Conduit Bending Lab 1

Program: Electrician Technician

Course: EL130 Flexible Cables/Conduit Bending and Raceways

Objectives: Under the supervision of your instructor, you should be able to do the following:

After completing this lab, you will be able to:

- Properly bend ½" EMT pipe using the 90 degrees, offset, and kick bends, with a ½" EMT pipe bender.
- Determine which fittings are proper for different applications.
- Properly install and level ½" EMT pipe.

Lab Equipment:

- N/A

Required Tools:

- 1– Phillips screwdriver
- 1– Flat head screwdriver
- 1–Tape measure
- 1– Level
- 1– Conduit Fitting Reamer Screwdriver
- 1 – ½" EMT pipe bender
- 1 – Hacksaw
- 2 – Pairs of channel locks pliers

Materials:

- 1 – ½" EMT set screw connectors
- 1 – ½" EMT compression connectors
- 10' – ½" EMT Conduit
- 2 – ½" one-hole EMT straps
- 6 – Drywall screws
- 2 – 4/s metal boxes (no brackets)
- 1 – Pencil

Safety (PPE):

- Safety glasses/goggles
- Hard Hat

Resources:

- Reference the current Ugly's Book

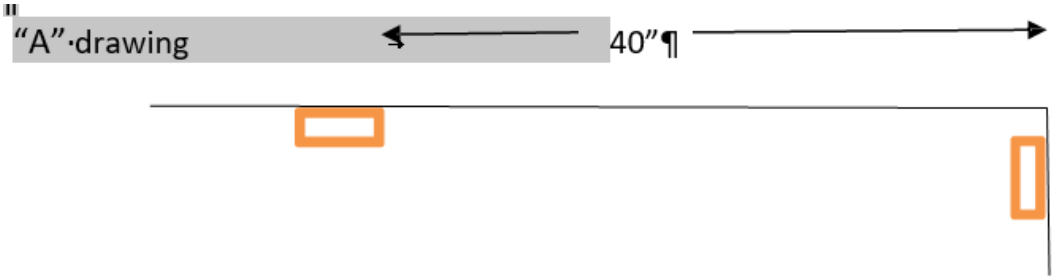
Required Time: 1 Day

Shop Maintenance:

- All work will cease 20 minutes prior to the end of class.
- All work areas must be cleaned.
- Tools and equipment must be cleaned and returned to the designated areas (cage, tool room, cabinets etc.)
- Any broken or missing tools must be reported immediately.
- Tools and equipment are students' responsibility

Procedures:

1. Install two 4/s metal boxes on the wall per Drawing "A". First box, install 30" higher than the second box and no less than 40" apart from the first box. Mount the second lower box within 3" of the corner.
2. Install one ½" EMT compression connector in the first box.
3. Install one ½" EMT set screw connector in the second box
4. Bend 90° in the EMT pipe to fit from one box to the other, using offsets to enter into the boxes.
5. Secure both connectors properly.
6. Practice each of the bends described in the steps below. (For Practice, cut one stick of pipe into three 40" pieces.)



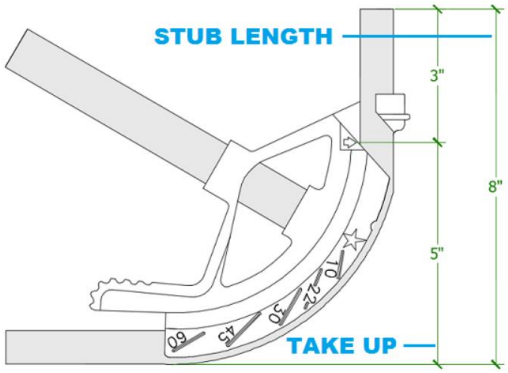
Important Definitions:

TAKE UP – This first thing you need to learn before bending a 90°. Take up is an amount of conduit length used to figure out where to place the marks on the conduit before the bend. Most hand benders have the take up stamped on the bender or on a sticker – usually on the bender handle. Find this first.

