

# Heat Pumps

## Overview

Many homes in King County use one of the following heating systems:

- Oil-, natural gas- or propane-fired forced air
- Electric resistance heating - baseboard or fan coil
- Electric forced air

These systems are familiar, reliable and cost effective for conventional homes. However, as new and remodeled homes become better insulated and more airtight, many of these systems simply have much more heating capacity than is needed.

In response to these changing needs, heating systems that used to be seen as “alternative” are now becoming more mainstream. These systems fall into two main categories - 1) high efficiency systems, such as heat pumps; and, 2) renewable energy systems, such as active or passive solar design. This Green Sheet provides information about Heat Pumps; for information about solar design, see the Solar Energy Green Sheet.

## When is This Applicable?

Heat pumps can be installed to meet code requirements provide a source of heating in all occupiable spaces in new construction, major renovations and commercial remodels.

They may also be used to replace an existing heating appliance upon failure or near the end of its service life, or when adding a cooling system.

## What Makes it Green?

Heat pumps are typically selected by owners who value energy efficiency, renewable sources of energy, energy independence, and low-carbon emissions, or whose homes are very energy efficient and in need of smaller heating systems to optimize their performance.



Air-source and ground source heat pumps can help meet the energy performance prerequisites and earn additional credit in Northwest ENERGY STAR Homes, Built Green, and LEED for Homes, as will renewable energy heating systems, such as solar thermal collectors and passive solar design.

Typically, while some alternative heating systems may have a higher installed cost than conventional systems, they offer long term energy consumption savings and protection from the future volatility of energy prices. Ductless heat pumps, for example, can be more than three times as efficient as electric resistance heat, and are small, modestly priced, and quiet. Ductless heat pumps are relatively easy to install into existing homes.



## Best Practices

The table on the following pages provides considerations and examples of heat pumps for your project.

SYSTEM TYPE	CONSIDERATIONS	BENEFITS
<p><b>Heat Pumps (general)</b> A heat pump is an electric appliance that works in a similar way to a refrigerator or air conditioner, but in reverse. The system uses electricity to drive a refrigeration loop that moves heat from a source (outside your house) to a point of use (inside your house). Heat pumps can be at least three times as efficient as electric resistance heating.</p>		
<p><b>Air Source Heat Pump</b></p> <p>The heat source is the outside air (or a heated space that requires cooling, when your home requires heating).</p>  <p><i>Sketch of a typical air source heat pump. From <a href="#">VippHeating</a>.</i></p>  <p><i>Ductless mini-split heat pump. From <a href="#">RevisionHeat</a></i></p>	<ul style="list-style-type: none"> <li>• Moderately priced to install, and very energy efficient.</li> <li>• Current “inverter” technology performs much better than typical single speed central forced air heat pump systems common until the end of the last century.</li> <li>• Inverter-based heat pumps can provide substantial heating even when the outside air temperature is zero degrees Fahrenheit.</li> <li>• Ductless heat pumps are great for open plan homes, and may be a good choice for modest retrofit projects, as a replacement for an oil or electric forced air furnace. They are easily sized to fit additions, bonus rooms, and similar projects. View more DHP products at <a href="http://www.goductless.com">www.goductless.com</a>.</li> </ul>	<p>Ductless mini-split heat pumps (DHPs) are small, quiet and can be easily installed into existing homes.</p> <p>Energy Star certified DHPs generally have variable speed condensers, so they can be sized to provide adequate heat on the coldest day of the year while still performing efficiently when heating loads are smaller.</p> <p>Heat pumps should be controlled by heat pump-specific thermostats that are designed to optimize the performance of the heat pump.</p> <p>DHPs can be more than three times as efficient as electric resistance heat.</p>

