BUILDING IN ALASKA

HCM-04950

Suggestions for Installing Domestic Water Storage Tanks

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Introduction

For many Alaskans whether it be home or commercial establishments, sufficient quantities of water may be difficult to obtain from a well or the home may be out of range of a local utility service. The most common way of dealing with this problem is to install a holding tank and have water commercially delivered. Some state regulations apply to the installation of holding tanks, and experience allows us to present these general guidelines for installations, which will be helpful to the contractor or to the owner-builder. It should be noted that the delivery services, especially truck services, are now required to report on the quality of their water and to maintain sanitary delivery methods. This is controlled by the Alaska Department of Environmental Conservation. Each delivery service should have a recent report describing the quality of their water and the results of the most recent test. These tests are regularly repeated to ensure continuing quality of the water delivered.

General Guidelines

Most people have no idea how much water they actually use. A standard American family of four commonly uses 150 to 200 gallons of water per day. In Fairbanks, the average city user consumes 3,000 to 6,000 gallons per month. Since most of us become quite accustomed to this rate of use, this obviously has clear implications for installing a large holding tank. If you are presuming to get water from a holding tank where you are paying 5 to 6¢ a gallon for the delivered water, you need to first understand that water conservation will be a prime motivator and a very good policy for operating your home holding tank. In the past, homeowners with little experience in water use rates installed 500-or 1,000-gallon holding tanks. At first, this sounded like an adequate amount of water, but most people find it is absolutely

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inadequate. A family with this size tank will frequently run out of water and will require deliveries every one or two weeks.

Guideline 1
Because of standard water use rates and the economies of delivering larger amounts of water, the minimum recommended tank size is 2,000 gallons.

Tank Specifications
Welded steel tanks used to be commonly used for most underground water storage in Alaska. But there are unique specifications for water tanks, and the prospective buyer should talk to the tank fabricator if you are intending to buy steel. Steel tanks are still available and made in a wide range of sizes. They are competitively priced with other alternatives. However they are declining in use and their advantages do not outweigh their disadvantages. Commonly they are coated with a epoxy lining to keep them from rusting but ultimately that doesn't always keep them from deteriorating. As of 2004, during which this publication was revised, the alternative of choice is to use high density polyethylene (HDPE) tanks. These are becoming the standard and are very competitively priced. They have all the advantages of steel and none of the disadvantages. Polyethylene is easy to repair, it is a lifetime investment because it doesn't rust or corrode, and it has no vulnerability to the normal chemistries that are put into water tanks. For this reason one can expect the tanks to last 100 years. The only things that degrade polyethylene once it's buried, are chemical or physical destruction. The only vulnerability to degradation most plastics have is ultraviolet light. Once the tank is buried, it is not exposed to any ultraviolet light. Plumbing failures might also cause it to leak, but generally speaking polyethylene tanks are the tanks of choice.

A schematic is shown in Figure 1 describing another useful feature which serves as a low-level water alarm[1].

The standard pipe delivery port for a double-tap fitting is shown. And then, a second double-tap port is included to provide for a second intake line into the home water system. The down pipe for the standard intake goes to within 10 inches of the bottom of the tank. When the water in the tank drops below this level, the normal supply runs out. The second line provides a reserve tank similar in function to a motorcycle fuel tank. When the water level drops below the intake of the standard line, a valve is closed in that line and another is opened in the reserve line. This allows another 50 to 100 gallons of water to be withdrawn before the water tank is empty.

This serves two useful purposes for those homeowners who may be on water tank supplies:

1. It serves notice that the water level is low and motivates the homeowner or operator to call for a delivery (presuming they are not on automatic delivery service).
2. It allows for a margin of water supply before completely running out.

The second intake fitting must be specified when ordering the tank. It is highly recommended and the additional costs are minimal.

