The author is James F. Thompson, Extension Agricultural Engineer, Davis.
Many home gardeners find a small greenhouse a relaxing hobby as well as very useful. It can be used to root cuttings and germinate seeds for the outdoor garden, special flowers or ornamentals can be raised, and vegetables can be grown out of season. A carefully chosen and attractive greenhouse can provide many hours of enjoyment. However, before building one, be sure to consider:

- location
- type of construction
- heating and ventilating
- maintenance

**LOCATION**

A sunny location is best. Locate the house as far from trees as practical. A southern or southeastern exposure is best for maximum light during the winter.

The greenhouse should be convenient to water, fuel for heating, and electricity. The area should be well drained.

**TYPES OF GREENHOUSES**

Almost everyone can find a greenhouse style to suit his needs. There is a bewildering variety of sizes, shapes, and styles. Greenhouses range from window-box size to 20 or 30 feet wide and 100 or more feet long. The size you choose depends on the area available, how much greenhouse gardening you wish to do, and the cost.

Gothic arch, rigid frame, air supported, shed roof, and conventional pitched roof are just a few of the available shapes. A greenhouse that fits both existing landscape and personal preference dictates the choice. Greenhouses are made with glass, fiberglass, polyethylene, or vinyl coverings. Wood, steel, and aluminum are used for framing.

**Glass**

Glass houses are very attractive, permanent, and expensive. These houses should be built by a greenhouse manufacturer or purchased in a ready-to-assemble package because they are difficult to construct. Any gardening magazine advertises companies selling these houses.

**Fiberglass**

Houses covered with fiberglass are durable, attractive, and moderately priced. They are commercially available or can be designed and built by the home handyman. Only transparent or translucent fiberglass weighing 4 to 5 ounces per square foot should be used. Most manufacturers sell a fiberglass made for greenhouses and it should be guaranteed for 10 to 20 years. Except for shading, lower grades and colored panels should be avoided.

**Film Plastic**

Film-plastic-covered greenhouses are inexpensive and temporary. They are less attractive and require more maintenance than other styles. Clear polyethylene, 4 or 6 mils (0.004 to 0.006 inch) thick, is most commonly used because it is inexpensive and readily available. Unfortunately polyethylene only lasts from 3 to 8 months because it is rapidly broken down by ultraviolet radiation from the sun. Polyethylene treated with an ultraviolet (UV) inhibitor is slightly more expensive but will last 3 to 6 months longer than the regular polyethylene. This film should be used if the greenhouse is to be covered in the summer or fall.

Longer lasting film plastics are available, but they have other disadvantages besides being more expensive. If more permanence is desired, the house can be covered with fiberglass. Polyethylene film costs 2 to 3 cents per square foot, fiberglass, 40 to 60 cents per square foot.
GREENHOUSE CONSTRUCTION

Use seasoned, construction-grade lumber when building the greenhouses described here. Redwood or Douglas-fir is best.

Paint the framework with a white exterior paint to improve appearance and reflect more light.

Posts and wood that touch the ground should be treated with copper naphthenate preservative. Do not use creosote and pentachlorophenol preservatives because they release vapors harmful to plants.

Polyethylene film should be installed on calm days. Film plastic first tears at the places where it touches the greenhouse frame or where it is folded. Wide, unfolded sheets of plastic are available and should be used. A batten strip at least as wide as the rafter will help extend film life. Double-headed nails are often used to fasten the plastic since they are easier to remove.

Two layers of plastic can be installed to reduce heat loss as much as 40 percent and eliminate condensation on the plastic. An inside layer of plastic 2 to 4 mils thick is spaced 1 to 4 inches from the outside layer to create a dead airspace. Closer or wider spacing does not create an effective dead airspace.

Although two layers are difficult to install, they are well worth the trouble. Typically, both layers can be installed on the outside of the framework with a 2x2 spacer placed between the layers where they are fastened to the rafters. One sheet is held by the 2x2 nailed just to hold it in place. The second sheet can then be held with the batten strip and nails driven through the 2x2 and an inch or more into the rafter.

In small greenhouses, the inner layer of plastic can be fastened to the inside framework with staples driven over a string. Simply pulling the string removes the staples.

