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INSTRUCTIONS
for
Model's DY-16, or C-16
Hoop Benders

Inventors and pioneers of these amazing Greenhouse bending
tools,

Please visit our web sites for more great Greenhouse related
products, featuring my own best selling E-books,
“Drill Your Own Water Well” &
“Heating Tables and Mats”

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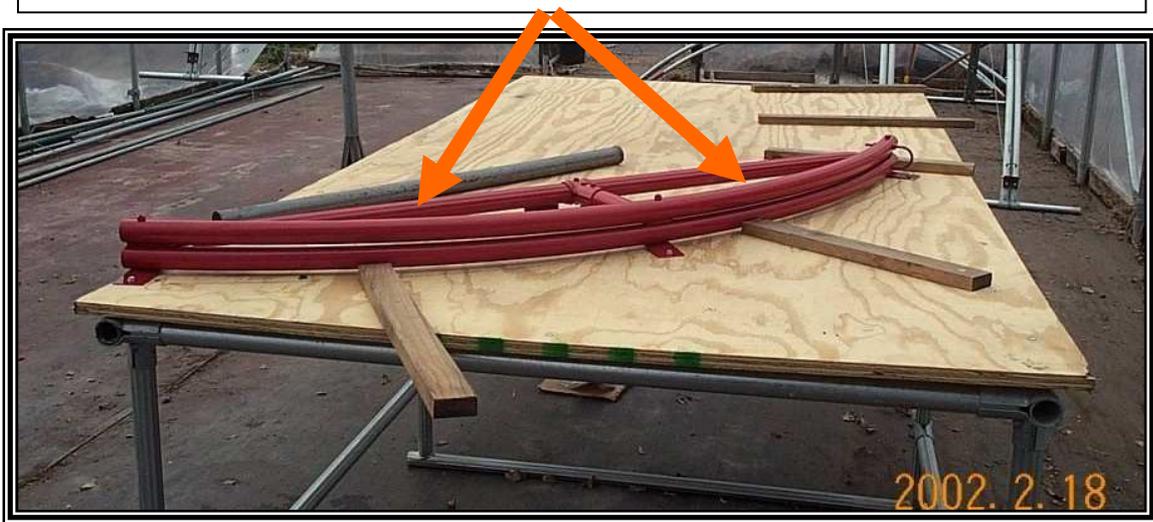
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The 16 foot wide hoops require three lengths of 17 or 16 gage by 1 3/8" outside diameter chain link fence top rail tubing Use two 10 ft. 6 inch lengths and one 5'3" length. Yes 21 foot lengths may be used and cut to the correct lengths.

Mounting Your Hoop Bender

Recommended Horizontal Mounting For All "DY" & "C" series mount using two 1/4" bolts in the 2 holes drilled & provided here.



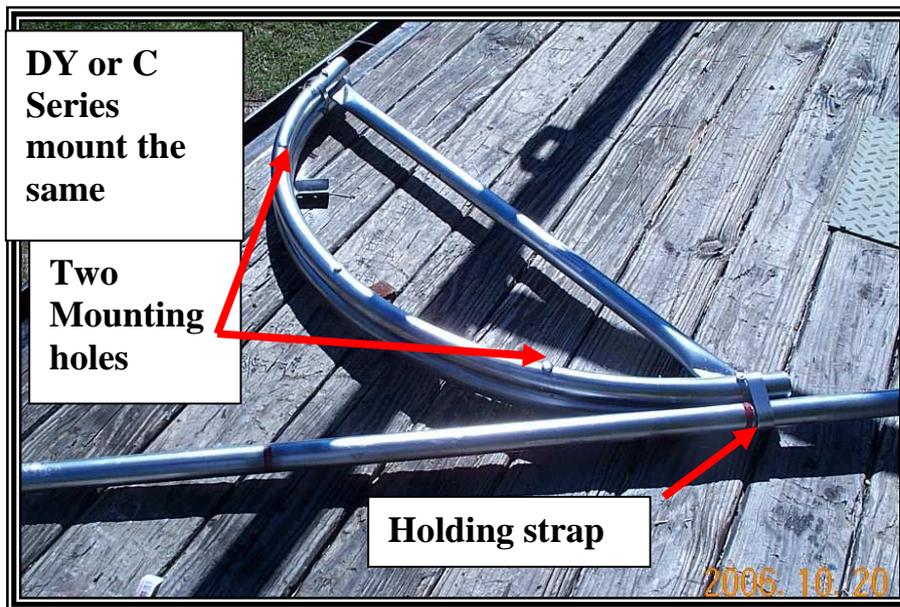
IMPORTANT: PLEASE READ ALL INSTRUCTIONS BEFORE BEGINNING

The "DY" & "C" Series can be mounted either in the horizontal or vertical position. We recommend the horizontal (Table Mount). The vertical position usually takes less time and materials to mount the bender, **however the horizontal position is best for the beginner.** Photo shows mounting points for both the "C" series and the "DY"

We recommend mounting your bender on a 4'x8' plywood table as shown above or any similar surface. The table legs must be secured to the ground or floor to prevent the table from twisting during the bending of your hoops.

