ASPE
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Monthly Newsletter | MARCH 2021

UPCOMING MEETING

MARCH 24th: 5:30pm-7:00pm

VIRTUAL MEETING

TOPIC:
Water Heater Sizing, Construction, and Efficiency

Speaker: Jeff Henscheid
PVI / Watts

REGISTRATION AVAILABLE AT:
https://education.aspe.org/products/baltimore-chapter-meeting-water-heater-sizing-construction-and-efficiency-mar-2021

Meeting will be free to ASPE members

Non-member fee is $25

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In This Issue

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Local Chapters are not authorized to speak for the Society. Newsletter questions please contact Jason Eagles

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- All ads must be paid in full prior to the advertisement being included in the newsletter.
- Advertiser must provide ads in high resolution PDF format. Logo must be provided in .jpeg format 200px wide max.

•Cost per advertisement size is as follows:

Size	Per Year
Full page	$750
½ page	$500
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Please Contact Jason Eagles or Jeff Edwards

Make checks payable to Baltimore Chapter of ASPE. Please contact the chapter Treasurer with any questions.

Kathy Dwyer
EJ Dwyer Company Inc.
kdwyer@ejdwyer.com

Jeffrey W. Edwards, CPD ,GPD
President

President's Report

As I begin my March President's Report, I'm happy that the weather forecast for the second week of March is to have sunny weather with temperatures ranging from the mid-60's to highs in the low-70's at end of the week. I'm on board for this type weather!!!

Speaking about nice weather, I'm very happy to report that we will be holding our annual golf outing this year, on Friday, April 23rd at our usual home course at the Timbers of Troy golf course. Our golf chairman, Dave Goodell has confirmed as of now, we will be able to have a cookout following our golf rounds while following seating and distancing protocols at the course. Keep your fingers crossed that no other restrictions will have to be followed. Please see the fliers attached in our newsletter for registration and sponsoring information. Hope to see all of you.

Those of you that are interested in obtaining your ASPE CPD (Certified Plumbing Designer) certificate from ASPE, please note that Dave Bailey with be holding a CPD review class on March 13 and 14th, virtually, from Kathy and Ned Dwyer's office. Cost is approximately $44.00 that includes a review manual. If you are a member of the Baltimore ASPE chapter, we will cover your expenses. Refer to the attached flier in our newsletter for additional information.

Today is International Women's Day. I would personally like to salute the following ladies that are members of our proud ASPE chapter and thank you all for being ASPE members and for all you do in our industry, 1) Sherry Abbott-Adkins, P.E.,CPD; 2) Nicola Anderson, P.E.; 3) Kathy Dwyer, our chapter's first lady; 4) Rosa Flickinger, CPD; 5) Meggie Gabrielian; 6) Jennifer leach, P.E.; 7) Nikita Patel, E.I.T., MBA; 8) Karen Schulte, P.E., CPD; 9) Madison Stine, E.I.T., CPDT; and 10) Jeanne Tebera, P.E.

If you have anything you would like to discuss with me regarding the chapter, invite me to play golf, or help me wash my BIG F250, please feel free to contact me!
Stay safe,
Best Regards,
Jeff Edwards, CPD, GPD
President-ASPE Baltimore Chapter

Virtual CPD Review Session 2021

The Washington DC and Baltimore ASPE Chapters are considering offering to its membership a virtual CPD Review Session tentatively scheduled for Saturday, March 13th and Sunday, March 14th should there be an advance expressed interest by its ASPE Chapters' members. The two-day session will be from 9:45 AM to 3:30 PM with a 45-minute lunch break both days. If you are interested in participating in the proposed virtual CPD Review Class next month, then please forward an e-mail by Tuesday, March 2nd to either Kathy Dwyer or Ned Dwyer at the following respective addresses: kdwyer@ejdwyer.com and ndwyer@ejdwyer.com so that it may be determined whether the level of interest justifies committing to the proposed virtual CPD Review Session 2021.

The new 2020 CPD Review Guide should be available in time for the proposed class. More details to be provided once the Review Session is assured. Please indicate whether the Chapter is to reserve a manual.

David Bailey

David M. Bailey, CPD, GPD, FASPE

DATE: March 13 and 14, 2021 from 9:45 AM to 3:30 PM
LOCATION: E.J. Dwyer Co. 10910 Pump House Road, Annapolis Junction, MD 20701
CONTACT: Kathy Dwyer – kdwyer@ejdwyer.com – Mobile: 443-250-0285
Ned Dwyer – ndwyer@ejdwyer.com – Mobile: 443-250-4275
Office - (240) 553-0112

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7:30 AM	Registration/Check-In/Breakfast		
8:30 AM	Shotgun Start Scramble Format "Captain's Choice" Mulligans Available	1:30 PM	Cookout (Hamburgers, Hot Dogs, etc.)
		2:00 PM	Awards & Prizes

Sponsors and Participants, please contact:
David K. Goodell
dgoodell@jamesposey.com
James Posey Associates
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Make checks payable to ASPE Baltimore Chapter.
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PLEASE RETURN COMPLETED FORMS BY APRIL 9, 2021

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2021 ASPE Baltimore Chapter Golf Outing Sponsorship Levels

○ **Tee Marker (with Foursome)**	**$125.00**
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All proceeds from the Golf Outing will benefit future Chapter events and activities.

