

Water Hardness

What Makes Water Hard?

Water is referred to as the "universal solvent" because, over the course of time, water will dissolve or erode almost any material that it is in contact with. It is this natural occurrence that contributes to the hardness of water.

Water hardness is normally referred to as a measure of the soap or detergent consuming power of water. This means that if you have hard water you will notice very little lather when using soap or detergent. If you have soft water you will notice a lot of foam or lather. Technically, hard water is water having a high concentration of calcium and magnesium ions. These, along with other minerals (Iron), are commonly present in all natural water.

When water that contains any degree of hardness evaporates or is heated in typical household water heating equipment it can leave residual mineral deposits. In the water industry, hardness is expressed in terms of milligrams per liter (mg/l). In the water treatment business, however, hardness is most often expressed in terms of grains per gallon (gr/gal). The conversion factor is 17.1 mg/l equals 1 gr/gal of hardness.

The table that follows describes the various textbook levels of hardness and their classifications:

Description	Hardness (mg/l)	Hardness (gr/gal)
Extremely soft	0-45	0-2.6
Soft	46-90	2.6-5.2
Moderately hard	91-130	5.2-7.6
Hard	131-170	7.6-10.0
Very hard	171-250	10.0-15.0
Excessively hard	Over 250	Over 15.0

Ground Water vs Surface Water

As water seeps through the ground (or percolates) to reach the aquifers, it is filtered and purified through the many layers of the earth. At the same time, water may dissolve and retain the naturally occurring minerals it comes in contact with. This is why ground water (or well water) does not usually need to be treated or filtered. Higher levels of dissolved solids, constant cool temperature, and low levels of dissolved oxygen characterize ground water. However, ground water may contain an abundance of the minerals that can contribute to hardness problems. Ground water supplies used by the Authority produce water with a hardness range of 170 to 240 milligrams per liter.

Water that comes from streams, rivers and lakes is exactly the opposite. Surface water accumulates mainly as a result of direct runoff from rain or snow. It does not percolate through the ground and does not pick up the elevated levels of dissolved minerals that contribute to water hardness. For the most part, surface water is referred to as "naturally soft", although it is not mineral free. In general, turbidity, suspended solids, rapid temperature fluctuations, and high levels of dissolved oxygen characterize surface water.

It is important to realize that the Bedminster Municipal Authority distribution system is served exclusively by ground water.

To Soften, Or Not To Soften... That Is The Question

Although the minerals in drinking water are beneficial to good health, the aesthetic effects caused by hardness are the most common reasons to soften water. The typical equipment used for this purpose is the ion exchange softener. Softening is accomplished with synthetic resin media by exchanging ions of calcium and magnesium that contribute to hardness with ions of sodium. Although this method of softening can produce water with zero hardness, it is important to understand the limitations of the process.

- Homes that use these devices show elevated levels of lead and copper in the plumbing system due to the aggressive nature of the softened water. For this reason, the Authority cannot use a property that incorporates softening equipment for water analysis monitoring.
- Ion exchange softeners increase the sodium content of the treated water and may be potentially harmful to persons that are on sodium-restricted diets. People should limit or restrict the amount of softened water they consume or use for food preparation.
- The softening process removes the chlorine residual from the water and may accelerate bacteria growth within the plumbing system.
- The disposal of spent brine solution and rinse water from softener regeneration is becoming a major problem and can impact wastewater treatment facilities and septic systems. Softener byproducts are corrosive to material they contact and possess varying toxic levels in relationship with the environment.