Plumber (General) Assistant

Reference ID: PSC/Q 0102

(Participant's Guide)

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Unit 1 – Introduction to Plumbing

Unit 2 – Assist in Installation/Service of Basic Sanitary Fixtures, Fittings, Related Piping and Accessories

Unit 2 - Assist in Installation/Service of Basic Sanitary Fixtures, Fittings, Related Piping and Accessories

Learning Objectives:

- Understand and learn about installation of sanitary fixtures, fittings, pipes & accessories
- Understand and learn about GI pipes
- Understand and learn about procedure for pipe bending
- Understand and learn about procedure for connection of metal Tap
- Understand and learn about procedure for connection of gate valve (metal)
- Understand and learn about procedure for connecting pipes using hot water joints
- Understand and learn about procedure for tap & gate valve (metal) servicing
- Understand and learn about plastic pipes
- Understand and learn about procedure for connection of plastic tap
- Understand and learn about procedure for connection of gate valve (plastic)
- Understand and learn about procedure for connecting pipes using hot water joints (plastic)
- Understand and learn about procedure for tap & gate valve (plastic) servicing
- Differentiate between plastic and metal joints
- Understand and learn about procedure for connecting geyser
- Understand and learn about procedure for connecting washing machine
- Understand and learn about blue print reading
- Understand and learn about procedure for fixing bathroom fittings

Installation of Sanitary Fixtures, Fittings, Pipes & Accessories

A plumber's job requires installation of sanitary/bath fittings in homes, offices or any premises and involves the following steps:

1. Pre-Installation

- Understand the task to be done
- Assemble pipe sections, tubing and fittings, using couplings, clamps, screws, bolts, caulking tools, or cutting, threading and joining equipment
- Establish the sequence of pipe installations
- Plan installation around obstructions such as electrical wiring, etc.
- Locate and mark the position of pipe installations, connections, passage holes, and fixtures in structures, using measuring instruments such as rulers and levels

2. Installation

- Cut openings in structures to accommodate pipes and pipe fittings, using hand and power tools (if required)
- Measure, cut, thread, and bend pipe to required angle, using hand and power tools or equipment such as cutting, threading and bending equipment
- Hang steel supports from ceiling joists to hold pipes in place (if required)
- Install pipe assemblies, fittings, valves, appliances such as dishwashers and water heaters, and fixtures such as sinks and toilets, using hand and power tools

3. Productivity & Quality of output

- Test the joints and fixtures for proper functioning
- Clear the work area and waste disposal

Introduction to GI Pipes

In the early 20th century, galvanized piping replaced cast iron and lead in cold-water plumbing. Typically, galvanized piping rusts from the inside out, building up plaques on the inside of the piping, causing both water pressure problems and eventual pipe failure. These plaques can flake off, leading to visible impurities in water and a slight metallic taste.

The life expectancy of such piping is about 70 years, but it may vary by region to region due to impurities in the water supply and the proximity of electrical grids for which interior piping acts as a pathway (the flow of electricity can accelerate chemical corrosion).

Pipe longevity also depends on the thickness of zinc in the original galvanization, which ranges from G40 to G210, and whether the pipe was galvanized on both the inside and outside, or just the outside.

Types of GI Pipes

GI (Galvanized Iron) pipes are classified into 3 grades based on their weight per meter and diameter. According the IS 1239, each pipe shall bear a colour strip across the circumference for identifying the “class” of the GI pipes

Light - Class A

These are light gauge pipes which bear a yellow colour strip for identification. They are cheaper than other classes of GI pipes

Medium - Class B

These are medium gauge pipes which bear a blue colour strip for identification. They are costlier than Class A and cheaper than class C

Heavy - Class C

These are heavy gauge pipes which bear a red colour strip for identification. They are costlier than other classes of the GI Pipes

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Making of L joints, U joints & T joints (GI Pipes)

The L joint , U joint and T joint using GI pipes are made for flow of water from overhead tank to usage places kitchen, bathroom, sink etc.

