

EMERGENCY DRINKING WATER

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Should disaster strike, a lot of things would change. Normal everyday tasks would suddenly become more difficult. Stuff that is easily accessible now would be impossible to get your hands on and this includes the liquid gold of life” water.

Think what your day would be like if you had to haul all of your family’s water from a local stream, pond, river or spring. Not only that, but you would then have to filter that water to make it safe. This would take an exorbitant count of time and energy.

If you have a well, then you at least have the ability to get clean fresh water. But, if you don’t have a manual pump, that water might just stay underground where it isn’t any use to you at all, so be sure to attach a back-up hand pump to your electric one now.

What if you don’t have a well? You can still gather at least some of the water you will need. A ceramic cistern can be used to gather rain water and runoff from your gutters. Keep in mind that this water will contain contaminants and will need to be filtered or sterilized, but at least you will have something to work with.

Cisterns are simply large storage tanks that can sit under a rain spout to help collect runoff water. A pump should also be installed to help retrieval easier.

If you live near any kind of water source, consider purchasing an inexpensive gas powered pump that you can use to help retrieve large amounts of water for both filtering and in case of a fire emergency.

Remember too that you can use this kind of pump to siphon water from swimming pools for cleaning and washing.

When preparing for a crisis, storing a certain amount of water is a must. The big question is how much? Figuring out your water needs will depend on where you live (you use more water in high temperatures and high altitudes); if anyone in your family is ill (sick people need to drink more) and how much exertion you will be under.

Figuring all of this, begin by calculating at least one gallon of drinking water for each person in your family daily, plus more for cooking, bathing and washing clothes. Also be sure to add some extra to cover spillage and what you may need to give away to family and friends who don't live with you. Once people realize you have a water supply, they are going to end up on your doorstep and you don't want to shortchange your family, so add in some extra during the planning stages.

Most experts agree that every family should keep at least a week's worth of water on hand at all times; but a thirty day

supply is best. That would mean having at least 60 gallons for each person stored in case of an emergency.

Of course, finding a place to keep all of that water might be a chore. While a large water tank may seem the easiest, it is always best to store a certain percentage of your drinking water in smaller portable bottles that you can grab in case of an evacuation. Plus, if something were to happen to your main storage container, you don't want to be left with no water after all of that planning!

Be sure to secure all larger storage containers by bolting them to the floor and/or walls to keep them from spilling in case of an explosion nearby; earthquake or tornado. Be sure to keep containers in areas where they are most likely to be used (kitchen, bathroom, etc).

Plastic containers are always best because they are less likely to break. Having those 2 liter soda pop bottles can make great storage containers, especially since they can freeze repeatedly in cold weather climates without spilling. Milk jugs aren't as durable and should be avoided.

To find larger water containers and drums, check with your local restaurants and fast food joints for large plastic containers that can be cleaned, sterilized and used for water storage. Many places will give them to you for free. Just be sure to only accept containers that originally held food; otherwise they may be contaminated with chemicals.

Commercial water containers are available but can be pricey. Still if you want good quality 5 to 55 gallon containers that may be a good choice.

Another new commercial product many people are finding helpful is the bag in a box. This is a mylar bag that sits in a box container when filled with water. The mylar is cheaper than plastic so the entire container is very reasonably priced and can help save storage space.

When choosing your best options for water storage consider these facts:

- be sure to secure containers well
- keep containers from freezing
- buy a hand pump or siphon hose for easy retrieval from larger containers

To help conserve water in an emergency try these tips:

- remoisten towelettes for cleaning
- turn off water valves and main lines to homes right away. This will help keep water in your pipes safe from contamination (or draining back into the system).
- Don't forget the water in your hot water heater. It is clean and can be released through the valve on the bottom

Boiling is always a good way to make contaminated water more safe. Be sure to boil water at a full boil for a full 15

minutes and add 5 minutes for every 1,000 feet above sea level you are located. And remember: boiling only kills bacteria and virus from the water; it does not clear it from other contaminants so any water that has come in contact with chemicals, pesticides, etc. In this case sterilization or filtration is needed.

