Parker
FluidConnectors

"Principles of Tube Line Fabrication"

Bulletin 4306-B5
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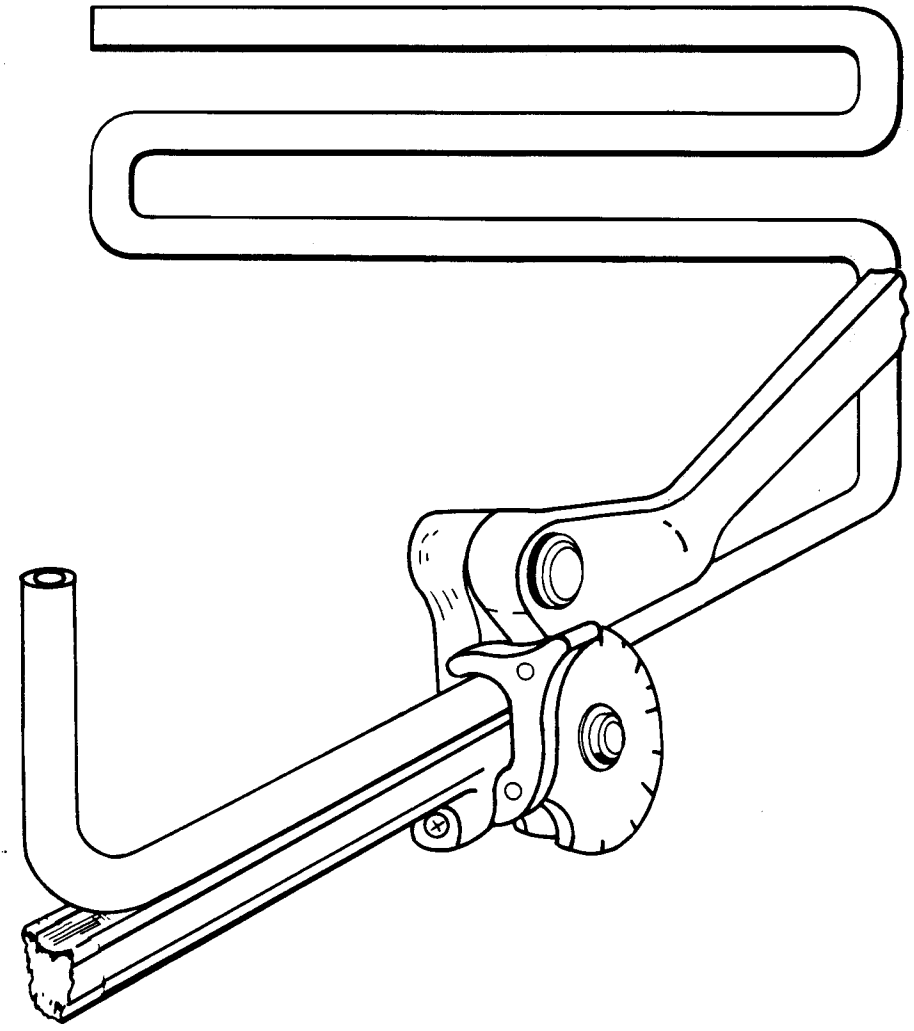

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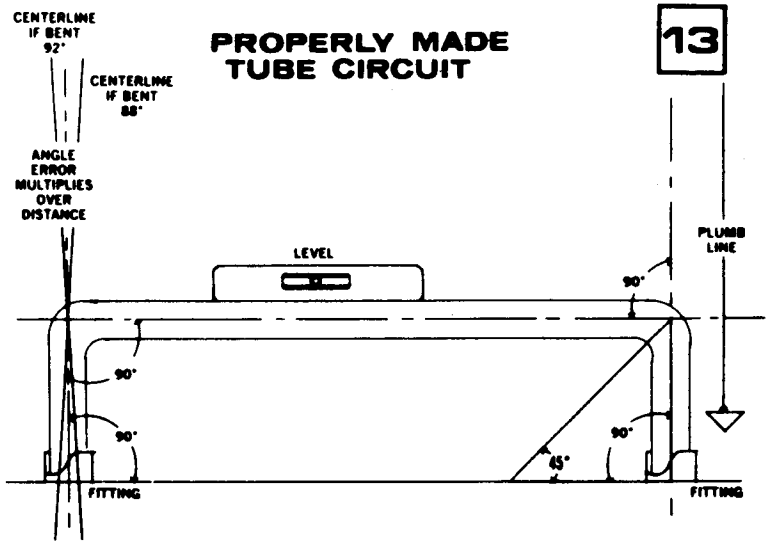
BEST WAY TO MEASURE

