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The hobby greenhouse

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Quick Facts

- Greenhouse structures are available in unassembled packages, complete and ready to set on a foundation, or they can be custom designed.
- There are three basic greenhouse types: the attached lean-to, the window design and the free-standing structure.
- When selecting a site for a greenhouse, consider exposure, accessibility of utilities and aesthetics.
- An eastern exposure is most desirable for a greenhouse.
- Greenhouses can be constructed of wood, pipe, steel or aluminum, with covers of glass, fiberglass reinforced plastic or film plastics.
- In general to heat a greenhouse, 200 BTUs/ hour/ square foot of ground area should be provided: in cooling a structure, 13 cubic feet per minute of air exchange/ square foot of ground area should be used in calculating fan size.

A hobby greenhouse is invaluable for starting plants you want to include in your garden. While seed catalogs offer a wide selection of varieties and types of plants, garden centers offer only a narrow selection in their bedding plants. A hobby greenhouse also is useful for extending the season, and if it is heated all winter, it can produce a variety of plants that thrive as houseplants.

Planning the Structure

Greenhouse structures are available in all sizes, shapes and degrees of durability. They can be purchased in unassembled packages, complete, ready to set on a foundation, or can be custom designed for a specific need. Once you know what you want in a greenhouse, inquire about the legal aspects of your design, including zoning, assessing and taxation. Much time can be saved if heating, cooling and irrigation are automated in the design.

Type of Structure

Most greenhouse structures fall into three categories. The attached lean-to type normally has one sidewall as a part of a house, garage or other out building. It costs somewhat less to construct and operate but can have some drawbacks in cooling or ventilating capabilities.

The window design is attached outside a selected window, often chosen to attract public attention. It is almost impossible to maintain a uniform temperature in the window type because heat depends on home conditions. Ventilation during periods of high solar radiation is also a common problem.

The free-standing structure provides the most versatility in regard to maintaining a good greenhouse environment. It is easy to ventilate throughout the year and is relatively easy to expand if the need arises.

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Locating the Structure

The first consideration should be the orientation or exposure. An eastern exposure is best, followed by a southern, then western, exposure, with a northern exposure being the least desirable. All greenhouse structures should be located well out of the shadows of trees, buildings or other structures, especially during winter months.

Accessibility of utilities also is important as extending water, gas and electricity lines can be costly. If such lines are extended underground, they usually have to be placed in separate trenches.

The structure should be aesthetically pleasing and fit well into the landscape design.

Building Materials

A framework is available in a wide variety of materials: wood, pipe, steel or aluminum. Redwood is durable and should be considered where contact with soil and water is inevitable. Less enduring woods may be used where they will remain dry. Local lumber yards usually can make the required trusses and supply all other materials for the superstructure. If wood is considered, select types without wood preservatives in the form of Penta or Creosote. Wood coated with these materials yields toxic fumes harmful to plants. Copper napthanate preservatives are safe products to use around plants.

Paint all non-redwood lumber with a good oil base white paint. Paint containing tung oil usually is available from commercial greenhouse suppliers. Do not use mercury-type paints in the greenhouse.

Galvanized pipe is often used to support fiberglass and plastic film coverings. Parts required for pipe construction can usually be obtained only from a greenhouse supplier. Black pipe, if painted properly, can be much cheaper. Steel structures involving angle iron are not recommended because of construction and maintenance difficulties.

Aluminum is associated with fiberglass panel coverings and is the only material to use for a glass-covered house. All parts are available from the manufacturer.

Covers

Glass, until recent years, has been the most commonly used greenhouse covering. It is subject to hail and accident damage and definitely needs to be shaded during summer months. Research at Colorado State University in the 1960s showed that superior growth was obtained from carnation plants grown under fiberglass reinforced plastic (FRP).

FRP panels have become common greenhouse coverings. Consider certain criteria with purchasing panels, namely, the presence of acrylic modifiers, ultra violet (UV) inhibitors and a Tedlar film laminated to the outside to increase panel longevity. Panels with these characteristics are classed as greenhouse grades and are not normally obtained through lumber yards.

"Clear" panels contribute to the best plant growth. However, colored panels of yellow, coral, light pink and violet are acceptable for plants requiring low light, such as orchids or violets. Green-colored coverings are not conducive to good plant growth.

Film plastics have aided more in the energy crisis than other coverings. The double-layer installation (air inflated) reduces heat loss from 20 percent to 30 percent. Properly applied greenhouse grade film plastics containing UV inhibitors will last 18 to 30 months in Colorado.

Controlling the Environment

One of the most important factors involving greenhouse management is the ability to control the plant environment, so that near-optimum growing conditions can exist.

Temperature requirements. Most plants are placed into two temperature categories, warm and cool crops. It is difficult for the small hobby-greenhouse operator to have areas for both warm- and cool-loving plants. Most plants also do better when the night temperature is approximately 10 degrees F lower than the day temperature.

