

# HEATING SYSTEMS -- AN INTRODUCTION

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Building codes require that a heating system be able to just barely maintain a comfortable house during the coldest day of the year. Hence the size of the heating system depends not only on the size of the house but on where it is located and how well it is winterized (sealed and insulated). The traditional methods of calculating the required heating sizes include a large margin for error -- because if an exceptional cold spell came along, a poorly winterized house would plunge into unlivable cold. However, modern well winterized houses can ride through short cold spells without much trouble -- the need for that extra heating power is no longer there. In addition, the heat load formulas were designed for houses requiring lots of heat. They don't calculate so well when a house doesn't need much heat at all (good solar gains and well winterized). Hence, most furnaces are already larger than needed for the houses they are living in -- and that costs you money because furnaces burn fuel inefficiently when they are too large; they have to turn on and off often to keep from overheating the house.

Looking at heating systems in the context of rewinterizing a house means making them more efficient and smaller. Even if you accomplish only half of what you could have done in rewinterizing, your furnace will still produce too much heat for the reduced needs of your house. It will be working more inefficiently than ever.

It is not uncommon today to have 1500 sq. ft. houses that require no more than a single 5 kW heater in the dead of winter. Some new heating systems are as simple as a small electric heater inside the ventilation ducting.

Heating systems commonly fall into one of seven categories;

- radiant space heaters;
- ductless furnace or floor furnace;
- wall mounted heat pumps;
- gravity flow air furnace;
- fan forced air furnace with or without a heatpump;
- gravity flow hot water boiler with room radiators;
- pump forced hot water boiler with room radiators.

Each of these types of furnaces could be fueled by any of the common fuels; electricity, oil, gas, wood and even the sun.

The type of fuel determines how the heat is made. The type of furnace determines how the heat is distributed. Both of these aspects can be improved to make your old heating system work better.

Studying this section will prepare you to talk intelligently to a heating contractor. He can quite easily (with all his graphs and charts) evaluate the heating requirement of your rewinterized house and tell you the recommended size of the heating system for your house. Because of the charts tendency to "overkill", don't get a furnace any larger than this recommendation.

A heating contractor will need to know: where your house is located, how big it is, what shape it is (heat loss is related to wall and ceiling surface area, not floor area; long American ranch-style houses lose more heat than square, two-story boxes of the same total floor area), how much insulation you have and where, how many and what kind of windows and doors you have, and some idea of how well you have sealed the house. If you have no ductwork - like furnace ducts or air exchanger ducts - then the configuration of the house will be important as well. Does it resemble an open plan or a labyrinth makes a big difference. Having no ducts in a highly segmented house (lots of smaller rooms) makes a big difference on how effective a split heat heat pump can be. When you can't move heat from room to room, it will take more heat to be comfortable than if it is an open plan or you can move conditioned air around with existing ducts. Often your utility bills tell more about the house heating needs than does the floor area. If the heating contractor doesn't ask these questions, doesn't even

look at your utility bills, find another contractor.

Finally, sit down with your heating contractor and evaluate all the possibilities open to you in the context of local fuel costs. Consider:

- Tuning-up or down-sizing your present unit;
- Are there any local fuel conversion grants available;
- Adding a tandem unit to your present unit or adding split-head wall mounted heat pump(s);
- Installing a totally new unit, either single or tandem;
- The need for air circulation and ventilation in your house and perhaps incorporating this need with your heating system.

Compare the answers to all these questions with more than one contractor.

**Keywords:**

Radiators, Heat Loss, Radiant, Types, Doors, Air Conditioning, Air Flow, Furnace, Air Changer, Fuel, Water, House, Heat Pump, Boiler, Heating, Forced Air, System, Wood, Gas

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