HEATING

Types of Heaters

The greenhouse must be heated for winter use. Many types of heating systems are available.

Home Heating Systems. If a home heater’s capacity is adequate, it can be extended to a small nearby greenhouse. However, the heat demand is different than that of the home so a separate thermostat and control system are required. A heating contractor normally will be needed for installation.

Space-Heaters. Either electric, gas, or oil space-heaters are often used to heat small greenhouses. Heated air is circulated by a fan in the heater. Some space-heaters have no fan and so are rather uneven and ineffective. Depending on the size of unit, space-heaters should not be more than 10 to 30 feet apart to produce uniform heating.

Oil or gas heaters must be vented to the outside since the products of combustion are toxic to plants. Electric heaters are easier to install and are convenient but cost more to operate than gas heaters.

Space-Heaters With Ducts. Recently a heating system has been devised to distribute heat more uniformly through the greenhouse. A space-heater with a fan built for moving air in ducts is attached to a clear polyethylene tube (diameter, 12" to 24") hung overhead. The tube has 2- to 3-inch holes punched along it every 2 or 3 feet. Warmed air is blown into the tube and out the small holes to provide uniform heating. When no heat is needed, the furnace can be shut off and the fan left on to ventilate the greenhouse. The fan-heater unit is located near the end of the greenhouse so outside air will be drawn through a door or opening into the fan and tube to be blown throughout the greenhouse. Usually this equipment is not needed for small greenhouses because space-heaters alone are satisfactory and less expensive. Normally, greenhouses are at least 15 to 20 feet wide and 50 to 100 feet long before this equipment is used.
TABLE OF HEAT REQUIREMENTS FOR GREENHOUSES

<table>
<thead>
<tr>
<th>Desired Minimum Inside Temperature</th>
<th>Lowest Expected Outside Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10</td>
</tr>
<tr>
<td>50</td>
<td>18</td>
</tr>
<tr>
<td>55</td>
<td>24</td>
</tr>
<tr>
<td>60</td>
<td>30</td>
</tr>
<tr>
<td>65</td>
<td>36</td>
</tr>
<tr>
<td>70</td>
<td>42</td>
</tr>
</tbody>
</table>

Forced-Air Furnaces. Home forced-air furnaces and ducts are also used to heat larger houses. Clear polyethylene tubes, such as used with the space-heaters and ducts, can be attached to the furnace and hung overhead for distributing the heat. Again, these furnaces must be vented.

Amount of Heat

The amount of heat required for a greenhouse depends on the size, minimum outside temperature, minimum temperature required inside, amount of wind, quality or tightness of construction, nearness to heated buildings, height of sidewalls, etc. For most construction, each square foot of surface loses 1.2 B.t.u.'s of heat per hour for each degree of temperature difference. The table of heat requirements helps in calculating the heat load.

An example of how the heat requirement is calculated is given in figure 1. In this case a 10- by 12-foot greenhouse needs to be heated 40 degrees above the outside minimum temperature.

From the table — 48 B.t.u./hr/sq ft heat is required or

48 x 418 = 20,000 B.t.u/hr is the total heat required.

FIGURE 1. How to calculate heat requirement.
Gas or oil heaters are frequently rated according to the total heat input. Some heat escapes through the vent so the usable heat is only about 70 percent of this total. If a gas heater were used in the greenhouse shown in the example, it should have a heat input rating of about

\[
\frac{20,000}{0.70} = 28,600 \text{ B.t.u./hr}
\]

If two layers of plastic are used, the heat loss is about 70 percent of the loss through a single layer of plastic. If the house in the example is built with a double layer of plastic, the heat requirement would then be \(20,000 \times 0.70 = 14,000\) B.t.u./hr. Of course, if a gas heater were used with the double plastic, its heat input would be

\[
\frac{14,000}{0.70} = 20,000 \text{ B.t.u./hr}
\]

**Maintenance and Safety**

Choose heaters having a safety switch or safety pilot. Be sure gas heaters are vented.

Clean dust from the burners and ducts before starting heating in the fall.

Check the flame to be sure it is burning with a clear blue color. A yellow flame indicates incomplete combustion and the flame setting should be corrected.

