

The Authoritative Source for Plumbing, Hydraulics, Fire Protection and PVF

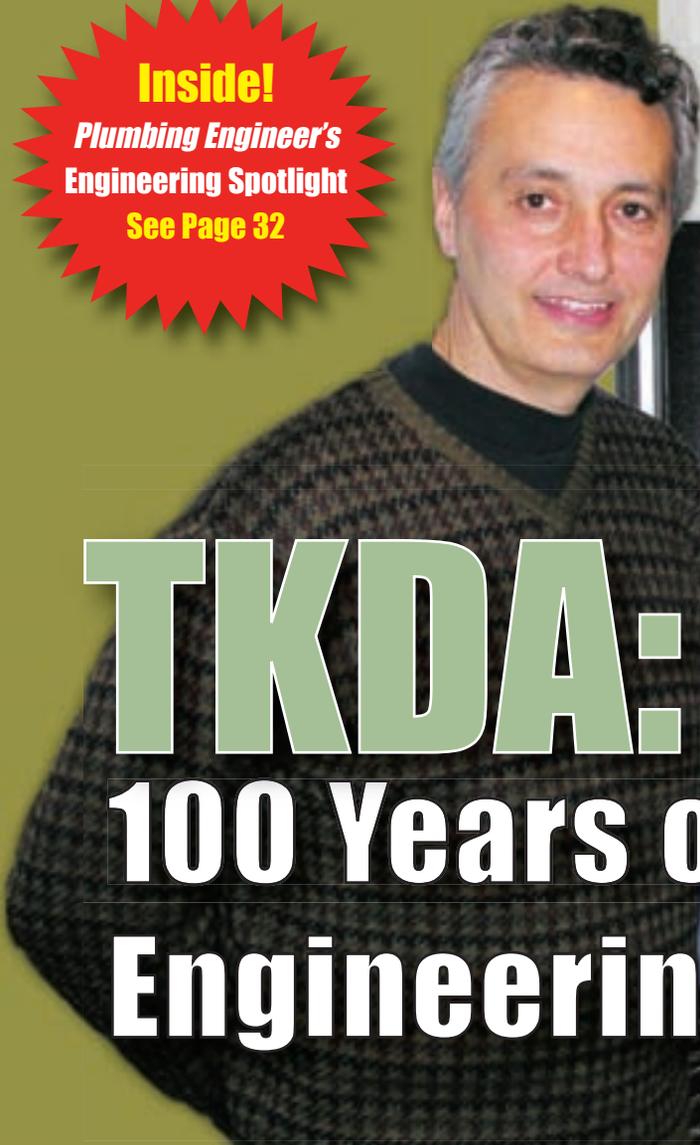
Plumbing Engineer®

A TMB Publication

March 2010



Inside!
Plumbing Engineer's
Engineering Spotlight
See Page 32



TKDA: 100 Years of Engineering Excellence



Also Inside...

- ICC & IAPMO Talk Codes
- Building Information Modeling & Revit®
- Hands-free Technology in Educational Facilities



Circle 1 on Reader Reply Form on page 57



Safety Is Our Shared Responsibility!



U.S. Patent #5,055,334
RE 34,832 other
patents pending

- IMPORTANT - Standards Update!

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

BE ADVISED:

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

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

At no additional cost, Handy-Shield MAXX™ is the superior solution when compared to some presently specified competitors. With ASTM E 84 flame and smoke tested insulation material, You can be confident it is the safe and responsible solution for You and Your Clients.

School Fire Statistics

- An average of 6,300 structural school fires per year
 - The leading area of fire origin of structural school fires is the lavatory
 - Plastics ranked second as materials first ignited in school structural fires
- The U.S. Department of Homeland Security and the U.S. Fire Administration Report on School Fires, August 2007, Vol 8, Issue 1 findings.

Eliminates Potential Liability!

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

Accessibility Requirements:

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

Building Code Requirements:

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

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

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

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Maximizes ADA & IBC Standards

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TKDA: 100 Years of Engineering Excellence

Kicking off the first Engineering Spotlight of 2010, *Plumbing Engineer* conducts an exclusive interview with Thomas Stoneburner, P.E., LEED AP, vice president facilities at TKDA.

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The I-Codes: Safe, Green and Global

The ICC followed superior and comprehensive code development and approval processes in the preparation of the Public Version of the International Green Construction Code (IGCC).

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Green Code Supplement Ushers in New Era

IAPMO's forward-looking document enables municipalities to take lead on sustainable building initiatives.

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Building Information Modeling & Revit®

Engineers and manufacturers are reaping the benefits of building information modeling and Revit® software programs and renderings.

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Hands-free Technology in Educational Facilities

Plumbing Engineers can help slow down the spread of germs in a school by choosing hands-free faucets and flush valves for public restrooms.

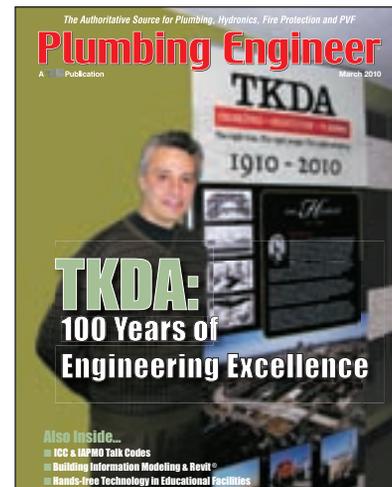
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Plumbing Engineer

A TWE Publication



On the cover: Thomas Stoneburner, P.E., LEED AP, vice president facilities at TKDA, is proud to announce TKDA's 100 years.

INDUSTRY NEWS & OTHER DEPARTMENTS

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**IT'S
TIME**

GET THE LEAD

OUT



Bradley got the lead out. Now it's your turn.

Lead-free requirements went into effect January 1, 2010. Bradley Corp was the first manufacturer to meet those requirements and now has third party certification. Bradley's Navigator lead-free thermostatic mixing valves are pre-assembled, 100% factory tested and deliver unparalleled performance. The time has come for lead-free compliance. It's time for Bradley.



CA AB 1953
defines lead-free
as less than 0.25%



***BIM files now available for all
Bradley TMVs – see website for details!***

bradleycorp.com/products/tmv | **800.BRADLEY** | Plumbing fixtures | Washroom accessories | Lenox® lockers | Mills® partitions

Circle 3 on Reader Reply Form on page 57

From the Desk of Tom Brown

By Tom M. Brown Jr., Owner

Approaching business with a clear focus

Some 40 years ago and fresh out of college, I was an enthusiastic member of a sales training class working for McGraw-Hill, the country's largest business publisher. In those years, McGraw-Hill owned more than 60 titles and was not only seen as the largest, but also the leading, company of its kind. Among its titles were *Business Week*, *Architectural Record*, *Aviation Week*, *Engineering News Road*, *Industrial Distribution*, *American Machinist*, and obviously many more.

McGraw-Hill's main competitors were other large, multi-magazine publishers such as Cahners, Chilton, Penton, Industrial Publishing, Fairchild and Technical. All of these organizations fielded many titles and were extremely tough competition out in the advertising sales trenches. The 70s, 80s and 90s were a rather unique time in our country's culture. On the heels of the turbulent 60s, people began to develop a more "Me"-centered attitude — one that focused on success, materialism and that old cliché of "bigger is better." Those thoughts transcended into the publishing arena, as well. Many agencies, advertisers and readers believed that being part of a larger publisher equated to a higher-quality publication, and perhaps was something of a status symbol. In fact, the smaller and medium-sized companies were sometimes an afterthought — and most were under the impression that to gain ground, they needed to add to their titles. While one can't deny that these large firms indeed had more resources and employees at their disposal, that didn't automatically mean they were the best publication for their respective markets.

Recently, while reading the magazine publishers' trade journal *BtoB*, I was surprised by the following statement: "Small is definitely big these days." The article outlines the problems that big publishers are facing in these difficult economic times. Specifically, it reminded me that McGraw-Hill sold its daunted *Business Week* to Bloomberg for just more than \$5 million and some debt, *Industrial Distribution* is closing, and that *American Machinist* (one of the oldest trade magazines, in business since 1877) will no longer be printed. Also, many of the previously named publishers have merged together, forming even larger publishing juggernauts with different names.

Further shocking news came at press time with the announcement that Penton Media has filed for Chapter 11 bankruptcy. This is very surprising to us at TMB because Penton publishes some titles that are directly or indirectly close to TMB's three publications — *PHC News*, *Plumbing Engineer* and *The Wholesaler*. While these facts by themselves would seem to portend gloom and doom for publishers, I don't buy into that notion. During 2009, *American Machinist* ran a total of 193 advertising pages while their primary competitor, *Modern Machine Shop*, sold 968 pages. *Modern Machine Shop* is published by the Kline family, which owns Gardner publications — described by the *BtoB* articles as "entrepreneurial by nature" and having strong and true sense of who their reader is and who their advertiser is targeting.

Sound familiar? At TMB, we call it niche publishing, and we believe in it wholeheartedly. We deliberately chose to stay within the PHCP/Industrial PVF niche, serving the complete vertical market. By doing so, we can focus all of our

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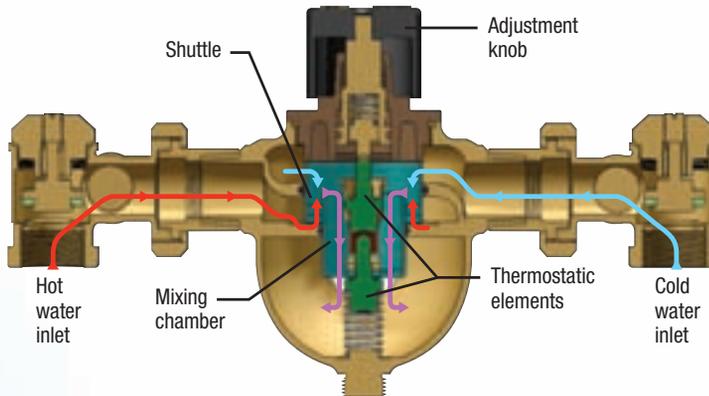


**Introducing
the LV980 Series
from Leonard,
the leader
in temperature
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NEW

Hot and cold water supplies enter through the water inlets. The hot and cold water supplies are directed to the valve's mixing chamber where the thermostatic element is located.

When an inlet temperature or pressure fluctuation causes a rise in outlet temperature, the highly responsive paraffin elements expand and move a piston. This allows for a restriction in the hot supply and a proportional increase in cold supply, thus maintaining the desired output temperature. The reverse occurs during times of water temperature decrease.



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

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

Integrated control with every valve from the leader in temperature valves, Leonard Valve.

Leonard...the right mix.



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Industry News

IAPMO releases first ever Green Plumbing and Mechanical Code Supplement

ONTARIO, CALIF.— The Sustainable Building Industry today has a powerful and revolutionary new tool at its disposal with the formal release of IAPMO's Green Plumbing and Mechanical Code Supplement, the most comprehensive document ever created to standardize sustainable residential and commercial plumbing and mechanical systems.

"The building codes are perhaps the biggest hindrance to the adoption of green buildings," said Dave Viola, IAPMO director of Special Services and staff liaison to the Green Technical Committee (GTC) that developed the document. "There's so little information about how to do green systems properly and safely within existing building codes, so we've rolled out a document that shows exactly how it's done."

The Green Supplement serves as a complement to any adopted plumbing and mechanical code, smoothly bridging the previously troublesome gap between existing codes and established green building programs. Where code language and green building concepts lack cohesion, the Green Supplement creates harmony by addressing such areas as:

- Use of alternate water sources (gray water, rainwater harvesting)
- Proper use of high-efficiency plumbing products
- Conservation of hot water
- Energy conservation in HVAC systems
- Training/education in green plumbing systems

IAPMO's Board of Directors created the GTC and charged these individuals with the development of the Green Supplement in an effort to fulfill the Board's call

for a reduction in energy and water consumption as permitted in the Uniform Codes. Established in January 2008 and comprised of a who's who of industry leaders in all facets of the sustainable plumbing and mechanical fields, the 25-member GTC (and 60 other plumbers, contractors, engineers, inspectors and energy/water conservation experts enlisted for task groups) was chaired by IAPMO Board Member Bill Erickson of CJ Erickson Plumbing.

"Many of the provisions in the Green Supplement are very advanced," said Amir Tabakh, director of Environmental Engineering, Environmental Affairs Division of the City of Los Angeles Department of Water and Power, and a member of the GTC. "These standards are 5-7 years ahead of the local codes. As you know, a code cycle takes 3-5 years and we cannot wait five years for products that are advanced or highly sophisticated before they are approved by the code. The Green Supplement gives a local jurisdiction the opportunity to adopt a superior product, a superior standard without waiting 5-7 years."

Though provisions dealing with sustainable plumbing are prominent, Tabakh contends the mechanical aspects should not be overlooked. "According to the California Energy Commission, 30 percent of the state's energy consumption within commercial buildings is mechanical equipment," he said. "If that 30 percent is positively impacted, it means many more electrical systems will become highly efficient. So, this document ultimately touches national standards for electrical efficiency."

Webstone introduces new website

WEBSTONE has redesigned its website making it easier than ever to browse their complete line of valve solutions, find the latest product news, view specification sheets, product literature and more. See firsthand why Webstone continues to revolutionize plumbing systems with their groundbreaking programs and technology.



Founded in 1954, Webstone is recognized as an industry leader for innovative design of residential and commercial valves used in plumbing, hydronic, radiant, solar and geothermal applications. These designs focus on time and space saving concepts that simplify future maintenance and upkeep of all piping systems. Some of Webstone's trademarked and patented items include; The Isolator®, Isolator® EXP™, Pro-Connect™ and Pro-Pal® step saving valves. Visit Webstone at: www.webstonevalves.com.

