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LONG TERM CARE MANAGEMENT

TOO HOT? TOO COLD?

Safe Bathing Temperatures

Bruce Fathers on

BATHING SAFETY FOR THE ELDERLY AND DISABLED

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BY BRUCE FATHERS

Bathing safety for the elderly and disabled

Can residents be protected from all hazards posed by bathing water? Technology's answer

It's a catch-22 for bathing operations in a nursing home: The demands of safer technology and risks of *Legionella* liability have stirred a trend toward institutional acceptance of the need to store hot water at 140°F or more and maintain water at 124°F or more in hot-water lines—temperatures that will neutralize or kill all bacteria. Yet those same higher temperatures pose the need to protect elderly residents from scalding injuries. Both risks—infection and scalding—can be life threatening.

Scalding Risks

A few years ago, an elderly man had a seizure while taking a shower at a nursing home. In his last moments of consciousness, he grabbed for the shower fixture's handle as he fell, activating full-hot temperature. With no preset thermostatic valve for protection, scalding water poured down on him while he lay unconscious on the floor of the shower enclosure, his body blocking water from draining properly. He was found an hour later and, by that time, although the water heater's supply had turned cold, the damage was done. He suffered permanently debilitating fourth-degree burns. Much of his skin, stripped off by the heat, required months of painful grafting to heal. Muscle tissue and bones were damaged, as well.

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 go to hospital emergency rooms each year for scald-related injuries. Children under the age of five, the elderly, and people with mental and physical disabilities are among the most susceptible. The elderly are also particularly susceptible to infection and are among those most vulnerable to *Legionella* exposure because of weaker immune defenses.

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

- Older people lose the ability to respond quickly; the blunting of reflexes worsens with age.
- With assistive bathing, temperature changes are not felt by the person controlling them.
- Individuals receiving postsurgical or burn care have delicate, healing tissues and need carefully controlled bathing temperatures.
- Bathers may be left unattended for extended periods of time, even though they are unable to change the water temperature.

Another important factor to keep in mind is that most residents of long-term care facilities—either because they're disabled or simply because they're elderly—have delayed reactions to a sudden rise in water temperature. Therefore, residents can be subjected or can unknowingly subject themselves to the risk of severe tissue damage and burns (figure 1). At a water temperature of 130°F, only 20 seconds of exposure can produce a first-degree burn. Even momentary exposure to scalding water can result in second- or third-degree burns. At 135 to 140°F, it takes an elderly person only 5 to 6 seconds to sustain third-degree burns that can potentially destroy all skin layers. This can cause permanent injury and disfigurement and–depending on the level of exposure–possibly death. It's not uncommon for scald-related injuries to require skin grafts and an average hospitalization of 17 days. Moreover, the many dangers of scalding water can expose your facility to numerous liabilities, lawsuits, bad publicity, and public ill will.

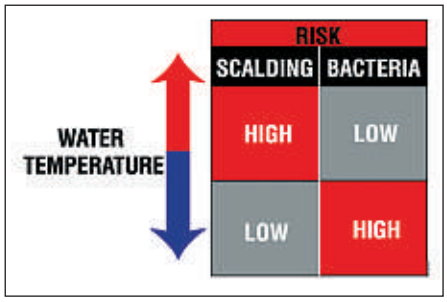

Figure 1. Water temperature risk levels.

Risk of Infection

Recent studies have shown that water temperatures as high as 180°F within potable distribution systems 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 consists of many species of bacteria, as well as fungi, algae, protozoa, debris, and corrosion products). Simply superheating and flushing water lines and fittings periodically will not necessarily ensure disinfection. Even at temperatures of 180°F or more, it takes time to pasteurize water within the pipes, and lower temperatures require even more time. At 151°F, *Legionella* bacteria die within two minutes; at 140°F, *Legionella* die within 32 minutes; and at 131°F it takes five to six hours.

Some facilities distribute hot water at temperatures as low as 120°F, and some even lower (e.g., 110°F), to eliminate any risk of scalding. Unfortunately, *Legionella* will grow in temperatures as high as 122°F, with an ideal growth range of 95 to 115°F (Figure 2).

OSHA's technical manual on Legionnaire's Disease (section III, Chapter 7) states that water should not only be stored at a minimum of 140°F, but it should be "delivered at a minimum of 122°F to all outlets" to "minimize the growth of *Legionella* in a system." The combination of 140°F water

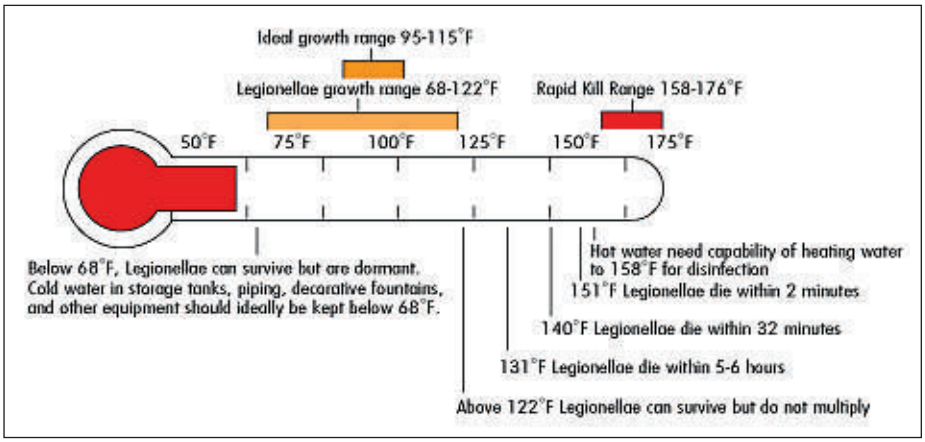

Figure 2. *Legionellae* growth chart.

with constant circulation (to prevent stagnation) and combination thermostatic/pressure balancing (Type T/P) valve technology is the only reliable way to kill bacteria and maintain sanitary potable water pipes.

