

Building Your Greenhouse Foundation

A foundation is one of the most important parts of your greenhouse project. It must be level and square. Greenhouses will have the “outside” foundation dimensions listed that are different than rounded dimensions. For example, a greenhouse listed as 8' x 12' may require a foundation 8' 4" x 12' 6". It is essential that you cross-measure the foundation from far corner to far corner (pg 5, fig 2). The measurement should be exactly identical each way.

Build your greenhouse foundation below the frost line. In northern climates that could be down a few feet, whereas warmer climates will only be down a few inches. If you are uncertain of the frost line in your area, contact your local Building Permit Agency. It is important that your foundation reaches below the frost line to prevent greenhouse damage from the ground heaving.

An excellent way of insulating and protecting your foundation is to line the outside of the foundation with 1" foam insulation, 1 ft. to 2 ft. deep or to your frost line. This will reduce heat loss through the soil, and will help to reduce your heating cost. Use a spade to pull enough soil away to slip the foam board up next to the foundation. Tamp the soil firmly back against the foam board.

- A level and square foundation is critical for a successful greenhouse installation.
- Be sure to double-check outside foundation dimensions specified for your greenhouse.
- Remove plants and sod, and then level the site.
- Square the foundation or forms by measuring diagonally from opposite corners and shifting the frame/forms until the measurements are equal (pg 5, fig 3).
- Level foundation using a contractor's level (pg 5, fig 3).
- Check your local building code before deciding on your foundation.

Materials used for wood foundations and sill plates

Pressure treated lumber

There are various levels of protections – check the end tags to determine the wood grade. Use Ground Contact Rating (can be set on the ground).

The newly treated lumber will corrode common steel, aluminum, and low-grade galvanized hardware. If this lumber will be in contact with the aluminum frame of the greenhouse, a permanent barrier between the wood and the frame of 10 mil plastic or thicker will be needed (asphalt shingles work well). **Must use stainless steel, hot-dipped galvanized, or powder-coated (commonly used to build decks) hardware.**

Redwood, Eastern red cedar (juniper), Western red cedar, Alaskan yellow cedar, black locust, and bald cypress

These are domestic wood species that are naturally more decay resistant than others. The durability can vary among different wood species and between trees of the same species or within one tree itself. This can cause a wide range of life expectancy. Apply a wood preservative to all sides and ends before installation.

Wood Size Common Name	Actual Dimensions
1 x 2	3/4" x 1 1/2"
1 x 4	3/4" x 3 1/2"
2 x 4	1 1/2" x 3 1/2"
4 x 4	3 1/2" x 3 1/2"
4 x 6	3 1/2" x 5 1/2"
6 x 6	5 1/2" x 5 1/2"
4 x 10	3 1/2" x 9 1/4"
5/4 x 4	1" x 3 1/2"
5/4 x 6	1" x 5 1/2"

Charley's Greenhouse 101

Building Your Foundation *continued*

Plastic Materials for Foundation Sill Plates

100% plastic needs no maintenance or sealing. Like wood products, it can be sanded and fastened using traditional tools and methods. Plastic lumber is commonly available in three grades: Structural Solid, Solid, and Hollow.

Structural Solid plastic lumber has a 20% fill of fiberglass to provide superior strength and reduce the expansion and contraction properties. It can be used for sill plates.

Hollow and **Solid** are not to be used as structural members as they have less rigidity than wood lumber.

Wood Composite Materials for Sill Plates

Wood composite material is made from recycled plastic and waste wood fiber, like sawdust. It never needs to be retreated and has no maintenance or sealing. It is not designed to perform as a structural replacement for wood or for primary structural load-bearing elements, such as posts, joints, and beams. It can be used as a sill plate with concrete, or as the top layer over pressure-treated lumber in a wood foundation.

Greenhouse Foundations

The four common types are: **Wood, Beam & Pier, Concrete Wall** (knee wall), and **Concrete Slab**. (For smaller glass greenhouse (8' x 12') and greenhouses with polycarbonate glazing up to 12' x 16', a wood foundation is popular due to ease of installation and low cost. However, if you live in an area with hard winter freezes, a concrete foundation or Beam & Pier (timber on concrete columns) is your best bet. If you would like extra headroom and space for hanging plants, another option is to build your greenhouse on top of a knee or stem wall. We recommend using Cedar, Redwood, or plastic/wood composites for the foundation and sill plates in the greenhouse.

