Common sense plumbing

A system in a Boy Scout camp protects against both scalding and disease.

BY DAVE YATES
SPECIAL TO CONTRACTOR

Master Plumber Dave Yates explains the piping system to Ranger Scott Holbrook while checking water temperatures.

Access to internal components for adjusting the Powers ASSE 1016 scald guard faucet is quick and easy.

My contracting company recently landed a design-build contract for a new bath house at Boy Scouts of America Camp Tuckahoe in southern Pennsylvania. In addition to standard showering facilities, ADA-compliant bathing areas would be needed and there were numerous sinks to plumb. A number of challenges arose: provisions for scald protection for diverse age groups with varying physical abilities; prevention of bacterial growth within the potable hot water system; energy conservation; and heating for the sections not winterized each year.

To begin with, a potable hot water system consists of three distinct parts: point of source, which is the water heater; distribution system, which is comprised of the network of piping supplying hot water; and points of use, which are the individual faucets where human contact with hot

water occurs. If I were to design a system that offered protection from both issues, it would be necessary to encompass all three parts into one coordinated cocoon of protection.

The building's cold water supply, which is delivered from a gravity-fed well-water storage tank with an atmospheric vent, was provided with a Watts double-check testable backflow preventer. Once potable water enters the bath house, it can only leave by way of a faucet being opened. This prevents any possibility of a sudden negative pressure if a main breaks or lower-elevation drainage point is opened while the system is down. Storage tanks are designed to withstand high pressures but can be quickly damaged if a vacuum builds.

I chose a Bradford White E-Force 99% efficiency water heater to serve as our point of source. One of the BSA credos is that we serve as good stewards for our environment. The Bradford White water heater accomplishes that through its frugal use of energy.

Yates trims out shower faucets as the bath house nears completion.

Temperature management

But I didn't set the storage temperature for 120° F, nor did I set it to maintain 140°. This tank's storage temperature would be set to maintain 160°. Interestingly enough, this does not result in any significant increase in energy usage because it only costs a few dollars' difference due to a very slight increase in standby jacket heat losses. The higher storage temperature also increased capacity due to a lesser proportion of hot water being needed for mixing with the cold water. There is no stack loss due to this water heater being equipped with sealed combustion that utilizes both PVC exhaust and combustion air lines. More on why I chose 160° as the set point later.

Since 160° is way too hot for distribution outward to points of use, a suitable means had to be included for managing our second piece of the potable hot water system puzzle. A Watts ASSE-certified 1017 thermostatic mixing valve was added to the potable distribution piping and set to maintain a minimum of 133°. A bronze circulator was incorporated to keep the distribution system constantly on the move while maintaining that 133° throughout its course, which prevents stagnation. Legionella will not gain a foothold here.

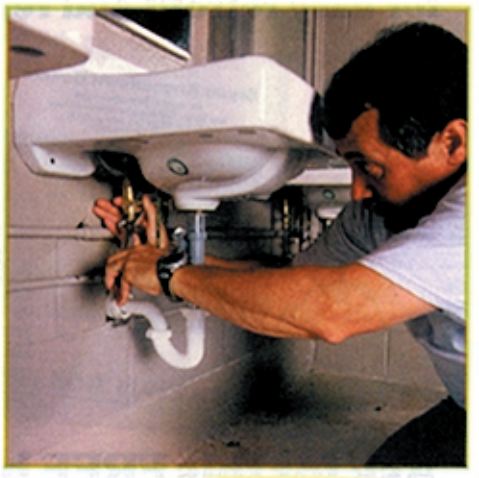
Most of the piping in this open-framed building would be exposed and our high temperatures too closely approached upper limits for rigid plastic lines. PEX was considered, but plastic piping expansion coefficients would have rendered the neatly installed lines into drooping or twisted runs. PEX-AL-PEX wasn't available in the larger sizes we needed to run. Copper was clearly the best way to plumb lines that would remain in plain sight for years to come.

One more piece of the potable hot water system remained: how to treat the many points of use. Our age group of bathers would range from 5 to 90, and Scouting encourages physically and mentally challenged participation. The potential for scalding looms large in a facility seeing such diversity of hot water users and, as a result, I needed to find heavy-duty, reliable ASSE-certified 1016 scald-guard devices.

