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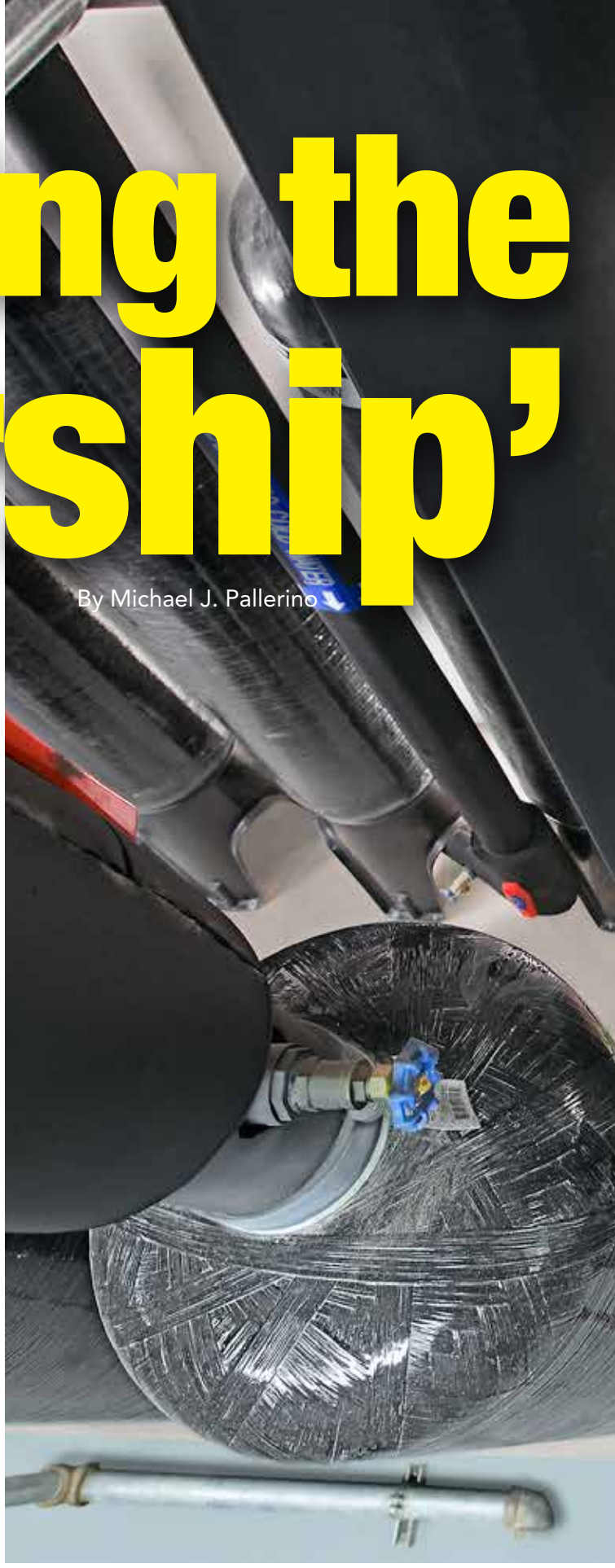


By Michael J. Pallerino

New technology solves age-old problems at Fort Sill

Built during the Indian Wars, Fort Sill served as the base of operations against Cheyenne, Comanche and Kiowa Indians. After decades of warring with "native hostiles," it was there, on Feb. 17, 1909, that Geronimo, the great Apache Indian chief, died of pneumonia. Today, Fort Sill is not only a National Historic Landmark, but also one of the U.S. Army's largest bases.

In the 1970s, Initial Entry Training (IET) "starship barracks," were constructed on Army bases nationwide, including Fort Sill. The facilities acquired the nickname because they're completely self-contained, with living quarters, classrooms, mess halls and latrines all under one, star-shaped roof.

Many of the starship barracks – designed to house up to 500 troops – are being renovated, chiefly to reduce energy consumption. Fort Sill already has renovated one starship and now is preparing to modernize four more.

Hard water has plagued maintenance crews at Fort Sill since the addition of indoor plumbing – and the problem remains today. Unfortunately, southern Oklahoma has some of the most challenging water quality nationwide. With all new mechanical and plumbing systems being installed during renovations, the Army Corps of Engineers has moved to eliminate domestic water scale problems before they begin.

"The Corps did their own research, looking for a better alternative financially, logistically and environmentally."