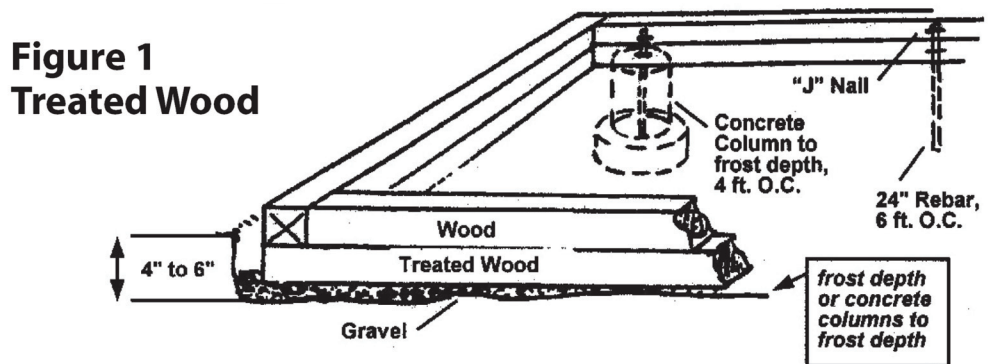
Figures 1 through 7 should give you a good idea of how each foundation type could be built. Be sure to check your local building code requirements. There are many books on the market that give specific information for building foundations.

Wood or Beam and Pier Foundation (figure 1)

Dig down to solid ground. Level the site using a contractor's level. Lay down a 2"-3" layer of crushed gravel. Fasten a double layer of 2x4's together using 3" deck screws; making sure the foundation remains square and level. (NOTE: Glass structures and greenhouses over 8 ft. x 10 ft. should have a **double** layer of 4x4's.)

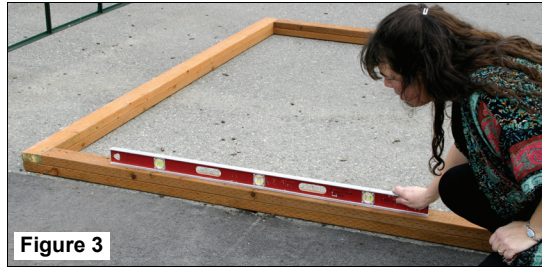
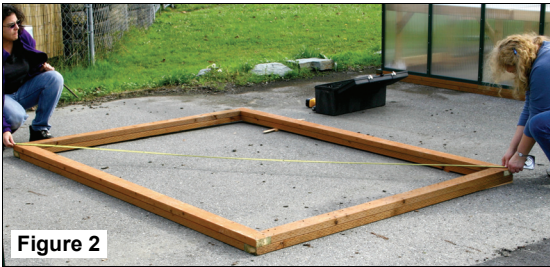
If you have not poured concrete columns to frost depth with anchor bolts, pound 24" rebar into the ground on the inside of the 2x4's. The columns or rebar should be 1 ft. from each corner and spaced 4 ft. on center (O.C.) along the 2x4's.

Attach the top of the rebar to the 2x4's with Conduit "J" Nails (fig 5, next page, B7418). For windy sites, use Anchor Stakes (Tie-Outs) to hold the 2x4's in place. Use 1" wood screws to attach the greenhouse to the 2x4's.



Charley's Greenhouse 101

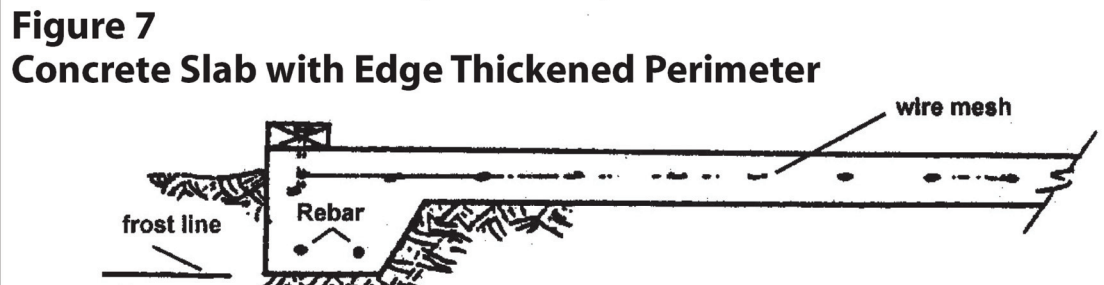
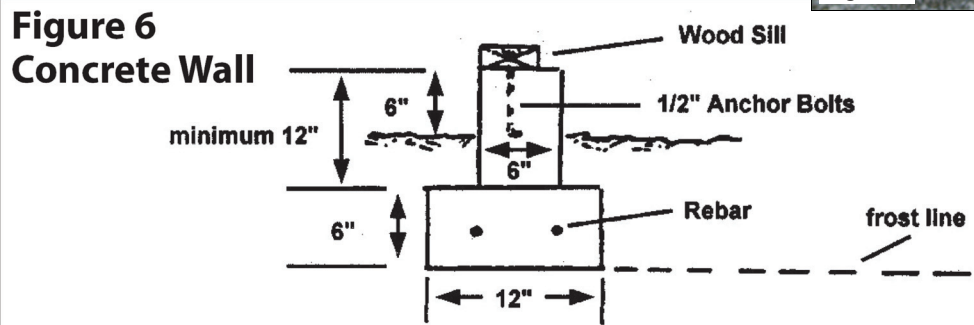
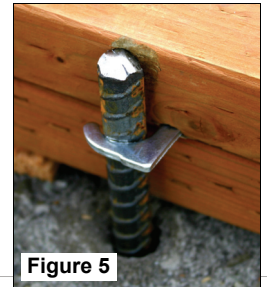
Building Your Foundation continued