There are several ways to clean water. Here are a few:

Tetraglycine Hydroperiodilide: these are simple water purification tablets that do a good job of sterilizing even the most contaminated water supply. They can be found at your local camping supply stores.

Tincture of Iodine: Use 5 drops per quart to ensure water safety and kill off organisms. If the water looks cloudy or dirty, double this amount.

Iodine Crystals: although effective at cleaning water, they can be dangerous if used in the wrong amount. Always measure carefully and follow the directions on the container they come in. Also, you do not drink the water you mix the crystals into, but rather, use that water to treat your drinking water supply.

Chlorine Compounds: chlorine can be used to clean water for washing, but it does not kill amoeba and viruses so it should not be used to clean drinking water unless absolutely necessary!

Sterilizing water is very important in a disaster situation where containments may make you sick. Always use your fresh water supply first for drinking and cooking, followed by water that needs purifying.

Emergency Drinking Water Treatment

We all take a fresh water supply for granted. One turn of the tap and we have as much as we need. But what would you do if that water supply was shut down or even contaminated? You would be forced to look for water elsewhere.

Yes, it is true that there is water everywhere. The problem is a lot of it is not safe to drink. Water from pools, streams, ponds, rain buckets and even snow may contain dangerous bacteria, virus and other contaminants. Boiling can help, as can using iodine purification tablets, but if the water supply contains things like gasoline, soap, detergent, antifreeze or other poisonous chemicals, it won't be drinkable at all.

Making what water you can find safe can be a tedious process. Your first step is going to be sifting off as much solid stuff from it as possible. This can be done by filtering it through a coffee filter or cheesecloth. A towel or t-shirt folded several times will work too in a pinch. Or you can drill a few holes in a clean bucket and then fill the bucket with clean dry grass or straw and sand to filter the water through.

Here are a few other tips for cleaning unsanitary water:

Boiling

Boiling water for at least 15 minutes can help to kill most of the bacteria, viruses and microorganisms found in it.

Boiling makes the water taste flat, but that's okay; at least it's safe.

Chlorine

If you have plain, unscented laundry bleach you can use it to disinfect drinking water. Put 8 drops of bleach into each gallon of water and wait 30 minutes before using. If the water is cloudy, double the amount to 16 drops.

Iodine

This works much better than bleach at disinfecting water. Follow the directions of the container of iodine tablets or tincture for best results.

Emergency Toilets and Garbage Disposal

A prolonged power outage will mean that your toilets don't flush. This can cause a real health hazard in your home.

Bacteria and virus are rampant in human waste. This means that you have to keep your waste and feces away from your house and family. Remember, when dealing with this kind of emergency, there are three things you must do right away:

- bury all garbage and human waste at least 100 yards from your house and water supply

- keep flies, roaches and animals out of your garbage and sewage
- wash your hands immediately after touching garbage and waste products (even if you use gloves)

Toilets

What would you do if your toilets no longer worked? Here are few suggestions with dealing with this annoying and dangerous problem:

- If your toilet bowl itself is still in good working order, first clean it thoroughly and drain the water. Then install a sturdy plastic bag in the bowl, using the seta to hold it down. Use the toilet as normal. Sprinkle sand or sawdust or grass clippings over the top after each use. When the bag is full, carefully remove and dispose of it
- If your toilet has been damaged or destroyed, you can use a five gallon bucket to hold waste. If you sit your toilet seat on the top it will be more comfortable. Again, line the bucket with plastic rags as described above. This will make cleanup and disposal much easier.
- In the event this is a temporary emergency you can dig small holes in the backyard that can be refilled after each use. Be sure to do this at least 100 feet from your home and water supply to keep germs contained.
- For longer emergencies, you can dig a latrine, just be sure to keep the pit covered when not in use to keep animals and bugs away from it.