– Allen Jones, Senior Mechanical Engineer, C.H. Guernsey

Technician Rob Myers opens the outlet connection to one of 12 tanks installed at Fort Sill Army Base.

Impressive demand

With 500 troops mobilizing together, high-quantity water use is inevitable. And at Fort Sill, dealing with persistent scale is a costly problem to solve compounded by the inevitable spikes in water use.

At the start of each new day, soldiers have a set routine. Wake up (still a cheerfully, piped-in, high-decibel Reveille at "O-dark-hundred") leads to a quick shuffle to the showers where a combined 632 GPM surge through the spacious gang showers.

A daunting challenge for the mechanical contractor is how to provide scale protection for domestic water systems at a rate of 632 gallons per minute – with a water quality defined as "very hard."

At 10 grains of hardness per gallon, water is considered hard, and over time, calcium and bicarbonate scale become a problem for system components. The water measures a whopping 27 grains per gallon.

"One plan was to use a commercial, salt-based water softener," says O.G. Mills, VP of Tulsa-based OK Sales. "But the four tanks needed wouldn't fit through the mechanical room door, and once inside, would've taken up far too much space. On top of that, the sheer amount of salt used to regenerate the water softeners would have required additional storage, constant attention from a service tech and an expense to treat all the water that would have made it nearly cost prohibitive."

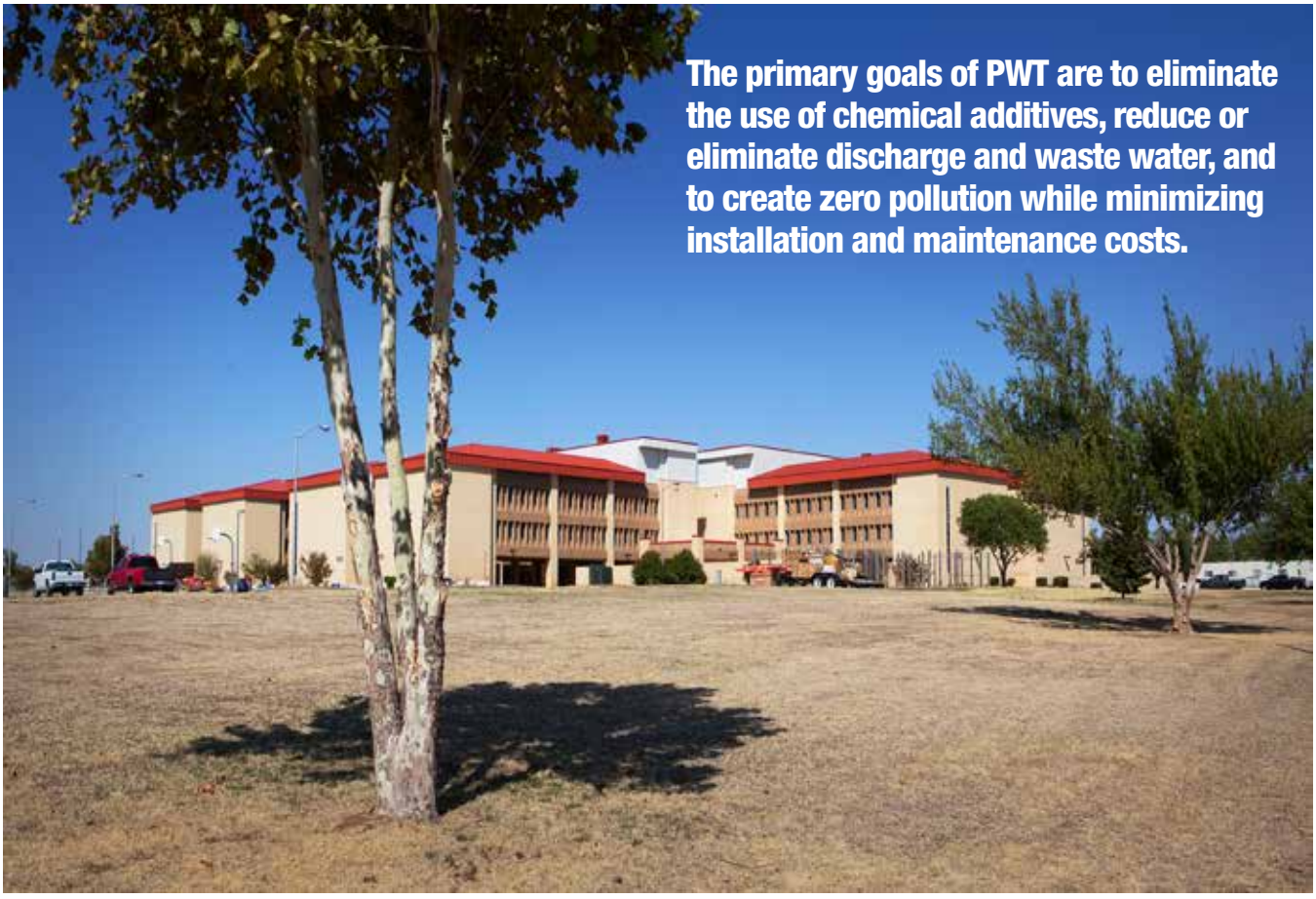
Mills says The Army Corps of Engineers started doing their homework, researching different means of scale removal. What they already knew was that the system must handle a huge volume while being cost effective.

