T

ruth be told, when your shop grows cold, so too will your interest in woodworking. While a basement shop can offer an acceptable level of warmth, borrowing from the home’s heating system and enclosed by below-grade walls, this is not the case with most dedicated outbuildings. For these, you need special strategies that match your climate, local heating offerings, budget, and safety requirements.

We’ll help you assess your heating needs and review your options, citing the pros and cons of each, using examples from across the country. We’ll cover electric heating, forced-air gas heating, overhead radiant heating, wood stove heating, and in-floor hydronic heating that works off a boiler. After examining your choices, whether for an existing shop or one you plan to build, you’ll come away with a practical path that will allow you to enjoy woodworking, regardless of the frosty temps outside.

Hot on the trail of heating solutions
Some people like to skip to the last page of a mystery novel for fast answers to whodunit and how they “dunited.” But there’s no point in jumping to the end of this article to discover the best way to heat your woodworking shop. That’s because there’s no universal solution that applies to everyone. Many factors come into play, depending on your location, situation, and preferences. Consider these questions.
Where’s your shop?
A lot depends on whether your shop is in International Falls, Minnesota, or in Interlachen, Florida. Location influences not only climate but also the availability and pricing of your fuel choices. As you’ll see in Chart 1 and Chart 2 above, substantial regional differences exist in both the amount of energy required to achieve comfort and in fuel prices themselves.

Local environmental regulations can also impact the economics of your choices. Washington state, for example, imposes wood smoke emission limits significantly tougher than the national maximums set by the Environmental Protection Agency (EPA). So buying a stove there will cost more because of greater restrictions, which limit your product choices and what you’re permitted to burn.

And while regulations can discourage certain choices, there may also be positive incentives from both the government and utilities that encourage using an energy-efficient heating source.

Freestanding or attached?
If yours is a basement or attached garage shop, extending service may be the easiest and least expensive solution. Your heating contractor can help you determine if your system can handle the additional load. Explain your plans and note that a shop space doesn’t need the same degree of comfort as a family room. Discuss ways to prevent dust and shop fumes from getting into the ductwork or leaking into living spaces.

A freestanding shop, such as a detached garage, requires its own system. Whatever you select, it will cost less to operate if the building is well insulated. As Chart 1 shows, investing in insulation means getting by with a smaller heater, saving on capital costs and operating expenses.

Most people think of shop size in square feet of floor area. But with heating you’re warming the total cubic feet of shop space. For that reason, consider sealing off portions of the shop, such as a storage area or finishing room that see only occasional use.

How much shop time?
An estimate of your shop time during the heating season will help you balance capital investment against operating expenses. If you have limited shop time, it may not make sense to pour a lot of money into a forced-air system, even though it’s economical to operate. A less expensive electric system, though more costly to operate, may better serve your needs.

If you work wood only in cool months, you likely only need heat. But if you’re a determined year-round craftsman in an area with brutally hot summers, consider looking into a system that can help with both extremes. Heat pumps can provide cool air to help combat heat and humidity.

Chart 1: Regional Costs By Fuel Type

<table>
<thead>
<tr>
<th>City</th>
<th>Electricity (per kilowatt hour)</th>
<th>Natural Gas (per 1,000 cubic feet)</th>
<th>Liquid Propane (per gallon)</th>
<th>Hardwood (per cord, delivered, stacked)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Philadelphia, Pennsylvania</td>
<td>$.15 per kwh</td>
<td>$16.20</td>
<td>$2.70</td>
<td>$175.00</td>
</tr>
<tr>
<td>San Jose, California</td>
<td>$.12 per kwh</td>
<td>$12.40</td>
<td>$2.99</td>
<td>$415.00</td>
</tr>
<tr>
<td>International Falls, Minnesota</td>
<td>$6.00 base monthly charge includes first 50 kwh; next 300 kwh at .047 per kwh</td>
<td>$8.94</td>
<td>$2.09</td>
<td>$180.00</td>
</tr>
<tr>
<td>Huntsville, Alabama</td>
<td>$5.77 base monthly rate plus $.081 per kwh</td>
<td>$14.54</td>
<td>$2.89</td>
<td>$145.00</td>
</tr>
</tbody>
</table>

* Insulation level based on regional average

Chart 2: Regional Heat Requirements (for a 1,200 sq. ft. shop)

<table>
<thead>
<tr>
<th>Shop Location</th>
<th>BTUs/Hr. Insulated Space*</th>
<th>BTUs/Hr. Uninsulated Space</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlanta, Georgia</td>
<td>8,400</td>
<td>18,000</td>
</tr>
<tr>
<td>San Jose, California</td>
<td>16,800</td>
<td>36,000</td>
</tr>
<tr>
<td>Hutchinson, Kansas</td>
<td>33,600</td>
<td>72,000</td>
</tr>
<tr>
<td>Philadelphia, Pennsylvania</td>
<td>42,000</td>
<td>90,000</td>
</tr>
<tr>
<td>Bismarck, North Dakota</td>
<td>58,800</td>
<td>126,000</td>
</tr>
</tbody>
</table>
Electric heat: simplicity is tough to beat

A half-hour before Nancy wants to work she cranks up the thermostat that usually keeps the 1,088-square-foot detached building at 50° F. The Cadet Hot One, mounted in a corner near the 10'-high ceiling, draws power from a 240-volt outlet, warming the heating elements before starting the fan to avoid an initial cold blast. (At shutdown, the delay switch runs the fan after the elements have cycled off to distribute the residual heat.) Although the heater has an integral thermostat, Nancy had her electrician bypass it with a wall-mounted unit for added convenience.

