

Tips and Pitfalls for Professionals New to Installing Heat Pumps and Heat Pump Hot Water Heaters

This guide is designed to provide tips and avoidable pitfalls for professionals new to installing heat pumps and heat pump water heaters. This list is not exhaustive, is supplementary to, and does not take the place of proper industry and manufacturer training, specifications, or protocols.

Heat Pumps

- Cold climate heat pumps
 - Choosing a cold climate heat pump is the best practice for Colorado's climate zones.
 - While there is different definitions of "cold climate" heat pumps, the term commonly refers to heat pumps that maintain a Coefficient of Performance (COP) of ≥ 1.75 @ 5°F, or retain at least 70% of the capacity the unit has at 47°F, or are [ENERGY STAR certified "cold climate."](#)
 - The [Northeast Energy Efficiency Partnership](#) has a great repository of heat pump performance specifications.
 - Not all cold climate heat pumps are the same and some maintain their capacity at lower temperatures better than others. Read the performance specifications carefully before selecting a unit. It is highly recommended to select heat pump models that are capable of providing a tested capacity at -13°F to reduce or eliminate the need for backup heating equipment. If a heat pump is not capable of operating at -13°F, then it is recommended to use gas heating rather than electric resistance for backup heat.
 - Cold climate heat pumps may be sufficient to run without any backup heat or can be paired with electric resistance or gas furnace backup. The decision should be based on homeowner tolerance, the performance specifications of the unit, and the heating load of the home.
- Non-cold climate heat pumps
 - Non-cold climate heat pumps are not recommended for heating in Colorado due to their poor performance at low temperatures.
 - Never install a non-cold climate heat pump without a backup heating system.
 - Installing a non-cold climate heat pump with electric resistance backup can lead to expensive electric bills and should be avoided. While a gas furnace backup is worse for the climate and risks methane leaks in the home, they are cheaper to operate than electric resistance backup.
- A Manual J or other equivalent heating load calculation should always be performed before selecting a heat pump to determine the heating needs of the building. Using the previous furnace or rules of thumb for sizing is not recommended. Heat pumps do not function properly when they are significantly oversized. Significantly oversized heat



pumps are prone to cycling on and off more frequently which can reduce equipment lifespan.

- Ducting needs should be considered with a heat pump in mind. Heat pumps in cold climates sometimes require additional airflow because heating discharge temperatures are lower than a traditional furnace.
 - For any heating system, ductwork should match the system air flow capacity. Inadequate air flow, oversized or undersized ducts can cause a variety of issues like system noise, insufficient heating, or premature equipment failure.
 - Assessing ductwork for new and existing homes should reference ACCA Manual D or other industry standards. These duct design standards will determine duct sizing, static pressures, and other details that deliver design airflow. It is also important that the design airflow be based on correct heating and cooling load calculations such as Manual J room by room loads.
 - Ducts should be well sealed. In a typical house, 20 to 30 percent of the air that moves through the duct system is lost due to leaks, holes, and poorly connected ducts. This lost air significantly degrades the effective capacity of a heating system.
- The performance of the heat pump varies with both the indoor and outdoor units. An outdoor unit may have different capacities with different indoor units and vice versa. Do not assume that one pair of equipment will have the same performance as another pair. When verifying the specifications, make sure you are looking at the correct pairing and derating of the equipment for altitude, temperature, lineset lengths, and other details per manufacturer guidelines.
- Heat pumps perform best in a well insulated and air tight home. Consider recommending insulation and air sealing prior to sizing and installing any new properly sized heating system including heat pumps and gas furnaces.
- Rebates, incentives, and tax credits may all have slightly different criteria and are rarely flexible. Read the program materials and make your equipment choice carefully to avoid missing out on incentives after the fact. Given recent equipment testing and performance standards, it is worth checking with equipment manufacturer resources for updated specifications.
- Setting customer expectations
 - At Colorado's typical utility rates, heat pumps can increase electricity bills compared to using gas for heating. This is because customers are switching from using gas to heat to electricity to heat. Electric bills will also spike during the coldest months of the year, this is normal and expected, just as gas bills spike during the coldest months of the year. Customers should be advised not to judge the operating cost of a heat pump solely on the coldest month of the year and as they often save money in the shoulder and cooling seasons compared to less efficient units. Over the full course of the year, combined electric and gas utility bills may go up, stay the same, or decrease depending on the performance of the system, home characteristics, and utility rates.
 - Heat pumps are designed to produce a steady amount of heat at a lower temperature for a longer time than furnaces, which produce higher amounts of heat in short bursts. Customers may need to adjust to the "system running



continuously a lot” which is really a benefit as it is circulating more filtered warm air which can improve air quality and help reduce uneven temperatures throughout the home.

- At temperatures below freezing heat pumps need to periodically pull heat from the home to defrost the outdoor unit or excessive ice will build up and damage the unit. This can briefly result in cool air coming through the ducts if not paired with backup heat to run simultaneously with the defrost cycle. Customers should be advised of this up front
- A high switchover temperature to backup electric resistance heat can be expensive and should be avoided.
- See [EnergySmart's ducted and ductless heat pump homeowners guides](#) for additional recommendations for homeowner satisfaction and heat pump management.
- Talk about your favorite benefits of heat pumps with your clients. A homeowner who is more excited about their heat pump and understands what to appreciate about it is likely to be more satisfied with it and treat minor operating differences between heat pumps and furnaces as neutral.

Heat Pump Water Heaters

- Heat pump water heaters typically require at least 120 square feet of space in the room around them from which to draw heat and are not appropriate for small utility closets without ducted ventilation.
- Heat pump water heaters make some noise, typically 45-55 decibels, which is equivalent to the volume of a dishwasher. Consideration should be made to the placement of the unit in the home regarding homeowner tolerance for audibility of the unit.
- Many heat pump water heaters can operate in heat pump mode down to 37 degrees so unfinished or unconditioned basements make a great location.
- Installing a recirculating pump with a heat pump hot water heater may void the manufacturer's warranty, cause it to operate only in electric resistance mode, or to run continuously. Read the manual carefully before installing a recirculating pump. For many heat pump water heaters the intake water temp must show a differential of approximately 25 degrees to operate in heat pump mode. A recirculating pump can prevent this from happening. As an alternative,
 - If you are changing the location of the water heater, there may be an opportunity to shorten the piping between the water heater and the most commonly used fixtures. This can accomplish the same benefits as a recirculating pump.
 - Consider installing a point of use electric on demand heater for instant hot water at the fixture that is attached to the hot water line from the heat pump and only operates until the hot water from the heat pump arrives at the fixture.
 - Push button controls for recirculating pumps set on an automatic shutoff timer may also be an effective solution.



- Pairing a heat pump water heater with a mixing valve and raising the temperature of the tank above 120 degrees is a great way to increase the effective capacity of the unit and may be required to earn utility rebates.
- Insulate all accessible hot water supply lines, particularly within the six feet closest to the heat pump water heater.
- Heat pump water heaters use air filters that should be cleaned periodically to ensure efficient operation. Customers should be informed of this and instructions of how to clean which simply involves wiping filter with a damp cloth, rinsing it under running water and letting it dry.
- Don't forget to plan for condensate line draining when planning for the heat pump installation. Existing water heaters may not be located near a drain.
- Heat pump water heaters exhaust air that is cooler than their surroundings unless additional ducting vents are installed. Therefore, careful consideration should be given if installing in rooms that are frequently occupied.
 - The cool air from heat pump water heaters should have a minimal effect. 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