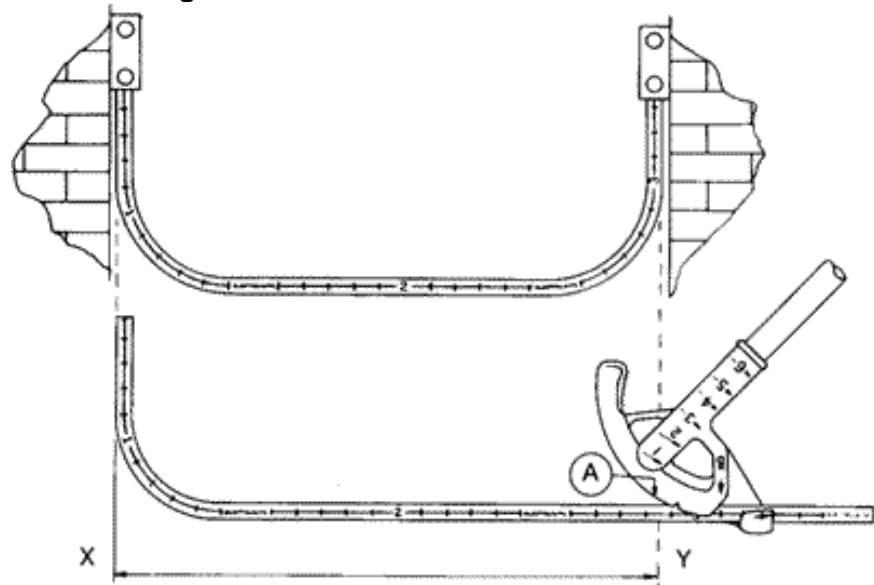


# Electrical Workshop

## PIPE BENDING VOCABULARY

**Back-To-Back:** Two ninety degree bends in one conduit, usually with both stubs turned up on the same plane forming a "U".



**Electrical Metallic Tubing (EMT):** conduit made to protect conductors and cables, also known as thinwall. Manufactured in 10' lengths, in sizes ranging from 1/2" to 4". EMT sizes 1/2", 3/4", 1", and 1 1/4" can be bent using a hand bender.

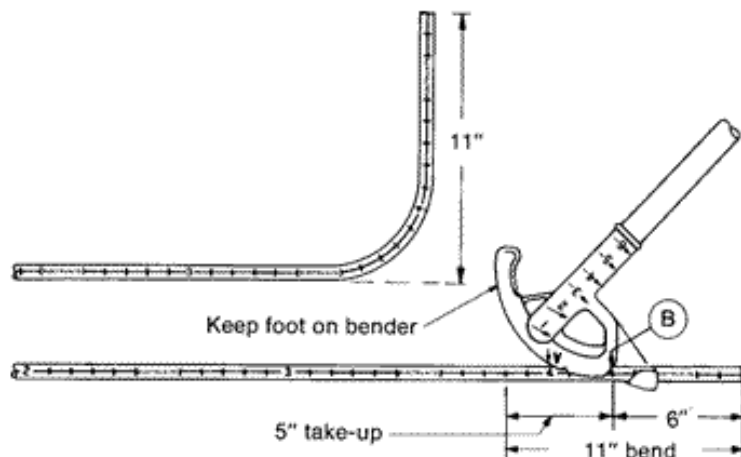
**Hand Benders:** Benders having a full shoe that the pipe is formed around. Used for hand bending EMT, IMC, and Rigid pipe.