Three factors working together allow Nancy to use a relatively modest heater, rated at 17,000 BTUs when pulling 20.8 amps on high. First, insulation: the shop’s 2 × 6 exterior walls have R-19, the ceiling below the attic is R-30, and the roof itself is R-38. Second, passive solar: Nancy and her husband sited the building to maximize winter solar gain through the generously-sized windows. Third, open layout: the shop has a minimum of obstructions above workbench level, allowing the heat to spread evenly. Several enclosed areas in the shop, such as the finishing room and greenhouse, have supplementary electric baseboard or wall-mounted heaters, respectively.

Electric heaters are readily available, relatively inexpensive, install easily, and provide clean heat at the flick of a switch. However, you may need an electrician to run a dedicated circuit for the heater. Also, be sure to observe the manufacturer’s recommendations on clearances around the heater when installing it.

An electric heater works on a very simple principle: current passing through a high-resistance element causes it to warm up. After subtracting small amounts of current required by the fan and other components, virtually all of the energy is converted into heat, making electric heat a highly efficient choice. Periodically, you need to unplug the heater and clean it to remove sawdust drawn in by the fan. For the model shown, there are no filters to replace. It’s simply wired into an electrical box in the ceiling. You can use it as the sole heat source or to supplement another system.

At a Glance: Electric Heat

Shop owner: Nancy Ballance, Hamilton, Montana
Heat source: 240-volt power, 30-amp dedicated circuit.
Heater: Cadet Hot One; two-speed; 11,400 BTUs on low, 17,000 BTUs on high; built-in safety controls.
Costs: $330 for heater; $300 for installation.
Pros: Easy installation, fast response time, no open flame, minimal maintenance.
Cons: Multiple heaters may be needed to heat large shops or deal with separate rooms or zones; potentially high operating costs.

Common choices and examples

Electric heat: simplicity is tough to beat

Nancy Ballance’s ceiling-mounted electric heater takes up no floor space and runs off a thermostat.

Photos: Chris Autio
**Stove burning wood can be good**

Tom Elder’s orchard wood provides a renewable energy source. In fact, without his stove, Tom would have a headache disposing of the trimmings.

When you shop for a wood stove, you’ll find that virtually every one has a tag from the Environmental Protection Agency (EPA) listing its smoke output, efficiency, and heat output. To qualify for EPA certification, its smoke rating must not exceed 7.5 grams of particulate per hour for a noncatalytic stove, and 4.1 grams per hour for a catalytic unit.

A noncatalytic (also called recirculating) stove starts at about $500 and has a default efficiency rating of 63%. A catalytic stove begins at about $1,000 and has a default efficiency rating of 72%. (For comparison, high-efficiency gas furnaces achieve over 90% efficiency.) In a catalytic stove, a coated ceramic honeycomb ignites both gases and particulates before venting. The catalytic feature rewards you with higher efficiency and long, even heat output.

Match the stove’s heat output with your shop’s needs because efficient burning requires a fire that’s proportional to the stove’s size. A too-small stove will struggle to keep your area warm and could become dangerously hot. At the other extreme, a small fire in a large stove will burn inefficiently, generating excessive soot and smoke.

Seek a knowledgeable retailer who can match a stove’s performance with your needs. Will the stove be the sole heat source or secondary? Tom Elder has an electric heater as the primary source, maintaining his shop at about 50°F, enough to keep the high humidity in his climate zone from making rust blooms on tools.

Some stoves can handle wood and coal. But unless labeled as a multi-fuel stove, feed it only solid hardwood. Softwoods burn quickly, which makes them fine for kindling. But softwood resins can accelerate the buildup of creosote in the stovepipe.

For many, a shop stove has a nostalgic charm, but it is definitely labor intensive. These tasks include cutting wood, stoking the fire, and disposing of ashes.

