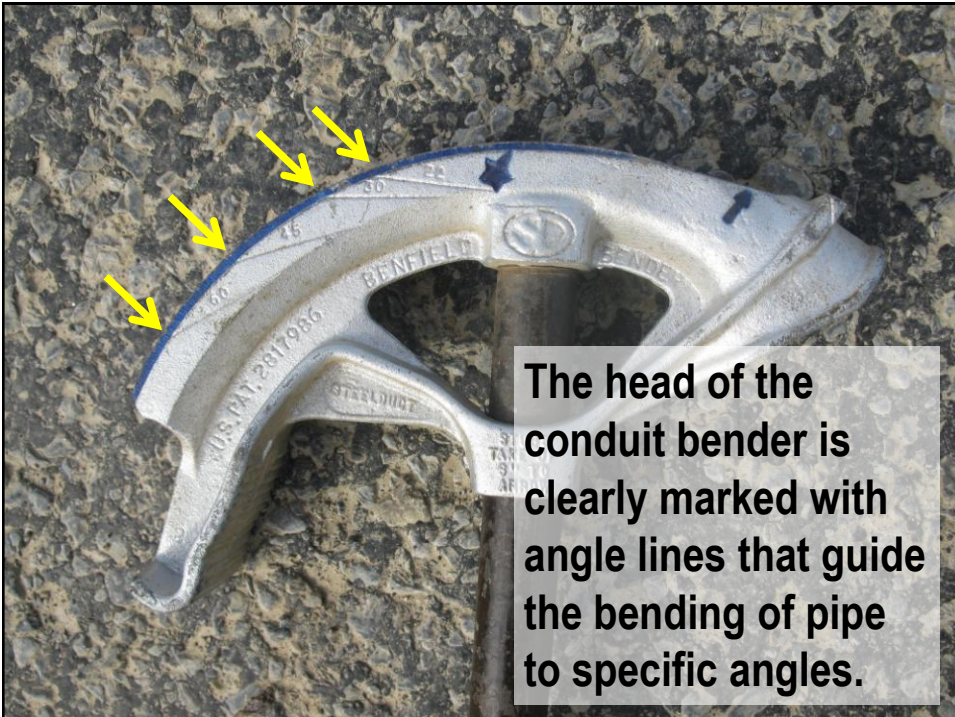


**Not quite low, not quite high ... let's call it mid.**  
**Photos taken and Guide prepared by the OSU Vegetable Production Systems Laboratory**



**Conduit benders can be purchased from most hardware stores.**

**A bender manufactured by Benfield is shown in this Guide.**



**The head of the conduit bender is clearly marked with angle lines that guide the bending of pipe to specific angles.**



Frames pictured in this Guide are made from 0.5 inch x 10 ft EMT conduit, available from a local retail outlet at a price of \$1.74/piece.



These frames can be made by one person but having a helper is best. Also, when using this method, the working surface must be smooth and firm. Layout a 10-ft section of pipe and tape measure side-by-side.