To make leakage proof joints using GI pipes, we need following materials:

- Pipe threader
- L-bow & T-bow
- Silicon sealant
- Teflon tape
- Tool holder/ bench vice
- Hacksaw frame

Pipe Threader

L-bow & T-bow

Silicon Sealant

Teflon Tape

Tool Holder / Bench Vice

Hacksaw Frame

Activity: Making of L joints, U joints & T joints (GI Pipes)

Procedure:

- Take 3 pieces of GI pipes and make thread on both the sides using hand threader.
- Role Teflon tape over the threading and apply silicon sealant in and over the Teflon tape rolling.
- Fix the pipe to tool holder or bench vice
- Take a GI L-bow with inner threading and tighten it over the pipe until it gets locked up.
- Take another pipe with same Teflon rolling over threading and tighten it to another opening of L-bow

Note:

- To make U joint make use of 2 L-bows and to make T joint make use to T-bow.
- T joint is used split single stream in to two.

Pipe Bending

How to Bend Pipe without a Pipe Bender:

Suppose you have some pipe that needs to be bent but you don't have a pipe bender.

This instruction will show you how to do it using sand and some creativity.

The pipe shown here is 4130 steel - 3/4" in diameter with a wall thickness of 0.035".

The point of using sand is to support the pipe (keep it round) so that it does not buckle when bent.

Plan ahead - the end closest to the bend will likely have to be cut off and discarded.

Step 1: Pack your Pipe

The first thing to do is to plug one end of the pipe. Here a small carriage bolt is used that fit snugly in the end.

The next step is to fill the pipe with sand. The sand should be nice and compact to stop the pipe from buckling. You can use a rod to tamp the sand. Tapping (bouncing) the pipe on a concrete paving stone will also help.

Step 2: Bend

Clamp one end to a form. Here I use a planter then add a rounded block to get a tighter radius.

You will likely need a lot of leverage to bend the pipe. This piece is 4 feet long and it will take some muscle power also to get the bend as required.

Step 3: Finish it up

Cut the deformed end off. Clean out the sand. You can use a piece of string with a rag on the end to get all the sand out.

The picture shows the slight dimple in the center of the bend. Unfortunately the method is not perfect but, it works. You can heat up the pipe with a torch before bending it to soften the metal and get a cleaner bend.

How to Bend Pipe using Bending Tools:

Three Methods:

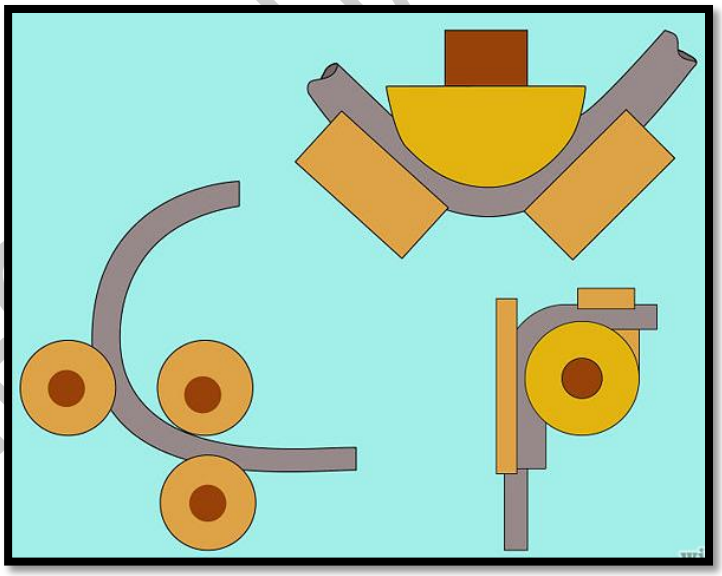
1. Selecting a Bending Tool
2. Making a Right Angle Bend
3. Making Multiple Bends

You can bend pipe and tubing using one of several methods, depending on what you plan to use the bent pipe or tube for. The problem in bending pipe is figuring out where and how much to bend the pipe.

While many bending tools come with a set of instructions for figuring out such things as bend allowances and bend deductions, they are often written in a complex manner and assume for having knowledge of mathematics that intimidates many users. While it's not possible to completely eliminate the math, it is possible to plan how to bend a piece of pipe in such a way that figuring the bending angle is simplified and so that the only math needed is simple arithmetic. The method described below is not simple, but with practice, you can master it.

