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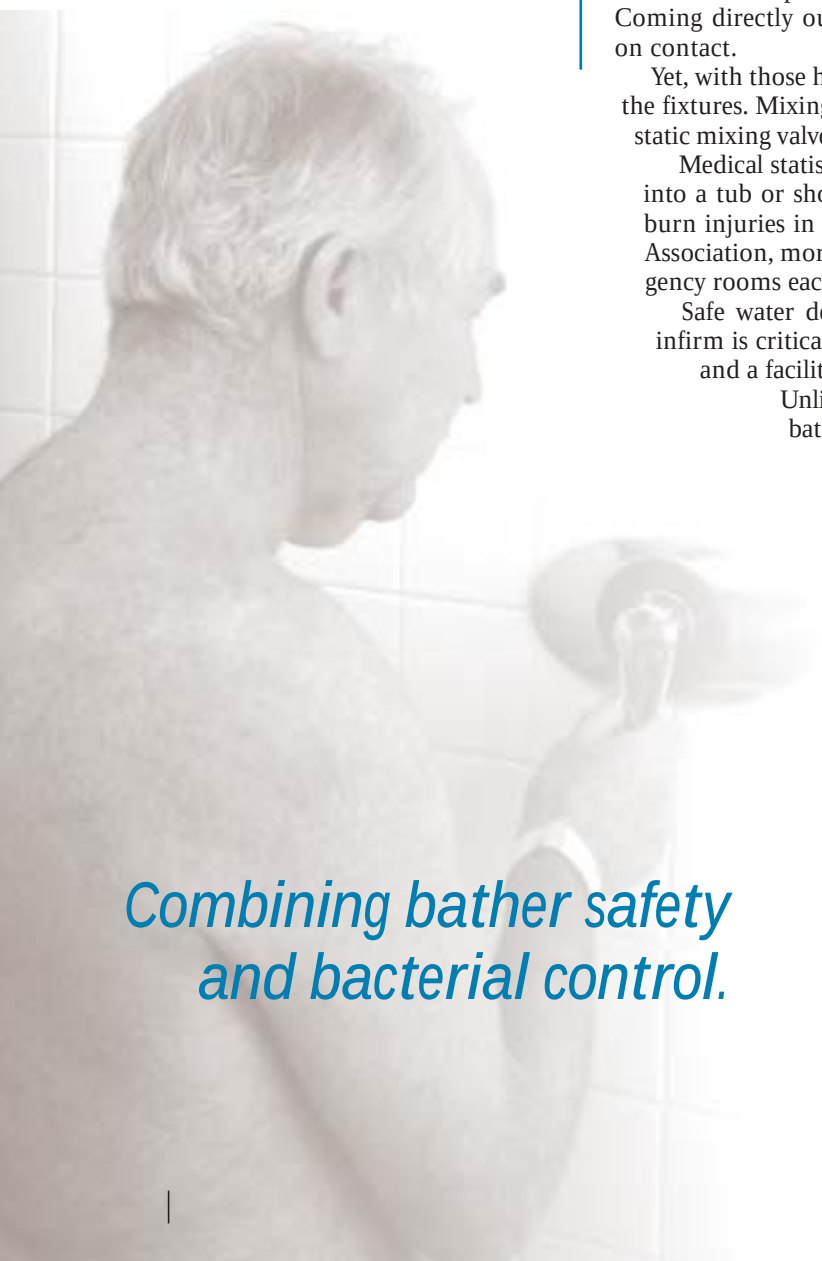
Water Safety
For The Elderly And Infirm

BY BRUCE FATHERS



Combining bather safety and bacterial control.

It's a classic Catch 22. Safer technology and Legionella liability have stirred a trend, moving accepted commercial and institutional plumbing toward the need for running water in excess of 140 degrees F throughout potable system lines.

At that temperature, within the heat source, all bacteria are killed. Coming directly out of the heat source, free-roaming bacteria are killed on contact.

Yet, with those higher temperatures comes the need to protect people at the fixtures. Mixing valves — and by far the safest of them is the thermostatic mixing valve — must be applied to protect users from risk of burns.

