Quick Hoops™ Moveable Caterpillar Tunnel Bender Instruction Manual

7030 E 46th Avenue Dr, Denver, CO 80216, United States
support@hensleyseeds.com | hensleyseeds.com

Caterpillar tunnels are an increasingly popular style — they are the best available option for growers to expand their protected acreage in a cost-effective manner. The Quick Hoops™ Moveable Caterpillar Tunnel Bender can bend hoops to create a moveable 12-foot wide, 7-foot high tunnel of any desired length. The bender produces 12' hoops, which are braced to create a rigid half-pipe frame that rides on a pipe track from plot to plot. The tunnel is anchored at either end and along the sides. Start winter crops in August while the tunnel is in one location, protecting heat-loving summer crops. Later in the season, the tunnel can be moved over the winter crops for cold season protection.



Contents:

- Curved bender
- Lever bar (for “finishing” the bend)
- Two 1/4" x 5" lag screws for mounting to wood surfaces
- Two 1/4" x 4-1/2" carriage bolts, nuts, and washers for mounting to metal surfaces
- Detailed instructions



Additional materials:

For a complete list of additional needed materials, please consult our parts calculator located in the Grower’s Library on our website.

- $1^{3}/_{8}$” top rail for chain-link fence
- $1^{5}/_{8}$” fence posts for chain-link fence
- Pro 5 Weed Barrier Landscape Fabric
- Tufflite IV™ Greenhouse Film
- Cross-Connector for $1^{3}/_{8}$” Pipe
- Pipe Track Wheel

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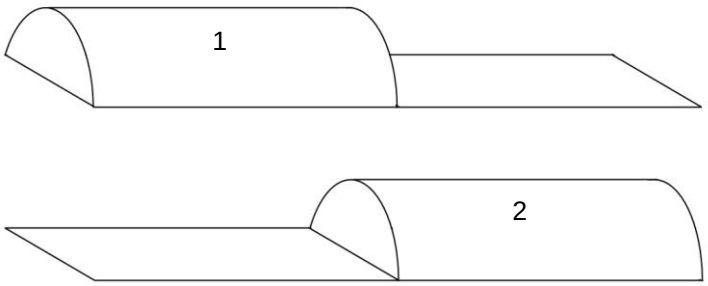
Tunnel Design:

In creating a moveable tunnel, you will need to consider a few things and make a few upfront decisions.

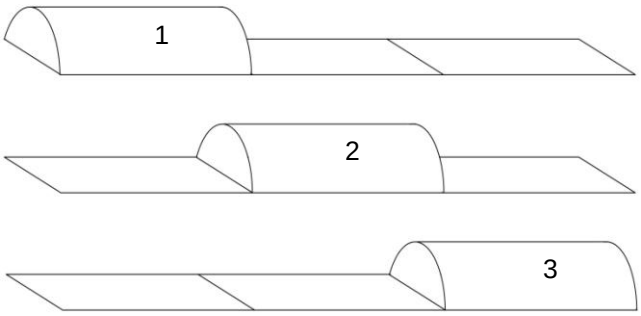
- Tunnel length: A caterpillar tunnel needs at least 5 extra feet on each end of each working position to accommodate bunching the plastic at the ends.
- Overall bed length: The length must be divisible by the bow spacing and the total number of bows must be an odd number in order for wheels to be located at both end walls.
- Number of bed positions

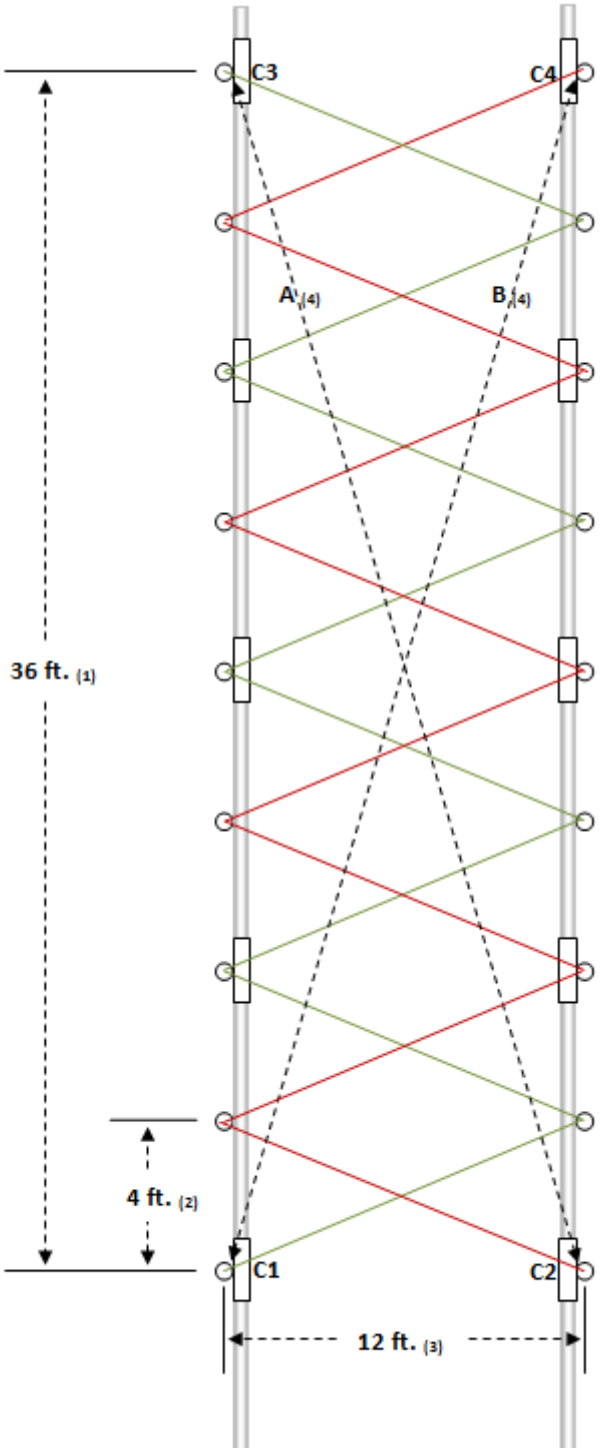
Use the following diagrams to help determine the size, spacing, and layout of your structure. The red and green lines indicate individual pieces of lacing.