Method 1: Selecting a Bending Tool

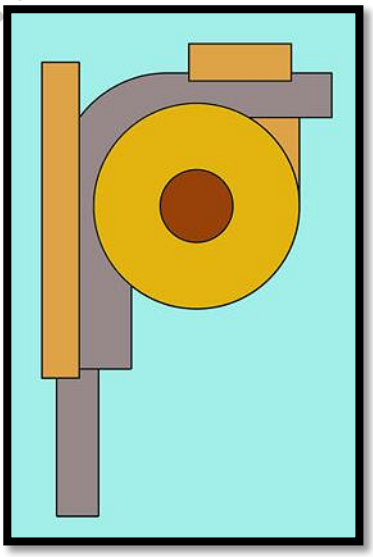
Choose the right bending tools for your needs. There are 6 main bending methods. Each is best suited to a particular type of pipe.



- **Ram style bending also called incremental bending**, is usually used for putting large bends in light-gauge metal, such as electrical conduit. In this method, the pipe is held down at 2 external points and the ram pushes on the pipe at its central axis to bend it. Bends tend to deform into an oval shape at both the inside and outside of the bend.
- **Rotary draw bending** is used to bend pipe for use as handrails or ornamental iron, as well as car chassis, roll cages, and trailer frames, as well as heavier conduit. Rotary draw bending uses 2 dies: a stationary counter-bending die and a fixed radius die to form the

bend. It is used when the pipe needs to have a good finish and constant diameter throughout its length.

- **Mandrel bending** is used to make stock and custom exhaust pipes, dairy tubing, and heat exchanger tubing. In addition to the dies used in rotary draw bending, mandrel bending uses a flexible support that bends with the pipe or tubing to make sure the pipe interior isn't deformed.
- **Induction bending** heats the area to be bent with an electric coil, and then the pipe or tube is bent with dies similar to those used in rotary draw bending. The metal is immediately cooled with water to temper it. It produces tighter bends than straight rotary draw bending.
- **Roll bending**, also called cold bending, is used whenever large bends are necessary in the pipe or tubing, such as in awning supports, barbecue grill frames, or drum rolls, as well as in most construction work. Roll benders use 3 rolls on individual shafts to roll the pipe through as the top roller pushes down to bend the pipe. (Because the rolls are arranged in a triangle, this method is sometimes called pyramid bending.)
- **Hot bending**, in contrast, is used considerably in repair work. The metal is heated at the place where it is to be bent to soften it.

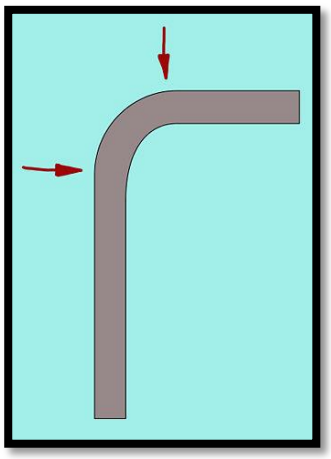


Method 2: Making a Right Angle Bend

Step 1:

Bend a test pipe at a 90-degree angle. Not only will this familiarize you with how much force you need to apply to operate your bender, but this pipe will serve as a reference for future bends.

To check the angle of your pipe, lay it against a carpenter's square with the outer bend facing the corner of the square. Both ends of the pipe should just touch the square's sides and run parallel to them.

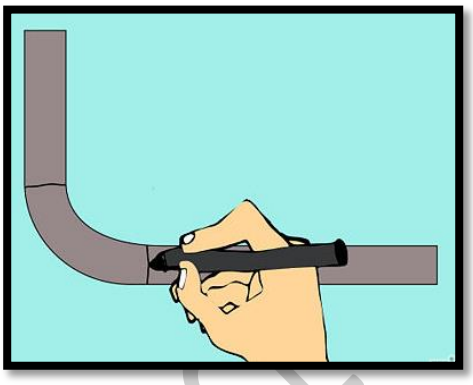


Step 2:

Find the place where the bend in the pipe starts. You should see or feel a small flat spot or distortion at the place where the bend starts and where it ends.

