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Information Regarding Lead and Copper in Drinking Water

Water quality standards for **public water systems** are outlined in 18AAC 80.300. The Alaska Department of Environmental Conservation (ADEC) maintains a database for public drinking water systems (http://map.dec.state.ak.us:8080/dww/index.jsp) that can be used to determine the private/public status of a water system. If it is not in this database it is usually a private water system, although it could also be an unregistered or undocumented system that is still required to meet public water system requirements.

Water systems serving single family or duplex residences are generally considered **private water systems**. Private residential water systems are not required to meet public water system standards. Systems that include two separate houses sharing a single well, and triplexes and larger apartment or housing complexes with up to 10 service connections or less than 25 individuals are considered **Class C** public water systems. Class C systems are not actively regulated at this time, although that will likely change in the future. The remaining public water systems are either **Class B** (usually a seasonal lodge, hotel or temporary camp) or **Class A** (larger municipal-type systems).

The U.S. Environmental Protection Agency (EPA) **Maximum Contaminate Levels** (MCL) established under the Clean Water Act for public water systems for **lead is 15 parts per billion (ppb)** or micrograms per liter (ug/L) and **1000 ug/L for copper**. Lead and copper are first draw samples, that is, the water needs to be resident in the piping system for a minimum of 6 hours and a maximum of 8 hours. Lead and copper can leach out from older brass fixtures (usually 95% copper and 5% zinc), copper piping and lead piping and solder if the water is corrosive and sits in contact with the piping system and fixtures. The EPA prohibited the use of lead solder in water system piping 1991; however even “lead free” solder can contain small amounts of lead (up to 8%) and still qualify as lead free.

The **Langlier Saturation Index** (LSI) is a general measurement of the potential corrosivity of water, and is a calculated value that provides an estimate of the potential for water to either deposit scale (usually calcium carbonate) or corrode piping. The LSI is based on pH, Total Dissolved Solids, temperature, calcium ($ca2^{+}$), and bicarbonate ($hco3^{-}$). LSI values range between -2 and +2. The following table illustrates the relative potential for scaling and corrosion based on LSI values.

LSI	Scaling Potential	Corrosion Potential
-2.0 < -0.5		Serious corrosion
-0.5 < 0		Slightly corrosive but non-scale forming
0.0	Balanced but pitting corrosion possible	
0.0 < 0.5	Slightly scale forming and corrosive	
0.5 < 2	Scale forming but non corrosive	

Generally, if water has a positive LSI it tends to deposit a protective calcium carbonate scale on the inside of the pipe or fixtures that inhibits leaching of metals into the water. However, a high LSI can also result in plugging and fouling of fixtures from the calcium deposits. A negative LSI usually indicates that metal leaching is possible. It is unlikely in our experience to encounter lead

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or copper in source waters in this area, and it is far more likely that elevated lead or copper content in the water is the result of older lead-containing fixtures or solder or copper piping in the plumbing system leaching into the water at the point of use.

Lead in drinking water can affect people of all ages, but is most damaging to pregnant women and small children, and to the elderly with significant heart or health problems. Most healthy adults can tolerate low levels of lead in drinking water for short periods of time without significant long term health issues, although blood pressure can be negatively affected. There is no evidence that **copper** causes disease in humans but at elevated levels it is considered an irritant and may cause stomach cramps and intestinal illnesses.

There are numerous ways to reduce the lead and copper content of the drinking water. These methods can range from simple user actions to **point-of-entry** and **point-of-use** water treatment, replacement of plumbing piping and fixtures or alternative water supplies. The simplest method with relatively low copper/lead levels is **user action**. Use only cold water for consumption and turn the water on and let it run for a few minutes in the morning, or any time that the system has been unused for more than about 4 hours. Reducing the amount of time that the water is in contact with the fixtures will significantly reduce the amount of lead and copper in the water. If this option is chosen we would recommend some additional copper and lead testing after differing residence times, say 1, 2 and 4 hours to verify that first draw flushing will provide acceptable levels in the water.

Another solution is to provide an **alternate drinking water source** such as a water cooler or water holding tank with delivered water from a public water system that meets EPA/ADEC public water requirements. This water source could be reserved for water that is consumed, and other water uses such as laundry, showers, dishwashing or flushing toilets could still come from the existing water supply. If this option is chosen the piping and fixtures that are in contact with the delivered water supply should contain no lead or copper.

Water treatment options include system wide **point-of-entry** water treatment and **point-of-use** water treatment. System wide **point-of entry** treatment provides treatment of all of the water that enters a facility from the water source. The most common method involves adding a corrosion inhibitor or buffering compound such as zinc orthophosphate to the water that reduces the corrosion potential. This usually involves chemical mixing and metering equipment and regular maintenance to verify that the system is functioning correctly, and is usually reserved for larger facilities such as schools or institutions that have an at-risk population. Other point-of-entry water treatment systems are available that are more complex. A system more commonly used for residential applications is a **point-of-use** system such as a reverse osmosis unit located under the kitchen sink that treats only the cold water at the kitchen tap, the source for most drinking water.

Other options include replacement of the buildings plumbing and/or offending fixtures, which is usually a method of last resort due to the expense involved. If this option is chosen we would highly recommend additional testing to isolate the plumbing and/or fixtures that are contributing lead and/or copper to the drinking water.

Additional information regarding lead and copper in drinking water can be found on following websites:

Environmental Protection Agency, http://water.epa.gov/drink/info/lead/index.cfm
NSF International, http://www.nsf.org/consumer/newsroom/pdf/fact_water_lead.pdf
American Water Works Association,
http://www.awwa.org/Government/Content.cfm?ItemNumber=1063&navItemNumber=3832

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