NFPA Americas' Fire and Security Expo will join with the 2010 NFPA Conference & Expo

LISLE, ILL.—The National Fire Protection Association (NFPA) and ROC Exhibitions, Inc. announced today that Americas' Fire and Security Expo (AFSE), previously held in Miami, will join together with the 2010 NFPA Conference & Expo, the largest and most prestigious fire and life safety industry event in the United States which will be held in Las Vegas June 7-10.

"AFSE has been a successful event for 15 years, serving primarily the Latin American distributors and integrators of fire and security products. Joining with NFPA's premier Conference & Expo, which alternates between Chicago, Boston and Las Vegas, will better serve distribution channels and end users from Latin America by providing a larger audience and additional opportunities," said Marc Rosenstock, President of ROC Exhibitions, Inc. "We are also exploring options for a possible return to Miami in 2011 with a new regional show that would meet the needs of that market," Rosenstock added.

More Industry News on page 10



Discover the New Frontier in Scale Prevention

OneFlow[®]

The Intelligent Scale Solution

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For more information, visit our web site TheScaleSolution.com



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Circle 5 on Reader Reply Form on page 57



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Industry News

Continued from page 8

Sessions of special interest to the Latin American audience will be offered in Spanish or simultaneously translated, a Latin American networking function will be introduced, and an International Business Center will be established for the convenience of end-users and channel partners visiting from Latin America and other countries.

NFPA and ROC Exhibitions, Inc. are inviting both attendees and exhibitors from AFSE to participate in the 2010 NFPA Conference & Expo which takes place June 7-10 at the Mandalay Bay Convention Center in Las Vegas. For more info, www.nfpa.org/conference.

ASSE receives ANSI approval on 10 product standards

WESTLAKE, OHIO — The American National Standards Institute has recently recognized 10 ASSE Standards as American National Standards.

The ASSE Standards that have been recognized as American National Standards are:

- ASSE 1003-2009: Performance Requirements for Water Pressure Reducing Valves for Domestic Water Distribution Systems, ANSI Approved on January 19, 2009
- ASSE 1013-2009: Performance Requirements for Reduced Pressure Principle Backflow Preventers & Reduced Pressure Principle Fire Protection Backflow

Preventers, ANSI Approved on January 10, 2010

- ASSE 1015-2009: Performance Requirements for Double Check Backflow Prevention Assemblies & Double Check Fire Protection Backflow Prevention Assemblies, ANSI Approved on January 5, 2010
- ASSE 1017-2009: Performance Requirements for Temperature Actuated Mixing Valves for Hot Water Distribution Systems, ANSI Approved on January 14, 2010
- ASSE 1047-2009: Performance Requirements for Reduced Pressure Detector Fire Protection Backflow Prevention Assemblies, ANSI Approved on January 5, 2010
- ASSE 1048-2009: Performance Requirements for Double Check Detector Fire Protection Backflow Prevention Assemblies, ANSI Approved January 5, 2010
- ASSE 1049-2009: Performance Requirements for Individual & Branch Type Air Admittance Valves for Chemical Waste Systems, ANSI Approved January 5, 2010
- ASSE 1050-2009: Performance Requirements for Stack Air Admittance Valves for Sanitary Drainage Systems, ANSI Approved January 5, 2010
- ASSE 1051-2009: Performance Requirements for Individual & Branch Type Air Admittance Valves for Sanitary Drainage Systems, ANSI Approved on January 5, 2010
- ASSE 1055-2009: Performance Requirements for Chemical Dispensing Systems, ANSI Approved on December 2, 2009

All of the American Society of Sanitary Engineering's ANSI Approved standards can be purchased online at the ASSE Webstore: <http://stores.assewebstore.com>.

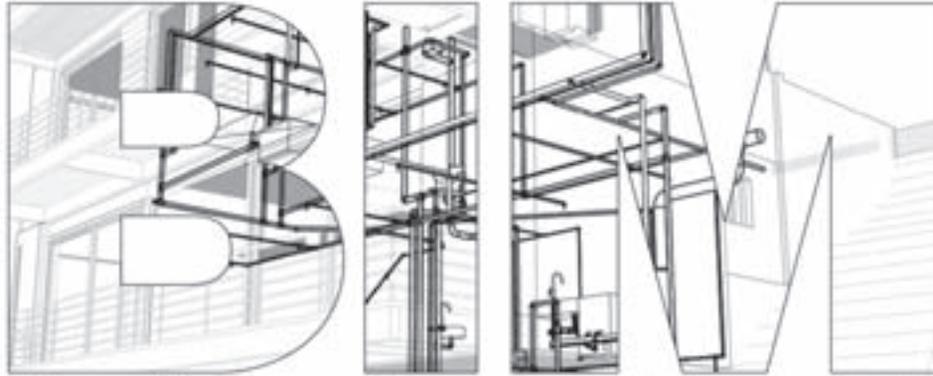
Green Restaurant Association endorses Bradford White Water Heaters

AMBLER, PA. — Bradford White has earned the endorsement of the Green Restaurant Association (GRA) for both the Ultra-Efficient eF Series® of commercial water heaters and Energy-Saving line of EverHot® tankless water Heaters. The eF Series utilizes exclusive designs and technologies for unsurpassed efficiency, installation flexibility and quiet operation. These products are among the most efficient in the industry with thermal efficiencies as high as 99.1%. Bradford White's new EverHot® tankless water heaters offer energy efficiency in a compact but powerful package. The water is heated on demand at flow rates up to 9.4 gallons per minute.

The Green Restaurant Association endorses products that exemplify environmental leadership in their category and meet the GRA Product Endorsement Standards. GRA's environmental consultants work hand in hand with manufacturers to assess their products and give them GRA's endorsement stamp of approval.

Since 1990, The GRA has been helping restaurants cut energy, water and waste costs. The GRA has been instrumental in helping restaurants realize that environmental responsibility can equal fiscal gain. Some Certified Green Restaurants® save thousands of dollars each year, and through the help of the GRA's consultants, are able to access rebates, incentives and other money saving programs.

More Industry News on page 56



Don't **fear** it, **embrace** it.

Always at the forefront of technological advancements, ATS proudly announces our latest capability which allows users to download combined 3D BIM nested families. With over 1,500 combinations already accessible for immediate download and new combinations being added daily, ATS is the largest source for Revit plumbing fixture information available anywhere. As with all of our spec services, all combined BIM families on atsspec.net can be downloaded at no charge. Our combination nested Revit families contain all fixtures, fittings, components and connections required, zipped together for download and ready to be dropped right into your BIM models. For example, a toilet will be nested with the appropriate seat, carrier and flush valve to generate one combination Revit file. This ground breaking advancement will make projects involving BIM a little easier and, just as BIM intended, improve workflow.

ATS Spec is the only online tool that can help you build a complete customized plumbing fixture specification in minutes! This free service is sponsored by the leading manufacturers of plumbing fixtures and fittings. Save your projects with all images, drawings, written specifications, pricing, and design details included. Download your projects in the format that is most suitable for your firm and application, from a Plumbing Fixture Schedule to a simple short spec in word format, along with all the CAD and Revit files required to support your documentation at every step of project delivery.



This is what a typical combined BIM family downloaded from the ATS website looks like when opened in Autodesk Revit.



Circle 7 on Reader Reply Form on page 57

Ask us for your free step by step guide to downloading these files along with handy tips to get your firm BIM ready with plumbing fixture and fitting BIM families available on ATS Spec.

BUILD YOUR **SPEC** HERE.
www.atsspec.net

ats allied
 technical
 services inc.

Designer's Guide

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



CPD exam review

Next month the American Society of Plumbing Engineers will offer its biannual CPD exam, which is an acronym for Certified in Plumbing Design. I personally never felt the need to take this particular exam (formerly known as the CIPE) because of the experience and credentials I already possess. However, it is always a good exam and credential to have under your belt to evidence your knowledge in the plumbing design industry.

Many years ago Ron George, my predecessor in this Designer's Guide column, wrote a series of articles that consisted of CIPE review quizzes. Those quizzes were quite helpful in preparing for the exam, so I will regurgitate some of them here, complete with commentary and answers at the end of the column.

First, the following conversions and formulas should be memorized by everyone in this industry and not just for the CPD exam itself.

- $\text{psi} = 0.433 \times \text{feet head}$
- $\text{feet head} = 2.31 \times \text{psi}$
- (note that $0.433 = 1 / 2.31$)
- $1 \text{ BTU} = \text{heat required to raise 1 pound of water } 1 \text{ deg-F.}$
- $\text{BTU} = 8.33 \times \text{gal.} \times \text{deltaT}$
- (deltaT is the rise in temperature)
- $\text{BTUH} = 8.33 \times \text{gpm} \times 60 \times \text{deltaT}$
- $\text{KW} = \text{BTU} / 3412$
- Water weighs 8.33 # per gal.
- Water weighs 62.4 # per cu. ft.
- There are 7.48 gal. per cu. ft.
- There are 448 gpm per CFS
- $\text{HP} = \text{gpm} \times \text{ft. head} / 3,960 \times \text{pump eff.}$

In the exam you will be provided with a pamphlet of equations that you do not have to memorize, but you have to know which to use when and where.

Sample questions

1. If you were asked to estimate a preliminary plumbing budget from architectural drawings, what method would be best suited?

- A. A percentage of the budget
- B. Cost per fixture
- C. Square foot pricing
- D. A detailed material & labor take-off

(I personally think this question is subjective and that answers A, B & C could all be right.)

2. If you were asked to estimate a set of 95% plumbing construction documents, what method would be best suited?

- A. A percentage of the budget
- B. Cost per fixture
- C. Square foot pricing
- D. A detailed material & labor take-off

3. The location of the following can be determined from a new project's civil utility survey except:

- A. Sanitary sewer
- B. Water main
- C. Building drain
- D. Storm sewer

4. Before designing a plumbing system, the engineer must determine:

- A. The applicable code
- B. The specification format
- C. The drawing size
- D. The scope of work

(Here I believe that answers A and D are both correct.)

5. What is the hydraulic radius of a 4" pipe flowing half-full?

- A. 0.0625
- B. 0.0833
- C. 0.1040
- D. 0.1250

(Hydraulic radius, R_h , is the ratio of the area of the flowing fluid over the wetted perimeter. It is measured in feet. For half-full and full flowing pipes it is the same, $D/4$.)

6. What is the weight per square foot of 2" of water on a roof?

- A. 7.48 lbs/sf
- B. 10.4 lbs/sf
- C. 5.2 lbs/sf
- D. 8.33 lbs/sf

7. Which has the greatest runoff coefficient?

- A. Grass
- B. Frozen ground
- C. Loose dirt
- D. Pavement

8. What is the approximate pressure exerted at the thrust block for a 6" water main at 400 gpm (5 ft/s)? This requires the Joukowsky formula:

$$P = WaV/144g$$

- A. 270 psi
- B. 470 psi
- C. 150 psi
- D. 570 psi

(You must know that W is the specific weight of water, "a" is the pressure wave speed of water or about 4,000 ft/s, V is the velocity change, and g is the gravitational acceleration.)

9. The critical velocity associated with laminar flow occurs at approximately what Reynolds number?

- A. 1

Continued on page 14



Precision Manufacturing

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



Producing Quality and Distinctive Products

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



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

JOSAM COMPANY 525 West Highway 20 Michigan City, IN 46360 P 800.36.JOSAM F 800.627.0008 www.josam.com

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Designer's Guide

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- B. 200
C. 2,000
D. 4,000
10. What is the neutral pH of water?
A. 1
B. 7
C. 11
D. 14
11. What are the color markings of copper pipe?
A. Type K has a green stripe
B. Type L has a blue stripe
C. Type M has a red stripe
D. All of the above
12. Which valve type is least suitable for balancing?
A. Gate
B. Globe
C. Ball
D. Butterfly
13. If you were to change a pump's rpm from 1750 to 3500 given 20 gpm and 40 feet of head, the new flow and head would be:
A. 20 gpm at 40 feet
B. 40 gpm at 80 feet
C. 40 gpm at 160 feet
D. 60 gpm at 120 feet
14. Two parallel risers are 200' tall. One is 2" and one is 6". The pressure at the base of the 6" riser is:
A. One-third the pressure of the 2" riser
B. The same as the 2" riser
C. Three times that of the 2" riser
D. None of the above
15. Which type of copper has the thickest wall?
A. K
B. L
C. M
D. DWV
16. A 60' tall riser reads 100 psi at its top. The pressure at the base of the riser would be:
A. 126 psi
B. 100 psi
C. 74 psi
D. 160 psi
17. Approximately how much KW is required to raise 500 gallons of water from 50 deg-F to 110 deg-F?
A. 63
B. 66
C. 73
D. 85
18. The ratio of a liquid's density to that of water at 4 deg-C is:
A. Its viscosity
- B. Its specific gravity
C. 4 to 1
D. 1.4 to 1
19. The mass of a fluid per unit volume is its:
A. Residual pressure
B. Density
C. Viscosity
D. Specific gravity
20. A 4" pipe has an invert elevation of 92.4 feet and runs 200 feet at 1/8" slope. The final invert elevation is:
A. 95.8'
B. 90.3'
C. 88.2'
D. None of the above
21. Which material is most resistant to corrosion?
A. Zinc
B. Cast iron
C. Copper
D. Steel
22. Fire sprinkler hydraulic calculations are based on which formula?
A. Manning
B. Bernoulli
C. Hazen-Williams
D. Haagen-Dazs
23. A fire sprinkler head has a k-factor of 7.6. What is the flow rate at 15 psi?
A. 24.3
B. 29.4
C. 41.3
D. 57.1
24. All valves controlling the supply of a fire sprinkler system should be:
A. Gate
B. Butterfly
C. Indicating
D. Insulated
25. The water flow in fire sprinkler system hydraulics is assumed to be:
A. Laminar
B. Tubular
C. Turbulent
D. Muddled
- Answers: 1) C, 2) D, 3) C, 4) D, 5) B, 6) B, 7) D, 8) A, 9) D, 10) B, 11) D, 12) A, 13) C, 14) B, 15) A, 16) A, 17) C, 18) B, 19) B, 20) B, 21) C, 22) C, 23) B, 24) C, 25) C
Good luck to those taking the test. ■
- Timothy Allinson is a senior professional engineer with Murray Co., Mechanical Contractors, in Long Beach, Calif.*
- 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.