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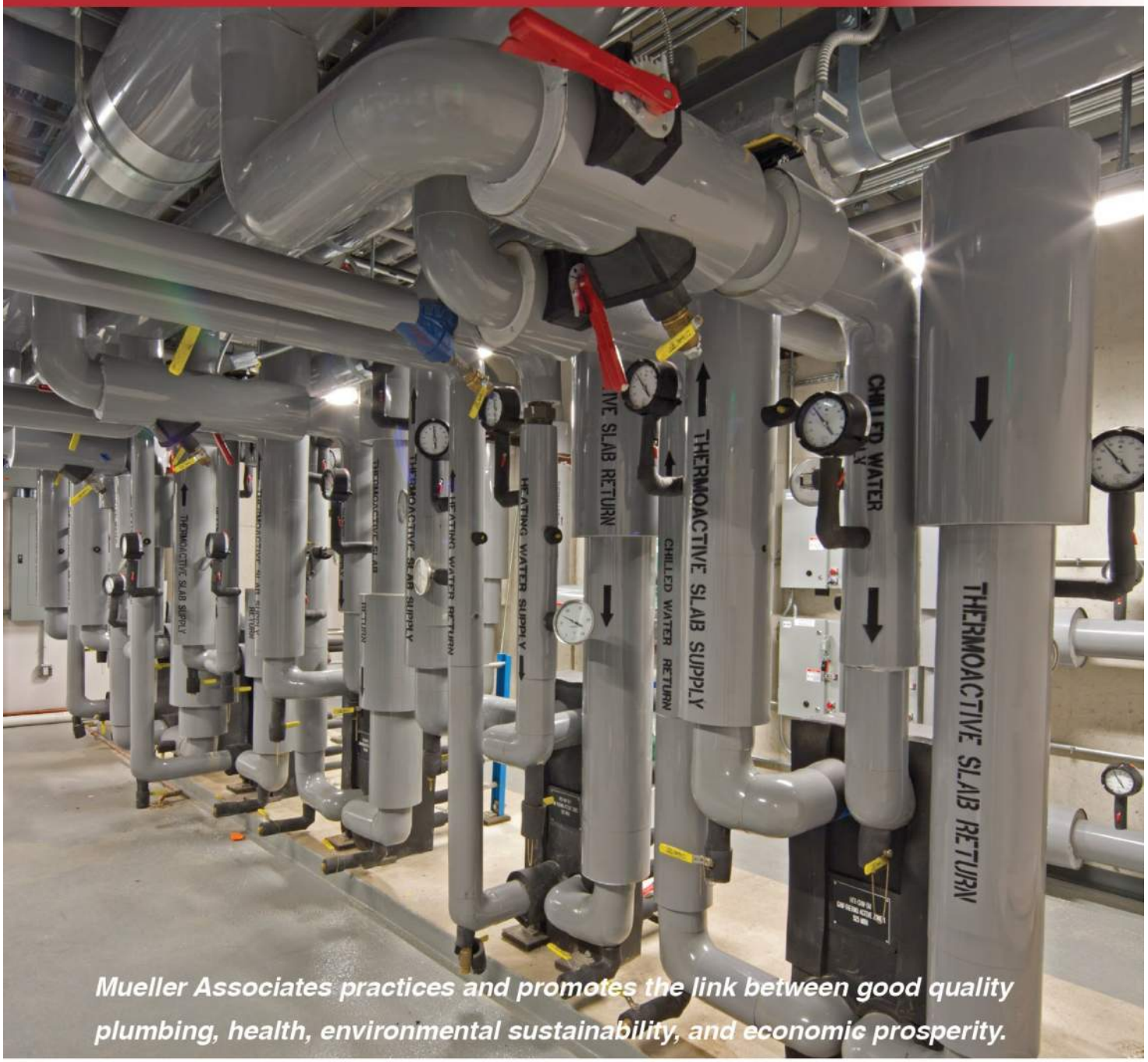