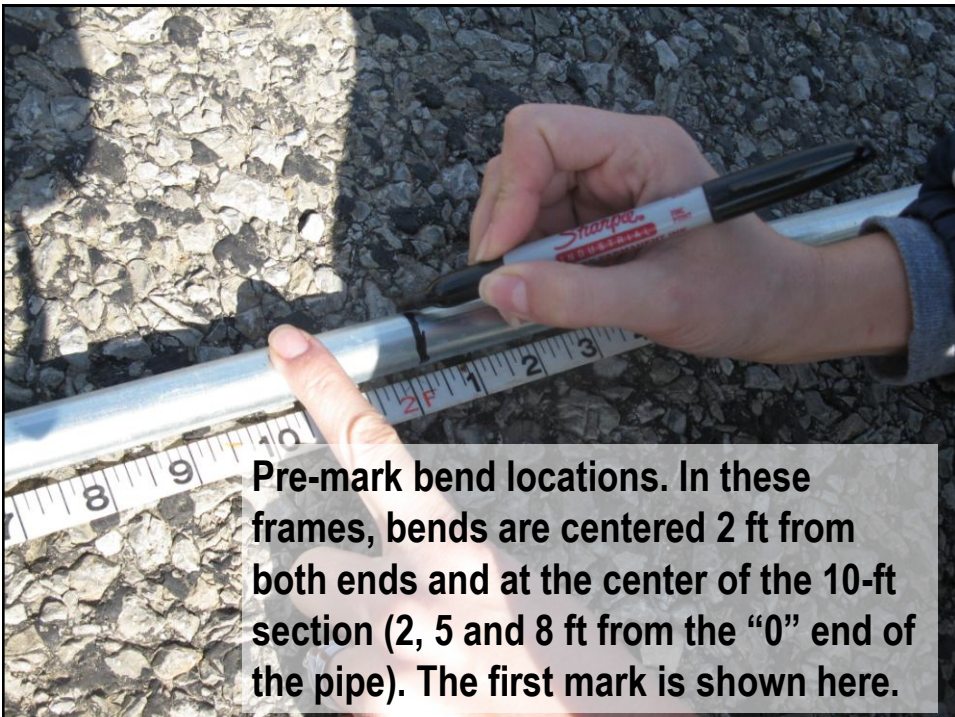


**“0” end**

**Make sure the end of the tape measure and pipe stay in place.**

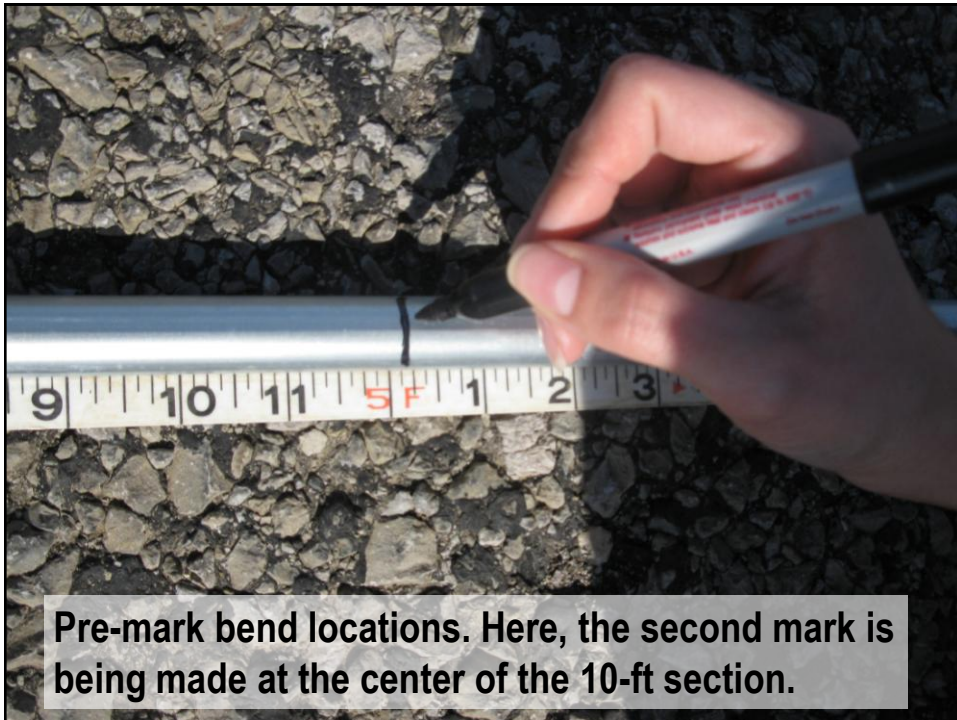


**“10” end**

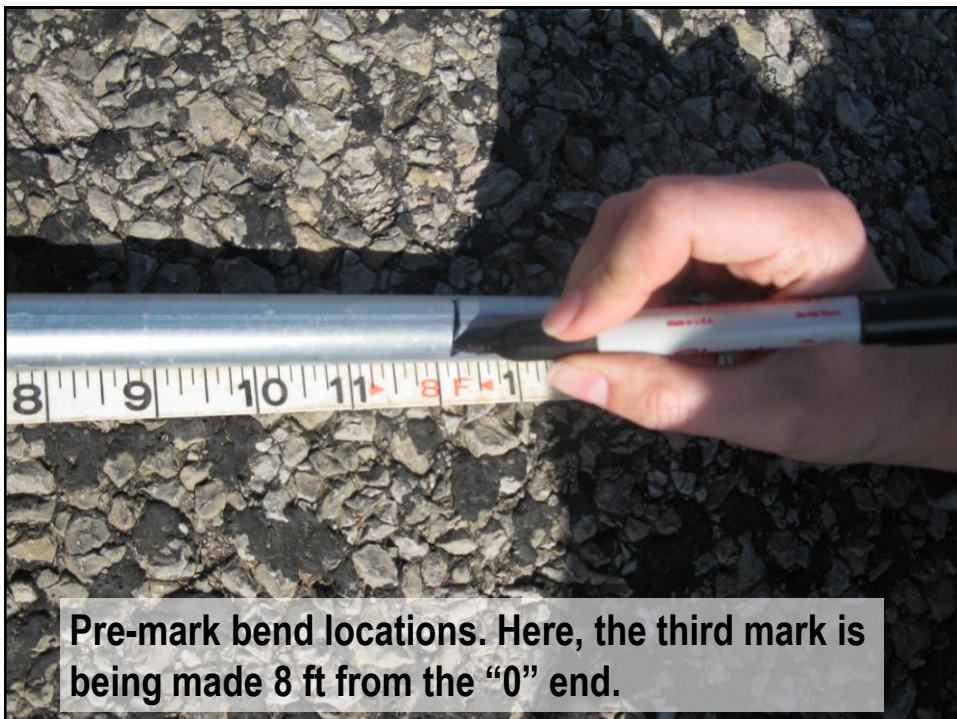


**Pre-mark bend locations. In these frames, bends are centered 2 ft from both ends and at the center of the 10-ft section (2, 5 and 8 ft from the “0” end of the pipe). The first mark is shown here.**



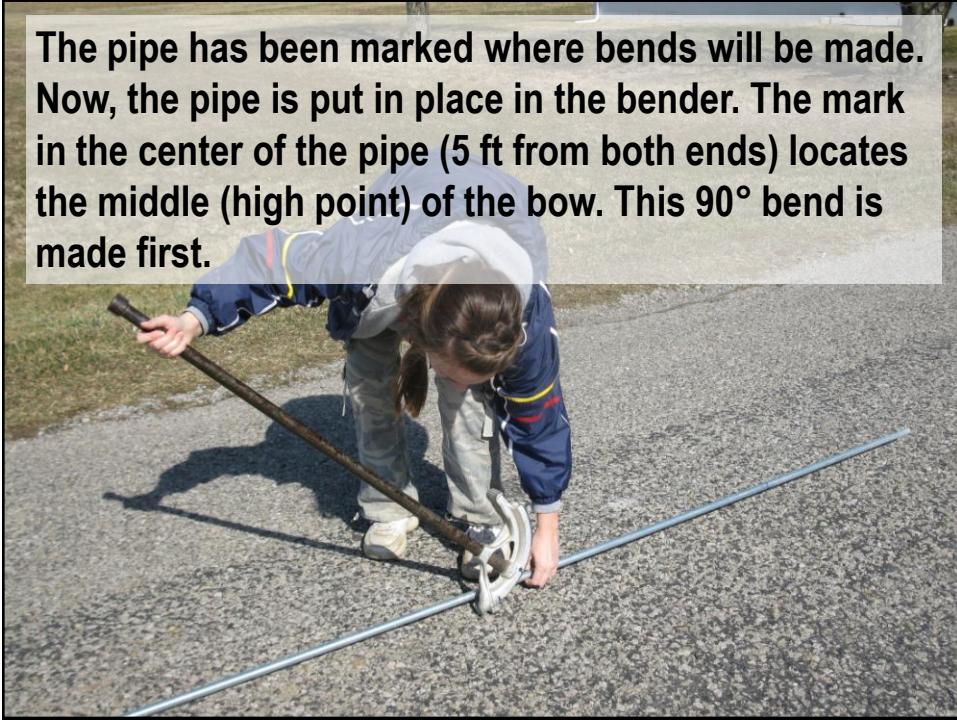


Pre-mark bend locations. Here, the second mark is being made at the center of the 10-ft section.

