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Mastering Conduit

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Introduction

Electrical conduit serves as a protective raceway for wiring, shielding it from physical damage, weather, and harsh environmental conditions. There are several types of conduits, such as PVC, rigid metal, flexible conduit (flex), and EMT. Most electricians in the field will primarily work with EMT (Electrical Metallic Tubing).

EMT is a thin-walled steel pipe that ranges in size from ½ inch to 4 inches in diameter. The most common sizes you'll work with on the job are ½ inch, ¾ inch, and 1 inch, all of which can typically be bent with a standard hand bender. For 1¼ inch conduit, a hand bender can still be used, but it requires more leverage and skill.

When available, a smart bender is the preferred tool for conduit ranging from 1 inch to 2 inches, as it offers greater precision and reduces physical strain. For larger conduit 2½ inches up to 4 inches, you'll need a hydraulic or table bender, which provides the power necessary to bend heavy conduit accurately and safely.



Smart Benders

Modern electric benders, such as Smart Benders, are designed to provide precision and consistency when bending conduit. These machines are commonly used in commercial and industrial environments where repeatable, accurate bends are critical. One of the key features is the digital remote control, which allows the operator to control the bending process using push buttons. This remote enables you to select and control the bend angle with a high level of accuracy, reducing guesswork and minimizing errors.

The bender uses interchangeable dies (or shoes) that match different conduit types and sizes. Selecting the correct die is essential using the wrong one can deform or damage the conduit during the bend.

To begin a bend:

- The conduit is inserted into the machine and aligned with a designated start mark, which indicates where the bend should begin.
- A locking mechanism is then engaged by sliding it into place to secure the conduit.



Important:

If the conduit is not fully locked into position, the pressure from the bending process can cause it to kink or flatten, ruining the bend and the material. Proper setup is just as important as the bend itself.



Important:

If conduit is not locked in correctly in securing mechanism, it can kink or flatten.



Table Benders

Table benders are used for larger conduit sizes that require more force than handheld or standard electric benders can provide. These are typically mounted units designed for stability and leverage.

Unlike smart benders, table benders are often:

- Manually operated (using mechanical leverage).
- Hydraulically assisted with added bending power.

They are ideal for bending rigid conduit such as:

- Rigid Metal Conduit (RMC).
- Intermediate Metal Conduit (IMC).
- Larger EMT sizes.

The conduit is placed into a fixed bending shoe, and the operator applies force either manually or hydraulically to form the bend.

Because these benders handle larger material:

- Proper positioning is critical.
- Force must be applied smoothly.
- Incorrect setup can lead to flat spots or uneven bends.

Table benders are commonly used on job sites where large conduit runs are required, such as in industrial facilities, utility work, or large commercial buildings.

Table Bender



How to Use a Handheld Conduit Bender.

Bending Basics

Conduit bending is not as hard as it looks. It just requires accurate bends that will look good where you install the pipe. Always pull measurements of the environment to ensure it looks aesthetically pleasing. There's nothing worse than a pipe bent into all sorts of random angles. Dog legs are a perfect example of this. They can result from two angles in an offset not lining up.

Offsets

Offsets are created when two equal angles are applied at different locations on a stick of pipe. The most frequently used angles are 22-degree, 30 degree, and 45-degree. Each of these angles has a set multiplier due to the shrinkage of conduit when it is bent. You will need to measure how large of an offset you want and then apply the multiplier to this number.

Angles and multipliers:

22 degrees: 2.6

30 degrees: 2

45 degrees: 1.4

Bending a 90-degree angle is not difficult. You just stick your level on the conduit and apply steady pressure on the pipe bender until one end is plum straight up and down. When you bend a 90-degree angle it also deducts the length of pipe too.

90 Degree Take Up Chart:

1/2inch pipe: 5inches

3/4inch pipe: 6inches

1inch: 8inches

When using a hand bender, the arrow and the star are reference marks that help you place your conduit correctly before making a bend. Knowing when to use each one is critical for accurate layouts in the field.

The Arrow (Start of Bend)

The arrow is the most used mark on a hand bender.

- It represents the start point of the bend
- You line your measurement mark on the conduit directly with the arrow

Used for:

Stub-ups (90° bends from the end of a pipe), Offsets, Saddles

The Star (Back of 90°)

The star is used specifically for back-to-back 90° bends.

- It represents the back of a completed 90° bend
- You align the back edge of your first 90° bend with the star