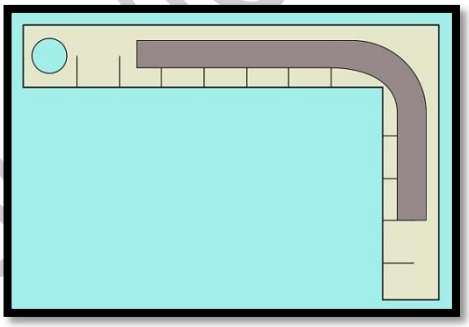
Step 3:

Mark the ends of the bend with a permanent marker. Draw the line completely around the pipe.



Step 4:

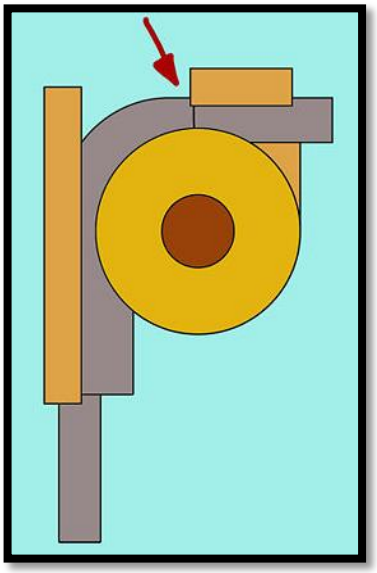
Lay the pipe against the square again to find the length of the pipe in the bend. Note the place on each side of the square where the pipe's markings touch. These should be at the same distance from the inside corner of the square. Add these lengths together.



If the markings on each end of the pipe bend touch the square at 6 inches (15 cm) from the inside corner of the square, the total length of the bent section of the pipe is 12 inches (30 cm).

Step 5:

Find the place on your bending die where the bend begins. Place the bent tube back in your bender with the die used to bend it and note where on the die the mark on the pipe lines up. Mark this place with a dot of paint or by notching the metal with a file.

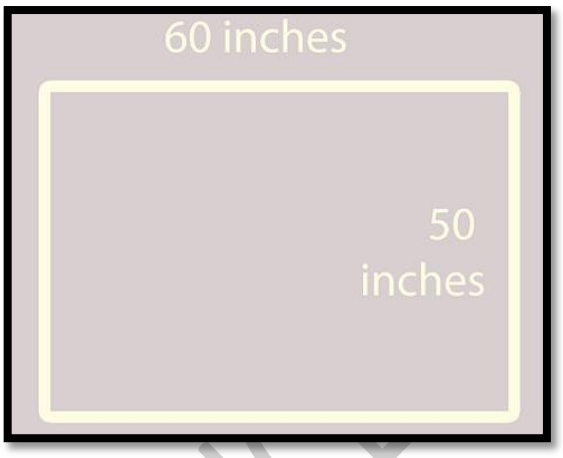


- If you have more than one die (for different diameters of pipe), make a test bend for each die, as each diameter will require a different amount of metal to make a 90-degree bend.
- Once you know how much pipe is needed to form the bend, you can calculate how long a piece of pipe you need by adding this figure (called the bend deduction) to the vertical and horizontal lengths of the pipe.

Method 3: Making Multiple Bends

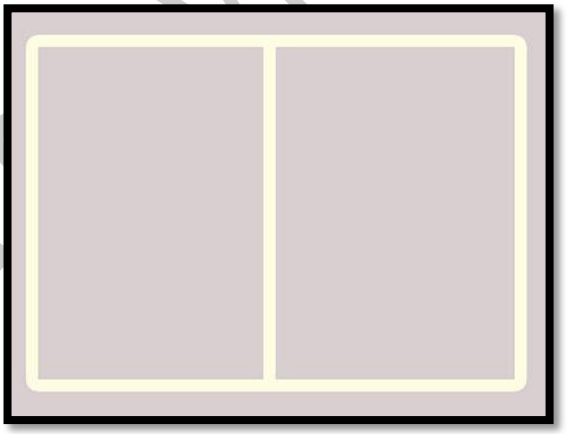
Step 1:

Measure out the space your bent pipe will occupy. If you're making a roll bar for a dune buggy that will occupy a space 60 inches (150 cm) wide by 50 inches (125 cm) high, make a rectangle with these dimensions on a clean space of concrete floor with a piece of chalk.



