

How to Build a Hand Pump

Hand Pump Parts List

Legend for pump drawing:

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

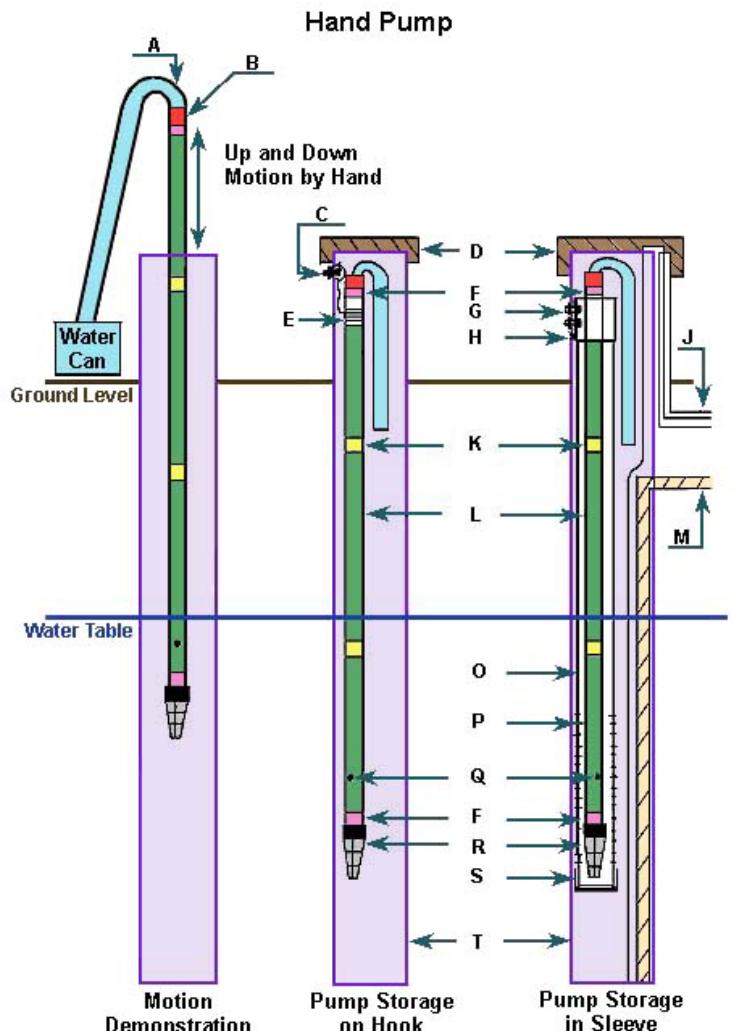
NOTE: For the pipe, adapters, etc you are using, make sure all parts are made with the same thread count.

Other Items Needed

- PVC solvent
- PVC glue
- Rags
- Pipe tape or compound
- Drill
- Drill bits for weep hole
- Eye hook hole
- Sleeve bolt holes

- Crescent wrenches
- Pipe wrenches
- Allen wrench for well caps

These parts are for this model only. You can vary the parts and adapters. The only thing necessary for a working pump is a foot valve, a weep hole (cold climates), a stiff hollow shaft above the foot valve and a hose or side pipe discharge for the water as it comes out.



Power outages are becoming more common due to storms, aging transmission grids, accidents and criminal acts. This hand pump can help citizens maintain a potable water supply. The more self-sufficient citizens are in having water, food, medicine, medical supplies and other basic needs, the less likely they will overload the local emergency services agencies in a power outage or other widespread emergency.

Please copy this document and distribute it to your local community via school activities, churches, civic clubs or local businesses.

Buy the parts and build a pump now. The parts are already scarce due to low inventory stock management practices in stores.

In such an emergency, the fate of yourself, your family and your community is in your hands. Will you be prepared to survive it?

Pump Assembly Notes and Instructions

Update 2 July 1999

Keith states he built this hand pump in 20 minutes for about US\$20. It 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. Sick persons must not have any contact with the well area, pump or water containers. Keep the area around the well sanitary and never drink from the hose or allow any waste water or animals near the well area.

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. It will cost more, be heavier and freeze easier in cold climates, but will allow the pump to be used on fuels from storage tanks. 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.

If you need access to water at greater depths, the following changes can be made which will increase working depth to about 150 feet:

1. Substitute 1/2 inch PVC pipe instead of 3/4 inch for the pump sections, collars and adapters.
2. Do not drill the 1/2 inch holes in the 1-1/2 inch casing, keep the guide sleeve as a closed pipe except at the bottom. Use a 1-1/2 to 3/4 inch reducer as a replacement for part "S" (the end cap) and thread another 3/4 inch foot valve into it, facing downward into the well.

The finished product should be a 1-1/2 guide sleeve with a foot valve at the bottom and the 1/2 PVC pump with a foot valve on the bottom of it. The guide sleeve should be suspended into the water table at least 5 to ten feet. When the pump is stroked up, it will suck the water in through the guide sleeve foot valve. On the down stroke, the guide sleeve foot valve closes and the pump pipe foot valve opens, shoving it up the 1/2 pipe.

Flow rates of two to three gallons per minute are possible at this depth with a steady stroke. Mark your pipe lengths so you do not bottom out on your stroke when pumping. The reduction to 1/2 PVC reduces the overall weight of the unit to allow for the greater depth.

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.

The best way to survive a power outage or any emergency is to prepare before it occurs. You need shelter, heat for cooking and warmth, water, food medicines, medical supplies, hygiene items and other things. These will not be easy to get in a power outage or emergency. Build a pump now while you can still get the parts. After a power outage will be too late.

This hand pump was designed, built and graciously donated by Keith Hendricks who lives in northwestern Ohio. Keith has distributed thousands of copies to folks attending survival expos because he believes we are all in for rocky times and that personal preparedness is our best defense. In an effort to make a contribution, he has made his easy-to-assemble pump available to all who wish it. If you have any further questions, or wish to express personal thanks, Keith can be contacted at patriot@ohio.tds.net