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**At a Glance: Wood Heat**

**Shop owner:** Tom Elder, Harrisburg, Oregon  
**Heat source:** Trimmings from commercial orchard; 120-volt power for blower motor of heat exchanger.  
**Heater:** Wood burning stove that was shop-built by welding 1/4"-thick steel plates. Magic Heat brand heat exchanger in the flue is thermostatically controlled to activate an electric fan that pushes heat into the shop, increasing heat output.  
**Costs:** Typical wood stove starts at $500; a catalytic version starts at $1,000. Installation cost depends on site conditions; start with a budget of $1,000.  
**Pros:** With a low-cost fuel supply from a local wooded lot combined with shop scraps, a wood stove may have the lowest operating cost.  
**Cons:** More BTUs are lost up the flue. All steps, from wood collection through stoking and maintenance, are labor intensive. The open flame could pose an explosion hazard in the presence of volatile fumes or fine dust raised by sanders.
Forced-air blast: hot and fast
Thanks to strategically placed overhead ducts, Peter French enjoys wall-to-wall comfort in his 896-square-foot Grand Rapids, Michigan, shop. With conscientious weatherstripping and insulation, he eliminated drafts and energy-robbing air leaks so that his gas-fired furnace operates economically. Other common fuel sources include oil and liquid propane (LP). There are forced-air furnaces that use electric resistance coils, but these are relatively rare.

The simplest forced-air system consists of a ceiling-mounted unit that burns fuel while a fan pushes the heated air into your shop. Of course, you need adequate ceiling height plus an open shop design because the system can’t direct airflow into remote spaces.

A ducted system, however, allows you to distribute heat over wide areas and into individual rooms. You can even create zoned spaces. The ducts make it easy to add a central air system when the budget allows.

At A Glance: Forced-Air Heat
Shop owner: Peter French, Grand Rapids, Michigan
Heat source: Natural gas; 120-volt power for ignition and blower motor.
Heater: Carrier STA070 natural gas updraft furnace, model 58MBC080, produces 74,000 BTUs; Carrier ABA324 two-ton air-conditioning compressor. Distribution via 14" spiral metal ducts.
Costs: $5,300.
Pros: Forced-air systems are versatile, responsive, and efficient. Systems available for a variety of fuel sources: gas, oil, LP. A programmable thermostat minimizes energy costs when not in the shop. Cons: Large initial expense. Moving air can carry dust into wet finishes. Forced-air heat tends to be desert-dry, promoting extreme lumber shrinkage, checking at board ends, and dry skin.

High-efficiency furnaces—rated at 90% or higher—squeeze so much of the heat from the fuel that installers can use PVC pipe instead of metal as a flue. The exhaust typically terminates at a special fitting called a concentric vent. It includes a separate intake pipe that supplies combustion air to the furnace. But even though you’re not directly pulling potentially explosive dust-laden shop air into the combustion chamber, common-sense precautions are prudent. Consider creating a furnace room with a door that’s weather-stripped to exclude dust or even install the access door on the outside of your shop.

Responsiveness is the plus of a forced-air system. It doesn’t take long to feel the warm blast of air. But even though you’ll feel heat quickly, it takes time for the warmth to penetrate into tools. Finally, replace the filter when it shows a coating of dust or the restricted airflow will overtax the blower motor and burn it out.
Radiant heat keeps your shop neat
The radiant heating system in Jim Harrold’s shop is essentially a miniature version of the sun’s energy traveling through space to warm the earth and its atmosphere.

Jim Harrold's workshop is a 660-square-foot attached garage in Des Moines, Iowa. Jim sought an alternative to a forced-air system to avoid combining an open-flame heat source with sanding dust and solvent vapors.

To address those concerns, he chose a ceiling-mounted Reverberay LD-20-40 infrared heating system. It can generate up to 40,000 BTUs. In a metal combustion box, an electronic igniter fires up natural gas mixed with supply air from outdoors. A fan then pushes the hot gases through the 4”-diameter tube, generating invisible infrared radiation.

A reflector directs the energy downward and into masses such as the concrete floor and tools, which then radiate warmth into the shop air.

The system consists of 20’ of tubing, costing about $1,200. Installation should run in the $600 range.

At A Glance: Radiant Heat
Pros: On the coldest sub-zero nights, infrared heating warms up a shop in a hurry—the vicinity immediately below the tube is comfortable within 5 to 10 minutes; it can be thermostatically controlled, and the flame is fully contained.
Cons: Standing directly below the radiating tube can cook the top of your head unless the tube is elevated above 10’. The metal reflector can dent easily if dinged with a board.

In the slab it goes to heat your toes
Heat rises from the 900-square-foot concrete slab, gently warming the oak floor and then into the Hollis, New Hampshire, shop of Louis Lovas. This "hydronic" system, is a bottom-up heating solution. It cost Louis $6,000, plus the slab. An in-floor heating system runs about $12/square foot.

Here, a gas-fired boiler pumps hot water through the continuous loop of flexible tubing embedded in the concrete, transforming the slab into a massive radiator. The heat radiates evenly, and the lack of ductwork allows the freedom to arrange machines.

Louis’ contractor compacted 4” of gravel for drainage, and then topped it with 2” of expanded polystyrene. Plastic staples support the cross-linked polyethylene (PEX) tubing, and stilts hold the steel reinforcing mesh in the middle of the 4”-thick concrete slab.

At A Glance: In-Floor Hydronic Heat
Pros: Quiet, even heat. A radiant in-floor system doesn't require much energy to maintain a comfortable temperature in the shop.
Cons: High installation costs. Heating up a shop takes time; must stay in a heating mode during colder months to prevent freezing the pipes.