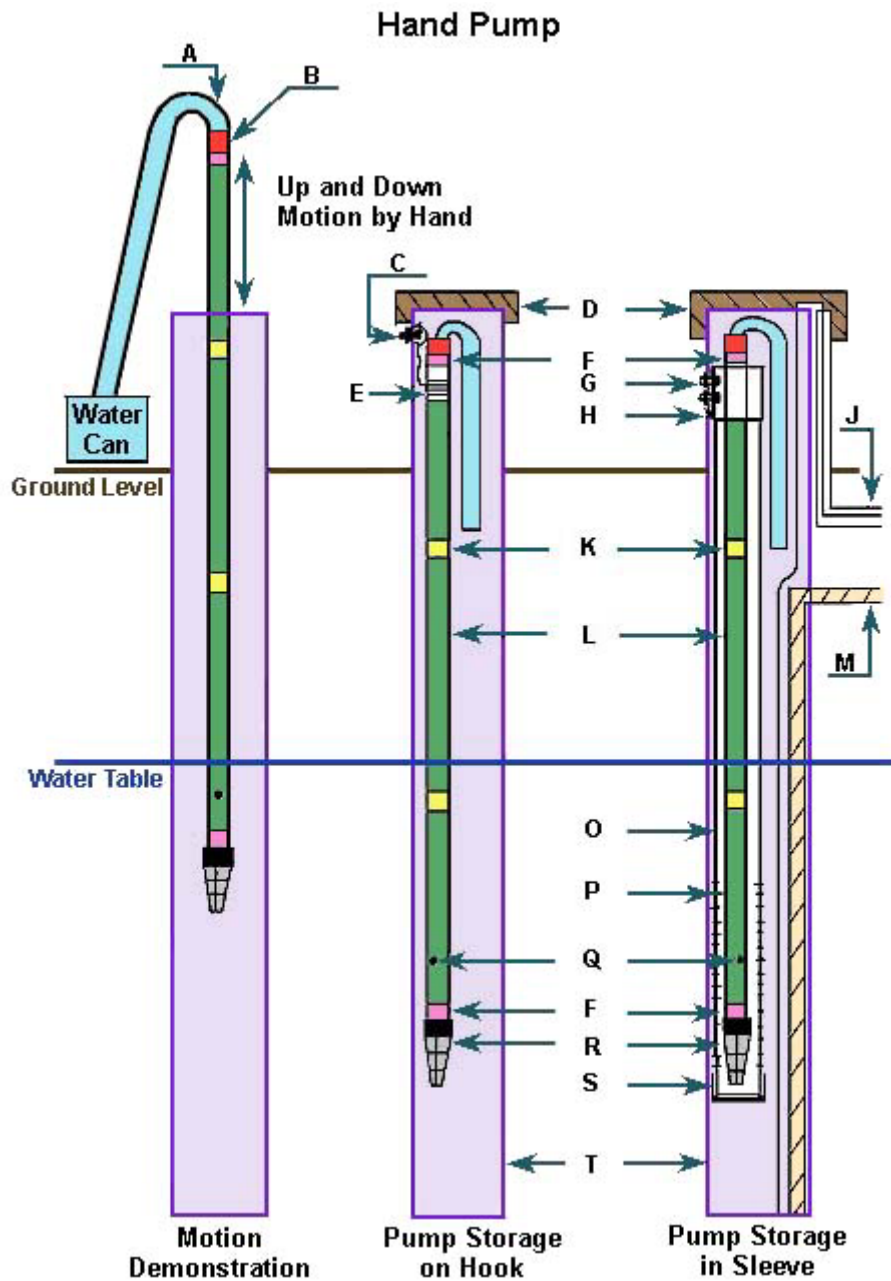
Disposing of Wastes

The best way to get rid of waste is to bury it at least 100 feet from your house and water supply. Be sure to cover the waste with at least 18 inches of dirt or animals may dig into it.