Heating. A good heating system is very important but can create problems. During periods of sub-zero temperatures, all cracks in the greenhouse structure "ice over" and free air exchange is eliminated. All heating systems for greenhouses must have a proper amount of fresh air coming to the burner area. If inadequate air is present, improper combustion occurs and ethylene will be a by-product that remains in the greenhouse and damages plants. The Public Service Company of Colorado recommends that a fresh-air inlet be installed near any heating unit at a ratio of one square inch of inlet opening for every 2,000 BTUs of heater rating.

If possible, have the heater or combustion chamber installed outside the greenhouse in order to eliminate combustion problems. Direct-vent, wall-mounted heaters have proven worthy for greenhouses. Hot water systems provide the most uniform heat and can be the least expensive to operate. Forced-air heating units, such as those used in homes, work well, provided they are vented properly.

As a general rule, 200 BTUs per hour per square foot ground area will be required to maintain 50 degrees F temperatures inside a standard designed house with -10 degrees F. The lean-to and air-inflated structures have a 10 percent to 20 percent lower heat requirement.

Cooling and ventilating. A greenhouse is a collector of solar heat. On winter days with full sun and an outside temperature of 20 degrees F the temperature in the greenhouse can reach to more than 65 degrees F. Hardly a week goes by that some ventilation isn't needed. A plastic-tube system is an ideal way to control greenhouse temperatures throughout late fall, winter and early spring.

Greenhouses covering less than 200 square feet of ground area can be cooled effectively with an evaporative cooler (swamp cooler). Such cooling systems produce a positive pressure. Install ventilating louvers in the peak of each gable and at least one or more vents opposite the air inlet. Select coolers on the basis of 15 to 20 cubic feet per minute (CFM) of air exchange per square foot of floor area.

Larger greenhouse designs are easier to cool with a fan-and-pad system. Special "nonloading" fans and cooling-pad systems are available through greenhouse supply companies. Use a design factor of 13 CFM per square foot of floor area to calculate the fan size.

When an aspen excelsior pad is used for evaporative cooling in a hobby house, a ratio of 5.6 square feet of pad area is required for every 1,000 CFM of cooling fan capacity. The cooling pad and fan should be at plant height and the air pulled across the longest distance of the house. Automated or manually operated louvers or ventilators will be needed to cover the pad area. A complete picture of the automatic ventilating system is shown in Figure 1.

Controls. A heating, humidity, cooling or ventilating system is only as effective as the method of control. Solid-state, automatic control systems now are available at reasonable prices. For ease of management, control the heating and cooling systems by thermostats placed in a protected area in the center of the greenhouse and in close proximity to the plants. Ideally, place all thermostats and thermometers in an aspirated box or tube. It should be designed so the air is pulled across the instruments and no solar or extraneous heat reaches them. Consider a battery operated high- and low-temperature alarm system.

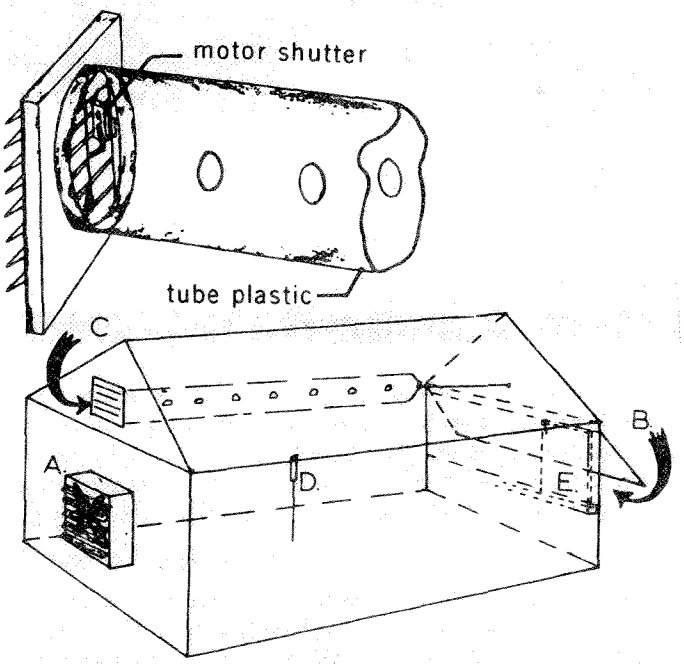

Figure 1. Components of a ventilated greenhouse.

A. Thermostatically-controlled exhaust fan for year-round operation.

B. Manual or automatic ventilator for summer cooling.

C. Convection tube ventilation for winter cooling when near ventilator is closed.

D. Aspirated container for control system.

E. Cooling pad system, completely across opening.