SINK 2 SEAT

Building Breakdown

Matter of Trust . org
Est. 1998
Eco-Home

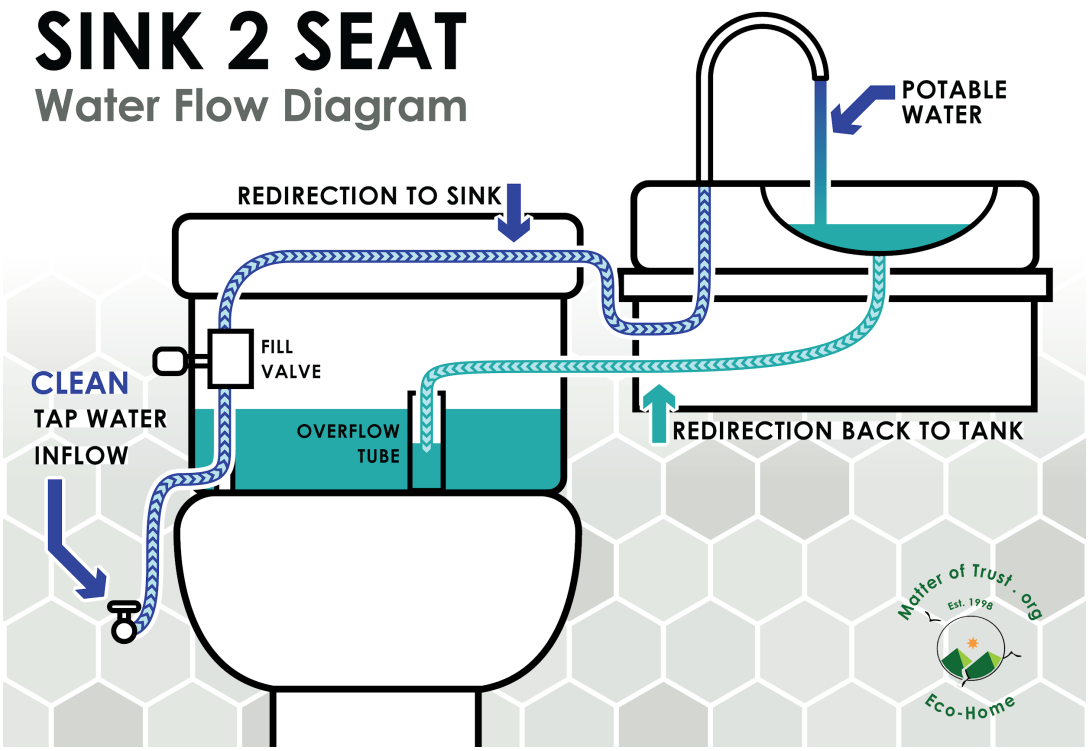
Table of Contents

Basic Concept 2
Preliminary Planning 3
Parts List 5
Sourcing Materials 6
Starting the Build & Initial Hurdles 8
Faucet Troubles 10
Plumbing Installation 13
Finalizing the Project 14

Basic Concept

The purpose of a toilet sink is to redirect water from the tank infill valve to a dedicated sink, which then diverts the greywater back into the tank. Filling the toilet tank with the water you use to wash your hands reduces waste, which is good for the environment and for your pocketbook.

Though many people are initially put off by this system, it is important to note that you never touch water from the bowl of the toilet. As shown in the diagram below, the water that enters the toilet's tank is clean tap water. Though not always potable, it is perfectly hygienic for washing your hands. The clean water is diverted to the sink, which is positioned higher than the tank so that gravity feeds the water back into the tank.



Preliminary Planning

Our dual-flush style toilet posed two significant hurdles: the flushing mechanism itself and the metal ADA bar bolted into the wall above the tank [Fig. 1]. The flushing mechanism is centered on the tank, which means that this tank has more components than traditional toilets. That limited the amount of tubing we could put in the tank [Fig. 2]. The ADA bar necessitated a more complex sink, one that could not rest on top of the tank and that could be moved or removed whenever someone needed to use the bar.

