

## Water Hardness

The level of hardness is related to the amount of naturally occurring dissolved minerals in the water. "Hard" water has high levels of dissolved calcium and/or magnesium minerals. Hard water does not pose a health risk but it can cause problems such as spots on glasses and dishes, chalky deposits on faucets, tubs, sinks, pots and pans, and can cause buildup of deposits in the hot-water heater. Hard water also reduces the cleaning effectiveness of laundry detergents and soaps and may cause soap scum buildup on bathtubs and showers.

The level of hardness is measured in "milligrams per liter (mg/l)" or "grains per gallon."  
[One grain per gallon equals 17 mg/l]

Typical water hardness classifications are:

Soft water	less than 17 mg/l
Slightly hard	17 – 60 mg/l
Moderately hard	60 – 120 mg/l
Hard	120 – 180 mg/l
Very hard	over 180 mg/l

The City of Topeka's water treatment process does reduce the amount of hardness that is present in the Kansas River (our source of water) but even after treatment, the hardness generally ranges between about 100 to 220 mg/l and therefore is considered hard. If the water hardness becomes an issue, then there are several things that you can do to reduce the problems associated with hard water.

The first suggestion is to set your hot water heater at 130 degrees or lower, because the higher the temperature, the greater amount of deposits will form. This lower setting will allow your hot water heater to last longer and will help to prevent plugging of faucet aerators and strainers with mineral particles.

If water spots are an issue on glasses and dishes in your dishwasher, this can usually be resolved by using a "rinse agent" such as JET-DRY® which are designed to lower the surface tension of the water, causing it to sheet off the dishes during the final rinse. This prevents the formation of droplets of water that can remain on the surface of the dishes and are 'set' by the heat of the drying cycle.

The use of some laundry additive chemicals such as phosphates or borax during the wash cycle will help increase the cleaning efficiency of laundry detergents.

For a more complete solution to hard water issues, the installation of a "water softener" may be the answer. These water-softening units are permanently installed into the home's plumbing system. Most water softeners operate by ion exchange. In this process, the hard water is passed through a cylinder filled with resin beads that have been saturated with sodium. These resin beads have a negative charge, with positively charged sodium ions attached and have a stronger affinity for calcium and magnesium ions than for sodium. When water containing calcium and magnesium passes through the resin, the hardness ions are attracted to the resin and the sodium ions are released. The water softener trades (exchanges) sodium ions for calcium and magnesium ions; hence the term ion-exchange.

Approximately one mg/l of sodium is released for every two mg/l of hardness that is "trapped." When the beads become saturated with calcium and magnesium, the softening cylinder is recharged with sodium by passing a very salty brine solution through the resin beads. The sodium in the brine then replaces the calcium and magnesium that are then discharged as wastewater into the septic system or sewer. Water softeners may regenerate automatically on a time basis, on a volume of water used basis, or by a sensor on the output side of the system. In normal situations, the added sodium from drinking softened water is a small fraction of sodium that is consumed from foods. However, people who may be at risk from ingesting too much sodium may want to have an "unsoftened" water line to the kitchen for cooking and drinking. Another option is to only soften the hot water by installing the softener on the cold water line that goes into the hot water heater. This installation will remove the hardness before entering the hot water tank and thereby reduce the amount mineral deposits that may occur in the tank. Also, since most of the need for softer water is when hot water is used, such as dishwashers, laundry, showers, etc. this will allow for the most efficient use of the softener and will extend the time between regenerations.