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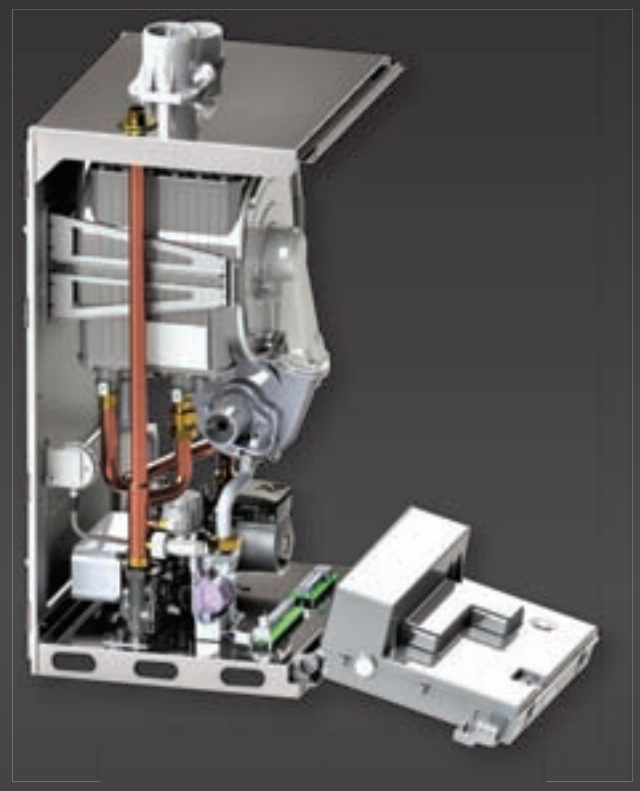

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CONTENTS APRIL 2022

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'Prefab everything' approach at Harris improves productivity and overall operations. **p16**

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CONTENTS | APRIL 2022

INDUSTRY NEWS

VIEWPOINT

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What's on Tap for Seventh Emerging Water Technology Symposium

PHC News and Plumbing Engineer are proud to be a media sponsor for the seventh Emerging Water Technology Symposium (EWTS). The EWTS, a biennial symposium co-convened by the Alliance for Water Efficiency (AWE), American Society of Plumbing Engineers (ASPE), International Association of Plumbing and Mechanical Officials (IAPMO), and Plumbing Manufacturers International (PMI), continues to provide critical insight into the future of our water-related industries. Join with your colleagues May 10-11 in San Antonio at this must-attend event. The speaker lineup this year is the strongest ever.

Two keynote speakers

Robert Puente, CEO of San Antonio Water Systems, will discuss how San Antonio Water Systems is cultivating a culture of technology to address water scarcity. The second keynote will be provided by Don Johnston, senior operations director, Indonesia, at Water.org.

Attendees will also hear from Sun Gil Kim, program officer at the Bill and Melinda Gates Foundation; Edward Osann, senior policy analyst at the Natural Resources Defense Council (NRDC); C.J. Lagan, product testing and compliance leader at LIXIL; and Clement Cid, PhD, senior research engineer at Linde+Robinson Lab, as they discuss the safety and performance requirements, and the likely regulatory framework, for the Reinvent the Toilet project.

Natascha Milesi-Ferretti, mechanical engineer, National Institute of Standards and Technology (NIST), will discuss several new research efforts that NIST will be addressing in the premise plumbing area — including a newly installed laboratory to characterize the pressure-flow relationship of plumbing fittings, a facility to study the growth of opportunistic pathogens in hot water systems as a function of temperature, water usage patterns and other factors, and other initiatives.

Learn the latest on keeping building water systems safe. Janet E. Stout, PhD, president and director, Special Pathogens Laboratory, will discuss new approaches for the control and spread of Legionella and other waterborne pathogens such as non-tuberculous mycobacteria. Kurt Steenhook, international representative, and Robert Viches, training specialist for the United Association, detail a compliance pathway for facility managers, contractors, and craftsmen to operationalize an appropriate response to the exposure of metals, chemicals, and bacteria to building occupants.

Dr. Markus Lenger, principal at Clean Blu Inc., will be back at the EWTS to discuss advancements in the design and monitoring of water reuse systems, and the need for new standards that will result in more affordable and reliable applications that can help to make direct potable reuse a consumer product!

Hear from academia

Professor Michael Gormley of Herriot Watt University will discuss virus presence, prevalence and fate within building wastewater sanitary systems; Professor Andrew Whelton of Purdue University will provide a presentation on predicting faucet water quality and predicting plumbing system contamination and recovery; and Professor Steve Buchburger of the University of Cincinnati will discuss the application and potential of the Water Demand Calculator.

Both days at the EWTS will include an informative panel discussion with today's most notable subject matter experts. Day one's panel will address the Effective Risk Management of Building Water Systems and Pathogen Control and day two's panel will provide a discussion on the Implications of the Infrastructure Investment and Jobs Act on Drinking and Wastewater Systems.

Finally, the EWTS will again feature a Young Water Specialists presentation. This year, "Team HydroPuris" will present remotely from Washington, D.C., on their eCybermisson competition project, Enabling Access to Clean Water Using a Portable Water Purification and Testing System. Hearing from the water experts of the future is a fun and great way to conclude the symposium.

There's so much more. See the full program at www.ewts.org, and register for the EWTS at www.aspe.org/2022-ewts-registration/.

Bradford White and PHCC Extend Exclusive Strategic Partnership Agreement for 2022

Bradford White Corporation, an industry-leading manufacturer of water heaters, boilers and storage tanks, and the Plumbing-Heating-Cooling Contractors—National Association (PHCC) announce the renewal of their exclusive strategic partnership agreement and confirm their joint commitment to promoting and strengthening the plumbing and HVACR industries.

The continuing partnership between two of the PCHP industry's most trusted organizations reflects their shared mission to support professional contractors and their teams through investments in training, education, recruiting and advocacy resources.

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INDUSTRY NEWS

foundational values that drive Bradford White and PHCC," said Joel Long, president of PHCC. "Bradford White's deep, demonstrated commitment to the priorities of contractors aligns with PHCC's dynamic initiatives for advancing the industry, and together we can enhance the positive effect we have on the lives of professionals on the ground who are providing essential plumbing, heating and cooling services now and in the future."

Through its strategic partnership agreement with PHCC, Bradford White supports a range of scholarships, programs and initiatives dedicated to the advancement of contractor education and excellence, contractor business development, and promoting the value of the trades, including the following:

- The PHCC Educational Foundation, which provides innovative educational programming to enhance the growth and success of the plumbing and HVACR industry workforce.
- The SkillsUSA Plumbing Championship, a national competition for high school and post-secondary students featuring more than 16,000 competitors, instructors, industry representatives and volunteers.
- The Invest in Your Future Campaign, a fundraising effort supporting future workforce development.

PHCC Education Partner, in support of PHCC education and training that provides PHC business owners and their employees with easy access to high-quality education and training opportunities.

"Bradford White's unique relationship with PHCC through the years has given us an opportunity to elevate and amplify our investment in the plumbing, heating and cooling industry," said

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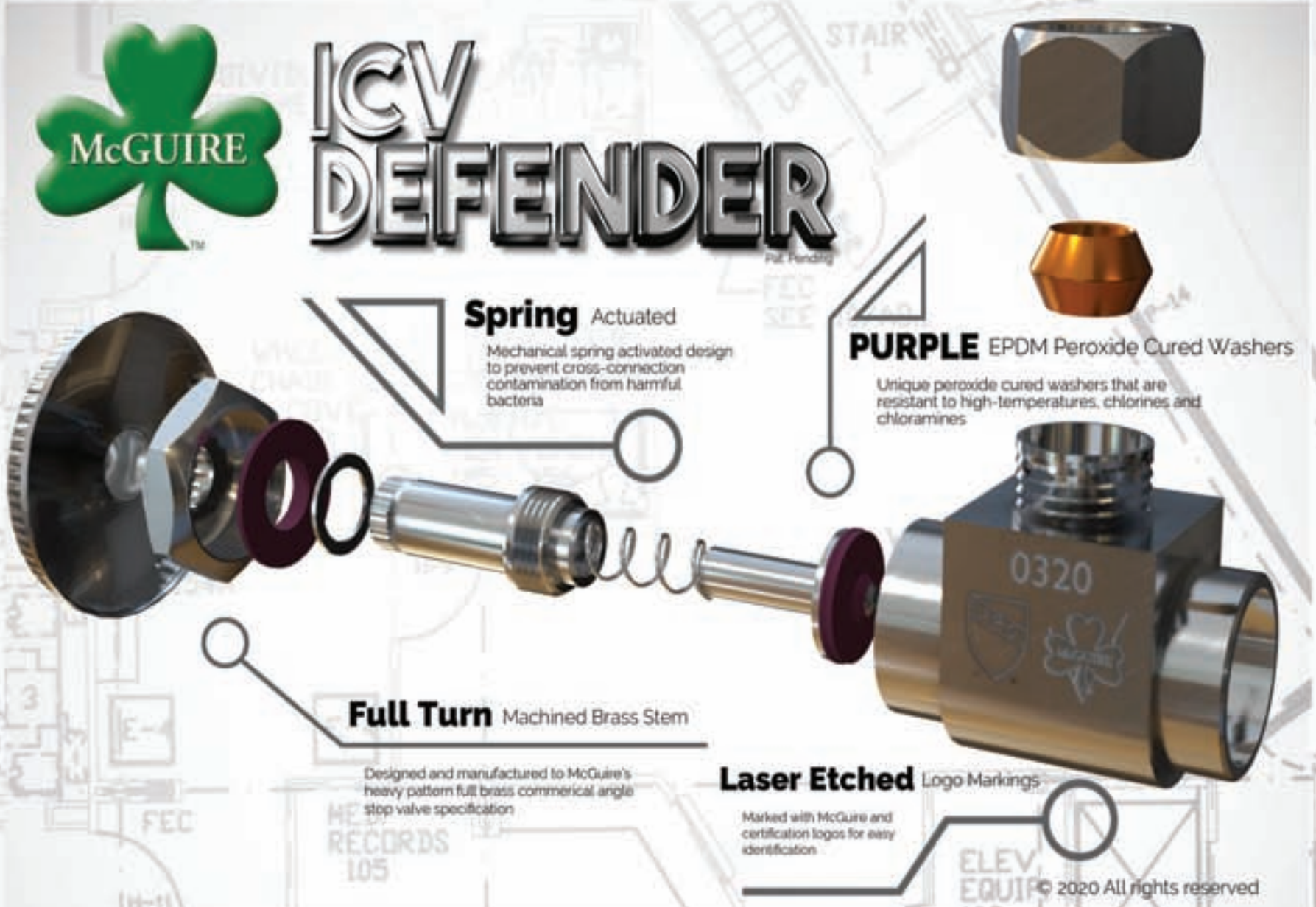

On center stage, McGuire Manufacturing Co., Inc. brings a new mechanical integral check valve to the scene. The ICV Defender is designed to be an effective solution as a last line of defense against reverse flow and cross-connection contamination that results in harmful bacteria known to contaminate water systems.

The spring actuated integral check valve is manufactured to McGuire's heavy pattern angle stop specification. It is completely serviceable and requires no third-party components. Available in IPS, sweat and compression connections. IAPMO and NSF/ANSI 61 & 372 certified. Patent pending.

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WARNING: This product can expose you to chemicals including lead, which is known to the State of California to cause cancer, and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

Carl Pinto, Jr., senior director of marketing communications for Bradford White. "Supporting the hard-working professionals in our industry and developing future generations of PHC experts not only enhances the current state of our profession, it's critical to ensure safe, reliable delivery of essential services for years to come."

SFA Saniflo North America Partners with Plumbers Without Borders

Saniflo North America, a division of Group SFA, a world leader in above-the-floor macerating and grinding toilets and drain pumps, has announced a partnership with Plumbers Without Borders (PWB) as a Mission Supporter Sponsor. The ultimate goal is to support the group's mission to connect volunteer plumbers and industry resources with organizations working to increase access to safe water and sanitation worldwide.

"We have been gratified and encouraged by our industry's generosity, and we're excited and proud to be aligned with SFA Saniflo," said Domenico DiGregorio, president of PWB.

DiGregorio added that Plumbers Without Borders is currently coordinating with partner organizations involved in installing rainwater harvesting systems, water filtration and above ground water tank storage, in addition to building pit latrines and other hygiene improving systems in several villages in Africa. "I was heartened to see SFA Saniflo's story of a donation equivalent to three Planet Water filtration systems in Cambodia," he said.

As a Mission Supporter Sponsor, Saniflo North America will support the philanthropic work of PWB with product donations and technical support on a case-by-case basis. Based on past projects, the organization predicts one or two projects that could benefit from Saniflo's innovative, above-floor plumbing solutions.

"We look forward to partnering with Plumbers Without Borders on NGO projects that could potentially benefit from Saniflo's above-floor macerators, grinders and drain pumps," said Regis Saragosti, CEO of SFA Saniflo North America. "Plumbers Without Borders has done so much to advance community empowerment and improve sanitation around the world, and we are proud to be a part of that mission."

MAX Service Group Names Greg Wells New President

MAX Service Group, which operates a number of leading heating, cooling and plumbing companies in the Midwest, is proud to announce Greg Wells as its new president. Wells, who has been with MAX Service Group for more than six years, started with the company in the role of fleet and safety manager and spent more than four years as director of sales before being promoted to vice president, and now, president.

"It is an honor to lead MAX Service Group, and I hope to follow the superior leadership footsteps left by Jacob Huck," Wells said. "Time and time again, I've been in awe of the way this company has been able to not only impact customers through exemplary services, but make a real impact in the communities it serves, as well. I'm thrilled to continue with MAX Service Group in this new role, and am confident we'll be able to expand upon our top-notch reputation to do more great things in the industry and in the Midwest."

Former MAX Service Group President Jacob Huck will remain with the company as a special project manager.

"When I decided I wanted to step away from the president's role with MAX Service Group to spend more time with my family, my instinct was to look within the company for a successor," Huck said. "Greg immediately came to mind. He has a long history of success with MAX Service Group and is an incredible leader. I have no doubt he'll push the company forward in meaningful ways, and I am confident he'll help spur more growth for the business."

MAX Service Group operates Williams Comfort Air and Mr. Plumber in central Indiana, Thomas & Galbraith Heating, Cooling & Plumbing in southwestern Ohio,

Buckeye Heating and Cooling in greater Columbus, Ohio and Jarboe's Heating, Cooling & Plumbing in greater Louisville, Kentucky.

The Unified Group Service Management Forum Tackles Members' Biggest Challenges

They say everything is bigger in Texas and the amount of educational information shared by The Unified Group is no exception. In January, 38 members from companies across the U.S. met in Houston for The Unified Group's 2022 Service Management Forum. Emphasized topics included accountability, training upcoming leaders and transitioning employees into new roles.

On the first day, Carla Fugit of Platinum Business Strategies — a public speaker with more than 20 years of experience helping everyone from small businesses to Fortune 500 companies — held a workshop where members participated in personal reflection activities, in addition to collaborative sessions that highlighted creating accountable employees and atmospheres. Members also discussed possible solutions to challenges they all face. After the session, various members

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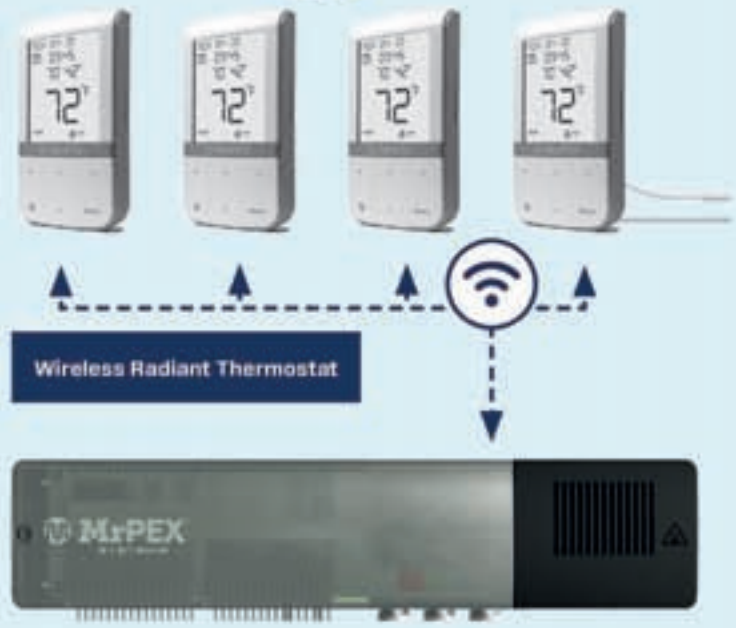

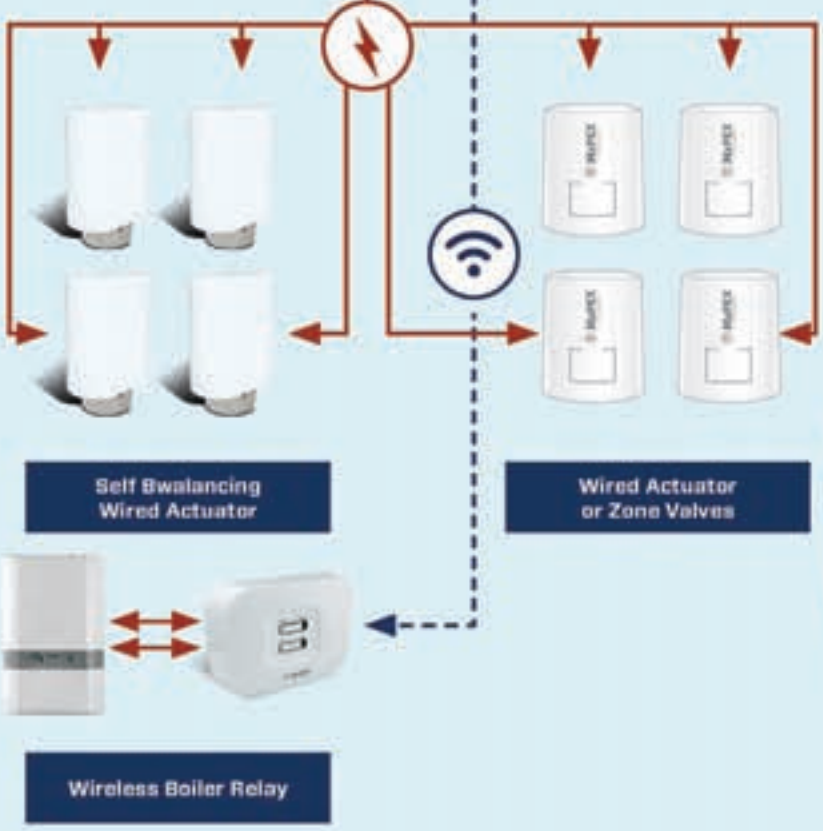

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of The Unified Group presented on topics they found to be successful within their companies.

