Total Water Hardness Table

Soft -	0-60 ppm	=	0-3 Grains/Gal
Semi-Hard -	61-120 ppm	=	4-7 Grains/Gal
Hard -	121-180 ppm	=	8-10 Grains/Gal
Very Hard -	Over 180 ppm	=	Over 10 Grains/Gal

Note: ppm= parts per million

Wheatland Water Total Hardness Test Results (as CACO3)	Well 3	2003	222 ppm
	Well 4	2006	273 ppm
	Well 5	2006	134 ppm
	Well 6	2006	242 ppm
	Well 7	2006	204 ppm
	Well 8	2006	66 ppm

Wheatland's Water Average Hardness results is approx. 208 ppm

The Sodium Issue;

For some consumers, the fact that sodium is used to soften water raises a concern about their drinking water and a potential health risk. However, what many people may not know is that when doctors and researchers discuss salt and its effects on a person's health, they usually refer to sodium chloride, and not sodium bicarbonate which is the result of softening.

Further, according to Dr. Andrew Zeifer, Director of the Hypertension Clinic at the University of Michigan, "Drinking water represents a very small part of sodium intake in most persons. Even water softening systems using salt don't introduce enough salt to be of concern." Similar view was expressed in the *New England Journal of Medicine*, and by the U.S. Environmental Protection Agency.

If consumers do not want to add any additional sodium to their diet, or if they are on a medically prescribed diet, they may choose to connect their water softener to the hot water line only, thus leaving consumers able to drink and cook with unsoftened cold water. Another option would be to install a reverse osmosis or distillation system, and have the full benefits of both technologies in their home.

Benefits of Softened Water

Even for those whose water is slightly hard, significant benefits can result from using softened water:

- The life of the plumbing system may increase because clogging from scale within pipes will be reduced.
- Many appliances may last longer and perform better.
- Soapy residue on clothes is reduced so they may look and wear better.
- Skin and hair can be rinsed more completely, making hair look shinier and skin cleaner.
- Film on tubs and shower tiles may be reduced, as will scratching to bathroom fixtures and sinks.
- Reduce water spots on shower doors, dishwashing, and washing your car.

Water Softener Cost;

Water Softeners systems are costly, ranging from $1500 for an ion-exchange system to $12,000 for a reverse osmosis system. You will have to make the decision if the benefits are worth the cost.

A final tip: Look for the WQA (Water Quality Association) Gold Seal on home water treatment systems. This recognizable symbol gives the consumer the assurance that the equipment has been tested against industry standards, and successfully passed these tests, and has been validated for performance capabilities.

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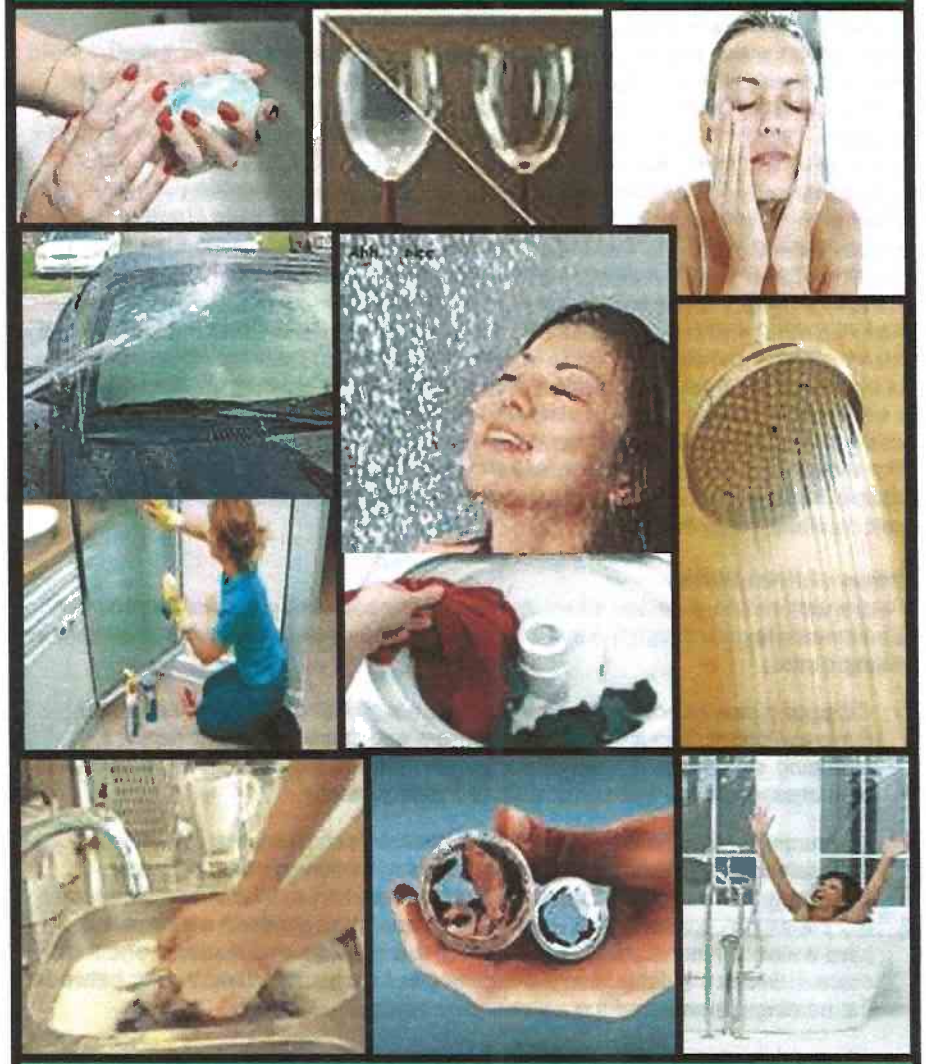
HARD WATER



