

HEAT PUMP WATER HEATER INSTALLATION BEST PRACTICES GUIDE



HOT
WATER
SOLUTIONS

HEAT PUMP WATER HEATERS ARE A PROVEN TECHNOLOGY KNOWN TO IMPROVE ENERGY EFFICIENCY.

Heat pump water heaters are more available, efficient and reliable than ever, with most products carrying a 10-year warranty. As water heating accounts for nearly 20% of home energy use, this appliance can have a significant impact on lifetime energy use.

While installing a heat pump water heater is like installing a standard electric water heater, there are some important considerations detailed in this guide. These include condensate management, proper sizing, and selecting the best installation location to enhance performance and customer satisfaction.

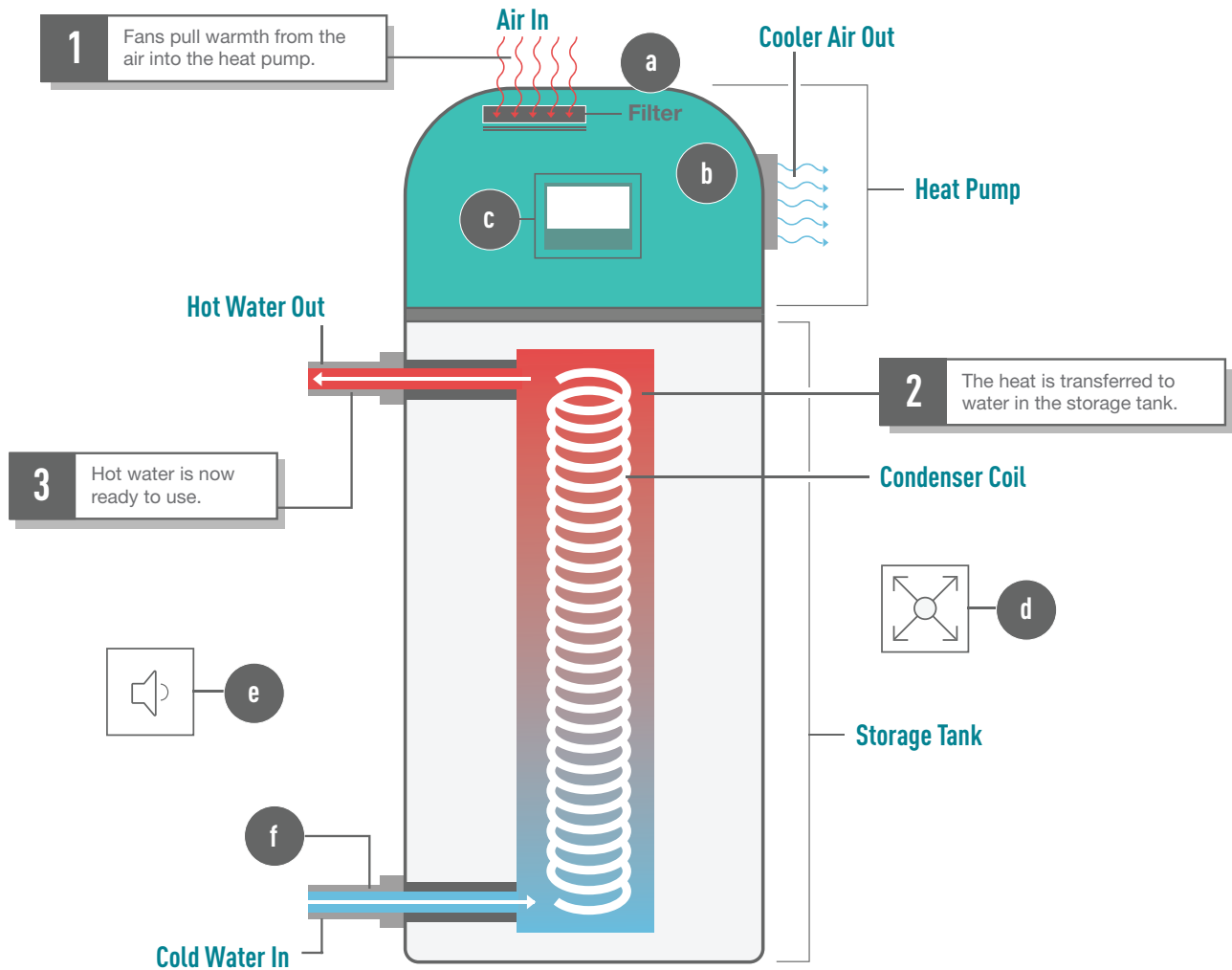


HEAT PUMP WATER HEATER FEATURES AND BENEFITS

- Reduce energy consumption and operating costs by up to 60% compared to standard electric water heaters
- Avoid the need for venting and combustion condensate management
- Achieve more hot water delivery capacity than standard electric resistance tanks
- Most heat pump water heaters come with a minimum 10-year manufacturer warranty on tank and parts
- Easily set the temperature and change operational modes to maximize efficiency using the digital touchscreen control panel, delivering much more flexibility than standard electric water heaters
- Wi-Fi connectivity and smartphone app (availability varies by model) to remotely change temperatures, engage vacation mode, and monitor performance
- Leak detection (some models)

