



Plumber (General) Assistant

Reference ID: PSC/Q 0102

(Facilitator's Guide)

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Introduction to the Facilitator Guide

1. Preface and Purpose of the Guide

This guide is designed to help you (the facilitator) to plan and conduct the course.

2. What will I find in the guide?

This facilitator's guide is a comprehensive package that contains:

- Presentation scripts and key points to cover
- Key points at a glance
- Facilitation tips
- Sampling of potential questions
- Checklist of necessary materials and equipment

3. Program Preparation

Programs require a significant amount of preparation. It is crucial that program facilitators familiarize themselves with the material they designed or are expected to deliver and have adequate time to adapt the content to the specific audience.

4. The Role of the Facilitator

Who is a facilitator?

A facilitator is someone who is present to assist a group reaches its objectives; the group, not the facilitator, may determine the objectives.

The facilitator's role:

When adopting the role of a facilitator, the facilitator needs to:

- Ensure the mere verbose do not take over and encourage contributions, particularly from those who may be less confident
- Devise non-aggressive, friendly ways to deal with difficult participants
- Control conflict by stepping in if necessary to help participants learn to deal with conflict positively
- From time to time get the participants to summarize what has been discussed
- Assist 'weaker' participants by rephrasing their arguments for them so that these do not get lost just because they are not forcefully put across
- Provide feedback to the group as a whole as to its performance
- Provide the information and resources for the group to function effectively



Session Preparation:

A. Questions

What

- What is the subject I have been asked to present on/lead/arrange

Why

- Why have they asked me to do it?
- What is the purpose of the session or the training course?
- To communicate information and knowledge.
- To make a proposition.
- To test existing knowledge.
- To practice skills.
- To inspire and motivate.
- The first thing to get clear in your mind is the objectives of the entire course or one session.

When

- What time of day will my session(s) take place? After lunch is known as the graveyard slot; you should therefore consider making it more active than, say, a morning session.
- How long have I got?

How

- How am I going to present my subject?
- Straight talk
- Talk with overheads
- Talk with PowerPoint presentation
- Talk with video
- Give the participants a period in which to discuss aspects of the subject, e.g. by using a case study.
- Combination of any of these.
- Am I going to allow questions during the session?
- Always leave time at the end for questions and discussion.

Where

- Where is the presentation due to take place?
- How do the windows open/air conditioning work? If using PowerPoint or video, how do we darken the room?
- What equipment have they got, e.g. video, computer, projector, overhead projector, etc.?
- Decide on seating arrangements
- Are there likely to be any distractions, e.g. loud air-conditioning; things happening outside the window, etc.
- Can I be heard at the back of the room?

Who

- Who are they? How senior/junior are they?
- How many will be present?



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- What is the extent of their existing knowledge of the subject I am going to present?
- What will be of interest to them?
- What will their attitudes, preconceptions or expectations?
- Is there a gender balance within the group?
- Could you foresee or expect any kind of dynamics or potential resistant due to group composition?
- What can you glean overall from the participants list and profile without making too many assumptions?

Icons Used In This Guide

Icon	Description/guidelines
	Trainer Led Discussion
	Show a slide < Used to denote the slide to be shown>. Even better paste the image of the slide being discussed.
	Show a video <mention video/clip name>
	Evaluate - administer assessment <mention name and guidelines for assessment>
	Narrate/Share a story or valid examples
	Share insights or ask participants to share insights about current topic



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	Distribute Hand-outs
	Transition from one subject/topic/objective/story, etc to another (also could indicate flow)
	Derive objective/key point
	Materials required
	Ask following Questions
	Group Discussion <mention guidelines (number in each group, whether team leader is required in each group, etc.) and duration>
	Play music < mention file names and duration>
	Capture on flipchart and put up in the class to be reference at a later point during the class or to summarize the learning of the session
	Summarize the session/day
	Activity - describe activity



Debrief

Debrief to bring out relevant learning

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



The Session in Perspective



Unit 2: Installation/Service of Basic Sanitary Fixtures, Fittings, Related Piping and Accessories

Module Learning Goals

This module covers the overview of installation/service of basic sanitary fixtures, fittings, related piping and accessories.

