

Healthy house water systems

This article is a catalog of measures to promote healthy water and deter mold. It includes tips for installing pipes, fixtures, wells, filters, etc. Choosing a filter is not covered here.

Keywords: Healthy house, less toxic, plumbing, water pipes, PEX, copper, well, water tank, pressure tank, reverse osmosis filter, RO filter, installation, mold prevention, stray current, MCS, chemical sensitivity

Introduction

Good water is essential for human health. Whatever is in the water will enter our bodies through the mouth, the lungs and the skin when we drink water or take a shower.

People with severe environmental sensitivities can be affected by minute amounts of minerals and chemicals in the water, at levels far below what people in general would even notice. These can come from wells, municipal water systems and household pipes.

Water running through a copper pipe will absorb trace amounts of copper. Humans do need to ingest small amounts of copper, so this is usually a good thing. The chemicals leaching out of plastic pipes do not have any benefits, though the amounts are so small it is rarely a problem, especially if the drinking water is filtered.

A pipe with a slow leak may take a long time to be noticed if it is hidden somewhere. Water creates mold, which can greatly affect a person with environmental sensitivities. Replacing the moldy building materials can cause severe health problems, and may not eradicate all mold in the house. Mold prevention is thus very important.

Pressure testing

It is a good idea to pressure test the entire pipe system. Pressure testing is usually only done on pipes placed under the foundation, but it can also be done on the full system. Pressure testing can locate faulty fittings and shoddy workmanship, which otherwise may take years to be discovered.

2 Plumbing

A good time to do this test is before the walls are closed in and before the connection to the house is made. If there is any leak, it is easy to investigate and repair at this time.

Safeguarding appliances



Gas water heater with a water-collection pan underneath.

Some appliances can develop leaks as they age, or if there is a malfunction. Flooding can cause a house to be moldy, especially if it is made of wood or has carpeting. In standard wood-framed American houses, water can easily run under a wall into adjacent rooms.

Appliances that can leak include:

- water heater
- washing machine
- water softener
- whole-house water filters

Options for preventing problems include:

- place appliance where a leak is a minor problem, such as garage or outbuilding

- place a water-collecting pan under the appliance
- put a drain in the floor (new construction)



Floor drain in utility room protects against flooding

Biofilm

A biofilm is a thin layer of bacteria, which eventually will coat the inside of any water pipe. This coating limits the direct contact between the pipe material and the water.

A person who has trouble with water delivered through newly installed pipes may do fine once the pipes are coated with this biofilm.

The water pipe biofilm itself does not seem to be a problem for sensitive people. Other types of biofilm live in the human body, such as on the teeth and inside the intestines, where it helps the digestive system.

Pipes inside the house

The water pipes in a house must be of a healthy material, and be leakage free.

4 Plumbing

Most pipes are hidden in the walls, where it is difficult to notice a small leak, and repairs will involve replacing the drywall and painting the new drywall. Additional material may need to be replaced to remove moldy building materials. Such renovations usually remove any material with visible mold, while less-moldy parts are left in place, so there may still be a low-level mold problem.

PEX pipes are becoming the norm for new construction in North America. PEX is flexible, so there is less need for individual pieces to create bends on the pipe (unless tight turns are needed). Compression fittings and crimp fittings are used instead of soldering. These features make PEX a lot faster to install than copper and thus less costly.

PEX pipes are made of high-density polyethylene (HDPE) plastic, which is one of the more benign plastics. However, in order to create the molecular cross-linking, various chemicals are added. Concern with chemicals leaking into the water delayed approval of PEX in California until 2009. Whether PEX is acceptable for MCS housing is still a question.



PEX crimp connections, before the wall was closed in.

Another issue with PEX is the connections. These connections may not be as durable as a soldered connection. The method is too new to have been exposed to daily and seasonal temperature changes for decades, which may eventually cause seepage and mold, possibly in a closed-in cavity where nobody notices it for a

long time. There have been class-action suits against two American manufacturers of PEX fittings, with claims that the fittings leaked. Both suits were settled out of court.

