**Types of Heating Systems 2**

**Direct Heat**

**Gas-Fired Space Heaters**

In some areas, gas-fired direct heating equipment is popular. This includes wall-mounted, free-standing, and floor furnaces, all characterized by their lack of ductwork and relatively small heat output. Because they lack ducts, they are most useful for warming a single room. If heating several rooms is required, either the doors between rooms must be left open or another heating method is necessary. Better models use “sealed combustion air” systems, with pipes installed through the wall to both provide combustion air and carry off the combustion products. These units can provide acceptable performance, particularly for cabins and other buildings where large temperature differences between bedrooms and main rooms are acceptable. The models can be fired with natural gas or propane, and some burn kerosene.

**Unvented Gas-Fired Heaters: A Bad Idea**

Gas or kerosene space heaters that *do not*have an exhaust vent have been sold for decades, but we strongly discourage their use for health and safety reasons. Known as “vent-free” gas heating appliances by manufacturers, they include wall-mounted and free-standing heaters as well as open-flame gas fireplaces with ceramic logs that are not actually connected to a chimney. Manufacturers claim that because the products’ combustion efficiency is very high, they are safe for building occupants. However, this claim is only valid if you keep a nearby window open for adequate fresh air— which defeats the purpose of supplemental heat. Dangers include exposure to combustion by-products, as discussed in [Ventilation](https://smarterhouse.org/content/indoor-air-pollutants), and oxygen depletion (these heaters must be equipped with oxygen depletion sensors). Because of these hazards, at least five states (California, Minnesota, Massachusetts, Montana, and Alaska) prohibit their use in homes, and many cities in the United States and Canada have banned them as well.

**Electric Space Heaters**

Portable (plug-in) electric heaters are inexpensive to buy, but costly to use. These resistive heaters include “oil-filled” and “quartz-infrared” heaters. They convert electric current from the wall socket directly into heat, like a toaster or clothes iron. As explained further under “Selecting a New System,” it takes a lot of electricity to deliver the same amount of useful heat that natural gas or oil can provide onsite. A 1,500- watt plug-in heater will use almost the entire capacity of a 15-amp branch circuit; thus, adding much additional load will trip the circuit breaker or blow the fuse. The cost to operate a 1,500-watt unit for an hour is simple to compute: it is 1.5 times your electricity cost in cents per kilowatt-hour. At national average rates—12¢ kWh for electricity— that heater would cost 18¢ per hour to run—and quickly cost more than its purchase price. On the other hand, for intermittent use, it is the “least-bad” solution when alternatives would require major investments to improve ductwork for a specific area, for example. Just remember, electric resistance heat is usually the most expensive form of heat, and it is, therefore, seldom recommended.

“Electric baseboard heat” is yet another kind of resistive heating, similar to a plug-in space heater except that it is hard-wired. It has two principal virtues: the installation cost is low, and it is easy to install individual room thermostats so you can turn down the heat in rooms that aren’t being used. Operating costs, as for all resistive systems, are generally very high, unless the house is “super-insulated.”

**Wood-Burning and Pellet Stoves**

Wood heating can make a great deal of sense in rural areas if you enjoy stacking wood and stoking the stove or furnace. Wood prices are generally lower than gas, oil, or electricity. If you cut your own wood, the savings can be large. Pollutants from wood burning have been a problem in some parts of the country, causing the U.S. Environmental Protection Agency (EPA) to implement regulations that govern pollution emissions from wood stoves. As a result, new models are quite clean-burning. Pellet stoves offer a number of advantages over wood stoves. They are less polluting than wood stoves and offer users greater convenience, temperature control, and indoor air quality.

**Fireplaces**

Gas (and most wood) fireplaces are basically part of a room’s décor, providing a warm glow (and a way to dispose of secret documents), but typically not an effective heat source. With customary installations that rely on air drawn from the room into the fireplace for combustion and dilution, the fireplace will generally lose more heat than it provides, because so much warm air is drawn through the unit and must be replaced by cold outside air. On the other hand, if the fireplace is provided with a tight-sealing glass door, a source of outside air, and a good chimney damper, it can provide useful heat.

**State of the Art Heating**

Radiant floor heat generally refers to systems that circulate warm water in tubes under the floor. This warms the floor, which in turn warms people using the room. It is highly controllable, considered efficient by its advocates, and is expensive to install. It also requires a very experienced system designer and installer, and limits carpet choices and other floor finishes: you don’t want to “blanket” your heat source.

Contact the [Radiant Panel Association(link is external)](http://www.radiantpanelassociation.org/)

Ductless, Mini-Split, Multi-Split. Residential ductwork is relatively rare outside North America. “Ductless” heat pumps, which distribute energy through refrigerant lines instead of water or air, are widely used. Large field trials in the Pacific Northwest suggest that they can have good cold weather performance, and be very cost-effective where replacing electric resistance heating. Like ground-source systems, relative immaturity of the market helps assure that whole-house multi-split systems carry premium prices.

Combined heat and power (CHP) or cogeneration for houses is being seriously studied in some countries. The basic premise is to use a small generator to meet some of the electric demand of the house, and recover the waste heat (typically more than 70% of the heating value of the fuel) to heat the house (hydronic or water-to-air systems) and make domestic hot water. These systems are not yet widely available. They are likely to have the best economics in houses with high heating bills because the house cannot be feasibly insulated, such as solid stone or brick homes.