

Low/High Tunnel Greenhouse Plans

Tools Needed (See the complete list of [Greenhouse Tools](#))

- Hacksaw or Reciprocating Saw
- Socket Wrench, Adjustable Wrench or Nut Drivers
- Electric Drill with Drill Bits
- Sledge Hammer
- Mason Line and Line Level
- 100' foot tape measure (if building 100' long get a 200' tape measure)

Our instructions assume ground posts and bows every 4 feet. We sink the ground posts 2 feet into the ground, allowing for higher tunnels and stronger frames. 20-24ft houses in high wind areas should make deeper ground posts and secure the plastic lock channel with extra screws.

Set Location of Hoop House

Start by placing your first marking stake at least 8 feet away from an existing greenhouse or other small structure. For larger structures such as a home you will want to place your greenhouse significantly further away.



Weed Barrier

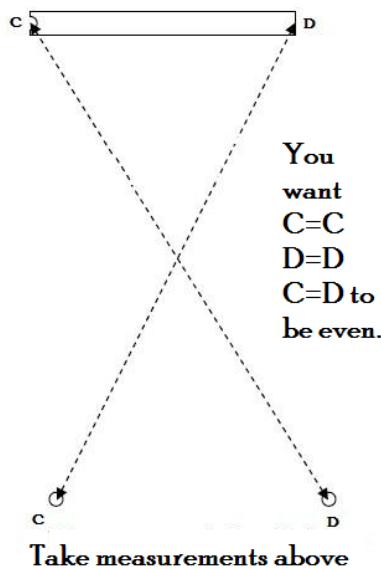
Lay down weed barrier if you prefer. (This is optional depending on your needs.) Secure the weed barrier with garden staples or dirt.



Making Your Greenhouse Square

Mark each corner of your planned greenhouse area with any kind of marking stake - First measure length to length (its best to stick with lengths divisible by 4'). The width should be 6 foot for low tunnels and typically 10, 12, or 20 foot for high tunnels. Then measure diagonally, making sure the *diagonal* measurements are equal to each other. Double check that each length, width and diagonal measurements are equal.

This ensures your greenhouse will be square.



Once your area is measured out, place a temporary stake to mark the location of each corner as this will be where your first ground posts are located.

Pre-Cutting Greenhouse Ground Posts

To make the job much quicker cut all your ground posts ahead of time. A 6' wide low tunnel greenhouse use pieces of 10' x 1" EMT conduit as ground posts. Larger hoop houses require 1 5/8" fence line posts. To calculate the number of posts you will need take the length of your greenhouse in feet and divide it by 4 and then add 1. This gives you the number of hoops you will have. For a 6 foot greenhouse divide this number by 2 because you will cut each pole into 4 posts.

6 foot wide Example Length = 100 feet. $(100 \text{ ft} / 4) + 1 = 26$ hoops. $26 \text{ hoops} / 2 = 13$ pieces of conduit needed.

20 foot wide Example Length = 100 feet. $(100 \text{ ft} / 4) + 1 = 26$ hoops. $26 \text{ hoops} = 26$ pieces of fence line posts.

Cut each into (4) 30" pieces for 6' greenhouses.

Cut each into (2) 48" pieces for 10'-24' greenhouses.

We recommend using a reciprocating saw with a vice to hold the poles in place while cutting, and you should be finished in about an hour. A hacksaw will work too but it is slower.

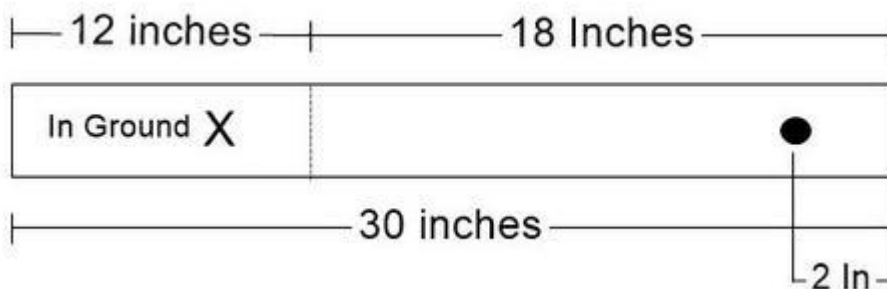


After all the ground posts are cut we want to mark both the depths to drive the post into the ground and the hole for EMT hoop attachment.