The first member-presented topic was Financials and KPIs (key performance indicators). In this section, attendees learned the importance of participating in weekly progress breakdowns that tell how the company is doing financially. Following, two best ideas were shared. The first — Gain Share for Service — emphasized the importance of incentivizing employees for a job well done; while the second — Team Leads — provided real-life, successful examples of implementing leadership roles for employees to work toward.

"The information I gathered from the other members has allowed me to determine an actual process to fix my greatest challenge," said Jake Ramsey of Fez Mechanical. "With the encouragement from these members, I have no hesitations in the decision making that will follow."

The second day began with Transitioning Technicians to Supervisors, where members shared their experience in what worked and what didn't during the promotion process. A presentation on Hiring and Retaining Employees followed. Key takeaways included creating a sustainable work environment, providing exciting team activities and encouraging exit interviews. This topic led into Training Technicians, during which attendees collaborated on the practices that allow them to grow in their field. After a presentation by purchasing partner Milwaukee Tool, everyone broke into smaller groups to discuss their specific biggest challenge. The day ended on the topic of the Generation Gap Between Older and Younger Technicians. Between the current five generations in the workplace, individuals find it difficult to maneuver communication between one another.

"It was great to hear from the very people who have been in the positions we're challenged to fill," said Chris DeMers of CMC Corporate Solutions. "They offer advice to others in the room to help them avoid pitfalls in their professional journey."

To end the forum, one last best idea was shared — Realigning Roles. By understanding employees' strengths and passions, rearranging positions within the company can create a higher rate of productivity.

"The highlight of these sessions is listening to all the member presentations," said Frank Quintanar of J&J Air Conditioning. "It's a reminder that individually, we can all shine, but together we make the difference."

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Digital Planning Pays Off in the Field

'Prefab everything' approach at Harris improves productivity and overall operations.

'Early decision-making is how we maximize prefab: It brings the right people together at the right time to determine what is best for the project.' Photo: Harris.

BY STEVE SMITH

We guess you could call the structure located at the corner of North 7th St. and North 19th Ave, just west of downtown Minneapolis a "garage."

The two-story 668,000-square-foot facility under construction for Metro Transit, the primary public transportation operator in the Minneapolis–Saint Paul area, will indeed include storage space for 216 buses, 24 maintenance bays, fueling and washing space and administrative offices. Expected to be completed later this year, the $113 million garage is also being built with the environment in mind and will feature a solar thermal wall, a rooftop solar array and a stormwater reclamation system (more on that later).

Since the project broke ground a little over two years ago, the Heywood Bus Garage Constructors, a joint venture of Knutson Construction and Adolfson & Peterson Construction, has relied on Harris, based in St. Paul, and one of the country's largest mechanical contractors, for the PHCP work.

"All of our projects start with a 'prefabricate everything' approach," says Michel Michno, CEO, Harris. "Our processes not only focus on prefabrication, but also on early decision-making and planning. Early decision-making is how we maximize prefab: It brings the right people together at the right time to determine what is best for the project."

Harris ranked 8th among the top 50 mechanical firms in the 2021 Top 600 Specialty Contractors list published by Engineering News-Record. The company ranked 53rd overall. Since opening its doors nearly 75 years ago, Harris has grown to 15 regional offices with more than 2,000 employees.

Garage work

Throughout the long Heywood project, Ryan Cousineau, project manager, Harris, has kept tabs on the mechanical contractor's push toward value engineering and prefab, all of which starts long before the work in the field begins.

"Prefabrication has been evolving for decades," Cousineau adds, "but especially in the last 5-10 years as owners want more complex buildings, and they want them done faster while still maintaining a manageable budget."

General contractors also push owners to bring in key MEP trades sooner when a construction project might still be in the concept and design stage.

"Our goal at the beginning of a project is to work closely with the owner, architect, engineers and general contractor to design a building that meets everyone's needs – and we try to do this in a way that saves as much construction time and money as possible," Cousineau explains. "It's a missed opportunity otherwise and one more reason to have communication with the entire project team very early on."

As Cousineau notes, CAD, VDC, BIM and prefab have all transformed how contractors think about design stages, as well as the process in which buildings are constructed. He says Harris' vision on the Heywood

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project grew as they sat down and began to find ways to make the project even better. Accustomed to design-build, what started as a plan-spec job constructing mechanical straight off the prints turned into much more.

"We saw where prefab could save time and money on the project and presented our ideas and their benefits to the GC and owner during the preconstruction phase," Cousineau says. "Sometimes it's about educating the owner and exploring what's possible when you bring on an experienced mechanical contractor as a partner. We have a big blend of opinions and expertise at Harris that helps to provide innovative solutions."

Opportunities payoff

Cousineau adds that while not all Harris' recommendations on the Heywood project were accepted, the consortium did say yes to two-thirds of its PHCP redesign ideas, which added up to reducing more than a mile of piping from the original design, and provided $1 million in value-engineered savings thanks to opportunities to prefabricate work and engage in project planning early on.

Here are some more details on the project worth considering:

- The stormwater reclamation system and overflow storm system were redesigned to reduce total footage by more than 3,600 linear feet, a 33 percent reduction.
- The building's heating/cooling plant was changed from a water-to-water heat pump plant to a simultaneous heating and cooling plant with waterside economizer.

These value-added options increased the cooling capacity by 50 tons. The main chilled water system went to 216 gallons per minute from 300 gallons per minute, reducing the chilled water mains to 4-inch pipe from 6-inch pipe, which in turn reduced the total volume of the chilled water system by 41 percent.

- For the hot water system, mains were dropped to 8-inch pipe from 10-inch pipe, and the heated water piping system was reduced by 1,700 linear feet. This reduced system volume by 20 percent.

As a result, pumps, air-handling units, expansion tanks and air separators, roof hoods, and simultaneous heat/cool heat pumps were re-selected. The changes are projected to save more than $30,000 per year in energy costs by using simultaneous heating/cooling, pumping reductions, fan horsepower reductions, and optimizing the use of the geothermal field. Finally, the reduction in the previous numbers of compressors, motors, dampers and controls, is expected to also reduce maintenance costs.

- Redesigned ductwork dropped the material weight to 317,000 pounds from 459,000 pounds, a 31 percent reduction.
- The sequence of operations was rewritten to reduce 194 points.
- Simultaneous heating/cooling heat pumps were made into a single packaged unit for easier control.
- Ductwork was calculated fitting to fitting to remove all 4-inch

Hub-and-Spoke Approach

Harris has been a long-time proponent in leveraging advanced modeling tools and employing BIM early on, making it easier to identify ways to maximize prefabrication and modularization. Physical and functional building characteristics can be seen virtually at the Harris offices well before shovels even hit the dirt in reality.

The Heywood Bus Garage project is only the latest example of Harris' handiwork. Another major recent project for Harris was taking charge of the PHCP systems for Allegiant Stadium in Las Vegas, which opened in 2020 as the new home of the Raiders.

The stadium work included more than 70,000 hours of fabricated plumbing, piping and ductwork assemblies, with Harris crews constructing 72-foot rack sections (two 36-foot sections each) to distribute HVAC and plumbing utilities to the various floors and concourse areas.

Because there was no overhead steel or floor to support the risers, engineers needed to come up with an alternative way to support the rack modules. What they did was construct a partial gravity and partial friction support system. BIM played a crucial role, helping to analyze constructability, configure the modules and detail structural attachments.

Of the eight riser racks built, six were constructed in a Harris prefabrication facility then delivered to the site where they were lifted off trucks and set in place. While the risers built conventionally took about 2,000 hours, the prefabricated risers took about 520 hours each – with only 70 hours of installation time on site. The racks also eliminated the need to work in an enclosed shaft with limited access.

The stadium project also included prefabricating large bathroom water in-wall modules, water heater skids, pump skids, sump racks, piping distribution racks and plumbing fixture assemblies. The units were prefabbed and stored off-site, delivered just-in-time, distributed to the appropriate level and set in place in an efficient manner.

How do the components get to the job site? Harris uses a hub-and-spoke strategy, with the hub being the project site and the spokes branching out to designated prefabrication shops, as well as to co-fabrication sites on or near the project.

The process creates just-in-time delivery and installation. Bulk materials are fabricated in a main facility, then flat-packed and shipped to a co-fabrication site. Final assembly is completed and prefabricated components and modules are delivered to the building, often being lifted into the air and immediately installed.

Harris' fabrication teams work with the most advanced cutters, drills, welding equipment and plasma tables, providing customers with unmatched precision at high speed. Its crews are certified in pressure vessel repairs and alterations, power piping, power boilers and a wide range of welding specialties.

In preparation for the increased application of prefab, two years ago, Harris added a plumbing-focused fabrication shop in St. Paul, Minnesota. The space was definitely needed as crews prefabricated all of the underground plumbing for the Heywood Bus Garage project.

At the same time, Harris also opened its in-house Design Studio, which delivers a collaborative approach to design and engineering. Based in Oakland, California but with Harris team members across the country, the Design Studio bridges the gap often seen between construction and design by prioritizing planning, understanding client needs and goals and addressing concerns – early on and throughout a project's journey.

Its team of skilled designers, engineers, preconstruction experts and building-simulation specialists provide building owners with a holistic approach to create efficient, cost-effective and sustainable building systems.

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American Standard

A stormwater reclamation system at the Heywood Bus Garage project includes a 40,000-gallon fiberglass tank, which is expected to save up to 13,000 gallons of water a day. Photo: Harris.

pressure class duct material costs, field install coats and costs related to ductwork sealant class.

• Harris provided Revit drawings to the engineer of record to use in the revised project change order drawings to reduce rework. And, Harris used a live Bluebeam studio session for using redlined PDFs of the construction documents as the basis of its VDC.

The JV's clash detection team was able to work hand-in-hand with Harris to pre-model the majority of the mechanical/plumbing systems for the building, which allowed Harris to prefabricate most components. As a result, most components were put together offsite, ready to be installed when they arrived at the job site, streamlining the construction process.

By the time the prefabricated materials arrived at the site, 75 percent of the labor associated with that work had already been completed off-site. Then it's just final assembly and installation, which improves jobsite safety, product quality and helps meet fast-paced schedules.

One of the last components Harris completed for the project included the prefabrication of a massive pump skid. The 21-foot by 10-foot skid, weighing roughly 15,000 pounds houses the base-mounted pumps, expansion tanks, air separators and pot feeders for the chilled water, ground source water and heating water systems running the building.

By prefabricating the skid, Harris was able to allocate several hundred hours to a controlled environment fabrication shop and also shorten the pump installation and piping activity schedule to one day in the field. Harris engineers within its BIM/VDC division produced the CAD drawings which allowed the prefabrication team to build the unit with exact precision.

"The working relationship that both parties of the JV have with Harris made it very easy to produce value engineering options to present to the owner to help drive the total costs down for the project," says Jacob Garr, assistant project manager at Knutson. "Many of the ideas actually provided a better product for the owner as well. The collected knowledge and experience that Harris and the JV have together makes it very easy to work through any issues that arise, which is key, especially for mechanical scope, which is typically one of the most complex."

Harris' work on the 668,000-square-foot Heywood Bus Garage project included prefabricating a massive pump skid. The 21-foot by 10-foot skid weighing roughly 15,000 pounds houses the base-mounted pumps, expansion tanks, air separators and pot feeders for the chilled water, ground source water and heating water systems running the building. Photo: Harris.

Stormwater Reclamation System

One of Harris' adopted re-designs during the early VE process was to add vortex filters to the storm piping/pre-filtration part of the stormwater reclamation system. Harris made the recommendation as vortex filters provide better filtration and lessen maintenance costs and would also save the owner valuable floor space throughout the garage. Harris also set the 40,000-gallon fiberglass tank in place. The tank measures 72 feet long with a diameter of 10 feet and weighs 11,600 pounds. The tank rests 23 feet below-grade and is expected to save up to 13,000 gallons of water a day.

Multiple filtration systems capture and treat runoff from the building's roof, which will ultimately be used to wash buses. The Mississippi Watershed Management Organization, a quasi-government agency designed to protect the urban watershed that drains into the Mississippi River, collaborated with Metro Transit for three years to design a system that could offset its water use.

Besides the huge buried tank and vortex filters, other components for the reclamation system include, ozone filters (oxidizing disinfectant for maintaining water quality held in storage) and piping from the ozone filter to the bus wash.

To maximize long-term tank performance, all excavated soil for the underground reuse system was replaced with approved backfill material consisting of clean pea gravel aggregate. To meet the city's stormwater management requirements, a dry pond and sump catch basins were also included in the design.

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Bridging the Gap between Engineer and Contractor

Collaboration is the best way to find solutions since a team makes better decisions than any single person on that team.

BY JUSTIN BOWKER, P.E.

Conventional wisdom tells us that engineers design and contractors build. This strict division of responsibilities, however, has not consistently resulted in reliable outcomes that owners demand and deserve. There is a solution. One that is easier said than done: engineer and contractor collaboration.

The design documents, while not dictating means and methods, provide the plan for building the project. But does it seem wise to exclude the builder's voice in the design? Furthermore, when contractors include the engineer in phasing and problem-solving for construction issues, new solutions are generated and better answers are developed.

I welcome collaboration. But having the desire to collaborate is only the first step. What structure should the collaboration take? I have been fortunate to have worked on almost every permutation imaginable, and with each one, I walked away with a new set of lessons learned. I will introduce the more common collaboration structures, common pitfalls to avoid, and best practices that I have observed.

Common collaboration structures

These collaboration structures have varying legal ramifications that are beyond the scope of this article. In all instances, compliance with state board of professional engineering rules is assumed.

Delegated Design: This is the formal shifting of design responsibilities for specific and limited portions of the design to the contractor.

A primary reason for delegated design is to allow the contractor the flexibility to implement proprietary systems and preferred means and methods without requiring the engineer to design for each possible scenario.

Delegated design scope may include structural steel connection details, fire suppression systems, sheet metal duct design, and hydronic expansion and contraction. The contractor employs a design professional for the limited scope to be submitted to the engineer for confirmation of compliance and consistency with the broader project.

Value Engineering: VE comes into play when the bid comes in over budget – a problem that plagues our industry. The contractor is requested to propose ways to lower the project cost after the design is complete.

Early in my career, working at a subcontractor, proposing VE made me extremely uncomfortable. Who was I to think I could sit at my desk for a couple hours in isolation from the design process and propose a better way to a design team that had been working on the project for several months or even years?

I now understand that contractors focus on factors in which engineers are not as well-versed. Contractors can often discover value-added modifications. The modifications are offered for consideration by the design

team to be evaluated against the project requirements.

Light Design-Assist: My definition of design-assist is when the contractor is brought on board prior to the completion of the design to influence the design in some way.

Design-assist covers a very broad spectrum. On one end of the spectrum, light design-assist has the contractor providing budgeting and constructability reviews to guide the progression towards the project requirements. Division of responsibility is easier to understand. The contractor participates in idea generation and evaluation, but the engineer is solely responsible for incorporation into the design and drawing production.

Heavy Design-Assist: On the other end of the spectrum, heavy design-assist can engage the contractor's virtual design and construction teams to create the permit drawings under the authority of the engineer.

Heavy design-assist can feel much like design-build, but is characterized by the engineer providing the concept, performance criteria, review and sealing of the documents. The contractor may lay out entire systems according to the engineer's performance specification. Division of responsibility can be become ambiguous. A clear delineation of responsibilities is key to success using this approach.

Design-Build: Design-build is an approach in which a single entity is contracted for both engineering and construction responsibilities.

While all collaboration structures are a step in the right direction and have a place in our industry, design-build offers the greatest opportunity for collaboration and streamlined workflows. Design-build requires a high level of trust between the owner and the design-build entity. Design-build is most successful with sophisticated team members who are focused on and challenged by providing owner value.

Conquering three pitfalls

Now that we understand the various collaboration structures, let's review three common pitfalls to avoid and best practices to which design teams should aspire:

- The most fundamental pitfall is a *lack of alignment*

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between the general contractor, architect, engineer and subcontractors regarding the collaboration structure.

Request for proposals may contain conflicting statements and may not have been vetted by all parties. Often, gaining alignment prior to award of the project is simply not feasible due to communication limitations. In these instances, the contractor defines the scope for how each team member can best serve the project based on their interpretation.

Ensuring alignment should be the first order of business once the project is awarded. Many years ago, I called an engineer to request a commercial kitchen drawing package that was to be issued that day. The engineer responded with, "I thought you were providing the kitchen design." This is an extreme case, but there are numerous opportunities for items to fall through the cracks.

A best practice is to create a detailed responsibility matrix spreadsheet with primary and secondary owners. The matrix should include calculations, energy modeling, system modeling, model annotations, specifications, details and construction administration.

• The next pitfall is a *lack of transparency* by any team member about their expertise or manpower.

Substandard work products and late deliverables are the root cause of many team conflicts. A best practice is to be open and transparent about your team's expertise and manpower. The project team can proactively evaluate availability of alternative resources or plan for deliverable schedule changes. The responsibility matrix is a living document that must be revisited and updated accordingly.

Successful professionals have experiences that allow the use of heuristics (rules of thumb) to make highly effective immediate judgments. Keep in mind that overreliance on heuristics is a common pitfall. The benefit of collaboration is that professionals with diverse backgrounds solve multidisciplinary problems. When two professionals come to different conclusions based on their gut reaction, conflict can arise.

A best practice is to stay curious when another professional questions something we hold to be true. We should view this as a learning opportunity, and let the facts decide the decision even when it breaks our paradigms.

Collaboration often occurs by proposing and debating ideas in real-time. For design professionals and contractors not accustomed to exposing their thought processes to the team, this can be uncomfortable and even intimidating. Some respond to this anxiety by becoming inflexible and defiant. Unable to articulate and defend their ideas, they dig-in to the safety net of how they have always done things. (I am guilty as charged.)

Reaching out to these team members outside of the big room to have one-on-one discussions for mutual education and alignment ensures that all voices are heard in a productive way.

• A pitfall of otherwise highly collaborative teams is the *disregard of process and documentation*. Without formal documentation, all parties are not provided access to crucial information and team member turnover results in substantial information loss.

I am a proponent of a two-step process where informal discussions are followed up with formal documentation. Collaboration is not an excuse for not following processes.

Collaboration offers the greatest leverage in solving many of our industry's problems. Engineers and contractors have different backgrounds and experiences, but we are united in a common goal. Teams make better decisions than any single individual on a team. With foresight, communication and planning, we can work together to provide owner value. Providing value is how we all earn profit. ●

Justin Bowker, P.E. has been part of the engineering team at TDIndustries since 2001. He became the manager of this team in 2009 and vice president in 2016. Under his leadership, the team challenges itself to harness technical approaches to provide focused value to the owner on design/assist and design/build projects.