Be sure the thermostat is protected from rain and is operating.

For greater heater efficiency keep the greenhouse doors closed and patch all holes.

**VENTILATION AND COOLING**

Greenhouses must have air movement for cooling. In winter, air movement is needed to reduce excess humidity, condensation, and dripping of moisture from the roof. Either greenhouse vents or fans can be used.

**Vents.** A continuous vent at the top or ridge of the greenhouse, combined with vents on the sides, gives the most effective natural ventilation. For small greenhouses, a 1- to 2-foot wide vent is adequate. In larger greenhouses, a ridge vent \(\frac{1}{3}\) the width of the house should be used. For example, if a house is 24 feet wide, at least a 3-foot-wide \(\frac{1}{3} \times 24\) ridge vent should be used.

Side vents are often not used in houses less than 15 feet long, since an open door or a few holes at each end allows enough air to enter on hot days. For very small houses, like those on plans 5941 and 5946, smaller ridge vents, open doors, or end vents provide enough ventilation.

Ridge vents should be opened slightly in cold weather to allow some moisture laden air to escape. With no ventilation, humidity in the greenhouse becomes too high and condensation, drip, and disease become severe problems.

**Circulating Fans.** Sometimes small fans are used to circulate air within the greenhouse to try to eliminate stagnant air pockets. These fans should only be used to correct a poorly designed heating and ventilating system. In small greenhouses and in greenhouses with good heating and ventilation systems, they are not of much use.

**Cooling Fans.** More positive air control is needed if the greenhouse is used in the summer. Fans will ventilate even on a calm, hot, summer day. Also, fans are easier to control automatically than vents. However, fans are more expensive and not normally used except in large houses. The fan exhausts the air from the house, and during warm weather it should change the air once every minute.

**Cooling Pads.** In large houses, a wetted aspen-fiber pad can be placed at one end and fans at the other to provide additional cooling. As the air is drawn through the wet pad it is cooled by evaporation—as much as 30 degrees on hot days. If additional cooling is needed in small greenhouses, a package evaporative cooler is more satisfactory. The cooler can be mounted to blow cool air into the house at one end and the door opened on the opposite end to exhaust the air. Coolers should change the air once per minute. The volume of of the house shown in the heating example is 855 cubic feet—the amount of air a cooler for this house would need to deliver per minute.
Shading. Shades, of course, besides reducing light, reduce the heat load in greenhouses. Shading compounds that are sprayed or painted on the greenhouse and aluminum, fiberglass, plastic, or wooden screens and panels are available. Partial shading does not normally reduce summer light enough to reduce growth, but it is a good way to reduce the heat load.

Humidification. During hot days the humidity in a greenhouse can become so low that plants are severely dehydrated and even ruined. Moreover, some tropical foliage plants and orchids grow best in high humidities. The least expensive way to increase humidity is to frequently water the gravel under benches and in walkways. Water nozzles that periodically spray a fine mist are also very effective humidifiers. The nozzles can be automated with a time-lock and electric valve. A time cycle of 1 minute on and 5 to 10 minutes off is common. Commercial greenhouse humidifier units can also be used.

Automation

Watering, heating, cooling, fertilizing and humidifying can all be done automatically. Only the budget limits how many chores are automated. Some people prefer to control all of these operations themselves, considering this part of the enjoyment of the greenhouse. However, some jobs are better handled by automatic controls. Heaters should be controlled by a thermostat. Vents or fans can also be thermostatically controlled, but this is not as necessary. Other automation is nice to have but the heating and ventilation system should be automated first.
UNDERSIDE OF RIDGE

BATTEN STRIPS

CLEAR PLASTIC

30° FOLD PLASTIC OVER AND FASTEN TO INNER SIDE OF CORNER STUDS AND RAFTERS

BATTEN STRIPS

ARCH FRAME

I"x8" BASE FRAME

SCIW HOOKS

END VIEW

CUT AWAY

6'-0"

2"x2" RAFTER

CUT AWAY TO SHOW CONSTRUCTION

SIDE VIEW

CUT AWAY

COVER DETAIL

2"x2"x7'-0" RIDGE

STEEL CORNER STRAP

I"x8" COLLAR

ALL 2"x" studS

ARE NOTCHED 3/4" FOR BASE FRAME

COVER SUPPORTS

CONDUIT STRAPS

ARCH FRAME

BATTEN STRIPS

PLASTIC (ENDS)

COVER SUPPORTS

SIDE AND TOP COVER SUPPORTS ARE 2x4 INCH WELDED WIRE MESH, HOOKED TOGETHER IN PAIRS AND HINGED LOOSELY TO THE RIDGE WITH STRONG CORD.