Enabling objectives:

Upon completion of this module, the participant will be able to:

- 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)



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- 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

Methodology: Trainer Led Discussion, Skill Practice, Individual Reflection, Assessment



Instructions to the Trainees:

The students should participate while the trainer discusses about each topic to make the class more interesting.

Equipment /Tools Required: Computer, Projector, White Board, Participants Manual, Markers, Flipcharts, Notes, Handout & PPT

Duration:  104 Hours



Installation of Sanitary Fixtures, Fittings, Pipes & Accessories

30 Minutes

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)



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- 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

1 Hr

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 to 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

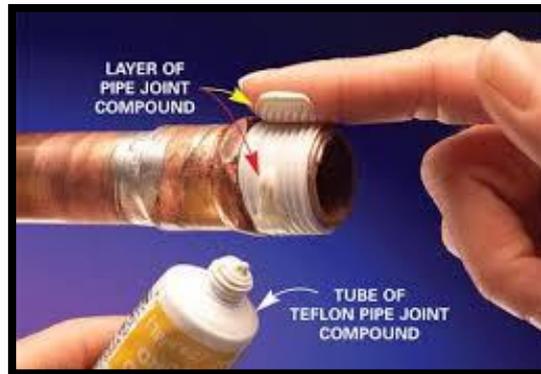


L-bow & T-bow





Silicon Sealant



Teflon Tape



Tool Holder / Bench Vice





Hacksaw Frame



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

2 Hrs

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.

Practice Activity:

2 Hrs



Pipe Bending

8 Hrs

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.





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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:

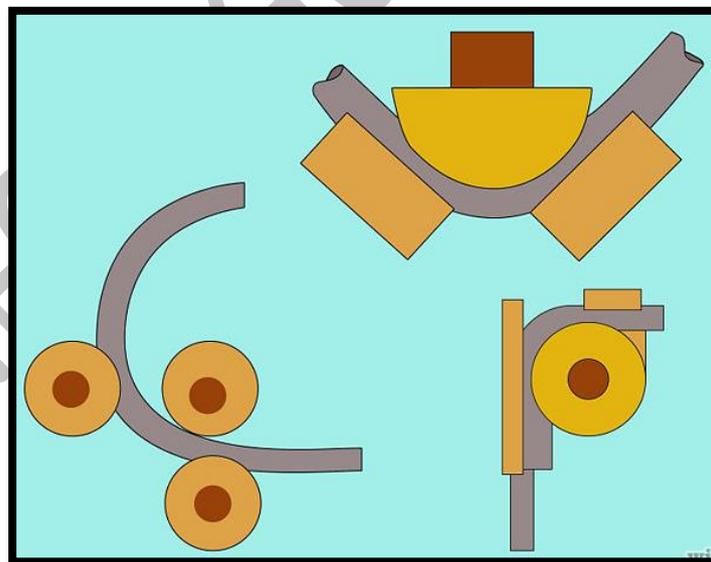
1. Selecting a Bending Tool
2. Making a Right Angle Bend
3. Making Multiple Bends

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.



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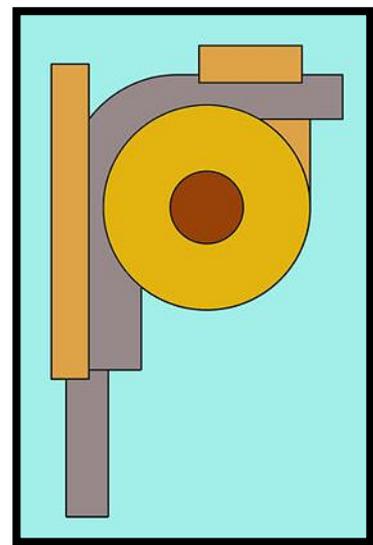
- **Rotary draw bending** is used to bend pipe for use as handrails or ornamental iron, as well as car chassis, roll cages, and trailer frames, as well as heavier conduit. Rotary draw bending uses 2 dies: a stationary counter-bending die and a fixed radius die to form the bend. It is used when the pipe 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.