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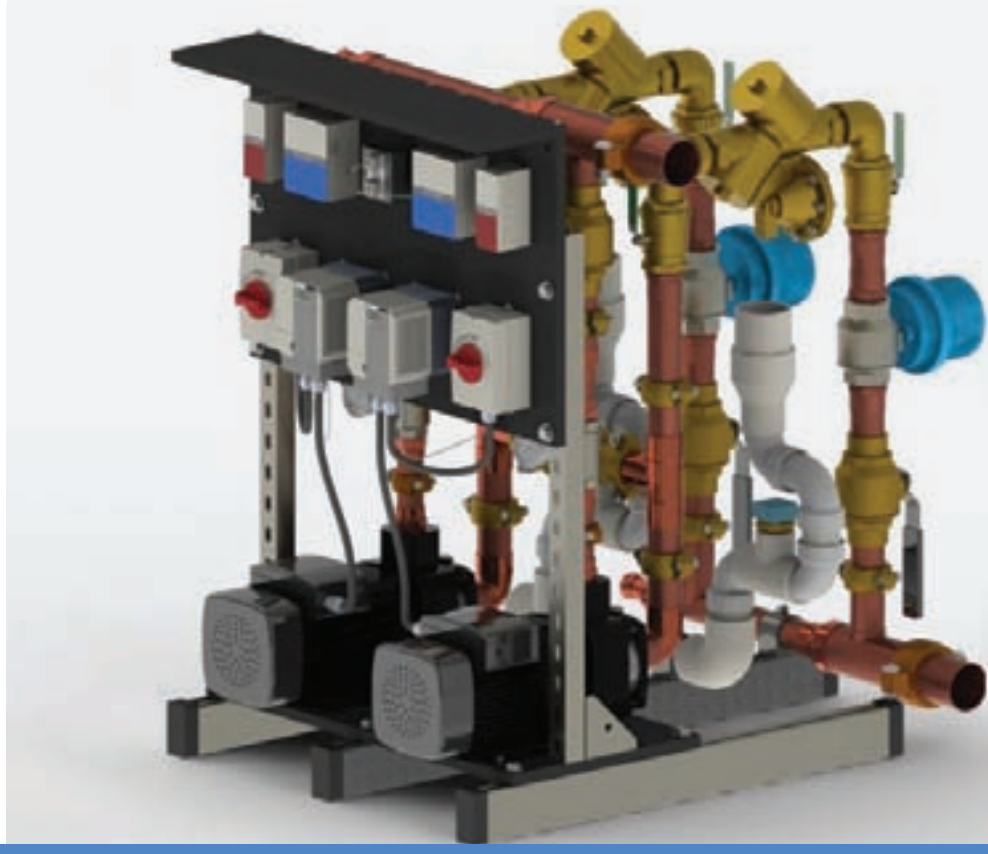

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Scalding Still A Risk With Commercial Water Systems

How can we store and circulate domestic hot water within large facilities at temperatures meant to mitigate bacteria, while also preventing burns at points of use?

BY TODD MCCURDY

Little did the author of Catch-22 know, when the novel was published in 1961, that the title would live on as a motto to mutually conflicting conditions. Why, even in the world of plumbing and mechanical systems, there's a "Catch-22" faced by facility managers worldwide. Still mired in our mid-COVID circumstances, one of the toughest dilemmas faced by building owners is commercial-scale "germ warfare."

Applicable to large plumbing systems – especially those that serve hospitals and nursing facilities where people are most vulnerable – is the challenge of killing pathogens, including legionella, while also protecting users from the risks of scalding.

Tied to that is a facet of the challenge that complicates efforts to control temperatures within domestic water systems, known as "thermal creep" – which can lead to thermal shock. Thermal creep is an anomaly that can give users (bathers or washers) a rather unpleasant surprise when unexpectedly high temperatures are possible, especially in the morning after periods of low use.

So, there's the Catch 22: How can we store and circulate domestic hot water within large facilities at temperatures meant to mitigate bacteria, while also preventing burns at points of use?

Studies show that scald injuries from tap water send more than 100,000 people to the emergency room each year, with approximately 7-10 percent of them requiring hospitalization.

Scald protection

Unfortunately, hot water scalding is one of the leading causes of serious burns in the US. Studies show that scald injuries from tap water send more than 100,000 people to the emergency room each year, with approximately 7-10 percent of them requiring hospitalization.

Some of the leading scald burn studies show that it takes 7 to 8 minutes of exposure at about 120 degrees to develop a serious scald burn. Small children and people with disabilities and the elderly – those unable to move quickly to avoid burns – are the highest risk groups. Scald burns can be fatal if a large area of the body is burned, and this can happen, especially if a person would fall in a shower, exposed to high-temperature water for a length of time.

Fortunately, we've come a long way in protecting people from the risks of scalding, and also thermal shock, thanks to advances in technology.

Preventing burns from water are at highest risk within facilities where patients (babies, the infirm or elderly) may not have the quick reflexes or ability to move away from water at points of use – whether sink or shower head.

Thermal shock often refers to a rapid and uncomfortable change in water temperature. While standing at a sink, this problem doesn't seem too threatening, but if it happens within a hospital or nursing facility shower, it's not uncommon for a person to react suddenly, slip and fall.

If that's not bad enough, as people fall they may grab for some way to

Water Temperature	Exposure Time	Effects of Exposure
100° F (38°C) or below	---	2nd & 3rd degree burns on adult skin
120° F (49°C)	5 minutes	2nd & 3rd degree burns on adult skin
130° F (54°C)	30 seconds	2nd & 3rd degree burns on adult skin
140° F (60°C)	5 seconds	2nd & 3rd degree burns on adult skin
150° F (66°C)	1.5 seconds	2nd & 3rd degree burns on adult skin
160° F (71°C)	0.5 seconds	2nd & 3rd degree burns on adult skin

FIGURE 1.

stabilize themselves, inadvertently turning the temperature control all the way to its hottest setting. At this point, it doesn't take much exposure to hot water to significantly increase the problem.

The figures are rather grim at this point: Scientists and mechanical experts have developed charts that accurately calculate the threat of first-, second- or third-degree burns based on varying degrees of water temperature, and length of exposure. (See Figure 1.)

A common cause of a sudden change in domestic water temperature often stems from a pressure increase in either side of the plumbing system. For example, a pressure imbalance creating higher pressure in the cold water line and lower pressure in the hot could lead the water temp to plummet quickly.

The opposite happens if there is a sudden increase in pressure within the hot water line, causing immediate risk of scalding. This emphasizes the need for constant control and stabilization of both water pressure and temperature.

ASSE standards

It wasn't long ago that two-handled bathtub and shower valves were common; in fact, there are still plenty of them in use today.

They do, however, contribute to thermal shock and scalding incidents. That's why manufacturers developed single-handled shower valves – those with a mechanical valve that mixed water temperature.

When these valves first emerged, however, they didn't offer a maximum temperature limit or pressure control. So, the risk of thermal shock or scalding remained.

Eventually, valves evolved to include mechanical means of maintaining the user's desired temperature for water delivery.

To help develop products designed to control water temperature, the American Society of Sanitary Engineering issued standards to establish performance requirements to protection against thermal shock and scalding.

For showers, ASSE 1016 standard was developed. The standard applies to automatic compensating valve designs intended to be installed at the point of use and separated into three categories: Type P, Pressure Balancing; Type T, Thermostatic; and Type T/P, Temperature and Pressure.

• Type P devices include a pressure-balancing function to protect against pressure fluctuations up to 50 percent, but are limited in their ability to control temperature fluctuations.

• Type T devices have a temperature-sensing element that protects against temperature fluctuations up to 25 degrees, but are limited in their ability to control pressure fluctuations.

• Type T/P devices have pressure-sensing and temperature-sensing elements to protect against pressure fluctuations up to 50 percent and temperature fluctuations up to 25 degrees, assuring the very best guard against water temperature changes.

For sinks, bidets, lavatories and bathtubs, ASSE 1070 was developed. While these devices are designed to reduce the risk of scalding, they are not designed to address thermal shock.

Finally, for systems that use multiple showers and lavatories, ASSE 1069 was developed for valves designed to supply only tempered water to the end-user. Like ASSE 1016, valves covered by this standard compensate for pressure and/or temperature variations in water distribution systems.

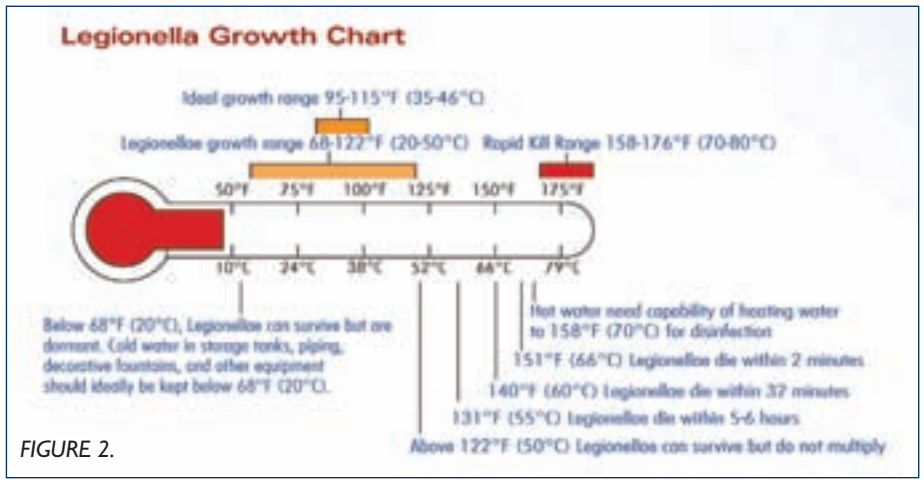

FIGURE 2.

Thermal mitigation

Clearly, POE delivery temperatures above 120 degrees pose great risk, though at those temperatures and higher, legionella and other harmful bacteria are either unable to multiply or killed. (See Figure 2.)

While there are benefits at increased temperatures, with greater temperatures and "germ warfare" comes the higher risk for burns.

ASSE developed a standard for devices that regulate water temperatures generated by hot water devices, such as boilers and water heaters.

ASSE Standard 1017 for hot water distribution system temperature-actuated mixing valves sets performance criteria for mixing valves designed to control water temperature from ±5 degrees to ±7 degrees depending on the plumbing system's required flow rate.

This standard provides added system temperature control since the hot water generating source cannot be considered a temperature-regulating device. Per the 2006 Universal Plumbing Code, section 413.1, "The water heater thermostat shall not be considered a control for meeting this provision [tempering public lavatories]"

Additionally, ASSE 1017 has no test for compensation during pressure fluctuation. As a result, in order to minimize pressure fluctuations between the hot and cold water lines, point-of-use mixing valves are best located near the end-use device.

The tandem use of ASSE 1017 valves along with ASSE 1016, 1069 and 1070 valves are meant to assure that water used by a bather is delivered at temperatures within a comfortable setpoint.

Digital mixing, like mechanical mixing, addresses the Catch 22 paradox by offering more precise temperature control while also providing overall energy savings.

The technology tops off the thermostatic peaks and valleys within a domestic water system – between the point of heat generation and points-of-use. For facility managers concerned about thermal shock or thermal creep issues, digital mixing is the great stabilizer.

If, through some miracle of modern technology, digital mixing had been around when facility managers first faced the challenge of water temperatures hot enough to kill or neutralize bacteria, while also mitigating scalding and temperature creep, there'd have been no Catch 22. Problem solved. ●

Todd McCurdy is the national sales manager for Watts.

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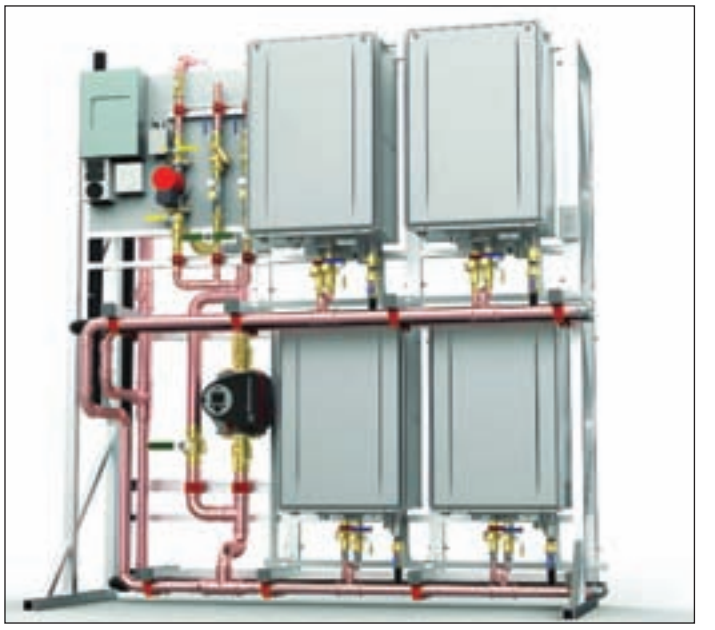

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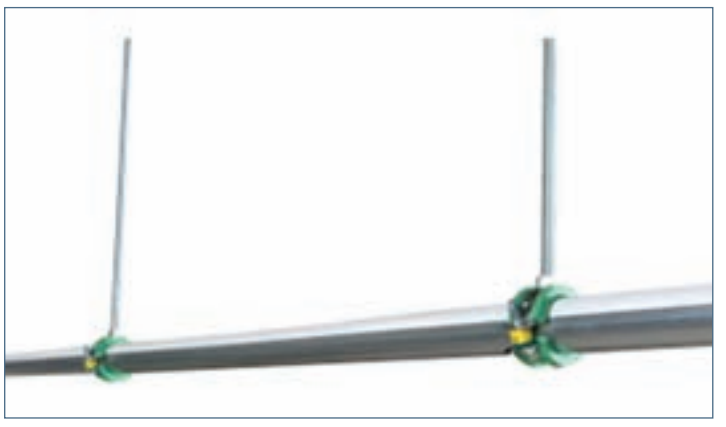

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ThermOmegaTech CircuitSolver Union Thermal Disinfection Dual Valve

The ThermOmegaTech CircuitSolver Union Thermal Disinfection Dual (CSUTD-D) valve mitigates the risk of Legionella growth in domestic hot water recirculation systems. The CSUTD-D has a dual-actuator design – the first actuator thermostatically balances the system during day-to-day operation, and the second allows for high-temperature flow during a thermal disinfection process. **www.thermomegatech.com**

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Kitchens and Radiant Heat

Radiant ceilings are too often overlooked as an option for primary heat or supplemental heat.

BY STEPHEN MINNICH

If you're a subscriber to PHC News — as you should be — and reading this right now — as you most certainly are — you've probably been involved with a radiant floor design, radiant floor installation or, at least, wish you had. And I think it's safe to say most of us wish we had radiant floors.

Radiant floors for basements, garages, living rooms, dining rooms, bedrooms and offices don't usually pose design issues as there is usually ample square footage to get the necessary BTUs per hour to meet the room heat loss. If they're covered with wall-to-wall carpeting, that's another story, a sad one at that.

Kitchens are usually the problem child requiring a bit of extra work. Next to the sunroom with its three exterior walls, all loaded with glass, the kitchen stands out as the room needing special attention when designing a radiant panel project. Rarely will you find the necessary usable floor space to squeeze enough BTUs per hour out of it. Kitchen cabinets, islands, and appliances abound, limiting heat output.

I have good news: The solution does not include hydronic kick-space heaters or baseboard. When my customers want radiant panel heating, I make every effort to abide by their wishes.

Figure 1 is a project I did about 25 years ago; a good-sized kitchen tricked out with all the latest and greatest of everything. It even included a cooktop fan that required me to run a 12-inch diameter metal duct up through the home's cedar shake shingles. A huge island was in the middle of the room, and three of the four walls were laden with cabinetry of some sort.

Unfortunately, the tubing and the 1 1/2-inch gypcrete overpour weren't enough, and the home had an extravagant ceiling that was off-limits to supplemental radiant. I ended up installing cast-iron baseboard toward the back under the windows. Options are almost always options to get the job done, even if it isn't in your sweet spot.

Figure 1. Kitchen radiant heating project. Photo credit: Stephen Minnich

I recently finished one design where I was able to add a second stage of radiant heat to a kitchen by way of the ceiling, and the one I started today will likely require the same. Here's how I approach this type of project.

The math

Similar to every design I do, I start with a Manual J heat loss load calculation. And by running those numbers, I know this kitchen is set to lose 7,440 BTUs/hour on the coldest day of the year. I also have these facts to work with: The total kitchen square footage comes in at 306. Then, when I add together the square feet from the island and the lower cabinets that sit on the floor, I get 84 square feet.

Total square feet: 306
Total cabinet/appliances square feet: - 84
What's left for radiant heat: 222 square feet

Do you see where I'm going with this? Just because we have 306 square feet in the kitchen, it doesn't mean we're going to be able to use it all. The cabinets and the appliances will only act as a show-stopping insulating blanket on our radiant panel, so we're left with the usable floor space.