Two positions, two moves:



Three positions, three moves:





Notes:

(1) Determine the desired overall length of tunnel. In this example, our tunnel is 36 foot long.

(2) Pick a distance between bows that will divide into that number. **4 feet** is our recommended spacing for a moveable tunnel.

(3) The width of the tunnel will be 12 feet.

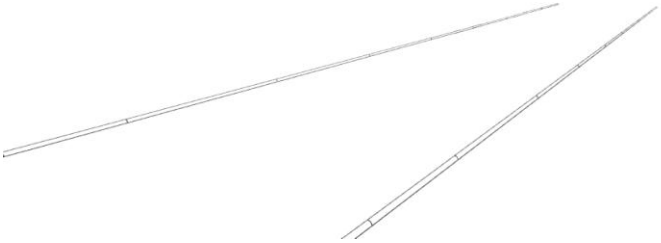
(4) Distances A and B must be equal for the tunnel to squared off and be a true rectangular shape.

(5) Wheels are located at every other bow. Total number of bows should be an odd number so that both end wall bows have wheels.

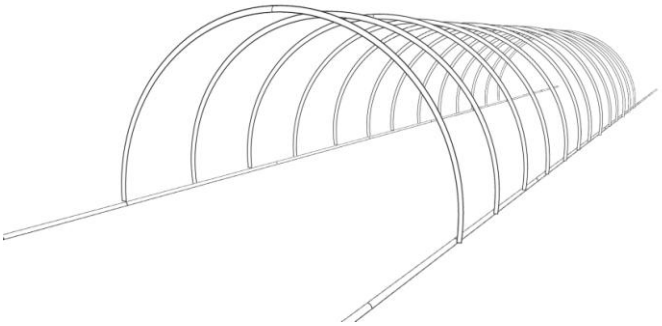
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Major Tunnel Components:

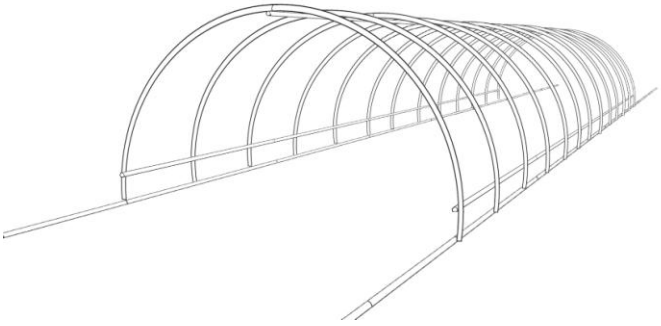
Track is made from $1^3/_8$-inch top rail. These come in 10½-foot sections with a 6-inch swaged end to fit into the next pipe.



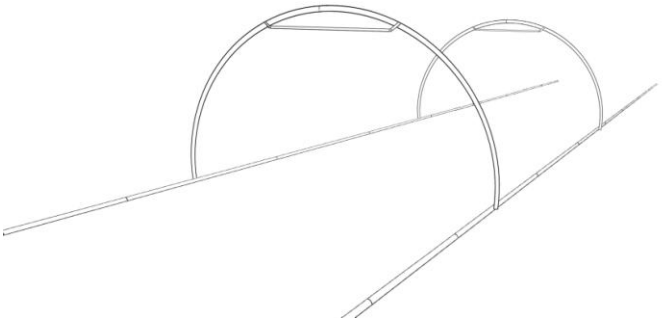
Bows (hoops) are made with 2 pieces of prebent $1^3/_8$-inch top rail. **An odd number of bows is desirable for optimum placement of wheels (explained later).**



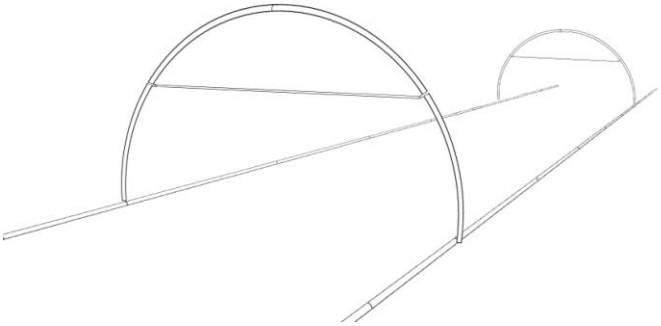
Ridge Pole and **Low Purlins** are also made from $1^3/_8$-inch top rail. These are each constructed by interlocking with 5 pieces of pipe and cutting off the excess 2 feet.



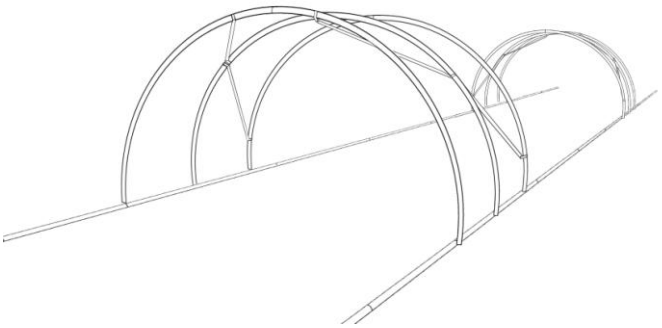
Collar Ties are "tensile" components used to strengthen bows and therefore smaller, less expensive stock may be used. We recommend ¾-inch EMT electrical conduit. This comes in 10-foot lengths and is cut in half for collar ties.



End Ties are similar in function but are full 10-foot length ¾-inch EMT electrical conduit placed at a lower point on the end wall hoops for added tensile strength and to help prevent the tunnel from "jumping track" when moved. You will need 2 pieces for the end ties.