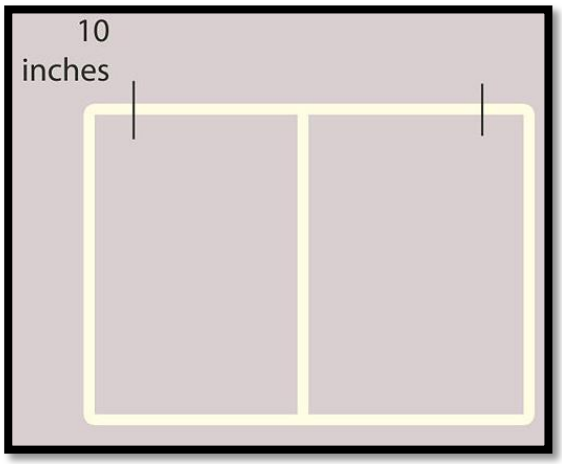
Step 2:

Divide the rectangle with a centerline. The centerline should bisect the longer (width) sides of the rectangle.



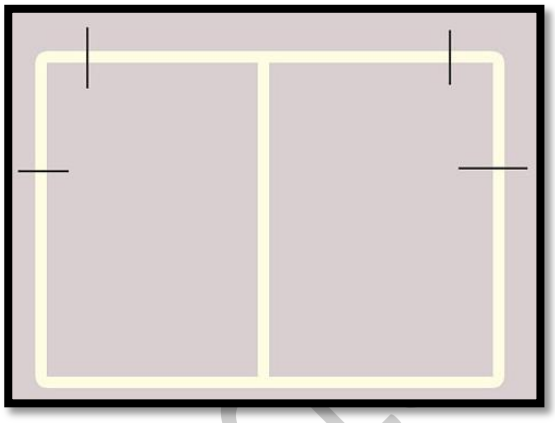
Step 3:

Measure in from the top corners of the rectangle to where the horizontal portion of the bent pipe begins. If the top of the roll bar should run only 40 inches (100 cm), subtract this length from the width for the bottom, then measure half the distance in from each of the upper corners. This works out to a difference of 20 inches (50 cm), half of which is 10 inches (25 cm), which is the distance to measure in. Mark this distance in from each of the top corners.



Step 4:

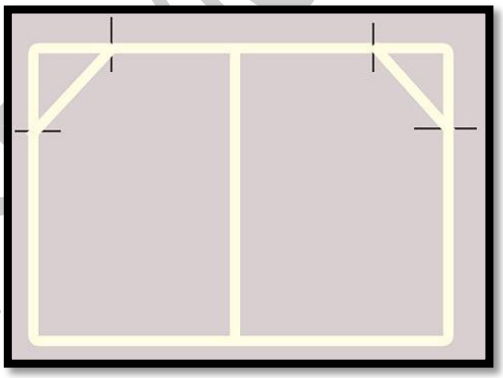
Measure from the bottom corners to where the lower bend begins. If the distance from the bottom of the roll bar to the first bend is to be 40 inches (100 cm), measure and mark this distance up from each side of the bottom corners.



Step 5:

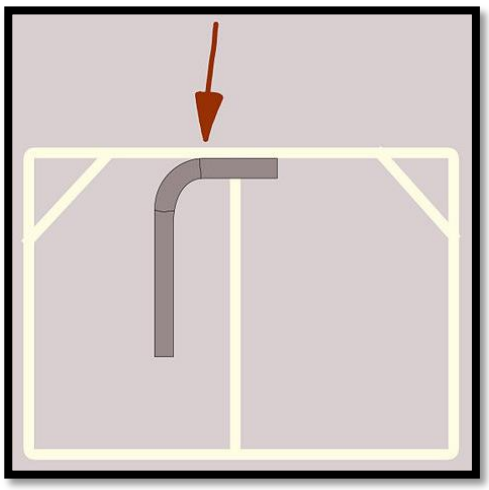
Connect the markings where the bends will be made, using a straightedge or ruler. You can measure the connecting lines with a ruler.

- In this example, the diagonal line connecting the marks on the horizontal and vertical lines is about 14 inches (70 cm) long.