Concrete Wall or Concrete Slab Foundation (figures 6 and 7)

Cover the pour area with 2" of gravel. For a slab, use rebar and wire mesh to strengthen the floor. Place 1/2" x 9" anchor bolts into the fresh concrete. Set bolts 2" from outside edge and within 1 ft. of each corner, then space additional anchor bolts about 4 ft. apart. Bolts must not project above the concrete more than the thickness of the sill plate.

On top of the concrete foundation use a Cedar, Redwood, treated wood (with barrier), or composite sill to which your greenhouse will be anchored. Counter-sink nuts into the wood sill so that the greenhouse base will not rest on the nuts.



Greenhouse Floor

Drainage is important. Materials such as gravel, bricks and pavers will provide proper drainage and easy installation. Before laying down any floor material, it is important to install the weed barrier (#B2379) to reduce weeds. Plastic liners are not generally recommended, but holes can be made to ensure you will have proper drainage.

A permanent flooring such as concrete or mortared pavers may be more difficult to install but can be easier to clean, more sturdy, and will block out weeds. Landscaping bark is not recommended because it can harbor insects and diseases.

Bricks and pavers are an excellent choice for pathways or the entire greenhouse flooring. They are easy to install and are available in many different styles. This is where you are able to customize the interior of your greenhouse to suit your style. As with the permanent materials, they store heat and are easy to clean.

(greenhouse floor continued on next page)

Charley's Greenhouse 101

Greenhouse Floor *continued*

How to lay bricks or pavers for walkway

First lay down 2" of fine crushed rock (5/8" diam. or less). Build a frame of 4x4 treated lumber. The width and length of the walkway is determined by laying out the pattern of bricks or pavers with approximate 3/8" spacing. Spread 1" of sand inside the 4x4 frame and set pavers in place. Fill the 3/8" spacing with sand. A final touch is to plant lemon thyme between the bricks, or apply a sealer to turn the sand into a hard mortar. Finish the remainder of the floor with 2" of loose material like pea gravel.

Permanent Flooring

Permanent flooring includes either a concrete slab or mortared pavers. Although they are more time-consuming and expensive to install, they are easy to clean, and will hold heat. They provide a sturdy surface for benches and there is no need for weed barriers. The surface must be rough, so it will not be slippery when wet. Plan for drainage before you pour a concrete slab. The floor must either drain into a central drain, or taper down at the edges slightly.

Loose Material Under Benches

The most popular material to use under the benches is pea gravel. It is easy to install and long lasting. An added summer benefit is that it can be sprayed down with water, and as the water evaporates, it cools the greenhouse and adds humidity to the environment. Since it drains well, there is less chance of standing water that can cause diseases. Lava Rock has the same benefits as gravel, is beautiful, and stores solar heat. White Landscape Rock has excellent drainage, helps to raise humidity, and is easy to install.

Home-Attached Greenhouses

Attaching a greenhouse to your house wall has many advantages. If you are attaching to a wall that has a heated room on the other side, the greenhouse will receive some heat from the house wall. You will, usually, be closer to power and water hookups.

Check with your local city or county permit department to see what they require for home-attached greenhouses. Remember, this is a greenhouse, not living space, and you need to be specific about this with your building department. The second issue is, do you have any limits for the height, width, or length of the greenhouse? We recommend that you check with a local contractor about methods of attaching the greenhouse to your home.

Attaching to the house wall

The greenhouse must be attached to a flat and plumb surface and the screws must reach the studs of the wall or into a ledger (a board that has been attached to the main framework of the wall). If your siding is **flat**, you can simply apply a bead of silicone between the house wall and greenhouse ridge and vertical glazing bars next to the house. If you have **brick** or **stucco**, we recommend that you install a 2x4 wood spacer to the house wall and attach the greenhouse to the wood spacer.

If you have **overlap siding**, you have two options: 1) The first is to cut into and remove a 3½" wide strip of the siding and attach a 2x4 wood spacer to the sheathing; 2) The second option is to attach the 2x4 wood spacer over the top of the siding. This seems like an easier option, but you have to fill in the gaps behind the spacer. **Be sure to add the thickness of the spacer to the foundation dimensions.**

Metal Flashing: Install metal flashing above the greenhouse.

The house wall inside the greenhouse – You do not need to do any additional work to this wall. The exterior finish of the wall will normally wear less inside the greenhouse than outside.