"There was the need for tolerance to huge pressure drops as well," Mills says. "And, according to the Buy American Act, the equipment would need to be American-made."

With those mission parameters, and after a careful study of their options, the Army Corps of Engineers chose Watts' OneFlow® anti-scale central treatment system. This uses TAC (template-assisted crystallization) technology. TAC falls into a category of water treatment often referred to as Physical Water Treatment (PWT).

The primary goals of PWT are to eliminate the use of chemical additives, reduce or eliminate discharge and waste water, and to create zero pollution while minimizing installation and maintenance costs.

The environmentally friendly technology behind leading TAC treatment systems was developed in Germany about 15 years ago. It was used throughout Europe for several years before coming to the US, and continues to be the dominant form of commercial water treatment there. TAC media starts out as polymeric beads (resin) in the 20 to 40 mesh size range. Catalytically active sites or templates are "imprinted" or coated on the bead surface through a batch-coating process.



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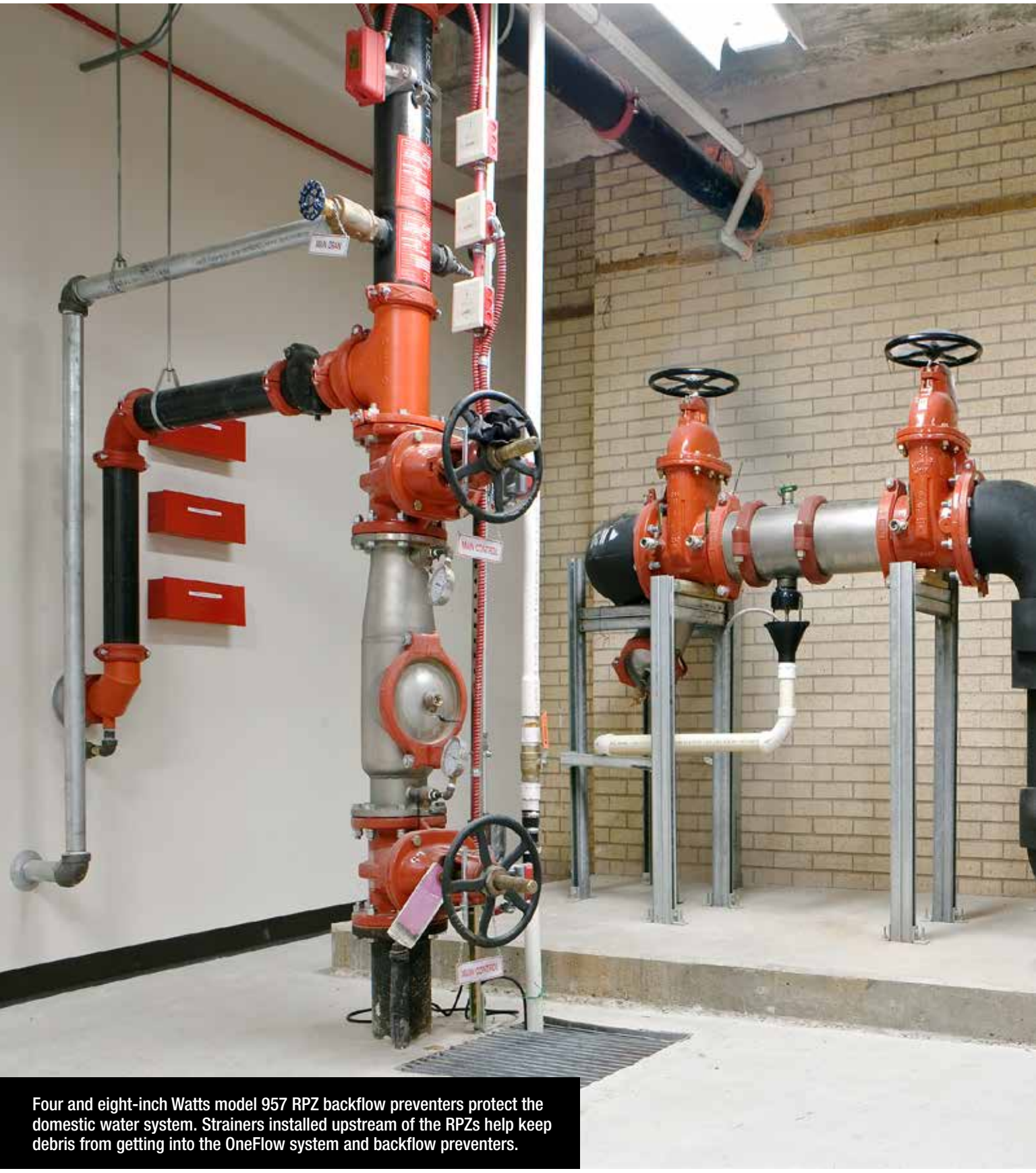