Further, the Centers for Disease Control and Prevention's *2003 Guideline for Environmental Infection Control in Health-Care Facilities* states, "Maintain hot water at the highest temperature allowed by state regulations or codes, preferably greater than 124°F" and "install preset thermostatic valves (Type T/P) in point-of-use fixtures (baths, showers and sinks) to help minimize the risk of scalding."

It is common knowledge that many facility managers have reduced thermostat settings for hot-water heaters in response to energy-conservation concerns—a "welcome development" for *Legionella* bacteria. Moreover, the use of chlorine, even at the highest concentrations considered acceptable in plumbing systems, does not necessarily kill hardy bacteria like *Legionella*. And—most relevant to bathing/shower facilities—these bacteria are most dangerous when atomized, carried airborne with water, and transported into the lungs.

Solutions

Providing bather protection is a must for healthcare institutions. In addition to adequate plumbing and proper plumbing maintenance, temperature-control devices can help to minimize the risks and liabilities.

American Society of Sanitary Engineers (ASSE) performance standards that govern potable systems' safety valves (see **www.asse-plumbing.org**) are numbered 1016 and 1017. ASSE 1017 applies to point-of-source and distribution systems; ASSE 1016 governs point-of-use or shower valves. ASSE 1016 recognizes three basic types of bath and shower valves (figure 3): 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 regulatory mechanisms.

The **pressure-balancing valve** (Type P) is designed to adjust water temperature automatically by maintaining a mix of hot and cold water to within 3°F of the set point when pressure changes occur in the system. For instance, Type P valves provide an excellent way to compensate for pressure fluctuations within a plumbing system when a toilet is flushed or an appliance is turned on, but they cannot make adjustments for either sudden or gradual changes in supply temperature. If the 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 the 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. The operational question is: How realistic is it to expect that maintenance will adjust these valves as required, two, three, or four times a year?

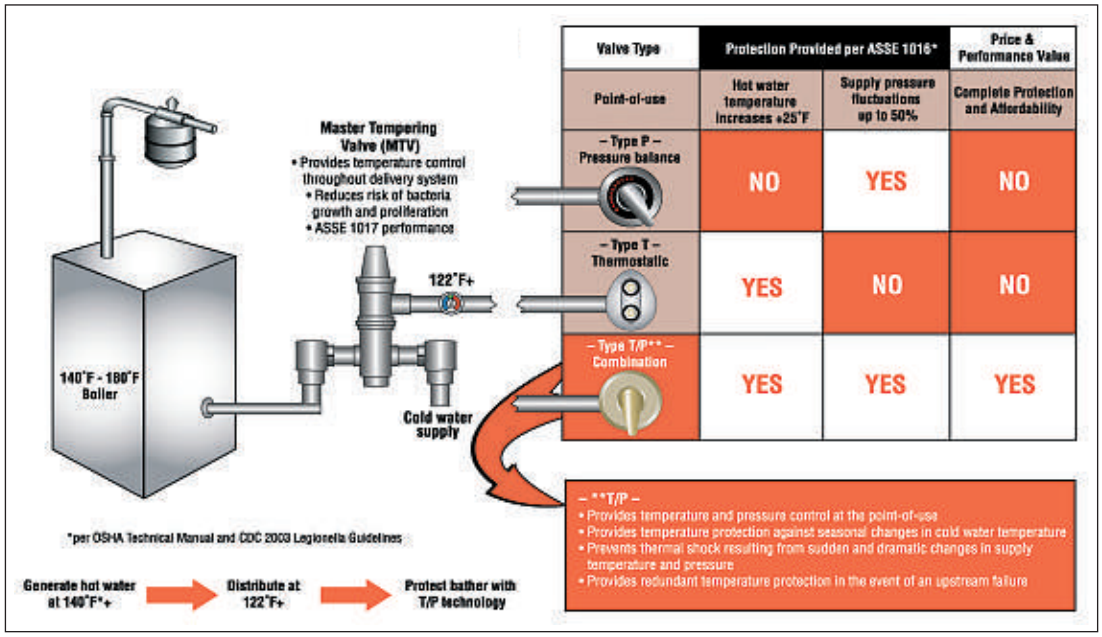

Figure 3. T/P technology minimizes risk of both bacteria growth and scalding.

Type T, or **thermostatic mixing valves,** compensate for both fluctuations in temperature and pressure (though to a lesser degree than Type P valves for pressure). Type T valves are designed to mix hot and cold water, delivering blended water at a constant, selected temperature, and 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 set point.

Combination valves, or Type T/P, offer the highest level of protection and are required to meet 1016's most stringent performance requirements for adjusting to both temperature and pressure change. 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. Type T/P valves allow water to be generated and distributed at higher temperatures, but 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, sometimes saving maintenance personnel hundreds of hours of labor per year. Also, Type T/P valves provide redundant temperature protection in the event of a temperature-control failure upstream within the delivery system.

Conclusion

Is the scalding-versus-*Legionella* dilemma a catch-22? Not at all. The potential for scalding can be minimized while, at the same time, the risk of bacteria growth is reduced. 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 the bather is protected from scalding with temperature/pressure sensing technology. With current technology, facilities no longer have to choose between possibly exposing residents to scalding or serious infection. ■

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