**Gain:** The amount of pipe gained (saved) by bending on a radius and not at right angles.

**Kick:** A bend of less than 90 degrees placed in a conduit to change direction.

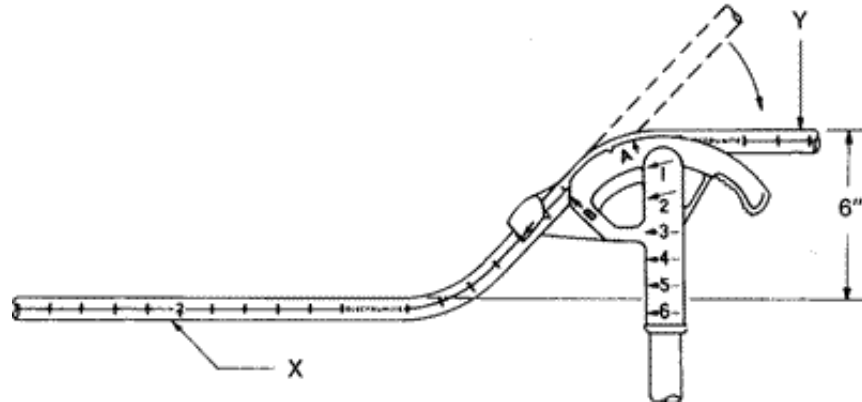
**Leg Length:** The longest part of a ninety degree bend.

**Ninety Degree Bend:** Any radius bend in a conduit that changes the direction of the pipe ninety degrees.



**O. D.:** Outside diameter of a pipe.

**Offset:** Two identical bends placed in a conduit to change direction or elevation of the pipe run.



**Radius:** The relative size of the bent portion of a pipe.

**Reference Point:** A mark used to locate the edge of an obstruction for bending saddles.

**Shrink:** The amount a conduit reduces in total length after an offset is bent.

**Stub:** The shortest part of a ninety degree bend.

**Take-Up:** The amount that must be subtracted from the desired stub length of a ninety degree bend to ensure that the bend is accurate.

## Instructions for 90 Degree Bends

For a ninety degree bend to be accurate, you must calculate take-up into your measurement. Take-up is a constant, and changes only with pipe size.

### Take-Up Table for Stubs

<u>Pipe Size</u>	<u>Take-Up</u>
1/2" EMT	5"
3/4" EMT- 1/2" Rigid	6"
1" EMT- 3/4" Rigid	8"
1 1/4" EMT-1" Rigid	11"

To bend a ninety degree bend, you first determine your desired stub height. Then, you subtract the take-up for the size pipe that you are bending from the desired stub height and mark the pipe.

Example: You want to bend a 15" stub using 1/2" EMT. Because the take up for 1/2" EMT is 5", you will subtract 5" from 15"

$$15" - 5" = 10"$$

Then, using a tape measure, measure from the end of the pipe back 10". Mark the pipe at 10".



Next, align the mark that you have made with the arrow on the bender.



Being careful to keep the arrow at your mark, put the pipe and bender on the floor. With your foot, bend the pipe until it is bend ninety degrees. Use a torpedo level to check for accuracy.



## Pipe Bending Math Worksheet

**Directions: Use the constant take-up for  $\frac{1}{2}$ " ,  $\frac{3}{4}$ " , 1" , and  $1\frac{1}{4}$ " EMT to solve the following questions.**

1. If you are bending a 54" stub on a  $\frac{3}{4}$ " conduit how far from the end of the conduit will you put your bending mark?
2. If you put the arrow on the bender 22" from the end of a  $1\frac{1}{4}$ " conduit, what will the stub height be?
3. The conduit size is 1". The arrow mark is at 52". What will the stub height be?
4. You want to bend a  $26\frac{1}{2}$ " stub on a  $\frac{1}{2}$ " conduit. Where will you put your bending mark?

For the problems below, fill in the blanks with the correct answer.

You want to bend a  $19\frac{5}{8}$ " stub. Where will you mark your pipe when it bending:

5.  $\frac{1}{2}$ " EMT? \_\_\_\_\_
6.  $1\frac{1}{4}$ " EMT? \_\_\_\_\_
7. 1" EMT? \_\_\_\_\_

You want to bend a  $31\frac{3}{4}$ " stub. Where will you mark your pipe when it bending:

8.  $\frac{3}{4}$ " EMT? \_\_\_\_\_
9.  $\frac{1}{2}$ " EMT? \_\_\_\_\_
10.  $1\frac{1}{4}$ " EMT? \_\_\_\_\_

## Math Worksheet Answer Key

1. 48"
2. 33"
3. 60"
4.  $21\frac{1}{2}$ "
5.  $14\frac{5}{8}$ "
6.  $8\frac{5}{8}$ "
7.  $11\frac{5}{8}$ "
8.  $25\frac{3}{4}$ "
9.  $26\frac{3}{4}$ "
10.  $20\frac{3}{4}$ "



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