

PRIVATE DRINKING WATER IN CONNECTICUT

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Publication No. 29: Hardwater-Softeners Facts and Issues

When water is considered “hard,” it means that the water is highly mineralized and contains high amounts of total dissolved solids, e.g. various salts and dissolved minerals. The principal contributing ions are calcium and magnesium. Hard water doesn’t lend itself to lathering and makes laundering difficult. The water is not necessarily harmful but aesthetically it can be unacceptable to the taste. The groundwater in CT is basically soft to moderately hard with one of the exceptions being a large fault line along the Ridgefield, CT/New York border where the groundwater is highly mineralized.



Historic DPH guidelines have recommended softening when the hardness level exceeds 150 parts per million (ppm) or 8.8 grain per gallon (gpg) hardness. (1gpg = 17.1ppm) There is no recognized standard or maximum contaminant level for hardness.

The American Water Works Association has recommended 80ppm hardness in the past “as the best level, considering all the quality factors, and the necessity for striking a balance between mineral deposition and corrosion characteristics”.

For every 100ppm hardness removed, 46ppm sodium will be added to treated water, using salt as a regenerative agent. With potassium chloride (KCl), 76ppm potassium will be added.



Softened water is made potentially aggressive to metallic piping, a properly sized and maintained softener will produce a water with zero hardness that can be corrosive to home plumbing. Water with zero hardness will also attack glassware resulting in a hazy surface sheen or “rainbow etching”.

All of the standard indices for a water’s aggressiveness i.e. Langelier, Ryznar and the Aggressive Index, require the level of calcium carbonate, CaCO_3 , hardness for computation, so we know hardness plays a major role in the aggressive (corrosive) quality of water. Other factors include pH, alkalinity, chlorides and temperature.

If one feels that the hardness in their water is becoming problematic there are solutions:

Non-Treatment Remedies

- Instead of soap alone use sequestering (polyphosphate) detergents e.g. “Calgon”
- Keep hot water temperature $<140^\circ$
- Hard water in CT is mostly Calcium Carbonate (temporary hardness) that can be removed from heater elements and boiler tubes by treatment and flushing.



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Treatment Hints

- Using potassium chloride (KCl) K-Life over sodium chloride (salt) will minimize sodium in the treated water. Potassium has no maximum regulatory levels. CT is unique in that we have a Notification Level for sodium of 28ppm for CT's public water systems. It is not a health regulated MCL but our Public Water Systems (PWSs) must notify their customers on an annual basis if their treated water exceeds 28ppm. This notification mainly targets people who are on a severely restricted sodium diet. It is also a de facto annual sodium-monitoring requirement for the PWSs.
- Only treat (softened) hot water and boiler feed lines. This would greatly reduce the amount of water softening especially since there is no need to soften water for flushing toilets!
- Use softener that backwashes by volume of water treated vs. automatic timer regeneration. This would reduce regeneration cycles and make the treatment system more cost effective. One cubic foot of high capacity zeolite resin can exchange 30,000 grains, or about 500,000 ppm of hardness. This means if water has 100ppm hardness, one cubic foot of resin will soften approximately 5000 gallons of raw water before requiring regeneration with salt. For a family of 4 (300gpd) this resin bed would require regeneration every 17 days, which would lessen the hydraulic loads on septic systems.
- Using dealer-supplied canisters that are regenerated off-site should be considered over on-site regeneration.
- Check quality control of dealer regenerated off-site units. Use a simple swimming pool hardness test kit to see if the new unit has been properly regenerated i.e. softened water with zero hardness. Newly regenerated units should result in zero hardness water.



The Problem (with on-site regeneration)

Backwashing softener regenerant to a septic system is specifically prohibited by the CT Public Health Code Technical Standards for Subsurface Sewage Disposal systems. The homeowner is usually unaware of the prohibition however, and it often happens that such backwash discharges are plumbed to the septic system, potentially leading to the following problems:

- hydraulic overloading of marginally sized septic systems,
- spalling of cement in concrete septic tanks, baffles, drywells and D-boxes, due to the introduction of salt or potassium chloride contained in the backwash discharge, and
- sludge buildup in the leaching system when significant levels of iron and manganese are present in the raw water, possibly leading to leaching field failure.
- groundwater contamination

Regulatory Issues



Backwashing of a softener to a septic system is specifically *prohibited* in the CT Public Health Code section 19-13-B103 and in the Technical Standards for Subsurface Sewage Disposal Systems. Discharging the backwash to a separate dedicated system is a viable option and is under the authority of the CT DEP, pursuant to Section 22a-430 of the CT General Statutes. For information on recommended disposal alternatives call CT DEP at (860) 424-3018. It is common practice in CT to use softeners for iron/ manganese removal, which this office does not support. There are better treatment techniques available for iron/manganese removal without the addition of any chemicals.

Any questions on this or other private well issues can be addressed to Cliff McClellan, RS or Ray Jarema, PE at the CTDPH- (860) 509-7296.

DEP NOTE

The DEP is working on a General Permit which would allow the discharge of water softener backwash into a dedicated subsurface disposal system, but *not* into a septic system. The current plan is to present this DRAFT to other “stakeholders” such as water treatment vendors, the CT Onsite Wastewater Recycling Association and the CT Homebuilders Association. The CT Environmental Health Association and the DPH have been closely involved with the development of this Permit. A public hearing process will be followed prior to the formal issuing of the Permit.

For more information please click on the following links:

EPA Office of Groundwater and Drinking Water

<http://www.epa.gov/ogwdw/>

EPA New England

<http://www.epa.gov/region01/>

Adapted from *Healthy Drinking Waters for Rhode Islanders*, University of Rhode Island Cooperative Extension, April 2003.