The ASSE performance standards that govern potable systems safety valves are 1017 and 1016. ASSE 1017 is applicable to the point of source and the distribution system. ASSE 1016 governs point-of-use faucets or auxiliary devices that can be installed slightly ahead, or upstream, of a non-protected faucet.

ASSE 1016 recognizes three basic types of scald guard valves: those that compensate for pressure changes only (known as type P); those that compensate for temperature changes (known as type T); and those that combine both and known as a "combination valve" (or type T/P). These valves must pass rigid testing and maintain temperature fluctuations within 3° F!

For this installation, I chose the Powers Hydro-Guard e700 ASSE-certified 1016 type T/P shower valves featuring an advanced thermal actuator that provides rapid response time. Our installation required mounting the shower faucets on solid block walls with a stainless steel shroud to conceal the piping.



Quick installation of Watts Under Sink Guardian ASSE 1016 point of use devices will grant scald guard protection for the sink faucets.

Maintenance is always an issue in public facilities where hard use or abuse often occurs, so the integral check stops, single cartridge design and non-corrosive components were much desired. In addition, the low profile kept the installation looking sharp with a minimal impact on the bather's space.

Whenever I'm in camp with my son's troop, Ranger Scott manages to recruit me for volunteer plumbing repairs. Last summer, I spied him approaching our camp site — dripping wet — and I knew immediately he wasn't coming by for a social call. I needed this bath house installation to be trouble free!

We still had sinks to consider and those became protected by Watts Under-Sink Guardian ASSE-certified 1016 scald-guard mixing valves. They tuck up neatly under the bowls with 3/8-in. OD compression fittings incorporated into their design, which permits rapid installation onto standard supply tubes.

Disease prevention

All that remained was the heating issue. With more than half of the bath house being winterized annually, our Bradford White water heater would have more than enough excess capacity to power up some hydronic units. But this is an area with huge potential for bacterial amplification when hydronic systems are coupled with potable hot water systems where no physical barrier exists between the two fluids (often called open systems). All of legionella's desires will be met and nothing short of a hydroponic super-amplifier will have been created.

What about the 160° pasteurization storage temperature lying in wait for the little buggers to come along? Granted, that's high enough to protect the point of source, but continually re-seeding the potable hot water system with high dosages of potentially infested water doesn't make good sense.

Also, adequate contact time is required for pasteurization of the infected water. The odds are that at some point people would be using the showers when this re-seeding happens and the opportunity exists for legionella to make a quick pass out to a shower head before being killed. After carefully designing a safe point of source, distribution system and points of use it would seem absurd to countermand that by connecting a bacteria breeding factory!

The solution for maintaining the system's integrity is quite simple and very reliable. A Flat Plate stainless steel heat exchanger was installed to isolate the potable and hydronic fluids. The potable side includes a bronze circulator that operates whenever there is a call for heating and without a check valve; gravity circulation takes over during idle times. No stagnation and temperatures remain within pasteurization range!

The hydronic side is treated like any other heating system with a 30-lb.

Scoutmaster Dave Yates conducts a tour of the new bath house plumbing for Scouts arriving at summer camp.

relief valve, water feeder and expansion tank. Given that this is the lower of the two pressure zones, any leaks that might develop within the heat exchanger will result in the hydronic side's relief valve leaking, alerting maintenance to the problem.

The Burnham Duo-Rad wall-mounted hydronic convectors each have their own thermostat, which allows for pumped zoning. No matter how frequently the doors are opened during wintry weather, each zone has the ability to maintain the desired indoor climate thermostat setting.

The Camp Tuckahoe installation is just common sense plumbing with safeguards implemented for protection against scalding and disease. The additional time spent installing these products was negligible and their cost didn't break the bank either.

It sure seems to me that the time has come for our national plumbing codes to enact rules that mandate these common sense safeguards. Our children and parents deserve nothing less.

Dave Yates owns F.W. Behler Inc., a contracting company in York, Pa. He writes a monthly plumbing column for CONTRACTOR.