TAKE UP	
Conduit Size	Deduction
½"	5"
¾"	6"
1"	8"

STUB – A stub is the length you need for the conduit to reach and is measured from the back of the bend or backside of the conduit.

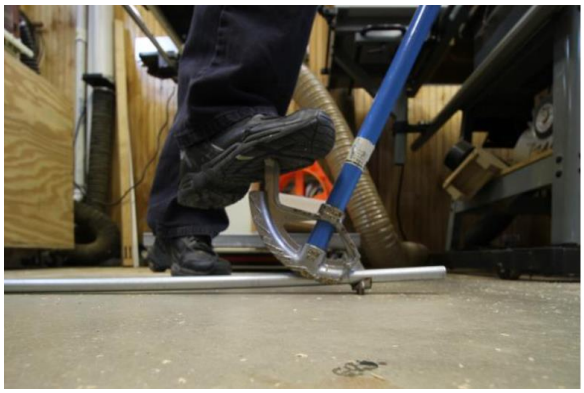
LEG – The remaining length of conduit minus the stub.



Step 1 – 90º bend

1. Measure how long you need the stub up length.
    - For this example, we'll use a stub up length of 8 inches (8"). Using the table above we know the take up for 1/2-inch EMT is 5 inches.
2. Subtract the take up from the stub up length and mark the conduit.
    - Stub length (8") minus take up (5") equals 3". Measure 3" from the end of the conduit and place a mark.
3. Insert the conduit into the bender hook and align the arrow on the bender with the mark on the conduit.
4. Place one foot on the conduit and the other foot onto the bender foot (by placing your foot on the conduit you'll prevent the conduit from slipping on the floor). Put a level on the upright part of the conduit and check for plumb. Grab the handle and use foot pressure on the bender foot and bend the conduit until it is just past being perpendicular with the floor. This is to allow for spring back. Spring back occurs when you release pressure on the bender – it's slight, but it's there.

5. Now check the bend with a level to make sure it's plumb (perfectly vertical). If your conduit bend isn't quite plumb, you can take the end of the bender handle and insert it over the stub. You'll need to either push or pull the handle depending on which way you need the stub to bend to make it plumb.



Step 2 – Kick

1. After bending the 90°, place the conduit on the ground, choose and mark a spot close to the 90° to add the kick.
2. Place the bender on the mark and place on the floor. Make sure the 90° is level to the ground and pointed in the right direction and take a measurement from floor to top of the conduit.
3. Most kicks are measured in inches and not degrees. Measure how much you want to raise the conduit and add it to the measurement from step #2 and bend slowly until you reach that measurement.

Step 3 – Offset

1. Measure the distance you need to offset the conduit. This will be the distance from where the conduit is currently and the difference of where the conduit needs to go, (the object you must account for).
2. For beginner purposes we are going to use 30° bends, there are other degrees that we will use in advanced classes.
3. Take the distance measured in step 1 and multiply it by two, (For example, let's say your measurement in step 1 was 3-1/2", multiply it by two and you have 7").
4. Measure from the point of origin of the conduit to the object you are adjusting the conduit for (this one will be 32"). Mark the conduit at 32", then subtract the amount of step 3 (7") and put your second mark on the conduit there (25").
5. Insert the pipe into the bender and align the 32" mark on the conduit with the arrow on the bender. Slowly bend the conduit until it lines up with the hash mark on the bender at 30°. Note: must be parallel with the line and not meeting the line.
6. Rotate the conduit 180° exactly and then slide the conduit forward until the second mark lines up with the arrow.
7. Making sure the conduit is still at 180°, slowly make a bend until it lines up parallel with the 30° line.
8. Install conduit in desired location.

OFFSET MULTIPLIERS

Bend Degree	Obstacle Multiplier
10 degree	x6
22.5 degree	x2.6
30 degree	x2
45 degree	x1.4
60 degree	x1.2