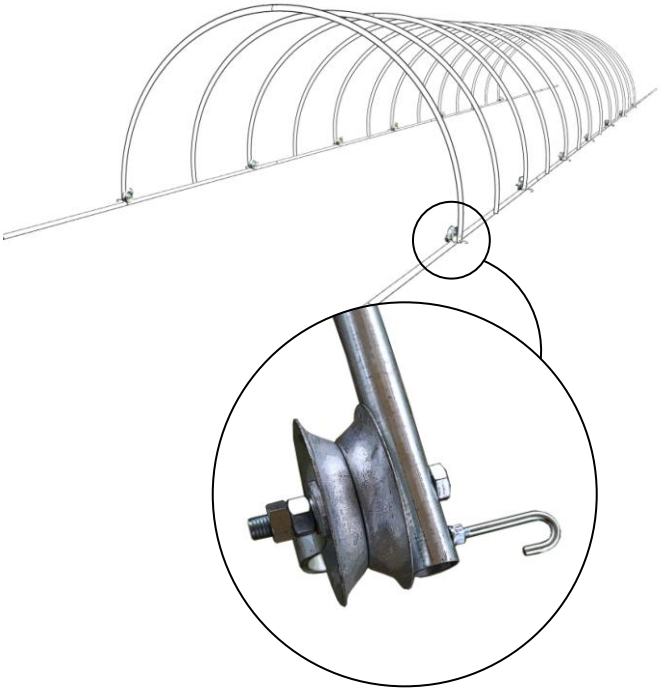


Angle Ties are "compressive" components used to keep bows vertical and prevent the structure from racking. The larger $1^3/_8$-inch top rail is recommended for these and is cut in half to create 2. There are 2 on each side, on each end, so you will need 4 5-foot lengths of the top rail for the angle ties on each end.



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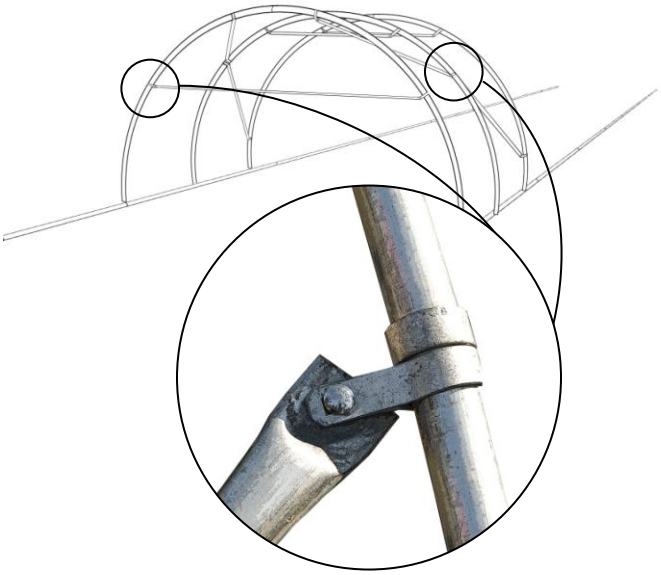
Wheels are placed on the end wall bows and on alternating bows in between. These are pipe track wheels normally used to suspend sliding chain-link gates. They come with only 1 nut, but we recommend using 2, tightened against each other to prevent loosening when moving the tunnel.



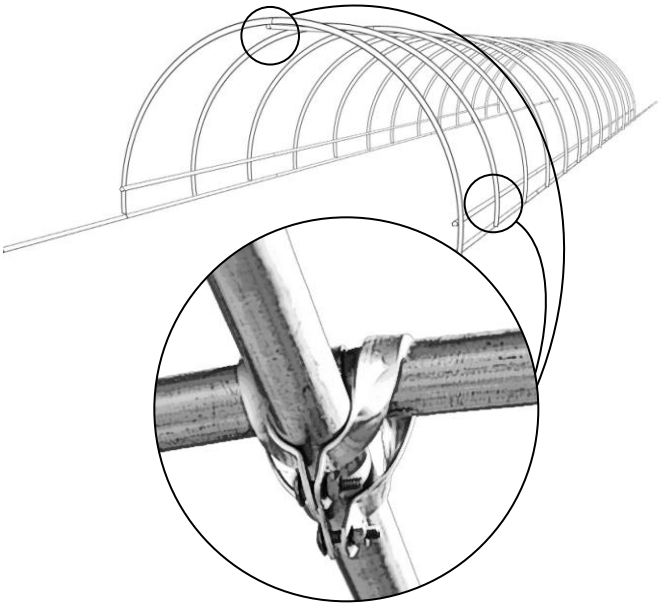
J-hooks are placed at the base of both sides of every bow and serve 2 functions: 1) They are used to secure the lacing. 2) They provide a convenient spot to anchor the tunnel to a stake. They come with only 1 nut, so 2 lock washers and 1 extra nut will need to be purchased for each J-hook.



Tension Bands are used to hold the Collar, End, and Angular Ties in place. These are normally used in chain-link fencing to hold the chain link to the top rail and are sized $1^{3}/_{8}$ inch. They are each secured with a 1-inch long ¼-inch-20 carriage bolt and ¼-inch nut.



Cross-Connectors are used to secure the ridge pole and purlins to the bows.