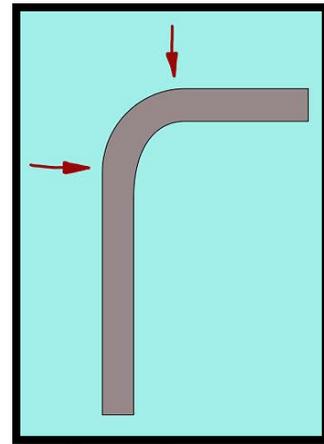




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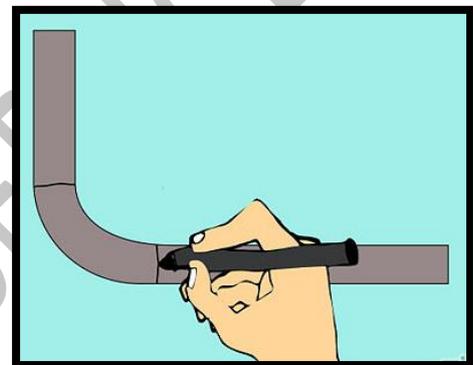
Step 2:

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:

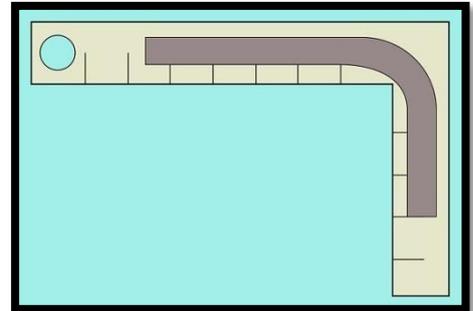
Mark the ends of the bend with a permanent marker. Draw the line completely around the pipe.



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.

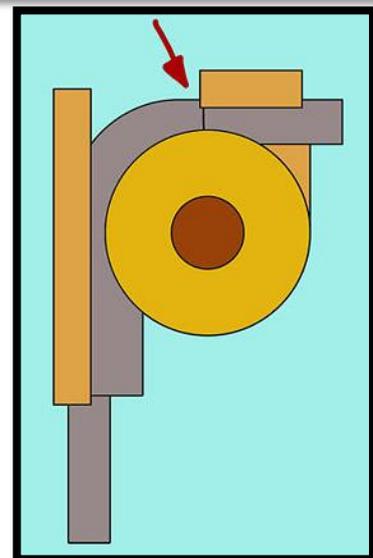
If the markings on each end of the pipe bend touch the square at 6 inches (15 cm) from the inside corner of the square, the total length of the bent section of the pipe is 12 inches (30 cm).



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.





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- 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

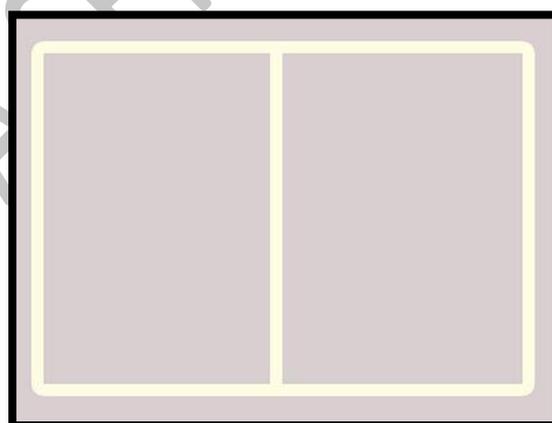
Step 1:

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.