PERSPECTIVE VIEW

FRAMING ONLY

MATERIAL LIST

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QUANTITY</th>
<th>SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>BASE FRAME</td>
<td>4 PCS</td>
<td>1 x 8&quot; x 6'-0&quot; LONG</td>
</tr>
<tr>
<td>COLLARS</td>
<td>1</td>
<td>1 x 6&quot; x 2'-8&quot;</td>
</tr>
<tr>
<td>RIDGE</td>
<td>3</td>
<td>1 x 6&quot; x 7'-0&quot;</td>
</tr>
<tr>
<td>RAFTERS</td>
<td>4</td>
<td>1 x 6&quot; x 3'-6&quot;</td>
</tr>
<tr>
<td>STUDS (CENTER)</td>
<td>4</td>
<td>1 x 6&quot; x 4'-0&quot;</td>
</tr>
<tr>
<td>COVER BATTENS</td>
<td>3</td>
<td>1 x 6&quot; x 7'-0&quot;</td>
</tr>
<tr>
<td>ARCH FRAMES</td>
<td>10</td>
<td>1 x 6&quot; x 10'-0&quot;</td>
</tr>
<tr>
<td>CONDUIT STRAPS</td>
<td>10</td>
<td>1 x 6&quot; x 10'-0&quot;</td>
</tr>
<tr>
<td>_CORNER STRAPS</td>
<td>10</td>
<td>1 x 6&quot; x 10'-0&quot;</td>
</tr>
<tr>
<td>PLASTIC (ENDS)</td>
<td>2</td>
<td>3'-0&quot; x 6'-0&quot;</td>
</tr>
<tr>
<td>COVER SUPPORTS</td>
<td>2</td>
<td>3'-0&quot; x 6'-0&quot;</td>
</tr>
<tr>
<td>BATTEN STRIPS</td>
<td>2</td>
<td>3'-0&quot; x 6'-0&quot;</td>
</tr>
<tr>
<td>SCREW HOOKS</td>
<td>8</td>
<td>SEE NOTES</td>
</tr>
<tr>
<td>FASTENINGS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SOIL HEATING CABLE</td>
<td>1</td>
<td>300 W x 120'-0&quot;</td>
</tr>
</tbody>
</table>

DUE TO POSSIBLE VARIATIONS IN ANGLES WHEN THE CONDUIT IS BENT FOR ARCH FRAMES, CHECK THE HEIGHTS SHOWN USING AN ARCH FRAME AS A TEMPLATE.

ALL WOOD SHOULD BE TREATED WITH PRESERVATIVE AFTER CUTTING AND BEFORE ASSEMBLY.

METAL PARTS AND FASTENINGS TO BE GALVANIZED OR OTHERWISE RESISTANT TO CORROSION.

METAL PARTS TO BE FASTENED WITH SCREWS.

WOOD PARTS MAY BE FASTENED WITH SCREWS OR WITH NAILS, CLINCHED WHERE POSSIBLE.

PLASTIC MAY BE FASTENED THRU THE BATTEN STRIPS WITH NAILS, SCREWS OR STAPLES.

SIDE AND TOP COVER SUPPORTS ARE 2x4 INCH WELDED WIRE MESH, HOOKED TOGETHER IN PAIRS AND HINGED LOOSELY TO THE RIDGE WITH STRONG CORD.

COOPERATIVE EXTENSION WORK IN AGRICULTURE AND HOME ECONOMICS

UNITED STATES DEPARTMENT OF AGRICULTURE COOPERATING

HOTBED & PROPAGATING FRAME

USDA '54 EX 5971 SHEET 1 OF 1
 Side View

End View

Cut Away

CUT AWAY

CUT AWAY

NOTE: SEPARATION OF HEATING CABLES IS VARIABLE TO AMOUNT OF HEAT NEEDED PER SQ. FT. ACCORDING TO GEOGRAPHIC LOCATION. REFER TO LEAFLET NO. 445 USDA.