6 foot Wide Hoop Houses

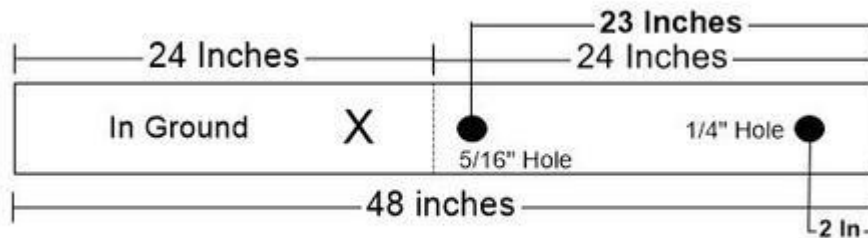
Mark each 30" pole at 12" from the bottom. This will be roughly the distance driven into the ground, leaving 18" above ground. I like to put an X below my mark so I don't accidentally drive the wrong end into the ground.

Pre-drill a hole using the 7/64" bit 2" from the top of the 18" end. This is where we will later screw the 3/4" EMT hoop which is slid into the 1" EMT post.



12-24 ft Wide Hoop House

Mark the pole down the middle at 24". Put an X on one end which will be the end in the ground. On the above ground end you will be drilling two holes. Make sure these holes are **perpendicular** from each other (90 degrees away from the other hole). Drill the top hole 2" from the top with a 1/4" bit. Spin the pole 1/4 of the way around. Drill the 2nd hole 23" from the top with a 5/16" drill bit.



**** Holes should face 90° away from each other ****

Installing Ground Posts

You will first install each corner ground post. Place your posts where you had previously marked the corners and begin driving those into the ground. When driving your ground posts make sure you use a [Ground Post Driver](#). This will prevent your pole from becoming warped.



While driving the posts into the ground you want to make sure the poles are level in all directions. As you are driving the pole into the ground check for levelness on the front and sides and adjust as needed. Also pay attention to those holes you drilled. The top hole needs to be facing in the direction of your ground posts (if you were really talented you would be able to shine a laser light from one end of the greenhouse to the other passing through all the holes). The bottom hole should be facing toward the inner part of the greenhouse.



Once corner ground posts are installed re-measure length, width and diagonally one last time. If you made a mistake it's not too late to fix it without too much work. Once you are satisfied tie a string line around the outside of the corner posts. This will help to keep all your ground posts in alignment so you don't get wavy hoops later on.

To further help to keep your ground posts straight use a 6', 10', 12' or 20' (same length as the width of your greenhouse) piece of lumber as a guide for measuring an equal distance between each ground post. This saves measuring each time and ensures the greenhouse is exactly the same width for the entire length. In conjunction with the string line, this will help to keep the top and bottom of your ground posts in a straight line.



Note: You only need 1 board - this picture just shows a 6' board between each post

Install each ground post 4 feet apart. As long as you chose a multiple of 4 as suggested earlier your poles should be evenly spaced. If you are building a longer greenhouse it may make sense to create a jig out of a piece of dimensional lumber and cut out notches 4 feet apart that your poles can fit into.

Attach Baseboards for 10-24 Ft Hoop House (Optional for 6ft)

For baseboards we use 1" x 8" x 8' white-wood ledger boards. This will be in contact with the grounds so some people like to use pressure treated wood here. You could, however, but we don't because of the harsh chemicals that are used to treat the wood. Pressure treated wood contains chromium, copper, and arsenic. Government studies have shown that these chemicals can leach from the wood into your soil. We don't want this anywhere near our food.

For the first baseboard we cut off the first 1 foot so that a board doesn't end on a ground post. Line up the cut board with the front of the first ground post. Clamp the board to the post and use your 5/16" drill bit and drill through the wood by going through your previously drilled hole in the ground post.



Insert a 5" x 5/16" J hook with the J on the outside of the greenhouse and the J facing down. Tighten with a washer and nut from the inside. The J hook is used in case you want to use a paracord on your greenhouse.



Where two pieces of wood butt together connect them with a scrap piece of 1" x 8" and attach with 1.25" screws. Be sure not to overdrive these screws as you don't want the screw tip poking out the other side as it could pierce your greenhouse plastic.

Once you have all the side baseboards attached you can install the baseboards on the end walls with a 2" x 6" x 8' board or you can do these later.

Bending Poles to Make Hoops

Lay out the poles with them all facing with the 'swagged' (male) end in the same direction. Mark each pole at 9" on both ends.



