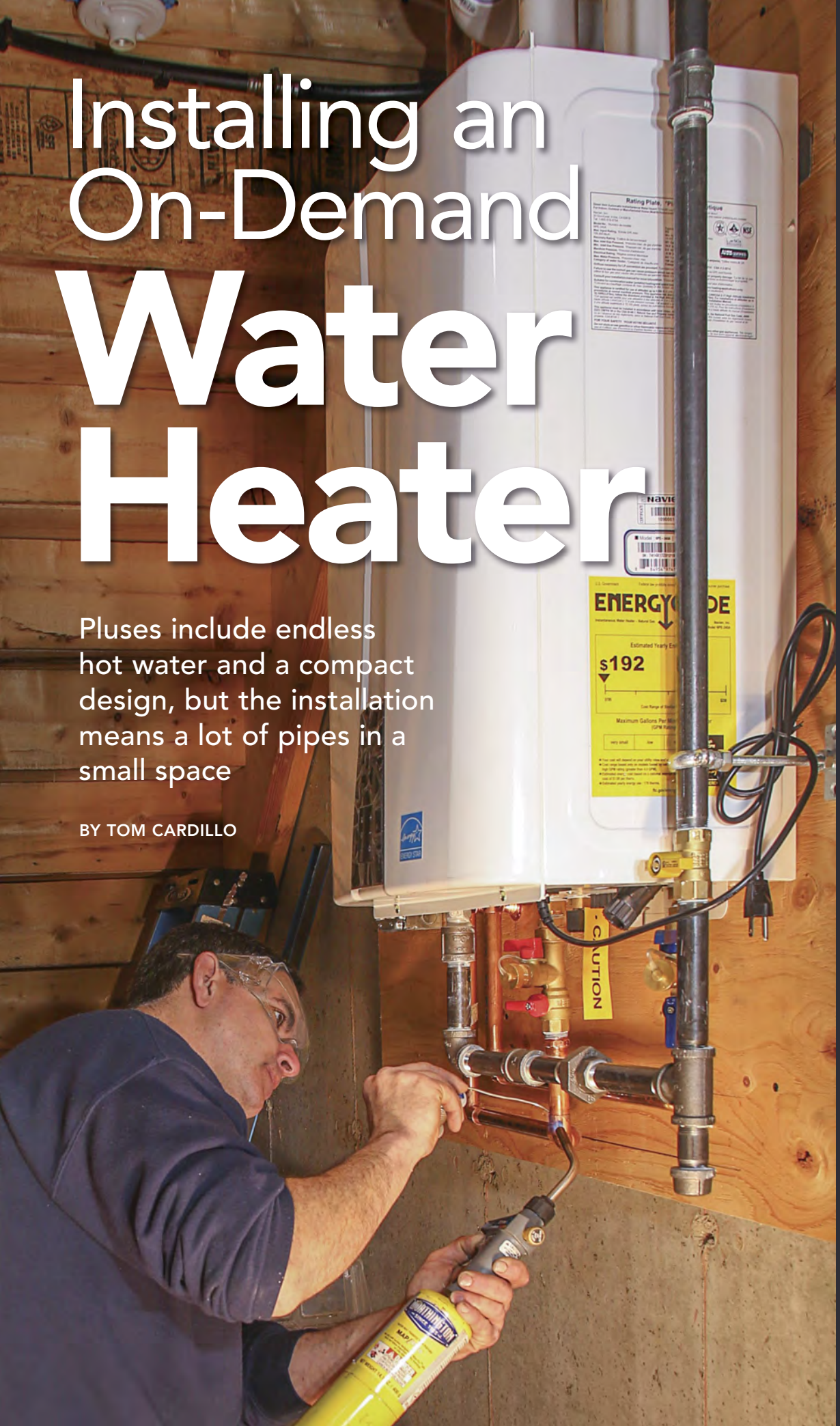
Installing an On-Demand Water Heater

Pluses include endless hot water and a compact design, but the installation means a lot of pipes in a small space

BY TOM CARDILLO



Promising endless hot water and taking up less space than a tank-type heater, an on-demand water heater has a lot to like. Every year I install several for clients who are hoping for more hot water and savings on their energy bill. Unfortunately, switching from a tank-type water heater to an on-demand unit is not just a direct swap. You'll need sufficient wall space for mounting the wall-hung heater, a different flue arrangement, and possibly a larger gas line. The installation means a lot of pipes in a small space, so it's important to think through the layout, and work from the biggest pipes to the smallest.