Wood Parts May Be Fastened With Screws or With Nails.

Metal Parts and Fastenings To Be Galvanized or Otherwise Resistant To Corrosion.

Material List

1. 360-watt Soil Heating Cable, Thermally Controlled To Shut Off At 70°F
2. White Plastic Film, 4 Mil, 5' x 8' For Covering Frame During Winter
3. Cheesecloth, 3' x 7'
4. Sand - 2' Above, 2' Below Heating Cable
5. 1/2' Hardware Cloth, 3' x 3 1/2'

All Wood Should Be Treated With Preservative After Cutting And Before Assembly.

Designed in Cooperation With:

Crops Research Division

Cooperative Extension Work in Agriculture and Home Economics

And United States Department of Agriculture Cooperative Extension Service

Mini-Hothouse and Propagating Frame

USDA '69 6080 Sheet 1 of 1
Greenhouse Assembly

Coldframe Unit

Vent Open
TOP PLATE BEVELED

4/6" CARRIAGE BOLTS IN 5/16" DIAM Holes

7/8" HOLES FOR ANCHOR RODS

LEFT END

FRONT

RIGHT END

VENT COVER

VENT OPENING

4" LOOSE-PIN BUTT HINGES ARE REG

TOP PLATE BEVELED

FASTENING DETAIL

BATTENS TO HOLD PLASTIC FILM, NAILED EVERY 4"

LOWER SIDE PANEL

1/4" LAG SCREWS WITH WASHER

LOWER END PANEL

COOPERATIVE EXTENSION WORK IN AGRICULTURE AND HOME ECONOMICS

PLASTIC COVERED GREENHOUSE-COLD FRAME

UNITED STATES DEPARTMENT OF AGRICULTURE COOPERATING

ORE. 91994 SHEET 2 OF 2
BENCH & BENCH SUPPORTS
NOT SHOWN IN THIS VIEW

NOTE *I
1/4 x 4" CLEATS CENTERED
IN 4'-0" BAYS & NAILED TO
UNDERSIDE OF EAVE PURLINS
FOR THE PURPOSE OF SECURING
TOP EDGE OF SIDE FIBERGLASS
PANELS.

CORRUGATED FIBERGLASS PANELS

1/4 x 4 PURLINS (3) EACH SIDE

COMMERCIAL OR
HOME BUILT BENCH

PLAN

BENCH SUPPORTS
END SUPPORT

BENCH SUPPORTS

END SUPPORT

DOOR ONE END

BACK WOOD GUSSETS

1/4" PIPE UVERT
SUPPORTS

1/4" BOLTS

1/4 x 4" POST AT
CORNERS AND CENTERS
PRESSURE-TREATED WITH
COPPER NAPHTHENATE

4 x 4 x 4'-0" POST AT
FOOTING P'T

NOTE *I
1/4 x 4" CLEATS CENTERED
IN 4'-0" BAYS & NAILED TO
UNDERSIDE OF EAVE PURLINS
FOR THE PURPOSE OF SECURING
TOP EDGE OF SIDE FIBERGLASS
PANELS.

FRAMING MEASUREMENTS

EAVE
(12) 4D NAILS EACH SIDE

MOISTURES

(12) 4D NAILS EACH SIDE

1/4" PLYWOOD GUSSETS

BRICK OR
BLOCKS UNDER
SUPPORTS

PULL SCREWS

2 x 4 BENCH

SUPPORTS AT
4'-0" CENTERS

GRITTL FILL

1/2" PLYWOOD GUSSETS

ON\BARI

1/4"

HEAD

FIELD

18"

11 1/4"

4'-0" 1/4"

10 1/2"

3'-9"

2'-6"

5'-3"