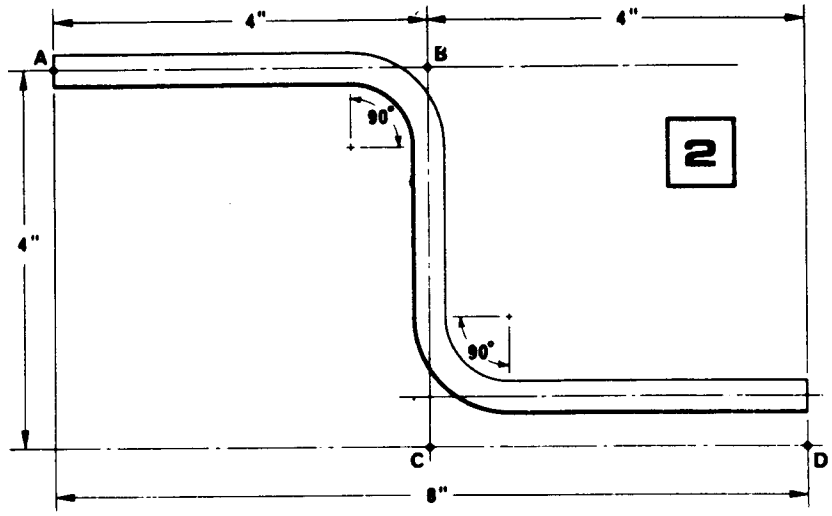
For maximum accuracy, measure and bend exactly for each individual bend in the tubing line. We recommend the practice of Measure and Bend, Measure and Bend, etc.

CHARACTERISTICS OF A WELL-MADE TUBING CIRCUIT

In a well-made tubing circuit or line, bends are accurate, measurement exact. The run is plumb, square and level. Tube ends rest firmly in the fittings and entry into the fittings is straight. Straight tube entry is very important to insure that fittings are not under stress and can be assembled without leaks. (Figure 12)

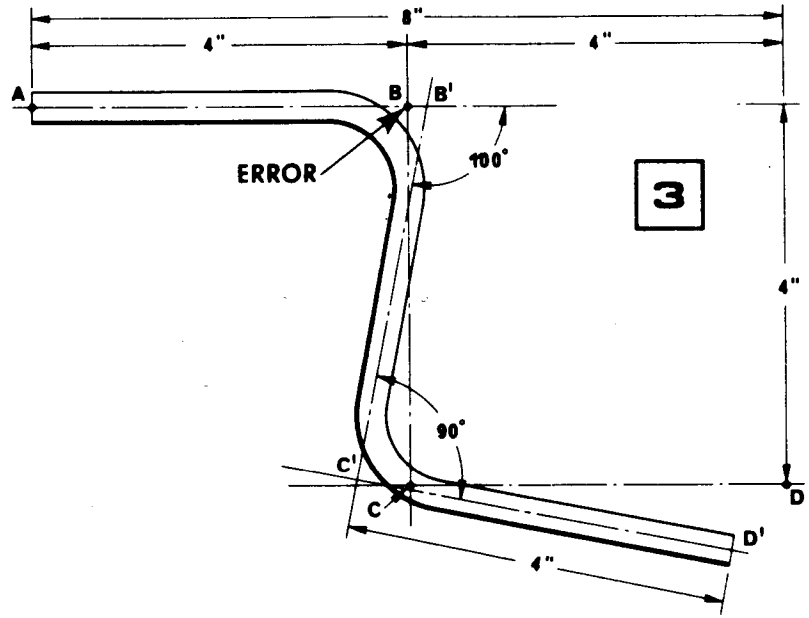
Remember too, that length magnifies bend angle errors. If the leg following the bend is fairly long, an error of 1° may result in the tube line missing the desired point completely.





Measuring error on second leg (B-C) results in tube line that can not fit at point (D).

