



electric baseboard heaters

overview

While electric baseboard heaters are not as convenient or as low-cost to operate as most gas furnaces, they are a common choice for heating homes because they are simple and inexpensive to install. This tip sheet discusses how to choose the best baseboard heater for your needs and how to install it properly.

Types of baseboard heaters

All types of baseboard heaters are 100 per cent efficient—in other words, all electricity consumed by the heating element is converted to heat.

Baseboard heating elements consist of a wire surrounded by an electrical insulator. This, in turn, is covered by a metal sheath complete with fins to provide good heat transfer from the element to the circulating air. In some cases, the elements may be surrounded by liquids such as water or oil. To provide extra air circulation, some baseboard heaters have a quiet, built-in operating fan or blower. Often these fan-equipped units will operate with lower enclosure temperatures than standard baseboards to reduce heat loss from the unit to the wall.

Some baseboards can be recessed in a wall or built-in wall unit—but only if they are approved for such installation. All recessed baseboards should have, as a minimum, the equivalent of RSI 3.5 (R20) mineral wool insulation behind and above them. A lack of proper insulation will cause unnecessary heat loss and higher bills. More insulation should be installed if possible.

Sizes and accessories

Baseboard units are generally 15 to 25 cm (6" to 10") high, 9 cm (3 1/2") or less in depth and come in lengths of 61 cm (2 feet) to 244 cm (8 feet). If other lengths are required, you can join standard sections and wire them together using the wiring raceway in the lower section of the unit.

A variety of end plates, junction plates and outlets are also available for convenient installation. Normally either built-in or add-on sections are used to mount relays for operating the unit in conjunction with low-voltage, wall-mounted thermostats. You can also use blank sections—containing no heating element—as fillers to provide a neat wall-to-wall appearance.

Heating capacity

The nameplate, which must be affixed to each unit, shows how much heat each baseboard is able to produce, in watts or kilowatts, for the specified voltage. A +5 per cent to –10 per cent variation between nameplate reading and actual operation is allowed.

Normally this variation is negligible and poses no problem if the heat loss calculated for the room is accurate and adequate wiring is provided. (Note: the actual kilowatt input/output of a unit decreases when the voltage provided at the element terminal decreases.)

Baseboards are available from 500 watts and up, in increments of about 250 watts. A few manufacturers have 300 to 350 watt units, which are suitable for bathrooms and other small rooms. Heating elements are normally rated for 120, 208, 240 and 277 volts. Higher voltages to 600 volts are available from some manufacturers for industrial applications. Standard-watt-density baseboards are normally 820 watts per metre (250 watts per linear foot) of unit.



Low-watt-density baseboards of 460 to 770 watts per metre (140 to 235 watts per linear foot) are also available to distribute the heat more evenly along entire exterior perimeter walls for increased comfort. Low-watt-density baseboards cost about 10 per cent to 30 per cent more than standard-watt-density baseboards.

To determine the heating capacity you require, seek advice from your heating contractor or heating equipment supplier, who should be able to do a heat loss calculation for you.

Installing your baseboard heaters

Select the area of highest heat loss, normally below a window or in the centre of a blank wall exposed to outdoor temperatures. If these locations are not available, they should be installed on walls adjacent to the areas of maximum heat loss, such as doors and windows.

By choosing a low-watt-density baseboard of the same wattage as the standard-watt-density baseboard, you can extend the area of coverage for more uniform heat distribution and greater comfort. Wall-to-wall perimeter heating with low-watt-density baseboards is ideal.

For proper installation, ensure the following:

- The installed unit must be chosen to suit the nominal voltage available.
- The wire size between the service panel and the heater must be adequate to allow full load operation with a maximum voltage drop of 2 per cent.
- Equipment should be selected to provide a kilowatt output as close as possible to the heat loss with a maximum variation of -0 per cent to +25 per cent between the kilowatt output and the kilowatt heat loss requirements.

Cost to operate

- Baseboard heaters are 100 per cent efficient.
- Operating cost affected by hours of operation and the wattage of unit.

$$\text{Formula: } \frac{\text{wattage} \times \text{hours of use}}{1000} \times \text{cost of electricity } (\$0.07)^1$$

$$\text{Example: } \frac{2000 \text{ W} \times 10 \text{ hrs.}}{1000 \text{ W/kW}} \times 0.07 = \$1.40$$

¹Cost of electricity subject to change

Installing your thermostats

Being 100 per cent efficient, the output efficiency of electric baseboard heaters can not be improved; however, controlling how they operate directly affects the amount of energy used to heat your home. The thermostat controls the temperature to which the living area is heated. Reducing the thermostat's set temperature reduces the temperature difference between inside and outside and therefore the rate at which the building loses its heat. BC Hydro customers can save between 5 per cent and 9 per cent on their annual heating bill by setting back the household temperature from 21°C (70°F) to 18°C (64°F) for one eight hour period per day.