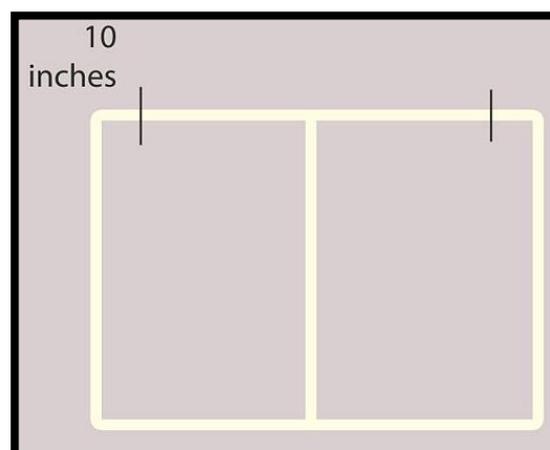
Step 2:

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.

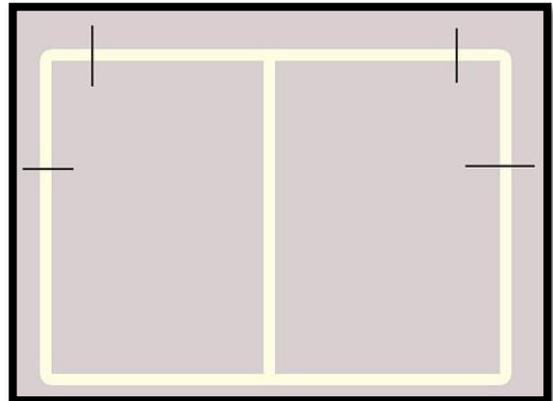




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Step 4:

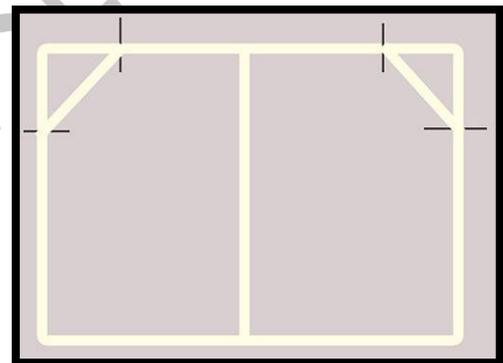
Measure from the bottom corners to where the lower bend begins. If the distance from the bottom of the roll bar to the first bend is to be 40 inches (100 cm), measure and mark this distance up from each side of the bottom corners.



Step 5:

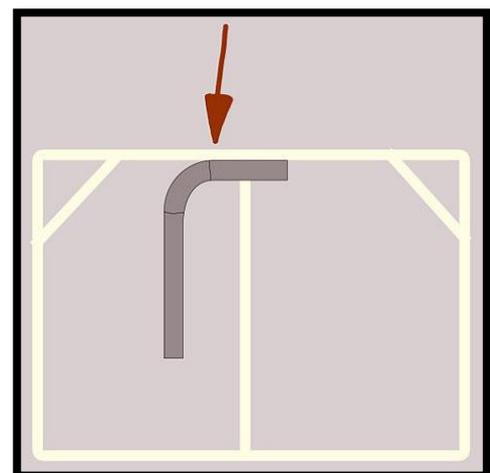
Connect the markings where the bends will be made, using a straightedge or ruler. You can measure the connecting lines with a ruler.

- 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.