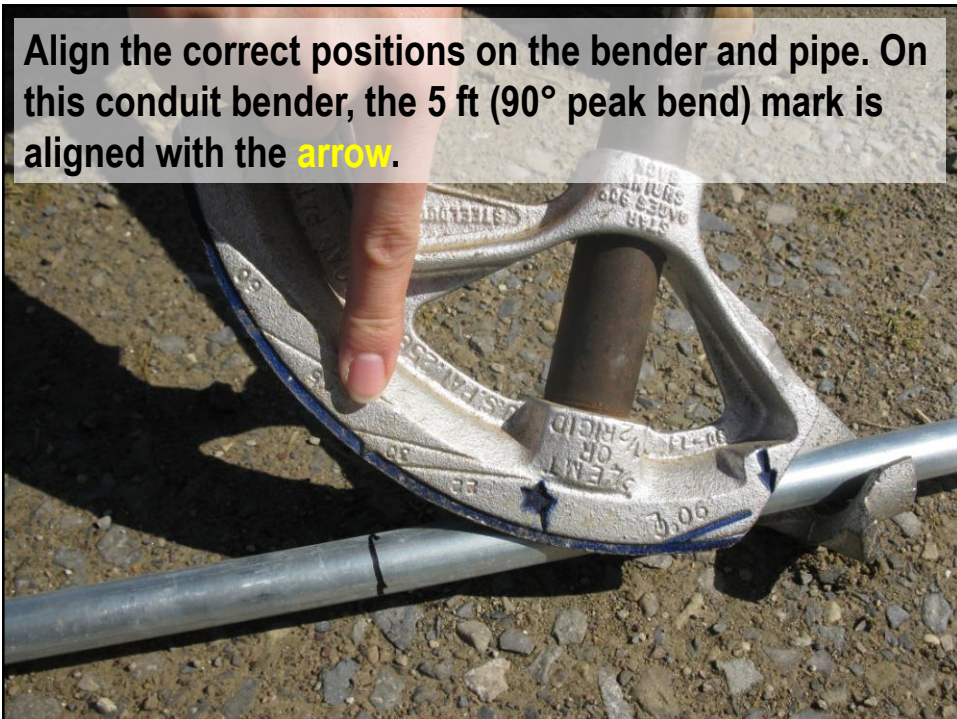


Pre-mark bend locations. Here, the third mark is being made 8 ft from the "0" end.

The pipe has been marked where bends will be made. Now, the pipe is put in place in the bender. The mark in the center of the pipe (5 ft from both ends) locates the middle (high point) of the bow. This 90° bend is made first.



Align the correct positions on the bender and pipe. On this conduit bender, the 5 ft (90° peak bend) mark is aligned with the **arrow**.





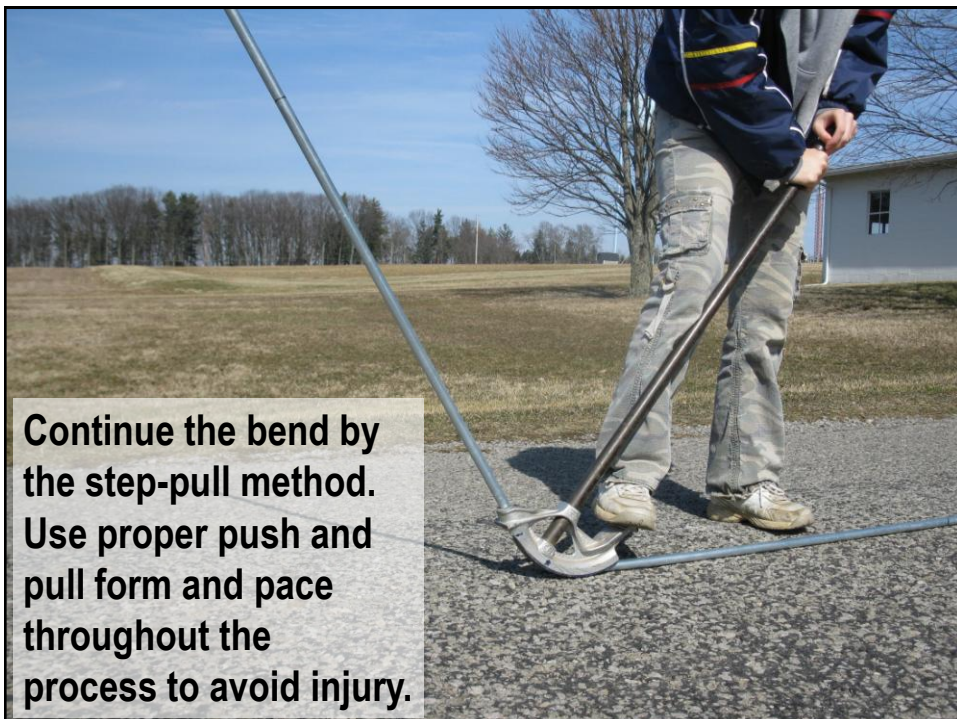
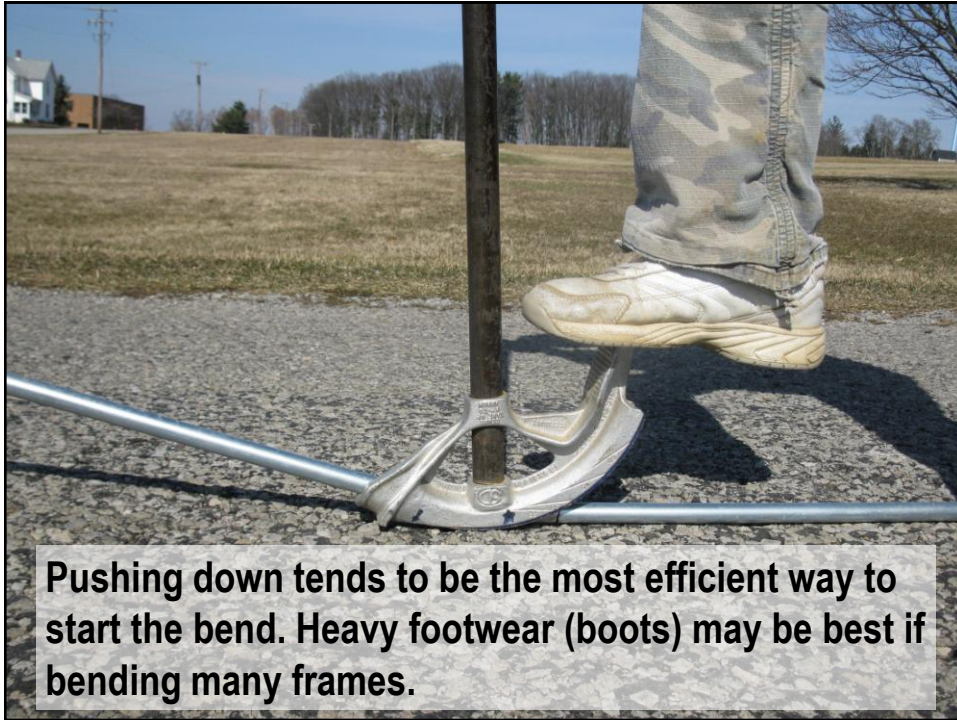