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The Code Classroom

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



A discussion on hot water system requirements in the 2009 International Plumbing Code – Part I

The following code update from Ron George is a two-part series. The following is Part I with Part II to be featured in the April issue of *Plumbing Engineer*.

The 2009 International Plumbing Code (IPC) addresses domestic hot water systems in several sections, including some general sections of the code; and the code also covers where the domestic hot water supply system is required in section 607 — Hot Water Supply System. The water heater and water heater accessories requirements are covered in Chapter 5 — Water Heaters. Although there are various requirements for water heaters, the code is silent with respect to minimum requirements for sizing and selecting of water heaters. There are a few requirements in section 607 covering: hot water temperature maintenance, insulation, controls, thermal expansion compensation and flow of hot water to the left side of a fixture faucet with some exceptions. There are many areas that could use some additional code requirements to provide a better level of safety for code users. The general section of the code covers the scope of the plumbing code in Section 101.2 in the following paragraph.

101.2 Scope. The provisions of this code shall apply to the erection, installation, alteration, repairs, relocation, replacement, addition to, use or maintenance of plumbing systems within this jurisdiction. This code shall also regulate nonflammable medical gas, inhalation anesthetic, vacuum piping, non-medical oxygen systems and sanitary and condensate vacuum collection systems. The installation of fuel gas distribution piping and equipment, fuel-gas-fired water heaters and water heater venting systems shall be regulated by the International Fuel Gas Code. Provisions in the appendices shall not apply unless specifically adopted.

The above text outlines the plumbing systems that are covered in this code. It also tells us that certain provisions for gas fired water heaters are covered in the International Fuel Gas Code.

Code intent:

The intent of the code or the purpose of the code is explained in section 101.3.

101.3 Intent. The purpose of this code is to provide minimum standards to safeguard life or limb, health, property and public welfare by regulating and controlling the design, construction, installation, quality of materials, location, operation and maintenance or use of plumbing equipment and systems.

Existing Installations:

For existing hot water systems or existing plumbing installations they are covered in section 102.2 below and it allows existing installations to continue to be in operation as long as no hazard to life, health or property exists. Many people have argued that the existing systems are “grandfathered” and they should be allowed to continue to be in operation even. When someone is injured in a facil-

ity, it is a hazard. If the system presents a hazard then it should be corrected according to the language in section 102.2. Many people have argued that hot water temperatures in excess of 120 degrees Fahrenheit in fixtures intended for bathing, showering or handwashing are dangerous and a hazard to life and health. Many of the consensus industry committees that I have served on also have agreed that the maximum hot water temperature to prevent scalding should be 120 degrees Fahrenheit. Many plumbing code sections in Chapter 4 addressing fixture requirements limit the hot water temperatures to 120 degrees Fahrenheit to prevent a scalding hazard.

102.2 Existing installations. Plumbing systems lawfully in existence at the time of the adoption of this code shall be permitted to have their use and maintenance continued if the use, maintenance or repair is in accordance with the original design and no hazard to life, health or property is created by such plumbing system.

Maintenance:

For maintenance of existing plumbing systems it is covered in section 102.3 below and it requires maintaining the system in proper operating condition and maintaining it in a safe and sanitary condition. This code section also allows a jurisdiction to mandate reinspections of facilities on a regularly scheduled basis if they choose to do so to assure that the facility is being properly maintained. The reinspection could include checking for testing of back-flow preventers and checking to see that the maximum temperature limit stops are adjusted properly to limit hot water temperatures at various fixtures to assure safe temperatures that do not create a hazard.

102.3 Maintenance. All plumbing systems, materials and appurtenances, both existing and new, and all parts thereof, shall be maintained in proper operating condition in accordance with the original design in a safe and sanitary condition. All devices or safeguards required by this code shall be maintained in compliance with the code edition under which they were installed.

The owner or the owner's designated agent shall be responsible for maintenance of plumbing systems. To determine compliance with this provision, the code official shall have the authority to require any plumbing system to be reinspected.

Additions, alterations or repairs:

For additions, alterations and repairs of existing plumbing systems the work is covered in section 102.4 below. Any new work on existing plumbing systems cannot cause an existing system to become unsafe. Replacing a water heater, temperature actuated mixing valve, circulating pump or a storage tank, can cause changes to a hot water

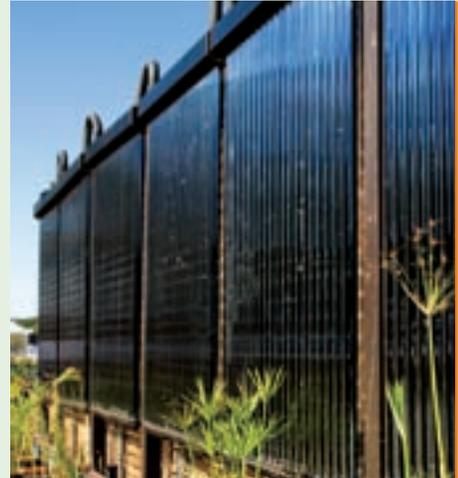
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Code Update

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system such as a different energy input value, heater type, or thermostat setting different from the previous water heater could make an existing system unsafe if the maximum temperature limit stops are not readjusted or if the hot water can be delivered to fixtures used for bathing, showering or washing at a hazardous temperature in excess of 120 degrees Fahrenheit.

102.4 Additions, alterations or repairs. Additions, alterations, renovations or repairs to any plumbing system shall conform to that required for a new plumbing system without requiring the existing plumbing system to comply with all the requirements of this code. Additions, alterations or repairs shall not cause an existing system to become unsafe, insanitary or overloaded.

Minor additions, alterations, renovations and repairs to existing plumbing systems shall meet the provisions for new construction, unless such work is done in the same manner and arrangement as was in the existing system, is not hazardous and is approved.

Change in occupancy:

The same applies for changing the occupancy of a building. For example: If a strip mall had a lease space that was an office space with minimal toilet facilities for employee and public use and it only had a 20-gallon water heater serving two lavatories, it will most likely need to be reviewed for the adequacy of the water heater size and capacity if a restaurant moves into the same space.

Depending on the seating capacity and size of the space the facility may need to have additional plumbing fixtures added to meet the requirements of Chapter 4 of the plumbing code and a restaurant has many plumbing connections to kitchen equipment that need to be inspected for backflow prevention and there are often fuel gas pressure and capacity issues that need to comply with the fuel gas code. The change in occupancy issue is covered in the following section of the code.

102.5 Change in occupancy. It shall be unlawful to make any change in the occupancy of any structure that will subject the structure to any special provision of this code applicable to the new occupancy without approval of the code official. The code official shall certify that such structure meets the intent of the provisions of law governing building construction for the proposed new occupancy and that such change of occupancy does not result in any hazard to the public health, safety or welfare.

Historic buildings:

There is a section covering historic buildings and once again the key words relative to the grandfather clauses are the inspector verifying existing conditions are safe. For example a two-handled tub or shower valve is not a safe installation, because there is no maximum temperature limit stop on a two-handled tub filler or shower valve. The two-handle valve installation can be made safer by the installation of a temperature actuated mixing conforming to ASSE 1017 (located at the source) or and ASSE 1070 device (located near the point of use) and a pressure bal-

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ancing valve conforming to ASSE 1066 (located in the hot and cold water supply lines to the fixture). The code text for historic buildings reads as follows:

102.6 Historic buildings. The provisions of this code relating to the construction, alteration, repair, enlargement, restoration, relocation or moving of buildings or structures shall not be mandatory for existing buildings or structures identified and classified by the state or local jurisdiction as historic buildings when such buildings or structures are judged by the code official to be safe and in the public interest of health, safety and welfare regarding any proposed construction, alteration, repair, enlargement, restoration, relocation or moving of buildings.

Plumbing fixtures, faucets and fixture fittings:

Chapter 4 of the International Plumbing Code covers specific requirements for plumbing fixtures in alphabetical order. The requirements for Bidet's limit the water temperature to 110 degrees Fahrenheit with the use of an ASSE 1070 device. This is for obvious reasons as the bidet water is used on sensitive areas and often the user is in a compromised position while using the bidet. The bidet water temperature text is as follows:

2009 International Plumbing Code, Chapter 4 — Fixtures, Faucets and Fixture Fittings

408.3 Bidet water temperature. The discharge water tem-

perature from a bidet fitting shall be limited to a maximum temperature of 110°F (43°C) by a water temperature limiting device conforming to ASSE 1070.

Emergency fixtures:

The code addresses emergency showers and eyewashes, and many years ago I submitted a code change to include the standard ISEA Z358.1 as the standard that covers emergency showers and eyewashes. Prior to this, the code said emergency fixture need to be supplied with an adequate supply of cold water. In many northern climates and some southern climates, it is not unusual to see the cold water temperatures drop below 40 degrees Fahrenheit (F) in the winter months. The ISEA committee is made up of only manufacturers of safety equipment, but they put the standard out for public review and I have provided comments to the ISEA working group for inclusion in the standard. A friend that has served on the Z358.1 main committee for many years told me there is no specific temperature mentioned in the standard because they cannot agree on a specific temperature range. In the past the appendix listed a temperature range between 60 degrees and 90 degrees Fahrenheit (F). There were comments about 60 degrees F being too cold for someone to stand in a shower for the full 15-minute period required to flush a chemical off of the body if there was an accident and at 90 degrees there may be a chemical that could react so someone familiar with the

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chemicals should be consulted for an appropriate temperature. To my knowledge, there have been no studies done on hypothermia related to flowing water from an emergency shower and its effect on the users relative to hypothermia. There are numerous studies by the coast guard on hypothermia for victims submerged or floating in lake or ocean water. In those cases there is a boundary layer of water around the body that warms up. In a shower situation there is a constant flow of water and there is also an evaporative cooling effect to consider. In my own personal testing experience with flowing water, I found that the water temperature should be at least 70 degrees before it was not so cold that it took my breath away or would discourage my use of an emergency fixture. This temperature could vary a degree or two depending on the individual. As the water rose from 70 degrees F to 80 degrees F, the more comfortable the water felt to me. There were also discussions that for eye washes, temperatures over 100 degrees Fahrenheit could cause damage to the eyes. My own recommended design would be to install an ASSE 1071 temperature actuated mixing valve for emergency fixtures and set it a 80 degrees. I can be set at any temperature by the facility medical, chemical, maintenance or safety personnel since they are familiar with the chemicals present at the facility. If you were to install a temperature actuated mixing valve that is set at 80 degrees Fahrenheit, it would probably operate between 75 and 85 degrees Fahrenheit. ASSE 1071 is the

industry standard that covers temperature actuated mixing valves for emergency fixtures. The valves have an additional safety feature to provide a cold water bypass in the event of an over-temperature situation. A temperature actuated mixing valve designed for domestic hot water distribution systems does not have the cold water bypass feature and should not be used to provide "tepid" water to emergency fixtures. Care should be taken to route water supplies to emergency fixtures and emergency fixture mixing valves where the pipes will not be affected by freezing temperatures, high temperature equipment, high or low temperature piping or direct sunlight. These situations have all caused temperature and performance problems in the field. The ISEA Z 358.1 standard could not require "tempered" water for the supply to emergency showers because "tempered water" is defined in the plumbing code as water having a temperature range between 85 degrees Fahrenheit and 110 degrees Fahrenheit. These temperatures are not appropriate for emergency fixtures so the committee used the word Tepid to describe the water temperature for emergency fixtures. The code text is as follows:

411.1 Approval. Emergency showers and eyewash stations shall conform to ISEA Z358.1.

Temperature limits for tempered water for public hand washing facilities are covered in section 416.5 of the IPC. The ASSE 1070 device is intended to serve a single fixture

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or multiple fixtures. There have been some states that require a separate device for each fixture unnecessarily, but the local code must be followed in those jurisdictions and additional valves must be installed in order to be compliant in those jurisdictions. The text covering tempered water for public hand-washing facilities is as follows:

416.5 Tempered water for public hand-washing facilities.

Tempered water shall be delivered from public hand-washing facilities. Tempered water shall be delivered through an approved water-temperature limiting device that conforms to ASSE 1070 or CSA B125.3.

Temperature limits and allowable devices for individual showers are covered in section 424.3 of the IPC. The temperature limits is 120 degrees Fahrenheit for showers. The text is as follows:

424.3 Individual shower valves. Individual shower and tub-shower combination valves shall be balanced-pressure, thermostatic or combination balanced-pressure/thermostatic valves that conform to the requirements of ASSE 1016 or ASME A112.18.1/CSA B125.1 and shall be installed at the point of use. Shower and tub-shower combination valves required by this section shall be equipped with a means to limit the maximum setting of the valve to 120°F (49°C), which shall be field adjusted in accordance with the manufacturer's instructions. In-line thermostatic valves shall not be utilized for compliance with this section.

Temperature limits and allowable devices for gang showers are covered in section 424.4 of the IPC. For single temperature installations the valve is typically set to a comfortable bathing temperature around set by the facility personnel at about 100 to 105 degrees Fahrenheit. The bather typically does not have individual temperature controls when an ASSE 1069 device is installed. The bather would simply have an on/off valve or a metering button. Gang showers are common in schools, prisons, health clubs and other institutions applications. There are temperature limits is 120 degrees Fahrenheit for gang showers. When individual shower controls are used the shower must have both hot and cold water supplied to it and then an ASSE 1016 device would be appropriate to control the water temperature and it has a maximum temperature limit stop at 120 degrees Fahrenheit. The text is as follows:

424.4 Multiple (gang) showers. Multiple (gang) showers supplied with a single-tempered water supply pipe shall have the water supply for such showers controlled by an approved automatic temperature control mixing valve that conforms to ASSE 1069 or CSA B125, or each shower head shall be individually controlled by a balanced-pressure, thermostatic or combination balanced-pressure/thermostatic valve that conforms to ASSE 1016 or CSA B125 and is installed at the point of use. Such valves shall be equipped with a means to limit the maximum setting of the valve to 120°F (49°C), which shall be field adjusted in accordance with the manufacturer's instructions.