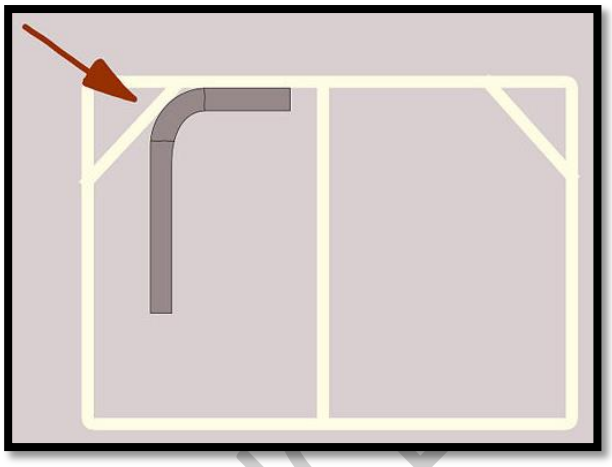
Step 6:

Lay your 90-degree bend pipe inside the top line of your frame. Lay it so that the horizontal straight end touches the inside of the upper horizontal line.



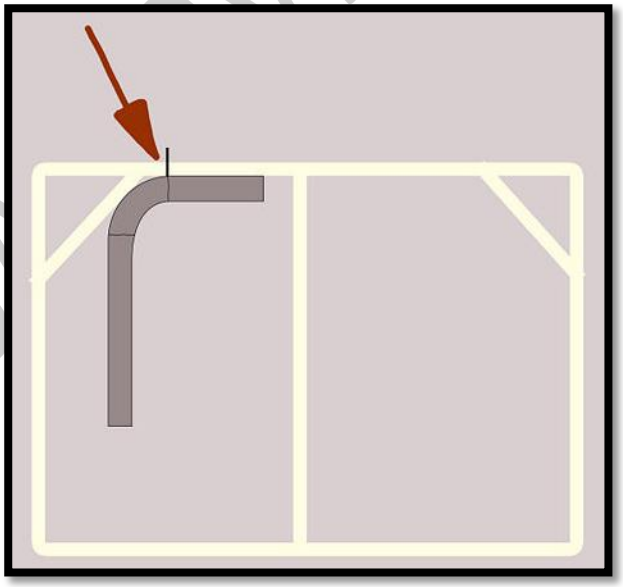
Step 7:

Slide the pipe until it touches the diagonal you drew.



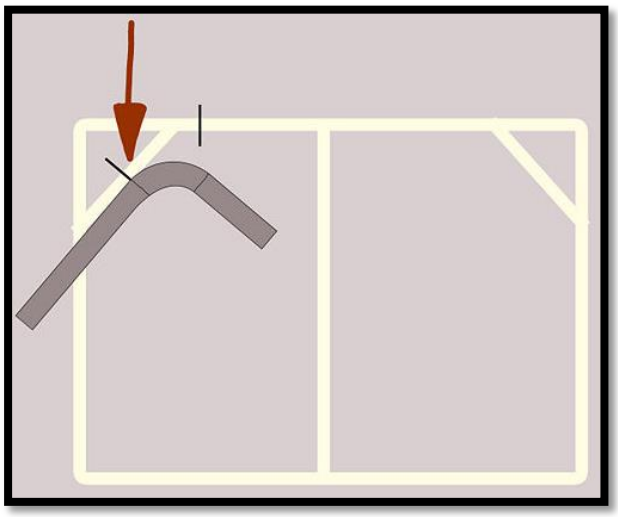
Step 8:

Mark the place where the bend mark intersects the frame line.



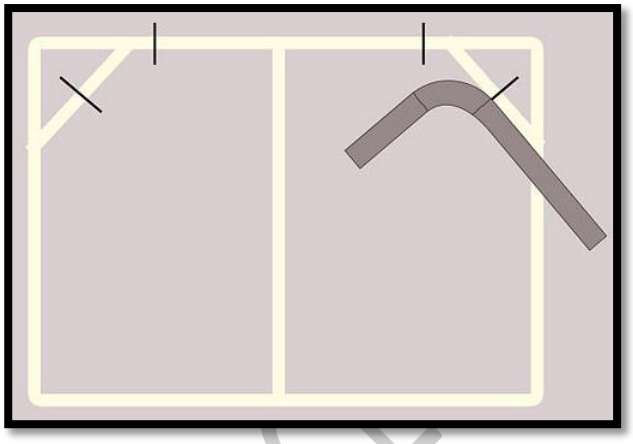
Step 9:

Rotate the pipe so the other bend mark intersects the diagonal. Mark this place on the diagonal.