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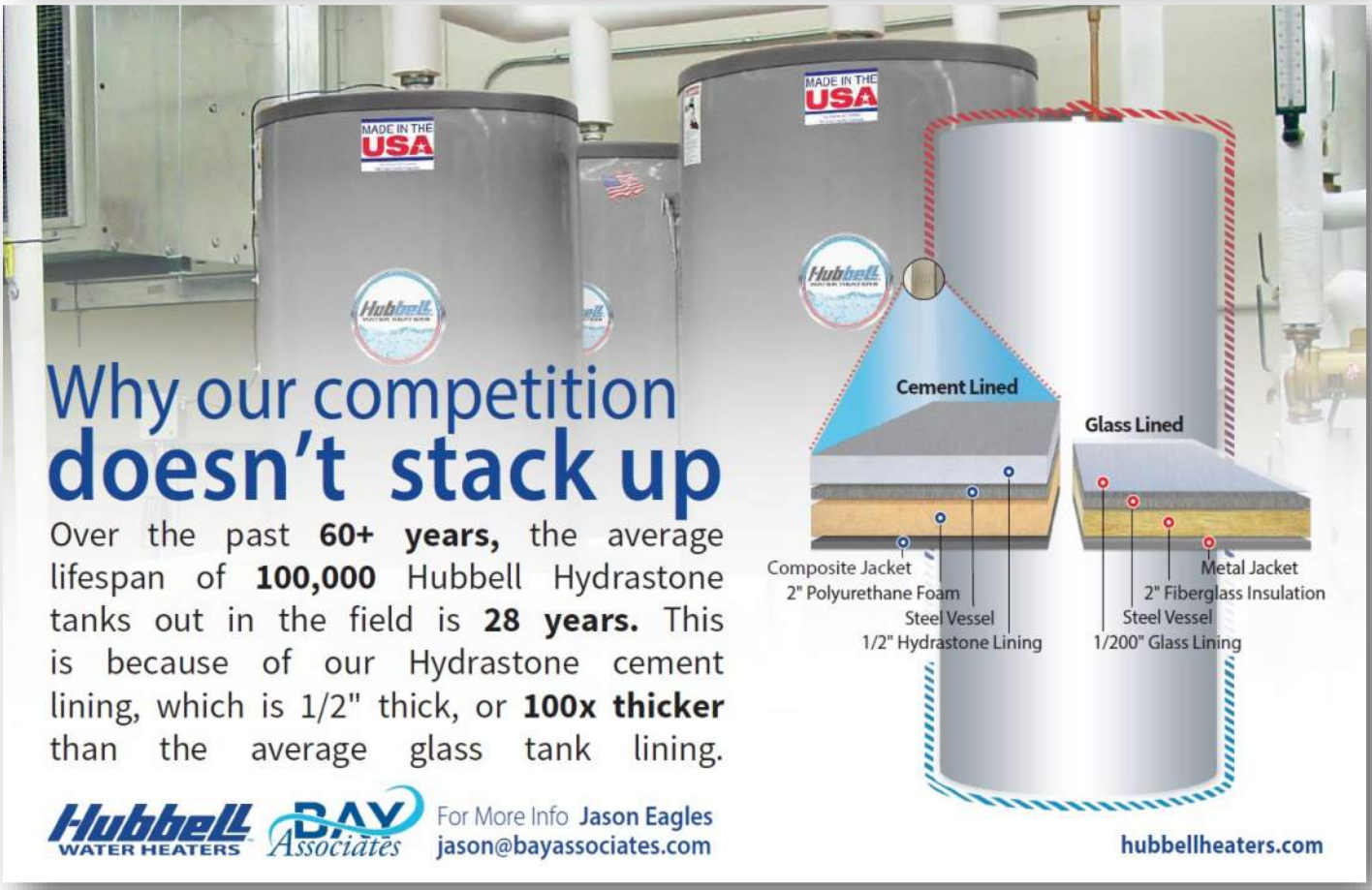

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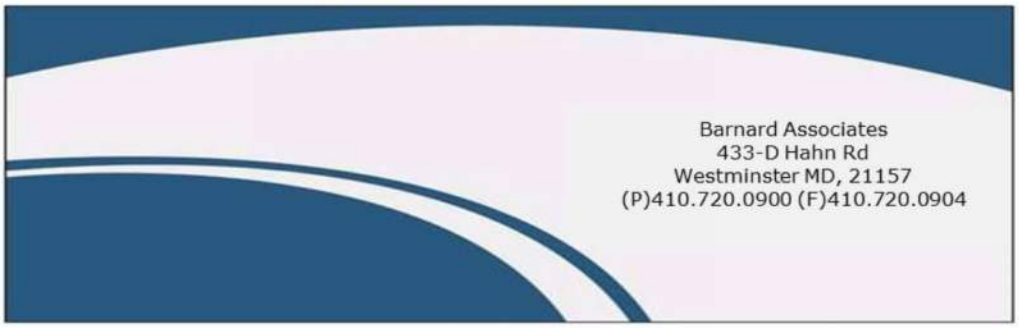

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Chuck Swope, PE, CPD, LEED AP BD+C
Vice President—Technical

Technical Report

Spring is right around the corner, no thanks to a particular ground hog (you know who you are, Phil). With that, we close our February Fire Protection month but that doesn't mean it's any less important any other time of the year. Please thank our presenter, Professor Ken Isman for his great seminar on Fire Protection Standpipes. We had a record 47 registrants for last months meeting, most of which attended! I sent the slides out to all of the registrants, so please let me know if you didn't receive them.