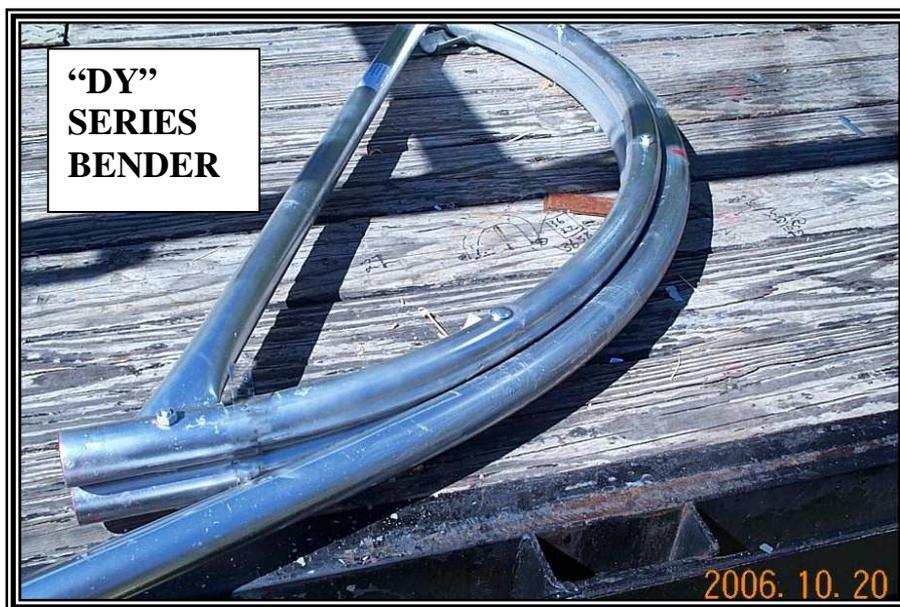
Note the 1"x2" wood strips which are fasten to the table top, these wood strips are very important to keep the tubing on a level plane to the bender body, they may be positioned as needed to support the tubing in this correct level with simple drywall screws to allow moving/ adjust them if necessary later. Most of the photos, above

depict our “C” series bender however the shorter “DY” series is positioned on the table in the same manner. Both the DY and C series mount the same way using either two ¼” carriage bolts or two ¼” lag bolts inserted through the two predrilled hole as shown on next page. Please note also that the holding strap is at the end of the bender nearest to the center of the table.

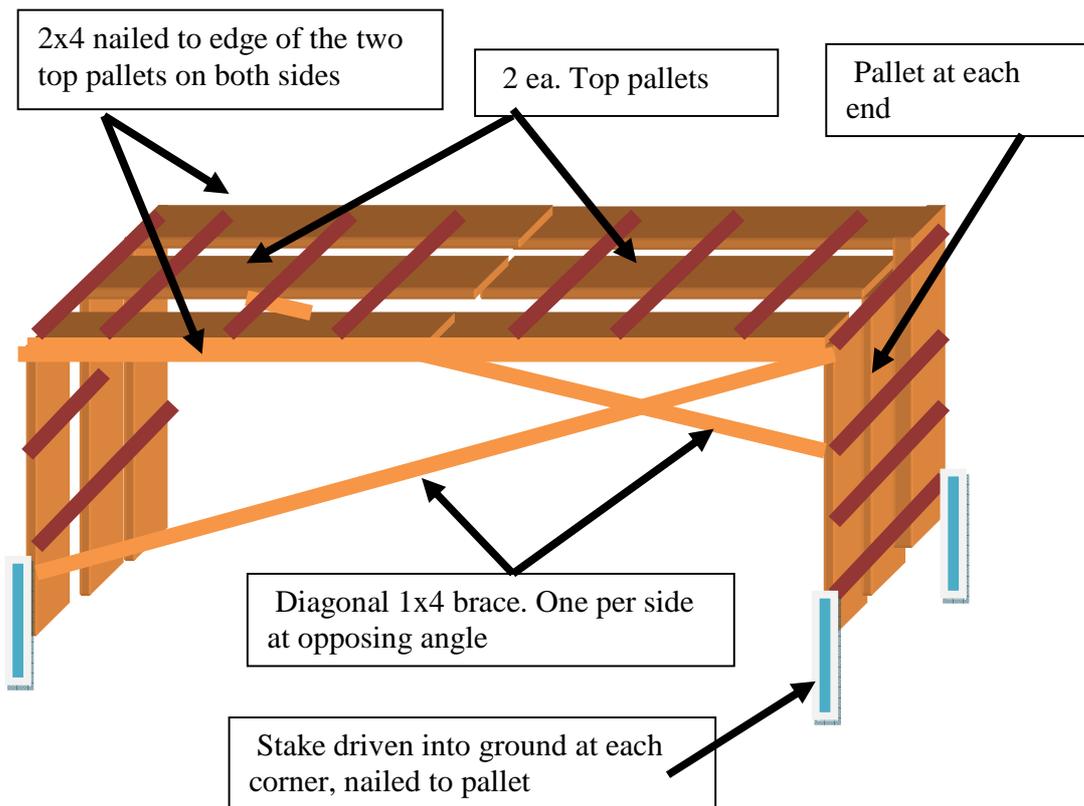


The following photos are of benders mounted in different ways. We recommend mounting your bender horizontally (flat) on a 4'x8' table or suitable flat surface.