With these constraints in mind, we created a rudimentary sketch of the system [Fig. 3]. Because we worked with many secondhand parts, our initial design was influenced by the materials we could get our hands on.

Fig. 1: Centered flushing mechanism & ADA bar

Fig. 2: Centered flushing mechanism (blue and gray cylinder)

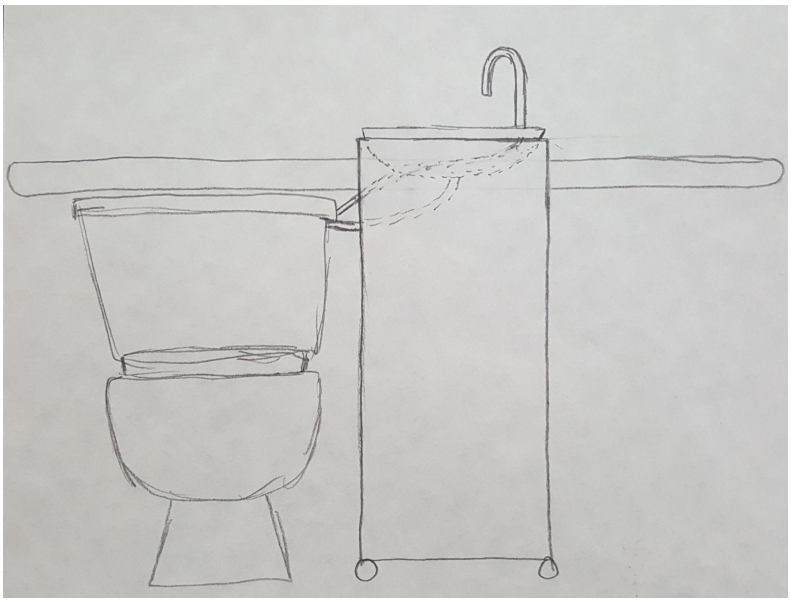


Fig. 3: Preliminary sketch

Parts List

Not everything we used was secondhand, but you can make the system entirely with secondhand parts if you are willing to search for materials. Here's what we used:

- Wood cabinet (salvage)
- Wood panel
- Wall-mount sink
- Single-lever faucet (to reduce plumbing complexity) (salvage)
- Caster wheels
- ⅜" tubing
- Stainless steel hose clamps

After some hiccups, we also had to acquire:

- ¼" compression x ¼" MIP plumbing adapter
- ¼" barb x ¼" FIP adapter
- Refrigerator ice maker waterline
- 1-¼" PVC pipe cap
- Liquid Nails glue (or any other high-strength, multi-use adhesive)
- ½" wood dowel rod
- ½" hole saw
- 10mm diamond-coated hole saw drill bit

In addition to the project-specific tools and materials, we already had a few tools on hand:

- Drill
- Jigsaw
- ¼" drill bit

**It is important to note that our builder on this project is not a plumber by trade, so some of their solutions were improvised. As such, when we reference these solutions, we will also offer in a footnote an alternative solution that may work better.*

Sourcing Materials

As much as possible, we tried to source our materials from secondhand and salvage stores. That allowed us to reduce our costs significantly, although it also required more time to source certain items than if we had purchased new materials. If money is tight but you have the time to source quality salvaged materials, you can get all used materials for the toilet sink, for less than half the cost of new materials. At the salvage yard, we found both the faucet and the cabinet that we placed the sink on [Fig. 4]. For our build, it was particularly important that the cabinet was high enough to allow the tubing to slope downward, toward the toilet tank, but it also had to be low enough to fit under the ADA bar.

We needed a sink that was especially small to conform to the limited space available, so we ordered the sink from Home Depot. While some salvage yards may have sinks of that size, it may take a while until an unusually small sink shows up at the yard. You might also use a small, metal bowl as a DIY sink, although that would require you to drill holes for the faucet and the drain. In either case, it is important for the faucet plumbing to fit between the sink and the cabinet. If necessary, you can cut a hole in the cabinet to fit the plumbing.