HOW IT WORKS: THE ANATOMY OF A HEAT PUMP WATER HEATER

Standard electric water heaters require a substantial amount of energy to heat water. In contrast, heat pump water heaters use less than half the energy to heat the same amount of water. By extracting heat from the surrounding air and transferring it to the water inside the tank, heat pump water heaters can significantly reduce the amount of heat that must be created.



KEY DIFFERENCES FROM STANDARD WATER HEATERS

- a. Filter cleaning required, along with sufficient space above
- b. Cold exhaust air
- c. Digital control panel
- d. May require a little more physical space and sufficient make-up air space
- e. Modest amount of noise
- f. Side piping on most units

INSTALLATION CONSIDERATIONS

Heat pump water heaters have some unique installation considerations compared to standard electric or gas water heaters, including installation location, air exhaust, and sound.

Space and Location

Manufacturers typically require 700 cubic ft. of air volume in the space where the water heater is installed, along with sufficient space to allow installation and service. For a house with 9-ft. ceilings, this translates to a 9x9 ft. room. Garages are ideal locations, providing ample space for heat pump water heaters. For houses in colder climates, such as east of the Cascades, consider the possibility of freezing conditions in the garage and follow standard location practices in your area. Basements, utility rooms, and laundry rooms also offer excellent locations for the water heater. Be sure to consult the manufacturer’s installation guide for recommendations specific to your model. For further considerations, reference the FAQ section beginning on page 9.

Cool Exhaust Air

Heat pump water heaters exhaust air that is cooler than their surroundings. Therefore, they should not be located in rooms that are frequently occupied. When garage installations are not available, basements, utility, and laundry rooms also serve as excellent locations.

Tank Size

First, follow the local plumbing code as you would any other water heater. To size a heat pump water heater to meet demand, consider the number of back-to-back showers that might take place in a household. A 50-gallon tank is enough for up to two consecutive ten-minute showers; a 65-gallon tank will work for 3 ten-minute showers; and an 80-gallon tank is suitable for 4 or more consecutive showers. For maximum efficiency, consider upsizing the tank over your standard practice. Heat

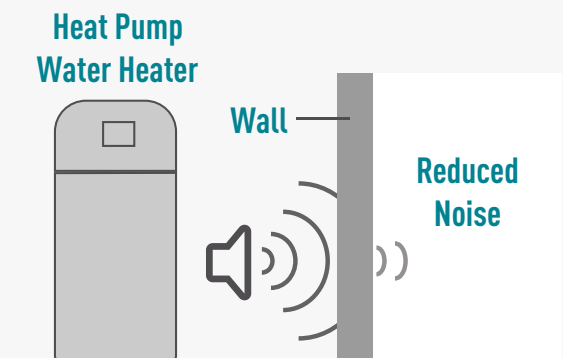
pump water heaters typically come with auxiliary resistance elements to meet periods of increased water demand. This operation is far less efficient than running in heat pump mode alone. Upsizing the tank will minimize inefficient resistance heating, allowing the heat pump to do most of the water-heating work.

TANK SIZING GUIDELINES

Number of Consecutive 10-minute Showers	Appropriate Tank Size
1-2	50-gallon
3	65-gallon
4+	80-gallon

Sound

Heat pump water heaters have a fan and compressor, both of which make noise. Most heat pump water heaters emit sound at levels less than 55 dBA. Standing on the other side of a wall or door, the sound level drops to 35–40 dBA, which is quieter than a refrigerator. Still, placing the water heater away from bedrooms and living rooms can help mitigate any potential sound issues. Check with manufacturers for best practices regarding isolation pads, foam, and mounting strategies.



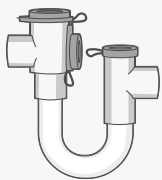
CONDENSATE PIPE ROUTING TIPS BY WATER HEATER LOCATION

Above Grade (e.g., garage)

- Install to ensure drain line won't freeze (consult installation manual for best practices)
- Laundry and/or sink drain

Below Grade (e.g., basement)

- Drain to floor drain, laundry sink and/or p-trap to plumbing line
- Pump to outside with condensate pump



CONDENSATE TIP #1

For added utility, consider draining the condensate outside to irrigate the landscape. For additional benefit to the homeowner, install the condensate drain with a p-trap and a tee port opening so the homeowner can periodically flush the condensate line with vinegar or similar cleaning solution.