This month we'll shift focus to another life safety device, Domestic water heaters. You may say to yourself, "What does a water heater have to do with life safety?" It's easy to see that heated water is necessary for all of processes from washing hands to cooking our food. What is also important to remember is that bacteria and other biological growth love the same water temperatures that we do! Maintaining proper water temperatures to prohibit that growth is paramount to a healthy building system. We've invited Jeff Henscheid from PVI to (virtually) present on the topic of Water Heater Sizing, Construction, and Efficiency. He'll discuss the main types of water heaters, tools and tips for sizing them, and the efficiency standards that govern them. Currently, Jeff is the Regional Sales Manager for PVI Industries, based in Fort Worth, Texas. After attending Midwestern State University, he has been in the industry for the last 37 years, serving in sales management for three different manufacturers. Jeff was also the National Sales Manager at PVI for 23 years. Please welcome Jeff to Baltimore and see what he can teach us.

Best Regards,
Charles J. Swope, PE, CPD, LEED AP BD+C
Vice President - Technical

Storage-type Water Heaters vs. Water-Tube Instantaneous: Which is Better for Legionella Control?

Although a good deal of conversation surrounds water heater design and Legionella, the conditions that contribute to the uncontrolled growth of Legionella are much more prevalent the closer one gets to the faucets and the farther from the water heater. Storage tanks can contribute to Legionella growth; if certain conditions are allowed. However, from more than four decades of research we now understand these conditions and know how to mitigate them. Do it right and storage tanks are not a problem. Centralized, instantaneous, water-tube water heaters are not a better solution (especially from a "whole building" perspective) and many of the claims of instantaneous, water-tube, water heaters should be questioned.

Stagnation or low flow

Storage Type: Tanks are lower flow (at times stagnant) but science proves that no or low flow contributes less to biofilm growth than higher flow rates. (***Stagnation should not be equated with high residence time.)*** It's presumed that the occasional water stagnation or relatively low flow velocity (~0.5 ft/sec) during operation contributes to higher biofilm growth on the sides of the storage tank. Actually, biofilm grows slower under a no-flow or low-flow rate compared to higher flow rates under the same water conditions. This was first documented in the late 1990s and has since been confirmed in several additional research studies [1,2,3,4,5,6]. Those who continue to preach that low or no flow equates to more biofilm and more Legionella than the higher flows typical of domestic water systems, are being disingenuous or are unaware of the scientific evidence.

Instantaneous, water-tube: When they operate, there is flow. But the flow varies with demand, and flow is not sufficient to prevent or remove biofilm from heat exchanger surfaces. Manufacturers suggest that the high-flow environment of the water-tube design inhibits or prevents the formation of biofilms. The flow rate through a 250,000 BTU water-tube module typically ranges from 0 gpm at no load to 6 gpm at maximum recovery. One manufacturer suggest a 10 gpm flow with a velocity of 8.5 ft/sec is normal and can therefore routinely shear biofilm from tube walls and render the exchanger "legionella free." This flow rate is possible but is certainly not practical or typical when considering proper water heater sizing as indicated in the table below for a condensing, 250,000 BTU water heater at 130°F.

Gal/Min	Feet/Sec	ΔT @ .94E_t	Inlet Temp for 130° Outlet	Notes
5.2	4.42	90°F	40°F	← Heater would be sized here.
6	5.10	79°F	51°F	← Or maybe sized here.
7	5.95	67°F	63°F	
8	6.80	59°F	71°F	
9	7.65	52°F	78°F	
10	8.50	47°F	83°F	This flow rate assumes usage increases with increase in inlet water temperature. Not true.

Table information extrapolated from Intellihot ASHRAE webinar presentation "Is ASSE 1017 and Legionella your worst enemy?," 2019

The BTU input of a water heater is sized for maximum building demand (output) at the lowest expected inlet water temperature, for example 40°F or maybe 50°F. Therefore, if 6 gpm maximum flow is used to size the heater, this flow (hot water demand) is expected to be consistent throughout the year as would the resulting velocity. Warmer inlet water does not affect hot water demand, flow rates or flow velocity.

For water-tube, water heater models where multiple heat exchangers are combined in a manifold and modulate to share the load, the annual average velocity through any one heat exchanger in the collective is estimated at 3 ft/sec due to daily variation in hot water demand. This velocity then drops considerably when flowing through the larger-diameter header manifold pipe that connects all hot water outlets from each heating module. In the header, the velocity will regularly drop below 2.0 ft/sec. In the modules and in the header, the average velocities are well within the range of biofilm formation and the occasional higher flows are not sufficient to remove it. The header is a considerable concern due to potential temperature drop during extended low demand periods.

It is true that sufficiently high flow rates can shear biofilms from the surfaces of pipe walls, but these velocities are thought to begin at 10 feet per second [6], far higher than ever recommended in domestic plumbing systems due to the resulting erosion and noise.