Kitchen heat loss:	7,440
Usable square feet:	÷ 222
Required BTU/hr/ft²:	33

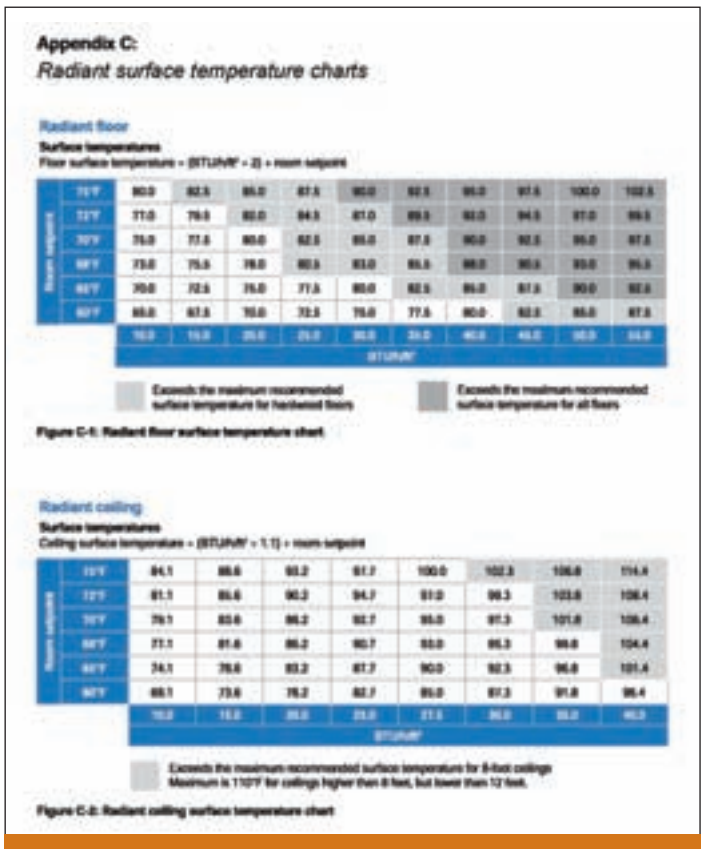

Figure 2. Radiant surface temperature charts. Photo credit: Uponor Complete Design Assistance Manual, 8th Edition, p. 81

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	MAC-205	MACF-205	164	29.5	205	29.5	5.0
HEAT ONLY	MAH-100	MAHF-100	93.5	16.6			
	MAH-125	MAHF-125	125	22.0			
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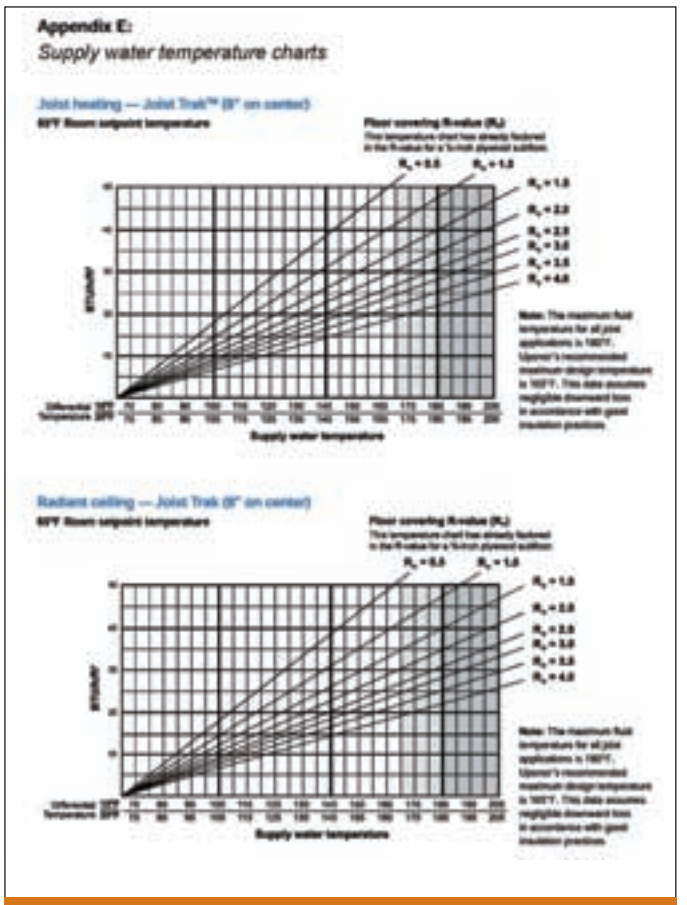

Figure 3. Supply water temperature charts for Joist Trak. Photo credit: Uponor Complete Design Assistance Manual, 8th Edition, p. 189

From the get-go, I'm not comfortable with that number and here's why. First off, did I mention the kitchen has hardwood floors? No? Well, the kitchen has hardwood floors. But it's not the only thing giving me pause. Going by the Uponor chart in Figure 2, you'll see that if the kitchen needs 33 BTU/hr/ft² and the room setpoint is 70 degrees, we're going to end up with a floor surface temperature of approximately 86 degrees.

It clearly exceeds the maximum of 80 degrees for hardwood floors and comes close to the maximum of 87.5 degrees for human comfort. Your dog might be good with those numbers, but the oak floor, not so much.

So, here's what we do. We slide to the left on the BTU/hr/ft² scale until we arrive at 20 BTU/hr/ft² because it gets into the safe zone of 80-degree surface temperature for hardwood. Given what we now know, we're going to quickly re-engineer this a bit.

We have 222 square feet of usable kitchen floor, which will provide 20 BTU/hr/ft²:

Usable floor space:	222 square feet
Heat per square foot:	x 20
Total floor output:	4,440 BTU/hr/ft²

We're falling short of meeting our heat loss by using only the floor — 2,960 BTU/hr/ft² short, to be exact. Now what? We could install a hydronic kick-space heater in a cavity beneath one of the cabinets. But then, if we're thinking about potential service down the road, it would probably be a good idea to install an access panel on the bottom of the cabinet.

At some point, the tangential blower wheel is going to collect its share of dust and dirt, and someone is going to expect you to clean it. Or we could slap some hydronic baseboard along an outside wall. Do you think the homeowner is going to sign off on that when they asked

Figure 4. Radiant ceiling detail. Photo credit: Stephen Minnich

for radiant heat, the ideal type of heating that you can't see and shouldn't hear? Maybe? Depends, I guess.

If you want to get homeowners' attention and get them what they asked for, mention a radiant ceiling to supplement the radiant floor. Their toes will still be warm, and you'll know they'll be comfortable when the digits drop to bone-chilling numbers.

Supplemental heat

Referring to Figure 3, we'll find out how we're going to make up for those 2,940 BTU/hr. With the ceiling, we don't need to worry about the island or the appliances, just some can lights and maybe a ceiling fan we'll have to avoid. Other than that, the whole space is ours to work with. Here's how I try to do it and I'll tell you why I prefer this method, although it's certainly not the only option.

I start with the 2,940 number and then I consider the 20 BTU/hr/ft² we're getting from the floor. Then I consider the R-value of the floor (1.6) and the water temperature necessary to generate 20 BTU/hr/ft². Referring to Uponor's Appendix E, we find that at a 10-degree delta T, we need a 126-degree supply water temperature to achieve our goal using Joist Trak at 8 inches on center.

That's the key for me when moving on to my plan for the ceiling. I prefer to go with a minimum number of supply water temperatures; for the ceiling, I'm targeting the same 126-degree value. If you see a wall of circulators lined up with a mixing valve for each, you can bet your next supply house order that somebody didn't think it through. The simpler the design, the better.

Looking at the radiant ceiling graph where 126-degree supply water temp intersects with the ceiling's R-value of 0.6, we're able to get 30 BTU/hr/ft². Not too shabby. Again, we have unlimited space to work with, but we only need 2,940 BTU/hr; 2,940 divided by 30 equals 98 square feet. That's all the ceiling surface area needed, but I like round numbers, so I'll bump it a bit to fit the configuration of the layout. These numbers will vary from manufacturer to manufacturer as all plates are not created equal.

Figure 4 is a radiant ceiling project of mine; in this one, I used 8-foot lengths of ThermoFin U plates, getting optimum plate contact with the drywall ceiling. Sneaking around the lights is easy, as you can see.

continued on page 65.

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Bell & Gossett Variable Speed ECM Smart Circulator

Bell & Gossett, a Xylem brand, has announced the launch of the new ecocirc 20-18/ecocirc+ 20-18 – Variable Speed ECM Smart Circulator. The newest generation variable speed ECM smart circulator, ecocirc 20-18, provides a highly efficient product for both heating and cooling as well as potable water. The ecocirc+ 20-18 model comes with additional premium features – such as Bluetooth communication – allowing wireless connectivity directly to a smartphone or tablet for remote access control. **www.bellgossett.com**

U.S. Boiler Co. Condensing Gas-Adaptive Boiler

U.S. Boiler Co. has significantly expanded its line of condensing, gas-adaptive boilers with a larger combi size and several heat-only models. Introduced last spring, the high efficiency Alta Combi boiler (136 MBH DHW / 120 heating) grew rapidly in popularity, and the trade anticipated a wider size range and heat-only options. The stainless steel Alta Combi boiler is now available in 200 MBH DHW input (5.2 GPM / 150 MBH heating input). In addition, Alta heat-only models are available in 120, 150 and 180 MBH. At 95% AFUE, Alta boilers feature next-generation gas adaptive technology that provides the shortest installation time and lowest operating costs. This technology providess true “no touch” combustion setup. **www.usboiler.net**

Mikrofill 3 Hydronic System Pressurization Unit

Mikrofill Systems Ltd. recently brought its thoroughly time- and application-tested Mikrofill 3 hydronic system pressurization unit to the North American HVAC market. Originally unveiled in the mid-1990s in the United Kingdom, the product made its debut on this side of the Atlantic at the recent AHR Expo in Las Vegas. As a result, U.S. and Canadian mechanical engineers and contractors are now able to experience first-hand what their U.K. counterparts have known for the past quarter-century: that the unique Mikrofill 3 is the most advanced, “direct-type” pressurization unit available for sealed, low-pressure hot-water (LPHW) and chilled-water (CHW) commercial and multifamily residential applications. **www.mikrofill.com**

HTP Elite ULTRA Duo Boiler

Ariston Group introduced a new commercial heating system that improves energy efficiency while also offering increased redundancy and reliability. The Elite ULTRA Duo boilers from HTP include dual heat exchangers that provide built-in operational redundancy. With firing rates between 285,000 to 399,000 Btuh, the boiler guarantees energy savings with up to 96 percent Annualized Fuel Utilization Efficiency (AFUE). The turndown ratio of up to 20:1 limits short cycling and provides more efficient energy consumption. Cascade up to four Duo boilers to further increase redundancy and provide up to an 80 to 1 turndown ratio. **www.htproducts.com**

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Keeping the Heat On

Oliver Heating & Cooling has been helping local families stay warm for 24 years.

BY STEVE SMITH

Now that many of us are in the shoulder season waiting for April showers to bring May flowers, we thought it would be a great time to profile Oliver Heating & Cooling, Morton, Pennsylvania, which has been helping keep the heat on in the dead of winter to those who need it the most throughout the contractor's Delaware Valley service area.

"We understand the value of growth through service, not just through our professional service offerings, but through our commitment to serving our community," David Oliver, second-generation owner of Oliver, says. "We believe strongly in giving back to the community that has helped us succeed."

Oliver Heating & Cooling, which celebrated 50 years in business last year, has helped provide local families in need with new heating systems through its annual Heat for the Holidays program.

Heat for the Holidays

Oliver, which celebrated 50 years in business last year, has helped provide local families in need with new heating systems through its annual Heat for the Holidays program.

Since the initiative first launched in 1998, Oliver has donated and installed more than 94 heating systems valued at nearly three-quarters of a million dollars, relied on more than 5,600 volunteer labor hours and enlisted the help of more than 940 Oliver employees.

The Oliver team reaches out to local community leaders, residents and through social media to identify deserving families throughout its trading area.

"This can include medical circumstances, financial hardships, community involvement from the family, or other situations that might aid in the evaluation process," a press release announcing last year's program stated.

About the only qualifications placed on candidates are that they own their own homes, and that they live in Chester, Delaware, and Montgomery counties in Pennsylvania; New Castle County in Delaware; and Atlantic, Cape May, Gloucester, and Salem counties in New Jersey.

Oliver then works together with heating equipment manufacturers, local supply houses such as Lyon Conklin, US Supply and J Lorber Supply and area financial institutions to donate finances, equipment, materials and supplies. Oliver donates all the labor for the installations. Each job is 100 percent complete and 100 percent free to the recipients.

Although the families receive the good news during Christmas week, the actual work is organized in January, when Oliver technicians gather in the early morning hours to begin loading trucks with equipment for the day's work. The group then gathers for breakfast and a prayer to bless the day's work, an Oliver tradition at the start of each meeting and company event.

Last January, six local families received new heating systems. Systems were installed on Jan. 8th, 10th, 20th and 26th. The work ranged from the installation of a new heat pump system; new gas

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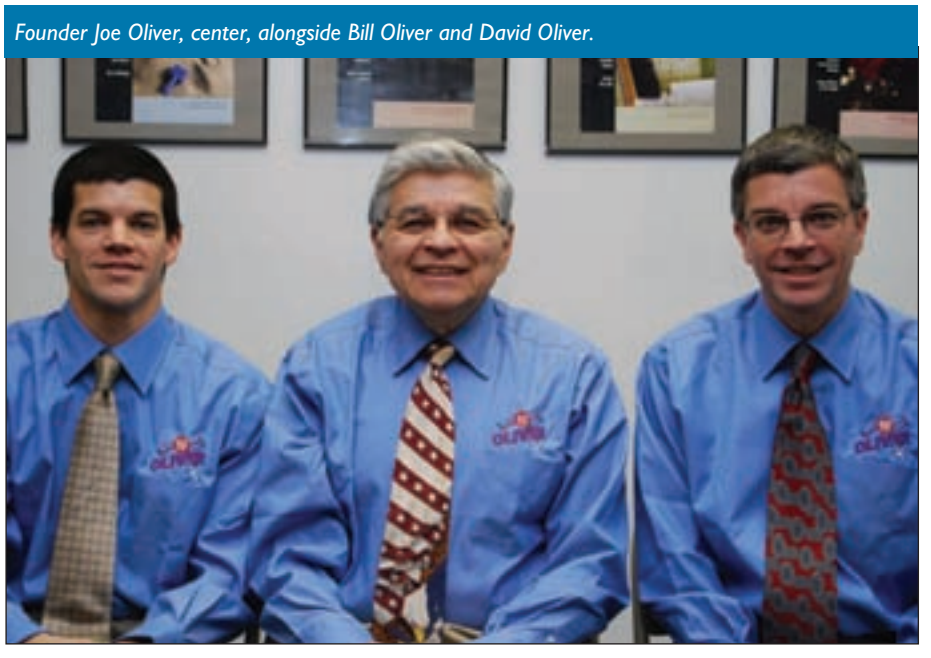

Founder Joe Oliver, center, alongside Bill Oliver and David Oliver.

furnace; new 90 percent direct-vent gas furnace installed from a failed chimney; new gas furnace; and a new oil-fired boiler.

Try as it might, Oliver can't help everyone. The company received 12 nominations in 2021. Techs head out to each address to decide who needs a new heating system the most. For families who aren't selected, Oliver still goes the extra mile and provides regular checkups at no cost.

The Heat for the Holidays program marks a celebration of giving throughout the company. In addition to the field employees who donate their time and expertise, office staff and family members organize and distribute additional holiday cheer to the recipients of the new installations.

Oliver history

Joe Oliver started the business in 1971. A Yale University graduate with a master's degree in engineering, Oliver's backstory is very different than the many we've heard over the years and is truly a leap of faith. There's a marvelous video the company did to mark its 50-year anniversary that outlines his accomplishments, which you can watch on YouTube (bit.ly/3hIS44k).

"It's almost surreal like I'm in a movie or something," Oliver says in the video, seemingly flabbergasted by his own success. "Did this really happen? That I can relax now and know that everything's in place and going forward, and I'm living such a full life."

Oliver was putting his college studies to work helping build Sikorsky helicopters during the Vietnam War. But as the war was drawing to an end, Oliver found himself along with 10,000 others out of work.

"I was devastated," he adds. "I had a family, a wife and six kids.

Oliver headed to a church prayer meeting where a couple of his fellow parishioners told him to go into the HVAC business.

"I didn't know anything about it, but they were familiar with the industry and offered to give me some pointers," Oliver says. "So I talked to my wife and we prayed and decided to go into it."

With the help and support of his wife, Beverly, as well as other family members and his church group – not to mention attending night classes and working 14-hour days – Oliver grew his business. And when Oliver was ready to hire his first employee, a man no less by the name of Adam answered the help-wanted ad and got the job.

"This biblical coincidence, coupled with Joe's strong beliefs, encouraged him that he had chosen the right path," says the company website.

Although the Oliver logo has evolved several times since the doors opened, one central image has remained – a white dove, symbolizing the company's roots in the founder's faith.

From its beginning at a church prayer meeting, Oliver has become a testament to hard work, perseverance and dedication. Since then Joe's sons, David Oliver and Bill Oliver lead the company as owners along with non-family members, namely, Bernie Sweeny and Rocco Pace, as key decision-makers.

Oliver currently employs 225 people and has more than 125 trucks on the road. The company installs and services most types of heating, ventilation, and cooling equipment and offers plumbing, electrical, and water heater services in addition to air duct cleaning for residential, commercial and industrial needs. Oliver also custom fabricates its own sheet metal in-house for commercial and residential service projects.

In 2018, the Air Conditioning Contractors of America named Oliver Residential Contractor of the Year for the company's "commitment to promoting professionalism and supporting the contracting industry for over four decades."

The company has "stood the test of time," according to David, because of the high standards and team built by his father.

In the YouTube video, Joe says success in all relationships, whether that be in marriage, work or friendship, comes down to trust.

"And to trust, you have to be real, you've got to do what you say you're going to do," he adds. ●

Oil Heat Cares

Oliver Heating & Cooling isn't the only individual PHCPPro we've heard about over the years who helps keep the heat on for those in need.

As far as organizations go, the granddaddy of them all has to be Oil Heat Cares. Since 1986, OHC has helped provide heat through the help of a veritable band of brothers comprised of dedicated hydronics contractors, oil heat dealers and suppliers.

The nonprofit OHC assists people and organizations by raising funds to purchase new oil heating systems to replace those on their last legs. The charitable activities are supported by the oil heating industry overall with the National Association of Oil and Energy Service Professionals organizing the effort.

OESP represents more than 1,000 service managers and highly skilled techs in the oil heating community. OESP heating technicians identify potential OHC recipients as they go about their day-to-day work. They then submit names to the OHC board, which judges the level of need, and then votes on whether to take on the project. If accepted, all the work and equipment becomes a gift to those in need.

OHC also strengthens the industry by teaming up oil heating professionals from all aspects of the industry whether they be an equipment supplier, owner or service technician. On the day the work is done, it's common to see local competitors work side-by-side to help out. Most of the time, the work is reserved for the weekends.

Since 1986, OHC has helped provide warmth through the help of a veritable band of brothers comprised of dedicated hydronics contractors, oil heat dealers and suppliers.

OHC has even turned the program into an educational tool with CTE students working alongside industry pros on the installations.

Care to Ride

This year one of the OHC's most popular fundraisers is back after being cancelled on account of the pandemic.

Care to Ride, May 23, features motorcycles, bicycles, walkers and runners, and is held in conjunction with the Eastern Energy Expo, OESP's convention, which takes place May 24-25, Mohegan Sun, Uncasville, Connecticut.

The last Care to Ride event in 2019 raised more than $20,000 for the organization. This year, the goal is $25,000.

OHC, however, is always looking for members, volunteers and donations throughout the year. Anyone can easily make a donation to the OHC by clicking on the "Make A Donation" on the OHC website, oilheatcares.com.

Although the industry hasn't been able to get together in person as it used to, that didn't mean the good work done by OHC came to a halt. The OHC website lists a number of recent projects, you can read about here: bit.ly/35GPQA8.

Pros and Cons of Technician Incentives

Develop a compensation policy to help you reward the levels of excellence each tech delivers to your clientele.

BY RICHARD DITOMA

I recently received an email from George, a general manager at a Florida plumbing company.

The email states: "Hello, Mr. DiToma. We enjoy each new article you write. We have gained a great deal of knowledge, insight and courage from your writings. We were wondering if you would address the pros and cons of paying commissions to service techs in the field. Whatever topic you choose, we look forward to reading and implementing it.

"Best regards,

"George"

Well, here goes, George.

Have you ever wondered about the difference between a union technician and a nonunion technician? I have. I believe the difference is only in the words preceding the word technician.

Other than that, technicians are basically the same. They're humans and technicians of their trade. And they all come with varying levels of abilities and assorted degrees of intent.

Smart and caring technicians realize that if they do their best and help the business to succeed, their own livelihood will be ensured. This type wants only to deliver excellence to consumers for the dollars that consumers spend with the business employing them.

I like to refer to these techs as Star Techs. Their abilities and attitude allow them to deliver excellence to your clientele and revenue to your business. They are the techs you should strive to employ.

