpm}$$

This should be rounded up to 1/3 or 1/2 gpm. This provides a safety factor in the calculation and some tolerance

for the contractor in the field. Since each of the 10 risers will circulate ½ gpm, the system will need to move 5 gallons per minute. At this time, velocities in hot water return piping should be checked to ensure a maximum of 5 feet per second.

Pressure drop

A recent project in Los Angeles required the contractor to balance over 130 risers to 0.3 gpm each. To stay above the heat loss and below the velocity requirements, balancing needed to be within 0.02 gpm. A difficult feat to begin with, this task became near impossible when considering that the flows came from five different buildings of different sizes and configurations. First, reasonable expectations were developed. This included flow rates around 0.5 gpm per riser with a tolerance of ± 0.1 gpm. Second, the worst case pressure drop was calculated for sizing the pumps. Third, the pressure drop through the next closest riser was calculated and a value for a pre-calibrated balancing valve was given. This was done for each of the subsequent risers. Fourth, the balancing valves were set to their assigned values. Fifth, the balancing valves were measured to insure flow and fine adjustments were made. An over-simplified example with 4 risers is shown in Figure A: Hot Water Circulation.

In this example, riser A is noticeably further than riser D yet to get equal flow, the head loss in each piping segment must be equal. Since the hot water supply is sized for the fixture flow rates, the head loss from circulation in such large pipe is often negligible. If this is true, the head loss in the balancing valve at the top of riser B should be equal to the head loss in the pipe segment E. Similarly, the head loss in the balancing valve at the top of riser C should be equal to the head loss in the pipe segments E and F. Finally, the head loss in the balancing valve at the top of riser D should be equal to the head loss in the pipe segments E, F and G. For non-similar risers a more in-depth calculation is necessary. When larger areas are connected to a single hot water circulator, additional sectional balancing valves are recommended.

There are many types of balancing valves available. Some have calibrated scales with literature and guides for calculating pre-set values. Others rely solely on electronic devices for measuring flow in the field. The dilemma that many engineers face is that few of these are listed for use in a domestic water system. Worse yet, none of them are currently listed with NSF or IAPMO for conformance with AB1953, California's tough new lead-free ordinance. Unfortunately, since most globe valves lack the listing for conformance with AB1953, many engineers and contractors are resorting to the worst balancing valve on the market: the ball valve. The balancing procedure for these is rather simple. Give it a quarter turn and hope for the best. ■

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

Safety and Low Flow Showerheads

By Tim Kilbane

With the green movement on the rise, homeowners are overwhelmed with tips and advice on how to conserve water and energy. Replacing the standard (2.5 gallon per minute) showerhead a low flow showerhead (less than 2.5 gpm) is a frequently recommended way to "go green." As a result, low flow showerheads have been evaluated and rated by reporters, consumer bloggers and the EPA's WaterSense program, based on the showerhead's performance. This information has been consumed by eco-friendly homeowners in hopes of getting guidance in their showerhead selection process.

Lost among the buzz about low flow showerhead attributes is information about shower valve compatibility. Surprisingly, an important factor in selecting the low flow showerhead that offers the best showering experience is something that can have a dramatic effect on the safety of your showering experience; the shower valve.

> Lost among the buzz about low flow showerhead attributes is information about shower valve compatibility.

What's behind the wall makes a difference

Behind the wall in every shower or tub/shower combination is a mixing valve that blends the hot and cold water. Recent plumbing codes require mixing valves installed in showers to be safety-type valves, which have a mechanism inside that compensates for pressure disturbances that cause changes in the outlet water temperature.

There are two types of safety valves installed in most showers, thermostatic valves and pressure balancing valves. Thermostatic valves react to temperature changes in the water that result from a disturbance in water pressure within the plumbing system. Pressure-balancing valves react instantly to the pressure disturbance within the plumbing system to maintain a safe, preselected water temperature.