**Begin the bend with a step and pull on the bender.**

**Be careful! Use proper push and pull form and pace to avoid injury.**



**Continue the bend by the step-pull method. Use proper push and pull form and pace throughout the process to avoid injury.**





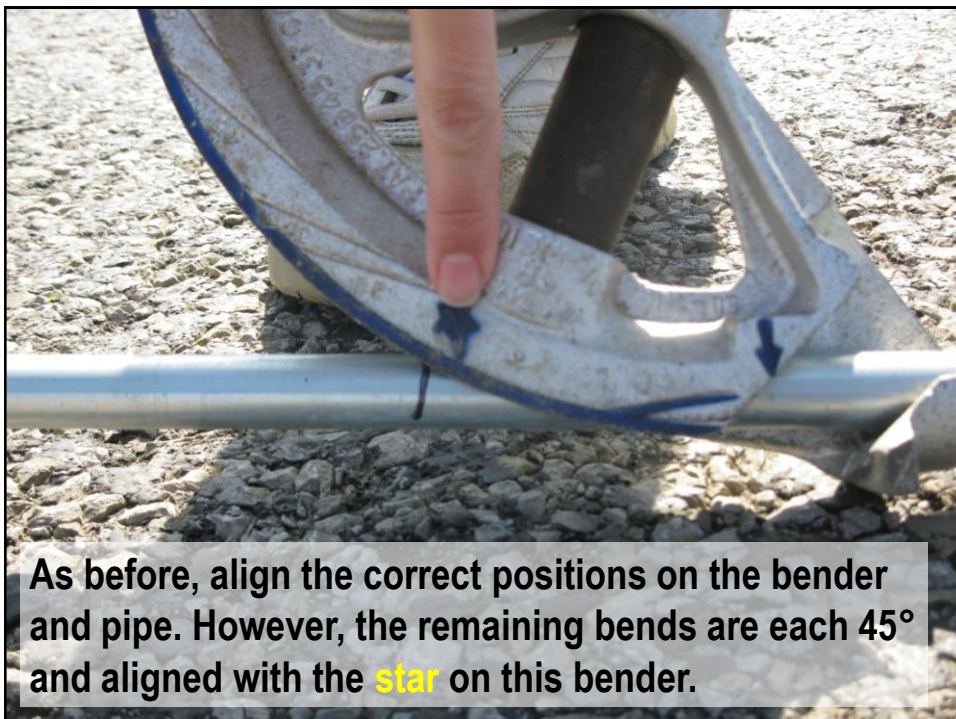
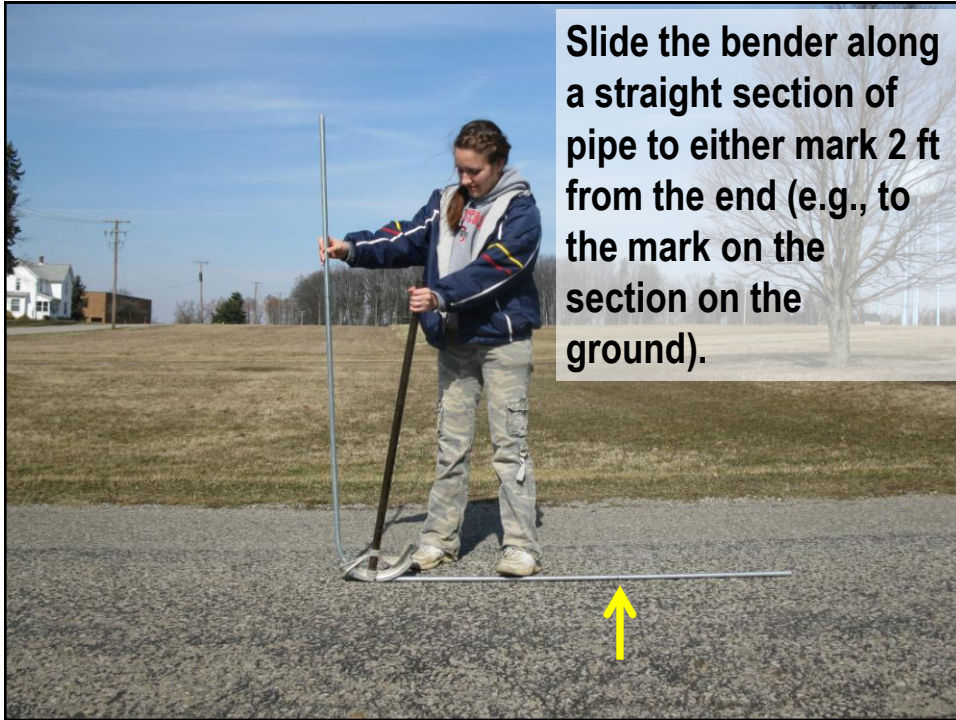
Complete the bend by stopping at the correct angle (in this case, 90°). The bar of the bender should be only slightly above the line that bisects the peak of the frame.