SYSTEM TYPE	CONSIDERATIONS	BENEFITS
<p><b>Ground Source Heat Pump</b></p> <p>The heat source is the ground, groundwater or sometimes a lake, river or pond (permit requirements may be complex if using a natural – not manmade – water body as the heat source).</p> <div data-bbox="110 520 532 926"> <p><b>Closed Loop Systems</b> Horizontal</p> </div> <p><i>Diagram of a ground source heat pump horizontal loop. Source: Department of Energy.</i></p>	<ul style="list-style-type: none"> <li>• Expensive to install, but very efficient.</li> <li>• Heat exchange loops require vertical wells (for small sites or poor soils), horizontal trenches (for large sites with good soils), or a large pond or lake as the heat source.</li> <li>• Loop installation contractor must be qualified and experienced to ensure long-term performance – poorly installed systems may never meet their efficiency potential.</li> </ul>	<p>If your priority is the most efficient heating system money can buy, ground source heat pump is likely for you.</p> <p>Ground source heat pumps can be three to five times as efficient as electric resistance heating.</p>

## Applicable References/Standards

**Bulletin 36:** Mechanical Permits FAQs

## Resources

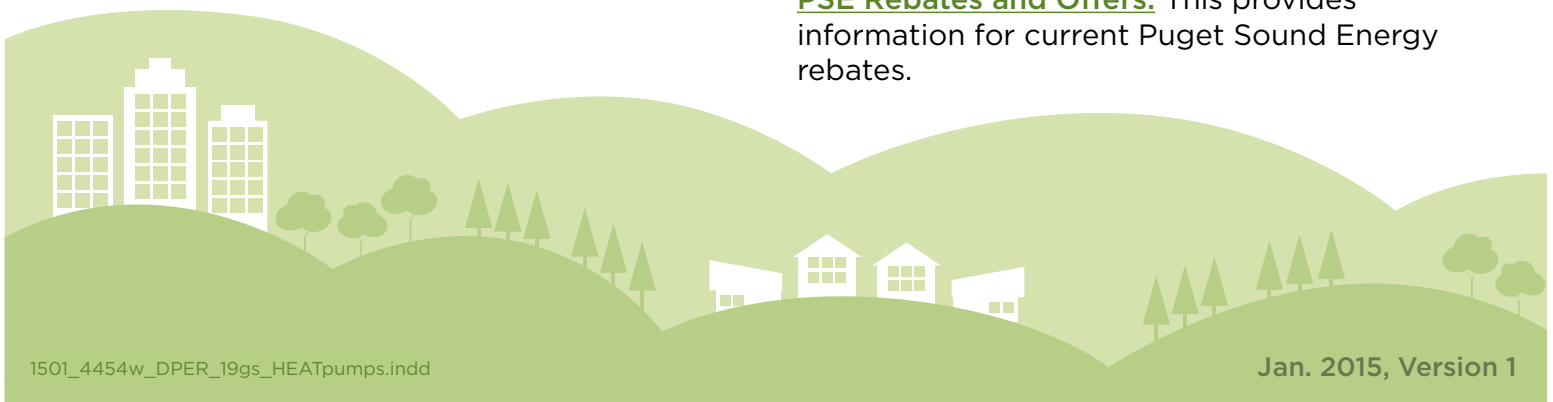
For the complete King County Green Building Handbook and individual Green Sheet PDF files, please visit our website at: <http://kingcounty.gov/property/permits/publications/greenbuild.aspx>. For additional information, please email

[dperwebinquiries@kingcounty.gov](mailto:dperwebinquiries@kingcounty.gov) or call 206-296-6600.

See these related DPER Green Sheets (GS):

- Furnace Replacement, GS Number 18
- Thermostats, GS Number 16
- Right Sizing Heating/Cooling Systems, GS Number 17
- Duct Sealing, GS Number 11
- Fresh Air Ventilation, GS Number 14
- Insulation, GS Number 13

**PSE Rebates and Offers:** This provides information for current Puget Sound Energy rebates.



# Heat Pumps *continued*

## Ground Source Heat Pump at 21 Acres Farm:

This site provides the project details and design and permitting process for a local installation of a ground source heat pump system.

## Permit Tips

Alternative heating systems are covered with mechanical permits, but the following tips provide additional considerations to smooth your permit application and inspection process.

- For solar thermal panels, you will need to engineer the roof for dead loads of the panels and note the information on your plans.
- Clearly show the energy credit option you are pursuing on your Energy Compliance Form and on your plans.

Talk to a plans examiner and permit review coordinator **before** submitting your application.

