



Cold Frames & Hot Beds

From Cornell Cooperative Extension, Chemung County

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Cold frames – or their heated versions, hotbeds, are miniature greenhouses. A cold frame is simply a bottomless box covered with a light-admitting lid. Sun enters the box during the day heating the soil and air inside. At night, the soil radiates the heat absorbed during the day back into the covered frame. This keeps the cold frame's internal temperature anywhere from a few degrees to 10° or more higher than the outside temperature. Ventilation is accomplished by raising and lowering the lid. The covered frame also protects the plants from cold, desiccating winds.

Hot beds are similar to cold frames, except that in addition the sun's heat, they use an artificial means of heating the soil – usually electric cable. Thus, hotbeds can be maintained at minimum desired temperature. This makes them more useful during the coldest times of the year.

Cold frames have many uses. A frame can hold tender ornamentals and bonsai plants over the winter months. They can be used to hold potted hardy bulbs for forcing, bringing them inside to bloom as desired. They are also a good place to root hardwood cuttings. In the spring, plants raised in the greenhouse or home can be hardened off in a cold frame before moving them to full outdoor exposure. Transplants or seeds can be planted under a cold frame several weeks before they can be planted in the field. In addition, a cold frame can extend the harvest season in the fall. Lettuce, spinach, endive, and other cold-tolerant crops can be grown well into winter in a cold frame.

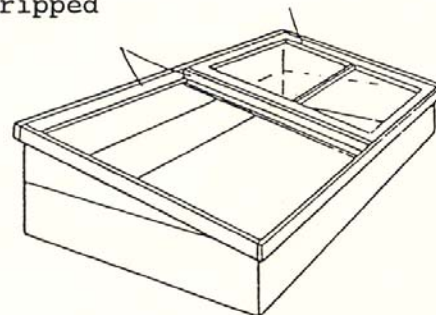
Hotbeds are most useful for seed germination in early spring. They also are used for growing seedlings in cold weather and for overwintering especially tender plants.

Hotbeds can be used to grow crops throughout the winter months.

Location

Hot beds and cold frames should always be located on well-drained soil, free from flooding during heavy rains. A southern exposure is desirable to make maximum use of limited winter light. Wind protection from the north and west is also important. Frames should be located close to the house to ensure that water and electricity are available and for ease of access.

Glass sash or plastic
Film on a frame
Sash support
weatherstripped



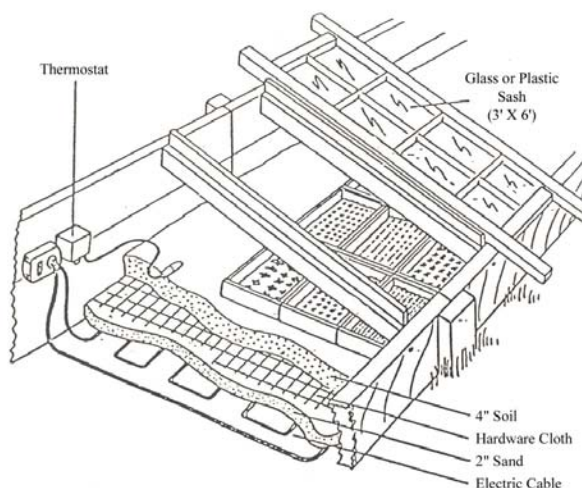
Construction

Cold frames and hotbeds generally consist of a wooden box with transparent lid. The back (north side) of the frame should be 6" higher than the front providing a slope to capture the maximum amount of light and to allow water to run off. The lid, which is best attached with hinges, can be made from old windows, fiberglass panels, or polyethylene film. If using polyethylene film or fiberglass

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panels, it is best to attach them to a wooden frame in a double layer, $\frac{3}{4}$ " apart. The double layer creates a dead air space, which provides greater insulation than a single layer alone.

When building with wood, all surfaces should be treated with a wood preservative. Do not use anything containing creosote or pentachlorophenol as these release vapors that are toxic to plants. Frames may also be constructed from brick, cinder blocks, and poured concrete, which are more permanent and last longer than wood. After construction, the inside of the frame should be painted white to reflect as much light as possible onto the plants.



The size of your frame should be based first on your needs and secondly on the size of available material. Generally, a 3' x 6' frame gives plenty of room while still allowing easy access to all corners. However, if you plan to use old windows, use their dimensions for the size of your frame instead. A height of 12" in front with an 18" back works well. If you want the ease of moving the frame, leave it at ground level and bank soil around the edges. Otherwise, sink the entire frame 4-8" into the ground, thus using the earth as a natural insulator.

The ground inside your frame should be amended to allow for good drainage, and for heating cable if you are building a hotbed. Excavate the frame's bed area 12" deep. Apply 4" of gravel or coarse sand for drainage. For cold frames, refill the remainder of the way

with fertile soil. For hotbeds, add a layer of burlap or similar material to prevent sand and silt from sifting down. Add 2" of sand on top of the burlap, and lay your heating cable on the sand. In general, every square foot of ground requires two linear feet of cable (12-16 watts). Be sure not to kink the cable or lay it over itself. Use weatherproof wiring and service entrances. Add another 2" of sand and then a layer of hardware cloth to protect the heating cable from damage. The remaining 4" can be filled with sand, soil, or soil mix, depending on what you are using the hot bed for.

Operation

The temperature inside a cold frame will fluctuate depending on outside temperature and sunlight. While not getting as cold as cold frames, hotbed temperature and energy usage are also affected by outdoor conditions. It is important to be aware of temperature fluctuations. Keep a maximum-minimum thermometer inside the frame to measure temperature change.

On sunny days, internal temperatures can become quite hot. This is just as true for hot beds as for cold frames. Opening and closing the lid moderates internal temperature. Heat actuated vent arms are available for this purpose. Be sure to close the top by late afternoon in order to retain as much heat as possible for the nighttime hours. On cold nights insulation, such as hay, blankets, or poly-styrene boards, can be placed over the top to help retain more heat. Be sure to remove this covering the next morning.

Because hot beds are heated, they are not susceptible to the low temperatures that cold frames can reach. For this reason, they are a better choice for starting seeds. They also can be used throughout the winter while cold frames are limited to spring and fall. Hotbeds are often used to start plants, which are then moved to cold frames to harden off.

Most seeds germinate best at a temperature of 70° F to 75° F. Following germination, the temperature should be

adjusted to suit the needs of the particular plant. Cool-season crops and seedlings that are being hardened off do best at 50° F to 60° F. Warm-season crops and tender seedlings grow better at 65° F to 75° F. Nighttime temperatures 10 degrees lower are normal.

Watering is very important in cold frames and hotbeds. The airtight frame and cool temperatures of cold frames slow evaporation and reduce watering needs. However, the electrically heated soil in hotbeds tends to dry quickly. The amount of sunlight and outdoor temperatures affect water needs in both situations. It is therefore necessary to check moisture levels frequently. In general, keep the soil moist, but not wet.

Compiled by Eric de Long
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