Conduit may 'spring' back slightly after being bent. Therefore, it may necessary to slightly over-bend to maintain a 90° bend.

The first and third marks (each 2 ft from opposite ends of the pipe) made at the beginning of the process are visible at the top-center and right-center of the image. Each locate where a 45° bend will be made to form the sidewall.



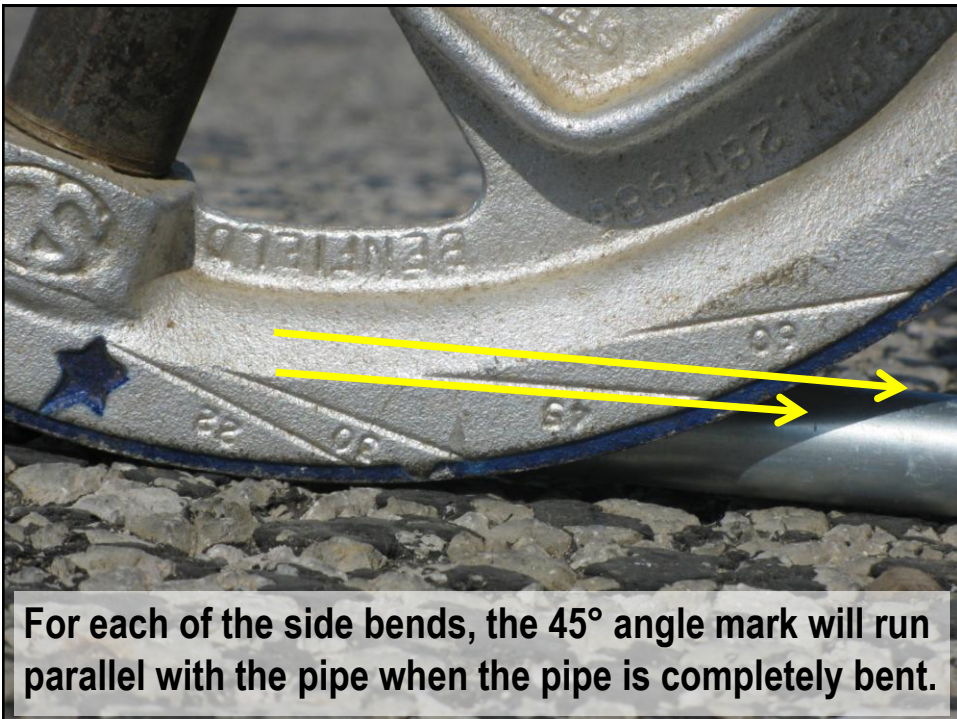




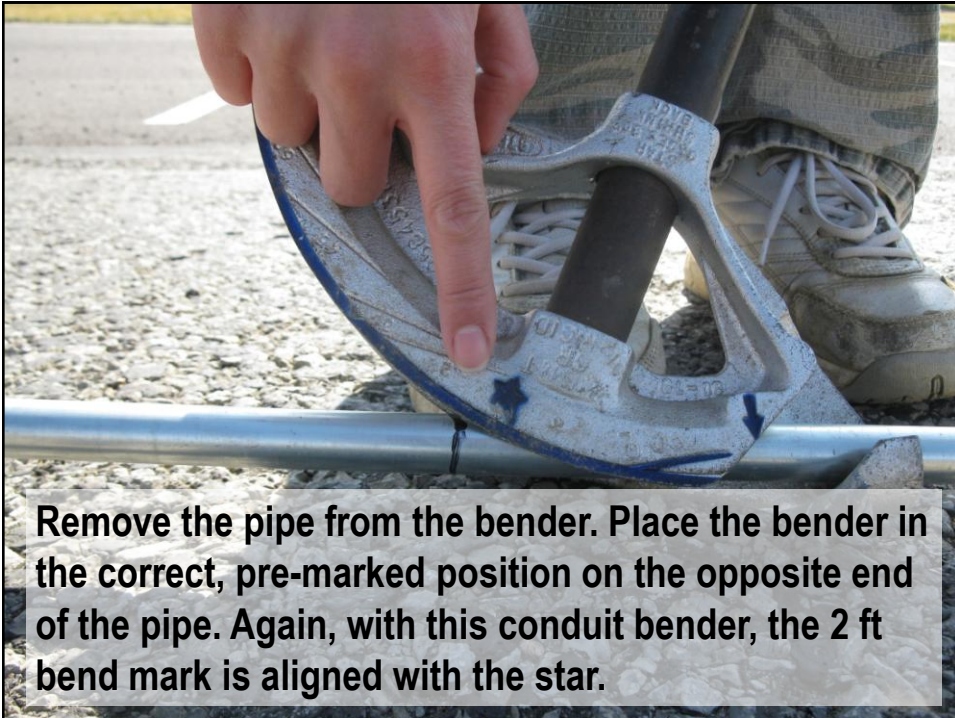
Repeat the step-pull method to complete the second bend. This bend will create one straight sidewall of the frame.