Temperature limits and allowable devices for bathtub and whirlpool bathtub valves are covered in section 424.5 of the IPC. The temperature limits is 120 degrees Fahrenheit for showers. The text is as follows:

424.5 Bathtub and whirlpool bathtub valves. The hot water supplied to bathtubs and whirlpool bathtubs shall be

limited to a maximum temperature of 120°F (49°C) by a water-temperature limiting device that conforms to ASSE 1070 or CSA B125.3, except where such protection is otherwise provided by a combination tub/shower valve in accordance with Section 424.3.

Temperature-Actuated Flow Reduction Valves:

Temperature-actuated flow reduction (TAFR) valves are addressed in section 424.7. They are not required by code because there are several options for providing a safe shower, lavatory or tub filler temperature. This code section simply states, if they are installed they must conform to the ASSE 1062 standard. Temperature actuated flow reduction valves protect against scalding only and do not prevent temperature fluctuations or thermal shock associated with pressure imbalances that cause temperature fluctuations in the plumbing system. The devices are designed to shut down the flow of water to a drip when the temperature exceeds about 115 to 117 degrees Fahrenheit. The device allows a small drip of water flow through the device after it has actuated to allow the user to readjust the temperature controls to a cooler temperature and allow the cool water to reset the device. These TAFR devices are a good and inexpensive device for building owners to install between the shower arm and the shower head in applications where there are dangerous hot water temperatures to prevent scalding. There are also TAFR devices that screw into the tub filler spouts and TAFR devices that screw onto faucet aerators

424.7 Temperature-actuated, flow reduction valves for individual fixture fittings.

Temperature-actuated, flow reduction devices, where installed for individual fixture fittings, shall conform to ASSE 1062. Such valves shall not be used alone as a substitute for the balanced pressure, thermostatic or combination shower valves required in Section 424.3.

The 2009 International Plumbing Code (IPC) also addresses domestic hot water systems in Chapter 5 Water Heaters. The water heater and water heater accessories are covered in this chapter. Although there are various requirements for water heaters, the code is silent with respect to minimum requirements for sizing and selecting of water heaters types or capacities for a given application. ■

Part II of this column can be found in the next issue of PE.

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

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.

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FPE Corner

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

Fire protection at 90 South

Last month I had the opportunity to return to Antarctica where I was part of a team responsible for final commissioning of the recently completed South Pole Elevated Station. My role was the commissioning of the fire protection and life safety systems. This article will briefly describe the fire suppression systems that are provided for this facility.

The facility is owned by the National Science Foundation, which for several years has been modernizing their facilities at the station. The new South Pole Station provides a state-of-the-art facility for housing, food service, maintenance, administration, and other functions in support of the National Science Foundation research programs at the South Pole.

The station is occupied and operated year round, but is most active in the summer season from October to February, at which time the station is occupied by 200 to 250 persons. During the summer, a constant stream of LC-130 Hercules cargo planes ferry personnel, cargo and fuel to the station from McMurdo Station, a facility located on Ross Island just off the coast of Antarctica. A smaller "winter-over" crew of about 40 to 50 persons maintains the station during the seven months of harsh winter weather in which conditions are too harsh to permit aircraft to land at the station.

The new South Pole Station was designed for NSF under a contract with the Naval Facilities Engineering Command, Pacific Division at Pearl Harbor, Hawaii. The project architect was Ferraro Choi Associates, Ltd. of Honolulu, Hawaii. The design of fire suppression and fire alarm and detection



The South Pole Elevated Station.

systems for the facility was provided by PDC Consulting Engineers of Anchorage, Alaska. The project was constructed by Raytheon Polar Services of Denver.

The station consists of a two-story elevated portion which includes berthing, food service, offices, a science lab, hydroponics garden, recreational spaces (including a small gym and basketball court), an emergency power plant and other support spaces. The elevated station is supported by columns several feet above the ice surface. The station is elevated to delay the inevitable inundation by the accumulating snow pack. To further extend the life of the station the building exterior has an aerodynamic design which helps prevailing winds slow the accumulation of snow beneath the structure. Also, the station structure also can be raised with a system of jacks to add even more service life to the building. Adjacent to the elevated portion are arched structures now buried in the snow and ice,

which contain the main power plant, warehouse facilities, fuel storage, a vehicle maintenance garage, and shop facilities.

The total floor area of the elevated station portion is approximately 65,000 square feet. The station was constructed in two phases, Pod A and Pod B. Pods A and B, each con-



Three preaction sprinkler system risers serve the elevated station.

taining half of the station, also correspond to the two major fire areas of the elevated station. The pods are separated by a two-hour fire barrier. The fire barrier also serves as a horizontal exit enabling building occupants to use either of these areas as an area of refuge from an incident involving the other area.

The elevated station is provided with automatic sprinkler protection throughout. The sprinkler system is a preaction system arranged primarily as a double-interlock preaction system. Though all sprinkler system components are located in heated areas, a preaction system was used in the event of an accidental loss of heating to a portion of this very large structure.

The water supply for the sprinkler system consists of a stainless steel pressure tank containing approximately 5,000 gallons of water. A dedicated air compressor maintains a pressure of 150 psi in the tank. This air compressor also provides the supervisory air supply for the preaction system piping.

The elevated station sprinkler system has three preaction risers. One riser serves Pod B and two preaction risers serve Pod A. In Pod A, one preaction system covers the kitchen and dining area. A second system provides protection for the remaining portion of Pod A.

Sprinklers are closed head, quick response-type sprinklers. With the exception of the risers, which are galvanized steel, the piping consists of Type L copper tubing.

There are three occupancy hazard classifications identified. The berthing areas, offices, recreation and dining areas are considered light hazard. The kitchen and utility spaces are consid-



Continued on page 26
March 2010

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Fire Protection

Continued from page 24

ered ordinary hazard Group 1. Storage areas are considered ordinary hazard Group 2. The system is hydraulically designed using the density/area method of NFPA 13.

The preaction valves are controlled by the fire alarm and detection system for the elevated station that provides automatic detection in all spaces. Open area photoelectric smoke detectors are provided in most areas, including sleeping areas, offices, corridors and the dining area. Heat detectors are provided in storage areas and certain utility and shop spaces. All control valves are monitored by valve tamper switches. Each preaction system also contains supervisory air and is monitored by a low air pressure switch.

The preaction valves are provided with electric actuation trim. The preaction valve serving the kitchen and dining areas is arranged as a single interlock system. The preaction valve is activated by operation of a single automatic detector. The other two preaction valves are arranged as a double interlock system. Valve actuation requires the operation of both an automatic detector and the operation of the low air pressure switch.

There are also other fire suppression systems and equipment in the elevated station.

Wet chemical fire extinguishing systems are provided in the kitchen for the two kitchen exhaust hoods. The two emergency generators in the emergency power plant are protected with a local application carbon dioxide fire extinguishing system. This system is activated manually by CO₂ release stations and automatically by cross-zoned heat detectors.

Portable fire extinguishers are located throughout the facility. General use extinguishers consist of multi-purpose dry



A pressurized water tank serves the preaction sprinkler systems for the elevated station.

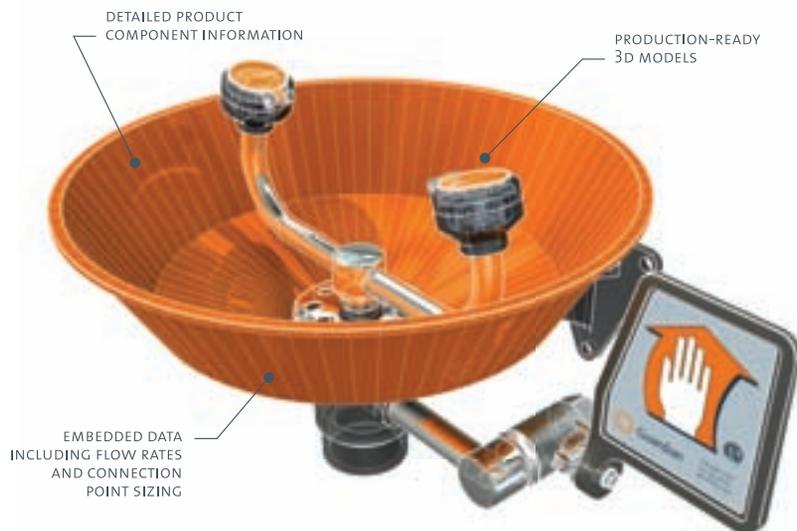
chemical stored pressure extinguishers. Clean agent extinguishers are also located in areas where appropriate.

Fire suppression systems and equipment for the South Pole Station work with the fire alarm and detection system, other fire protection features provided in the station construction and an emergency plan to provide life safety at the southern most location on our planet. ■

Samuel S. Dannaway, PE, is a registered fire protection engineer and mechanical engineer and past president and a Fellow of the Society of Fire Protection Engineers. He is president of S. S. Dannaway Associates, Inc. He can be reached at SDannaway@ssdafire.com.

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.

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Circle 17 on Reader Reply Form on page 57



Solar Solutions

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



Beyond Solar Combi 101

A solar combisystem is a heating system designed to provide heat for both space heating and domestic hot water and includes supplementary (backup) heat, as well. There are many ways to design a combisystem. The International Energy Agency (IEA) has identified more than 20 “generic” versions of the solar combisystem, each requiring a unique piping configuration and different control strategy for collecting, storing and delivering heat. (Most include large water tank solar heat storage systems.) While this is useful and interesting for solar heating specialists, it actually defines the chief obstacle that must be overcome by mechanical contractors and installers. It is a daunting task to learn the finer points of 20 separate plumbing diagrams and their control requirements thoroughly enough to choose the right variation for each new heating application. The mechanical professional who has the time, the skill or the interest to do this successfully is the rare exception in the ‘real world’ of construction deadlines and budgets.

In an article a few months ago, I introduced a solar heating system I call Combi 101. Figure 20-1 shows the piping diagram for this system which contains the minimum components to qualify as a Solar Combisystem (including a hydron-

sources and a bunch of different heating loads. The primary check-loop (which can be assembled at the site or in a shop out of copper parts) provides the “socket” into which any number of sources and loads can be “plugged in.” The Combi 101 has only two heat sources and two heat loads and can be duplicated in any small building that has those requirements. Let’s take a look at some practical applications that go beyond this minimal solar heating system.

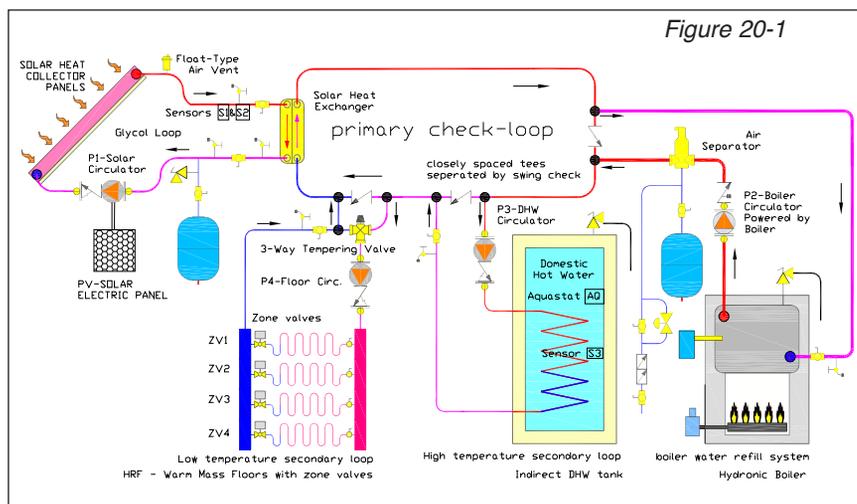
Multiple heat sources

Heat sources can be divided into two major types: Intermittent (alternative) versus On-Demand (conventional) heat sources. The Combi 101 uses two sources, the intermittent solar heat and the on-demand hydronic boiler. But there are many other sources of heat commonly available, and any one of them can be easily added to a primary check loop.

Let’s not forget that the basic idea here is to allow easy access to more than one heating “fuel,” and to give priority to the least expensive fuels first.

This idea not only works for solar heat, but also for wood-fired boilers, waste heat from gas powered generators or when several boilers are available using different fuels such as the combination of electric, oil, natural gas or propane. A ground source heat pump is another version of a hydronic boiler that runs on electricity. In some rare instances in areas known for their natural hot springs, high temperature geothermal heat is available where the ground temperature can be used as a heat source with or without a heat pump. In the future, fuel cells may become more widely available that generate both electricity and heat. Even a large pile of compost can generate enough heat to be useful in some applications.

The point is that any one of these heat sources can be plugged into a heating system that is designed with a flow center like the Combi 101, without any major redesign of the piping connections. In Figure 20-2,



ic boiler backup) using a piping configuration that I call the primary check-loop. This piping diagram provides a skeleton for many of the different versions of the generic combisystem, without the need to re-think all the piping connections each time a new variation is required for a building project. (The control wiring diagram originally published with the Combi 101 piping diagram a few months ago also provides a skeleton for the controls needed for all the hydronic equipment.) I have found that in order to include solar heating in many projects, the design time must be kept to a bare minimum. This is especially true in most residential and smaller commercial building projects.

When you reduce all the generic variations down to their basic elements, what you have is a bunch of different heating

the top of the primary check-loop shows the suggested piping locations of some of these heat sources. As you can see, each new heat source requires two tees and a swing check valve added to the primary pipe. The on-demand sources can be controlled much like the original boiler. The intermittent heat sources (which tend to be the cheaper fuels) can be controlled much like the solar heat is controlled. The cheaper fuels can be controlled (when available) to lock out the more expensive fuels, and also to provide pre-heat for them. Pre-heating is easily accomplished by connecting the on-demand sources down-stream from the intermittent sources.

