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Environmental Fact Sheet

(Information compiled from New Hampshire Department of Environmental Services Literature)

Corrosivity of Water Samples

WHAT IS MEANT BY CORROSIVITY?

Corrosive water can be simplistically defined as a condition of the water's quality that will dissolve metals from a home's metallic plumbing at an excessive rate. The factors that make water corrosive (sometimes called acidic or aggressive) include:

- A low pH value, typically between pH = 1 to pH = 7.
- A lower alkalinity. In the remainder of this document, we use the term "alkalinity" when we more specifically mean "dissolved inorganic carbon."
- A higher specific conductivity, which is an indirect measure of "total dissolved solids."
- Higher temperature.

Unfortunately, most surface water and groundwater in New Hampshire are highly corrosive. If you have copper plumbing and notice a bluish-green stain on sinks and showers or below a leaky faucet, your water likely is highly corrosive. Blue green is the color of copper oxide, as orange brown is the color of iron oxide.

EFFECTS OF CORROSIVE WATER

Corrosive water can cause physical damage to plumbing systems, create taste problems, and cause potential health risks. These three concerns are discussed below.

1. **Damage to Plumbing.** If your water is leaching metal from the plumbing of your home, you should expect that eventual plumbing repair will be necessary. While all plumbing will be affected over time by the water it carries, corrosive water will damage plumbing much more rapidly than water with low corrosivity. Pre-flushing the plumbing before taking water for consumption will not lessen this structural damage but will reduce the risk to health.

2. **Aesthetic Considerations (taste and appearance).** At higher levels of copper, water will have a metallic taste. There is little or no taste from lead even when the dissolved lead concentration is high. The presence of elevated copper can also stain clothing, fixtures, and hair. Flushing the plumbing will somewhat reduce staining but will not lessen the structural damage that occurs to metal plumbing.

3. **Potential Health Risk.** Corrosive water, by itself, is not a health concern; orange juice, vinegar, and carbonated soft drinks are all considerably more corrosive than typical New Hampshire well or surface water. What is of concern is that corrosive water can dissolve metals from the plumbing within your home and your well pump. The consumption of excessive amounts of certain types of these metals can present a health risk.

Pure lead plumbing or other metallic plumbing containing lead impurities may be present in many older homes in New Hampshire built prior to 1900-1930's. In addition, most of the copper pipe and fittings used in house plumbing prior to the mid to late 1980's has sweated joints, where lead solder was used. When corrosive water is present in such piping, and especially when there is no water flow, these metals can accumulate to concentrations that present a health risk to users if that stagnant water is regularly consumed.

This accumulation of metals is at its worst when the water is sitting stagnant in the plumbing system. This can occur late at night typically between 11 p.m. to 6 a.m. and during the day between 9 a.m. and 4 p.m. if all family members are at school or work. Using stagnant water for direct consumption, or for making a thermos of coffee or diluting juice concentrates can result in excessive lead or copper intake. TO AVOID THIS HEALTH RISK, FLUSH THE PLUMBING BEFORE COLLECTING WATER FOR CONSUMPTION. Flushing is a process by which one runs the cold water to "waste" for a period of time to allow fresh water to enter the plumbing system.

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USING FLUSHING TO AVOID EXCESSIVE COPPER AND LEAD

When water is corrosive, it is recommended that the faucet be flushed before taking water that will be consumed internally. The purpose of flushing is to capture fresh water from your well or the municipal water main. There is no meaningful lead or copper in either New Hampshire wells or surface water.

There are two methods to determine how long you need to flush the cold water tap:

1. Flush until after the water has turned cold (cold water indicates the arrival of fresh water from the well or municipal water main (approximately 1 minute); or

2. Use the following chart to determine the approximate volume of water to "waste" to be assured that fresh water has arrived directly from the well or municipal water main.

Volume In Pipes (Approx. Volume in 100 Linear Feet of Pipe)

Nominal	Inside Diameter	Gallons
0.50 inches	- 0.662 inches	1.5 gal/100'
0.75 inches	- 0.824 inches	2.7 gal/100'
1.00 inches	1.049 inches	4.5 gal/100'
1.25 inches	1.38 inches	7.7 gal/100'

EPA STANDARD - ACTION LEVELS

EPA has established special health-based drinking water standards for lead and copper and given that category a special name. That category is called "action levels."

The EPA's action level for lead in a public water system is greater than 0.015 milligrams per liter (mg/L); the action level for copper is greater than 1.3 mg/L. The term action levels (ALs) has a special meaning that differs from the meaning of the term "maximum contaminant levels" (MCLs), which is used for all other health-based drinking water contaminants.