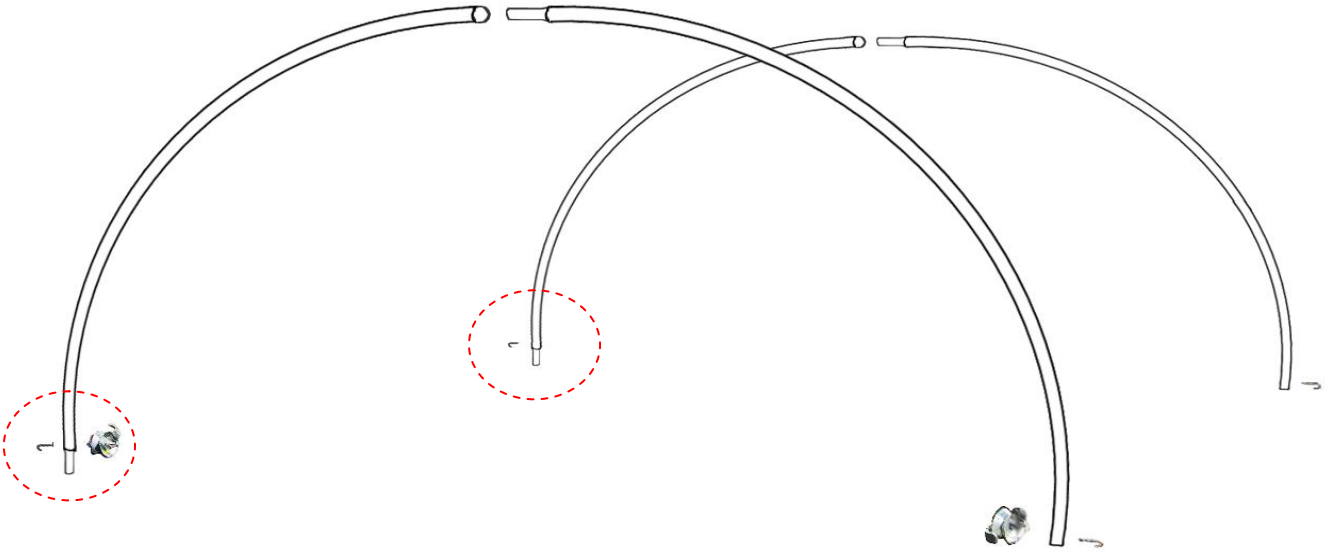
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Self-drilling Screws, also known as tech screws, create a strong connection without the need for predrilling. They are very useful and save a ton of labor. The size we use is **#10 x ¾ inch**. They are best inserted with a cordless drill or ratchet driver and **$^{3}/_{8}$-inch socket bit**. These used in a multitude of places, including joining bow halves, connecting rail and purlin pieces together, as well as adding additional strength on each of the tension bands, to stiffen the collar and end ties and prevent them from slipping.



PREFABRICATION:

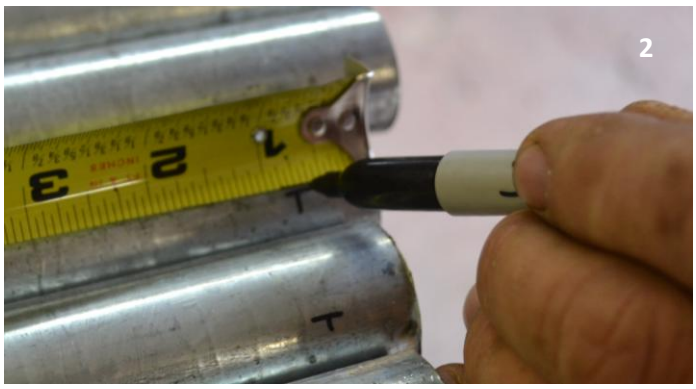
Some shop work will need to be done prior to bending pipes.



Bows are made with two pieces pre-bent $1^{3}/_{8}$-inch top rail. This produces a bow with a swaged end on the bottom of one side and a female end on the other. Since we will be attaching wheels and J-bolts to the bottom of the bows, having a swaged end here is not desirable, and must be cut off. This can be done with a metal-cutting saw (as shown), band saw, or even a hack saw.

1. Cut off the swaged end on one half of all top-rail pieces used for bows. Be sure to remove any burrs with a file to prevent getting cut or getting them caught on plastic.

2. The number of bows should be an odd number to allow wheels to be located at each end of the tunnel and at every other hoop in between. Count out the number of pieces needed for bows without wheels (this should be 2 less than those needed for bows with wheels) and place them side by side. **Note:** Half of these should have their swaged ends cut off and half should have them intact. Next, mark each piece being used for bows <u>without wheels</u> ¾ inch from the factory cut female end as shown.



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3. Now do the same for the pieces used for bows <u>with wheels</u>. This time, make two marks; one at ¾ inch and the other at 2¼ inch from the factory cut female end as shown.
4. With a punch, make a dimple at each mark to prevent the drill bit from "walking".
5. Set the first piece up on a drill press as shown, with support for the opposite end of the pipe. A drill press is desirable, but if unavailable, a hand drill may be used. Using a **$^{5}/_{16}$-inch drill bit**, drill through all the prepunched marks on all pieces of pipe.
6. Using a **$^{5}/_{8}$-inch drill bit**, drill through the $^{5}/_{16}$-inch hole at 2¼ inches from the end of each of the pipes being used for bows with wheels. The existing $^{5}/_{16}$-inch hole serves as a pilot for the $^{5}/_{8}$-inch bit.









Collar Ties are made with ¾-inch EMT electrical conduit.

1. Start by cutting 10-foot lengths in half. These will be on every bow except the end-wall bows. Next, with all the collar ties lying next to each other, make a mark as shown on the top of each end of each collar tie. Be careful not to let them roll when doing this.
2. Insert ¾–1 inch of one end inside a bench vise with the mark positioned as shown.
3. Fully compress the vise. Remove and repeat for the opposite end. Aligning the marks keeps the flattened areas facing the same direction. Now repeat for the rest of the collar ties.
4. With a **¼-inch drill bit** (cobalt bits work best), drill through the center of the flattened area on each tie. Marking and punching is not necessary because hole positions are not critical.







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End Ties are ¾-inch EMT electrical conduit left at full 10-foot length. Two pieces are needed. Repeat the flattening and drilling process above for these.

Angle Ties are made with $1^{3}/_{8}$-inch top rail. First, cut off the swaged end as we did with the bow pieces; then, cut the remaining portion in half to create 2 5-foot pieces. You will need 4 of these on each end of the tunnel, regardless of length. Therefore, 4 pieces of top rail will be needed to produce 8 angle ties. Repeat the flattening and drilling process used for the Collar and End Ties for these as well. If your bench vise is not large enough to compress the ends of this larger pipe, they may be flattened with a hammer instead.

MOUNTING:

Quick Hoops™ Benders may be mounted to any solid surface, such as a workbench, a picnic table, hay wagon, etc. They may be lag-screwed or thru-bolted into place. $^{5}/_{16}$-inch mounting holes are provided on benders. Screws, bolts, etc. are included. By securing the bender in a fixed position, and pulling the tubing around the bender, the operator can maintain precise control of the tubing being bent.