Copper pipes remain the standard for MCS houses. Just make sure lead-free solder is used, which is standard in North America.

One contractor with extensive MCS experience uses double the usual amount of solder, to be absolutely sure there will never be any leakage. We do not have data on how often a correctly done solder fails, so it is unknown whether this extra precaution is necessary.

A third option is polypropylene pipes, which some consider a more inert material than PEX and copper. It is not commonly used.

Pipe dope and teflon tape

Where fittings are screwed together, such as for faucets and appliances, there is a need for something to make the threads water tight. The options are “pipe dope” and teflon tape.

Pipe dope contains biocides to deter mold growth, which is unacceptable to most people with MCS. Teflon tape is much more benign.

Unfortunately, pipe dope is easier to work with and less prone to leakage.

Flexible hoses

Flexible hoses are usually used to connect the faucet on a sink with the outlets below the sink (usually with shutoff valves). The standard hoses are made of plastic, with some sort of protective cover over it. These hoses have worked well for sensitive people.

Some very sensitive people have made their own “hoses,” using thin, flexible copper pipes and compression fittings. These can be difficult to get together, especially when using teflon tape. Some of these custom installations had to be replaced when the faucet was replaced, as the “hoses” were not long enough to reach the new faucet.



Flexible copper pipes used to connect a faucet.

Another option is to use flexible copper connectors used for water heaters, with adapters to fit the smaller threads.

Pressure tank

Houses with a well use a pressure tank to maintain a steady water pressure, so the well pump only needs to run intermittently. These tanks are made of either steel or fiberglass. Both materials work well for people with MCS.

These tanks have an air filled bladder inside, to provide expansion under pressure. The bladder is usually made of rubber, which will impart smell and taste to the water for awhile. Some people have rinsed out their new pressure tank repeatedly before installing it. They did that by connecting it to a garden hose, to fill the tank under pressure. Then they let it sit in the sun for a day or two, before emptying and refilling it.

Some MCS houses use pressure tanks with an ethyl vinyl acetate bladder. They were sold under the Dayton Electric brand, but are currently not available in America. Other bladder materials may become available, so it may be worth checking.

Another option is to not use a bladder at all. One household uses a large (80-100 gallon/300-380 liter) pressure tank with a big air bubble in direct contact with the water, instead of separated by the bladder material. The only difference from using a bladder is that the air slowly dissolves into the water, so more air has to be pumped into the tank from time to time. A larger tank makes the need for more air less frequent.

Installation of reverse osmosis filter

Reverse-osmosis (RO) filters are very common in MCS houses. There are whole-house versions available, but the most common is the type with a separate spigot by the kitchen sink. A whole-house RO filter is costly and will throw away a lot of water.

The hoses that come with an RO filter are usually polyethylene, which seems to work well.

The RO system usually comes with a small storage tank, as the filter generates clean water very slowly. These tanks usually have an air filled rubber bladder, which can be a problem for sensitive people.

Another problem is that the RO membrane contains a preservative, which may leak into the water.

As the system is used, these problems will be solved, but with the low volume of water it will take some time. What some people have done is to install a carbon filter on the line going to the spigot. This can be done by adding an extra filter house, which is available from many hardware stores. Some people have reconfigured the hoses on their RO filter system, so one of the pre-filters now serves as a post filter instead.

If an RO system is installed in a new home, make sure to flush the pipes first, to avoid the filters becoming overloaded.

Underground water pipes

Water comes to the house from either a well or a municipal water system. In both cases, PVC plastic pipes are the standard material in the United States. Steel pipes are common in older neighborhoods and are still installed in some countries.

Steel pipes have problems with corrosion on both the outside and inside. With inside corrosion, iron (and perhaps nickel and other metals) will be added to the drinking water, which may not be desirable. Water with a high iron content will also produce discoloration of shower stalls, commodes, etc. The insides of an old steel pipe can be surprisingly disgusting.

A few people with MCS have used buried copper pipes. This is costly, and buried copper pipes may corrode faster than steel pipes.