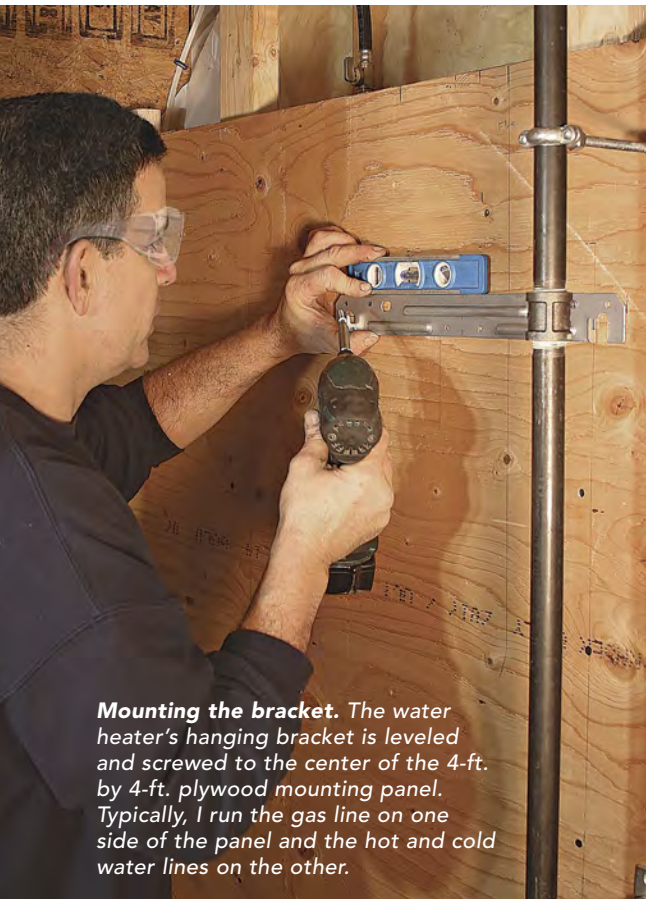
How much heater do you need?

Before any installation, you have to size the water heater. My preference is to size the unit so there will be enough hot water, even if all of the hot-water fixtures and appliances are in use at the same time. To do this, I consider both the number of hot-water fixtures in the house and the temperature of the incoming water. Here in Rhode Island, we may have 40°F (or colder) incoming water during the winter. The Department of Energy suggests you should set your water heater at 120°F, so the temperature rise needed is 80° (40°+80°=120°).

The number of gallons per minute (gpm) that on-demand water heaters can produce goes down with greater temperature rise, so you have to get a larger heater in colder climates than you would in warmer areas. Many manufacturers have size calculators on

MOUNTING AND VENTING

After the water heater is hung on the mounting panel, the holes in the exterior wall for the combustion-air and flue connections are located. It's best to start with these larger-diameter pipes because they are the least flexible with regard to routing and placement.



Mounting the bracket. *The water heater's hanging bracket is leveled and screwed to the center of the 4-ft. by 4-ft. plywood mounting panel. Typically, I run the gas line on one side of the panel and the hot and cold water lines on the other.*

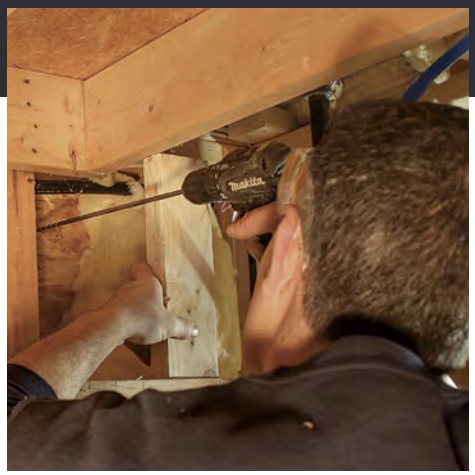
Hanging the heater. *Weighing in at around 75 lb., this on-demand water heater is hung from the mounting bracket and then a pair of screws at the bottom lock it in place. Before finalizing the location, I confirm that there are no obstructions that would interfere with the combustion-air and flue piping.*

their websites that make it easier to match the right model to your particular situation. The water heater in this installation is a 19,000-Btu to 199,000-Btu model, which is normal for a house with three bathrooms.