In the photos it is simply lag bolted to a flat bed truck.



I will show you several different methods of mounting your bender in the following pages. The mounting table can be anything that is at the proper work height and will not move as you bend the tubing. The mounting table doesn't need to be elaborate. In fact the first example is a simple and effective table constructed with four wooded pallets shown below in the drawing, two 8 ft. 2x4s and a few 1x4 boards.



This pallet table does not require any plywood for the top. Just mount bender directly to the pallets in position shown for a plywood table top on page 3.

Perhaps the simplest table mount ever used was supplied by one of my customers. He simply bolted the bender to a 4'x8' sheet of plywood and slide the plywood into his pickup bed, with the tail gate down he let the plywood overhang the tailgate. Leaving enough plywood between the fender wells inside the bed to keep the plywood wedged firmly when he pulled the tubing around the bender. If he needed to run to the hardware store he pushed the whole sheet into his pickup bed closed the tail gate and off he went. That's really a slick setup, and it does not get simpler than that. You may need to tinker with the placement of the bender onto the plywood to allow bending of a complete section within the confines of the bed but he did it and so can you. The slide in truck bed table top, works even better if you build a simple 2x4 wood frame to fasten the plywood too as he did. Short wood blocks can be used to further wedge the unit between the fender wells of the pickup

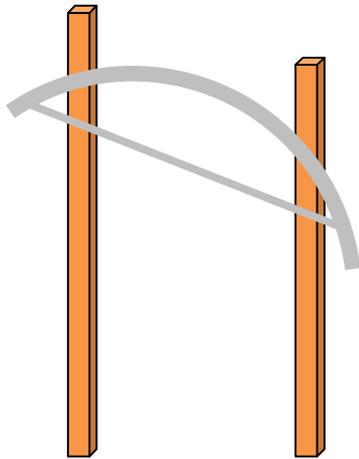




Vertical mounting can also be performed several different ways without a lot of cost and labor.

The picture above is an ingenious mounting configuration sent in by another customer if you have a tractor with a front bucket, if not you get the ideal. This allows easy changing of bender angle and height.

Another quick vertical mount is simply two post with the bender bolted to them see drawing below.



Vertical mounting can be made to any available, existing wall or fence, as long as it is stable and does not move.

General Bending Instructions

Important:

With these hoops laying flat on the ground (uncompressed) the hoops should measure 16' 6" to 18'. Then compressed and installed into the stakes which are installed at the 16 ft. installed width.

After bending the hoops, connect the sections together laying flat on the ground and measure across the base. Example if your bending a 16 ft wide hoop using any of our 16 ft benders, then the hoop must measure at between 16'6" to 18' feet across the base, when the three sections are connected and laying flat on the ground, This extra width is necessary because the hoops must be compressed inward to install into the ground anchor tubes. This is referred to as “post tension” which strengthens and smoothes out the hoops.

To start with purchase only enough tubing to build one or two test hoops.