Multiple heat loads

In the world of solar combisystems, we need to differen-

Continued on page 30

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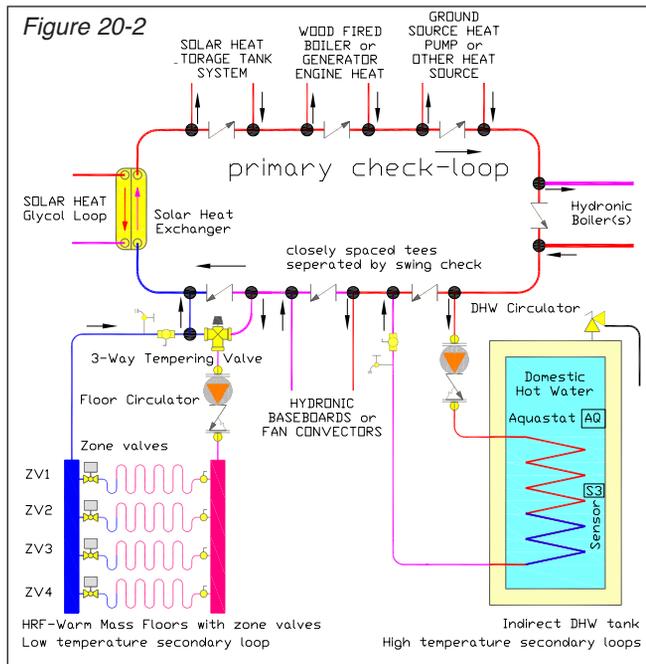
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Solar Solutions

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tiate between several categories of heating loads. For our purposes, heat loads come in three types: Non-Mass, Mass and Reversible Heat Storage. Each of these types may require higher temperatures or lower temperatures depend-

ing upon the application. (The term “Mass” in this context refers to “Thermal Mass,” which is the capability of a heavy substance like concrete or water to store heat due to its density and specific heat capacity.)

Non mass loads

Hot water baseboards, fan coils and non-mass hydronic warm floors (e.g. wood floors) are the most common non-mass heating loads. Heat is delivered to the air or light density materials so that heat storage is not possible. The most common baseboards and fan coils require higher temperatures than radiant warm floors. Because of this, the sample pipe connections shown in Figure 20-2 shows the baseboard supply tees installed up-stream of the supply to the warm floors. In solar hydronic heating systems, it is common practice to specify ‘low temperature’ baseboards or panels (e.g. Runtal, Myson) to make better use of lower temperature solar heat when it is available.

Mass heating loads

Domestic hot water (DHW) tanks, warm floors with mass (e.g. concrete, brick), pools and spas are the most common heating loads with high thermal mass. This allows heat to be stored in the concrete or water by raising its temperature within reasonable limits, as described in an earlier article. Since DHW tanks often require fast recovery during times of high DHW consumption, the DHW tank in Figure 20-2 is first in line to receive the hottest fluid from any of the heat sources. Since warm floors require lower temperatures, they are connected down-stream from the high temperature loads and controlled with a thermal mixing valve for finer control over the temperature response of the floors. Additional sec-

ondary loops for more floors or pool heating can be added down-stream, as well.

Reversible heat storage

Large Heat storage water tanks act like a mass heating load and can be controlled just like DHW water tanks when heat is being stored. But when the heating function is reversed and the stored heat is removed from the tanks, they act more like solar collectors and so must be controlled like an intermittent heat source. The heat storage supply tees in Figure 20-2 are located directly down-stream from the solar heat exchanger so that solar heat can be stored immediately as it arrives if it is not needed by the other heating loads. The same tees or the next pair down stream can be used for heat delivery from the tanks. This allows both the direct solar and the stored solar heat to provide pre-heat to all the other heat sources as well as heat to all the loads.

Flow center

I have designed and installed scores of combisystems using the primary check-loop configuration. The swing check allows any secondary pump to induce flow around the primary loop in the right direction without using a primary pump, which simplifies the control system. Secondary pumps with different flow rates simply mix their flows together as they go around the check-loop, just like in any hydraulic separator. The primary check-loop can be expanded to include more heat sources and more heat loads simply by adding tees and a swing check in the right location on the loop. In some retrofit applications, I have stretched the primary loop piping to extend across a building to connect several boiler rooms together so that all the equipment becomes

part of one big solar heating system.

The same concept can be achieved using hydraulic flow separators, manifolds and pump modules that are available prefabricated from several hydronic equipment suppliers. In recent solar home heating designs we have adapted this type of equipment from Caleffi, PAW and PHP to perform the same functions as the check-loop flow center system. While the prefabricated component cost is usually not less expensive than the site-built components, the time and labor to install the heating system can be considerably faster.

For more information about generic solar combisystems, see the authoritative book from the IEA, *Solar Heating Systems for Houses — A Design Handbook for Solar Combisystems*, edited by Werner Weiss, and printed in 2003. Brand names, organizations and manufacturers are mentioned in these articles only to provide examples for illustration and discussion and do not constitute any recommendation or endorsement. Most of the heating system details presented here are based on solar heating systems installed in recent years in northern New Mexico, mostly in residential sized buildings. The examples shown here have certain technical limitations of temperature control and flow rate and may not be appropriate in every installation. ■

Bristol Stickney, partner and technical director at Cedar Mountain Solar Systems in Santa Fe, N.M., has been designing, manufacturing, engineering, repairing and installing solar hydronic heating systems for more than 30 years. Visit www.cedarmountainsolar.com for more information.

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.



Thomas Stoneburner, P.E., LEED AP,
vice president facilities at TKDA

100 Years of Engineering Excellence

By John Mesenbrink, Chief Editor

PlumbingEngineer presents its first engineering spotlight for 2010 — St. Paul-based TKDA is center stage for this edition. TKDA is proud to celebrate its 100th year of providing forward-thinking engineering, architecture and planning to communities, government and private industry. German engineer, Maximilian Toltz, founded the Toltz Engineering Company in Saint Paul, Minnesota in 1910. Over the years, the firm has helped to build and grow communities, schools, airports, railroads, and corporations such as 3M, BNSF Railway, Nestle, and Kraft, to name just a few. TKDA's experience includes such diverse projects as the I35W St. Anthony Falls Bridge in Minneapolis and the Wabasha Street Bridge in Saint Paul, a steam generating facility for Andersen Corporation, and complete city engineering services for communities throughout the region.

Since its founding, the company has grown to become TKDA (Toltz, King, Duvall, Anderson and Associates, Incorporated), a 100% employee-owned firm with a staff of nearly 200 to provide single source, integrated services and solutions nationwide to clients in eight key markets: Aviation, County Government, Education, Corporate/Industry, Military, Municipal, Rail and Transit, and State/Federal Government.

The following is an exclusive interview with Thomas Stoneburner, P.E., LEED AP, vice president facilities at TKDA.

PE: What is your mission statement for the company?

Stoneburner: To provide services that build on our tradition of creating value for our clients, communities, and employee owners.

PE: What are your initiatives for the company?

Stoneburner: For the near term, our goal is to increase revenue and staff size to pre-recession levels.

PE: What are your core markets?

Stoneburner: TKDA provides services in the following core markets: aviation; county, state and federal government; education; corporate/industry; military; municipal; and rail and transit.

PE: What are the services you provide?

Stoneburner: **Engineering** — Civil, Structural, Electrical, Mechanical, Municipal, Water and Wastewater, Transportation, Bridge, Rail, Water Resources, and Aviation

Architecture — Master Planning, Programming, Space Planning, Architectural Facility Design, Interior Design, Site Design, Landscape Architecture, and Urban Design

Planning — Comprehensive, Land Use, Transportation, Traffic, and Environmental

PE: How are you immersed in sustainable design?

Stoneburner: In order to assist our clients on all aspects of their projects, TKDA set and achieved a goal to have LEED Accredited Professionals in each of our building design disciplines (Architectural, Civil, Structural, Mechanical, Electrical, and Landscape Architecture). Also, long before LEED, we have promoted practical, energy- and material-efficient designs on all of our projects.

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TKDA Spotlight

Continued from page 32

PE: *How has your firm dealt with the economic uncertainty? How do you see your vision through this tough time?*

Stoneburner: We have always been a fairly conservative company. This is reflected in our current multi-disciplinary structure. TKDA's market diversity has certainly helped the firm weather the difficult economic times. Because we aren't focused specifically in one industry or one marketplace, we have done better recently than some of our competitors. Hopefully, this strategy will see us through to brighter days.

PE: *How can engineers better assist builders and contractors in today's economic climate?*

Stoneburner: Engineers combined with builders and contractors can serve as a team to better meet the Owner's needs. Integrated Project Delivery can be a valuable and efficient means of providing a successful project.

PE: *What are some new trends or new products that peak your interest for 2010?*

Stoneburner: We are excited about the trend of reducing energy costs. This objective can lead down many avenues, such as sustainable design, energy conservation, energy audits, boiler upgrades, heat recovery, energy plants, etc.

PE: *How do you avoid "green" over-saturation? How do you spec products that are truly sustainable and true to the application?*

Stoneburner: Virtually everyone claims to be green



A typical day in the office, Thomas Stoneburner, P.E., LEED AP, vice president facilities at TKDA, completes his research.

these days. We try to couple sound research with common sense in specifying products.

PE: *Are you seeing any of the stimulus money open up? If so, in what markets?*

Stoneburner: Yes, we have seen stimulus money in energy- and transportation-related projects.

PE: *Any recent projects of which you are most proud? Why?*

Stoneburner: We've been working with a major food industry company on a couple of large projects that I'm very proud of because of the projects' technical and schedule demands.

PE: *How do your satellite offices complement your overall goals?*

Stoneburner: Our satellite offices help us achieve our goal of serving our clients wherever they need our help. These offices originally began as a direct response to the needs of our Rail and Aviation clients.

PE: *How do you achieve an 80% repeat business client base?*

Stoneburner: We have served many of our clients for several decades. TKDA's brand is rooted in our reputation for providing the highest levels of engineering, architecture and planning to clients who need single source, integrated services. Our repeat client base has come to experience and expect this high level of service and our firm continues to deliver and meet this expectation. Each of our projects is a complete collaboration with our clients. And many times we deliver solutions that go above and beyond the initial client request. For example, in 2005, a major window and door manufacturer was notified that they would be losing a major source of steam for their facility. (They had been generating a portion of their steam in-house and purchasing additional steam from a nearby thermal facility, which was changing its offerings and no longer was able to meet this manufacturer's needs.) TKDA offered an innovative solution that went beyond our client's initial need of replacing a steam source. We designed a facility that eliminated a reliance on coal-based steam, decreased landfill waste and emissions, and enabled the company to control its current and future energy requirements by using state-of-the-art equipment. ■

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Circle 22 on Reader Reply Form on page 57



The I-Codes®: Safe, Green and Global

It is said that we may run out of freshwater before we run out of oil. With the possible exception of water conservation groups, no one knows better than plumbing professionals how critical water-saving measures are to our future. Yet, while water shortages have existed for centuries in regions all over the globe, many might not realize that, unless conservation efforts are dramatically heightened, water supplies will become even scarcer or non-existent, even in cities that have rarely or never experienced shortages.

Thankfully, the building industry has been well ahead of the green trend, implementing sustainable building practices for years already. With consumer interest and the Federal government becoming increasingly interested in and aware of conserving natural resources and saving money through the efficiencies realized from these efforts, the industry and the codes that support these changes are responding with ever more “green” codes and related products.

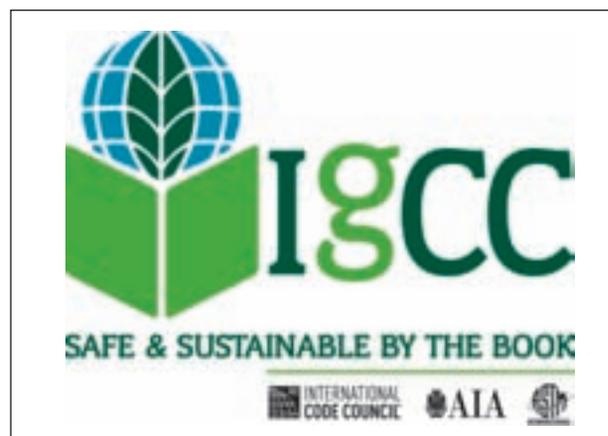
While several organizations that publish building provisions within specific industry segments have rushed out green building references to be the first to market, so to speak, the International Code Council® followed the same superior and comprehensive code development and approval process in the preparation of the Public Version of the International Green Construction Code (IGCC), the latest in a long list of sustainable design codes and provisions as the Code Council® has been offering for decades. The publish date for the IGCC is March 15.

Naturally the IGCC meets sustainable rating system (e.g., LEED, Green Globes) requirements. But it also goes well beyond these standards, offering a wide range of green building applications for every industry segment and a lot of exclusives. Of course, the IGCC is based on the same clear, easy-to-use progression as the other I-Codes®, but it also offers the most comprehensive and effective code for alternative water sources and energy sources, and is the first and only construction code that establishes minimum level sustainability requirements.

Going green becoming second nature

Although the green movement is relatively new, the not-too-distant future of codes in general will naturally integrate green building practices instead of having separate references for sustainable applications. “That is why it’s more important than ever to adopt building codes that are comprehensive and fully integrated,” said Jay Peters, executive director of the International Code Council’s Plumbing, Mechanical and Fuel Gas Group. “Of course, our newest offering, the IGCC is integrated with ICC’s complete family of codes and future editions of the I-Codes will incorporate these green provisions within the body of each code. This will make implementing green and other codes totally seamless and simple. It will quickly

become second nature to implement greener plumbing, mechanical and all other energy- and resource-saving practices. The future is now and the building industry can lead the rest of commerce with these innovations.”