The clock-watching techs could care less about their workmanship and start their workday when the workday clock begins and constantly watch that clock for breaks and quitting time. This group is hardly capable of being Star Techs and consists of bad apples that can spoil all the rest.

Then, there are those who fit somewhere in the middle. They must be monitored and trained to deliver excellence to consumers so they can be Star Techs rather than bad apples.

All technicians want to earn a living and not have to worry about money; it's the reason why they work.

All humans want to enjoy life. As technicians, they chose their specific trade choice as a career to attain those goals.

Even though God created all humans equal, the abilities and intents of individuals may differ.

As a contractor, it is your responsibility to hire people capable of performing the services your business offers to consumers in an excellent manner. Some Star Techs are fast. Others are slower, but because of their meticulous manner, they are Star Techs nonetheless.

Star Techs who deliver excellence to consumers and stick to the job until it's done expertly, whether they are fast or slow, are who you want to retain in your employ. To do this, you must compensate them in a way that is commensurate with their contribution to your business.

Clock-watching, schlock-serving techs can only serve to impede the success of your business. You would be wise to consider why you have them in your employment in the first

place. After all, you don't want them spoiling your Star Techs.

Your responsibility for your middle techs is to train them how to embrace excellence and shun schlock.

Incentive pay

I dare say that all techs want the most compensation from the businesses employing them. That's only human.

To help hire and retain Star Techs, you must develop a compensation policy to help you reward the levels of excellence each tech delivers to your clientele. You also want to compensate techs in a manner that is commensurate with their contribution to your business and helps you attain your goals as a businessperson.

Paying only an hourly wage is fraught with problems. If you don't pay everyone the same wage, you will deal with the heartburn that comes when Tech A finds out Tech B is being paid more per hour.

Since Tech A believes he/she is just as good as Tech B — if not better — you have to give Tech A a raise. But then, up pops Tech C and so on and so forth.

You can leave everyone at the same pay rate. But then a competitor might offer them a dollar more per hour and steal them away from your business. This method surely defeats the premise of compensating techs dependent upon their contribution to your business.

You must also consider that if Tech A believes he/she is more productive than Tech B but gets paid less, Tech A will be tempted to be less productive and less excellent than Tech B.

In this instance, your business suffers and, eventually, your ability to deliver excellence to your clientele fades into the delivery of mediocrity and subsequently to schlock workmanship. After all, we're only human.

Since it's my firm belief that each tech delivers different levels of ability and intent to the performance of their duties, the question becomes — How do you fix this circular problem? The answer is as simple as it is logical.

Embrace the same pay level for all techs at their skill level — by that I mean helpers in one category and journeypersons in another category. Then, embellish each tech's earnings by instituting an incentive program based on the amount of revenue each tech brings into your business.

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However, remember the old saying, "Haste makes waste." You want to control callbacks that might be the result of techs hurrying through tasks to bring in more money. Incentive amounts take into consideration callback rates and the costs of those callbacks, so techs don't just rush through tasks — leaving a wake of callback costs behind each job done.

While incentive pay increases what each tech can earn, callbacks can reduce that amount. It's the old carrot-and-stick theory and it's logical and fair.

The reason any tech makes more money than another tech is because they bring in more money and have fewer callbacks. At the same time, all techs will be able to make more money by just applying themselves and embracing the delivery of excellence. It creates healthy competition while avoiding the argument that one tech may have if another tech makes more money than he does.

It also reverses the propensity of a tech doing less because he is paid less. If techs want to earn more money, all they have to do is emulate the performance of Star Techs.

Professional ethics

Here's the caveat — your techs must adhere to principled ethics. They must never tell a consumer she needs something so they can make a sale and earn more money. They can offer suggestions on the services your business offers. After all, they are your salesforce. But telling someone they need something they don't could be considered fraudulent.

For example, after only seeing the consumer's dripping faucet, a plumbing tech tells the consumer he needs a new faucet when, in truth, repairing the faucet is a possibility that might solve the problem.

When the word "need" is spoken by a plumbing professional, as in this example, there could be a misrepresentation of the facts when replacing internal faucet parts may solve the problem.

The plumbing tech should, instead, offer the possibility of repair with the caveats as to why an attempted repair may not solve the dripping problem, and tell the consumer the benefits of a new faucet replacement.

The tech can say to the consumer: "I can attempt to repair your existing faucet by replacing the removable internal parts and installing new parts. However, if your faucet body is flawed, the drip problem may not be resolved. I can perform this task for $X with no guarantee of the results. You could be paying for this service and defeating your purpose. Most often, the repair works, but there are those instances when it doesn't."

The tech may add: "Before you make up your mind, allow me to give you the prices for replacing your existing faucet with a new faucet. This includes a warranty from the manufacturer for the faucet and a warranty from our business for the labor to repair or change the new faucet."

In this instance, the consumer can make up her own mind as to which way she wants to go — and there is no potential fraud.

Peace of mind

As a PHC contractor, I found that the price to replace the existing faucet with a new one, plus a warranty, was often not much more expensive than attempting a repair to an existing faucet when the price to repair was properly calculated.

And if the repair attempt didn't solve the dripping problem, the cost of the new faucet replacement was certainly less than the consumer paying for both the attempted repair and a new faucet replacement.

Techs must know the products and services their company offers, give consumers options, and provide pros and cons of each option so consumers have all the facts and can decide what they want to buy.

As a contractor and a tech, I always preferred to change a faucet rather than repair an existing faucet. A nice, shiny new faucet makes the consumer feel better than paying for a repair and still having an old faucet that might not be so shiny. In addition, the warranty gives the consumer peace of mind.

I learned this from a customer when I first started my PHC service contracting business so many years ago. At that time, I used a time-and-material pricing method because it's the way all the other contractors billed for their services. Sound familiar? That's the definition of ignorance being bliss.

As a contractor and a tech, I always preferred to change a faucet rather than repair an existing faucet. A nice, shiny new faucet makes the consumer feel better than paying for a repair and still having an old faucet that might not be so shiny.

As I entered her home to address her faucet drip, I quickly went to the faucet and visually saw the problem. I took out my tools and the replacement parts for the faucet, did the repair and handed her the bill. I thought I performed the service in the most expeditious and excellent manner.

She looked at the bill and said, "Rich, what would a new faucet have cost?"

I gave her the price of a new faucet with installation. She said, "I would have preferred to replace the faucet with a new one."

She was absolutely right. I hadn't given her the options available to her. That was the last time I used the old T&M pricing method and switched to giving consumers options and a contract price (upfront price or flat rate price) in writing before commencing any task.

And I had the consumer authorize in writing said tasks at the agreed prices before starting the job.

I hope I have addressed your request, George. If you or any contractor needs assistance setting up an incentive program, call me. Have a healthy and wealthy life. ●

Richard P. DiToma has been involved in the PHC industry since 1970. His Contractor Profit Advantage podcasts, Solutionars and programs show contractors how to improve their business results. DiToma has authored books on contracting business management as well as customized contractor price guides. Contact him at 845-639-5050, richardditoma@verizon.net; or R & G Profit-Ability, P.O. Box 282, West Nyack, NY 10994, www.contractorprofitadvantage.com. For podcasts, check iTunes or other major distributors.

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The Learning Never Stops: Meet Carley Lorditch

BY NICOLE MEYER

In our February 2022 Women In PHCP spotlight, we invite you to meet Carley Lorditch, chief administrative officer for Handyside Plumbing, HVAC & Electrical.

PHCPPros: What is your role in the PHCP industry?

Lorditch: Achieving growth while maintaining a strong reputation within a plumbing, heating, and cooling business requires many moving pieces and skillsets to keep the engine moving forward. When a single component is missing, we lose efficiency. My role within the company is to help optimize, implement and enforce processes within the office to better support our field staff. My ultimate objective is to create a smooth experience for our customers and foster a synergistic and positive work environment for our entire team.

PHCPPros: How and why did you decide to enter a career in the PHCP industry?

Lorditch: I was born into the industry. My dad, Bryan Handyside, began Handyside Plumbing and Heating when I was just three years old. For many years, he worked long hours in the field, and my mom, Jennifer Handyside, maintained the office and paperwork. The dinner table is where I learned valuable lessons in business and customer service. When selecting my career in the industry, it was an easy decision. Not only do I get to offer an essential service that the community will always need, but I also get to work alongside my family and an incredible team every day!

PHCPPros: What have been some of your career highlights?

Lorditch: When I first started my career, I was overflowing with ideas and eager to make elaborate changes to grow the business. In college, I had learned about marketing plans and how to build a successful business on paper.

Once I accepted that real-world experience is invaluable compared to a college degree alone, my career started to propel forward. A turning point was when my brother, Jake Handyside (Handyside Plumbing, HVAC & Electrical general manager), encouraged me to read "HVAC Spells Wealth" by Ron Smith. I realized that I had a lot to learn. I then began watching and listening to others who've already seen success within the industry. I volunteered my time on the board of a local trade organization, read more, and spent more time educating myself by watching trade-specific videos. When I began those new habits and embraced that the learning never stops, I became more empathic, and it helped me design more efficient processes. This turning point was my most successful career highlight to date.

PHCPPros: What are your thoughts on mentorship for women?

Lorditch: While primarily male-dominated, there is a growing number of incredibly successful women thriving in the industry. Women should embrace their unique skillsets and leverage them in their careers. I don't have a specific women mentor in the industry that I know personally. However, I am always eager to see business owners and keynote speakers, such as Ellen Rohr from Zoom Drain, creating massively successful careers in our industry and helping others do the same!

Our industry is very different from what it was just 10 to 20 years ago, and I believe women both within and outside of the industry played a significant role in that. For example, the idea of welcoming a stranger into your home to make a repair can be uneasy, especially for women. Women demanded and now expect that they take added precautions to improve safety when hiring a tradesperson. Some examples include receiving a picture of the technician via text or email before the visit, having well-marked vehicles, name tags, business cards, and a clean uniform. Women inspired this transition, and with more women entering our industry, it will keep innovating and moving forward.

We have an incredible group of women on our team. While I can't say if they consider me a mentor, I do my best to set a good example. Our entire management team stresses the importance of work and life balance. We begin every team meeting with everyone sharing something positive in their lives, either work or personal, as well as something they are trying to work on. We try teaching skills to help both their careers and to foster confidence and personal growth outside of work.

PHCPPros: What do you think the PHCP industry can do to better recruit and retain women?

Lorditch: It is difficult to change a mindset once it has been established. In school, the trades are often portrayed as dirty jobs for kids who don't fit a standard four-year college mold. I believe developing hands-on outreach programs for girls and boys, even as early as elementary school, could help change this stereotype. If young people knew plumbers can make over $100,000 a year and are in extremely high demand, it would be a more appealing career path for both girls and boys alike.

PHCPPros: Is there anything from your personal life that you would like to highlight?

Lorditch: One of my greatest fears, along with many other women, was balancing career advancement and my growing family. I have a husband, a three-year-old, and a six-month-old. While there are challenging times, becoming a mom has given me more ambition and made me adapt better to fast-paced changes in life. It opened up another layer of skills that I believe added depth and gave me a fresh perspective. My advice to women with the same concerns is that you're strong and capable, and never let your thoughts hold you back from your greatness. ●

Do you know someone you would like to nominate for our Women In PHCP newsletter series? Email Nicole Meyer at nicole@phcppros.com!

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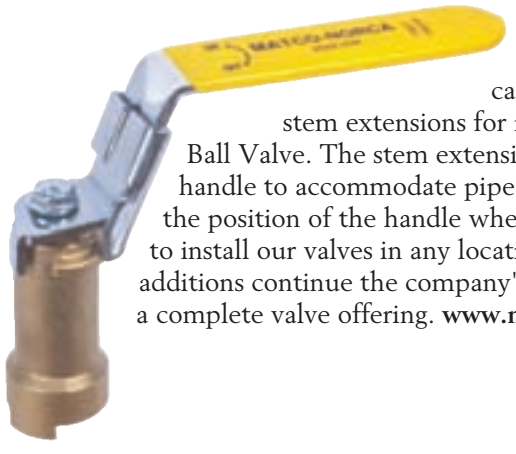

Matco-Norca has announced that it now carries locking handles and stem extensions for its popular 759P Press Ball Valve. The stem extension, used to elevate the handle to accommodate pipe insulation or to relocate the position of the handle where necessary, will allow you to install our valves in any location. Sold separately, these additions continue the company's effort to supply users with a complete valve offering. **www.matco-norca.com**

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Bemis Radiance Heated Toilet Seat

Bemis Manufacturing Co. has announced the launch of its new Radiance heated toilet seat. This seat is completely redesigned with a slim profile and updated features that deliver style and comfort to consumers. The new Radiance, exclusive to Bemis in the North American market, will feature a slimmer profile that complements the modern home. **www.bemismfg.com**

Mastering Dispatch from Beginning to End

CSRs, dispatchers and technicians communicating seamlessly is the key to happy customers, more referrals and more profit.

BY AL LEVI

One of the questions I get asked all the time by clients and customers is, "Why can't my customer service rep also be my dispatcher?" My answer is CSRs can and often do take on that role, especially if it's a small company. But if I ask more questions, usually I discover they're struggling to be good with one or the other, maybe even struggling to be only OK.

The reason? CSRs and dispatchers have very different skills sets, and the best people to fill each of those roles have different personalities. In fact, every time I've separated the CSR and dispatcher roles, clients always report there is more money and more profit coming in.

Here's why: CSRs need to be like the happy hostess in a restaurant. Their job is to make customers feel good that they called, not as if they interrupted the CSR's day.

CSRs need to be good listeners who prove that they're listening so the customer feels he's being heard. They need to proactively help with the customer's expectations by doing things such as telling them that when Al, the great tech, shows up, life is going to be good again.

CSRs are not to get baited into quoting prices over the phone or diagnosing the job. That paints the technician into a corner; when he arrives and it's anything different, there's a problem to overcome.

They need to explain how the process is going to work from the beginning to make customers comfortable with it. For example, CSRs must explain what forms of payment the company accepts and find out what type of payment the customer wishes to use at the time of service.

CSRs are not to get baited into quoting prices over the phone or diagnosing the job. That paints the technician into a corner; when he arrives and it's anything different, there's a problem to overcome.

All this takes knowing the CSR manual and the scripts in it by heart so they can be authentic and empathetic. The CSR gets the customer's job on the schedule and explains that if something changes, the dispatch team will be in touch and keep them in the loop. The job is to set the tone and book the call.

Maximizing billable hours

The dispatcher's job is to work closely with the

service manager so they can maximize billable hours and handle the workload in the best way possible. Based on my box organizational chart and how I help my clients either redesign their office or build their new office, the dispatcher and service manager sit in close proximity.

This is always important, but especially important when the Truth Comes Home Hour, normally at 2 p.m. They need to know objectively how to handle these three things:

1. Who has to love you?
2. Who has to like you?
3. And who not so much, and what are you going to do about it?

A dispatcher needs to be free to proactively schedule work with techs. One big problem that occurs is that the dispatcher thinks he's the boss of the techs, and the techs think they can boss around the dispatcher. They are both wrong; both roles report to the service manager.

The dispatcher's job is to report any issues he's having with the techs to the service manager and techs should report any issues they're having with the dispatcher.

- **Example 1.** Every day at 3 p.m., technician Al complains he wants to go home and never stays on to help out.
- **Example 2.** The dispatcher is being rude, not attending to workflow or not proactively getting all the information desired and required about the call to the techs.

The service manager will get the people in a room and get it fixed.

Another question I get is, "Does a dispatcher ever answer calls?" The answer is yes.

The CSR primarily follows the CSR manual and focuses on taking calls — until the service manager tells him they're overloaded and to shift to the manual's better screening section so they can be sure to triage and run the right calls.

CSRs also are cross-trained to the dispatcher manual so they can do a good job when the dispatcher goes to lunch, is out sick, etc. You also can (and should) cross-

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train the dispatcher on the CSR manual, so if the phones are overloaded, the dispatcher can stop and flip into the CSR role and be good at it.

Triangle of Communication

Another objection I hear is, "What if my company is too small to have a separate CSR and dispatcher?"

Again, the quicker you can get to the point where there is a separate person in that role, the more money you will make. But if you only have one person, here's what to do.

It's important to include a priority section that is the same for all three roles so that what to do is no longer someone's opinion — it's all objective.

That person needs to be trained so when he answers a call, the CSR role is the only role he's filling. And when he's acting as a CSR, he follows the CSR manual and scripts until the customer hangs up.

Once the call is booked, that is the time he switches to the dispatcher role and follows all the steps laid out in the dispatcher manual. Both manuals are (or should be) integrated with the technician manual so everyone is already on the same page, which today is digital.

It's important to include a priority section that is the same for all three roles (CSR/dispatcher/technician) so that what to do is no longer someone's opinion — it's all objective.

When it's all clicking, here's how it should work:

The CSR starts the relay race by gathering the right information, managing expectations and booking the call. The dispatcher then takes the baton and gets all the info out to the techs per the manuals. They know what they need to give the tech to run the call, keep tabs on what the tech is up to, and what information they need back from them so the baton does not get dropped.

It's why I call these three roles the Triangle of Communication. Having these three roles communicating back and forth seamlessly is the key to happy customers, more referrals and more profit. Ensuring that customers feel seen and taken care of from the time they pick up the phone to the time the tech leaves is essential. The coordination of these roles is how you achieve customer satisfaction.

Remember that customers will forgive a high price, but they won't forgive being forgotten. ●

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Public Relations 101: See and Be Seen

Making your company more visible online can boost its reputation and solidify you as the expert in your industry or community.

BY HEATHER RIPLEY

With so many companies vying for visibility online, a small- to mid-sized business owner may feel that trying to outpace the bigger companies within their industry is a losing battle.

But you can easily keep up with larger companies' branding efforts if you prioritize visibility and strategically plan ongoing news releases, blogs and social media content that is both interesting and educational to your readers and potential customers.

Making your company known as the experts in your industry takes a continued relationship with the people in your community; your online presence goes a long way in promoting this commitment. You can't let your company's news or advice go unnoticed or allow your blog to whither on the vine for lack of constant communication.

While most business owners understand the need to advertise in their coverage area, many don't realize how added public relations from an active and engaged online presence can boost business. Keeping your opinions on issues relevant to your industry fresh or consistently offering your customers tips through online communication helps establish you as an expert in your field.

Tips to stay relevant

Here are nine tips to becoming more visible online and stay relevant to your community:

1. It's the quality of your followers, not the quantity: Sure, we'd all prefer to have several million followers who hang on our every word, but most community businesses don't have the pool of potential followers an internationally famous entertainer, athlete or politician does. A home services company in Roanoke, Virginia, or Las Vegas simply isn't going to have the reach of a Beyoncé or a LeBron James.

This ensures that those who follow you are real stakeholders who support your company. If you have 20 or more followers who are so satisfied with your work, they are willing to sing your praises or share your articles, blog posts or social media comments, you have a fan club you can be proud of.

2. Engage with your followers: It's also not enough that you have followers. You need to stay engaged with them to grow your visibility. Make time to review your social media posts, the comments in response to your blog posts, and your online reviews. Thank those posters who share your articles or answer their questions.