CONDENSATE TIP #2

Condensate pumps, commonly paired with air conditioners or condensing furnaces, can be used to drain the condensate produced by a heat pump water heater. A single pump may often be used for both the air conditioner and the heat pump water heater.

INSTALLATION BEST PRACTICES

Installing a heat pump water heater is essentially the same as installing an electric resistance water heater, so no additional trades or special skills are needed on site. Installation is simple, with no refrigerant handling required. In addition to following the guidance of product manuals, consider the following best practices:

Clearance and Positioning

- Follow manufacturer specifications regarding water heater clearance and local code for seismic strapping
- Position the unit so the control panel is facing outward and easily accessible to the homeowner
- Make sure all data connection ports are accessible
- Aim the exhaust air away from the center of the room, where it might blow on someone walking by, and so it does not discharge directly into a wall, which can cause a continual lowering of intake air temperature
- Ensure the intake air path is sufficiently free and open
- Make sure the positioning allows for easy access to inspect the water heater and controls, change the air filter, and drain the tank

Condensate

Heat pump water heaters produce a neutral condensate that must be drained away from the water heater. Generally these products only produce a couple cups of water per day during the late spring through early fall seasons. Unlike condensing gas water heaters, which produce acidic condensate as a combustion byproduct, there are no special piping or handling requirements for heat pump water heaters other than to convey the neutral condensate to a drain. However, it is important to make sure the tank is level to ensure the evaporator drain pan drains properly. Also note condensate is not produced in very cold weather.

Insulation Pad

Provide minimum R-10 foam pad under the heat pump water heater to minimize unnecessary heat loss through the bottom of water heater. This is a best practice regardless of floor type, and R-10 foam pads are readily available at plumbing supply centers.

Drain Pan

If installing on a floor susceptible to water damage, install a drain pan to guard against any problems from future leaks. Connect the outlet from the pan to suitable drainage in accordance with your local code.

No Stand Needed

Electric storage water heaters with lower elements above 18", including heat pump water heaters, do not need to be raised off the floor with a stand. That requirement was a safety provision for older atmospheric gas storage water heaters located in garages. Most electric heat pump water heaters are taller than electric storage water heaters — they have the same nominal volume, but their connections are in different places. Make sure there is space above and around the heater to accommodate the variations for the models you are considering.

Seismic Strapping

As with other water heaters, your local code may require seismic strapping. When installing, use rubber standoffs when attaching straps to the wall to minimize the vibration and transfer of sound to rest of house.



Pipe Insulation

Insulate the hot water piping to at least the minimum requirements in accordance with your local code. To improve the system performance overall, insulate all of the hot water piping. It is more important to make sure the pipe insulation is continuous than it is to increase the wall thickness or R-value of the pipe insulation.



Heated Water Circulation (Temperature Maintenance)

Do not use a continuously operated circulation pump (this is prohibited under some states' energy codes). If pipe runs to fixtures that are too long, use a demand-, sensor-, or occupant-activated pump to circulate just enough water to prime the loop with hot water. Connect the return pipe of the circulation loop to the cold inlet of the water heater — this will guide the cooler returning water to pool at the bottom of the tank so it does not interfere with hot water availability. Continuous circulation is particularly detrimental to heat pump water heaters and will result in lack of hot water availability and greatly increase energy use. Consequently, never set the circulation system controls to continuous and advise the homeowner to do the same.

After Installation: Servicing the Water Heater

Most heat pump water heaters come with a 10-year equipment warranty. After installation, heat pump water heaters require modest servicing. The air filter should be cleaned every 3–6 months, with a more frequent cleaning cadence in high dust locations. The heat pumps in current water heaters are designed like refrigerators to operate as a fully sealed system with no servicing, so there are no ports to add or remove refrigerant. On extremely rare occasions, the homeowner may have to clear the condensate drain port should it become blocked. Like any other water heater, follow the manufacturer's recommended service requirements including regular maintenance for draining the tank and servicing the anode rod.



FINAL INSTALLATION CHECKLIST

Based on the considerations and best practices outlined above, the following checklist provides guidance on verifying the proper installation:

- Condensate safely conveyed to drain or exterior. (Note: condensate is neutral water and does not require special pipe material).
- Proper wire gauge is used. (Note: Most heat pump water heaters still have full-size resistance elements, so wiring requirements are identical to standard electric-resistance water heaters).
- T&P valve is properly plumbed.
- Wiring is grounded with proper gauge.
- Water heater is on minimum R-10 foam pad if in unconditioned space or on concrete floor.
- Seismic strapping is employed, as required by local jurisdiction.
- Pipe insulation is minimum R-3 or local code — whichever is greater.
- Correct space is provided around the heat pump (per manufacturer's instructions).
- Heated water circulation systems, if present, are configured to pump only on demand for hot water within the occupancy.
- Recirculation loop (if present) returns pipe to cold inlet of water heater.
- Water heater is positioned with clear intake air path, and oriented to minimize exhaust air drafts.
- Water heater is positioned for easy access to the control panel and to change or service the filter.
- Connections to the water heater are located so that the water heater can be easily removed for repair or replacement.
- Make-up air volume around the water heater is large enough, or make-up air is provided as per the manufacturer's requirements.
- Mode of operation is set to hybrid at a minimum, and preferably to heat-pump only.