Development of the IGCC: Safe and Sustainable by the Book involved many organizations and ICC members, with extensive participation by the American Institute of Architects and ASTM International.

Of course the IGCC ensures that, when systems are installed per the code, the standards by which sustainable rating systems (e.g., LEED, Green Globes) measure compliance will also be met. The IGCC also offers many overall features and benefits others cannot in that it:

- Is the first and only construction code that establishes code requirements for a minimum level of sustainability in commercial buildings;
- Is based on the same clear, easy-to-use sequence that makes the I-Codes® the most accepted code adoption platform in the U.S. This, combined with the extensive support and level of devotion the Code Council® offers its users, is why they’re the leader in codes and related products, and is a key reason for why more and more countries around the world are choosing to adopt ICC® Codes over others;
- Offers the flexibility jurisdictions need in order to customize the code based on local factors such as flood areas, greenfield sites, light pollution, and many others.

The IGCC will use as a baseline the myriad sustainable plumbing provisions referenced in the 2009 International Plumbing Code® (IPC). Building from those provisions, the IGCC will provide the most comprehensive and effective code for water conservation across many applications and industries.

Also, unlike other green standards and rating systems that use rigid and inflexible water reduction requirements, the IGCC offers a performance-based system for water conser-

Continued on page 38



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The I-Codes®

Continued from page 36

vation in plumbing fixtures while also offering designers greater flexibility in selecting the right devices.

Peters added, "With the green and sustainability challenge changing so rapidly and spanning across all facets of construction, it is imperative to do it right. It is a major investment, not only for customers in general, but also for

contractors. The last thing they want is to complete a 'green' installation, only to realize it is already outdated or doesn't integrate with other codes, standards and even the related systems."

Specific to plumbing applications, the IGCC will cover water conservation issues such as:

- Being the most comprehensive and effective code for alternative water sources such as graywater, rainwater and reclaimed water. This is important, not just for regions strug-

gling with limited water supplies, but to offset possible water shortages in the future, even in areas where this has never been an issue;

- Specific examples for these applications include reclaimed water use and systems, including municipally-reclaimed water, onsite water recycling systems, rainwater catchment systems, condensate capture systems, foundation drain water reclamation systems, and dual plumbing considerations and requirements;

- Fixtures, fittings and appliances, including faucets, toilets, urinals, dishwashers, washing machines, pre-rinse spray valves, showers, and drinking fountains;

- Hot water delivery system design, including pipe sizing and insulation;

- Landscape and site water use to include xeriscaping, turf, landscaping, and storm water management;

- Recreational water such as pools, spas, ornamental water features and water parks.

"The International Green Construction Code will provide the PMG industry, especially installers and inspectors, with a tool that is understandable and simple to use," said Peters. "It is not a rating system or a complicated method of trade-offs, but a prescriptive method to design, install and inspect these systems. Like following the IPC, the IGCC is written in a simple language that prescribes each facet of the installation. It is being coordinated with all of the International Codes® already in place so, when adopted, unlike other green codes, it won't require extra amending, correlating and editing.

"For example," Peters continued, "the International Energy Conservation Code is the most widely adopted energy code in the country and is slated for nationwide adoption as per the American Recovery and Reinvestment Act. Yet, other codes, standards or supplements contain energy and mechanical code provisions that are sure to duplicate or, even worse, conflict with the most widely adopted codes."

Ever-improving water conservation

More and stricter requirements regarding water savings will continually be improved upon. "Water saving fixtures have always been in there," Peters noted. "But water monitoring and leak detection devices might be

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Fig. # 1005



Fig. # 1605

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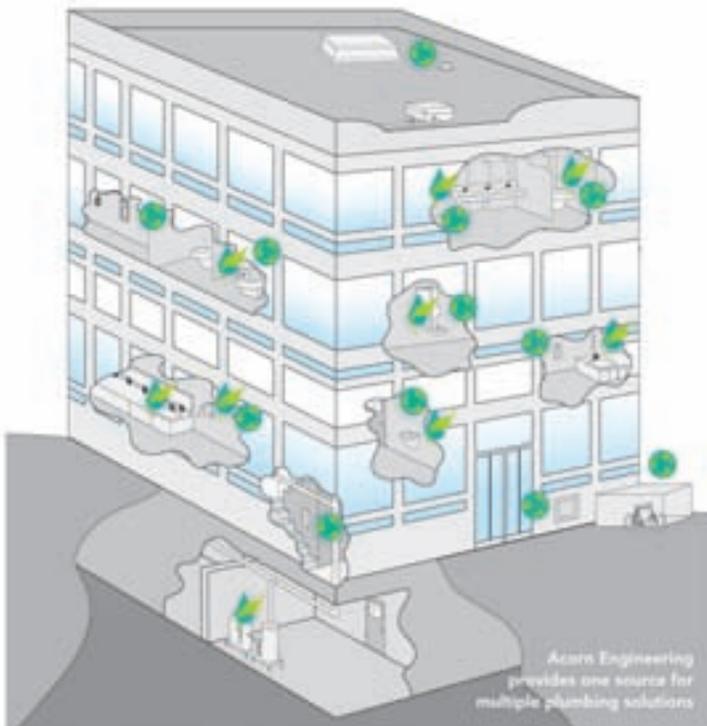
Continued on page 40

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The I-Codes®

Continued from page 38

added in the not-too-distant-future.” These measures, although seemingly small, are in fact huge. According to the EPA, the amount of water wasted from leaks in U.S. homes each year could exceed one trillion gallons — equivalent to the annual water use of Chicago, Los Angeles and Miami combined. The adage, “every little bit helps” certainly

resonates with that statistic.

Of course, green plumbing applications aren’t restricted to water conservation practices. Selecting materials that are environmentally safe or recyclable is important, as is the material selected for a particular job. This decision may also be based on proximity to the manufacturer or other factors. For example, PVC might be the best option based on its long lasting properties. However, depending on the projected lifespan of the fixture it will be applied

to, a cast iron drain might be a better option because of that material’s recyclability and the fact that it isn’t made from nonrenewable petroleum.

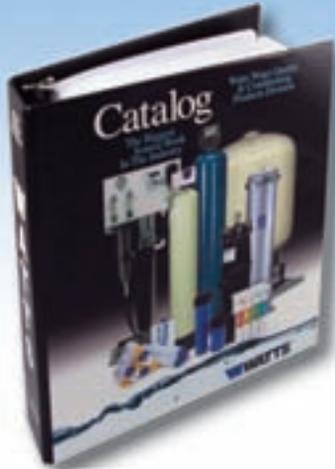
Supplies are also being made using as little materials as possible to avoid wasting resources. Transporting smaller supplies also conserves fuel, thereby saving additional resources, not to mention related cost savings.

While many resource-saving materials are available for plumbing professional looking to follow sustainable design practices, the best way to conserve is to use fewer materials for each project as much as possible. The IPC has always focused on material conservation along with efficiency and public health and safety.

Actually, although the color of the cover of the IPC was the initial reason for why it is often referred to as the “green book,” this code has also come to symbolize the beginning of the environmental sustainability movement across the plumbing industry. A few examples of the material conservation measures referenced in the IPC are:

- Dimensions of water, drain, waste and vent pipes are smaller where feasible for the same number and type of fixtures than other plumbing codes;
- Greater venting options result in less piping required to accomplish the same task;
 - Vent terminals can end through exterior walls rather than through roofs which reduces vent piping length requirements;
 - Air admittance valve venting options can significantly reduce the length of vent piping to outdoor terminals;
 - Circuit venting methods within the IPC eliminate redundant vent piping;
 - Waste stack venting is an efficient option for installing vertical drainage pipe systems;
 - Some approved engineered vent system designs allow reduced vent system pipe sizes;
 - Manifold water distribution systems are allowed, which require smaller water pipe sizes, resulting in significant water and energy savings;
 - Waterless urinals are a huge water saving measure and do not require “backup” water supply, which reduces additional piping needs. Graywater systems can be used to ensure waste pipes are flushed, yet without the need for fresh water; ■

The remainder of this article can be found on www.plumbingengineer.com.



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Green Code Supplement Ushers in New Era

*Forward-looking document enables municipalities
to take lead on sustainable building initiatives*

By Geoff Bilau

The Sustainable Building Industry today has a powerful and revolutionary new tool at its disposal with the formal release of IAPMO's Green Plumbing and Mechanical Code Supplement, the most comprehensive document ever created to standardize sustainable residential and commercial plumbing and mechanical systems.

"The building codes are perhaps the biggest hindrance to the adoption of green buildings," said Dave Viola, IAPMO director of Special Services and staff liaison to the Green Technical Committee (GTC) that developed the document. "There's so little information about how to do green systems properly and safely within existing building codes, so we've rolled out a document that shows exactly how it's done."

The Green Supplement serves as a complement to any adopted plumbing and mechanical code, smoothly bridging the previously troublesome gap between existing codes and established green building programs. Where code language and green building concepts lack cohesion, the Green Supplement creates harmony by addressing such areas as:

Use of alternate water sources (graywater, rainwater harvesting)

"The biggest void in the industry is how to safely use alternate water sources," said Viola. "Inspectors and code officials think it's best to avoid using graywater because they're very conservative and feel it's best to avoid the risk of something bad happening." Many green building rating systems give points for using alternate water sources, but they don't prescribe how to use the graywater correctly. "That's where the supplement fits in. We show you how to replace potable water, earn your points, and do it safely."

Proper use of high-efficiency plumbing products

With water conservation comes the potential for drain line clogging. The Supplement establishes more efficient flow rates and consumption limits for plumbing fixtures, faucets and appliances while providing product specifications and installation requirements necessary to achieve the necessary performance and anticipated water savings.

Conservation of hot water

The Supplement contains measures to increase the effi-

ciency of hot water generation, hot water distribution and hot water usage. This includes setting minimum appliance efficiencies, enhancing insulation provisions and establishing design criteria that minimize water waste while waiting for hot water to arrive at the tap.

Energy conservation in HVAC systems

Though provisions dealing with sustainable plumbing are prominent, Amir Tabakh, director of Environmental Engineering, Environmental Affairs Division of the City of Los Angeles Department of Water and Power, and a member of the GTC, contends the mechanical aspects should not be overlooked. "According to the California Energy Commission, 30 percent of the state's energy consumption within commercial buildings is mechanical equipment," said Tabakh. "If that 30 percent is positively impacted, it means many more electrical systems will become highly efficient. So, this document ultimately touches national standards for electrical efficiency."

The Supplement achieves a significant reduction in energy use for heating, ventilation and air-conditioning systems from that permitted by mechanical codes. In most cases, the reduction is more than 20 percent. The cornerstones for these provisions are ASHRAE 90.1-2007 Energy Standard for Buildings Except Low-Rise Residential Buildings and ASHRAE 90.2-2007 Energy Efficient Design of Low-Rise Residential Buildings.

Training/education in green plumbing systems

"The existing infrastructure for training professionals lacks the green element," said Viola. The Green Supplement recommends that jurisdictions look for examples of specific competency from professionals involved in designing, installing, and inspecting green systems.

The Green Supplement was developed in response to the IAPMO Board of Directors' call for a reduction in energy and water consumption currently permitted in the Uniform Codes. In January 2008, the Board established the Green Technical Committee (GTC) and charged these individuals with the development of the Green Supplement. The 25-member GTC is chaired by IAPMO Board Member Bill Erickson of CJ Erickson Plumbing and comprised of the leading authorities in all facets of the sustainable plumbing and mechanical fields. Operating under the leadership of the GTC, an additional 60 mem-

Continued on page 44



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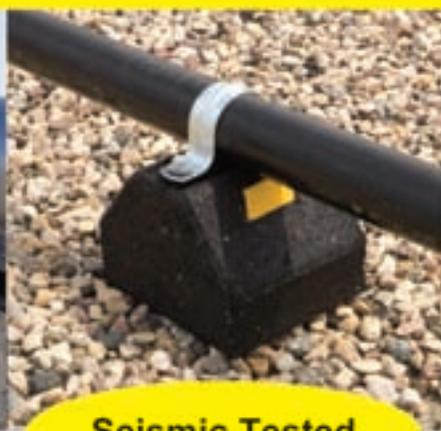
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Green Codes

Continued from page 42

bers that include plumbers, contractors, engineers, inspectors and energy/water conservation experts serve on nine task groups.

The Green Supplement serves as an invaluable resource for code officials, plumbers, contractors, engineers and manufacturers in designing, installing and approving more sustainable plumbing and mechanical systems. Among its features:

- Provides the most comprehensive collection of plumbing and mechanical provisions available toward increased water and energy efficiency;
- All provisions contained in the Green Supplement are proven safe and reliable;
- Provides related installation and maintenance requirements; and
- Where possible, the Green Supplement provides commentary detailing the water and energy savings associated with the provisions detailed within its language.

“Many of the provisions in the Green Supplement are very advanced,” said Tabakh. “These standards are 5-7 years ahead of the local codes. As you know, a code cycle takes 3-5 years and we cannot wait for products that are advanced or highly sophisticated before they are approved by the code. The Green Supplement gives a local jurisdiction the opportunity to adopt a superior product, a superior standard without waiting 5-7 years.”

The Green Supplement is designed as a transitional suppository for these concepts that are perceived as being ahead of their time. The end game, according to Viola, is ultimately for the supplement to go away as Green becomes the mainstream industry standard and these provisions are rolled into the codes.

With the Supplement complete, the Green Technical Committee has fulfilled the next step of the Board charge by submitting proposals that would incorporate the applicable portions of the Green Supplement into the 2012 Uniform Plumbing Code and 2012 Uniform Mechanical Code as non-mandatory appendices. The Uniform Plumbing and Mechanical Code Technical Committees will consider these proposals at their meetings, April 26-30, in Milwaukee, Wis.

Because there is no rest for the weary, the GTC has already made plans to start the maintenance process of the Green Supplement at its upcoming meeting in Chicago, April 14-15. ■

Geoff Bilau is senior writer, marketing & communications for IAPMO.