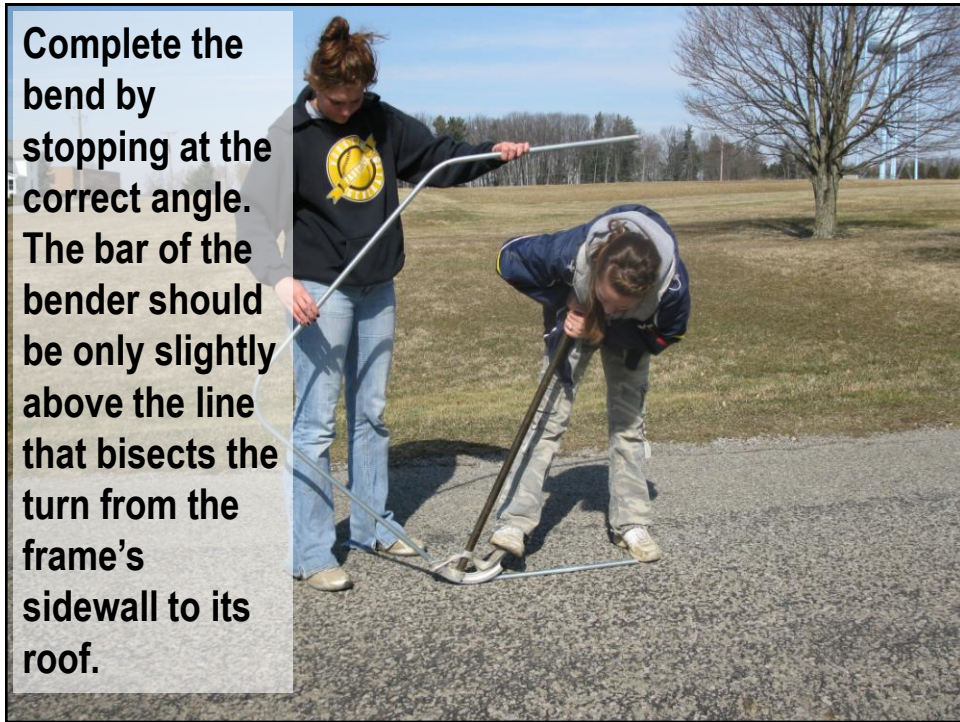
At this stage, having a partner helps ensure that bends remain aligned.

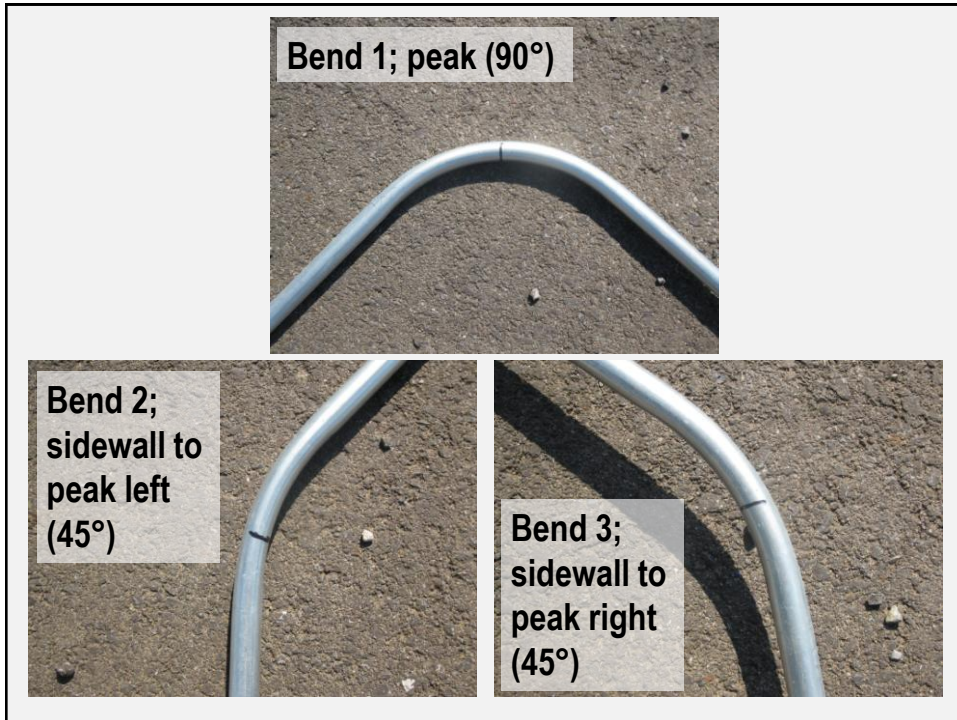


For each of the side bends, the 45° angle mark will run parallel with the pipe when the pipe is completely bent.













**Rebar is driven with a light sledge. Again, be careful and recruit help, if possible.**



**Rebar driven into the ground until approx. 1 foot remains exposed has been sufficient to support frames.**









**Frames can be installed and removed by one person but a team is better.**



**Frames are relatively easy on-easy off and portable.**



**The gothic-framed bows are wide enough to cover a standard raised bed common in vegetable production. Here, though, the bows will cover an unconventional growing system comprised of containers held on standard-size pallets.**

**Bows are in place and covering has begun. Here, 12-ft wide x 80 ft long sections of 6-mil greenhouse film are secured with cement blocks. Additional steps are required to secure the plastic where high wind and heavy snow is expected.**