A common misconception is that a room will heat faster if the thermostat is set higher than the desired temperature. Setting the temperature higher wastes energy, and drastic temperature swings will make occupants uncomfortable. The rate at which a room will be heated is determined by the size of the heating appliance, not the set temperature of the thermostat.



Types

There are two types of thermostats for the home: line voltage and lower voltage.

Line voltage thermostats are low cost on/off switches that are used exclusively with in-room electric heating systems. They are slow to respond to temperature changes which can result in large temperature swings above and below the thermostat's temperature setting. And because the full heating load passes through the thermostat, the thermostat itself heats up when the heater is on. This means the thermostat responds to its own internal heat and will shut off prematurely.

Low-voltage thermostats are used for gas, oil and electric central heating systems. They operate on a 24V power source that is converted from a standard 120V electric service through a transformer. This type of thermostat handles a very light electrical load and is highly responsive to temperature changes.

Electronic thermostats are available in both line voltage (240V) and low-voltage (24V) models. Using electronic or solid-state components, these thermostats provide very accurate temperature control and can cost less than a conventional low-voltage thermostat and relay.

Programmable thermostats offer "set and forget" convenience. Room temperatures can be set lower at night and when you're away, and then higher when you are up and about. Putting a programmable thermostat in your main living areas are your best option. Regulating heaters manually in other areas will allow you to reap the benefits of programmable thermostats without the cost. Remember that the heater will not warm the room faster by setting the thermostat at a higher temperature. Regardless of the type of thermostat you choose, ensure that it is compatible with the electrical wiring of the heater.

Location

The room thermostat should be conveniently located on an interior wall close to a doorway, making it easy to turn it up when entering and set it back when leaving the room. To measure room temperature accurately, never install the thermostat directly above a baseboard heater, near a refrigerator, or where it will be affected by direct solar heat.

More energy saving tips

Baseboard heaters provide the heat for an individual space, and so they should be set to a temperature appropriate for that living area. Energy can be saved in seldom-used rooms by turning down the thermostat and closing the door to that room. The homeowner should be cautioned that closing off a room significantly affects fresh air circulation. Over an extended period of time, the reduced air circulation could allow bacteria a chance to grow. Opening the door to closed rooms periodically, such as at night, will reduce the chances of problems occurring due to a lack of adequate air circulation.

Baseboard heaters should be cleaned periodically to remove excess dust that will accumulate over time. Dust acts as an insulator inhibiting the transfer of heat to the air. Make sure that the heater is turned off before you do this.

More tips

Safety around drapes

Make sure there is adequate clearance for drapes above the electric space heating units to ensure proper air circulation.

To avoid trapping warm air rising from the heaters, draperies should not touch them. The bottom of the drape should be at least 10 cm (4") above the heater. If floor to ceiling drapes are used, there should be at least 5 cm (2") clearance from the back of the drape to the heater face and 4 cm

(1-1/2") clearance from the bottom of the drape to the floor. (Note: Some manufacturers specify more clearance than this, depending on the baseboard design. Always follow manufacturers' recommendations.)

Where valance boards are used and heaters are located behind the drapes, the valance board should be open above to allow good air circulation throughout the room.

Accommodating carpets

Carpets should be installed so as not to block the baseboard air intake. Since wall-to-wall carpet often expands if not tightly stretched when installed, we recommend baseboards be installed after carpets are down, or that units be mounted 2 cm (3/4") off the floor to allow carpets to be installed underneath. Because lint from carpets can block the air circulation, vacuum the air intakes and heater elements regularly in heavily carpeted areas.

Avoiding wall streaking

Fit baseboard heaters tightly to the wall so that air does not circulate behind them. Many manufacturers provide a sealing material either in a tube or as a gasket. In recessed-type baseboards, a wood strip is often used. This tight fit to the wall is essential to avoid marking the wall with streaks above the unit. Wall streaking is caused when the rising warm air from the baseboard deposits dust particles, allowing a gradual build-up of this airborne material.



Installation

This brochure is designed as a general guide. Please ensure that installations meet your requirements, manufacturers' instructions and all applicable codes, standards and regulations. BC Hydro is not responsible for installations.

For more Power Smart information call:

Lower Mainland..... 604 431-9463

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