As stated previously, recent experience with polyethylene plastic water tanks

[1]*This feature was suggested by Don Cameron of Water Wagon delivery service.*

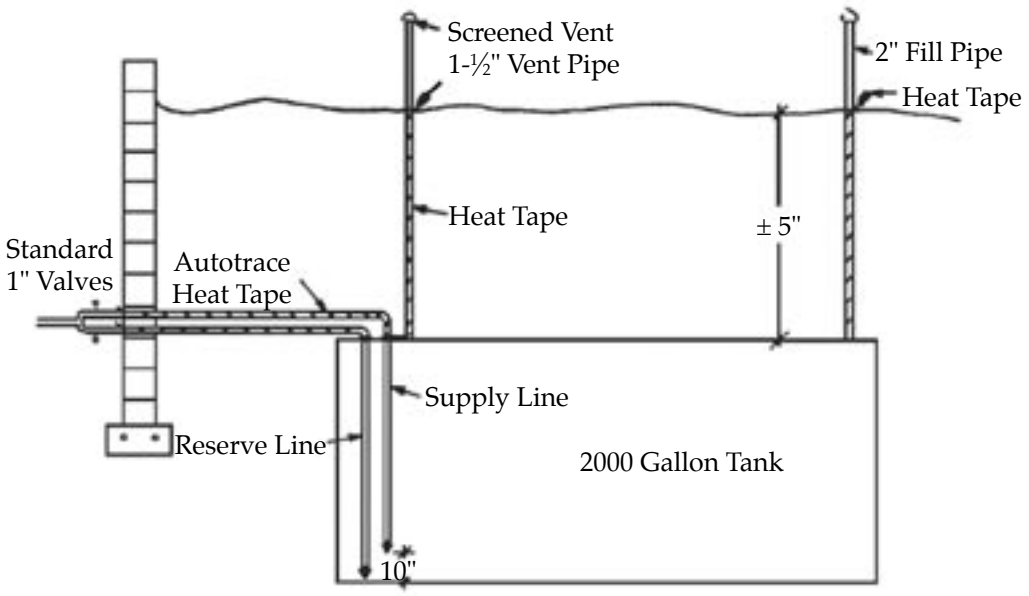


Figure 1
Typical Underground Tank Installation

has shown them to be a desirable and superior choice for domestic water storage. A major advantage is the virtual elimination of corrosion. This makes a buried polyethylene tank a lifetime tank. Previously these tanks were not manufactured in Alaska but this is changing, and will probably lower the cost. At present a quote from one supplier (M&M Constructors) on both a 1,200 gallon and a 1,700 gallon cistern HDPE water tanks, is as follows: the 1,200 gallon lists for $1,450 and the 1,700 gallon lists for $1,700. As a comparison, a 1,500 gallon steel tank (quote from Greer Tank and Welding in Fairbanks), is $1,590 and a 2,000 gallon tank is $1,781. So these are quite competitive prices for either option. A photograph of the Norwesco water tanks, courtesy of M&M Constructors, is shown in Figure 2.

Tank Size

- The average family (of four) can expect to use 1,500 to 2,000 gallons of water per month. Even that rate requires some considerable water conservation.
- 1,000 gallon tanks are simply too small to serve this usage. Owners will find themselves running out of water too often and delivery companies are hesitant to put small tanks on automatic delivery, as the cost escalates with the number of deliveries required.
- Consider a 2,000 gallon tank as a minimum size.
- Bear in mind that the larger the tank, the more efficient the delivery, and thus, the cheaper the price per gallon. A large tank can also provide a large reservoir of water for use in case of a fire. Plumbing should be roughed in for this option at the time of installation if you so choose.
- The fill and vent lines should extend at least 2 feet above grade, and preferably 4 feet.

Guideline 2

When using tanks for holding water, several measures must be considered for

Figure 2
M & M Tanks —High density polyethylene tanks. Tanks shown are ~1,500 gallons.

ease of filling and protection from freezing and pollution. You should place the tank in a location where truck access for fill-ups is as simple and direct as possible. The folks at Water Wagon have also noted that auto-fill customers and any customers who expect winter service, should keep their driveway and fill pipe area well maintained in winter. Driveways that aren't plowed are difficult and often create obvious problems. The trucks are wide, long, and heavy and they do not have 4-wheel drive in most cases. These trucks require a 10-foot-wide clear driving surface and extra room to maneuver around curves, trees, and obstacles. The situation could become so difficult that they won't attempt to deliver your water in marginal conditions. The run to the tank from the truck should be 30 feet or less. You should locate the tank as close as possible to a utility room and be able to see the tank location from the truck pumping area so that the driver can see the tank and vent. Putting the tank in a crawl space is feasible, but the filler and the vent should slope downward and away from the tank to prevent water being trapped in them after filling (see Figure 3). *The vent and the filler should be in plain view and clearly marked with a sign. Filler caps should be blue to indicate that they are water (a red cap indicates an oil filler tank). Keep the water tank as far from fuel tanks as possible.* More than once water tanks have been accidentally filled with fuel oil.

Guidelines for Buried Tanks

First, every tank should be flushed with water very thoroughly. Most water storage tanks are buried outside a building. The tank should be a minimum of 4 feet below the surface. However this can be lessened by insulating the tank from above with 2 inches of styrofoam rigid board insulation or some other foam insulation. Every inch of this insulation is equivalent to 3.7 feet of soil in insulating value, so it doesn't take much extra foam to protect the tank