Step 10:

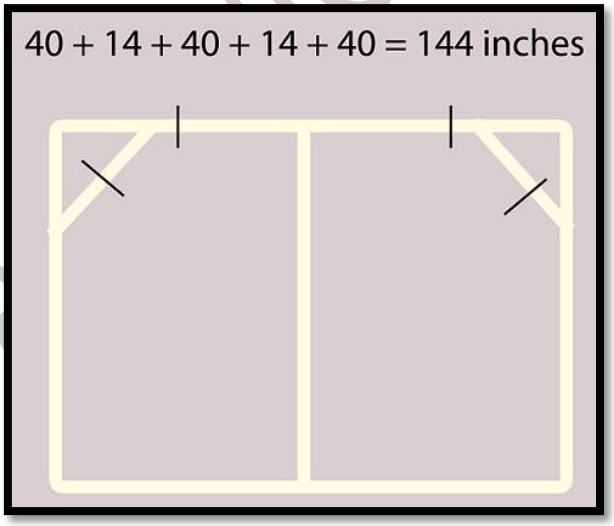
Repeat the last 4 steps for the other upper corner.



Step 11:

Calculate the total length of pipe needed. Add together the measurements from the bottom corners to the first marks, the lengths of pipe between the lower bend, and the length between the upper bend.

In the above example, the vertical portions of the roll bar will each be 40 inches (100 cm) long, the diagonal portions will each be 14 inches (70 cm) long, and the horizontal portion will be 40 inches long. The total minimum length of pipe will be 40 + 14 + 40 + 14 + 40 inches (100 + 70 + 100 + 70 + 100 cm), or 144 inches (440 cm) long.



Step 12:

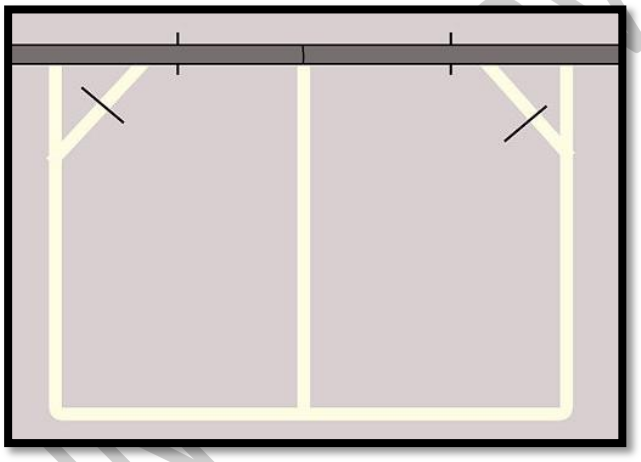
Cut the pipe. Although the minimum length of pipe needed is 144 inches, it's a good idea to allow for error, add at least 4 inches (10 cm), making the total length 148 inches (450 cm).

Step 13:

Find and mark the center of the pipe. You'll work from this point outward.

Step 14:

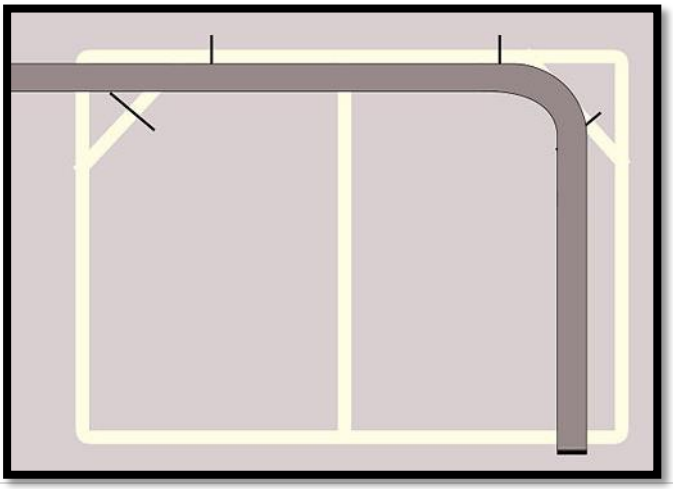
Lay the pipe against the top line of your layout frame, aligning the pipe's center with the center line. Mark on the pipe where the upper bends are to start and finish using the marks on the frame.