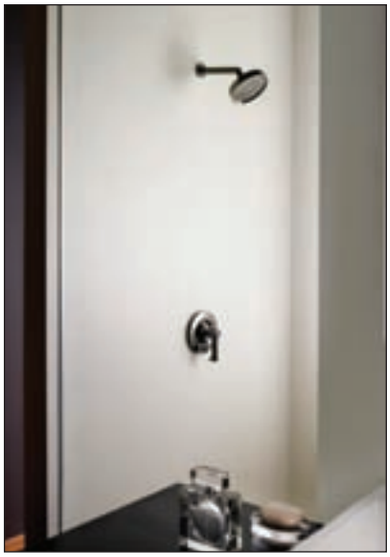
If you have ever experienced the sudden change in water temperature when a toilet is flushed or a washing machine cycle begins, you have experienced thermal shock. Thermal shock is a safety concern for bathers, not only because it can result in scalding of the skin but also because, more commonly, the bather suffers slip and fall injuries as he or she reacts quickly to avoid the sudden change in temperature in the water flowing out of the showerhead.

Shower safety valves are designed to react and adjust to these disturbances in water pressure within the plumbing system and, consequently, they maintain safe water temperatures, providing bathers a comfortable and enjoyable shower. Furthermore, certified shower safety valves must adhere to a standard as set forth by the American Society of Sanitary Engineers, listed as ASSE 1016 – Automatic Valves for Individual Showers & Tub/Shower Combinations. Minimum test requirements within this standard mandate that a safety-type valve maintain the bather's set outlet water temperature at a flow rate of 2.5 gpm.

How pressure-balancing valves support low flow showerheads

As previously stated, safety valves work properly with a

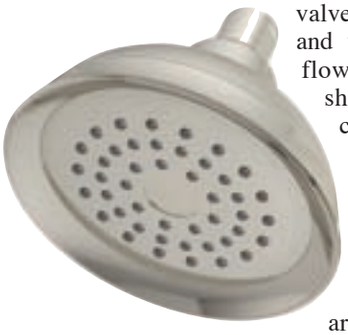
standard 2.5 gpm showerhead because they have been mandated to do so by ASSE 1016. However, the same valve may not work properly in combination with a low flow showerhead at a flow rate lower than 2.5 gpm. This is impor-



Knowing the type of valve that is behind the shower wall could have an influence on purchasing decisions.

tant for the consumer to understand, because, if the valve is unable to accommodate a change in pressure as a result of the low flow showerhead, it may not be able to maintain safe bathing temperatures.

Until a standard is published for showerheads and valves operating at flow rates lower than 2.5 gpm, bathers need to understand the importance of the valve and showerhead compatibility. For the safest shower experience, consumers and installers should contact the valve manufacturer and verify that the flow rate of the showerhead is compatible with their shower valve.



Low flow in the future

Manufacturers are working with industry organizations and standards developers to prepare standards for the safety of low flow showerheads and valve performance. In the future, consumers will have a better guide for compatibility because manufacturers will publish in their literature and on their packaging the valve and showerhead flow rates.

So, regardless of the latest consumer report on low flow showerheads, knowing the type of valve that is behind the shower wall could have the biggest influence on a decision in selecting the safest water and energy conserving showerhead. ■

Tim Kilbane is the national sales manager of Symmons Industries.

Industry Movers

Gerber appoints two managers

WOODRIDGE, ILL. — Gerber Plumbing Fixtures LLC added **Dave Stuker** and **John Perkins** to the company's expanding sales team. Stuker will serve as the territory manager for new construction, and Perkins will be the Western regional builder manager.

Mestek names project engineering supervisor

WESTFIELD, MASS. — **Thomas Neill** was promoted to the position of supervisor for project engineering at Mestek.

Vanderweil Engineers adds mechanical/plumbing designer

BOSTON — Vanderweil Engineers, one of the nation's largest and most experienced mechanical and electrical consulting engineering firms, announced that **James E. Foster** has joined the Las Vegas office as a mechanical/plumbing designer.

ROTHENBERGER USA names vice president/general manager

ROCKFORD, ILL. — ROTHENBERGER USA named **Chera M. Ellis** vice president/general manager of Rothenberger USA/a Greenlee Textron company. Ellis replaces Chris Vernon, who is now vice president of marketing and product management at Jacobsen Textron.

Webstone appoints regional sales managers

Anderson

WORCESTER, MASS. — Webstone continues to strengthen its management team with two new regional sales managers, both with more than 20 years experience in the plumbing and HVAC industries. **Todd Anderson** joins Webstone after holding positions with Georgia-Pacific Corporation, Kohler Company and Uponor/Wirsbo. **Fred Hoffman** has spent his career working at every stop in the channel from tradesman to wholesaler to rep and now manufacturer, managing installations, sales and sales reps.