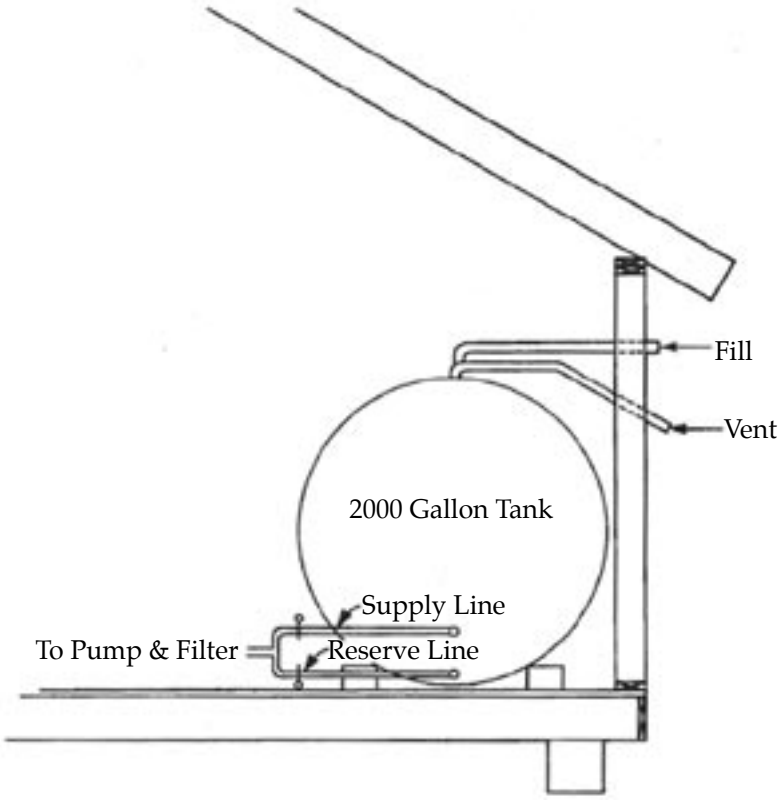


Figure 3
Typical Shed Installation
(In Heated Space)

from freezing. Even so, in extremely low snow years, some ice can form in a tank. Usually this is not a problem. The intent is to protect the tank from freezing in the winter, and from mud and possible floating of the tank during breakup or in a heavy precipitation event. The soil should be mounded or graded above the tank to divert surface water. And for extra safety, insulating the tank with at least 2 inches of foam insulation, as previously noted, is an excellent precaution.

If an extra option for thawing frozen fuel lines is desired, electrical, autotrace heat tape can be installed on the supply line to the structure. The heat tape should not be used continuously, but only in the case of an emergency when it is certain that the supply lines are frozen. Note the inclusion in this publication of the Consumer Products Safety Alert on electrical heat tapes and their possible dangers. If the water line is uninsulated, it should be at least 5 feet below grade, if possible. Uninsulated lines are not recommended.

The burial of the tank has several advantages. First, burying the tank avoids using valuable indoor space, which costs $100 or more per square foot, for water storage, perhaps less in a basement. Second, there is no chance of flooding the living space with the water if a leak should occur. And third, if water is stored indoors, 20 to 30 gallons of fuel oil a year can be expended to heat it. Some people feel this is worth the price but it is not really necessary. Indoor tanks result in cold water not really being cold, but being closer to room temperature due to the inadvertent heating by room air contact.

If the soil conditions, such as the presence of rocks or permafrost, do not permit burial of the tank, an insulated shed, preferably attached to the house, should be provided. A full 2,000-gallon water tank however, weighs in excess of 17,000 pounds (8½ tons). Therefore, a reinforced floor is a must. Sealing the system to avoid interior spillage is also very important. This type of installation is detailed in Figure 3.

Avoid burying tanks or water lines under driveways and other cleared areas. Heavy traffic may collapse a tank and the lines. Also, the soil under cleared areas is colder, increasing the likelihood for freezing problems. Before burial, pad the bottom of the tank with sand to protect it from sharp rocks.

Pump Protection

It is advisable to consider protection of the pump in your water system in the event of a water leak or for when you run out of water. When you run out of water the pump will attempt to pump water on demand when none is available and it could destroy itself. To prevent this, there are water level switches and low-pressure pump cutoffs, which can shut the power to the pump off when there is no water in the tank. Many product types are available, and new products are becoming available regularly such as:

1. Mercury float switch, which simply floats when water is present but when contact is made with tank bottom, this switch shuts off the pump. It is available for $30 to $40 in most cities in Alaska.

2. Conductive water level sensing device, which relies on conductivity of water to maintain pump operation. When water is absent, the pump shuts off.

Other Tanks Are Available Also

As previously noted, most common tanks are rolled steel tanks or polyethylene plastic tanks. Inevitably steel tanks are going to be replaced by polyethylene tanks, as they are becoming more durable and stronger, so that they can be buried empty. They have none of the disadvantages or shortened lifespan of steel tank.