A typical installation

Tankless water heaters are fairly straightforward to install, but don't assume you can do the job yourself. Doing your own installation may void your warranty, so first check with the manufacturer. Because these heaters are wall-mounted, you need a ¾-in.-thick panel to mount them on. I center a 4-ft. by 4-ft. panel on the wall vertically, which leaves about 2 ft. above the panel for running the vent and combustion-air pipes to the outside.

Depending on the size of the heater, the length of the piping, and the temperature rise, you may need a ¾-in. gas line for the heater's burner. This can add several hundred dollars to the cost of switching from a tank-type heater, which commonly has a ½-in. gas line. Early tankless on-demand heaters didn't always need an electrical connection, but almost all modern ones need a nearby receptacle for the electronic controls and the heater's internal blower. The electrical demands are low, so the Navien NPE model I generally install doesn't require a dedicated circuit,



Marking the pipe locations. *A pilot hole for the combustion-air pipe made with a ¼-in.-dia., 12-in.-long bit transfers the interior location to the exterior. Once the small pilot hole is made, the larger holes can be drilled from the exterior using a hole saw.*

Drilling the holes. *The first hole helps locate the second hole for combustion air. Some water-heater makers offer a vent-termination kit that allows you to drill one larger hole for both pipes.*

Cutting straight. *Instead of a handsaw or a reciprocating saw, I prefer to use a 10-in. miter saw. The miter saw makes precise, perfectly straight cuts in seconds and it can easily trim a fraction of an inch when necessary.*

Dry fit comes first. *Once all the PVC pipe and fittings for the combustion-air and flue-gas piping have been fully dry fit, the connections are marked for easy reassembly. Then the parts are disassembled and glued together with PVC cement. I do one pipe at a time and then repeat the assembly process for the second pipe.*

Tightening the clamps. *This tankless water heater has hose clamps for connecting the combustion-air and flue-gas piping to the top of the water heater. This style of connection allows the unit to be more easily removed in the future, if necessary.*

but depending on the proximity to the nearest outlet, you may have to add a receptacle.

Finally, condensing tankless heaters need a way to deal with the condensate produced by the heater's burner. If there isn't a floor drain nearby, you have to pump the condensate. Adding a condensate pump increases the cost of the installation. I prefer pumps by Mars, which are quieter and longer lasting than other brands I've tried. Also, the condensate produced by the burner is acidic, so you should use a condensate neutralizer to protect metal drain pipes (see sidebar p. 71).

Plan for venting

Modern condensing on-demand water heaters are designed to squeeze every possible Btu from the combustion process, so the exhaust gasses are cool compared to an atmospherically vented tank-type water heater or non-condensing tankless model. Venting systems vary—some models use a single proprietary pipe for handling intake (combustion air) and exhaust (venting fumes), others use two separate proprietary pipes. The heater shown here is a two-pipe setup that uses solid-core PVC pipe.

The diameter of the vent pipe depends on the length of the run and the number of elbows, so you have to check the manufac-

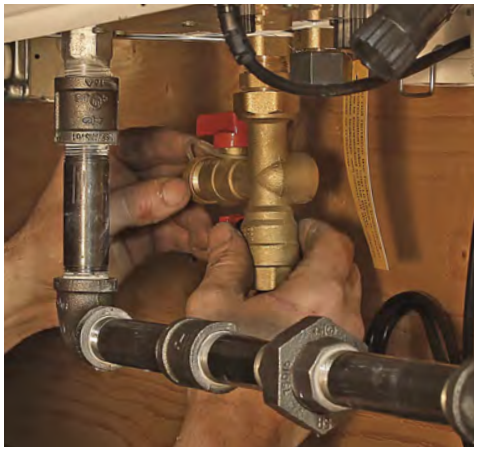
CONNECTIONS, FROM BIG TO SMALL

Once the PVC combustion air and flue piping are roughed in, the gas line is run next, followed by the cold- and hot-water piping. The gas piping in this installation is steel, but you can also use corrugated stainless-steel tubing (CSST). The water lines are ¾-in. L–type copper, but PEX is also acceptable.