Four and eight-inch Watts model 957 RPZ backflow preventers protect the domestic water system. Strainers installed upstream of the RPZs help keep debris from getting into the OneFlow system and backflow preventers.

The system changes the physical characteristics of the water with little or no change to the solution's chemical composition. PWT chiefly is used to reduce the negative effects of water hardness (calcium carbonate) in plumbing systems, appliances and equipment, valves and other components.

The template influences the water solution at localized sites (on the media surface) such that hardness ions and their counter-ions (bicarbonate) combine to form inert nanometer-size "seed crystals." Called nucleation, this occurs when dissolved molecules or ions dispersed throughout a solution start to gather to create clusters in the sub-micron size range.

The seeds provide an enormous area for preferential growth of remaining hardness ions still in solution. "Low energy heterogeneous transfer" then begins. The remaining dissolved ions reach their solubility shift, attach to the seed crystals and continue harmlessly downstream.

Out with the old…

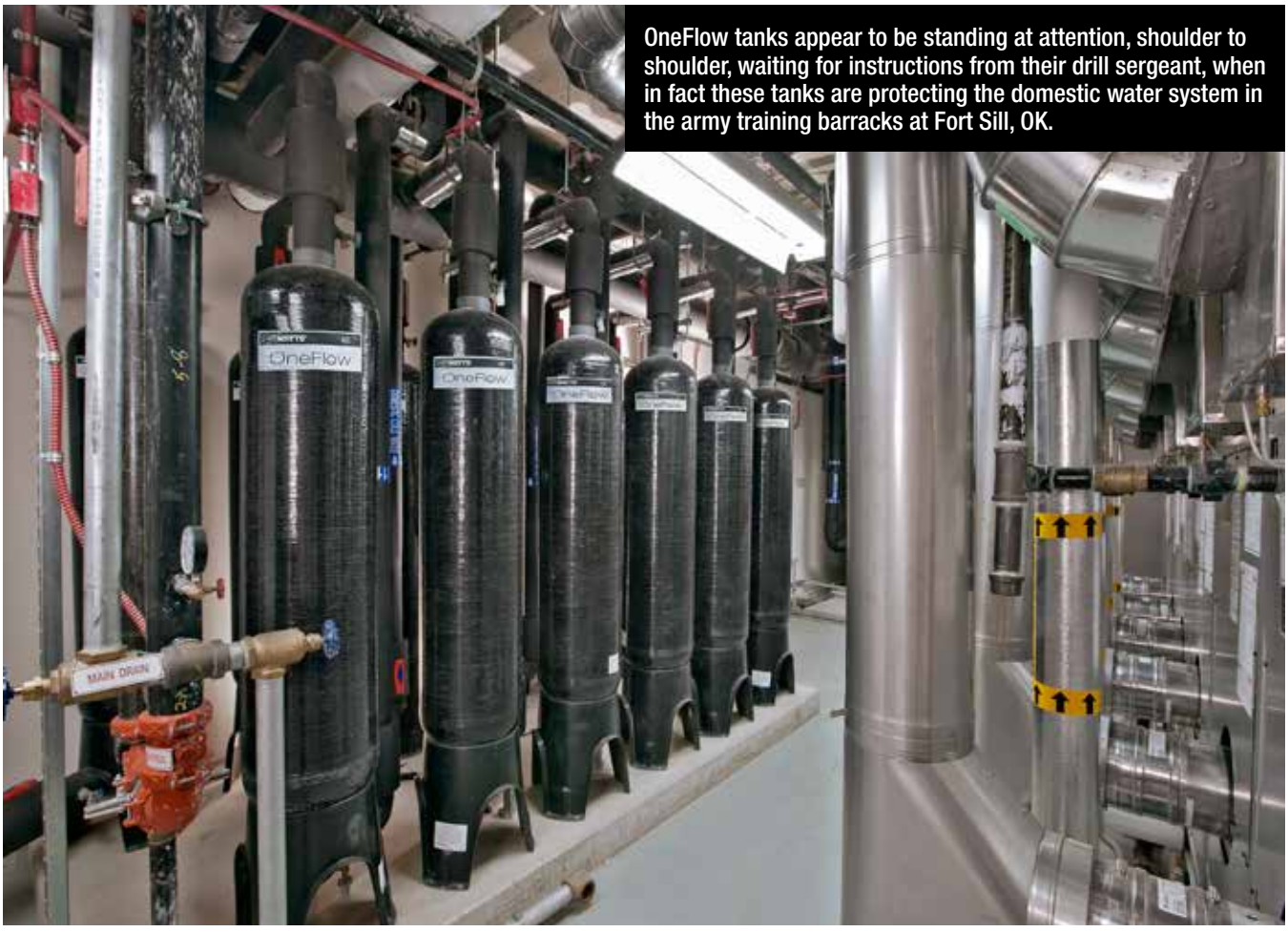
"The Army Corps of Engineers in Lawton wasn't impressed with the old traditional water softening system, or the service contract attached to it," says Allen Jones, senior mechanical engineer at C.H. Guernsey, the lead mechanical engineer on the project.