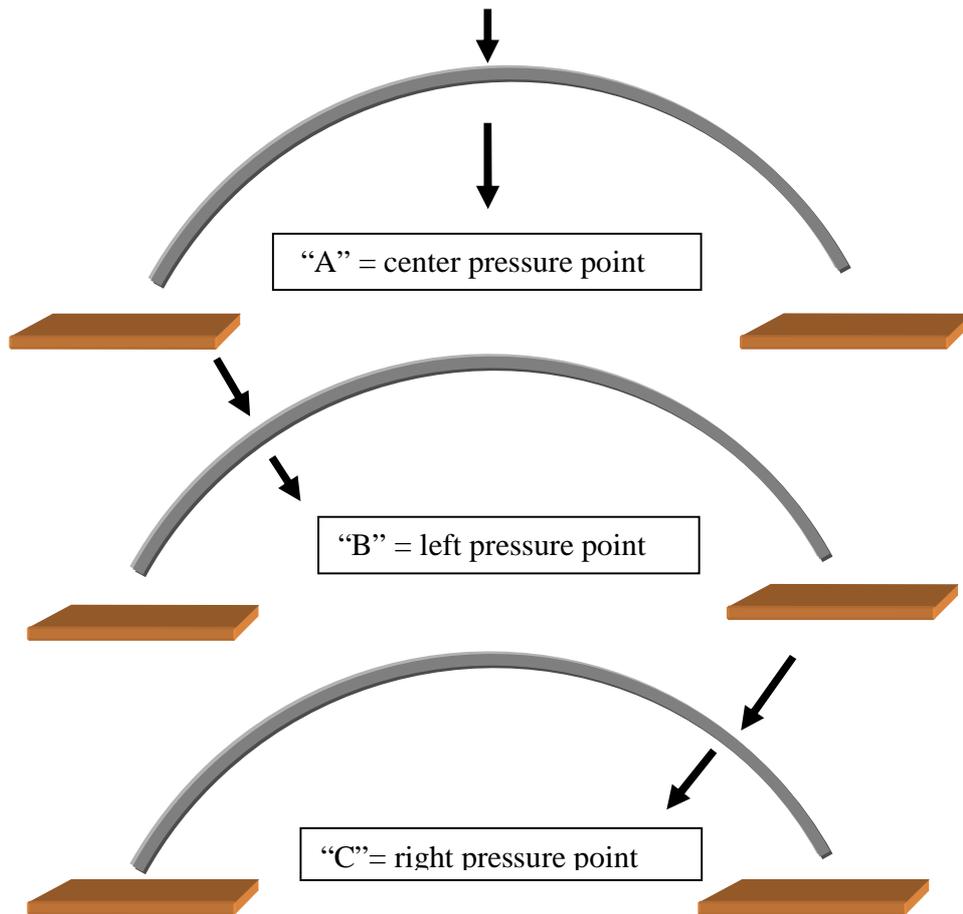
The reason for this is simple; Not all tubing is made from the same alloy of base metal. Understanding metal springs back to some degree (rebounds) after being bent. How much rebound, is determined by the hardness of metal used in manufacturing the tubing. Our benders are set to produce the prescribed hoop width assuming you are using tubing of average hardness. But understand this can vary a lot so do some test hoops first. EXAMPLE: If your hoop is to be a 16 ft wide hoop. As discussed on the previous page, your

finished width after bending must be between 16'6" and 18 feet wide. The hoop are will then be compressed inward when installed into the post anchors. Let's say you bent the hoop and its 15 1/2 feet wide. The hoop must never be pulled outward to install, it must always be compressed inward. So what do you do about this problem?

Actually there is a fast and simple method to get the hoop out to the uncompressed width of 16'6"- 18' foot. Afterwards it can then be compressed and installed at the required 16 ft hoop. We refer to this method of resizing as "Tune Out" it has been proven to work every time and produce good hoops. Never attempt to resize a hoop by any other method other than the following method, the result will be "well let's say not good".

The hoop tune out method is the same regardless of number of hoop sections in your hoop, These 16 ft wide ft. hoops require two 10'6" lengths & one 5'3" length

If your first test hoop measurement is less than 16 feet when laying loose on the ground. Take the sections apart and spring out both section's as follows. Place two small wood planks or thick cardboard on the ground so that each is positioned under the ends of a hoop section. While holding the section at the center (point "A") shown below, push the center of section down about two inches and release. The wood planks allow the hoop to slide outward as you push downward. Now move to point "B" on the same section, pushing downward about two inches, at the angle shown by arrows. Now move to point "C" and repeat this step again. Resize each section. Reassemble the sections and measure the width. The hoop will be wider now, if it still is a little narrow repeat the three point spring out steps above, reassemble and check hoop width. When the target width is achieved mark this hoop and use it as a pattern for resizing all other hoops hoop's. It is not necessary for all of the next hoop sections to match the pattern exactly, just as long as they or close, within a few inches. When all are compressed and installed they will all look exactly the same.



The three pressure points are the same regardless of section lengths sections. Applying pressure at these three points on each section and by allowing the ends to slide freely when pushing down, each section will uniformly be resized into wider hoops. After a few hoop sections this method will resize a section in about 20 seconds each. AGAIN, NEVER attempt to resize using any other method or press down in more places other than the three points shown above.

Determine the spacing of the hoops. Hoops can be spaced 4, 5 or 6 feet apart, four feet being most often used, although you can space them closer if desired. Example if you plan for a 16' x 36' greenhouse, then the best spacing is four feet apart so 36 ft. (the greenhouse length) divided by 4 ft. (the hoop spacing) equals 9, this is the spaces required not the hoops required. You will require seven (10) hoops to build a 16x36 using 4 ft. spacing.

Simply put; Number of hoops required equals the greenhouse length divided by the hoop spacing plus one (1 hoop). As each 16 ft. hoop requires three lengths you would need 20 lengths of 10' 6" tubes & 10 lengths of 5'3" refer to the tube orientation page preceding this chapter for tube preparation before bending.

IMPORTANT:

During the manufacture of this tubing, one end is swaged (made smaller) sometimes the machines that perform this job causes the swaged end to cant (tilt) slightly to one side. By looking down the length of tubing while turning it slowly you will be able to determine if your tubing has this slight cant. If it does mark or note the direction of cant. Then when you begin the bending process make sure that the cant direction is pointed in the same direction as you are pulling (bending) the tube.