DIY or DON'T
Although many tankless water heaters are available through retail channels, check with your local inspector or gas supplier before routing gas lines yourself.

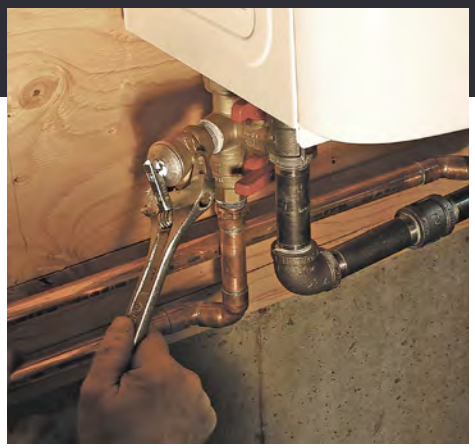
Gas connection. *The water heater's gas inlet is connected to the gas supply with a coupling, a short length of pipe, a 90° elbow, and a union. The union allows you to join two pipes running from opposite directions and allows the heater to be more-easily removed.*

Sediment trap for debris. *Many local codes require a drip leg, or sediment trap, close to the heater's gas inlet and downstream of the shutoff. The gas flow must change direction at the trap, allowing debris to fall out of the gas stream into the trap.*



Service valves to start. *Service valves on both the hot and cold sides of the water heater include shutoffs and hose connections. The valves and hose connections allow the unit to be descaled.*

Water-pipe connections. *The hot and cold sides of the water heater are connected to the house's domestic water system with ¾-in. copper tubing. I always check the solder joints on all sides to ensure there won't be leaks when the water is turned on.*



Installing the relief valve. *Like conventional units, tankless water heaters require temperature and pressure (T&P) relief valves to relieve pressure in the case of a malfunction. Some have dedicated T&P outlets; this one screws onto the hot service valve.*

Filling the trap. *There's a condensate trap within the heater that on some units must be filled with water before starting the unit. A small amount of water is poured into the flue-gas piping and then the combustion-air and flue-gas piping is fitted with elbows and screens to keep out rain and pests.*

The deal is sealed. *With the exterior pipe connections complete, the gap between the pipes and the siding is filled with silicone sealant.*

Time to test. *The condensate pump, the condensate neutralizer, and all the piping connections are complete, so it's time to plug in the water heater for a test. Unlike a tank-type heater, an on-demand water heater should start making hot water almost immediately.*

turer's specs and plan the pipe routing before determining the size of vent and combustion-air piping you'll need. Generally speaking, the straighter and shorter the run, the smaller the pipe diameter required. When planning the route for the flue pipe, keep in mind that in direct vent setups you need to keep the pipe outlet at least 12 in. away from any operable door or window and at least 12 in. above grade. If your area experiences heavy snow, you have to move the intake and combustion piping higher so it doesn't get buried in a blizzard. These codes can vary by region in the U.S., and are more stringent in Canada, so check with local code enforcement before moving forward with an installation.

Installing an on-demand water heater like the one shown here costs between $2800 and $3500, depending on the complexity of the job. My customers, who have two small children, really like how their new on-demand water heater keeps up with evening bath time, even while they're simultaneously running the dishwasher and washing clothes. □

Tom Cardillo is a plumbing and heating contractor in Hope, R.I. Photos by Patrick McCombe.

Do you need a condensate neutralizer?

The condensing burners found in modern on-demand water heaters increase the unit's efficiency and allow you to vent the exhaust gases with inexpensive and installer-friendly plastic piping. Perhaps the only downside to these modern burners is the condensed water vapor, which is a by-product of combustion—and it's not just a matter of where to drain or pump the water. Nitric acid, a by-product of the heater's combustion, makes the water acidic. Even in a new home where all the drain pipes are made from plastic, which is impervious to the acid's corrosive effects, you can never know what pipes down the line may be affected. The acidic water can also kill plants, and I've heard it's damaging to septic systems.

Neutra-Safe condensate neutralizer $70

To solve the problem, I almost always install a condensate neutralizer. I used a Neutra-Safe neutralizer in this case, but there are other brands. Just make sure to choose the right filter for each install, as separate models should be used for vertical and horizontal mounting.