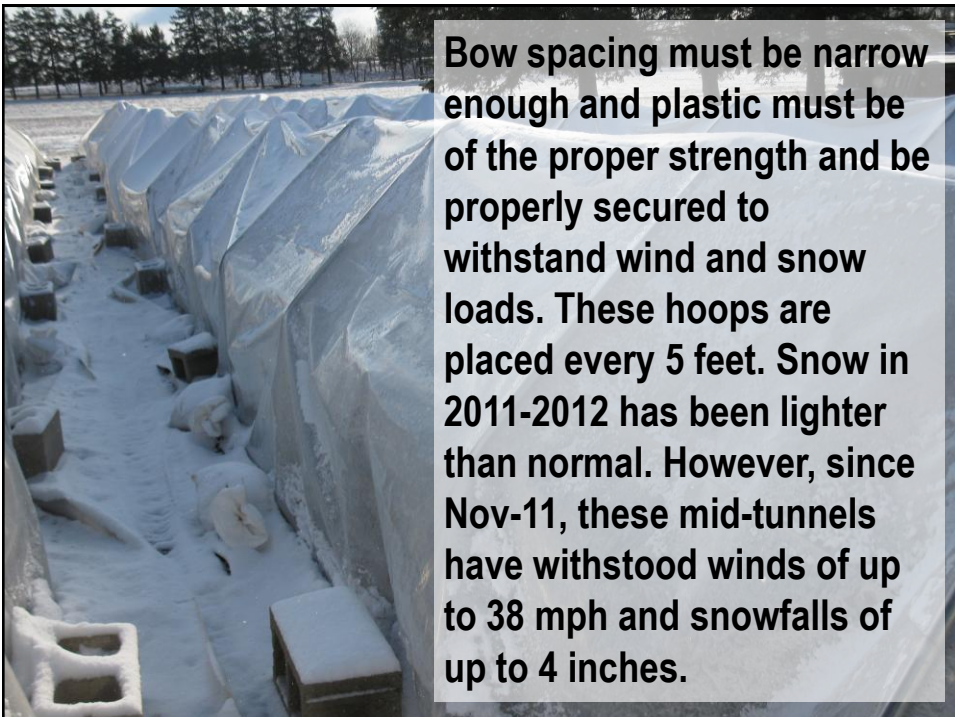
**Many hands make light work. However, covering low tunnels tends to be easier and more flexibly scheduled than covering a high tunnel.**



**Outdoor raised beds were initially covered with light, vented film over u-shaped bows in early fall. Here, the u-shaped bows are being replaced with gothic-framed bows which will be covered by heavier film and remain in place over-winter.**

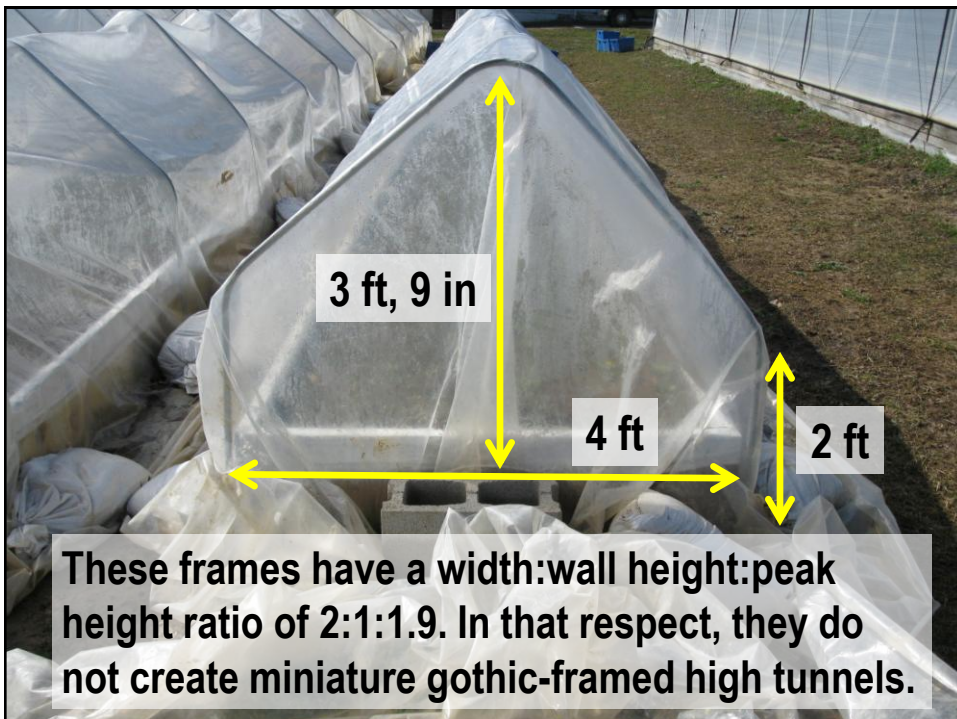
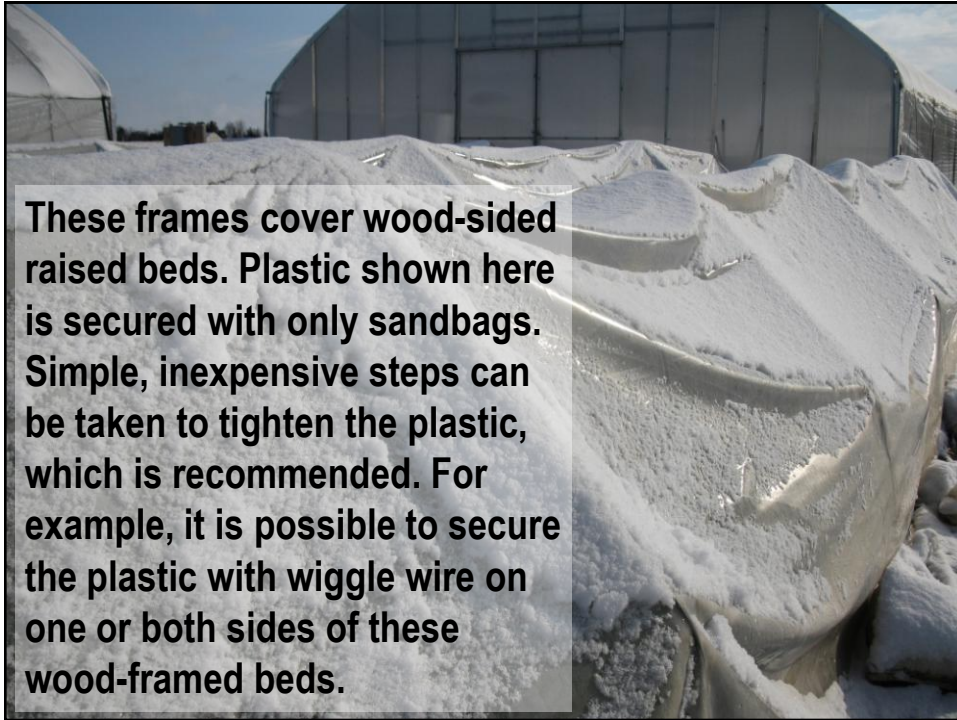