While all of the plumbing and other miscellaneous parts can be found at big-box home improvement stores, we found most of our parts at our local hardware store, which we recommend in order to help local businesses. We also had some materials on hand, such as the wood panel attached to the top of the cabinet and the adhesives we used for the tubing and pipe adapters.

Fig. 4: Single-lever faucet (left) and cabinet (right) from a local salvage yard

Starting the Build & Initial Hurdles

After sourcing all the requisite materials, we measured the cabinet and outlined the spot where we would mount the sink so the wood panel would fit symmetrically on top of the cabinet. Using a jigsaw, we cut a hole through the "roof" of the cabinet for the sink's drain tubing. We made the hole large enough so that we could easily maneuver the tubing in later steps.

Because our cabinet had a gap between the "roof" and the edges of the wall planks [Fig. 4], we had to clamp the wood panel to the top of the cabinet and drill four screws through the "roof" and the panel, ensuring that the screws were short enough to not puncture the top surface of the panel [Fig. 5]. This precaution was, strictly speaking, unnecessary because the sink would cover any screw tips anyway. Still, it made for a more professional-looking final product.

Our largest hurdle at this stage was mounting the sink. Clamps on the underside of the counter—or possibly arms attached to the wall—typically hold a sink to a countertop. Then its edges are sealed with silicone caulk. Because ours was a wall-mounted sink (due to our size restrictions), we had to concoct a solution that would keep the sink in place on the countertop while allowing us to access the sink's underside. Our solution was to treat the wood panel as a Lego block: we drilled ½" holes halfway into the top of the wood panel at the corners of the underside of the sink. Then we hammered short ½" dowel rods into the wood panel, held in place by friction [Fig. 6]. We then slotted the sink into place. Once installed, the sink would not shift if bumped, but we could still lift it up to access any component that needed fixing.

Fig. 5: Wood panel installed and holes cut for sink drain

Fig. 6: Dowel rods used to keep the sink in place

Faucet Troubles

Once we could safely place the sink on the cabinet, we began working on the faucet and the drain. We ran into a problem almost immediately: the size and threading of the faucet pipe [Fig. 7]. Our salvaged faucet used compression-type threading on a male pipe (threads on the outside). It was extremely difficult (for our non-plumber builder) to find compatible fittings to connect the ⅜" tubing to the faucet. We could not find a simple, single-adapter solution for a ¼" barb fitting to a ¼" female compression fitting. After a few days of trying to use only brass adapters, we had to settle on a compromise that involved two adapters (¼" barb x ¼" FIP, ¼" MIP x ¼" compression) and refrigerator water lines that use compression threading [Fig. 8]. To secure the tubing on the barb, we used a small hose clamp.[1]

Attaching the faucet to the sink was our final challenge. In theory, it should have been easy to find a nut that fits the threading and to use a washer to clamp it down on the inside of the sink, but the compression threading complicated matters. The "compression nuts" that the hardware stores sold had a small inset and a threading termination [Fig. 9], making it impossible to thread it completely through. After much research, we decided to use a hacksaw to cut one of the nuts in half [Fig. 10].

After solving the faucet issue, we turned our attention to the drain. Because the sink was intended for light handwashing, the tubing would be very thin, and we needed to maintain the downward slope to drain fully into the tank. We decided to forgo a U-bend. To seal the sink's drain and allow the ⅜" tubing to be attached, we glued a 1-½" PVC cap to the bottom of the sink drain. Liquid Nails worked better than PVC cement because it was a plastic-to-ceramic bond rather than a plastic-to-plastic bond.

[1] **Solution Note**: You can avoid most of this trouble by purchasing a new faucet or a used one with proper connections, although you will need some fitting adapters to attach the ⅜" tube.