This mark will tell us where we insert the pole into the hoop bender and how far to insert our poles into the ground posts.

Securely attach the hoop bender to a table or bench. Your hoop bender should come with screws or bolts to anchor it in place.

Slip each pole through the holding strap on the hoop bender and push the pole up to the mark you made. Bend the pole every 18". We laid out some scrap pieces of wood on our bench so that the pole stays level while bending. You want to try to keep the pole from twisting while you bend. When you reach the end of the pole find a scrape piece of pole with a male end to use as a pole extension. This will make bending significantly easier.

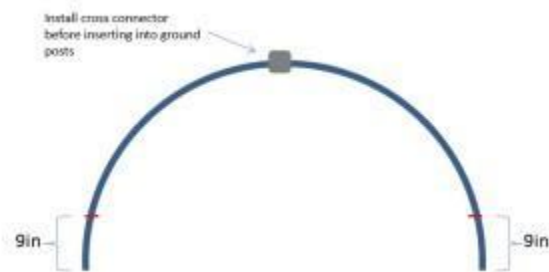
Connecting Poles to Form Hoops

Note the following:

- 6 ft wide greenhouse requires (1) 10 ft 3/4" EMT per hoop (1 piece)
- 10-12 ft wide hoop house requires (2) 10 ft 1 3/8" top rail per hoop.
- 20 ft wide requires (3) 10 ft 1 3/8" top rail per hoop.
- 24 ft wide requires (4) 10 ft 1 3/8" top rail per hoop

After bending the poles, join male and female ends and screw together with 1/2" self-tapping screws. (Be sure not to place the screws on the top of the hoop where it would rub against the plastic.)

6 ft Hoop House Only: Before setting the hoops into the ground post, place a cross connector on the hoop you bent, so we can later insert the ridge pole. (With the larger greenhouses, it is easy to do this later so don't worry)



Insert Hoops into Ground Posts

Start inserting all your hoops you built into the ground posts. Use the line you previously marked at 9" to know how far to push your bows in. You should expect your hoops to be a little wider than your ground posts. This is perfectly normal as you will just bend them in a little as you get each end of the hoop into the ground posts.

After setting all of the hoops into place, you may have to adjust some of these in or out to make all of the hoops look even when viewing it from the ends.



Ignore the wood frames. These were for hydroponic rafts

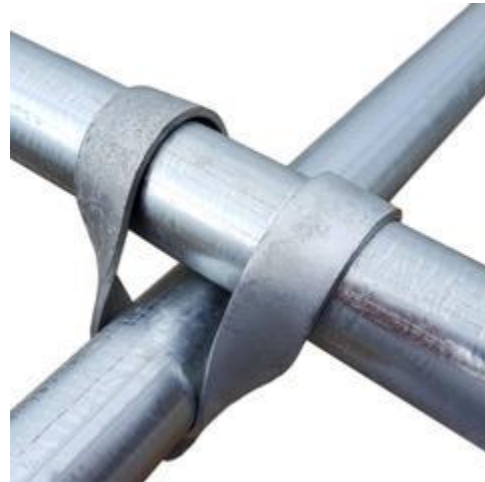
Once satisfied use your 1/4" bit to drill through the hoops (at your pre-drilled hole) in the ground posts. Attach with a 2" 1/4" hex bolt with washer and nut.



Installing Ridge Poles and Cross Connectors

Once all hoops are secured in place, begin inserting your ridge pole into the cross connectors. For a 6 foot greenhouse you should have already installed your cross connectors before securing the hoops into the ground posts. On wider greenhouses you will be using 1-3/8 cross connectors:

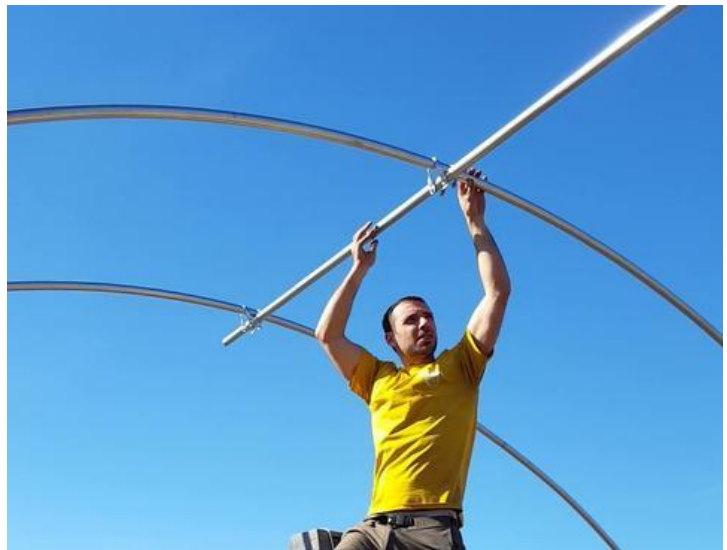
Center all your cross connector in the middle of the hoop which should be the highest point. For the 6 foot wide cross connector secure the first connector in place by using a self-tapping screw. Be sure to screw from the side and not the top as you don't want your plastic to get caught on the screw.



6ft wide Greenhouses: Use the 3/4" EMT couplings to connect the 10 ft (3/4" EMT) ridge poles on your low tunnel hoop house. Once finished, screw all the ridge pole cross connectors (using 1/2" screws) in place after making sure the entire length runs straight. Make sure no screws are pointed up where it would snag your plastic.



12-24 ft Greenhouses: You will be using the same [1-3/8" fence top rail poles](#) you used for the hoops as ridge poles. Slide each pole through the cross connectors and connect each ridge pole together by inserting the male end into the female end and securing with a 1/4" screw (again from the side or bottom but not the top). Make sure each end of the pole is flush with the end of your greenhouse by cutting off the excess from one end with a hacksaw. You don't want any excess sticking out as it could get caught on your plastic. Before tightening the screws on the cross connectors, ensure each bow is 4 ft from each other then tighten.



We also like installing duct tape on the ends of the ridge poles. This will prevent the plastic getting hung up on any sharp or protruding edges.



Installing Hip Boards to Hoop House

There is no hard rule as to where you should place your hip boards. You want to set them up at least as high as you want your roll up sides to go. For our hoop houses we typically place the bottom of the hip board about 36 inches (usually a little higher for larger greenhouses) from the top of the ground post. Mark each hoop at your desired height (I like to mark from the top of the hip boards as it's easier to see).

Similar to your baseboards you want to cut the first 1 foot off your hip board so the butt joints don't land on a hoop.

6 foot low tunnel attachment: The hip board can now be installed using [3/4" EMT straps](#) for 6 foot low tunnel hoop houses. Line up your board with your mark and then use a clamp (or a friend) to hold the board in place while you attach the straps to the boards. Then place a screw directly through the EMT strap and into the hoop so the hip board doesn't slip down.



High tunnel attachment: Line up your boards on the marks and use a clamp to hold in place. Drill a 1/4" hole through your board and then through the hoop. Place a zinc plated 1/4" x 4" carriage bolt through the wood and attaching with a washer and nut on the hoop end.



Installing Greenhouse Wiggle Wire Channel

The [wiggle wire channel](#) can now be installed on the hip boards. ([Further wiggle wire installation information can be found here](#)) It is helpful to pre-drill the holes before installing (at least 4 holes per 6.5' piece, 6 in higher wind areas and on larger sizes). Be sure that the lock channel is installed straight from one piece to another. If the wiggle wire lock channel is not straight it can create corners where it butts together and the plastic may snag.



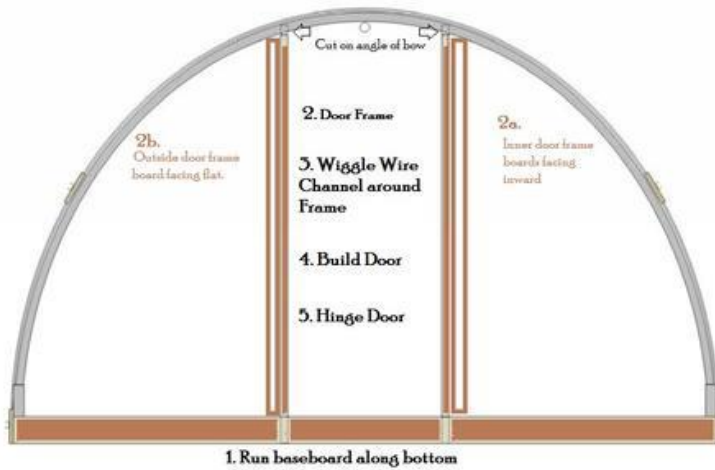
Once the channel is installed on the hip board, install wiggle wire channel on the first and last arches (over the entire hoop but not over lapping the hip board), using a clamp to help you keep the channel in place while you bend it along the curve. Your lock channel should easily bend to the curvature of your hoops.



