

## Camper Plumbing for Beginners

When I set out to add a hot water heater and new faucet to our Aliner, I knew almost nothing about plumbing. Ignorance worked to my advantage, though, because I tried all sorts of things before I was successful. I did buy a plumbing reference book, but trial and error taught more. Maybe some of the things I learned will help others who are also starting from scratch.

First, I had to consider what I wanted to connect, where the pipe/hose would or could run, and what kind of water it had to carry – potable (drinking), hot or cold, under pressure or not, inside or outside. All of that made a difference. I had 3 basic options – metal pipe, plastic pipe, and hose.

**Metal:** I didn't even attempt metal pipe, but I did use lots of brass fittings. They come in all kinds of sizes and shapes. Male ends (threads on the outside) and female ends (threads on the inside) are usually "pipe threads" - slightly tapered. As you tighten the joint with a wrench, the threads wedge together, making a watertight seal. Teflon tape, wrapped 3-4 times around the male threads *in the direction of the threads* makes it easier to tighten the joint, and will help seal any pinprick leaks. I also tried using a paste "joint compound", but the tape worked better for me. I was told that brass connections are the hardest to get watertight, and it seemed to be true. Pipe-thread connections can be taken apart with a wrench; I read, however, that because of the tapered threads, there's a limit to how many times they can be re-assembled before the threads no longer seal well. Note that pipe threads are different from garden hose threads!

Brass adapters are available to connect almost any 2 different sizes or threads, and multiple adapters may be necessary; for example, with one or more adapters you can connect a 1/2" male pipe thread to a 5/8" male garden hose thread. Brass adapters are a bit expensive – mostly in the \$2-\$4 range. You can also find many cheaper threaded nylon connectors, but I felt more secure with brass.

**Plastic pipe:** This comes as PVC, CPVC, and PEX. PEX is a newer kind of pipe, a little more flexible than PVC, and becoming popular for residential use. While you can cut any of these with a saw, a small pipe cutter is inexpensive (under \$10) and very handy; it's also the *only* way to get the smooth, even cuts needed for PEX connections. You will find all kinds of PVC and CPVC connectors: caps, tees, ells, etc. Some have pipe threads (use Teflon tape), and others can be glued together with PVC cement (which actually dissolves a bit of the plastic to make the seal).

PEX pipe requires mechanical connections – it can't be glued. There are new "push" connectors that are *very* easy to connect and disconnect. They are expensive (in the \$3-\$5 range), but the only tool you need is a pipe cutter. They come in a variety of sizes and styles (ie tees, ells and adaptors). I was advised, though, that they might be susceptible to leaking with the vibration of a camper. PEX can be connected to barbed brass adaptors with a crimped band, but the crimping tool costs well over \$100 – make friends with somebody who already has one, or beg a favor from a plumber!

There is a system called "Flair-It" which uses barbs and nuts to connect PEX or CPVC pipe. An RV dealer might carry it, or you can find it online at <http://www.escousa.net/flair-it/pexcoupling.htm> The fittings are expensive (similar to push connectors) and seem to make a very good connection. You need a pipe cutter and it takes a lot of pressure to seat the pipe on the barb. I also found them impossible to take apart.

**Hoses:** You can buy different kinds of hose (reinforced or not, thick or thin) by the foot from hardware stores. You connect them by pushing the hose end over a ridged hose barb and using a screwdriver to tighten a hose clamp around it. Barbs are sized to match the inside diameter of the hose (I.D.) and clamps to match the outside diameter (O.D.). There are all kinds of brass and plastic/nylon fittings with barbed ends, as well as barbed splices to join 2 hoses. Hose is pretty cheap and barbed connections are easy to make and take apart.

You can also buy many different hoses, in varying lengths, with factory-assembled ends: garden hoses (not for drinking water), RV water hoses, faucet supply hoses, dishwasher supply hoses, washing-machine hoses. Some, like supply hoses, are reinforced with fibers and/or braided stainless steel. The ends on these pre-fab hoses may be garden threads, pipe threads or compression threads. They include washers to help seal the connection and are easy to tighten. You can use brass adapters to change the type or size of connection, or connect 2 different hoses. If the hose isn't the right length, or the fitting isn't what you need, you can cut it and use a barbed fitting. Even braided stainless can be cut and joined with a barb. If the hose is hard to get over the barb, warm it with a hair dryer - it should stretch enough to slip right on.

After lots of visits to Lowe's, many purchases, and almost as many returns, I ended up using prefab hose wherever I could. Braided stainless washing-machine hose with garden-hose threads were perfect for hot water lines outside the camper. Inside, I used braided stainless-steel faucet supply lines for hot water, and plastic supplies and hose-by-the-foot for cold water.

I tried to keep my connections to a minimum – more joints mean more potential leaks. It was a big help to test connections, using temporary garden-hose fittings, whenever I could. If I had a female end to work with, I could use a garden hose. Washing machine hoses, with their 2 female ends, were great for testing male connections. This was especially useful when I was trying to get the connections watertight on the heater; I worked in the basement (near the floor drain!) until I got it right ... which I *finally* did.