You may also want to mark the direction of your bends by putting arrows on the pipe pointing outward.

Step 15:

Make each of the upper bends with your bending tool. Be sure the pipe's seam is to the inside when you bend; this prevents twisting or kinking during the bending process.

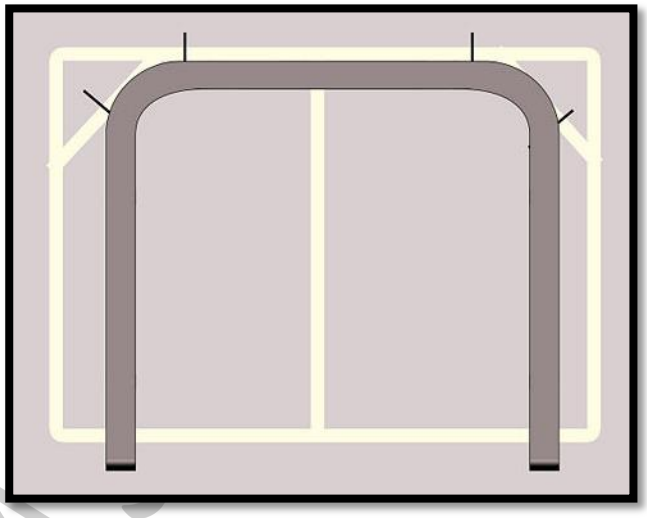


To ensure your bender is set to the correct angle, you can prepare a reference tool of 2 flat pieces of metal whose ends are attached to a pivot. Bend this tool to the angle indicated on your frame, and then matches the bending angle of your bending tool to this angle.

After making each bend, lay the pipe against your frame to check that the angle of the bend is correct.

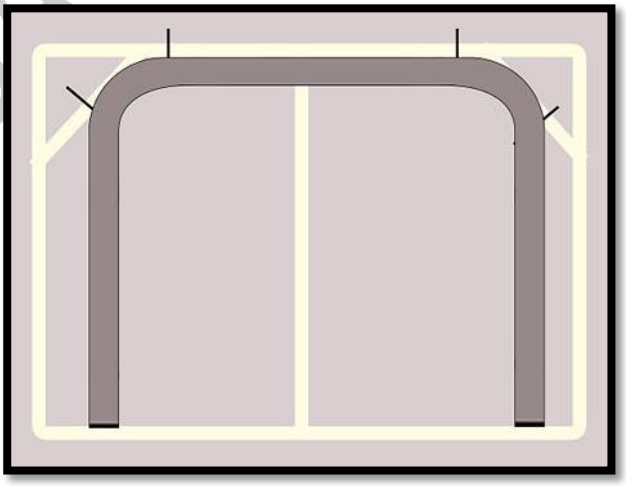
Step 16:

Make each of the lower bends with your bending tool. Follow the same procedures as outlined in the previous step.



Step 17:

Cut off any excess from the ends of the bent pipe.



Tips

- Start with simple pipe bending projects before tackling something more complicated. You may have to make several practice bends before you become comfortable with this technique.
- Allow sufficient workspace for your equipment. Metal pipe will spring back somewhat from being bent, so you need to allow room for it to happen so that you can get out of the way when necessary. You'll want a minimum of 10 feet (3 m) clearance, and 20 feet (6 m) is better.
- Spray the floor around your bending tool with a spray adhesive to provide extra foot traction when bending the pipe.

Warnings

- Regularly inspect your bending tool and dies for wear after bending pipe. Even pins and bolts of 1/2 to 5/8 inch (1.25 to 1.56 cm) in diameter will bend and fail after a while.
- Bending pipe 2 inches (5 cm) or more in diameter is best left to a professional.

Things You'll Need

Length of pipe, Bending tool and dies, Flat, clean floor or large table, Chalk (or sheet of butcher paper and pencil if using a table), Carpenter's square, Pipe cutter, Assistant (for long, heavy pipe).