Sediment

It's been known since the mid-1980s that sediment and scale precipitant at the bottom of a storage tank, a water heater, or anywhere in the plumbing system can provide a prime location for the development of biofilm and potentially promote Legionella growth.[7]

Storage Type*: *Sediments and precipitant accumulates over time but can be flushed out easily. The low- turbulence environment in a storage tank allows the sediment and precipitant to collect at the bottom and provides the opportunity to regularly flush the material through the bottom drain valve. The heater design and the regular tank flush largely eliminates sediment from the entire building piping system and by doing so helps to maintain a residual disinfectant level. In addition, modern, top-fired, condensing tank-type heaters suffer no efficiency loss due to the small amount of sediment and precipitant that accumulates at the bottom of the vessel between flushing cycles.

Instantaneous, water-tube: Sediment and precipitant can be carried into the building piping. The flow-centric design of instantaneous, water-tube water heaters forces scale precipitant and sediment to be carried into the common hot outlet header or into the building piping, where the sediments' potential to harbor Legionella continues. Afterward, locating the sediment and eliminating it from the building piping system becomes a more difficult if not impossible task.

Temperature stratification

Storage Type: Occurs due to relative densities. Hot water is less dense than colder water and temperature in storage tanks will naturally stratify. Toward the bottom of the tank, water temperature will be within the optimal growth range for Legionella (~95°F to 115°F). However, in the presence of a typical and maintained residual disinfectant level, microbial growth in water is curtailed regardless of the temperature. The typical residual (free) disinfectant level of water entering a building from a municipal distribution system is between 0.2 to 0.5 ppm, which is highly effective at eliminating Legionella in open water and, when maintained, has also been shown to mitigate biofilm growth under certain water quality conditions [19, 20].

Instantaneous, water-tube*: *Occurs due to forced counter-flow of water and flue gases. Although this style of heater is not generally considered to experience temperature stratification, they absolutely do for condensing models as it is required by the laws of physics. In higher-efficiency condensing heaters, stratification is required to achieve condensing operation because flue products must pass across portions of the heat exchanger that contain cooler water for condensing to occur.

Operating temperature

Storage Type: A 140°F set point is recommended because it kills Legionella. All consensus Legionella control guidelines state that water should be stored at 140°F [23,24,25,26]. At 140°F, the decimal reduction time for Legionella Pneumophila serogroup 1 (the most pervasive and temperature tolerant strain) in open water is 2.7 minutes. Meaning a 9.99% kill rate (3 log) can occur within 8.1 minutes [16]. A storage water heater has an adequate volume of water at 140°F to provide the needed exposure time and this is a sufficient Legionella control maintenance temperature. It is often stated that 140°F water kills Legionella in 32 minutes. This is true in a highly contaminated environment with 1 x 10^7 or more bacteria per milliliter (99.9999% kill) and should not be considered a typical scenario for maintenance [18].

An additional and often over-looked benefit of 140°F water temperature is its ability to kill amoeba within the same time frame as Legionella. Many experts consider the prime growth mechanism for Legionella in a building plumbing system to be replication within a host amoeba after consumption, during which time the Legionella are protected from disinfectant residuals [9,10,11,12]. When the number of Legionella clones exceeds the amoeba's capacity to contain them, the amoeba bursts and the Legionella are released into the piping system. The chlorine residual required to quickly destroy amoeba in drinking water is far higher than required for Legionella control and is dangerous for human consumption [13,14,15], so the 140°F temperature is an <u>essential</u> control measure.

Higher stored water temperature has raised some concerns; including scald risk and energy loss. The scald risk is addressed through the use of a failsafe digital mixing valve to blend water down prior to delivery to the building or point of use thermostatic faucets. The heat loss is addressed by the higher levels of tank insulation mandated by the Department of Energy. As a result, heat loss associated with 140°F stored water amounts to a fraction of a percent of the total energy used to generate domestic hot water. Compared to a 120°F stored water temperature, the difference in cost with a 250-gallon tank insulated to R12.5 (DOE requirement) would amount to an additional $10 a year (9.8 therms).

As a final note on stored water temperature, 140°F is a recommended <u>maintenance</u> temperature. The occasionally cited temperature of 158°F (70°C) is intended for an emergency and temporary thermal eradication of a building piping system. It should not be considered the recommended stored water temperature, although a tank could be set at this temperature if desired.

Instantaneous, water-tube: **Lower water temperatures are promoted but have a negligible effect on Legionella kill.** Manufacturers of instantaneous, water-tube heaters promote an outlet water temperature of 120°F to 130°F as a benefit compared to the 140°F recommendation for storage-type heaters. The claimed benefits are fuel savings via lower standby loss, reduced scald risk, and lower equipment cost through elimination of an ASSE 1082 main mixing valve. Manufacturers assert that the low water content of the water-tube heat exchanger naturally minimizes or "prevents" Legionella, so higher temperature is not required as a control measure.