With the bender mounted, all tubes will have one painted end. Start bending by inserting the painted end into and through the holding strap 4" inches. Pull the tubing around the bender stopping about 5 or 6 inches before you reach the end of the bender, now push one half of the tubing you just bent through the holding strap then pull tubing again around the bender always stopping a few inches from the end of bender. Repeat this bend and push through adding the lever bar when needed until the very end (unpainted end) is aligned so it will contact the bender itself about 5 or 6 inches before reaching the end of the bender.



Here I'm completing the final bend on one section for a 16 foot hoop. Note the already bent tubing being supported at the opposite end with the 1"x2" wood strips



Here I've bent and pushed some of the tubing thru the bender and pulled the more tubing around the bender towards me in this bending stroke. Making sure that the tube I'm bending stays in the groove formed by the twin tube bender body.

Here I've completed one of the 10'6" sections for a 16 foot wide hoop.

NOTE: The 5'3" section is bent the same as both the 10'6" lengths were bent



Choosing The Tubing For Your Hoops

Our benders are fixed radius (not adjustable) First a little information on the properties of this metal tubing you will be working with. **RULE # 1...** Metal like many materials will rebound (spring back) after being bent. This rebound is directly influenced by the hardness of the metal and to a lesser extent on its thickness and over all size. With this in mind we have built each of these benders to produce its designated hoop size provided that you are bending the gauge and diameter pipe size we recommend.

We are often ask, “will your bender bend smaller, larger, heavier or thinner tubing” The answer is yes it will bend many other gauges and even diameters, however if you do so then **RULE #1** above applies and there is no way I can tell you what the finished radius of the material will be. **EXAMPLE** if you purchased a “DY-16” bender which produces a 16 foot wide hoop using the tubing we recommend for that hoop, but you instead choose to bend 3/4 inch diameter EMT electrical tubing you may not get a 16 foot wide hoop. The rebound of the smaller thinner tubing affects the finished radius which in this case would produce a much smaller radius. So please, unless you just want to experiment, use the tubing we recommend for your bender and greenhouse.

Below are specifications for the required tubing for each hoop size regardless of bending it on our “DY” or “C” series benders.

The 16 foot wide hoops require 2 lengths of 17 or 16 gauge by 1 3/8” outside diameter chain link fence top rail tubing in 10’ 6” lengths & 1 length of 5’3”. Yes 21 foot lengths may be cut to get the correct lengths.

The next page will show you how to mark tubes using precut 10’6” or cutting 21’ lengths in half yourself to get the 10’6” lengths.

Orientation of tubes for precut factory 10’ 6” lengths is shown as “A” See next page

Orientation of tubes for factory 21 ft. lengths which must be cut in half is shown as “B”

See next page

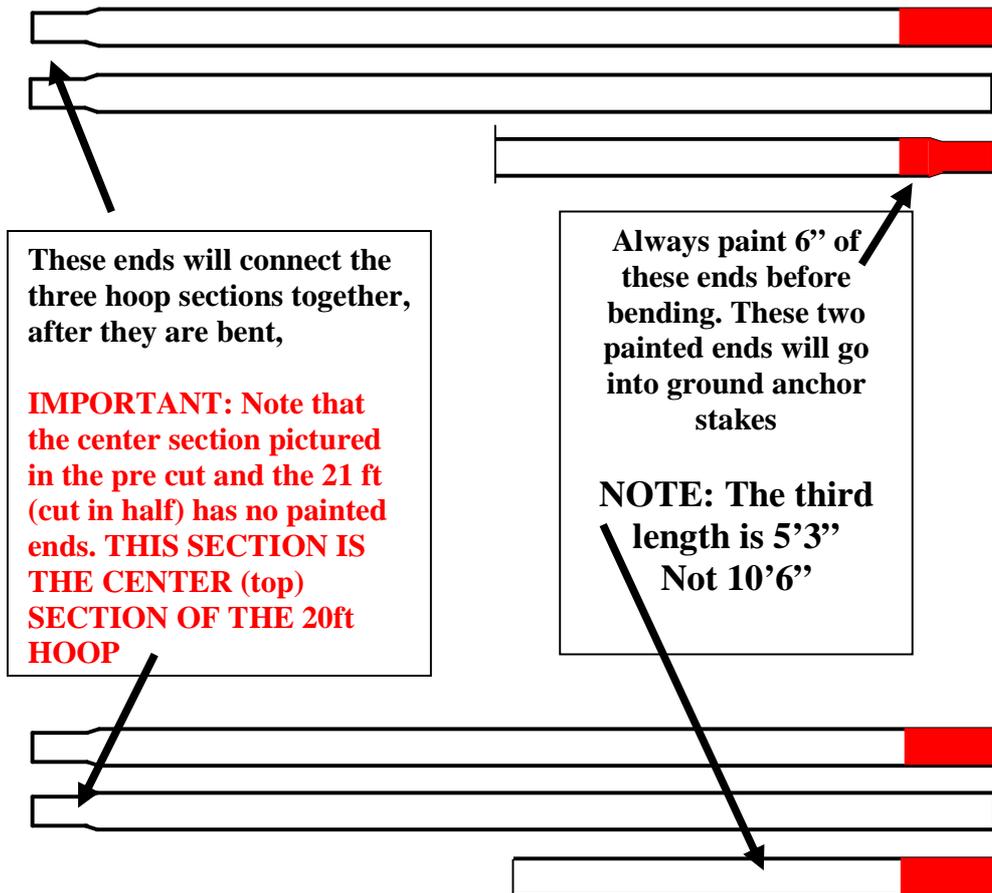
I’m often ask “**Can I bend the 21 ft lengths without cutting them in half?**” The answer is yes, **but don’t try it**. It seems that most people reason that it would be faster to skip the cutting in half and just bend the full 21 ft length. Controlling a 21 ft length while bending it is to say the least a nightmare and will 99% of the time end up in disaster and a very long wine bottle cork screw. Most factory made hoops are made using 10’ 6” or shorter lengths. Please take my word for this.