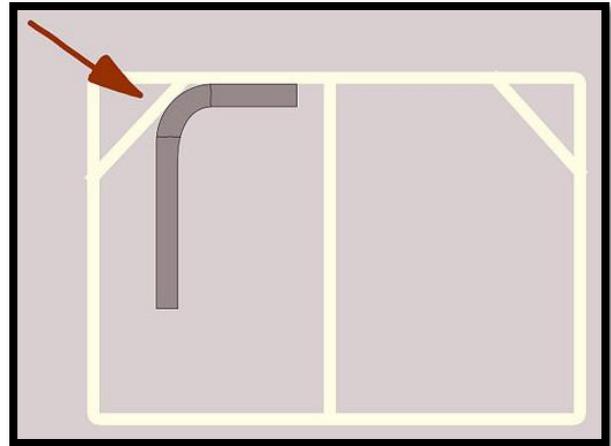




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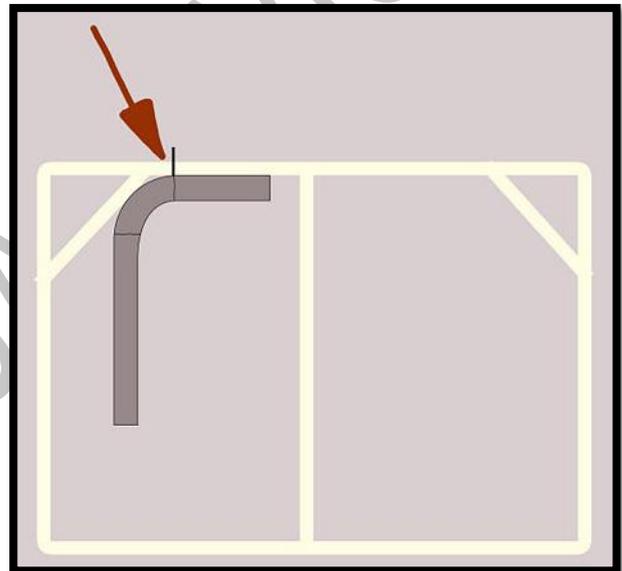
Step 7:

Slide the pipe until it touches the diagonal you drew.



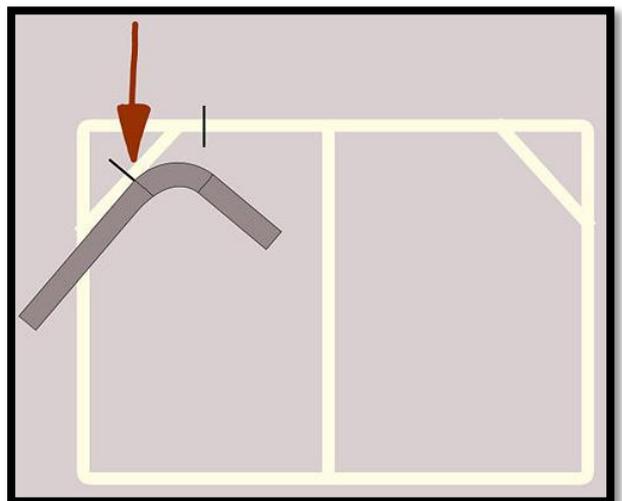
Step 8:

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



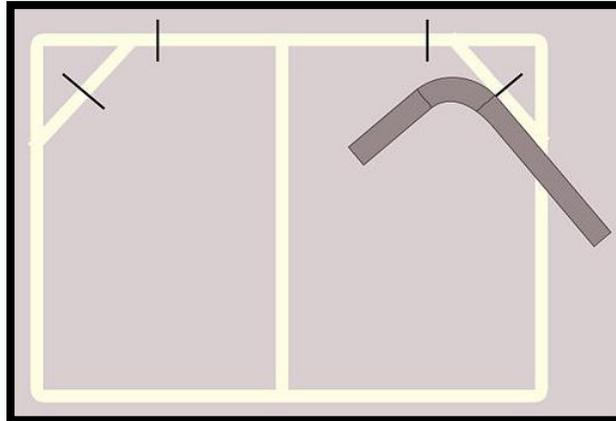
Step 9:

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



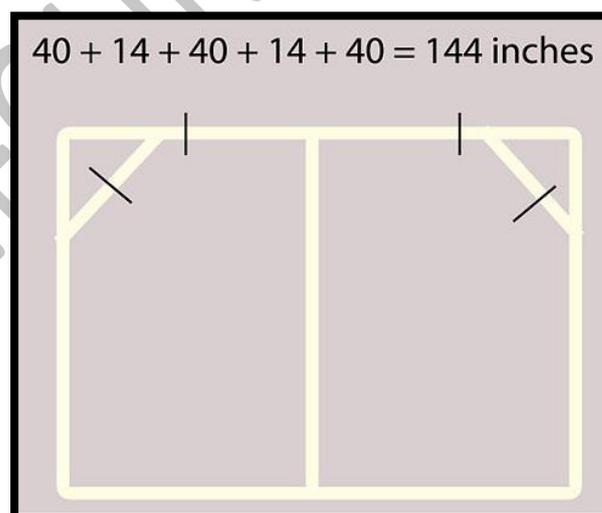
**Step 10:**

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.