Aluminum tanks are available in all sizes and applications. They do not rust, are lighter than steel, and will last a lifetime (barring damage). However, they cost about twice as much as an equivalent steel tank and have no real advantages over polyethylene. Stainless steel tanks are also available but are about 4 times as expensive as steel.

A collapsible steel tank with liner is available in a 1,500 gallons size for $2,850. This is especially good for transport to bush locations and other difficult logistical situations. It can be assembled by one man on-site and is transportable by small plane or boat.

Further Information

There are many options for on-site water storage not covered in this publication. For further information, call the Cooperative Extension Service in Fairbanks at 474-7201.

A useful reference for on-site water systems as well as other private water supplies is *Private Water Systems Handbook*, MWPS-14, $7.00. A new publication from Cooperative Extension has been developed for Interior residences to help residents with water protection and quality, indoor air quality and waste disposal. It is titled: *Living in the Interior*, CDR-00011, $5.00. Both are available from: Distribution Center, Cooperative

cont'd on page 8

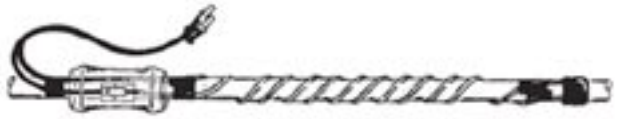
This publication contains advice on the use of electric heat tapes. These can cause fires if installed improperly. Please read the following consumer product safety commission alert, if you are planning to use heat tapes on your water lines.

Consumer Product SAFETY ALERT

From The U.S. Consumer Product Safety Commission, Washington, D.C. 20207

Electric Heat Tapes May Cause Fires

- **Install only as instructed.**
- **Some heat tapes must not overlap or touch themselves, unless specifically permitted in the manufacturer's instructions.**
- **Replace if electrical insulation is damaged or deteriorated.**



Electric heat tapes are used by thousands of home-owners (especially mobile homeowners) to protect their water pipes from freezing. Yet, if improperly installed or maintained, heat tapes could go beyond keeping your pipes warm; they could burn your house down.

A heat tape (also known as a pipe heating cable) consists of two wires enclosed in plastic insulation. When plugged into an outlet, it emits heat from electrical current passing through the cable. Heat tapes are usually installed in crawl spaces and in the sub-structure of mobile homes and other dwellings where exposed water and drain pipes could freeze during the winter. The products are often plugged in year-round and are activated by a thermostat when the outdoor temperature approaches freezing.

The U.S. Consumer Product Safety Commission (CPSC) estimates there are 2,600 fires each year involving heat tapes. These fires result in an estimated 20 deaths, 110 injuries and $24.8 million in property loss. Fires often occur because of improper installation by consumers. For example, a heat tape that is wrapped over itself or used near flammable material can lead to fire.

CPSC urges consumers to inspect their heat tape annually. If there is any damaged or cracked insulation or bare wires the old heat tape should be replaced immediately.

If you are purchasing heat tapes CPSC offers the following safety tips.

- Buy the proper tape for the proper pipe. Know the diameter and length of the pipe to be protected, then buy the heat tape recommended for that size by the manufacturer. (Some heat tape can be cut to fit the length of the pipe.)
- Buy heat tape that meets voluntary standards and is listed by a nationally-recognized laboratory such as UL.
- Follow the manufacturer's instructions for installing heat tape. Heat tape should not be lapped over itself around the pipe unless specifically permitted in the manufacturer s instructions.
- Wrap the heat tape directly over the pipe to be protected, never on top ot the thermal insulation covering a pipe.
- Don't cover the heat tape with insulating materials unless so advised by the manufacturer. If you insulate the tape, it must be a nonflammable insulating material such as fibrous glass.
- Never use more insulation than recommended by the manufacturer. Over-insulation can cause a fire.

009201

TYPICAL MATERIALS LIST FOR A BURIED HOLDING TANK
2,000 GALLON CAPACITY WITH RESERVE FEATURE

1	–	1½" X 7' galvanized pipe - thread both ends
1	–	2" x 7' galvanized pipe - thread both ends
1	–	1½" vent cap with screen
1	–	2" fill cap
1	–	10' heat tape
2	–	2" x 1" double-tap tanks adapters
2	–	1" foot valves
1	–	1" x 58" galvanized pipe - thread both ends
1	–	1" x 48" galvanized pipe - thread both ends
2	–	1" swedge 90° fittings
	–	1" copper pipe (soft) sufficient for need
2	–	1" copper gate valves (sweat)
1	–	1" copper tee
	–	Auto-trace heat tape with ends—sufficient for need
	–	Insulation and visqueen

Extension Service, P.O. Box 756180, University of Alaska Fairbanks, Alaska 99775-6180, Phone: 474-7268.

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Electric Heat Tapes May Cause Fires, Consumer Product Safety Alert is from the U.S. Consumer Product Safety Commission.

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