For online reviews, make sure you deal with any negative feedback quickly by posting directly to the commentor. You don't need to go into detail, but assure them you will follow up offline. Showing that a real person or people are behind your online accounts boosts your visibility and breeds goodwill.

3. Use hashtags: In the online world, hashtags are how average people search for a topic on social media. If your plumbing company is offering tips on how to prevent piping

systems from freezing in the winter, for example, be sure and include a hashtag of your city name and #frozenpipes to be picked up in local searches for this information.

Relevant hashtags are usually pretty easy to find by searching for them yourself. It also will give you an idea of how many people are searching for that topic and what topics are popular.

4. Use images: When scrolling through your own social media feeds, think about the posts you notice first. Unless the headline is earth-shattering, chances are those posts you gravitate toward are those with eye-catching visuals. The same is true of your own posts. You can either provide a high-resolution image of your own, subscribe to an image service and use their quality imagery or develop your own charts or graphic designs.

5. Post your news at the right times: While your post should include quality information, ensuring that it's posted at the right time of day to get the most views is also important. Social media's peak posting times are usually between 9 a.m. and 11 a.m., but you also should research your own posts to see what time your followers are most active. You may find that your online community is more active in the evenings or on weekends.

Experimenting with posting times is recommended to help you determine the best time to post your updates.

6. Share your own content: If you've recently given an interview on a local news station or written an article for a trade publication within your industry, share it! Post the link to the interview or article on your blog and your social media accounts. The more you share, the more the article or interview will be viewed — and the more you will be perceived as an expert in your field.

7. Share others' content: Reciprocity is key to building your online visibility. The more you share others' content, the more likely they will follow you and share your content. If you see a good article related to home services from a source you follow online, share it through your own channels. The more you engage with the people you follow

and who follow you, the more your company's insights will be shared.

8. Brand your company (and yourself): Make sure you and anyone posting on behalf of your company know your organization's talking points and brand messaging. Many companies now also require all employees who post on social media as representatives of their organization to follow a set of rules when writing online.

Remember that very few people use the Yellow Pages in their homes anymore. When they need a plumber or an HVAC repairperson, they go online to find help.

Make sure you and your employees are on the same page when sharing your company news.

9. Maintain your website: Make sure your website stays updated with your company's latest news, offers and products or services. If you no longer carry XYZ product, take it off your products page. If you won an award this month for community involvement, post the information about your award promptly.

Your website is your welcome mat if you want to stay and remain visible online. You can't develop it once and leave it to stagnate. It must be kept up to date for the convenience of your stakeholders.

Remember that very few people use the Yellow Pages in their homes anymore. When they need a plumber or an HVAC repairperson, they go online to find help. And they don't stop at the list of related businesses in their area. People also use the internet to research companies before they make the call.

Studies have shown that between 70 percent and 80 percent of consumers research a company online before doing business with that company. If there is virtually no information about your company online, the information about your company is old or any bad reviews you've had have not been answered or resolved, homeowners are going to opt to research your competitor, who may have a brilliant online presence.

Staying visible online is no longer just for tech types or students; it's now a part of doing business and should be a mainstay in your marketing plans. ●

Heather Ripley is founder and CEO of Ripley PR, (www.ripleypr.com) an elite, global public relations agency specializing in the construction and skilled trades. Ripley PR was recognized by Entrepreneur Magazine as a Top Franchise Supplier three years in a row and was named to Forbes' America's Top PR Agencies for 2021. She is the author of "NEXT LEVEL NOW: PR Secrets to Drive Explosive Growth for your Home Service Business."

Arbitrate with Care to Avoid 'Flimsy *Post-Hoc* Excuses'

Parties should read and be familiar with contract dispute resolution mechanisms to help avoid surprises and heavy-handed arbitration clauses.

BY STEVEN NUDELMAN

Recent case law is chock full of arbitration-related disputes. More and more construction contracts include alternative dispute resolution clauses, providing for mediation, arbitration or even a hybrid of both, known as med-arb. Parties to a construction contract include such clauses to avoid litigation — often including a jury trial — because lawsuits, complete with discovery and appeals, are long and expensive.

The problem with this approach is that these parties often agree to arbitrate without understanding precisely what they are agreeing to. The result is a great deal of "satellite litigation" involving the enforceability of arbitration clauses.

In this column, we explore a good example of satellite litigation involving a med-arb dispute resolution clause, *Clayco, Inc. v. Food Safety Group, Inc.*, No. 4:20-mc-00739-MTS, 2021 WL 859557 (E.D. Mo. March 8, 2021).

Background

Contractor Clayco Inc. (Clayco) entered into a subcontract with Food Safety Group Inc. (FSG), pursuant to which FSG would furnish and install metal wall panels for a commercial construction project at a cost, including change orders, of just over $4.4 million. At some point, Clayco alleged that FSG did not meet its obligations under the subcontract and associated progress schedule.

Clayco served FSG with a notice of default and demanded that FSG cure the default. Since FSG was not responsive and its work remained incomplete, Clayco terminated the subcontract.

The parties' subcontract contained an interesting dispute resolution clause. Under Article XXVI, Sections A through M, the parties were required to mediate their dispute and, if unsuccessful, proceed to arbitration. This is a standard, common process.

However, Section N included a twist. Under Section N, Clayco — and only Clayco — could invoked an alternative procedure in writing. Under the Section N alternative, the parties were required to mediate their dispute through the American Arbitration Association (AAA). The mediation commenced by Clayco's written demand to the AAA and it had to be completed within 60 days thereafter.

Following initiation of the mediation, the parties would

exchange mediation position statements and attend a mediation session that had to be conducted in eight hours on a single day. If the matter did not get resolved in that time, the mediator would automatically become an arbitrator and the proceedings would shift from mediation to "baseball arbitration."

Under baseball arbitration, each side provides the arbitrator with a last, best and final offer and demand in writing. The arbitrator then discloses the parties' offer and demand. Within five days after the disclosure, the arbitrator issues an award, adopting either the offer or demand, without modification or amendment. This award is considered final, binding and enforceable by a court of competent jurisdiction.

Here, counsel for Clayco filed a request for mediation with the AAA. Its transmittal letter, which was copied to FSG's attorney, indicated that Clayco was invoking Section XXVI.N of the parties' subcontract. The mediator selected for the case issued a scheduling order that followed the process set forth in the Section N alternative. Clayco brought suit seeking to compel FSG to participate in arbitration.

Nine months later, the parties mediated for eight hours and were unable to resolve their dispute. The mediator then became an arbitrator. He accepted the parties' best and final offers, and ultimately selected one of the offers (Clayco's). This award was for $1,684,108. Clayco went to court to move to confirm the arbitration award. FSG filed its own motion to vacate the arbitration award.

Avoid med-arb clauses

Before discussing how the district court addressed the parties' motions, a brief interlude is required.

If you are ever presented with a choice, stay away from the Section N alternative or any other kind of med-arb clause for that matter. The "hat" and mindset of a mediator differ greatly from that of an arbitrator. Mediators are facilitators; arbitrators are decisionmakers. Mediators learn confidential information from the parties during the mediation process. This information is seldom usable during arbitration proceedings.

However, just because information cannot be overtly used does not mean that it plays no role in the mediator-turned-arbitrator's thinking and perception. In short, the procedure is flawed from the outset since the parties may very well be prejudiced in the eyes of their arbitrator based on conduct that occurred in the mediation.

The parties are better off using different people as mediator and arbitrator. That having been said, a court is going to enforce the parties' lawful agreement to arbitrate — even if Steven Nudelman thinks that the methodology may be wacky. And the Section N alternative is lawful — at least in the eyes of the district court hearing Clayco's case.

Federal Arbitration Act

The district court here began its analysis by referencing the applicable statute that sets forth the bases to vacate an arbitration award — the *Federal Arbitration Act*, 9 U.S.C. § 10(a) (FAA). Under the FAA, an arbitration award may be vacated where: it was procured by corruption, fraud or undue means; there was evident partiality or corruption in the arbitrators; the arbitrators were guilty of misconduct in refusing to postpone the hearing, or in refusing to hear relevant evidence, or of any other misbehavior that prejudices the parties; or the arbitrators exceeded their powers.

FSG attempted to argue that the arbitrator exceeded his powers because Clayco failed to invoke the Section N alternative. FSG argued that it never received Clayco's written intention to invoke the Section N alternative and it never received Clayco's written request for mediation. The district court disagreed, giving short shrift to FSG's arguments.

The court found that Clayco sent the AAA a letter expressly invoking the Section N alternative and formally requesting mediation. Moreover, *counsel for FSG was copied on the transmittal letter* as a courtesy. Under the AAA rules, a request for mediation is initially filed with the AAA alone. There was no requirement under the AAA rules or the subcontract for Clayco to give FSG written notice that Clayco was invoking the Section N alternative, and requesting mediation through the AAA (even though Clayco did, in fact, provide such notice to FSG's counsel).

As the court concluded: "Arbitration is a matter of contract. The FAA does not prevent the enforcement of agreements to arbitrate using different rules than those set forth in the FAA itself because such a result 'would be quite inimical to the FAA's primary purpose of ensuring that private agreements to arbitrate are enforced according to their terms.'" Clayco, 2021 WL 859557, at *4 (citation omitted).

The court noted that FSG participated in the baseball arbitration process after mediation failed — precisely the procedure set forth in the Section N alternative. Yet, at no time did FSG object to the procedure until after it lost. As the district court said: "FSG made no formal objection [to the procedure]. Instead, it chose to assert flimsy *post hoc* excuses only after the outcome displeased it." *Clayco*, 2021 WL 859557, at *4.

The court found that the arbitration process took place as the parties agreed, and FSG waived any procedural defects through its participation. Even if it did not waive such defects, FSG failed to demonstrate any of the four bases to vacate an arbitration award under the FAA.

Takeaways

The Clayco case does not present any earth-shattering legal principles. Rather, it enforces the notion that parties should read and be intimately familiar with the dispute resolution mechanism in their contracts.

Here, FSG should have known that under the parties' subcontract, Clayco could invoke the Section N alternative by written demand to the AAA. Furthermore, FSG should have been aware that under the AAA rules, a party commences the mediation process by serving a request to the AAA.

Finally, FSG should not have sat on its rights; if it felt that the med-arb process under Section N was objectionable, it should have chimed in sooner and not waited until after it received an adverse award.

Again, none of these lessons is particularly complex. However, parties to construction contracts tend to gloss over the dispute resolution clause during the contract negotiation. Instead, they would be better served by having their construction attorney review the dispute resolution mechanism ahead of time. Such a review would help avoid surprises and heavy-handed or lopsided arbitration clauses. ●

Steven Nudelman is a partner at the law firm of Greenbaum, Rowe, Smith & Davis LLP, where he is chair of the firm's Construction Contracting & Risk Management Practice Group. He also is a member of the firm's Real Estate and Litigation Department and its Construction Disputes, Community Association, Alternative Dispute Resolution, and Alternative Energy & Sustainable Development Practice Groups. Email him at snudelman@greenbaumlaw.com.

Clean Energy Systems Get BIG

Passive House projects in Boston and NYC are reducing carbon emissions and conserving energy.

BY BF NAGY

For me, 2022 began with the return to my routine, but it was anything but routine. Armed with three COVID-19 shots and a flu shot, I was able to visit different cities once again and review climate solutions for buildings, transportation, microgrids and other power systems. And then, I attended the AHR Expo in Las Vegas. Wherever I went, it seemed as if something big was happening.

I expected to feel the usual mixed emotions: The optimistic side of me would be excited to report great new progress on clean energy and clean water systems. The pessimist would bemoan the plodding, bureaucratic, incremental pace of change that is always inadequate for an impatient environmentalist.

But guess what? The optimist easily won the day. Not only is change penetrating all corners of the building industry, but it's accelerating like a Tesla Model S.

I discovered more than a technology shift or two; rather, a broad technical and economic disruption of the construction industry. Heating, cooling, ventilation, controls, building envelope, design process, refrigerants, plumbing, civil infrastructure and urban planning are all affected and are all connected.

Yesterday's trends and buzzwords are falling away or, if they have real value, are becoming today's mainstream operating practices in clean, efficient energy, water and refrigeration technology, electronics and smart buildings. There are more clearly defined applications for the Internet of Things and artificial intelligence, preventive maintenance and more. Not only are these previously nebulous concepts providing value in real equipment, but they are being applied on a mass scale.

When dramatically different methods are employed on the largest projects, you know we've moved beyond rhetoric — like when you visit Boston's 53-story, 696-foot-high Winthrop Center Passive House project just a few days after snapping pictures on-site at Harlem's 709-unit Sendero Verde affordable housing Passive House project in New York City.

Or when you walk into the Mitsubishi-Trane booth at the AHR Expo and Cain White says: "There's no turning back. A massive shift is starting in the US right now." Then he shows you a new 40-kW, industrial-sized, $C0^2$ cold-weather heat pump water heater that can be connected to up to 15 more of the same modules to provide a total of 640 kW (about 2,183,771 BTU/hour). BIG!

This happened a few minutes after David Budzinski informed me at the Johnson Controls exhibit that the company tripled its investment in heat pumps last year. It is still making efficiency gains through ever more digitized and connected building technologies, will soon move to all-natural refrigerants in all products, and will make clean heating systems more accessible through a utility model.

"This is not only a trend," he says. "We're well-positioned to help consumers, builders and owners become carbon-neutral. Not only is it a value for corporations from a bottom-line perspective, but it's something required to attract top talent. The next-generation workforce wants to work for companies that are creating a better world, and we want the next generation to have a safe, healthy and clean environment."

Boston's 53-story Winthrop Center is a mixed residential and office tower. The latter section is all Passive House standards, resulting in substantial energy savings. Photo credit: Millennium Partners

Winthrop Center in Boston

Brad Mahoney from Millennium Partners, one of America's biggest urban developers, echoes Budzinski.

"This is not just a blip," Mahoney adds, while touring with me through the 812,000-square-foot Winthrop Center site in Boston. "This is the way that projects will be built," he says

About half of the massive high-rise is of Passive House design, with triple-glazed windows and additional insulation both at the sill and at the head positions in the spandrel areas. Mahoney notes that if design decisions were being made today, rather than four years ago, MP would have likely applied Passive House to the residential floors, which make up most of the other half of the project.

"Lessons learned, right?" he notes. "Boston recently enacted its building energy reporting disclosure ordinance. They call it BERDO 2.0, which is similar

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to Local Law No. 97 in New York. Starting in 2025, buildings are going to have to cut their carbon intensity. And so this project as a whole is already using 50 to 55 percent less carbon and 55 percent less energy than the average building in Boston."

The building's massive 65-foot-high mechanical room floor is located about 300 feet above the city, between the office and residential sections of the tower.

"We're taking a leap forward," Mahoney says. "I ran the numbers; if we applied Passive House to the entire building stock in Boston, we would effectively cut our city-wide building emissions in half. And we would reduce the timeline for carbon neutrality by 10 to 15 years. That shows you the power of this technology. It's striking, and I think it's resonating with tenants and with Boston."

The building is expected to have an energy use intensity of 28 KBTU/rentable square feet a year as compared to an existing LEED Platinum building, which uses 60 percent more energy (44 KBTU/rsf/year), and a typical Class A building, which uses 150 percent more energy (70 KBTU/rsf/year.)

"No other substantially renovated or new office building in a similar climate can achieve these energy savings without incorporating Passive House standards, which are being adopted within the industry on a wide scale to help cities achieve their aggressive carbon-reduction goals," Mahoney notes.

Tom Burroughs, senior vice president at WSP Engineering, confirmed that the center's dedicated outdoor air ventilation system provides high-level health benefits with MERV 15 filtration and real-time indoor air quality monitoring. It provides 5,000 cfm to each floor or about 125,000 cfm for the Passive House floors.

This amounts to 30 to 50 percent more fresh air than the code requires, while the energy recovery ventilators supplying it achieve a 70 to 80 percent energy recovery rate. Vertical ductwork is sealed to minimize inefficient air leakage.

To add to efficiency, the control system varies settings while accessing two occupancy data systems, specifically $C0^2$ sensors, plus employee security badge swipes.

The façade employs a state-of-the-art, high-performance unitized curtain wall system, triple-glazing that exceeds double-glazing performance by 15 to 20 percent and single-glazing by 50 to 60 percent. Vision glass is 10-foot high across the majority of the floor plate.

Cooling is supplied by the central plant using three 1,000-ton electric Arctic magnetic scroll chillers, and heating by fan coil units and condensing gas boilers. The latter is the compromise I dislike, but I'm heartened by the overall low-energy requirements, thanks to the four-pipe configuration, sophisticated zone control and much better envelope relative to comparable projects.

Winthrop Center also uses low-flow fixtures and collects and reuses rainwater for its toilets, which saves 2.4 million gallons of water each year — again, around 50 percent less than similar conventional buildings. The pumping system is designed to maintain a three-day supply of filtered rainwater in each area of the building.

The Sendero Verde Passive House project in New York City's Harlem will be completed in 2022, providing 709 new affordable housing units and a host of community amenities. Photo credit: BF Nagy

In addition, its tenant agreements require efficient LED lighting and its parking levels provide electric car chargers.

"New codes will force changes like this, but we were ahead of the curve incorporating these measures several years ago," Burroughs says.

He adds: "I believe this is a transformational project that changes the dynamic in Boston and represents a benchmark building for North American cities. It's bigger than what we usually build here. It was challenging in the design with mixed-use, garage levels, office, residential — how do you service these different uses?"

Burroughs notes that collaboration between WSP, the architect, the contractor, the developer and some tenants was a key achievement — a fully integrated design process: "It was a holistic process with early modeling of different scenarios involving mechanical system options, envelope choices, window-to-wall ratios, and all reviewed to provide optimal energy and operational efficiencies."

He adds: "A lot of engineers and developers are taking inspiration from this project and in a way, there is a sigh of relief because these changes are coming in the code. More importantly, they are being driven by the building's tenants. These are corporations with decarbonization targets; you can only be as green as the building you move into. They are modern companies who need to attract the best employees, so they are demanding these changes. Climate change matters to people."

NYC's Sendero Verde

Sendero Verde's 395,000 square feet in New York City will be completed this summer, supplying Harlem with about 700 new affordable residential apartments, plus extensive community space, retail space and outdoor gardens. A school will be operating within, as well as Union Settlement programming and retail stores on the ground floor.

I was fortunate to be granted an interview in 2019 with Lois Arena, the project engineer from Steven Winter Associates, and we published a technical description in early 2020, which has been essentially followed. There is, therefore, some repetition in the following information, and also some minor corrections and additions.

The mechanical systems include a high-performance, low-energy variable-refrigerant flow system with floor-mounted air handlers in each of the one-, two- and three-bedroom apartments, and split-style, wall-mounted units in the studio units.

Each floor is served by the equivalent of one condenser, meaning that each condenser does one-third of a level, multiplied by three stories. This is to minimize energy loss, optimize piping and because different zones face the sun in different ways, involving different gain conditions.