Medical statistics reveal that scald burns caused by hot water flowing into a tub or shower enclosure are among the leading causes of severe burn injuries in the United States. According to the American Hospital Association, more than 112,000 people are admitted into hospital emergency rooms each year for scald-related injuries.

Safe water delivery throughout any facility housing the elderly or infirm is critical to reduce the threat of scalding, toxic bacteria growth and a facility's liability exposure.

Unlike other commercial and institutional facilities where bathers typically can respond to shower and point-of-use temperature changes, senior health care facilities must accommodate a wider range of user needs and risks.

Among older people, the threat of scalding attributed to pressure and temperature changes is dramatically increased. Consider that:

- Elderly people lose the ability to respond quickly; this worsens with age.
- With attendant bathing, temperature changes are not felt by the person controlling water temperature.
- Bathing temperatures must be carefully controlled for patients with delicate healing tissues, such as post-surgical or burn care.
- Bathers who are unable to change water temperature may be left unattended for extended periods of time.

Related to the threat of scalding is a second challenge. Recent studies have shown that temperatures within potable distribution systems — as high as 180 degrees F — cannot immediately kill "biofilm-insulated" bacteria on contact. Biofilm forms when bacteria adhere to surfaces in aqueous environments and

begin to excrete a slimy, glue-like substance that anchors them to the inner walls of plumbing pipes. A biofilm can be formed by a single bacterial species, but more often a biofilm consists of many species of bacteria, as well as fungi, algae, protozoa, debris and corrosion products.

Even at temperatures of 180 degrees F or more, it takes time to pasteurize water within the pipes; the higher the temperature, the less time required to kill Legionella bacteria.

A Solution: Is it a Catch 22? Decreasing hot water temperature in a delivery system reduces the danger of scalding, but increases the risk of bacteria growth. Increase the hot water temperature and just the opposite risks occur.

Is there a solution?

Some facilities distribute hot water as low as 110 degrees F, to eliminate any risk of scalding. Unfortunately, Legionella will grow in temperatures as high as 122 degrees F, with the ideal growth range from 95-115 degrees F. In this instance, solving one problem only creates another.

The recommended 140 degrees F temperature works, but only if constant-circulation techniques are used. The combination of 140 degrees F water with constant circulation and thermostatic (Type T) valve technology is the only reliable way to kill bacteria and maintain sanitary potable water pipes. This method maintains the set temperature within the piped system so that cooling cycles between hot water use won't give bacteria an opportunity to recover and grow.

According to the Occupational Safety and Health Administration's technical manual on Legionnaire's disease, water should not only be stored at a minimum 140 degrees F but should be "delivered at a minimum of 122 degrees F to all outlets" to "minimize the growth of Legionella in a system." At 140 degrees F, Legionella are killed within 32 minutes. At 151 degrees F, Legionella die within two minutes.

Higher water temperatures within potable systems are indeed a concern, especially when the American Society of Plumbing Engineers reports that an estimated 70 people in the United States die each year from bath and shower scalding. Yet, according to experts at the Centers for Disease Control, many more people die from exposure to Legionella bacteria.

It's common knowledge that, in response to energy-conservation urgings, many facility managers have reduced thermostat settings for water heaters. Legionella welcome this news because the lower temperatures allow them to multiply, causing a keen health risk for those who shower — the bacteria are most dangerous when atomized, carried airborne with water and transported into the lungs.

The use of chlorine, even at the highest concentrations considered acceptable for use in plumbing systems, does not kill hardy bacteria like Legionella. Which brings us back to the issue of high temperature risks.

Hospital patients, those struggling with disabilities or during physical rehabilitation, and most people within nursing facilities are known to have delayed reaction to a sudden rise in water temperature.

Pain is the body's means of protecting itself. At 130 degrees F, it requires only 20 seconds of exposure to produce a first-degree burn. Yet, illness or medication, as well as the delayed reactions of the elderly, can all affect the warning mechanism, and patients can unknowingly subject themselves to the risk of severe tissue damage and burns.

Even momentary exposure to scalding water can result in second- or third-degree burns. At 135-140 degrees F, among the elderly, it takes only five to six seconds to sustain third-degree burns that can potentially destroy all skin layers. This could cause permanent injury and disfigurement, and depending on the level of exposure, possibly death. It's not at all uncommon for scald-related injuries to require skin grafts and an average hospitalization of 17 days.