Garbage

Trash with food or anything that an animals or insect may be attracted too should not be allowed to accumulate; especially near the house. Liquids that contain fats should be buried at least 18 inches into the ground to keep away bugs and animal. Other liquids can be poured outside away from the house. If you expect garbage removal services to begin in a few days, keep garage tightly sealed away from the house. Otherwise, you will need to burn what you can and bury the rest.

How to Build a Water Hand Pump



There are a lot of reasons you may need a hand water pump. Maybe you have a well that works with an electric pump or maybe you will simply need a small pump to siphon water from a nearby lake, pond, stream or even a swimming pool.

Whatever the reason, you will want to know how to make this simple pump.

Legend for Pump Drawing

- A. 5/8 inch diameter garden hose (can be larger)
- B. 3/4 inch NPT to garden hose adapter
- C. Open eye hook, washers and nuts
- D. Well cap
- E. 1/2 inch thick nylon cord
- F. 3/4 inch PVC schedule 40 to 3/4 inch NPT adapter
- G. 1/2 inch carriage bolts, washers and nuts
- H. 1 – 1 1/2 inch PVC schedule 40 collar
- I. Electric power pump wiring
- J. 3/4 inch PVC schedule 40 pipe collar
- K. 3/4 inch PVC schedule 40 pipe section
- L. Electric power pump feed line
- M. 1 1/2 inch diameter schedule 40 pipe
- N. 1/2 inch holes in 1-1/2 inch PVC pipe sleeve
- O. 1/8 inch diameter weep hole
- P. 3/4 foot valve
- Q. 1 1/2 inch PVC schedule 40 pipe cap
- R. Metal well casing

Note: the letters reference the drawing on the previous page. Be sure all parts you use feature the same thread count.

Other Items You Will need

- PVC solvent

- PVC glue
- Rags
- Pipe compound (or tape)
- Drill and drill bits for weeping hole
- Eye hook hole
- Sleeve bolt holes
- Crescent wrenches
- Pipe wrenches
- Allen wrench

Note: these parts are for this model only. You can vary the parts and adapters but you will need a foot valve, a weep hole, stiff hollow shaft above the foot valve and a hose or side pipe discharge for the water to escape.

Assembly

This pump style can be used in water wells that have no existing feed lines, wiring or submersible pumps in place, or in water wells with them in place by the addition of a 1-1/2" interior diameter PVC pipe as a pump guide sleeve. The 1-1/2" interior diameter PVC guide sleeve should have a cap glued on the bottom end and 1/2" holes drilled through the bottom pipe section above the end cap. The holes allow water to flow freely into the 1-1/2" interior diameter sleeve when it is submerged into water. The sleeve separates the hand pump from feed lines, wiring or submersible pumps so they do not rub during pumping. It also keeps the water clearer by keeping the hand pump off the bottom of the well. The guide sleeve can be bolted to the above ground well casing area with 1/2" carriage bolts

and nuts. Be sure to seal the bolt holes with rubber washers or caulking. The guide sleeve and pump should extend down below the water table. As the foot valve of the pump is pushed down below the water table, the water flows up through the foot valve and into the pump shaft above it. The valve is open on the down stroke and closed on the up stroke. Repeated pumping motion shoves the water up the pipe and out the hose by a hydraulic ram effect. The water flows out the hose on the down stroke only.

Pump length is based on well depth and the water table height in it. The pump should be long enough to stay submerged in at least 3' - 5' of water so the pump remains in the water during the pumping motion cycle. Remember that water tables may change with seasonal conditions. If you know of wells that you may need to use in the future, you should get proper water samples from them and have them tested. Stagnant or unused wells should be cleaned out

with a power pump and disinfected. Local health departments and well drillers maintain well records and can give you information on well depths, testing and on keeping wells sanitary. You can also measure a well and water table with a sanitized cord and plumb bob. When using untested well water, you should use water treatments (boiling, bleach, iodine, filters, etc.) to protect you from typhoid, dysentery, diarrhea, cholera, giardia and other diseases.