After attaching the cap, we drilled a ⅜" hole into the end of the cap [Fig. 11] and glued the ⅜" tubing into the hole, ensuring that it was flush on the other end to allow all the water to flow unobstructed into the tank.[2]

Fig. 7: Faucet compression threading

Fig. 8: Refrigerator water line connected to faucet with adapters fitted on the right

[2] **Solution Note**: We don't recommend using this method to make the drain because it makes it hard to repair and replace parts in case of a failure. Instead, we recommend that you attach a threaded cap to the end of a common bathroom sink drain (metal or plastic). Then you can drill a hole for a ¼" barb fitting with a male threaded side to screw into the cap. This method allows you to take everything apart and replace parts without relying on an adhesive.

Fig. 9: Compression fitting (image via Home Depot)

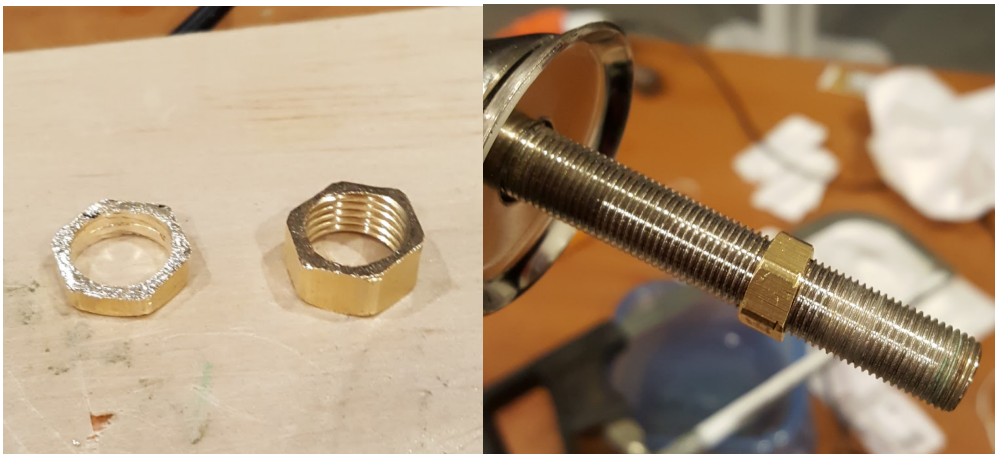


Fig. 10: Cutting compression fitting in half to thread through faucet pipe

Fig. 11: PVC cap glued to sink drain, before attaching ⅜" tubing

Plumbing Installation

Once we had all the plumbing hooked up to the sink, we prepared the toilet for the additional plumbing. We drilled two holes in the tank: one in the lid for the incoming water and one in the side of the tank for the outgoing water. We had planned to put both holes in the lid so as not to compromise the structural integrity of the tank wall, but the height of our cabinet prohibited such an approach. Instead, we moved the drain hole down to the tank wall to preserve the slope into the tank. It was important to make the hole well above the tank's fill line so water could not escape.

We tried to use a carbide-tipped masonry drill bit to cut through the stone, but we were unsuccessful [Fig. 12]. While decent at penetrating stone and tile, the drill bit could not cut through the porcelain, which proved too dense. Switching to a diamond-coated hole saw allowed us to cut through the porcelain easily, though we had to constantly apply water to the hole to reduce heat buildup from friction.

Fig. 12: After six minutes of constant drilling with the masonry bit, we could only penetrate the surface of the porcelain

Finalizing the Project

After we had carefully cut the toilet holes, we cut a small hole in the side of the cabinet for the tubing. We then cut the tubing for the faucet and drain so they were a manageable length, and we threaded the tubing through the holes [Fig. 13]. We attached the sink tubing to the old water inflow tubing and the drain tubing to the overflow tube. We positioned the tubing to permit movement while reducing loops and kinks that might disrupt drainage [Fig. 14].

After connecting and securing all water lines, we put the sink through its first few water cycles. We discovered leaks in the glue seal around the drain and on the threads of the pipe adapters, both of which we fixed. Then, after putting some finish on the sections of wood we cut, the toilet sink build was complete.

Fig. 13: Sink tubing threaded into the tank

Fig. 14: Tubing from the inside of the cabinet

The final product, a fully functional toilet sink!