Important Note: If you cut 21 ft lengths of tubing to build the 16’ hoops. there may be tubing left over after building hoops. Don’t worry, you can use these extra lengths for the three perlines. To connect these unswaged lengths, cut 8” lengths of 1”emt tubing (Get it at any hardware store), slide 4” inside one tube and fasten with tech screw, now slide the next tube over the remaining 4” of the emt and fasten it with tech screw, what you’ve just done is make your own swaged end, This can be used for connecting any unswaged 1 3/8” fence tubing.

Pre-Bending Tube Orientation

Tube Orientation for 20 ft. Hoops

NOTICE: The swaged (small ends) on all 1 3/8" fence tubing
"A" Using factory pre-cut 10' 6" lengths, 1 3/8" 17 or 16 ga.



"B" Using factory 21 ft. lengths 1 3/8" 18 or 17 ga. cut in half. when cutting 21 ft lengths for this hoop there will be more than usual left over sections. use them for purling and connect them if necessary using the 1" x 8" lengths of emt described on pg 12.

Bending tubing for a 16 foot wide greenhouse.

With the bender mounted to a stable platform described in mounting instructions. Determine the spacing of the hoops. Hoops are spaced 4, 5 or 6 feet apart, although you can space them closer if desired. 4 ft being used most often. **The following is a repeated Example** If you plan for a 16' x 36' greenhouse, then the best spacing is four feet apart so 36 ft. (the greenhouse length) divided by 4 ft. (the hoop spacing) equals 9, this is the spaces number of 4 ft spaces required, not the hoops required. So the total hoops required for a 16x36 is 10 hoops. Simply put; the number of

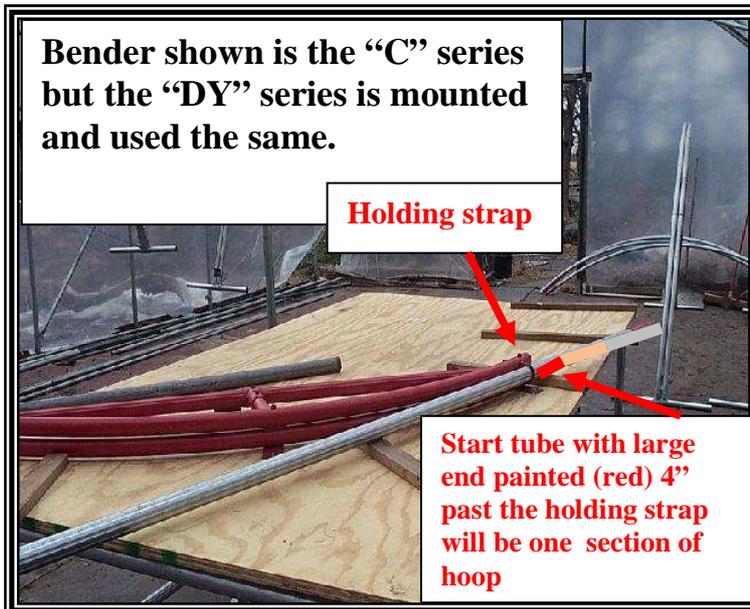
hoops required equals the greenhouse length divided by the hoop spacing, in this case its 36 ft length divided by 4 ft spacing, plus one (1 hoop.). As each 16 ft. hoop requires three (3 ea) lengths of tubing top rail tubing, refer to the tube orientation page above for tube preparation before bending.

IMPORTANT:

During the manufacture of this tubing, one end is swaged (made smaller) sometimes the machines that perform this job causes the swaged end to cant (tilt) slightly to one side. By looking down the length of tubing while turning it slowly you will be able to determine if your tubing has this slight cant. If it does mark or note the direction of can't. Then when you begin the bending process make sure that the cant direction is pointed in the same direction as you are pulling (bending) the tube.



Insert **about 4 inches** of the tube end indicated by red paint (see tube orientation page) through the holding strap of the bender.