ACCURATE BENDING is necessary to achieve the exact angles required for the tube line. If you do not bend accurately, the tube line will not fit. (Figure 3)



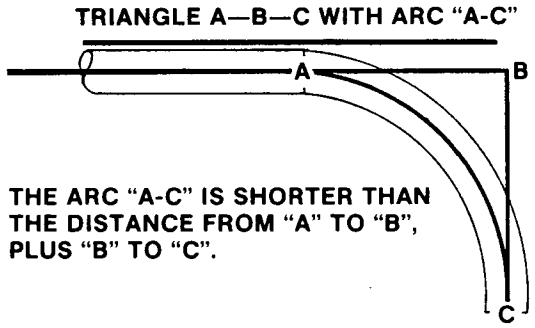
YOU MUST ALWAYS MEASURE EXACTLY AND BEND ACCURATELY.

Compensate for springback:

1. Test a piece of the material before you start fabricating a line to see how much it springs back on a 90° bend.
2. Overbend by the amount of springback. For example, if the material springs back 3° on a 90° bend, bend to 93° to secure a finished 90° bend, or to 46½° to obtain finished 45° bend.
3. Remember, it is always better to underbend slightly. You can always bend a little more if needed, but it's almost impossible to remove or straighten a bend, especially with large-heavy wall tubing.

TUBE STRETCH OR PICKUP

When bent, tubing seems to stretch or pick up length. This is because it takes a curved shortcut across the inside of the angle. A good "rule of thumb" for most standard tubing materials and radius blocks is that the tubing will stretch approximately one tube diameter for each 90° of bend.



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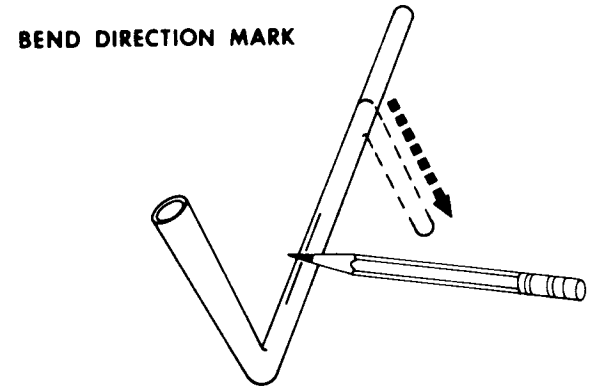
Always try to bend in the same direction -- away from the original starting end. If you reverse the direction of bending (bending towards instead of away from the original starting end) you will "trap" the stretch. Thus, if you unknowingly make a reverse bend of 90°'s, you will trap approximately one tube O.D. and increase your length between bends by that amount.

If bend direction must be reversed, subtract one tube O.D. from the measured length for a 90° bend or one-half the O.D. for a 45° bend.

KEEP TRACK OF CHANGES OF PLANE

Benders bend in only one direction. Changes in plane are accomplished by rotating the tubing in the bender. To insure that the tubing is correctly placed for the desired change in plane, a reference mark on the tube is very helpful.



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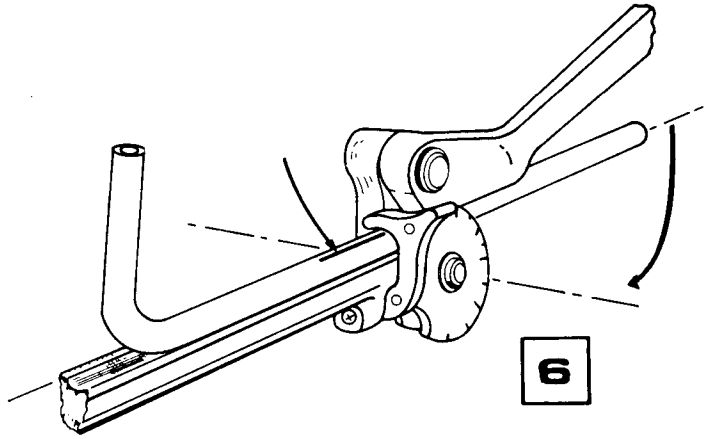
One method for keeping track of changes in plane is to use a longitudinal or lengthwise bend direction mark. (Figure 5) Put the mark on the side opposite the direction in which you wish to bend. When you put the tube in the bender, center the mark face up in the groove of the radius block. (Figure 6) This will insure that you bend in the correct direction. It also gives you a reference mark in case you must leave your work unfinished.



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