5'-3"
NO 9 GALVANIZED WIRE TIES, TWISTED

FRAMING ELEVATIONS

ROOF PANELS SLIDE DOWN FOR REMOVAL OR VENTILATION AT RIDGE

DOUBLE-GLAZED WALL PANEL WITH LOOSE-PIN HINGES

1/2" THIN-WALL CONDUIT 10'-0" LONG, FLATTEN 6" EACH END

3/4" CARRIAGE BOLT WITH WASHER

2X4 POSTS

1X4 SASH STILE (1X3 AT CORNERS)

9X12X16'-9 1/2" FRAMING ELEVATIONS

CROSS SECTION

USE LONGER BOLT AND TWO NUTS TO ANCHOR ENDS OF WIRE TIES

END WALL PANEL

1X6 CAP

2X3 RAFTER END RAFTER

1X1 PANEL SUPPORTS WITH 1/4" BEVEL FOR GUTTER

RAFTER DETAILS

NOTE:

CONSULT LOCAL HEALTH AND BUILDING CODE AUTHORITIES BEFORE STARTING CONSTRUCTION.

COOPERATIVE EXTENSION WORK IN AGRICULTURE AND HOME ECONOMICS

UNITED STATES DEPARTMENT OF AGRICULTURE COOPERATING

PLASTIC GREENHOUSE

USDA '76 6251 SHEET 1 OF 2
DOOR DETAIL "C"

1x1 STRIP, FULL LENGTH

1/8"x1/8" METAL STRAP, FLUSH WITH WOOD, EACH SIDE

DOOR PANEL
TWO REQ'D

APPLY FILM TO INSIDE FIRST OUTER FILM
SHALL EXTEND OVER TOP RAIL AND LAP
THE TOP EDGE OF THE INNER FILM

2x2, BEVELED
2x4x10'-0"
2x2

GABLE SASH PANEL
TWO REQ'D

METAL RIDGE COVER BENT DOWN AT EACH END

1x3 SASH STOP FOR SIDE WALL PANEL

2x4x10'-0"
1x0 CAP

END WALL FRAMING

8" GALVANIZED T-HINGE WITH BRASS PIN PIN
SHOULD BE REMOVABLE, INSET SO LEAVES ARE
FLUSH WITH THE SURFACE OF WOOD MEMBERS FOR
EASE IN APPLYING OR REPLACING THE PLASTIC FILM

1/4" CARRIAGE BOLT

SILL DETAIL "A"

2x2
1x4
2x4x10'-0"
1x4

NOTES:

THE ROOF PANELS ARE HELD IN CLOSED OR
PARTLY OPEN POSITIONS BY 6d DOUBLE-HEADED
NAILS IN HOLES DRILLED THROUGH LOWER END OF
RAFTER CAP INTO PANEL FRAME.

INSTALL RESILIENT WEATHER STRIPPING TO
CLOSE THE SPACE BETWEEN THE PLATES
AND ROOF PANELS.

ALL WOOD PARTS TO BE TREATED, AFTER
CUTTING, WITH A COPPER-NAPHTHENEATE
PRESERVATIVE.

ALL METAL PARTS SHOULD BE OF NON-
CORROSIVE METAL OR GALVANIZED
STEEL.

COOPERATIVE EXTENSION WORK IN
AGRICULTURE AND HOME ECONOMICS

UNITED STATES DEPARTMENT OF AGRICULTURE COOPERATING

PLASTIC GREENHOUSE

USDA '76 6251 SHEET 2 OF 2
NO. 9 GALVANIZED WIRE TIES, TWISTED

DOUBLE-GLAZED WALL PANEL WITH WASHER%

2x4 POSTS s-y
g-i

2x12x16'-9"/8"

ROOF PANELS SLIDE DOWN FOR REMOVAL OR VENTILATION AT RIDGE

1/4" THIN-WALL CONDUIT 10'-0"
LONG, FLATTEN 6 EACH END

3/16" CARRIAGE BOLT WITH WASHER

3/16" LAG SCREW

2x4 POSTS
1x4 SASH STC. (1 AT CORNERS)

5 MIL TYPE W-POLYESTER FILM CEMENTED TO OUTSIDE OF PANEL

1/4" 2" FRAME

3/32" 1/2" CORNER IRON

2" 3" NO. 10 SCREWS

3 MIL FILM CEMENTED TO INSIDE OF PANEL

1/4" 2" FRAME

USE LONGER BOLT AND TWO NUTS TO ANCHOR ENDS OF WIRE TIES

NOTE: CONSULT LOCAL HEALTH AND BUILDING CODE AUTHORITIES BEFORE STARTING CONSTRUCTION.