For more information about the Green Supplement and/or IAPMO's commitment to a sustainable environment, visit www.iapmo.org/Pages/IAPMO_Green.aspx or contact Maria Bazan at (708) 995-3000 or maria.bazan@iapmo.org.



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Building Information Modeling

in the PHC industry

By David Morris

What is Building Information Modeling (BIM) and how does it affect the plumbing and hydronic industry? With improvements in affordable computer hardware and software for visualization of entire buildings in three dimensions, the opportunity for prefabrication and project pre-planning are possible in ways only dreamed of 10 years ago. Inter-trade spatial coordination with ninety-five percent or better accuracy provides PHC end users the ability to build digitally and then prefabricate with certainty of fit far beyond the “Large Bore” and welded systems focused on in the past.

These opportunities abound for both large and small firms and are limited more by the complexity of the project than dollar value of the contract. While there is an upfront investment in hardware, software, and training, most contractors see a return on investment that exceeds their initial projections.¹ After a 3D model is spatially coordinated, accurate bills of materials can be extracted automatically with a few clicks of the mouse. Fabrication drawings are linked to and extracted from the CAD models, and do not need to be drawn from scratch. This saves time and improves quality and accuracy of the finished product. By moving the “thinking” from the field to a controlled environment, better decisions can be made earlier in the process.

How do you get started? Find a capable trade knowledgeable individual with detailing experience and train them to use the computer and software, or hire a competent 3D CAD detailer with trade experience. However, it is much easier to teach someone to use the computer than to teach a “computer wizard” your trade. Mechanical Contractors Association of America (MCAA) has a BIM committee that is actively pursuing best methods for BIM training. They may offer some seminars on the subject in the near future. Your local training center or junior college may offer CAD classes, as well. Training is the key to success.

Most users experience a sense of being overwhelmed at first, then the pain of the learning curve sets in. Finally, as expertise improves, the return on investment is realized, and they move forward with confidence. Those who measure their success find the ROI is higher than those who do not.¹ A well-planned implementation with milestones and measures of success will achieve earlier positive outcomes than a more organic evolution. The good news is that most of the initial groundwork for standards is in place and a phc does not have to start from scratch. Organizations such as the buildingSMART alliance and the National Institute for Building Sciences (NIBS) have active pro-

grams in place that offer many advantages.

The National CAD Standard is a great resource for pre-defined computer aided drafting layers, colors, and naming conventions. The National BIM Standard is less mature but entering into its second revision and promises to be a valuable tool for interoperability and social exchanges. Both documents are available through the NIBS or buildingSMART websites.

The benefits of BIM processes far outweigh the effort required to overcome the learning curve. The technology is mature enough to provide a multitude of improvements in almost every aspect of the phc construction process from estimating through project closeout. If your contracts do not already require the use of BIM, they will very shortly. The Building Information Modeling trend started on the West Coast, gained momentum on the East Coast and is rapidly closing the gap between. Those who wait for the technology to mature may soon find themselves scrambling to catch up. ■

¹ “The Business Value of bim” 2009 McGraw Hill SmartMarket Report



David Morris is the director of Virtual Construction, EMCOR Construction Services. Morris more than 30 years of experience performing and directing all phases of piping and mechanical systems for Commercial, Hospitality, Industrial, and Power Generation construction. Current duties include improving BIM processes and sharing best detailing and virtual design practices for his company. Morris is well known as an industry activist for Integrated Project Delivery, BIM and Process Transformation and has presented to AIA, CURT, AGC, MCAA BuildingSmart Alliance, and other industry functions related to Virtual Construction and Building Information Modeling. As the director of the National BIM Standard, Deputy Director of the National CAD Standard, vice-chairman of the BuildingSmart Alliance Board of Directors and Director of the Quality of Life and Visualization, Simulation & Analysis Programs, Chairman of Associated General Contractors BIM Forum Subcontractors Subcommittee, and Member of The Construction Users Round Table Process Transformation Committee, and Chairman of the AGC San Diego BIM committee, Mr. Morris brings a practical and commercial perspective to the use of technology in construction.

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Taco is the first and only HVAC systems company to provide complete, data-rich .RFA files for Building Information Modeling (BIM). Access is easy through AutoCad and the AutoDesk® Revit® Architecture programs for Building Information Modeling (BIM) or through download from our web site.

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Circle 31 on Reader Reply Form on page 57

Jumping on the Revit® Express

By John Mesenbrink

Engineers and manufacturers alike are reaping the benefits of building information modeling (BIM) software programs and renderings. Software such as Autodesk's Revit® offers huge benefits by helping one explore early design concepts and forms, and more accurately maintain vision through design, documentation and construction. These intelligent files offer 3-D renderings and data. "From what we've seen, Revit is the complete package for building modeling software. It features quick reference and preconfigured elements to draw a building fast. Walls, floors, ceilings snap into place with a few clicks. Conduit, water and gas piping, duct work are run from preformed elements so there's no need to painstakingly draw every minute bit of geometry," said David George, product manager, Lochinvar Corp. "Lochinvar is pleased to provide working Revit models of our product to designers. It is in our corporate philosophy to support all aspects of the efficient and clean installation of Lochinvar boilers and water heaters. To get our products in at the earliest stage of design serves only to improve the quality of the final installation."

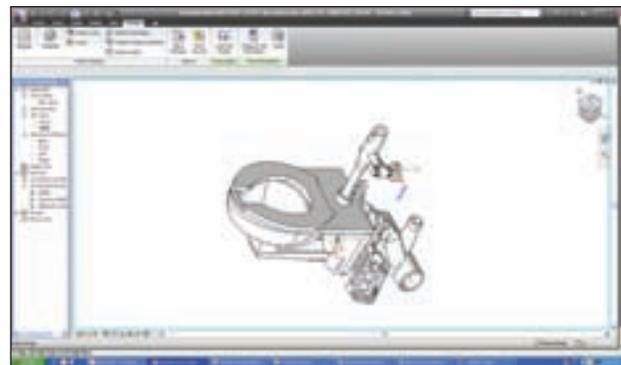
From boiler design to pump specs to faucet renderings, Revit offers convenience. "Our basis in 3D is the Revit Family or BIM block — it is an image, piece of data and product file — but much more, it is an enriched specification of a product or products including a rendering, dimensional data, consumption rate, physical and operational properties, pricing, source, and supplier details, even warranty, installation and owner's documents. For other manufacturers, BIM objects are just generic shapes — ie: a wall hung toilet, complete with size and shape. Revit families mean enriched data — dimensional and beyond — data that is relevant for the lifecycle of the structure, campus, or program, and necessary to its operation and performance," said Jeremy Cressman, LEED AP, commercial vice president, American Standard.

"Previously, a BIM block was just a shell: a fixture or fitting without data, just the dimensional shape and size of a wall-hung toilet used to render the design. Today, the engineer can convert their master spec or build a unique project specification, complete from fixtures through mixing valves, drains & carriers, specialty equipment and hydronics — and from this spec, generate a fully nested BIM object of each fixture or equipment tag. So what was once a shell is now the American Standard Everclean Aftwall 3351.128 1.28gpf toilet, complete with the AS 6065.121 Selectronic sensor-operated flush-valve, fitted with open front seat, attached to the RH horizontal carrier. All our enriched objects with connectors, now combined into a nest that can be dropped into the plan and pro-

vide an accurate 3-D rendering and model in minutes," added Cressman.

Manufacturers like American Standard are using Revit to their advantage. Pump companies such as Grundfos and Taco, for example, are getting into the act. Recognizing the vital and growing importance of building information modeling to construction professionals and HVAC system designers, Grundfos Commercial Building Services (CBS) is making computer-generated, three-dimensional models of eight popular commercial and industrial pumps available for easy downloading in a Revit (.rfa) file format on Autodesk® Seek at <http://seek.autodesk.com>.

Intended to eliminate the need for printed information on products, Autodesk Seek is a leading online resource for 3D models, 2D drawings, visual images and specification data on a wide array of building products. "Our objec-



This combined Revit file has been enhanced with connection points for the water inlet of the American Standard flush-o-meter and waste outlet of the toilet. The product shown consists of the American Standard 3351.160 1.28gpf Aftwall toilet, 5905.100 Heavy Duty Elongated Seat, and 6065.161 Selectronic 1.28gpf flush-o-meter. The toilet is supported by the Jay R. Smith 0210Y Single Horizontal Carrier.

tive with the new Revit drawings is to make it easier for system designers to use Grundfos products," said Matt Gallucci, LEED AP and regional sales engineer, Grundfos CBS, "by providing information, drawings and models in a format that they now routinely use everyday. The ultimate goal is to do our part in making the BIM process more efficient and effective for everyone involved in a project using our pumps," said Gallucci.

Taco, Inc. has added another commercial pump line and three related commercial product lines as Revit® (.rfa) family files. In addition to Taco's GT Series Pumps, the

Continued on page 51

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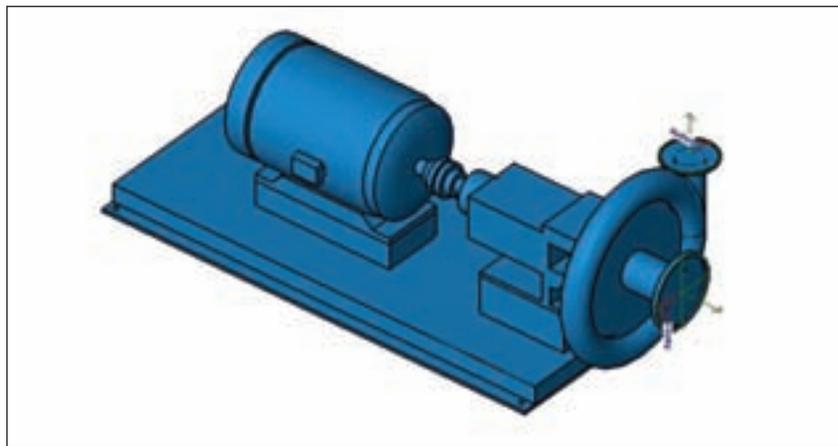
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Building Information Modeling

Continued from page 48

company has added its 4900 Series Air-Dirt Separator, its patented 5900 Series FlexBalance Air Separator, and its Multi-Purpose Valves (MPV).

With these four new additions, Taco now has a total of seven pump lines and three associated equipment lines available as Revit (.rfa) family files for the use of design engineers and building construction professionals.



An example of a Revit drawing, here is a view of the PACO LF frame-mounted end suction pump, which Grundfos will offer system designers via Autodesk Seek.

Another company breaking the innovation barrier with regard to computer-generated renderings for the designer and engineer is Allied Technical Services (ATS). ATS provides a technical plumbing specification information service to designers in the construction industry.

Serving the United States and Canada (in the languages of English and French) since 1969, ATS is frequently called upon to assist designers with the preparation of plumbing specification packages, either through our online platforms, e-mail spec services or telephone customer support.

The ATS Spec Website (www.atsspec.net) is a complex relational database, which enables the user to build a complete and customized plumbing specification for their project quickly and easily. It guides the user through the selection of product combinations, creating specifications based on compatible fixtures and fittings while providing suggestions to the user based on manufacturers' intended usage of products.

ATS is the only no-cost, no-catch plumbing specification information system provided to all mechanical consulting engineers, architects and

interior designers in the North American marketplace. The specification services of ATS are provided to engineers and designers free of charge with such services being fully sponsored by many of the major manufacturers in the plumbing industry.

The ATS system allows its users to download combined 3D BIM-nested families for projects built on the

website. ATS features an ever-expanding archive of .rfa files, with over 1,500 combinations already accessible for immediate download. ATS is the largest source for combined nested Revit plumbing fixture information available anywhere. The combination nested Revit families contain all fixtures, fittings, components and connections required, zipped together for download and ready to be dropped right into your BIM models. For example, a toilet will be nested with the appropriate seat, carrier and flush valve to generate one combination Revit file, while all other resources currently only offer single BIM details.

For engineers implementing a BIM design platform, this means tremendous time savings, not only in searching for the appropriate fixtures with their compatible fittings, but by having the combined BIM details available for each item, complete BIM families can be dropped into a 3D BIM project with little modification required. This groundbreaking advancement will make the plumbing specification process of projects involving BIM much easier, faster and more accurate. ■

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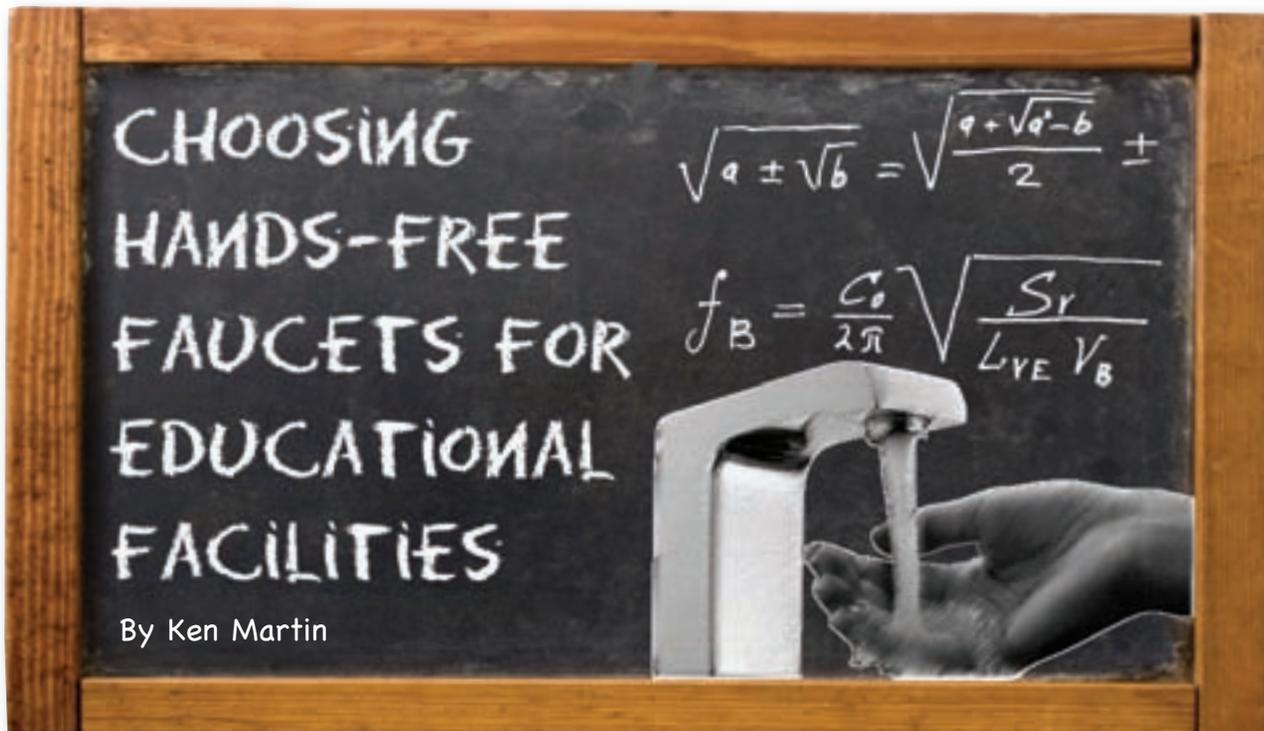
Thanks to new revisions to the ASTM standards, it's now easier to protect yourself from the uncertainty surrounding imported cast iron. The revisions call for product inspection reports to be available upon request that contain more specific and detailed cast iron data across a broader range of pipe samples. If importers can't provide them, ask questions like - Where was it made? And, were the raw materials screened for radioactive material?