It is not disputed that Legionella stops multiplying at a water temperature of 120°F, but laboratory studies differ, and experts do not agree on the length of time the bacteria can remain alive and viable in 120°F water [16, 17]. Achieving a 3 log kill at 120°F takes an estimated 14 hours. Achieving a 3 log kill at 130°F takes an estimated 1.5 hours. This is also true for their amoeba hosts. The concern is that 120°F or 130°F is initially not effective at killing the microorganisms and is then circulated through a building plumbing system, where maintaining the temperature becomes difficult if not impossible due to demand induced flow rate changes in what is often a complex hot water distribution piping system. When temperature drops 10 or 15 degrees, the still viable bacteria are exposed to an ideal growth temperature and possibly biofilms. Exacerbating the issue is that chlorine residuals are also decaying in that same piping system due to water temperature and the greater surface area to water volume ratio.

Unfortunately, simply adjusting the outlet temperature on an instantaneous water-tube heater to 140°F is no guarantee of killing Legionella because the exposure time is insufficient. Unless the required mixing valve is a considerable distance away from the water heater, the 140°F water would be blended down too quickly.

Preservation of a disinfectant level

Without a disinfectant level, the type of water heater is irrelevant when attempting to control Legionella in the building, so the focus must be on preserving and refreshing the residual. The central issue is avoiding prolonged residency of water in the system, which consumes chlorine residual through the bulk decay effect. Additionally, systems that have low water storage relative to larger amounts of surface area will see more rapid loss of disinfectant residual due to the influence of surface decay effect [21,22].

Storage Type: Proper water refresh rate can be accomplished by "right-sizing" the tank. The presence of a water volume alone is not related to the accelerated growth of Legionella. Occasional stagnation is common but prolonged residency of water can be avoided if the water heaters or tanks are sized properly. This regular refresh rate ensures that the residual chlorine level is maintained. Additionally, regularly flushing sediment from the bottom the tank eliminates another cause of chlorine consumption further preserving the disinfectant level. An additional benefit to a storage tank is the very low surface area to water volume ratio, which minimizes chlorine decay.

Instantaneous, water-tube: ***High surface area to water volume is a concern.*** The most assumed benefit of an instantaneous, water-tube heater is that the low water volume helps to

prevent the growth of Legionella. While refresh rate is naturally high during operation, what many people don't realize is that the large amount of surface area relative to the water volume within the water-tube heat exchanger results in accelerated decay of residual chlorine. It's known as surface or wall effect decay. Circulation further hastens chlorine decay by increasing the contact against the pipe walls.

When comparing the factors that influence the potential uncontrolled growth of Legionella, the claims made by makers of instantaneous, water-tube water heaters do not hold up to scrutiny against the scientific evidence. When properly sized, operated and maintained a storage water heater can play a role in an effective Legionella control strategy. Regardless of the claims made by any manufacturer, a water heater cannot eliminate Legionella, especially throughout the building.

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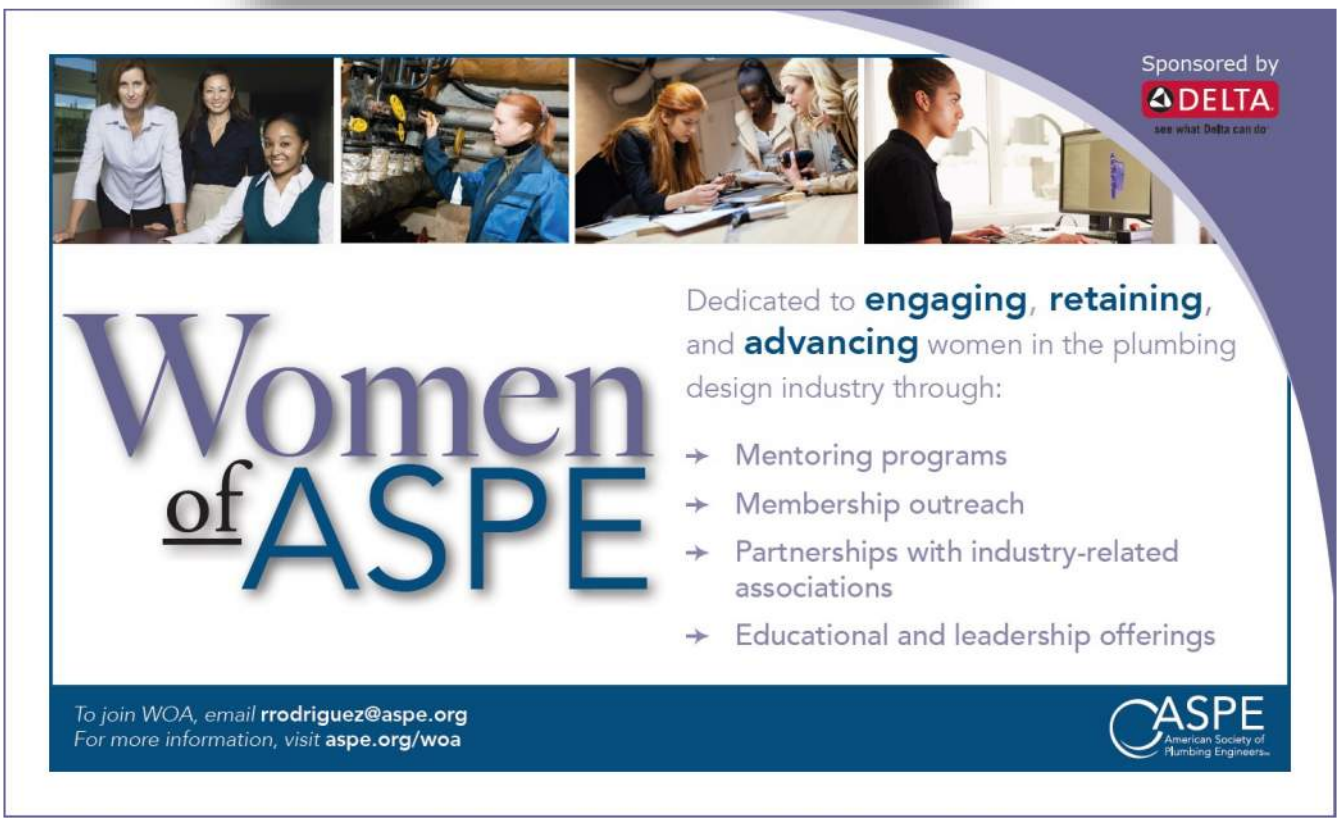
Nikita Patel, EIT, MBA
AYP Liaison