The term action level means that at least 9 samples out of every 10, must have lead and/or copper concentrations below the respective AL noted above for samples collected in accordance with special sampling protocol that includes stagnation.

The action level would be exceeded by having lead or copper concentrations above the respective action levels in more than 10% of these stagnant samples. Where lead and/or copper concentrations exceed the AL, the utility is required to take certain actions that include: study the corrosive nature of the water, take appropriate treatment action, and give public notice to system users of the failure to meet the ALs.

For a private well serving just one home, meeting the ALs for lead and copper would mean that individual copper and lead test results, taken under appropriate stagnant sampling conditions, should be below the respective AL. (Please note, however, that these action levels only legally apply to public water systems.)

IS YOUR WATER CORROSIVE?

The appropriate method for determining whether water is corrosive is to follow the EPA sampling protocol. The alternative is to infer the water's corrosiveness from existing pH and alkalinity water quality data.

Determining Directly the Copper and Lead Concentrations in Stagnant Samples.

In the EPA Safe Drinking Water Act, the corrosiveness of water is determined by taking samples for lead and copper collected in accordance with the protocol shown below:

One liter volume; taken under stagnant conditions, (no flow for at least the previous 6 hours); taken at homes with lead soldered plumbing, built between 1982 and 1987; and the appropriate number of samples based on the number of people served by that public water system.

If any more than 10% of these lead and copper samples are above the AL, the water is considered as too corrosive and certain actions are required. Often these actions result in the addition of chemicals to neutralize the water's corrosiveness.

Inferring A Water's Corrosiveness From pH and Alkalinity Data

The corrosive potential of water is largely, but not totally, determined by the water's pH and alkalinity concentration. The pH is the most important single term. By reviewing your existing water quality data, an estimate can be made relative to the water's corrosiveness by applying following guidance.

1. Where the pH is below approximately 6.0, the water is normally highly corrosive.

2. Where the pH is between approximately 6.0 through 6.9, water is somewhat corrosive and stagnant testing is probably appropriate.

3. Water between pH = 7.0 and 7.5 is probably not excessively corrosive.

4. Water above pH = 7.6 should not be particularly corrosive to metal plumbing.

It is a common misconception that a pH = 7.0 or slightly above indicates that water is not corrosive; in fact, water with a pH of 7.0 can be somewhat corrosive if the water's alkalinity is very low. A substantial number of water sources in New Hampshire have a pH of less than 7.0 and low alkalinity (e.g., alkalinity less than approximately 30 mg/L).

TESTING FOR CORROSIVITY

Before taking a water sample to Nelson Analytical Lab for testing you may wish to evaluate your plumbing. If your system has copper piping, you should test for copper and lead. If the system has galvanized iron pipe, you should test for cadmium, lead, and zinc (zinc does not create a health risk, but does cause taste problems). Cadmium and lead are common impurities in the zinc used for galvanizing. In addition to the home's plumbing, lead and other metals can also come from your well pump or the connecting piping to your home. Well pumps manufactured after January 1, 1996 generally have little lead.

Water quality tests for metals from your home's internal plumbing should be performed under two conditions:

1. The "first-grab" non-flushed sample, in which the water that is collected has been in the pipe for a minimum of six hours up to a maximum of 10 hours simulating the overnight or away-at-work period.

2. A "flushed" sample after the water has been running long enough to ensure that all stagnant water has been washed away. At least 10-15 minutes is recommended prior to a sample collection for a "flushed" sample.

The most logical procedure is first to test the "non-flushed" condition. If the results are high for lead or copper, then the "flushed" sample should be collected to confirm that the source water is low in lead and copper. If the "non-flushed" test results are low, the water would be judged as non-corrosive and further testing is not needed.

WAYS TO REDUCE THE HEALTH RISK

If you are unsure of the corrosiveness of a water supply:

- Do not use hot water for cooking or coffee; draw cold water and heat it.
- Flush pipes before using water for drinking or cooking.
- Secure potable water from outside source (but make sure that source is safe and tested). Bottled water is well tested and widely available in supermarkets.

FOR MORE INFORMATION

Treatment for reducing corrosivity in drinking water often involves increasing some combination of the water's pH or alkalinity. Please contact Nelson Analytical Lab regarding testing your drinking water for pH, alkalinity, lead and copper. We can mail you a water test kit with the necessary test bottles and water sampling instructions. Results will be emailed upon completion within 1 to 2 business days. Nelson Analytical Lab will discuss your test results with you should you have any questions or concerns, or would like to be directed to speak with a water treatment company regarding treatment options for your water supply.