You must disinfect your hands before using the well. Keep all the pump parts off the ground and disinfect them before placing them in the well.

Leaving the pump in the well and keeping the well cap on when not in use will help keep the well sanitary. If no sleeve is used in your well, you can hang the pump inside the casing by a cord with a prussik knot (Scout handbook) around the pump shaft. Install a hook below the well cap area on the inside of the casing and hang the pump from it. If you use a pump sleeve, you should make the sleeve about 2" shorter than the well casing top. Make the pump long enough to stand above the sleeve but still be short enough for the well cap to be replaced over the well casing. You can also wire a hook to the top of the pump shaft and hang it over the sleeve edge.

The pump can be made from copper and brass to stand up better to colder climates. Some makes and models of brass foot valves are:

Simmons model 1402

Merril Series 810, model FV75

Water Ace model RFV75

Brady model SFV75 (plastic)

A plunger action check valve can be used but you should put a 1/8" screen over the intake end and secure it with a ring clamp to help keep any well debris out of the valve. Foot and check valves have a closure spring which may need to be trimmed down or removed to get the best flow rate from pressures generated by hand pumping. The weep

hole is about 1/8" diameter. It should be drilled through one side of the pump shaft above the foot valve but a good distance below the frost line in your area. This allows the water in the pump shaft to slowly drain back down into the well when the pumping stops. This helps keep the well from freezing in cold weather.

NOTE: This pump works great at depths of 0 to 20 feet; good at 20 to 35 feet; OK at 50 feet. It remains workable down to 75 feet for one person, but beyond that, it is too heavy for only one person to operate due to the increased water and pipe weight. It will work deeper and is limited only by the person's downward thrust with more energy than it takes to suspend the existing water column in the pipe.

The pump model displayed is only one of an endless number of pump variations you can build. Parts are becoming harder to find in quantity due to low inventory stocking practices at stores. Other pipe types, sizes, adapters and fittings can be readily made into pumps that will work with varying degrees of efficiency levels. A functional pump only needs a foot valve, a weep hole (cold climates), a stiff hollow pipe shaft above the valve for the water to flow up in, and a hose or side pipe discharge to get the water away from the pump shaft and into a container.

Slow Sand Filters

In many cases, slow sand filtration is a good option for filtering water. Those who have access to surface water from ponds, streams and springs as well as groups that need more water than a cartridge can handle or those who don't want to use chemical treatment will find this more natural filtration system both practical and easy to use.

Slow sand filtration can remove up to 99% of bacteria, virus and Giardia cysts from the water if used properly.

Rapid vs. Slow Sand Filtration

There are two types of sand filters that can be used to clean water: the slow and the fast filter system. Rapid sand filters need a qualified person to handle them. Since the water is filtered at a much higher rate (about 1-2 gallons per minute), it is a good choice for larger groups that need a large steady supply of clean water. It uses strainer or pores to sift out solids and polymer injected into the sand to help stick other contaminants to the sand as the water quickly falls through the system.

Slow sand filters work much differently, allowing the water to more slowly make its way through the sand, thus cleaning it. Because of the slow movement of the water, particles usually embed themselves higher up in the sand bed. The more water that is passed, the thicker this top layer becomes and the water moves even more slowly toward the bottom. When this happens you know that your bed has been

saturated with bacteria and other particles and needs to be cleaned.

Maintaining a Slow Sand Filter

Draining the system and then scraping off the top layers of the sand and replacing it is usually all that is necessary to make it functional again. Be sure to run water to water through until a new layer has formed, so that you water is not accidentally contaminated. Larger pits may take a long time to scrape, so be sure to have another water source ready in the meantime.

Harrowing is another method for cleaning a slow sand filter which does not require the removal of top layers. It is done by slowly draining the pit to a depth of 15 inches or so, and then the upper layer is raked or harrowed while water is drained off above the filter bed. The process releases fine suspended particles that have accumulated. They are then washed away by the water as it drains through the valves. This method has its advantages, the biggest being that there is no need to re-reopening, which means it is back up and working within house of the harrowing.