End-wall and Doors for High Tunnel Greenhouses

There are many ways to build end wall doors. Searching online you will find an endless number of ways to do this however we are providing what we find to be the easiest.

If you haven't already done so now is the time to install the baseboards on the front and back of your greenhouse. Simply run the baseboard the entire length of your greenhouse and attach to your baseboards that ran the length of your greenhouse.



You will want to make sure that your door is wide enough to fit a wheelbarrow or tiller through. Also give yourself an extra inch or two for the door stops if you will be using those. Take the width of the door you want to build and divide it by 2. Measure from the center of the hoop in a straight line and put a mark on each side on the hoop. Then place a 2" x 4" from the ground up to the mark with the wide sides facing each other (skinny side facing outside). Trace the top and bottom of the curve from the hoop onto the 2" x 4" and then cut the top mark with a jig saw. For the bottom mark you will cut out a 1-3/8" deep notch. This is how you will anchor the stud to your hoop. You want the 2" x 4" to be just slightly shorter than the top of the hoop. Repeat on the other side of the door frame.

To attach you will drill a 1/4" hole through the hoop and notched 2" x 4" and insert a 1/4" x 4" carriage



bolt into the hoop and through the wood. Secure with a washer and nut against the wood. The bottom of the

stud should be behind (toward the inside of the greenhouse) the baseboard. Then use a bubble level to level the stud and secure with 2.5" wood screws through the baseboard.

Adding Door Header

Determine the height you want to make your door. Add an extra 7/8" to account for the reveal around the top (3/8") and bottom of the door (1/2"). Measure up from the baseboard along one of the inner door frame boards to that measurement and make a mark. Repeat for the opposite side as well.

Cut a 2" x 4" to fit in-between with the bottom lined up with your marks. Make sure your header is level using a level and adjust as needed. Secure your header using 2.5" wood screws by screwing to your posts. Cut another 2" x 4" to fit directly above your header to form an L as a header. This should be flush with the outside of the lower header piece. Secure this piece with the 2.5" wood screws as well.

Now you want to install posts on the sides to form an L similar to how you did the header. These provide areas to secure your wiggle wire lock channel later on. The easiest way to measure these side posts is to place the bottom on the ground and just mark underneath the hoop and cut. Secure these additional side posts with the same 2.5" wood screws.

Building Greenhouse Door

To build the door frame use two 1" x 4" boards to create a door frame. The width of your door should be 3/4" shorter than the opening and length 7/8" shorter. This allows for 3/8" of expansion on each side and top of your door when it gets wet. Allow for 1/2" expansion on the bottom of your door. To provide your door some support we sandwich plastic and chicken wire between the two 1" x 4" boards. You also want to add a 1" x 4" board in the middle of your door for stability. Install your door with some [zinc plated hinges](#), making sure while installing to keep the spacing between the door and frame even.

After your door is installed place your lock channel around the frame of your door.