AYP Report

I don't have anything new to report for our AYPs this month. The National AYP Liaison role has recently been filled, and I look forward to bringing you some interesting events once I have had a chance to coordinate with national.

Thanks,
Niki



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Oatey Company was founded in 1916 with headquarters in Cleveland, Ohio. They are the leading manufacturer of solvent cement, roof flashings, washing machine outlet boxes, and hundreds of other plumbing specialty products. They are the parent company to other American-owned and operated brands, including **Keeney, QuickDrain USA, Cherne, Harvey, and Hercules**, with 18 locations worldwide.

www.tracpipe.com

OmegaFlex was established in 1975 and located in Exton, Pennsylvania. They lead the flexible metallic piping industry with over 200 registered patents worldwide. In 2004, they introduced the **TracPipe CounterStrike** flexible gas piping used for natural and propane gas for residential and commercial applications.

www.watts.com

Watts was established in 1874 by Joseph Watts, the inventor of water pressure regulators. They are headquartered in North Andover, Massachusetts, with 10 locations in the United States, and 50 locations worldwide. They are the parent company to several brands, also located in the United States, including **Ames, Backflow Direct, Dormont, and Mueller Steam**. They proudly support the Buy American Act on a number of their products.

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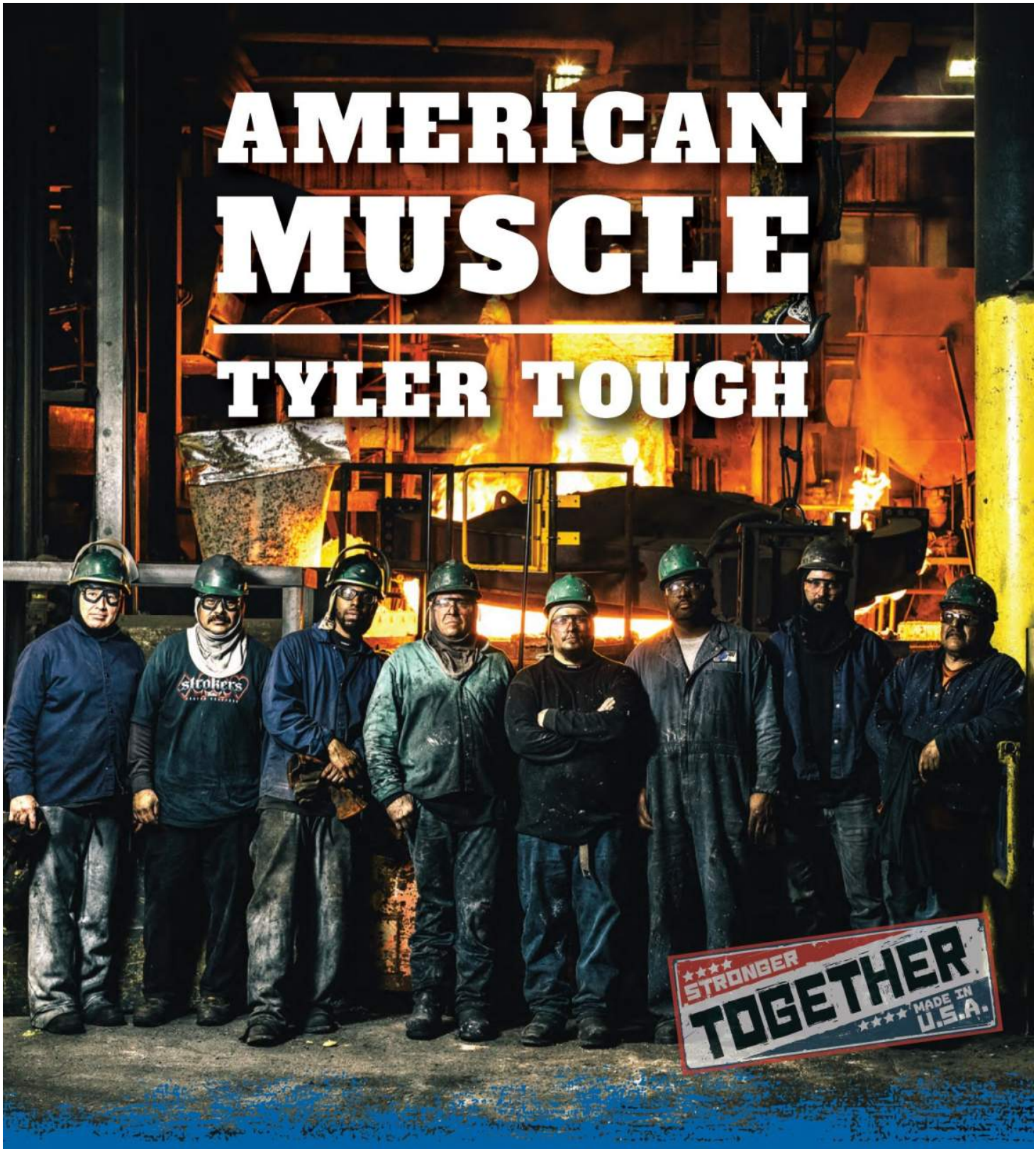

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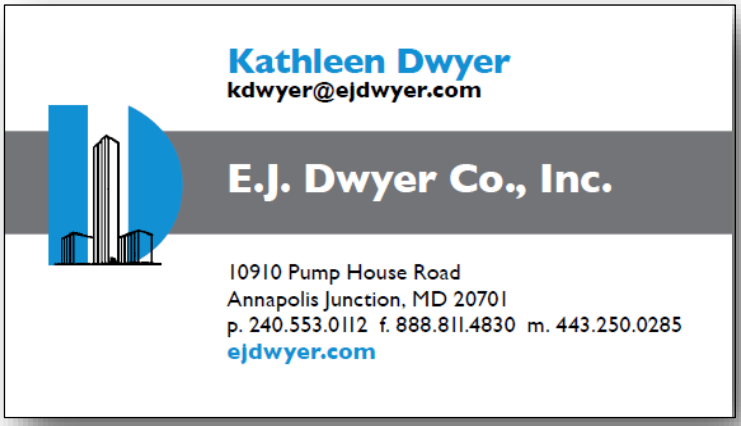