To ensure that you slow sand filter is working properly be sure to include these important features:

- 2 or more vessels that are at least 6-8 feet deep
- An under grade assembly to collected filtered water
- A gravel support layer under and over the drain
- A 3-4 foot sand layer above the gravel

- Controls to regulate flow rate
- Head loss measurement devices
- Keep flow rate consistent at .04-16 g/ft/minute

By keeping a three foot layer of water at the top, the water being filtered is forced through the end, creating a natural cleaning process.

Sand Filter Drawbacks

Sand filters can be expensive to install and often become clogged. Still they remain one of the most efficient ways to filter large amounts of water that is pumped from rivers, springs and ponds.

Installation

For a bio-sand filter to work right, it must be installed correctly. Start by making a checklist of what needs to be done and look at it often during the installation process. Also, be sure to laminate a copy of the filter maintenance guide and attach it either to the filter or to a nearby wall for easy retrieval.

Keep in mind that the filter itself is probably about three feet long and one foot in width and height and weighs nearly 200-300 pounds so be sure to have plenty of help when installing. Be sure to choose your location carefully, since once installed the filter can not be moved. Here are some things to consider when choosing your filter's locations:

- keep it away from sunlight, wind, rain and animals
- place inside of home if possible
- never install near food prep areas if possible
- keep it on level ground
- place the filter somewhere you can easily get to it and easy to use it (remember you'll be filling large buckets with water so be sure there is space to do this)

Placing the Media

Here are the tools you will need:

- 3 liters are washed $\frac{1}{2}$ inch gravel
- 3/14 liters of washed $\frac{1}{4}$ inch gravel
- 25 liters of washed sand
- A 40 inch long and 1-2 inch wide stick
- 2 buckets of water

Here are steps to placing the media:

Step # 1: ensure that the drain hole (the standpipe opening at the bottom of the filter) is clear of debris

Step # 2: check to make sure that the flow rate without anything in the filter is 1 liter/25 seconds

Step #3: place a stick inside the filter until it touches the bottom

Step # 4: draw a horizontal line on the stick where it meets the top edge

Step #5: mark a line 2 inches lower than the first one

Step # 6: fill the filter half full with water

Step # 7: add 2 inches of under drain gravel to the filter

Step # 8: Mark a line 2 inches below the second line

Step # 9: add 2 inches of support gravel into the filter

Step # 10: level the gravel and pull stick out. Place the bottom of the stick on top of the gravel and when the 3 inch line is flush with the edge you have enough gravel

Step # 11: quickly pour about 20 liters of washed sand into the filter (ensuring that there is always water above the sand)

Step 12: Continue adding smaller amounts of sand until water begins to pour from the spout, but be sure water always remains above the sand. When the water stops pouring from the spout, the water is equalized in the filter.

Step # 13: smooth out the sand

Step #1 4: measure the depth of the water above the sand bed. If the water is less than 2 inches, remove sand until the

depth is two inches. If the water level is more than 2 inches, repeat previous steps 13 until the water depth is 2 inches

Step # 15: level the sand

Flushing the Filter

Here are the tools you will need:

- diffuser
- 40-80 liters of water

Step 1: place the diffuser plate snugly on the ledge (inside the filter) without actually touching the filter

Step 2: Place a receiving container under the spout

Step 3: Pour your eater into the filter

Step 4: keep adding water until the water coming form the spout is clear. This could take upwards of 20 gallons so be patient.