Hoffman

WSP Flack + Kurtz names managing director – Seattle

NEW YORK — The engineering firm WSP Flack + Kurtz announced that **Tom Marseille**, PE, LEED® AP, will assume the role of managing director of its Seattle office, effective January 1, 2011. He is taking over the role from Henry Di Gregorio. Di Gregorio has been dedicated to WSP F+K for more than 43 years and will retain a leadership role at the firm.

Classified Ads

HVAC OR WATER HEATER TECHNICAL SPECIALIST

AO Smith. Innovation has a name

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A.O. Smith Water Products Company (WPC), a leading manufacturer of residential and commercial water heaters and boilers, is searching for Technical Specialists near Nashville, TN and near Dayton, OH.

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- Engineer/Engineering Education or Experience

Qualified individuals should send their resumé to:
Brian.Collins@PrincetonOne.com
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Plumbing Engineer
A TMC Publication

December 2010

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☐ Sprinkler/Fire Protection (d) ☐ Plumbing (e)

4 I am employed by one of the following:
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☐ Manufacturers Rep (i) ☐ Government (j) ☐ Other (x) _____

5 My title is: ☐ Construction Manager (c) ☐ Engineer (e) ☐ Owner (o) ☐ President (p) ☐ Specifier/Design (s) ☐ Vice President (v)
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Product News

Plumbing Engineer's Product of the Month

SentinelPro™ T/P shower valve line

The SentinelPro T/P is a dual element thermostatic and pressure balanced valve, which is certified to meet ASSE 1016 at 1.5 gallons per minute. The SentinelPro's dual element design allows the valve to protect against both scalding & thermal shock at flow rates as low as 1.5 gallons per minute. The need for T/P valves has become increasingly important with low flow showerheads. When using a low flow showerhead the potential for thermal shock and scalding situations increases. The valve is often overlooked when low flow showerheads are specified. **Speakman.**

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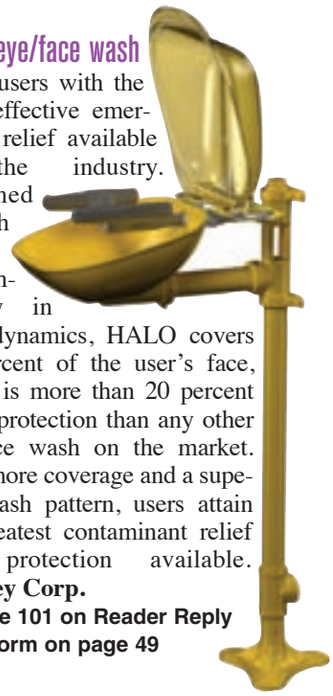
HALO eye/face wash



Arms users with the most effective emergency relief available in the industry. Designed with the latest technology in fluid dynamics, HALO covers 85 percent of the user's face, which is more than 20 percent better protection than any other eye/face wash on the market. With more coverage and a superior wash pattern, users attain the greatest contaminant relief and protection available. **Bradley Corp.**

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Tankless gas water heaters

The new comprehensive line of tankless water heaters offers a wide range of products including condensing models with higher efficiencies and heavy-duty commercial models. Models offer improved flow rates for

increased hot water delivery. On top of excellent performance and high efficiency ratings, tankless units also offer optional remote temperature controllers and full line of accessories. **A.O. Smith.**

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Variable speed drives

Advantage drives combine the manufacturer's proven pumping technology with Schneider's variable frequency drives, now complete with Square D enclosures to provide advanced, user-friendly technology. When matched with optimal output of equipment, the drives will deliver more reliable performance and increase productivity while reducing energy costs. **Taco.**

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Haws partners with Brita® Brand

The Brita® Hydration Station™ is a touch-free, hygienic, water dispenser that allows users to enjoy the benefits of healthier, great-tasting water away-from-home. The Brita® Hydration Station™ encourages hydration with its aesthetically appealing design, can help save money when used as an alternative to bottled water and helps encourage sustainability efforts. **Haws Co.**

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Circle 29 on Reader Reply Form on page 49

Files for Wilkins Backflow Preventers, Zurn Floor and Shower Drains, Carriers, Fixtures, Flush Valves and Faucets are now available in RFA, DWG, and DXF formats at www.zurn.com

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