The many dangers of scalding water can expose a healthcare facility to numerous liabilities, lawsuits, bad publicity and public ill will. If safety is a priority, providing bather protection is a must for healthcare institutions. Adequate plumbing with temperature control devices, proper plumbing maintenance and education are some of the steps that can help to minimize the risks and liabilities.

Types Of Valves And ASSE Standards: The American Society of Sanitary Engineers 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 or shower valves.

ASSE 1016 recognizes three basic types of bath and shower valves. There are those that compensate for pressure changes only, known as Type P; those that compensate for temperature changes, and to a lesser degree, pressure fluctuations (Type T); and those known as "combination valves," or Type T/P, a hybrid of both pressure-balancing and thermostatic performance requirements.

The pressure-balancing valve (Type P) is designed to adjust water temperature automatically by maintaining a mix of hot and cold water within 3 degrees F of the set-point when pressure changes occur in the system, say when a toilet is flushed or an appliance is turned on.

Water Safety

While Type P valves provide an excellent way to compensate for pressure fluctuations within a plumbing system, they cannot make adjustments for sudden, or gradual, changes in supply temperature. If hot water supply line temperature unexpectedly increases to a dangerous level while inlet water pressure remains constant, the pressure-balancing valve will continue to pass water, but at a dramatically increased temperature.

Type P valves come with an adjustable limit stop that can be set to prevent handle rotation to the maximum hot water position. The limit stop requires routine seasonal adjustment to accommodate for variations in seasonal temperature swings. This is especially important in regions where extreme weather conditions dramatically affect temperature from water sources such as lakes and rivers.

If the pressure-balancing valve was installed during the winter months, the limit stop is usually set to deliver higher outlet temperature to compensate for colder conditions. As the weather gets warmer, temperature from water sources will rise, causing an increase in water outlet temperature. Since temperature variations are inevitable, periodic adjustments to the limit stop become essential. How realistic is it to expect that maintenance crews will adjust these seasonally — two, three or four times a year?

Type T, or thermostatic mixing valves, compensate for both fluctuations in temperature and pressure (though pressure to a lesser degree than Type P valves, as required by ASSE 1016). Type T valves are designed to mix hot and cold water as well, delivering blended water at a constant, selected temperature. Type T valves also feature an adjustable limit stop to prevent excessive handle rotation.

The key advantage these devices have over Type P valves is that they have a temperature-sensing device. There's no need to adjust the limit stop from season to season. The valve makes the temperature correction automatically to maintain the high limit setpoint.

Combination valves, or Type T/P, are required to meet 1016's most stringent performance requirements for both temperature and pressure changes. Type T/P valves must respond not only to temperature fluctuations as defined for a Type T valve, but must also meet the pressure change criteria of a Type P valve, as set forth by the ASSE standard. Type T/P valves allow water to be generated at higher temperatures, distributed at higher temperatures, and delivered at safe temperatures to the bather.

It's important to point out that Type T/P valves require no seasonal adjustment of the limit stop, saving maintenance personnel sometimes hundreds of hours of labor. It's also important to note that Type T/P valves must compensate for the same pressure fluctuations as Type P valves, as set forth in ASSE 1016. While Type P and Type T/P valves must compensate for 50 percent fluctuations, Type T valves need only accommodate 20 percent changes. Finally, Type T/P valves provide redundant temperature protection in the event of a failure upstream within the delivery system.

A Catch 22? Not at all! The potential for scalding can be minimized, while at the same time reducing the risk of bacteria growth. With a properly designed delivery system and a temperature/pressure-sensing shower valve (Type T/P) at the point of use, both risks are virtually eliminated. Water can be distributed at higher temperatures, reducing the peril of Legionella, while protecting the bather with temperature/pressure-sensing technology.

Remember, all shower valves are not created equally. There are critical distinctions in the performance requirement for the three valve types set forth in ASSE 1016. It's important to look behind ASSE 1016 to understand the fundamental differences between Type P, Type T and Type T/P valves and their implication to bather safety and facility liability.

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