WATER QUALITY & HEALTH COUNCIL
PERSPECTIVES

Drinking Water Challenges in a Winter Wonderland

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As much of America endures a particularly cold winter—especially for those of us in the polar vortex-targeted tundra of northern Minnesota—our aging drinking water infrastructure is under tremendous pressure. Cold temperatures, snow, and ice can challenge large metropolitan water treatment facilities and privately-owned household wells alike. Fortunately, there are many proactive steps that experienced public water system operators, as well as savvy homeowners, can take each year *before* temperatures fall to help ensure that safe drinking water is available during even the coldest winter. That way, everyone can focus more on enjoying the wintry weather (and ice fishing) and less on responding to water-related crises.

RM's home in Bemidji, Minnesota

Cold Weather Does Not Mean Less Water Use

Although it might seem counter-intuitive, household water use actually goes up during winter—the more time people spend indoors due to cold weather, the more water they consume. So when you factor in high-water demands, cold weather challenges are only magnified. That's why the consequences, complications, and costs of fixing broken water mains (which can also disrupt natural gas lines and other utilities), as well as homeowner repair and clean-up of burst pipes, typically increase during colder months.

Winter Challenges for Community Drinking Water Systems

While many people are enjoying fall's vibrant colors and looking forward to snow-covered landscapes, most public utilities are already gearing up for winter. Cold weather considerations and challenges for community water system operations are myriad, but winterizing steps for utilities include those affecting raw water supply, drinking water treatment processes, treated water storage, hydraulic control systems, and distribution and delivery of water with an adequate level of residual chlorine disinfectant. (And that is in addition to utility workers getting safely to and from the plant and addressing issues in the fields, as well as responsibly salting roads and walkways before, during, and after snow and ice storms, etc.) As in all things, *proactive* planning, smart budgeting, and ongoing public education and awareness programs help allow utilities to provide safe water 24/7 and avoid *reacting* to costly service disruptions during the winter.

Frazil ice in Yosemite National Park
Photo credit: National Park Service

A particularly troublesome occurrence for water utilities is "frazil ice." This collection of loose, slushy ice forms on cold, clear nights when water temperatures are very near freezing. Frazil ice forms at the surface and is notorious for blocking submerged raw water intakes and shutting down pumps. To avoid problems with freezing in the plant and distribution system, sealing external openings and insulating facility buildings and pump and disinfection booster stations can reduce heating loss and cold air penetrations. Backup generators can help keep facilities operational and employees warm during power losses and outages.

Drinking water storage tanks are subject to a variety of threats, but harsh winter weather increases risks for elevated tanks and associated pipes and valves—especially during nighttime hours when water demand and turnover rate is low. Most temperature-related problems that can lead to emergency tank repairs, however, can be prevented with appropriate planning, maintenance, and inspections. For example, water that is flowing is less prone to freezing, and thus moving water in and out of elevated tanks, as well as mixing systems, insulation, and standby heating, are frequently used to keep water liquid, pressurized, and available for community needs. This is particularly important for fire protection. And in very cold climates in places like Alaska, some utility water pipes contain an inner pipe that circulates heated antifreeze to keep the water flowing.

Lateral lines leading from a utility-owned water main through the yard to a home (the privately-owned "service line") are particularly susceptible to freezing under the roadway or sidewalk where there is no grass or snow to provide an insulating barrier between the cold air and buried pipe.

Households and "Pipe Passivity"

Bitter cold temperatures are not unusual in a Minnesota winter, but widespread cold-snaps and wintry weather affect other areas of the United States as well, leading to frozen plumbing, broken pipes, and potentially catastrophic water damages—on average costing $18,000 per homeowner claim. Frozen pipes[1] also mean loss of household water for drinking, bathing, cooking, and cleaning. (In the winter of 2015, over 100 residents of Syracuse, New York, were forced to use melted snow to flush their toilets while their pipes were frozen). Moreover, water pipes in houses in southern climates often are more vulnerable than northern homes to winter cold spells because their pipes are more likely to be located in unprotected areas outside of the building insulation, and because homeowners tend to be less aware of freezing problems (and the consequences).

During particularly frigid temperatures, homeowners are often advised by utilities to let one or more faucets run slightly or drip to help keep water moving and not freezing in the pipes. Longer-term solutions include having a plumber re-route at-risk pipes to protected areas, or if not practical, fitting vulnerable pipes with insulation foam or fiberglass sleeves. The added insulation (and peace of mind) is almost always far cheaper than dealing with a burst pipe! If you're going on an extended trip, your best bet is to drain the water system; no water in the pipes means no freezing.

For private wells, although the water inside cannot freeze because it is below the frost line, the parts subject to freezing typically include water supply pipes located at or near the surface and at the pump. Keep these parts insulated and ensure the well is securely covered. A short-term option is to let a small stream of water run through one or more faucets, especially at night. Frozen wells cause more than the inconvenience of losing water; they can also lead to cracked water pumps, burst pipes, flooding, and water damage inside and outside the home.

Concluding Thoughts

Winterizing public and household water systems, and everything in between, is a necessity for much of the United States. Although being caught unprepared is more likely in southern climates, the clean-up, costs and headaches can be daunting wherever they occur. Stay warm, be prepared, and enjoy safe (liquid) water in your home this winter!

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[1] Water expands as it freezes. However, pipe breaks do not typically occur at an ice blockage; rather, continued freezing and expansion cause water pressure to increase between an ice blockage and a closed faucet. It's actually this increase in water pressure that leads to pipe failure—usually where little or no ice has formed.