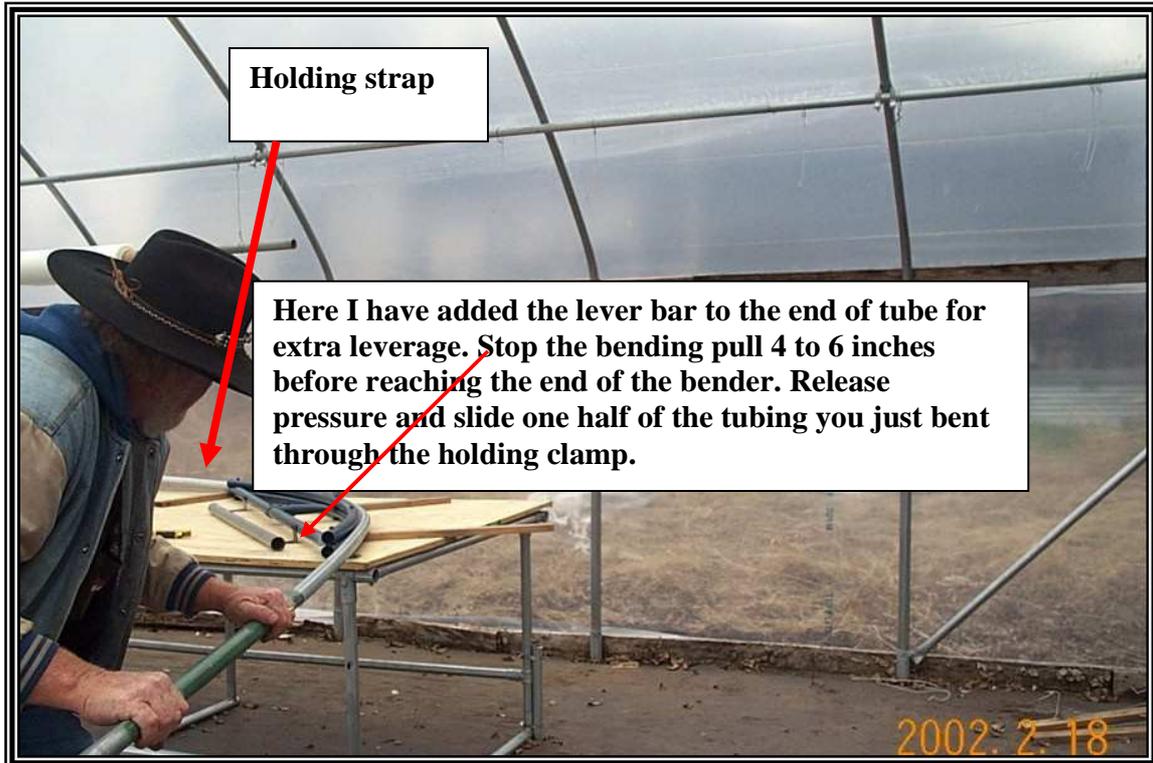


Bender shown is the "C" series but the "DY" series is mounted and used the same.

Holding strap

Start tube with large end painted (red) 4" past the holding strap will be one section of hoop

Remember the 16 wide frame is a three piece (section) hoop. The photo at left shows placing one of these 10'6" tubes with large end painted red into bender, When you bend the other half section tube you will push the small end painted (red) through the holding strap 4". And bend as instructed. When both sections are completed they will join together at the top of the hoop described later. 16 ft. hoops are bent in the same manner as our 20' hoops juts bend on a 16' bender and using 2 and 1/2 lengths of tubing rather than 3 full lengths of 10' 6" tubing



Holding strap

Here I have added the lever bar to the end of tube for extra leverage. Stop the bending pull 4 to 6 inches before reaching the end of the bender. Release pressure and slide one half of the tubing you just bent through the holding clamp.

Always start the bending with the painted ends inserted through the holding strap. In the case of bending the 16 ft. wide hoops you will push the painted ends of each side section tubes 4 inches past the holding strap then begin bending

Let's start with one pipe section, pick one tube with a small (Swaged) end painted. Push through strap 4 inches. Pull the tubing around the bender, STOPPING about 4 to 6 inches before reaching the end of the bender, release pressure and slide one half (1/2) of the tubing you just bent through the holding strap,

CAREFUL never push more than one half of the previous bent portion thru the holding strap between strokes. Doing so will cause flat spots in your hoop. As you began bending the first tube fasten 1x2 inch wood strips to the table as shown in most all photos under the end of the bent tubing after you slide it through the strap. Then repeat this bending and pushing through the strap, adding more 1x2 wood strips as needed each time you push more bent tubing through strap. Fasten each wood strip to the table as you install them.

These wood strips are only installed one time as the first tube is bent and they are very important. They hold the bent tubing in alignment to the bender, without them your hoop section will resemble a cork screw (not desirable for greenhouses) adding the small end lever bar into the tube when needed as you near the end of the tube being bend, (the last 12 to 16 inches), be sure that the last pull, at the connection point where the lever bar slides onto tubing makes contact with the bender itself about 5 inches before you reach the end of bender. A slight raised ridge can be felt or seen on the outside curve 3 1/4 "from the end. You have just completed one side section of the hoop. Some people may need a second person

on the out put side to help insure the bent portion remains on the 1x2 wood strips between bending strokes.