Wherever the bender is mounted, it is important to have enough room to accommodate the pipe infeed and outfeed, and to support the outfeed at about ¾ inch above the mounting surface. This will prevent corkscrewing and ensure that the hoophouse bows created are in a single plane. This is accomplished most easily with something similar to 1-inch by 4-inch slats (actually ¾-inch thick), illustrated above. ¾-inch plywood or a similar material would also be adequate

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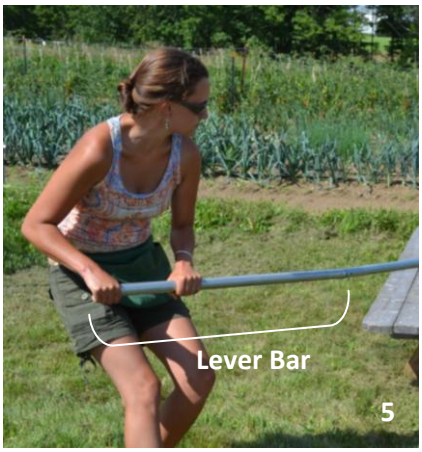
BENDING THE PIPES:











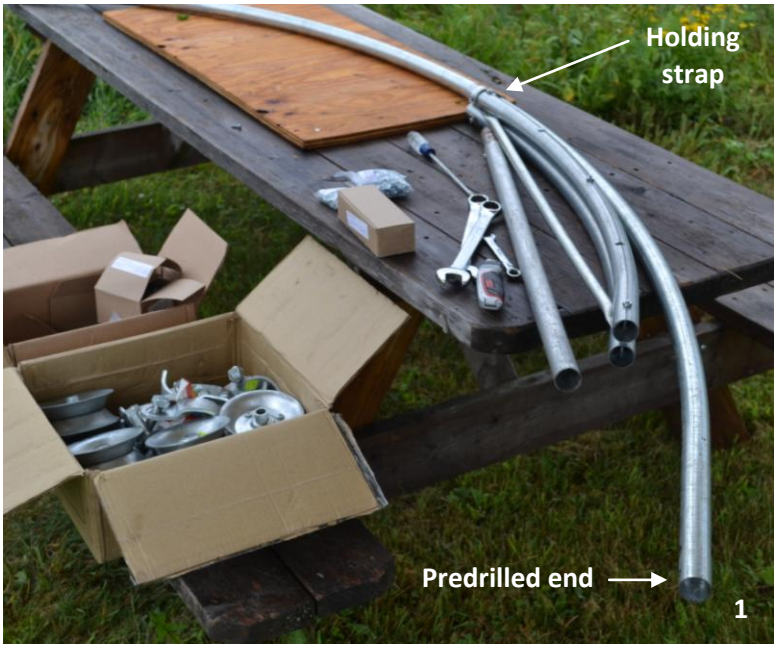




1. Loading: Insert the predrilled end of a pipe into the holding strap at the end of the bender, as shown.
2. Levelling: Insert a Phillips-head screwdriver or similar straight instrument through the $^{5}/_{16}$-inch hole near the end of the pipe. Rotate the pipe until this instrument is horizontal. This will ensure that the wheels and J-bolts are oriented properly when assembled.
3. Beginning the bend: With a smooth motion, pull back on the pipe as if on a long oar (do not push), and bend the pipe all the way around the bender. Release when the pipe is just touching the bender opposite the holding strap. Do not bend past the end, or the arc created will not be smooth.
4. Continuing the bend: Slide the pipe through the holding strap about half the length of the bender, so that the next section of unbent pipe rests against the curve. It is important to keep the screwdriver horizontal throughout the bending process.
5. Extra leverage: Repeat steps 3 and 4 until about 3 feet of unbent pipe remain beyond the closest end of the bender or, if bending becomes too difficult. Depending on the orientation of the pipe, insert the lever bar into the female end or over the swaged end of the unbent end of the pipe. This effectively makes the pipe longer and will instantly give you more leverage for bending the rest of the pipe.
6. Finishing the bend: Repeat steps 3 and 4 until the end of the lever bar is even with the closest end of the bender.
7. Pull the now bent pipe out of the bender and repeat for all other unbent pipes, always inserting the predrilled portion of pipe into the bender first.

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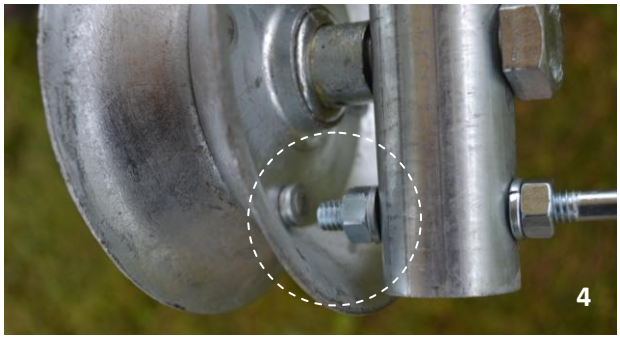
ADDING J-BOLTS AND WHEELS:



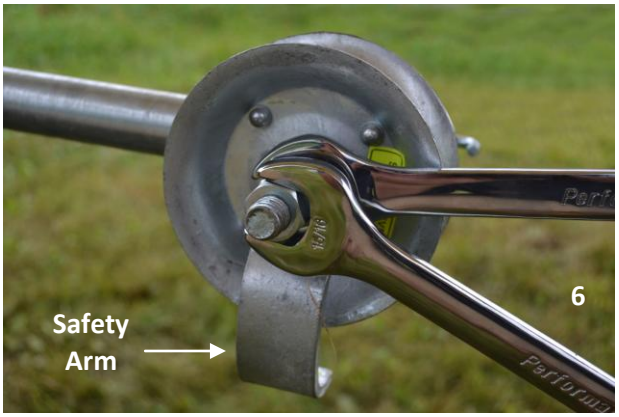




1. The bender serves as a convenient work-holding device for this portion of the work. Insert a bent half bow into the holding strap of the bender with the predrilled end closest to you as shown.
2. Select a J-bolt and thread its included $^{5}/_{16}$-inch nut all the way on, leaving about ¼ inch of thread showing on the J end of the bolt. Add a lock washer and insert through the $^{5}/_{16}$-inch hole on the end of the half bow. Add a lock washer and nut on the opposite side and tighten with ½-inch wrenches, leaving the tail of the J pointing down.
3. If this is the only predrilled hole in the end of the half bow, remove from the bender, insert the next half bow and repeat step 2. If it also has a $^{5}/_{8}$-inch hole, insert a $^{5}/_{8}$-inch bolt from a pipe track wheel from the J-bolt side. Slide a wheel onto the bolt with longer portion of the bearing tube toward the pipe.
4. Slide the safety arm on the bolt. This normally serves to keep the wheel from jumping track when the wheel is used on a hanging chain link fence gate; it serves only as a washer in this application. Thread the $^{5}/_{8}$-inch nut on and hand tighten. Inspect to see if any binding occurs with the end of the J-bolt. If it moves freely, proceed to step 5. If it binds, remove wheel, loosen J-bolt, and re-tighten with less thread protruding on the wheel side of the pipe. Repeat steps 3 and 4.
5. Tighten the wheel using 2 $^{15}/_{16}$-inch wrenches. Be careful not over tighten and crush the pipe.
6. If desired, add a second $^{5}/_{8}$-inch nut (purchased separately) and tighten counter to the first one. This will prevent the wheel from loosening over time.







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ASSEMBLING THE BOWS:





On any flat, horizontal platform, lay out 2 half bows of the same type (with or without wheels) as shown with male and female ends facing each other. Join halves and secure with two tech screws. Remember to keep screw heads facing away from where plastic will be. Repeat for remaining bow halves.

LAYING THE TRACK:

1. Start by rolling out 4-foot wide Pro 5 Weed Barrier along the entire length of all plots of the bed area for your moveable tunnel. Fold in half with shiny side up and the fold facing in, and position so that the center of the now 2-foot wide fabric is where you would like the first track to be. Pull tight to create a straight line and secure with fabric staples. On the side without the fold, only secure only the bottom layer. Repeat for the opposite side, placing the fabric 12 feet apart, on center.
2. Lay $1^{3}/_{8}$-inch top-rail sections end for end along the center of these fabric pieces and connect. Secure each section with a single tech screw.
3. At each end of the track, drill out a hole to accept a long spike.
4. Rotate the track 180 degrees so that the tech screw heads are facing down against the fabric.
5. Drive the spikes in the ground to prevent rotation. Repeat for the other track. Add spikes at the ends of the tracks only. The tracks are now complete.

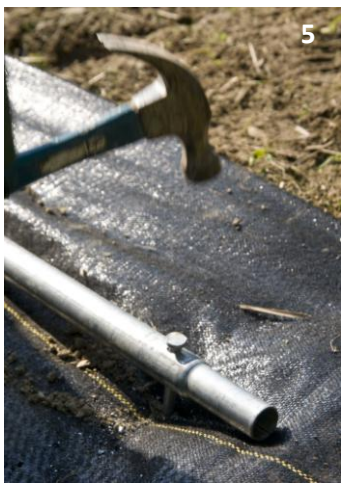












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INITIAL FRAME ASSEMBLY:





1. Begin by placing a bow with wheels on the track. The wheels should fit perfectly on the rails. If not, tweak the bow by spreading or compressing it until sized correctly. This will prevent the wheels from jumping track later on when you move your tunnel.
2. Slide a cross-connector over the top center of the bow. Always loosen the cross-connectors' carriage bolts fully before installing them. This will save you much time and aggravation when sliding top rail through them. Insert the female end of a piece of top rail through the cross-connector. This is the end of the ridge pole.
3. With the ridge pole at 90 degrees to the bow and about a ¼-inch protrusion, snug up the nuts on the cross-connector. Do not fully tighten. This will keep the ridge pole in place, but allow some swiveling around the first bow as the second bow is installed.





4. Now place the second bow (without wheels) 4 feet from the first and install a cross-connector on the ridge pole. Snug this one up as well to hold it in place. It is important that the swaged joints at the peak of all bows are oriented the same way; this will allow the cross-connectors to be installed at the same location on eachbow, and result in a straighter ridge pole.



5. Add the third bow (with wheels) at 8 feet from the first, install a cross-connector and snug it up to hold the bow in place. It is useful if you have a long tape measure, to secure it on the first bow and allow it to hang over the bow you are installing. This will keep the tape tight and prevent compound error caused by only measuring bow to bow.



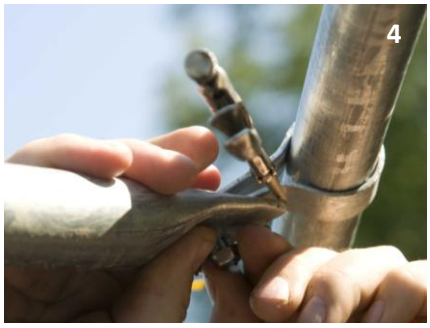
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INSTALLING ANGULAR SUPPORTS:









At this point, you will have 3 bows standing somewhat precariously that are in need of support. Install angular supports as follows:

1. Angle ties will be loosely assembled as shown. The tension bands on the third bow should be about 1½ feet from the ground to allow room for a low purlin below. This arrangement is repeated for the opposite side of the tunnel.

2. Start on one side of the tunnel by spreading apart and placing 1 tension band over the first bow, 2 over the second, and one more over the third. Repeat for the opposite side.

3. Spring clamps work well to suspend tension bands during assembly.

4. A pair of needle nose vise grips or similar type of pliers will be of great help in keeping tension bands compressed while working on them.

5. When connecting angular supports to brace bands, insert a 1-inch long ¼-inch x 20 carriage bolt through both sides of each brace band and then through the predrilled hole in the angle tie. Hand thread a ¼-inch nut on the bolt.

6. When all components of the angular supports are in place and finger tight, adjust the first (end wall) bow for plumb (loosen nuts on cross-connectors if needed), then tighten the nuts on the 2 tension bands connected to it. Adjust the second bow for plumb, then tighten the nuts on the 4 tension bands connected to it. Repeat for the third bow, ensuring that the tension bands are no less than 15 inches from the ground. Tighten all cross-connector nuts.

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INSTALLING LOW PURLINS:

1. Install low purlins roughly the same way as the ridge pole, placing them about 1 foot from the ground. Begin by installing a cross-connector on each bow with the nuts facing up. Then slide a piece of top-rail through the connectors.