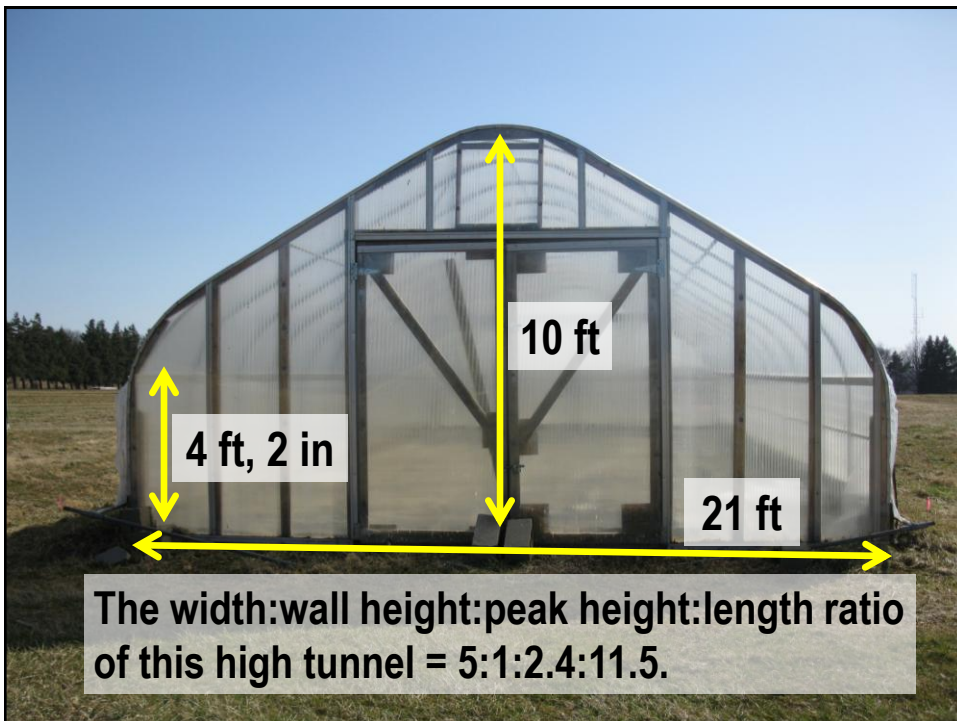
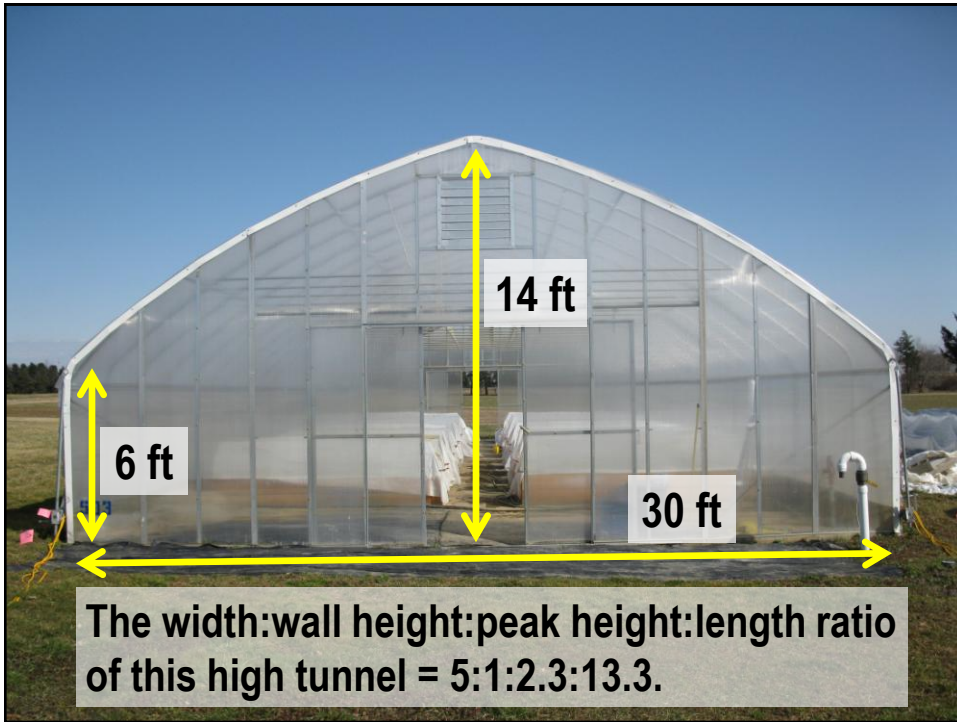
**Of course, u-shaped bows topped by light, vented film can remain in place over winter, covered by taller and wider gothic-framed bows topped by heavier film.**



**Bow spacing must be narrow enough and plastic must be of the proper strength and be properly secured to withstand wind and snow loads. These hoops are placed every 5 feet. Snow in 2011-2012 has been lighter than normal. However, since Nov-11, these mid-tunnels have withstood winds of up to 38 mph and snowfalls of up to 4 inches.**









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