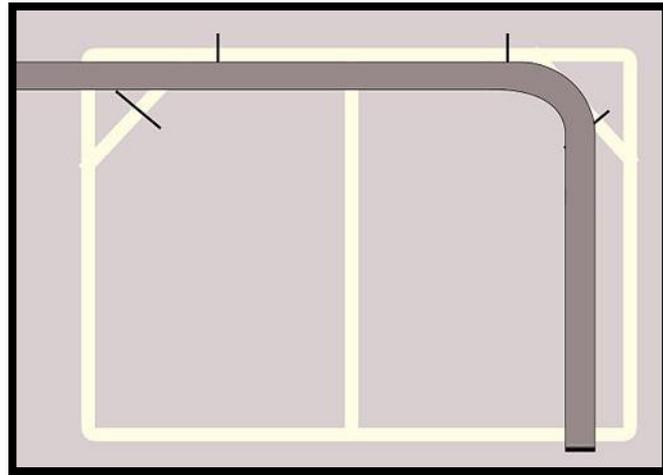




You may also want to mark the direction of your bends by putting arrows on the pipe pointing outward.

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.

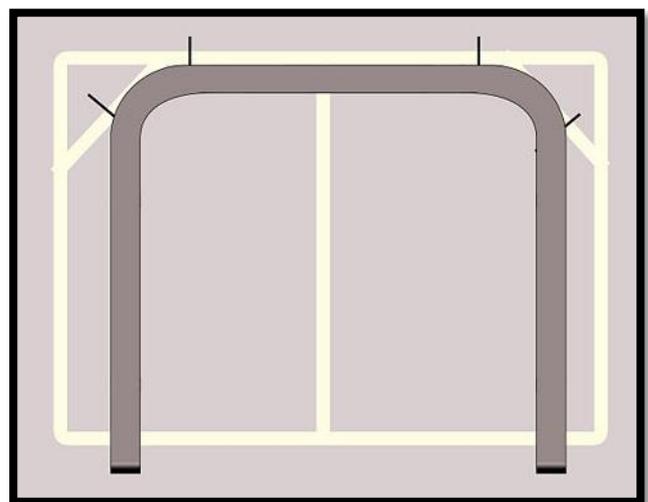


To ensure your bender is set to the correct angle, you can prepare a reference tool of 2 flat pieces of metal whose ends are attached to a pivot. Bend this tool to the angle indicated on your frame, and then matches the bending angle of your bending tool to this angle.

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

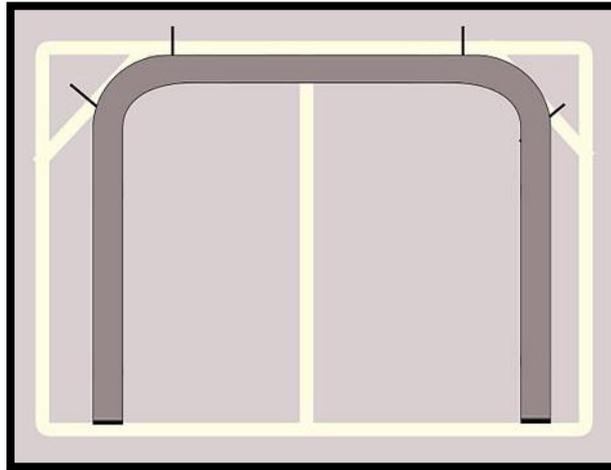
Step 16:

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).



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