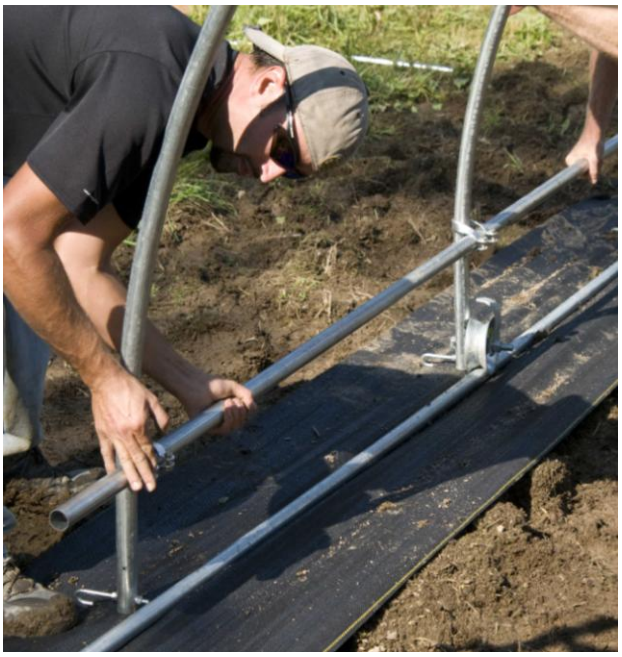
2. Spring clamps will conveniently hold the cross-connectors and purlins in place.

3. Tighten the cross-connector on the first (end wall) bow to hold to hold it in place.

4. Tighten the cross-connector on the third bow with the bow positioned 8 feet out from the first.

5. Adjust the cross-connector on the second bow (which should still be loose) so that it is 4 feet from the end bow. While pushing down on the purlin, lift the bow up through the cross-connector slightly so that the bottom of the bow is suspended about a ½ inch above the track. Tighten the cross-connector. The purlin is now supporting this side of the bow.

6. Repeat for the other side of the tunnel.











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FINISHING THE FRAME:

1. Place a bow without wheels on the track and slide a cross-connector over the top center of the bow. Slide a piece of top rail through the connector female end first, pointed at the unfinished tunnel.

2. Raise the top rail up until horizontal and slide the female end over the male end of the ridge pole. The new bow will serve to support the top-rail piece while it is being attached to the ridge pole. Secure this new ridge pole extension in place from the bottom with a tech screw.

3. Position the new bow twelve feet from the first and tighten the nuts on the cross connector.

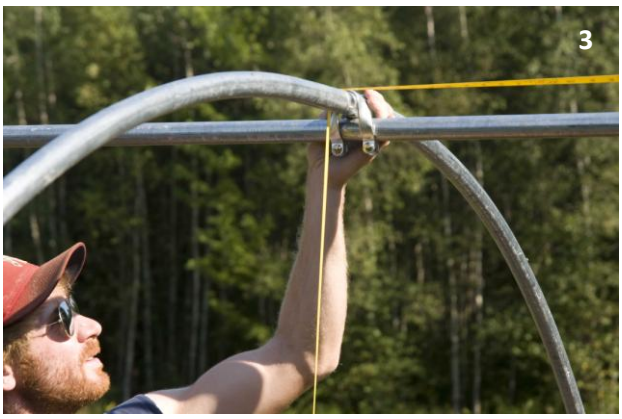
4. Add another bow with wheels at 16 feet from the first and secure with a cross connector.

5. Install low purlin extensions in a similar fashion as before, connecting them with tech screws installed from the inside of the tunnel, pointing out. Continue building the remaining length of the tunnel, setting bows and cross connectors at four foot increments each time. It is good to check the plumb of bows occasionally as you go.

6. When the final end wall bow has been attached, add a second set of angular supports. There should be very little adjustment at this point. Refer to page 12 for the procedure. The supports should angle down from the end walls toward the center on each end of the tunnel (see next page for illustration).











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7. Finally, cut off top rail pieces from the low purlins and ridge pole that protrude beyond the end wall with a hack saw.

8. Install end ties on each end of the tunnel, using tension bands, carriage bolts, and vise grips the same way that angle ties were installed. Position them on the end wall bows at the point where the tension bands pull tight and the end tie is level. Add one or two tech screws through the tension band and into the bow to prevent slipping and add strength.

9. Install collar ties in a similar fashion, as the end ties. For aesthetics, you may find it useful to install all of these loosely and have one person “eyeball” them from one end of the tunnel so they all look symmetrical.











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SKINNING THE TUNNEL (CATERPILLAR STYLE):

1. With the tunnel positioned at one of its planned working locations, drive two 6 foot T-posts side by side with their “ribs” facing each other, about 5 feet from the end of the tunnel, directly between the rails, at about a 45-degree angle. Repeat for the opposite end of the tunnel.

2. You may also want to drive the T-posts for the other working positions of the tunnel at this time.

3. Ensure that they are driven deeply enough so that the end ties will clear them when the tunnel is moved.

4. There are many ways to cover your tunnel. 20-foot wide greenhouse film is used for this style of covering. If you choose to install traditional roll-up sides and end walls, 24-foot wide plastic would be preferable. Using the T-posts as an extra set of hands, wedge the end of the plastic between the T-posts and unroll around the side of the tunnel until you reach the opposite end.

5. Place the roll just beyond the T-post at the far end of the tunnel, spread the T-posts, and run the plastic between them to temporarily hold it in place. Take up as much slack around the tunnel as possible when doing so.











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6. Bring the plastic up over the tunnel.

7. Hold in place temporarily.

8. On one end of the tunnel, start gathering the plastic like a pony tail, working from the middle out to the sides, pulling the slack out each time the plastic is gathered.

9. Spread the T-posts apart, run the bunched plastic pony tail through the T-posts and twist.

10. Wrap it around one of the T-posts and then back between them again.

11. Close the T-posts and tie them together. Repeat for the opposite end of the tunnel.













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LACING THE TUNNEL:

Parts of this process are not unlike lacing your boots. **Refer to the diagram on page 2 for the pattern.** There are many lacing materials that you could use. Source trials tested military parachute cord, which has great availability online and is low cost. It has a high tensile 550 Lb. test multi-strand core and a smooth over braid which slid over the plastic effortlessly. It tested very well for us, without one breakage, and we highly recommend it. The following is a two-person operation with each person positioned on opposite sides of the tunnel.