The mechanical room had been built around the existing system. Two tanks, one 10 feet tall, and the other 5 feet in height, were situated on either side of the mixing unit. The tanks were disassembled and removed.

"The Corps did their own research, looking for a better alternative financially, logistically and environmentally," Jones says. "Mills was a bulldog when it came to explaining how TAC technology is the winner in all three categories, and also uses less than half the floor space of any of the alternatives."

TAC: Unaffected by fluctuating water demand

Another huge advantage the TAC system has over a traditional water softener is the ability to operate effectively at trickle flow rates," says Steve Callahan, national sales manager of water treatment products at Watts Water Technologies.



OneFlow tanks appear to be standing at attention, shoulder to shoulder, waiting for instructions from their drill sergeant, when in fact these tanks are protecting the domestic water system in the army training barracks at Fort Sill, OK.

Because TAC media always is used in an up-flow design, it's not subject to low flow channeling or high flow pressure drops. "With traditional [salt-based] systems, if flow is below peak rate, you can get hard-water bypass," Callahan says. "That's when water finds the path of least resistance through the media, and comes in contact with minimal amounts of resin."

Callahan says TAC media isn't sacrificial; it doesn't dissolve. Media lifecycle is not influenced by the amount of water being treated, or the hardness of the water. But impurities in the water, such as chlorine, over time can degrade the template on the beads, which affects media longevity. The typical suggested media change-out is three years.

"Selecting the appropriate size system is simple. All you need to know is peak flow rate," Callahan says.

The first phase of the Fort Sill restoration project called for 12 OneFlow tanks, each capable of handling 75 GPM. Linked in parallel, the tanks treat up to 900 GPM. This system also affords the base the flexibility to isolate tanks if the barracks aren't at full capacity, and to perform media change-outs one tank at a time.

"For the Army Corps of Engineers to review and ultimately select TAC technology over a traditional softener, it meant that we had to meet a very strict performance standard to protect their plumbing systems."

– Steve Callahan, National Sales Manager, Watts Water Technologies

Four and 8-inch Watts model 957 RPZ backflow preventers protect the domestic water system. Strainers installed upstream of the RPZs help keep debris from getting into the OneFlow system and backflow preventers.

"For the Army Corps of Engineers to review and ultimately select TAC technology over a traditional softener, it meant that we had to meet a very strict performance standard to protect their plumbing systems," Callahan says. "We have thousands of installations, some in areas where water is even harder than at Ft. Sill, so I was certain our technology was best suited for water use at Fort Sill. They'll reap the benefits of zero water discharge and no salt expense for years to come." **FC**