ROOF PANELS T-0"

4'-0"

4'-0"

12'-0"

12'-0"

12'-0"

COOPERATIVE EXTENSION WORK IN AGRICULTURE AND HOME ECONOMICS

PLASTIC GREENHOUSE
FRAME CUTTING LAYOUT (CUT FROM (8) 2x4x10'')

BILL OF MATERIALS

COFFERED FIBERGLASS REINFORCED PANELS (FRP) 5 OZ COATING:
ROOF PANELS (6) 24" C IN HALF
SIDE PANELS (5) 24", 2 SPLIT EACH SIDE
END PANELS (4) 36" OF WHICH 5 ARE LOCATED AT END WITH NO DOOR
RIDGE ROLL (1) 12" LENGTH
LUMBER
(8) 2x4x10' TO MAKE FRAMES
(2) 2x4x10" SILL AT ENDS (PT COPPER NAPHTHENATE)
(2) 2x4x6" SILL AT SIDES (PT COPPER NAPHTHENATE)
(2) 2x4x6" END FRAMING
BENCH SUPPORTS NOT INCLUDED
(8) 1/4x4x12" FOR PURLINS & DOOR
(2) 4x4x16" PT POST FOR FOOTINGS
(2) 1x2x12" & (2) 1.12x10" REDWOOD MOULDS
(1) 4x6x6' EXTERIOR TYPE CC PLYWOOD SHEET FOR PLYWOOD GUSSETS SEE CUTTING DIAGRAM
* CHECK WITH FIBERGLASS SUPPLIER FOR NECESSARY RELATED HARDWARE & COVERING INSTRUCTIONS
NAILS, HINGES & LATCHES

BLOWER AT END WALL FOR INFLATION OF PLASTIC LAYERS,
SEE SECT. A-A

DOUBLE LAYER 6 MILL PLASTIC COVERING, AIR INFILTRATED, IN LIEU OF FIBERGLASS PANELS.
(A 24x100' ROLL OF PLASTIC WILL COVER HOUSE 4 TIMES. ONCE EACH YEAR FOR 4 YEARS.)

ALTERNATE CROSS SECTION

ENVIRONMENTAL CONTROL

HEATING
TO MAINTAIN A TEMPERATURE DIFFERENCE OF 60° BETWEEN INSIDE & OUTSIDE
30,000 BTU/HR SINGLE COVERING
20,000 BTU/HR DOUBLE COVERING
CONNECTION TO HOME HEATING SYSTEM IS MOST DESIRABLE. IF NOT POSSIBLE, USE GAS OR OIL HEATER VENTED TO THE OUTSIDE. ELECTRIC HEATERS ARE EASY TO INSTALL, CLEAN, BUT EXPENSIVE TO OPERATE. WHEN USING OIL OR GAS, BE SURE TO PROVIDE A FRESH AIR SUPPLY DIRECTLY TO THE HEATER TO SUPPLY OXYGEN FOR COMBUSTION.

VENTILATING
REQUIRE A TWO SPEED FAN RATED AT 1000 CFM.
AN AUTOMATIC AIR INLET OF 2 SQ FT IS REQUIRED. THE FAN CAN BE MOUNTED IN ONE GABLE END AND AIR INLET IN THE OTHER. BOTH SHOULD BE CONTROLLED BY A THERMOSTAT.
FOR MORE INFORMATION SEE USDA BULLETIN NUMBER 357 "BUILDING HOBBY GREENHOUSES."
NOTE 1: 3/4 x 4 x 6" CLEATS CENTERED IN 4'-0" BAYS & NAILED TO UNDERSIDE OF EAVE PURLINS FOR THE PURPOSE OF SECURING TOP EDGE OF SIDE FIBERGLASS PANELS.

ISOMETRIC VIEW

PLAN

FRAMING MEASUREMENTS

DETAIL "A"

CROSS SECTION