1. Lacing:
   a. Tie the end of a spool of parachute cord, or similar strong twine material of your choice to the J- bolt on one of the corners of the tunnel.

   b. Gently (because the spools are sometimes made of flimsy cardboard and can come apart, which is a frustrating mess) throw the whole spool over to the other side of the tunnel and loop under the next bow's lacing bolt.

   c. While holding some light tension on the cord, throw the spool back over the tunnel.

   d. Repeat steps b & c until you reach the bow at the other end of the tunnel. Temporarily tie off the cord on the last corner J-bolt on that end.

   e. Repeat steps a through d, starting at the same bow, but on the opposite side.

2. Tensioning:
   a. Start in the same positions you started at in step 1.a. above.

   b. Pick one of the cords, and with one person keeping tension, while the other cinches up the cord, working back & forth down the tunnel until you reach the end, just like tightening the lacings of a boot.

   c. Tie off permanently on the last corner J-bolt.

   d. Repeat steps a through c, starting at the same bow, but on the opposite side, for the other cord.

3. The tunnel should be fully laced and the plastic should tighten right up.





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ANCHORING:

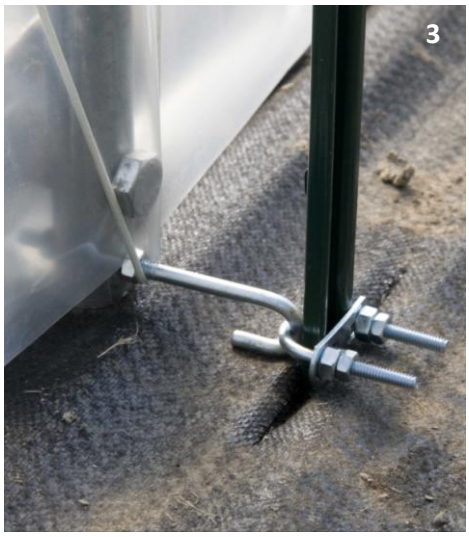


Please note: Anchors must be placed at least at every wheel. If your tunnel is in a particularly windy area, we would recommend placing an anchor at the base of every bow and maybe even adding auger still anchors to further strengthen the structure and prevent vertical pull-out. This anchoring system has only been tested in a few locations and while it has performed well there, we do acknowledge that some applications may need further reinforcement and extra hardware to prevent storm damage.

1. Start by cutting a slit in the weed barrier fabric, parallel to the tunnel, directly below the end of a J-bolt.
2. With the rounded side facing the J-bolt, use a sledgehammer to drive a 3-foot U-post in as deeply as it will go. It should butt up to the J-bolt and have a minimum of 6 inches still above the ground.
3. Install a ¼”-20 x 1-1/8” x 2-1/4” U-bolt as shown. Add an extra $^{5}/_{16}$” nut inside each ¼” nut as a spacer to allow for full compression; then tighten.
4. Repeat for all other anchoring points as described in the paragraph above. A minimum of one anchor at each wheel is recommended.







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OPERATION:



1. **Access and venting** are accomplished the same way, by simply lifting up the plastic.

   a. Start at one end of the tunnel, grasp the bottom edge of the plastic between the first and second bows, and raise it to the desired ventilation level.

   b. Repeat down the entire length of the tunnel.

   c. Repeat for the opposite side of the tunnel to ensure good air circulation.

2. **Seasonal operation:**

   a. Early spring and late fall: You will generally want to leave the tunnel sides fully closed, day and night for maximum warming.

   b. Mid-to-late spring and early-to-mid fall: Closed at night, vented a foot or two high during midday.

   c. Summer: Pretty much opened all the time, except for stormy days. This design relies on friction to hold the plastic at a given ventilation height. We found that in the intense heat of the summer, the plastic expands substantially, beyond the point of adjustment by tensioning the lacing.





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To avoid having to readjust the pony tails within the T-posts, we found that spring clamps were the answer. They kept the now loose plastic perfectly suspended at any height we desired. We also found that we could use them for extra security to hold the plastic to the bottom of the bows during storms. Shade cloth is also an option for protecting crops from summer heat.

d. Winter: If you are operating your tunnel during the winter, you will want to seal the bottom outside edge. You can do that as follows:



   i. Remove all U-bolts and pull out all U-posts.

   ii. At the base of each bow:
      1. Cut a slit perpendicular to the tunnel.
      2. Release the lacing at the J-bolt and leave hanging.
      3. Flip the top layer of weed barrier fabric up over the J-bolt and tuck up under the edge of the plastic.
      4. Replace the lacing now over the plastic and weed barrier.

   iii. Use sandbags at the edges of the plastic near the ends to hold it down to the ground and provide a good seal there.

   iv. Internal row cover directly floating on crops or suspended by hoops will add an extra layer of protection and spur growth even earlier in spring.



e. Winter Layup – If you choose to not use your tunnel in winter (or if you are bracing for a major storm), simply rotate the plastic all the way over to one side and leave it there. Tying it to the bows is also a good idea, to prevent wind from wreaking havoc. In early spring, the plastic can be rotated back into place and used to melt the snow, allowing a super early start on the season.

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3. Moving the tunnel: Your tunnel has been designed to hopefully take you no more than 30 minutes (after the first or second time) to disconnect, move, and reconnect. The steps to take are as follows:
   a. Remove any internal trellising and connections that may exist with the frame.
   b. Fully vent the tunnel by raising the plastic up to chest level or so.
   c. Using a battery powered ratchet driver or drill and a $^{7}/_{16}$" socket, remove all U-bolts on the anchor points.
   d. Slip the lacing on the J-bolts on both sides of the second bow off to loosen tension on the plastic.
   e. Remove the plastic pig-tails from their associated T-posts and flip up over the tunnel. The pig-tails can be conveniently tucked under the lacing to temporarily hold them in place for the ride.
   f. Roll the tunnel to the next desired bed location.
   g. If they are not already installed, drive T-posts and U-posts as described previously in this manual.
   h. Reconnect plastic at each set of T-posts first.
   i. Tighten up lacing and slide back over the J-bolts on the second bow.
   j. Re-install U-bolts at all anchor points.







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