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2020-2021 ASPE Baltimore Chapter Meeting Schedule

Date: **September 23, 2020**
Speaker: Niki Patel -Sherman Engineering
Topic: NFPA 99

Date: **October 28th, 2020**
Speaker: Ed Ross -QuantumFlo
Topic: Booster Pumps

Date: **November 18th, 2020**
Speaker: Lauren Berenato –Jomar Valve
Topic: Valves 101

Date: **December 16th, 2020**
Speaker: James Walls–CISPI
Topic: Installation Standards of Cast Iron Piping

Date: **January 27th 2021**
Speaker: BJ Schrader/Laura Loziuk –McWane
Topic: Cast Iron and PVC Piping Value Engineering

Date: **February 24th, 2021**
Speaker: Ken Isman –UM
Topic: Fire Protection Standpipe System Design

Date: **March 24th, 2021**
Speaker: Jeff Henscheid –PVI
Topic: Water Heater Sizing, Construction & Efficiency

Date: **April 23, 2021**
Event: Annual Golf Outing

Date: **April 28th, 2021**
Speaker: STH
Topic: Electroadsorptive Water Treatment Technology

Date: **May 26th, 2021**
Speaker: Tom Weaver Associates /Franke
Topic: Engineered Infection Prevention

Date: **June 17, 2021**
Speaker: Joint Meeting / Philadelphia
Topic: Fire Sprinkler Protection of Rack Storage

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The Baltimore Chapter of ASPE continues to have successful meetings and is looking to continue improving throughout the year.

The Chapter has the following sponsorship opportunities for each month:

Tabletop Presentations: $100 to provide a tabletop presentation of equipment or material relative to the plumbing profession. The tabletops will be set up from the beginning to the end of the monthly meeting and provides the opportunity to provide a brief (under 5 minutes) presentation.

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