WHEATLAND's QUESTIONS AND ANSWERS

What makes water hard?
The most common water quality problem reported by consumers throughout the U.S. is hard water. So then, what makes water hard, and what can consumers do to treat this problem? Because more than 60 percent of the earth's water is groundwater, it travels through rock and soil picking up minerals, including calcium and magnesium along the way. These two contaminants produce what is commonly referred to as "hardness" in water. A U.S. Geological Survey indicates that hard water is found in more than 85 percent of the country.
Hard water is water that has high mineral content (in contrast with *soft water*). Hard water minerals primarily consist of calcium (Ca^{2+}), and magnesium (Mg^{2+}) metal cations, and sometimes other dissolved compounds such as bicarbonates and sulfates. Calcium usually enters the water as either calcium carbonate ($CaCO_3$), in the form of limestone and chalk, or calcium sulfate ($CaSO_4$), in the form of other mineral deposits. The predominant source of magnesium is dolomite ($CaMg(CO_3)_2$). Hard water is generally **not harmful** to one's health. The total water 'hardness' lab result (including both Ca^{2+} and Mg^{2+} ions) is read as parts per million (ppm) or weight/volume (mg/L) of calcium carbonate ($CaCO_3$) in the water. Although water hardness usually measures only the total concentrations of calcium and magnesium (the two most prevalent, divalent metal ions), iron, aluminium, and manganese may also be present at elevated levels in some geographical locations. Iron in this case is important for, if present, it will be in its tervalent form, causing the calcification to be brownish (the color of rust) instead of white (the color of most of the other compounds). Generally speaking, hardness is measured in grains per gallon (gpg). For example, if a water test indicates a range of 1.0 to 3.5 gpg, the water is considered fairly soft. If the measurement is greater than 10.5 gpg, the water is rated as being very hard.

Affects of Hard Water;
Hard water can be detected easily, even as one performs personal hygiene such as hair washing, or through the appearance of fixtures and appliances or changes in heating costs.

- Clogged pipes and/or appliances could be a sign of hard water. Hard water mineral deposits can form in coffee makers and can build up in pipes or plumbing equipment. A consumer may notice a reduced water flow, as well as an increase in the number of calls to a repair person.
- Consumers may notice a film on their bathtubs or shower tiles, or even on themselves. The film that is left often results in additional scouring and scrubbing of the affected fixtures, and can cause hair to be dull and limp, and dry the skin. A consumer's water heating costs could increase as a result of hard water. When hard water is heated, the minerals can precipitate and form scale. Besides buildup, mineral deposits can form an insulating barrier between the heating element and the water to be heated.
- The calcium and magnesium in hard water act on many soaps and detergents to reduce their sudsing and cleaning capabilities. The soapy residue they form can be abrasive and reduce the life of clothing.

Water Softening System;
Wheatland's water unfortunately, is in the very hard range at 208 parts per million or 10+ grains per gal. It would be very expensive for the City to try and treat this condition and at this time is not possible in our current water budget. The City does not recommend or suggest purchasing a water softener or do we advocating any one brand or type of water softening system. We are only supplying this information so you may make an informed choice and decision about your hardness water quality and if a water softening treatment meets your household needs and your household budget. If you decide to purchase a water softener system, the most common option for consumers is ion exchange water softening in the home but there are many different types of softeners, each with its own benefits. Please do your own research. The ion exchange water softening method is a cation exchange, the principles of which are simple. An ion is an electrically charged atom or group of atoms. A cation is a positively charged ion. The water is softened when the hardness ions (magnesium and calcium) are exchanged for sodium ions. This exchange occurs in a resin bed during the softening cycle.
Three main parts make up most water softeners:

- Resin Tank - Contains the resin bed
- Resin Bed - This is made up of tiny bead-like material often made of styrene and divinylbenzene. The beads attract and hold positively charged ions such as sodium, but will exchange them whenever the bead encounters another positively-charged ion such as calcium or magnesium.
- Brine Tank - This tank holds the dissolved salt solution that is necessary to regenerate the resin. Regeneration refers to reversing the ion exchange operation. The magnesium and calcium ions are driven off of the resin beads and replaced by positively charged sodium ions. The regeneration occurs when the resin beads are washed with a strong salt water solution. The salt forces the calcium and magnesium ions to be released and they are then discharged as waste during the backwashing cycle. The beads are ready to once again attract hardness ions from the water.

Many installed water softeners are fully automatic. An automatic unit regenerates according to a preset clock. For example, it might be set to regenerate every third night at 3am. Other systems may use an electronic sensor that regenerates the system according to water usage.

Size and Type Considerations;
When water softeners were first manufactured, manual and semi-automatic models, where the regeneration process was started "manually" by the homeowner, were the most common types sold. Today, the two main types on the market are automatic and demand-initiated regeneration (DIR) water softeners. Automatic softeners regenerate on a schedule regulated by a timer. DIR softeners are the most sophisticated, containing a hardness sensor or water meter which triggers regeneration as needed.
There are several factors that a person must take into consideration before purchasing a softener, including the number of people in the home, how much water is used, and the hardness of the water. Determining the size of the softener, knowing these factors, is rather simple. Multiply 75 (average gallons per day used per person) by the number of people in your household. For example, four people in a household will likely use 300 gallons of water per day. Multiply the 300 gallons per day by the number of grains per gallon of hardness present in your water. Continuing the example, 300 gallons per day times 20 gpg gives a figure of 6000 grains of hardness per day that would require removal. Given a typical regeneration capacity of 18.000 to 30,000 grains per regeneration, a softening system in this case would optimally be regenerated every three to five days.