FREQUENTLY ASKED QUESTIONS

Will the heat pump water heater reduce the temperature of the room it's located in?

Heat pump water heaters work efficiently by extracting heat from the surrounding air and transferring it to the water inside the tank. In an opposite manner, refrigerators work by extracting heat from inside the refrigerator and transferring it to the kitchen. Just as refrigerators do not make the kitchen noticeably warmer, heat pump water heaters do not typically make the room in which they're located noticeably colder.

If installed inside the house, will the heat pump water heater's energy savings be offset by the extra heating system runtime?

Installed inside the house, the heat pump water heater will use some energy provided by the heating system in the winter and reduce some of the cooling system in the summer. Additionally, the heat pump water heater can make use of excess heat in the house from solar sources, other appliances, and even the ground. The more efficient the space-heating system is, the better the benefit for the heat pump water heater and the smaller the heating offset. Regardless of space-heating system, the energy savings from the heat pump water heater far exceed any additional energy needed from the heating system.

Are heat pump water heaters loud?

Heat pump water heaters have a fan and compressor, both of which make noise. Most heat pump water heaters emit sound at levels less than 55 dBA, which is quieter than a typical conversation. On the other side of a wall or door, this drops to 35–40 dBA, which is quieter than a refrigerator.

Can I reduce the sound?

To mitigate heat pump water heater sound levels, locate the unit far away from the most actively

occupied areas of the house. Additionally, use vibration dampening standoffs to connect the seismic strapping from the water heater to the wall. Placing the water heater on an insulating pad will also help. Attaching a short duct run, such as a 90-degree elbow, can reduce sound. Finally, insulating the walls between the installation location and occupied spaces of the house can reduce sound levels.

How reliable are heat pump water heaters?

Heat pump water heaters have been available for more than 40 years. Current heat pump water heaters are designed like refrigerators to operate as a fully sealed system with no servicing required. The only additional, regular service needed is to check the air filter every 3 months. Further, most heat pump water heaters come with a category-leading 10-year warranty.

Will the occupants have enough hot water?

Heat pump water heaters have hot water delivery capability that is comparable to or greater than electric-resistance tanks. Follow the tank-sizing guidelines on page 4.

When should I go to a bigger tank?

If space, budget and location allow, a larger tank is the better choice as they rely on the heat pump for the majority of, if not all, the water heating.

What if I need more hot water but can't install a larger tank?

One approach is to install a whole house tempering valve, which allows a higher set point on the water heater. Higher temperatures may result in small performance penalties. Always consult with local plumbing codes to guide professional installation and fail-safe equipment.

I have a 600 sq. ft. ADU and the homeowner wants a heat pump water heater. Where do I locate the unit, and what other installation considerations are there for installing in a small space?

If you are installing a heat pump water heater in a small space, consider installing it in an area that will not be impacted by a modest amount of noise and or cool air while operating (e.g., a kitchen closet with louvered door). Other installation locations to consider may include:

- Closet with venting in and out of the structure
- Sufficiently large crawl space
- Adjacent semi-conditioned garage with enough volume of air (700 cubic feet)
- Conditioned space outside that doesn't freeze (in this case, the unit will need to be set in Hybrid mode (heat pump water heater and electrical resistance)

Where can I find additional information?

- General information: HotWaterSolutionsNW.org
- List of Qualified Products: neea.org/img/documents/qualified-products-list.pdf
- Installation help: HotWaterSolutionsNW.org/installation/do-it-yourself
- **Heat Pump Water Heater Handbook** from the American Council for an Energy Efficient Economy 2018 Summer Study on Buildings (Widder and Larson)
- AO Smith: aosmith.com
- Bradford White: bradfordwhite.com
- Rheem: rheem.com
- Sanden: sandenwaterheater.com
- ENERGY STAR®: EnergyStar.gov

Hot Water Solutions is an initiative of the Northwest Energy Efficiency Alliance (NEEA) working to accelerate the adoption of heat pump water heaters in the Northwest by providing resources, tools and support to increase sales and installations of heat pump water heaters.

To learn more, visit HotWaterSolutionsNW.org