The condensers on each floor are thermally isolated because the project is Passive House-certified. This means they are located in cubicles enclosed on three sides with a grill on the fourth side. A Ceco Trio-E insulated door with a thermally broken frame permits access to each condenser cubicle.

Rooftop energy recovery ventilators provide apartment ventilation, with the goal being to balance exhaust and supply ventilation within 10 percent of one another and, of course, retain as much heating or cooling energy as possible.

Passive House certification requires an overall source energy maximum of 120 kW/m2 each year (38,100 BTUs/ft2/year); heating can be 15 kW/m2 a year (4,750 BTUs/ft2/year). Cooling in the New York area can be 17 kW/m2 a year (5,390 BTUs/ft2/year).

"This building and most of the Passive House projects already meet the 2030 New York carbon cap," Arena says. "The walls are R30. We've been paying a lot of attention to thermal bridges and perforations."

Air changes per hour throughout the facade can be no more than 0.6 at 50 pascals of pressure, which is five to 10 times tighter than a typical building. It means the Sendero Verde walls will be insulated continuously and carefully sealed for an R-value of 30, the roof for R-40, and the double-pane windows will provide U values of 0.149 (operable) and 0.134 (fixed).

In addition, New York is among the most demanding places to plan a new building if you're still stuck on carbon fuel systems. New laws are regulating them out of new buildings and are even requiring thousands of existing building retrofits beginning in 2024. Fines for noncompliance are significant.

Among the other inspirations during my early 2022 travels was my walk-through of a large sewage heat recovery project in Washington at DC Water's headquarters, which I wrote about last month, and a number of others that will appear in future columns.

These include a tour of ASHRAE's new headquarters in Georgia, a microgrid lab in New Jersey — and the Tesla Gigafactory in Austin, Texas, said to be the world's largest building at about 5.3 million square feet. It will start making thousands of Cybertrucks this year, employing more than 5,000 locals, increasing surrounding real estate values by about 40 percent, and powering its production entirely through its own massive solar array.

Not all these projects are big. I will also write about a clever, clean system at a small craft brewpub in a pretty little town in Connecticut. The place is small, but the ideas used there are part of something big. ●

BF Nagy is becoming a renowned climate solutions specialist, author of the critically acclaimed book "The Clean Energy Age," and more than 200 articles on clean energy, clean water technologies, green government programs and energy economics. A podcast host and broadcast personality, he has traveled all over North America interviewing experts in climate science, government, engineering, architecture, clean transport, renewables and storage. Nagy also is a consultant to governments, corporations, trade organizations and research bodies.

Dihydrogen Oxide Batteries

The storage technology right in front of us.

BY MAX ROHR

Batteries are a key piece of technology missing on the path to a future of sustainable energy. Homes need a better way to store electricity to avoid peak utility demand periods. If consumers could shift the time of day they use electricity, they could make the grid more sustainable. As electrification moves into mechanical rooms in various markets, sustainability becomes an important topic.

What if consumers already had a big piece of the technology to influence the demand spikes?

My chemistry teacher in high school once said that some local news station would call a water quality expert about once a year after hearing a report that someone dumped a bunch of dihydrogen oxide in the local reservoir. The journalist wanted to know the consequences for consumers. The expert explained that dihydrogen was H^2 and oxygen was O, so they described dumping water into water.

The rarely used, extended chemical name for water was the source of confusion and apparently a recurring chemistry prank call of sorts.

In a way, misunderstanding dihydrogen oxide is pertinent today in the battery conversation. Water has always been an excellent battery; it has a higher specific heat capacity than most readily available molecules on earth, meaning it is a great sponge for thermal energy. Hydrogen and helium gas have higher specific heat capacities, but they probably are not piped to a tank in many homes.

As opposed to a lithium-ion battery, water is not for the direct storage of electricity. In cases where homes use electricity to heat water with a heat pump or an electrical resistance element, water is a large indirect battery. Unlike the large lithium-ion batteries entering the market to store electricity directly, most homes already have the water battery tucked away inside the structure. From a usable space perspective, this is different from adding a new Tesla battery into a garage for electricity storage.

How does a tank of water affect the future of the utility industry and national energy goals? U.S. buildings consume about 40 percent of the nation's energy. Averaged across all homes in the nation, space heating accounts for 43 percent of energy use and water heating uses 19 percent, according to a 2015 Energy Information Administration dataset (https://bit.ly/3MELWZn).

To put that into perspective, if all the nation's boilers, furnaces, space heaters and water heaters disappeared today, nearly the same energy savings would be achieved as eliminating the entire transportation sector. Space heating and plumbing take up 25 percent of the U.S. annual energy consumption. Cars, planes, trains, trucks and motorcycles consume about 26 percent of the nation's energy (https://bit.ly/37lyTMf).

In the forgotten mechanical space in homes, behind the broom and dusty storage boxes, are a couple of simple machines responsible for a quarter of the energy used by our nation annually.

Adding efficiency

If plumbing and HVAC machines are so pivotal, how can we make them more efficient? The good news is that almost all installers can drive to their local supply house and pick up a 90+ percent AFUE boiler, condensing furnace or efficient water heater.

The bad news is that most of those machines are still operated with the simplest of controls. The thermostats and aquastats in the vast majority of homes are simple on/off calls for heat that do not understand the implications of the time of day. If we do not schedule these devices better, we are headed for a utility duck curve.

An electric utility demand dashboard, graphed over 24 hours, will likely show a spike in electricity demand in the morning, rising to a higher spike from about 6 p.m. to 10 p.m. This traditional demand curve has been consistent over many decades (see Figure 1).

As electric utilities add more solar photovoltaics, the graph changes a bit. When the sun is out during the day, the demand for fossil-fuel power shifts. Solar energy gathered throughout the day brings the megawatt burden down for fossil fuels. However, it does not change the spike from 6 p.m. to 10 p.m. much because the sun is generally down by that time and the consumer habits have not changed.

The added solar capacity (duck curve) line in Figure 1 shows this change: a short peak of a tail in the morning, a big dip when the sun is up and a large spike up to the duck's head when consumers are home from work.

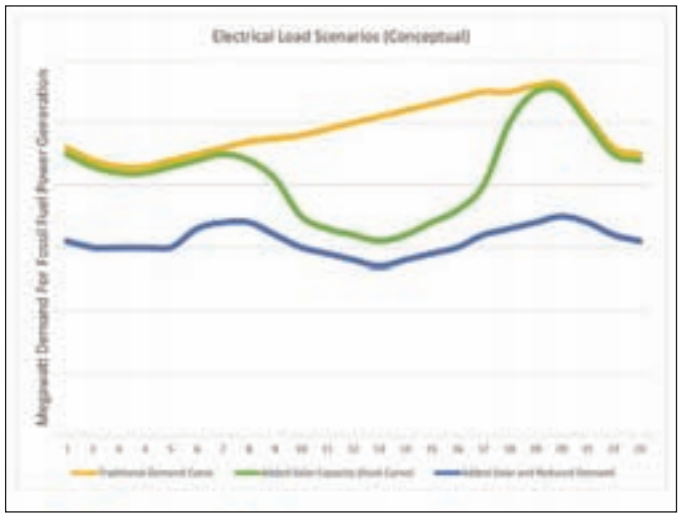
Beware of the duck

If utilities add an enormous amount of solar PV to the grid, it may reduce the need for fossil-fuel power plants during the day. However, if a peak usage time occurs as the sun sets, we are still missing something important. We need to lower the duck's head to reduce the amount of fossil-fuel power in the utility mix.

One way to fix the problem is to better store renewable energy for evening use. A second option is to let the utility decide when to limit power usage at their customers' electric heaters and water heaters to avoid spikes. In several utility markets, these load-shedding technologies are available. Markets with high potential for summer brownout scenarios love when consumers allow them to limit air conditioning to push demand down.

Another demand-shifting option is for consumers to stop using as much energy in the early evening. As mentioned before, HVAC and plumbing energy use is an enormous factor in home energy use. If these machines charge a water battery during daylight hours and coast through the evening without cycling on and off multiple times, the demand line starts to look different.

If the machines and systems are more energy-efficient, the curve looks like the added solar and reduced demand line in Figure 1. In a scenario where electric customers lower their energy demands, utilities have more flexibility



to take older, expensive-to-operate fossil-fuel plants offline.

Many people reading this article are likely familiar with the problem described previously. What is the solution? If everyone in the industry went door-to-door and told their neighbors, "Do not use a lot of electricity in the evening," there might be a lot of befuddled looks. It might be too much to ask the general public to understand the flow of kilowatts at all times anyways. The average person wants to come home, watch TV, do laundry and cook dinner.

As industry professionals, we can manufacture, install and commission these electrified space and water heaters to flatten the graph without disrupting homeowners. However, a change is needed to better time electrical heating. With a large volume of water, proper controls and components, designers and installers can change the curve without homeowners noticing a difference.

The standby loss of a modern water heater is so small that "overstoring" it during the sunlight hours, beyond the typical setpoint while letting it coast as far into the evening as possible, is not wasteful. In practice, an electric water heater or heat pump control could adjust the setpoint up 15 degrees from 1 p.m. to 3 p.m. and down 20 degrees from 6 p.m. to 10 p.m.

Proper scald protection valves are always needed if overstoring a tank of domestic water. In a perfect world, this would lower the head of the duck curve. Equipment manufacturers and utility companies are currently working together to figure out a control strategy, but anyone reading this column could likely do the same sequence with a setpoint controller.

In the United States, we love an energy, get-rich-quick scheme. We always have. We badly want some sort of new technology to triple the miles per gallon of our cars, power our phones for days at a time and store energy for our home in a tiny box. Realistically, we should better use the dusty water batteries in our basements as this will be key for the markets pushing electrification. ●

Max Rohr is the education and industry engagement manager with Caleffi North America. He can be reached at max.rohr@mac.com and on Instagram @caleffi_na_max.

Wastewater Energy Exchange is Making Sense to Energy Utilities

Geothermal heat pumps are the central component of the thermal extraction/rejection portion of energy recovery.

BY JAY EGG

Where is most of the energy lost from our homes and buildings? Some might guess that it's through windows and doors, poor insulation or inefficient appliances. The No. 1 answer could be down our wastewater pipe.

The Water Environment Research Foundation estimates roughly 80 percent of the latent energy in wastewater is thermal, 20 percent is chemical and less than 1 percent of the potential exists in hydraulic generation (https://bit.ly/3HRH8fE). That means the low-hanging fruit for our purposes is stripping the thermal energy (for which we've already paid) out of the wastewater leaving our homes and businesses.

Every day, our homes, office buildings, schools, commercial establishments, hospitals, etc., have a tremendous amount of potable water piped into their plumbing systems. Nearly all potable water plumbed into buildings eventually goes down the sewer. The water comes into buildings at a temperature somewhat affected by the seasons.

For example, during the middle of the summer in the Southern states, it's not uncommon to see fluid temperatures at 80 degrees or above entering residential and commercial buildings. By the same token, during winter, it is not uncommon to see fluid temperatures in the 40 degrees to 49 degrees coming into our buildings, especially in the Northern states.

What do all these fluids have in common? They all eventually leave the building at room temperature, roughly between 65 degrees to 75 degrees. That is because the fluid coming into our buildings is tempered to conditioned room temperature; it's how heat transfer works. Anything inside our homes and buildings will assume room temperature after a period of time.

In other words, we are paying to heat and cool the fluids that come into our buildings at an average rate of 82 gallons/day (gpd) a person. Let's talk about how much energy that is.

With 330 million individuals in the United States using 82 gpd at an average temperature difference of 20 degrees, that is 1.3 billion kWh of energy a day or more than 480 billion kWh a year (https://bit.ly/3sPM8wZ). By the way, that figure was estimated at 350 billion kWh a year in 2005.

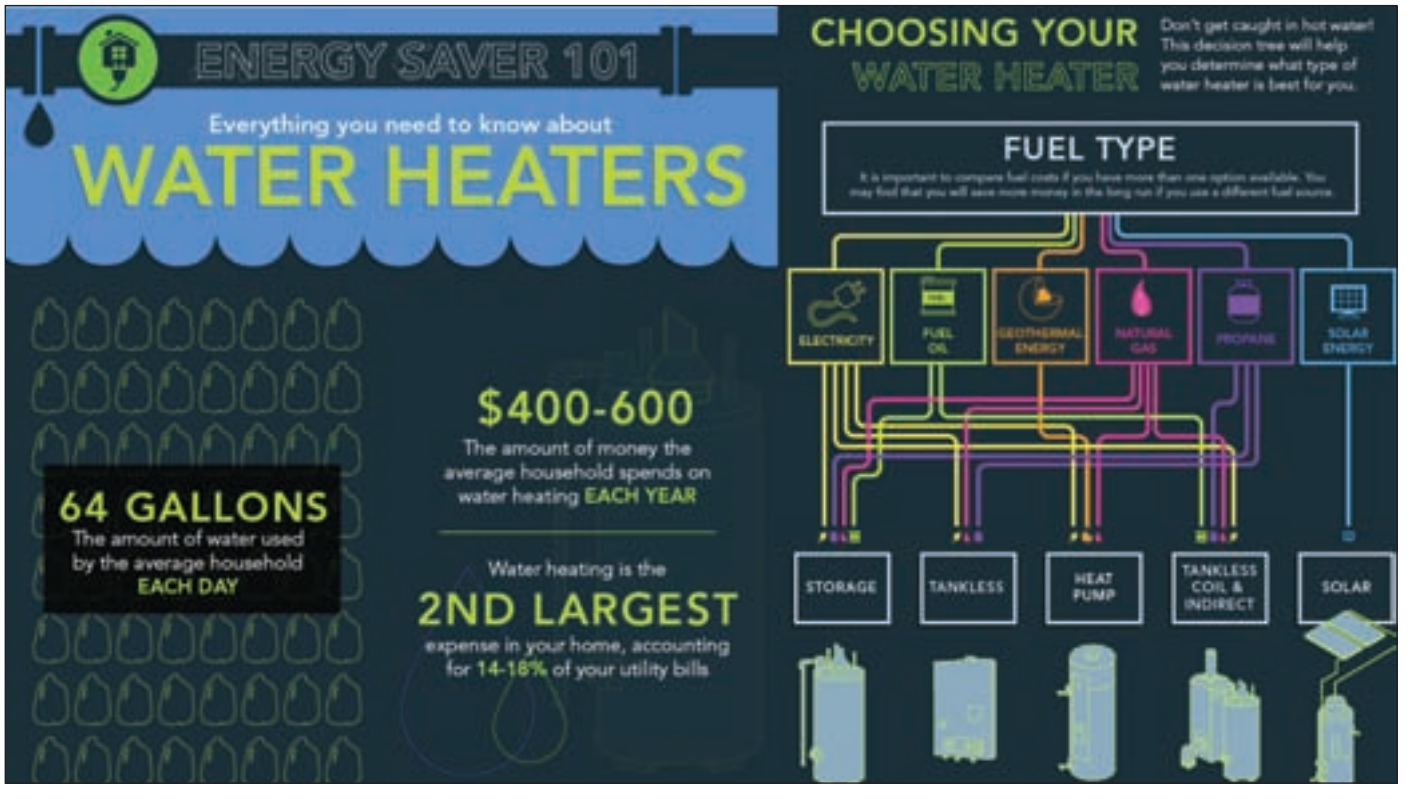
In 2020, the average annual electricity consumption for a U.S. residential utility customer was 10,715 kWh a year (https://bit.ly/35SSNxo). At that rate, wastewater extraction could provide an equivalent kWh (in thermal energy) for 44,846,395 U.S. households.

According to the U.S. Census Bureau, as of 2019, there were 139,684,244 U.S. households — meaning wastewater energy recovery has the potential to recover more than 32 percent of that energy.

Energy extraction

Wastewater thermal energy extraction is here. It sounds messy, but don't worry; others have done much of the dirty work for us. This technology is related closely in concept to energy recovery ventilators and will likely be a code requirement in the coming years.

Lynn Mueller, chairman of Sharc Energy, has been a pioneer of this technology and was in New York



City with one of our clients in February 2022. This cooperative apartment complex in Manhattan saw that wastewater thermal energy exchange was the most cost-effective use of geothermal exchange-type heat pump technology available today to reduce greenhouse gas emissions.

Whenever you take a shower, run the wash machine or dishwasher, the temperature of the water going down the drain is going to be warm, at least as warm as the indoor temperature. It even counts for flushing toilets because those flush tanks often have enough time indoors to assume room temperature.

Wastewater energy exchange extracts the heat by sending wastewater through a heat exchanger, where a geothermal heat pump heats the domestic water. It can even provide space heating and cooling, or about any other heating and cooling function that may be needed.

Similar to an ERV in principle, the heat going out of the building is captured and sent back to a mechanical device — in this case, a heat pump providing domestic hot water, heating and cooling. In this process, the energy stays in the building and is re-used.

After noting the energy consumption in US buildings, it's easy to see that DHW runs second only to the energy consumption for heating and cooling

It's important to understand some of the ways energy can be recovered. It's easy to convert waste heat, or thermal energy, to a warmer temperature by use of a fluid/water-sourced heat pump, more often called a geothermal heat pump. A GHP's job is to move thermal energy "uphill" — to increase the temperature. With 70-degree wastewater, the jump to 130+ degrees can be done efficiently, boasting a coefficient of performance of 4 or 5. A COP of 5.0 means that for every unit of electricity used, five units of heat are transferred.

GHPs are the central component of the thermal extraction/rejection portion of energy recovery. They use available energy in liquids between 25 degrees and 110 degrees and can absorb or reject heat to and from them. GHPs are thermal energy pumps, concentrating heat energy through the Carnot Cycle principle, delivering final temperatures from well below freezing to more than 140 degrees for uses such as space conditioning, refrigeration or domestic hot water.

Wastewater temperatures are favorable for the process of thermal transfer with GHPs. The average temperature of wastewater for all buildings/dwellings is between 65 degrees to 75 degrees, right in the middle of the highest efficiency ranges for GHPs.

A GHP uses liquid (similar to the water entrained in pipes, underground or even from a sewer line) as a heat source or a heat sink. There is a lot of energy in 70-degree water, but at that temperature, the water is also able to absorb vast quantities of energy effectively. When the water is giving off heat, it's a heat source. When it's absorbing heat, it's a heat sink.

Hydronic systems are amazing because they effectively channel BTUs within a pipeline, unlike air-source systems. GHPs make the magic happen by manipulating BTUs to whatever temperature is needed at the time. They are the center of the energy universe for renewable and sustainable energy systems.

[Disclaimer: I'm a neutral industry consultant. This story was selected solely on its value to the industry.] ●

Jay Egg is a geothermal consultant, writer and the president of Egg Geo. He can be reached at jayegg.geo@gmail.com.

Value Engineering Commercial DWV with Foam Core PVC

While the plumbing industry still debates cast-iron soil pipe or PVC, a new, even lower-cost alternative is being introduced on many commercial projects.