Now let's do the other side section with the large painted end. Look down the length of the tubing as you would when checking the straightness of a wood 2x4. Look as you rotate the tubing to see if the small (unpainted) end is canted to one side slightly. Make a note of or mark the direction of this canted small end. Push the painted large end through the holding strap 4 inches. Then bend this tubing as you did for the first tubing. As you near the end of tubing (the last 12 to 16 inches), with large end of the lever bar slide over the small end of the tube, making sure that the connection junction of the tube and lever bar will contact bender about 5 inches before the end of the bender same as before.

HOWEVER AND THIS IS THE ONLY DIFFERENCE BETWEEN FINISHING OFF THE LARGE END AND FINISHING OFF THE SMALL END, AND IT IS VERY IMPORTANT THAT YOU FOLLOW THIS STEP. Pull the lever bar steadily and slowly around the bender when finishing off the bending at the small ends. As the lever bar nears the bender on this last pull you will feel a slight give in the lever bar. STOP, release pressure. Slide the lever bar back off of the small end of tube using your thumb feel of the shoulder of the small end along the inside of the curve.

You should feel a slight budge on the inside of the curve at the shoulder. If a slight budge is not present then slide lever back onto tube and bend a little more, always being on the alert and stopping when you feel any give in the tubing, stop and recheck for budge. When this budge is present you have bend the tubing as far as it can be bent, (It's Complete) do not bend more. Now both side sections are completed. The last (center) hoop section has no painted ends because it connects to the two side sections. Bend the center section same as the side sections, except after bending the section all the way to one end, remove from bender, turn it 180 degrees (end for end) push it back thru the strap and finish off bending the other end as well.

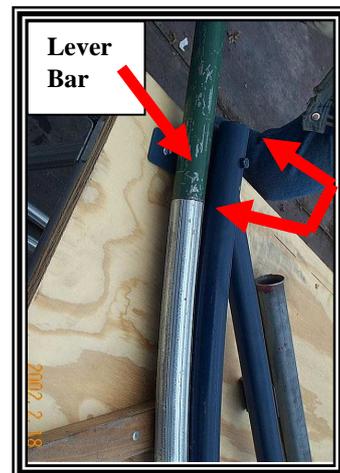
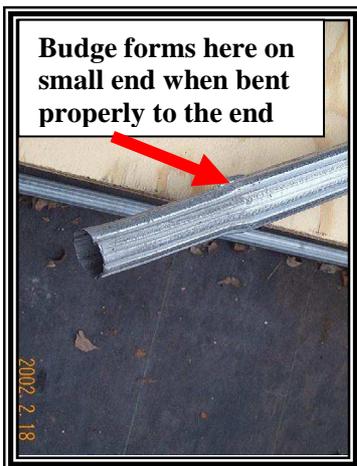
NOTE: If necessary both side sections can be inserted back into the bender and both of those painted ends can be finished off the same as the center section. This step can reduce the hoop width a little if needed.

Now you have successfully completed one complete bending one complete hoop. So now let's put it together. Choose a level spot of ground and place the two hoop halves flat with the two painted end pointing away from you, slide the two un-painted ends together and using a #10 X 3/4" tech (self drilling) screw secure the two halves together as shown below.

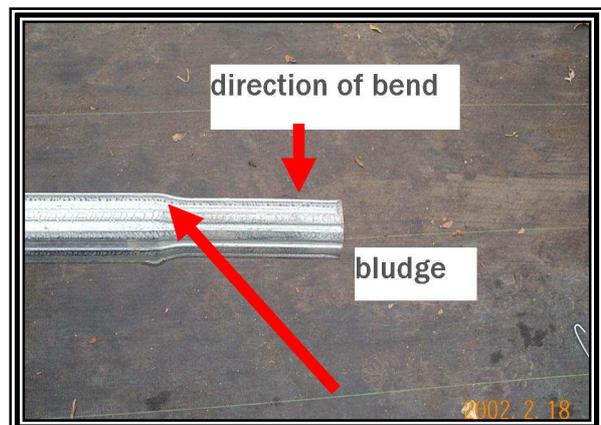
Here a wood block is used to support the two ends because the ground is un-level, it's not need if level ground is used.



Build the number of hoops you require and then refer to our separate basic hoop house instructions



Ridge forms here, when finishing off the large end of tubing. It is created by the tip of small end of lever bar inserted into large end of tubing and bending pressure brings the two into contact with the bender body.



In this photo the junction of the lever bar and tubing should have been here, another 4 inches further back onto the bender. However at all times the completion of a bend on any tube, the junction of the lever and tube being bent must end on the bender body not past the bender. The action in above photo will be ok but it's getting to close the end of bender.



Refer to pdf Basic Greenhouse construction for building your greenhouse found at the same location as these instructions www.hoopbenders.net then click on INSTRUCTIONS and choose Basic Greenhouse Construction pdf

