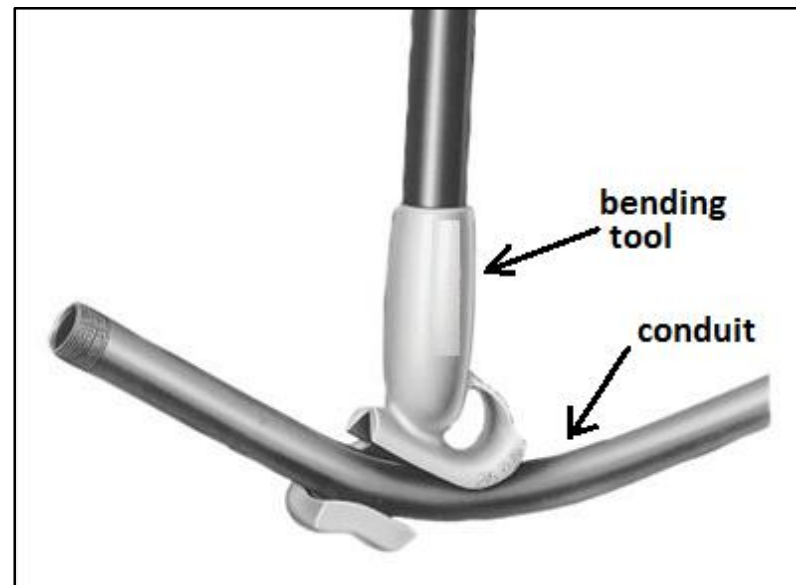
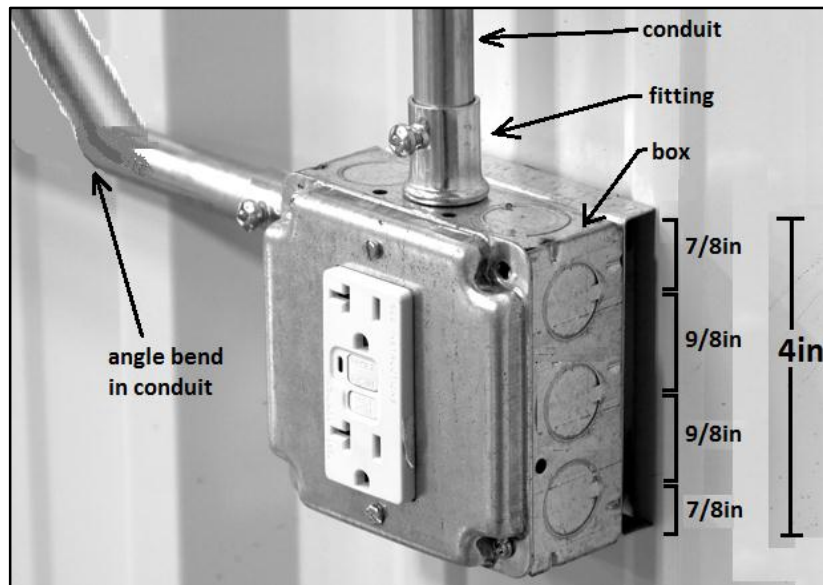


What's behind your wall? The results may be shocking...

Behind every electrical outlet, light switch, connected smoke detector, wall/ceiling lamp, ceiling/bathroom fan, thermostat, etc., there is an *electrical utility box*. The wires that come to any such hardware are connected inside these thick metal electric boxes required by code in order to inhibit electrical fire. The wires travel from box to box through metal piping called *conduit*. There is a special bending tool that can bend any conduit up to 90° to line it up with its target box. The boxes are 4x4 inches, and have 3 half-inch diameter holes on each side. The dimensions showing the distance from the edge to the center and from the center to the center of each hole is given in the diagram.

Rules:

- 1) Every electric box must have at least one conduit attached to it. I can go to any of its holes.
- 2) Boxes must be connected with one solid piece of conduit (no pieces).
- 3) The conduit must go to the hole of the box straight (not on an angle)
- 4) The conduit can only be bent no less than 2 inches from the end where it goes into the box.
- 5) The conduit reaches exactly to the surface of the conduit box by its hole, not inside. There is a special fitting that holds it in place.



In a remodeling project, the outer wall was removed in order to redo the conduits and wiring. The live wires that supply the power to all the boxes are coming in to the top left box. The conduit between these six boxes was removed and needs to be replaced in such a way that all boxes have a connection to the live wires. Your job is to determine 1) an arrangement of conduit that connects to all six boxes using as little conduit pipe as possible 2) the total length of conduit 3) the angles at each bend so that electricians can be told how exactly how to install the conduit. If the lower left corner is a  $(0, 0)$ , then the boxes have the following coordinates in feet  $(1, 7)$ ,  $(1.5, .5)$ ,  $(5, 5)$ ,  $(9, .5)$ ,  $(9.5, 5)$ ,  $(10, 7)$ .