BY PAUL TULLY

Until the 1960s, mechanical engineers and plumbing designers specified hub and spigot cast-iron soil pipe joined with lead and oakum for drain, waste and vent systems in the vast majority of their commercial projects.

With the introduction of the CISPI 301 standard, hubless cast-iron soil pipe offered material and labor savings to plumbing contractors while still providing a durable, reliable system. PVC piping systems, first installed in Germany in 1934, began appearing in multistory buildings in the late-1960s and 1970s here in the US. However, PVC piping systems were primarily used in single-family and some multifamily applications during that time. Then, beginning with the Great Recession in 2008, many commercial contractors offered PVC as a value-engineered alternative to project owners to lower construction costs.

Today, while the plumbing industry still debates whether to use cast-iron soil pipe or PVC on a particular project, a new, even lower-cost alternative is being introduced on many commercial projects—cellular core PVC.

Within 60 years, a relatively short period in the history of plumbing, commercial DWV systems have been value engineered from hub and spigot cast-iron soil pipe to foam core PVC. Is the latest proposed alternative the right choice for commercial plumbing?

Cellular core PVC

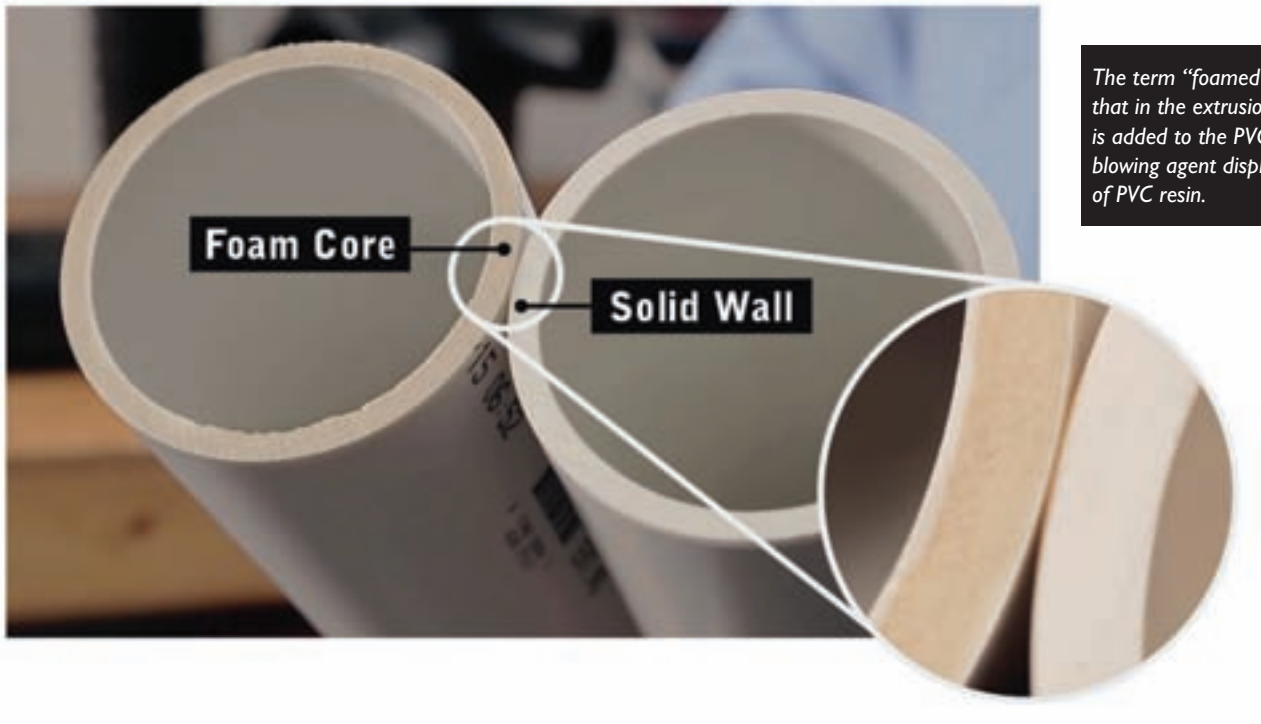
Schedule 40 PVC cellular core pipe, commonly referred to as foam core pipe, is manufactured to ASTM F891, *Standard Specification for Coextruded Poly(Vinyl Chloride) (PVC) Plastic Pipe with a Cellular Core*. This specification covers coextruded PVC plastic pipe with a cellular core and concentric inner and outer solid layers and is produced using a multilayer coextrusion die.

Product manufactured to this standard consists of a foamed PVC core and two thin skins of solid PVC. The term "foamed core" refers to the fact that in the extrusion process, a blowing agent is added to the PVC in the center layer. This blowing agent displaces a significant amount of PVC resin.

In essence, cellular core pipe has less PVC than solid wall PVC pipe. Cellular core PVC pipe is listed for gravity systems only and not rated for pressure. The print line on the pipe generally includes terms such as "COEX," "CELLULAR CORE" and "NOT FOR PRESSURE."

Cellular core pipe technology was developed in France in 1979 by Alphacan, a large, multinational pipe company. Alphacan introduced cellular core pipe into the French market in 1982, and the product quickly gained acceptance and market share.

The manufacturing process resulted in a pipe that was less expensive, lighter in weight and easier to cut. By the late-1980s, cellular core PVC pipe was produced regionally in parts of the United States by various pipe manufacturers, and it attained



The term "foamed core" refers to the fact that in the extrusion process, a blowing agent is added to the PVC in the center layer. This blowing agent displaces a significant amount of PVC resin.

PIPE STIFFNESS VALUES (lbf/in² @ 73°F †)		
Pipe Size	PVC Sch 40 F891 (Foam Core)	PVC Sch 40 D1785/ D2665 (Solid wall)
2"	300	600
3"	300	510
4"	200	310
6"	120	150
8"	100	100
10"	60	78
12"	50	63
14"	—	59
16"	—	59

significant market share in single-family residential construction.

It is interesting to note that many plumbing professionals commonly refer to solid wall PVC pipe as "Schedule 40" and cellular core pipe as "foam core," conflating the topics.

For an engineer reviewing submittals, it is important to remember that both solid wall and foam core are manufactured to Schedule 40 dimensions. Schedule 40 refers only to the dimensions of the pipe (O.D., wall thickness, etc.) and has nothing to do with the material composition of the pipe. If engineers scan the piping submittals and see "Sch 40," they may think they are getting solid wall PVC pipe. Submittals for solid wall PVC pipe will contain references to ASTM D2665 and ASTM D1785.

Code compliance

The ASTM F891 manufacturing standard is referenced in all major model plumbing codes. As with any code item, always check with the authority having jurisdiction for acceptability, limitations or restrictions. In some local jurisdictions, cellular core pipe is not permitted in commercial construction.

It is important to remember that code compliance is the minimum requirement for performance of any given material. Just because a product meets the code does not mean that the material is optimal, or even viable, for a particular project.

So, how does cellular core PVC pipe compare with solid wall PVC pipe? Engineers, designers, specifiers, contractors, building owners and facility managers should evaluate the performance capabilities of all materials based on the requirements of the specific project over the life of the structure.

Here are several points to consider:

Strength: In buried applications, a commonly asked question is "What is the crush strength of PVC pipe?" The questioner often wants a simple answer in tabular format and is sometimes frustrated with the complexity of the answer.

As flexible systems, both cellular core and solid wall PVC piping systems work with the surrounding soil to support an earth or live load, termed the "soil-pipe mechanism." For that reason, the crush strength of a section of PVC pipe in a press without the support provided by the surrounding soil is not relevant.

The Iowa Formula is commonly used for this purpose. The Uni-Bell PVC Pipe Association publishes a very helpful calculator based on the Iowa Formula that is available as a free download from its website (uni-bell.org). Uni-Bell's Handbook of PVC Pipe Design and Construction is an excellent and inexpensive reference that aids in the use of the calculator.

The Uni-Bell calculator allows a designer to input variables specific to the application, including maximum allowable deflection, soil modulus, load parameters, additional live loads, pipe diameter and pipe stiffness. Pipe stiffness values for these equations can be taken from the applicable ASTM standards and are available from pipe manufacturers.

The table on this page lists the pipe stiffness values from the ASTM F891 and ASTM D2665 standards. The pipe stiffness values differ for foam-core PVC and solid-wall PVC pipe for smaller diameters, eventually merge at 8-inch diameters, but diverge again at diameters of 10 inches and 12 inches. When these values are entered into the Iowa Formula, the results demonstrate a greater load capability for solid wall PVC pipe than form core.

Sound attenuation: Many consider foam core PVC pipe to be the "loudest" DWV pipe. Sound attenuation is a function of material density. The more dense the piping material, the better sound attenuation it provides.

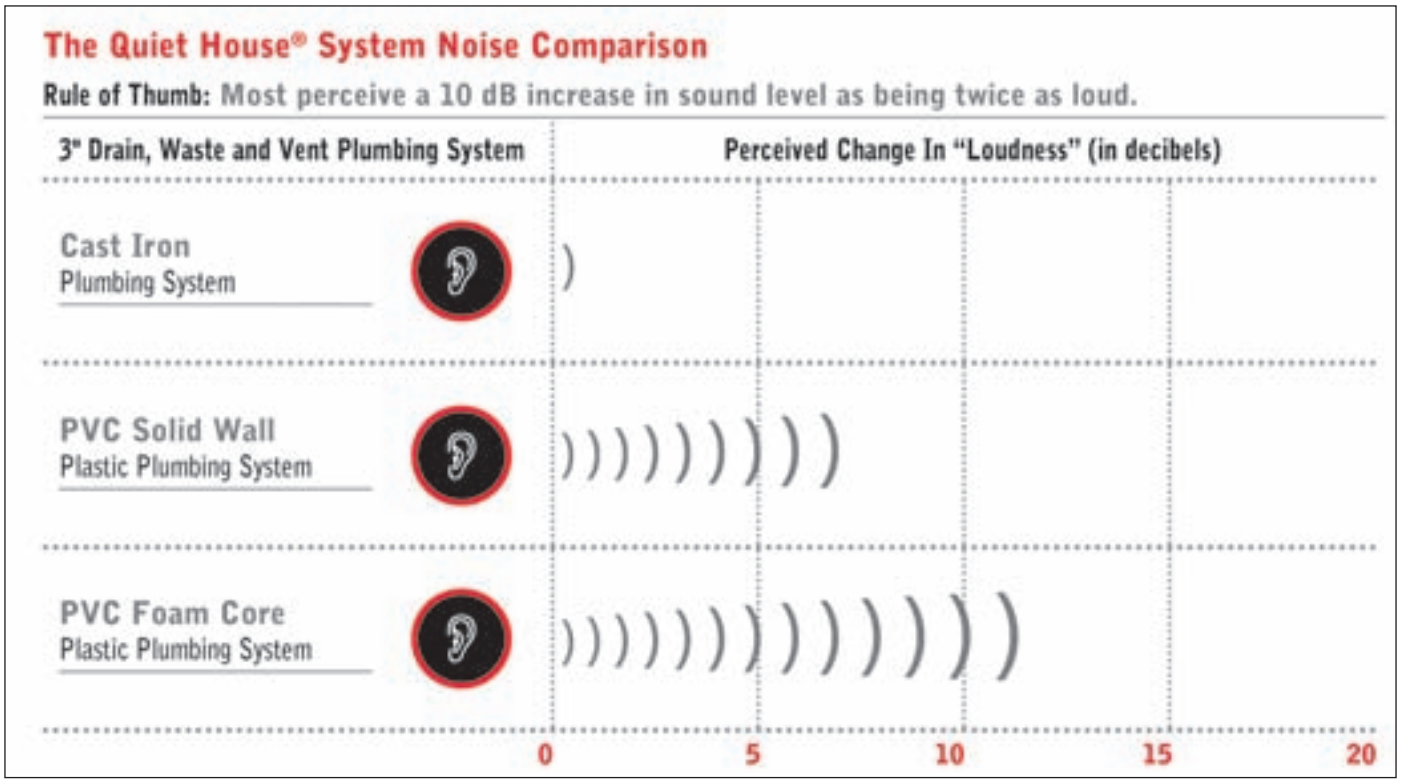
The chart on the next page shows the perceived "loudness" provided by the three most common types of DWV piping systems.

While advocates of foam core PVC pipe contend that the market offers numerous products that can be used for sound abatement on these systems, many times the addition of sound-attenuation materials can negate the cost savings that foam core PVC pipe offers.

Keeping in mind that a contractor's biggest cost factor is labor, does it make financial sense to go back a second time and install more material on the same system? For facilities and structures that require minimal ambient noise levels, such as schools, hospitals, upper-end residential and condominiums, foam core pipe will probably not be the optimal material choice.

Temperature capabilities: Cellular core PVC pipe is manufactured from the same PVC compound as solid wall PVC pipe. It, therefore, has the same temperature capabilities as solid wall PVC. Both PVC products have a maximum operating temperature of 140 degrees.

Installation: Both cellular core and solid wall PVC pipe are joined using



a two-step solvent welding process consisting of primer conforming to ASTM F656 and cements conforming to ASTM D2564. Cement manufacturers make no distinction between these two different piping systems in regard to cutting, preparation, joining, cure times and set times.

In above-ground installations, cellular core PVC has the same requirements for horizontal and vertical support. Additionally, both are combustible per ASTM E136 and, therefore, cannot be installed in a return air plenum without additional fire wrap.

Below ground, there is a major installation requirement difference. While both products are suitable for burial, as mentioned earlier, solid wall pipe is somewhat more robust and stiffer, particularly in sizes 6 inches and smaller. However, ASTM F891, Appendix X3, Installation, paragraph X3.1, has the following limitation: Maximum aggregate size shall be limited to ½ inch (13 mm) for angular and ¾ inch (19 mm) for rounded particles.

This statement is significant, as ASTM D2321, *Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications*, allows aggregate and stone that pass through a 1½-inch sieve. In other words, foam core PVC pipe takes even more care than solid wall PVC pipe to be installed below ground.

Mechanical maintenance: In facilities that require regular or frequent cleaning, the use of mechanical devices such as auger bits or snakeheads is commonplace, and special consideration should be used when selecting what material can or should be specified.

Repeated passes with a mechanical cleaning device can eventually nick, chip or wear down the thin inner wall to the point where the cellular core is exposed to the effluent being conveyed. While there is no definitive study that determines how many passes with a mechanical device will lead to pipe degradation, many specifiers will avoid the issue altogether and require solid wall PVC.

Jobsite damage: Because cellular core pipe consists of two thin skins, it is more susceptible to job site damage. Damage to the surface of cellular core pipe could lead to increased leaks in the pipe itself or an issue known as "weeping" should the pipe have to endure sustained static head pressure in the event of a blockage during operation of the system.

Cellular core PVC does offer advantages, primarily lower cost, lighter weight and easier cutting. However, these advantages must be evaluated against the loss of strength and sound attenuation, additional care required in underground installations, and additional maintenance considerations that are inherent with cellular core products. ●

Paul Tully is a field technical representative for Charlotte Pipe and Foundry Co. Tully, a 30-year plumbing industry veteran, focuses educating engineers, designers, contractors and code officials on products and industry trends.

Decision Criteria Checklist

- To determine whether cellular core PVC is acceptable or appropriate for a given commercial project, evaluate these decision criteria:
- Does the AHJ allow cellular core piping in commercial construction?
- What are the burial conditions?
- What are the backfill materials?
- Is sound attenuation important to the successful use of the facility?
- Will the lower price of using cellular core PVC outweigh the additional cost of adding higher-performing sound-abatement materials?
- Will the facility require regular or frequent cleaning using mechanical devices?
- Will the savings generated by using cellular core PVC outweigh any potential future issues?

CONTRACTOR STORIES

continued from page 32.

My preferred method of design is to approach these kitchen projects as two stages of heat. The radiant floor panel would be the first stage of heating, managing the load through the bulk of the winter. And the ceiling would be the second stage, banging on only during the coldest days. This is easily accomplished with a two-stage thermostat and a couple of relays; don't forget to use a floor sensor with projects including hardwood floors. I prefer to use them on all my jobs, but that's just me.

I think radiant ceilings are too often overlooked as an option for primary heat and supplemental heat if needed. Once you know the heat loss and the area of space, the rest is simple. And you get to install it standing up. No knee work, no bending over, no crawlspaces. ●

Stephen Minnich has nearly 40 years of experience in the heating industry, primarily designing, servicing and installing hydronic systems. He's moved from the Chicago area to Las Vegas and has hung up the tools for good. His newest venture is Minnich Hydronic Consulting & Design. He can be reached at stephen.minnich@yahoo.com or 630-291-3028.

VIEWPOINT

Extraordinary Becomes Ordinary

BY STEVE SMITH, EDITOR

It used to be that "going above and beyond" was reserved only for an extraordinary effort to get the job done. Commendable, of course. But no one expected it had to be done every day. Now, however, the extraordinary effort is just an ordinary effort to get the job done.

With supply chain matters continuing to vex most every industry, we've read plenty recently about the routine efforts made to help PHCP customers get what they need.

When a boiler in a 20-unit apartment went out, Brian Stack, president of Stack Heating, Cooling & Electric, Avon, Ohio, needed a $500 circuit board to make the repair. But the replacement board wouldn't get to his supply house for another three weeks.

So, Stack went a route he would have never considered otherwise and that most distributors would never give an OK on. Stack placed an order for the board, but also bought a whole new boiler for $13,000.

He removed the circuit board from the new one and put it in the old boiler to get heat back on to the apartment building. Then, once the replacement board finally arrived, Stack put that into the brand-new boiler and returned it to the distributor, which had already approved the return.

"In the past it's in stock at a supply house, we just call up and say we need this piece of equipment," Stack says in an article published in the March 2 edition of the Wall Street Journal. "And we'll go and put it in. Now, it's a scramble."

Scramble, indeed. The feature makes us think of the classic line, "I've got good news, and I've got bad news."

Want the good news first? In many cases, the pandemic has proved to be a boon for our industry. Apparently, it's dawned on plenty of people stuck working from home for the past two years that their homes require plenty of professional work to be comfortable. ACCA, for example, says shipments for central air conditioners and air-source heat pumps increased more than 9 percent in 2021 from 2020. Meanwhile, HARDI distributors reported a 35 percent increase in January sales, with an average annual sales growth for the 12 months through January 2022 up 25 percent.

Want the bad news first? Makers of HVAC equipment can't keep up with the demand created by the pandemic because of all the various manufacturing and shipping problem created by the pandemic.

The WSJ article, for example, reports Trane, Carrier and Johnson Controls have said order backlogs are rising, in some cases hitting record levels.

"It's very, very disruptive," says Dave Regnery, Trane's CEO, in the article, adding that his factories are making constant adjustments to staffing and inventory to keep production rolling. "This is a plant manager's kind of nightmare."

The article goes on to discuss many other creative, but expensive stopgaps contractors and wholesalers have had to take. How about you? What have you had to do to get what you need to get the job done? Tell me about in an email at: steve@phcppros.com. ●

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