For more questions to ask importers and information on the new ASTM standards, visit charlottepipe.com/verify.

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By Ken Martin

In educational facilities — from elementary schools to middle schools to high schools — promoting cleanliness through proper hygiene through proper hand washing is important. With a high concentration of people in close quarters, schools provide an ideal environment for the spread of influenza, colds and other common ailments.

Preventing the spread of illness is a key concern, especially in schools for younger children. Campaigns aimed at teaching kids about the importance of hand washing are being incorporated into curricula. To further encourage cleanliness, some schools have set up temporary or even permanent hand washing stations near the cafeterias, in the hallways, or in other locations.

While no one can completely stop the spread of germs in a school, plumbing engineers can help slow it down by choosing hands-free faucets and flush valves for public restrooms.

Physical contact is one of the principal ways that cold and flu germs spread. By their nature, hands-free faucets can minimize one source of contact. Combined with vigorous cleaning, these faucets promote cleanliness by reducing the need for people to directly contact surfaces.

In addition, hands-free faucets can help schools reduce water use. Because they typically cannot be left running — either on purpose or inadvertently — they help minimize the wasting water. They are also less prone to vandalism and general wear and tear, as there are no exposed valve handles or moving parts above the deck. As a result, they can last longer and generally require less maintenance and repair.

Different hands-free technologies

Hands-free faucets and flush valves have been available for years, but not all technologies are the same. Over the years, hands-free technology has evolved, resulting in products that work better and help promote proper hygiene.

The first hands-free faucets contained intensity-based infrared sensing technology, which measures the intensity of light reflected from the user's hands or body. A problem with this technology when integrated within a hand-washing station is that it tends to operate inconsistently. The sensor's field of "vision" can be quite narrow, requiring the user to move his or her hands around in an attempt to activate the faucet. Also, the sensors can sometimes be "confused" by the environment; a user's light-colored clothing, for example, can cause the faucet to not work properly. Both of these factors can have the effect of discouraging proper hand washing. Cleaning the faucet itself can also be an issue, particularly around the sensor window.

A different kind of infrared technology, called triangulating or optical infrared, is available and offers greater accuracy and reliability than intensity-based infrared. The same technology as is found in the auto-focus feature of digital cameras, optical infrared calculates the user's distance from the faucet or valve and starts the flow of water when the user is within a preset distance for a certain amount of time. This technology is more accurate than standard infrared and is not affected by external factors like clothing color.

The state-of-the-art in hands-free technology doesn't use intensity-based infrared or any optic technology at all. Instead, it uses capacitance, the body's ability to hold an electrical charge, to detect a user's presence. In essence, capacitance technology turns the whole faucet body into an ultra-sensitive antenna and creates a three- to four-inch field around the faucet. Whenever a user's hands enter that field, the faucet turns on and maintains a steady stream until the hands leave the field, or until a set amount of time expires.

The benefits of this technology are twofold. First, the faucets are easier to operate, thus promoting more effective hand-washing practices. Second, the faucet body has

no seams or sensor windows, making cleaning easier and helping to minimize vandalism.

Selecting the right hands-free faucet

For plumbing engineers working on an educational facility project, there are many factors to consider when specifying faucets. In addition to hygiene and water conservation, there is also cost, maintenance and reliability.

One of the best resources specifiers can look to for education and information are manufacturers, who often have websites like www.specselect.com to provide information for sourcing commercial faucets. Specifiers should also ask their manufacturer representative questions about the products they offer and how they promote cleanliness. They should look for innovations in these areas, as this demonstrates the company's commitment to improving performance. ■

Ken Martin is director of commercial business development, Delta Faucet Company.

81T Series Flush Valve with H₂Optics™

Suitable for commercial and institutional applications, Delta's H₂Optics™ hands-free technology is one of the most advanced sensing technologies in the industry today for electronic faucets and flush valves. With the ability to accurately sense the user's distance with minimal effect from external factors such as light reflection or clothing color, faucets using H₂Optics™ Technology provides consistent, dependable results.

The 81T Series also features a battery strength indicator to make maintenance easier. By simply holding the override button for five seconds, maintenance staff can see the strength of the battery.

The 81T Series also has dual flush capabilities, which can help a project qualify for LEED points. A flush of 1.6 or 1.1 gallons is initiated based on the length of time the user is present.

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Proximity Sensing Technology has been added to two of Delta's most popular faucet styles: Arzo™ and Grail™. Both faucet bodies are constructed of solid brass and have a smart, modern design that continues to be a highly sought after style for public facilities.



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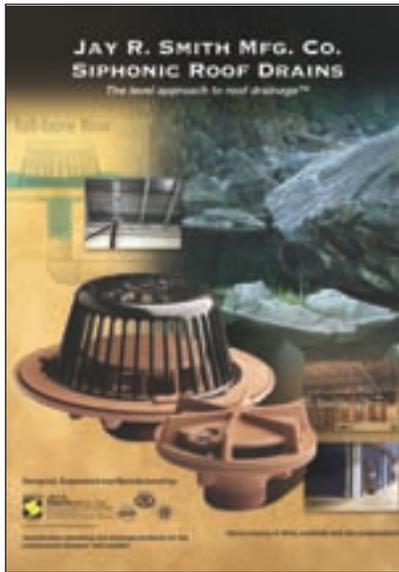
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Product News



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Figure #1005 and 1605 Siphonic roof drains promote the principle of full-bore flow within engineered siphonic roof drainage piping systems. Siphonic drain uses siphon action created by an internal baffle to have superior volume and velocity performance compared to traditional drainage. This 4-color brochure details siphonic technology and illustrates how capturing rainwater from a buildings rooftop aids in implementing rainwater harvesting. To contact your local representative, or for more information on this product, visit www.jrsmith.com. **Jay R. Smith Mfg. Co.**

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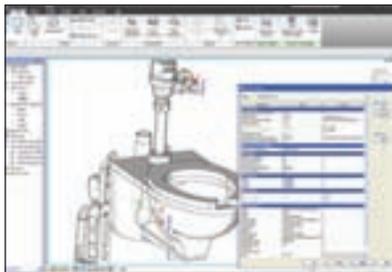
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Stainless Steel Finish Line

Floor drain and cleanout are now available for purchase. Stainless Steel Finish Line™ products are cast/machined Type 304 stainless steel and have 3" or 4" no-hub connections. Stainless steel's superior corrosion resistance makes it suitable for applications where harsh fluids may be present, as in breweries, chemical/textile plants, dairies, or laboratories. Stainless steel also provides a more sanitary surface than other materials, making it a common choice for commercial/restaurant kitchens, health care facilities, or food processing plants. Finally, the clean, durable, soft-silver appearance of the "shot-blasted" finished tops is perfect for areas where aesthetics are important. **Sioux Chief.**

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Navigator® TMVs

Navigator® Thermostatic Mixing Valve (TMV) brochure highlights the different thermostatic valves including hi-low, standard, point-of-use, lead-free, and those for emergency fixtures. Navigator's single-valve design simplifies set-up and start-up. Anti-scald protection is built in; adjustable set point controls temperatures to within three degrees. **Bradley Corp.**

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Industry News

Walmart announces latest sustainability commitment

In 2005, Walmart announced three broad sustainability goals: to be supplied 100 percent by renewable energy; to create zero waste; and to sell products that sustain people and the environment. Thursday, February 25, the company announced another major step toward its sustainability mission.

Walmart CEO Mike Duke announced the company's goal to eliminate 20 million metric tons of greenhouse gas emissions from life cycle of products Walmart sell around world by 2015. This represents one and a half times the carbon growth over the next five years. To understand the scale, 20 million tons is equal to what 3.4 million cars emit in greenhouse gases over one year. "We will be a leader in retail, because we will be first to take a look at the supply chain on a global scale," said Duke.

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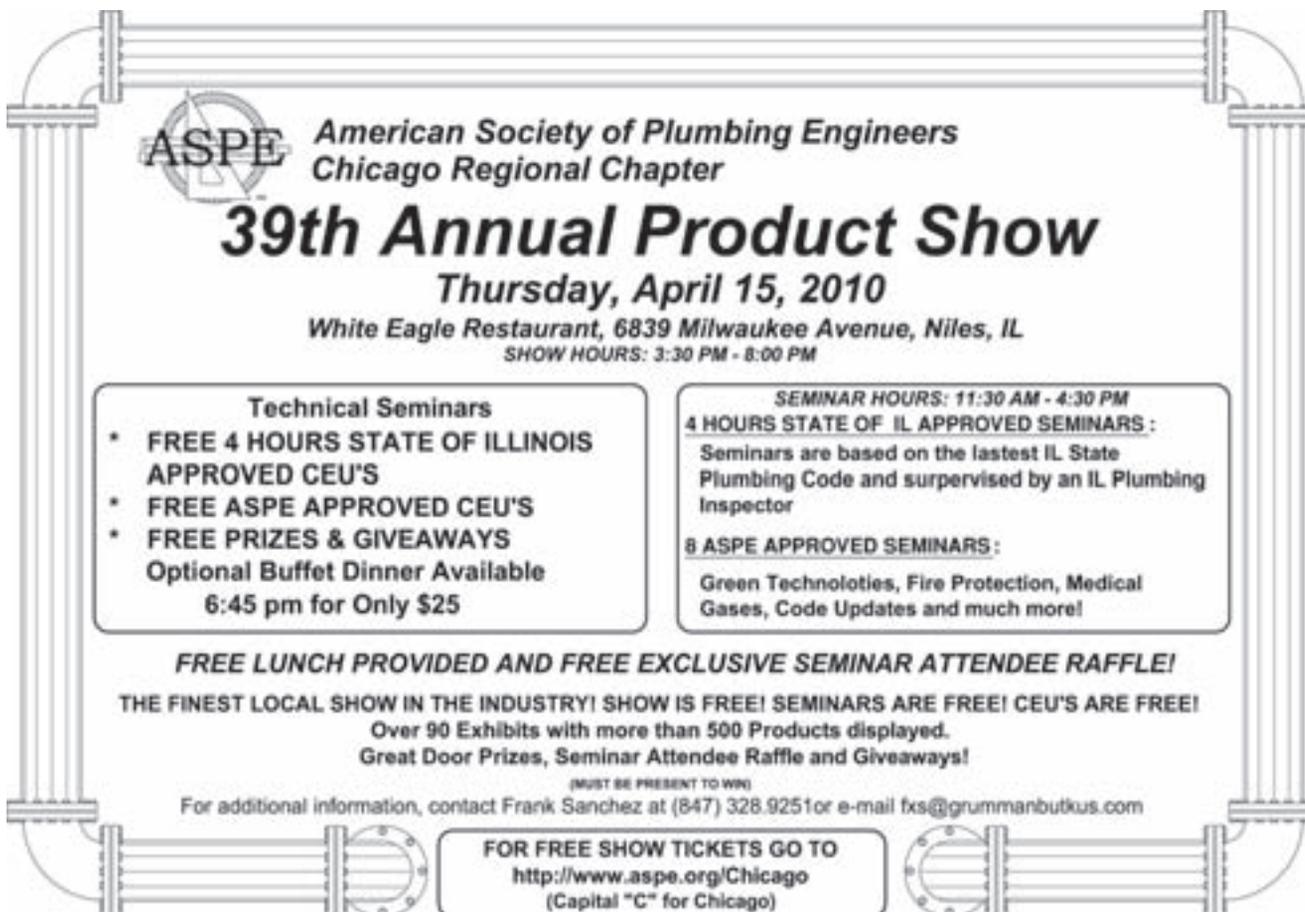
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the last few years, TMB has engaged in other media in which to address our readers. We have done this to ensure our continued appeal to readers and advertisers of all generations, who have varied preferences in how they like to receive news and information. Of course, we still believe very strongly in the value of the printed page and will continue to keep that as our focus, but we realize that with so many new means of communication available, it was critical to embrace them. Among the ways we are reaching our readers and advertisers are through regular, sponsored e-newsletters that contain short articles of a breaking news nature; our “On the Road” series of video interviews conducted by our editors at trade shows, conventions and other special events around the country; the “Between Us” video blogs regularly posted by our editors; Wholesaler Radio, www.thewholesaler.com’s weekly radio/podcast that features interviews with our columnists, industry experts and leading executives; daily news updates on our websites; and, of course, our digital edition.

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