Metallic water pipes can be a pathway for stray currents travelling from a well or neighbor into a house. This can cause elevated magnetic fields and even electric shock. This problem can be corrected by inserting a short (1 ft/25 cm) piece of plastic pipe as an insulator (dielectric coupler).

PVC pipes are glued together, using a special glue which becomes odorless within a few hours. It is not a good idea to try using any less-toxic glue that is not specifically tested for these pipes.

Most plumbers put copious amounts of glue on both the inside of the coupler (female side) and the outside of the pipe (male side). When the pipes are then put together, a lot of the glue is pressed further into the pipe and exposed to the water in the pipe (see picture).



*Cut-out PVC water pipe, showing excess glue exposed to the water stream.
Note how the glue has leached along the bottom of the pipe.*

A plumber experienced in MCS construction avoids this excessive “glue donut” by putting a very thin layer of glue on the inside of the coupler (as a primer) and then the regular amount of glue on the outside of the pipe.

It is best to allow the glue to cure for a full 24 hours, before any water is let into the pipe. This waiting period is regardless of any claims by the manufacturer that a shorter time is sufficient. Glue cures best with air.

Flushing the pipes

The pipes should be flushed before they are used, to remove contaminants. There will always be some contaminants left in the pipes after they are installed, both from the manufacture of the pipes and their installation (such as flux from solder).

Drilling a well

The drill must be cooled and lubricated as it works its way into the ground. Some well-drillers use ordinary dish detergent to avoid contaminating the well water.

Water storage tanks

A water storage tank is used when the water supply is intermittent, or not able to keep up with peak demand. Examples include:

10 *Plumbing*

- slow-producing well or spring
- solar-powered well
- generator-powered well
- water is trucked in

The water tank supplies the water to the household in a steady stream, while the tank may only be filled up now and then. This allows the household to fire up a generator to run the well pump once a week, or less, or let a solar pump run when the sun shines.

In desert regions, the water table can be so low a well becomes too expensive. People there may receive their water monthly with a tanker truck, or they use their own water truck or trailer.

A benefit of having a water storage tank is that it can improve water with a high mineral content (high TDS number). When water sits still in the tank, the mineral particles will tend to settle on the bottom.

Household size water tanks are usually from 1000 to 3000 gallons (3800 to 11,000 liters).

Water storage tanks are usually made of plastic, concrete or steel. The plastic tanks are the cheapest and are also the easiest to obtain. Hardware stores serving rural areas often have them in stock, or can order them.

Various plastic materials are used for these tanks, usually with UV-protective additives for tanks that can sit out in the sun. All of the plastic tanks impart a slight plastic smell and taste to the water, even after several years of use. This can be filtered out, and several MCS households do use these tanks.

Galvanized steel tanks do not have problems with odor and taste, and are considered healthier than the plastic tanks. They cost more than the plastic tanks and may not be available locally, though they can be transported long distances on a flatbed trailer. These tanks are often produced to order by small welding shops. Ask a local well driller for a source.

Steel tanks must be placed on a bed of loose gravel with good drainage, to limit rust. The gunk collecting on the bottom should also be cleaned out once a year, to prevent rust.

Expect a steel tank to last ten to twenty years.



Cleaning the inside of a 3000 gallon (11,000 liter) steel water tank.



Installing a steel water tank on a gravel bed to prevent rust. The intake/outlet is in the bottom, to prevent freezing.

Concrete tanks are also called “ferro cement tanks.” They are custom built on site, which can be done by a handyman. There are books available on how to do this (see later). This author has no experience with these tanks, and is not aware of any MCS household using one.

A newly installed water tank should be scrubbed inside, before it is taken into use. This can be done by someone climbing inside with a mop.

Make sure the outlet is elevated about 10 inches (25 cm) above the bottom of the tank, to limit sediments in the pipe.

A sediment filter should be installed on the line entering the house.

For more information

The book *Water Storage* by Art Ludwig is an excellent source about water tanks.

Other articles about healthy house building designs and practices are available at www.eiwellspring.org/saferhousing.html.