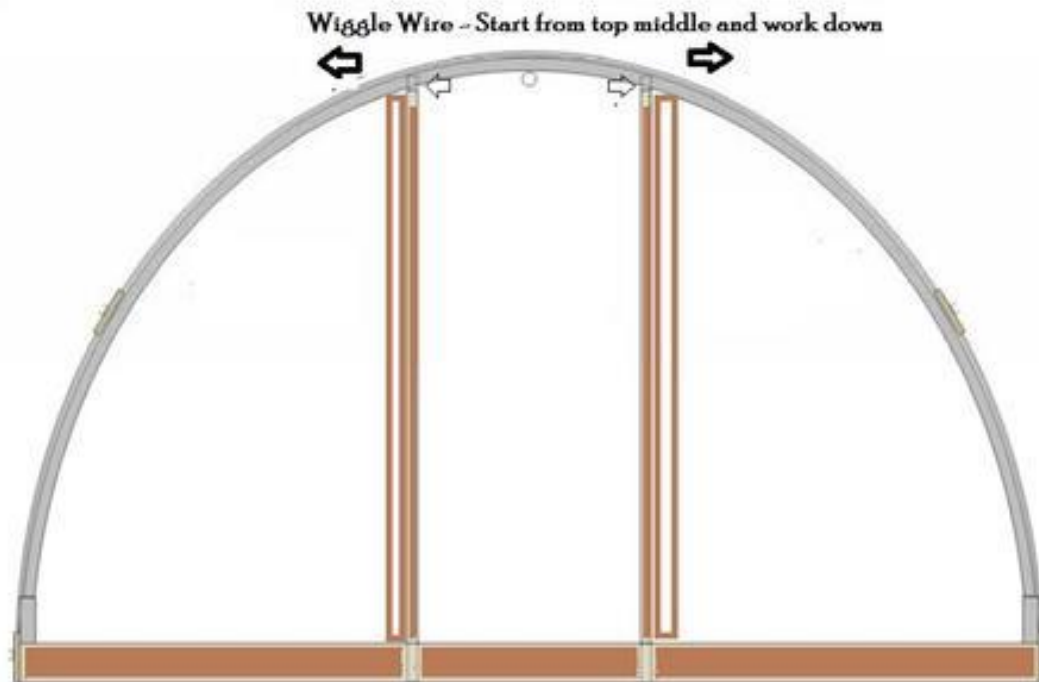


This door uses chicken wire and plastic for the door. Our instructions call for polycarbonate roof panel. Use whichever you prefer!

Installing Greenhouse Plastic (all sizes)

First, make sure you can finish securing the plastic before you end for the day so it doesn't blow away on you.

Roll the plastic out and drape over the length of the greenhouse, equidistant from each end. Securing the plastic only on one end by installing the [wiggly wire](#) from the top of the arch to the hip board.



Once the plastic is secure on the first end arch move to the opposite end and secure the greenhouse plastic in the arch the same way. Pulling the plastic tight as you go. Just install the wiggly wire down to the hip board. We will install the remainder of the wiggly wire after we complete the roll up sides.

Install Roll-up Sides for Greenhouse Ventilation

Now is the best time to install your roll-up sides. Doing this now will help pull down the plastic tight before the wiggle wire is installed on the hip-boards. This will ensure even venting when the [hand crank](#) is used.



Connect 3/4" EMT conduit along the length of each side of the greenhouse, using 3/4" couplings to connect the pieces together. Extend the EMT a foot past the edge of the greenhouse on both sides. If you are using our [3/4" couplings](#), using self-taping screws to secure the poles together. If you are using a standard EMT coupling make the screws as tight as you can to prevent slippage. Roll the ends of the plastic around the connected EMT until the greenhouse plastic is tight and the pole is flush with the bottom of the greenhouse.

Install [snap clamps](#) every 2 ft to ensure even ventilation. Put a screw through each snap clamp for permanent installation. After all the snap clamps are secure, the greenhouse plastic should be hanging down taught.

Secure Greenhouse Plastic with Wiggle Wire

This is the time to install the rest of the wiggle wire onto the hip boards. Work your way down from one end to the other. The plastic should already be somewhat taught from the weight of the EMT conduit.

When the length of the greenhouse has all of its plastic secure, now is the time to move to the front and back of the greenhouse to secure the plastic. If you find that the plastic is not tight enough hopefully you used wiggle wire. You can simply just wiggle the wire out of the channel. Pull the plastic tight and reinstall the wiggle wire. If you stapled your plastic to your hip boards you may be better off just leaving it.

Use the wiggle wire to install the plastic on the end walls, in the same manner as before, starting from the top and working down towards the ground. The plastic will need to be cut in half to be used for each end.

Install Hand Crank for Roll-up Sidewalls (Ventilation for your Greenhouse)

You can install the greenhouse ventilation [gear crank](#) now. The wiggle wire should be secure on the top ends and at the hip board all along the sides first. The EMT on the roll up sides should be extending a foot past the greenhouse on each end. You will just have to eye this one out a bit, but it's very simple.

There are different ways to secure the guide rail for the hand crank, but all I did was take a scrap piece of 1" EMT, about 3-4 ft, and hammered that into the ground near the edge of the 3/4" EMT conduit. I then put a 6 ft piece of EMT conduit about 2 ft down into this pipe and put in 2 screws at ground level to secure it.



Put your hand crank on the guide rail, slide in the 3/4" conduit, drill a hole and use the included screws to secure and you're done!

Here's a 12 ft x 100 ft tunnel shortly after construction:



Any questions or comments please email us at byoust@bootstrapfarmer.com