Test Flow Rate

Here is what you will need:

- measuring container with a 1 liter mark
- stopwatch
- bucket

Steps:

1. pour water to the top of the filter
2. collect water coming from spout

3. measure how long it takes the entire liter to run through (should not exceed 80 seconds)
4. the flow rate is too slow if it takes more than 80 seconds for the entire amount to flow through the filter. This could cause clogging later on. The flow rate can be improved by swirling the top sand and scoping out the dirty water. If this does not work replace your sand
5. If it takes less than 50 seconds for the water to make its way through the filter, the flow rate is too high and your water may not be sufficiently cleaned. Replace the media with less washed sand

Disinfecting the Spout

What you will need:

- 3 foot garden hose that fits the filter spout
- 1 hose clamp
- Funnel (can be made from the top of a soda bottle)
- Bleach solution made with $\frac{1}{2}$ teaspoon bleach to 2 liters of water. Never pour bleach directly into the filter!

Steps:

1. clamp hose over spout
2. place funnel on the other end of the garden hose
3. hold the funnel higher than top of the filter
4. pour 2 liters of bleach solution into top of funnel
5. hold for 2 minutes
6. remove hose
7. drain bleach solution

8. wipe outside of spout with a bleach-soaked cloth
9. add 20 liters of water to flush bleach out. Do not use this water
10. place lid back on filter

Operations

The schmultzdecks or biolayer is the key to removing bacteria from your filter. Without it only 30-70% of the contaminates will be removed from the water put through the filter. With a strong biolayer as much as 99.9% of contaminates will be removed. Keep in mind that it will take about three weeks of use to build a substantial biolayer. Be sure to re-sterilize the water coming from the filter during this time. Note: you will not be able to see the biolayer.

Daily Usage Tips:

To help your filter working well be sure to follow these daily use tips:

- make sure everyone using the filter understands how to use it properly
- slowly pour raw untreated water through the filter daily (at least 20 gallons. Try and use the same source of water daily for best results)
- The better the raw water, the better treated all of your water will be.
- Keep the diffuser in place when putting water into the filter. Never pour water directly onto sand mound

- Never remove the lid from the filter top
- Use a designated bucket for collecting raw water
- Keep treated water in a sanitized bucket or tank
- Install a tap or spigot to keep treated water clean
- Place the receiving bucket as close to the spigot as possible to eliminate contamination
- Never connect a hose to the spigot
- Never store food inside the filter. The diffuser may be cold, but it can contaminate both the water and the food
- Chlorinate all treated water sufficiently

Maintenance

Once you have built and installed your filter you will have to keep it well maintained so that it works properly. The two main things that must be done on a regular basis is disinfecting the spout and cleaning the biolayer when the flow rate is insufficient.

Disinfection

To disinfect your spigot follow these steps:

- use gloves as much as possible when touching the spigot
- clean the spigot every day with soap and water or a chlorine solution
- wash the receiving container daily with a chlorine solution
- never pour chlorine bleach into the top of the filter

- be sure to regulate clean the diffuser, and interior/exterior filter surfaces

Swirl & Dump

The flow rate through the filter will decrease in time as the biolayer traps more particles becoming too thick to let the water flow through. Even though the filter is still cleaning the water when this happens, it takes so long for the water to make its way through, most people are anxious to swirl and dump. To do so, follow these steps:

- remove the filter lid
- add 4 liters of water to the top of the filter
- remove the diffuser
- swirl your hand around the standing water a few times. The water will become dirty
- scoop out some of this dirty water with a cup or small bucket
- Repeat this step until all of the water has dumped from the filter
- Be sure to dump this contaminated water somewhere safe
- Replace diffuser
- Pour 20 liters of water into filter
- Measure the flow rate
- Repeat each step until your flow rate returns to a sufficient level
- Wash your hands thoroughly with soap and water

Be sure to check the following periodically:

- be sure that your filter remains free of rain, insects, etc.
- look for drips and water spots under the filter
- keep the lid tightly closed
- check the diffuser for clogs
- check to be sure the sand remains smooth and level and is 2 inches below the water surface. Note: over time the sand may settle, requiring you to add more

Having a clean water supply is essential to survival in every circumstance. It doesn't matter what disaster strikes, without clean water your family will find it difficult to stay healthy. Be sure to prepare with one of these important filtration additions to your survival preparations.