



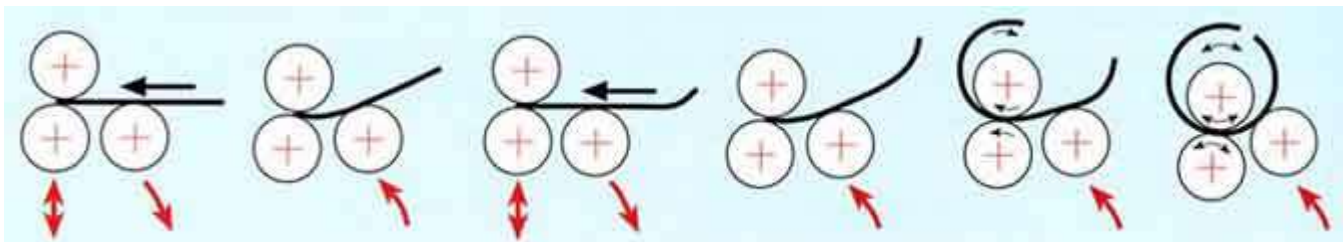
Some viewpoints on rolling metal:

Three roll benders work by "pinching" the flat work piece between two rolls and bending it as it comes in contact with a forming roll. This bends the work piece into a cylindrical form, where it is welded together to produce a cylinder. The upper roll is in a fixed position; the lower roll has adjustable movement to perform the gripping function. These are the "pinch" rolls.

The third roll (the forming roll) is also adjustable. With a manually opened or hydraulically moved drop hinge, the end of the top shaft is opened to allow removal of the finished work piece, especially a completed tube shape. You may also weld the seam while it is still on the machine (ground to part with machine power off).

Note: Without a lot of skill, on 3 roll machines, it can be difficult to form metal into tubular shapes smaller than 3 times the upper roll diameter when forming near capacity thickness. 1.5 times the upper roll diameter is often the tightest diameter using thinner and narrower metal. Results vary depending on metal thickness, width, tensile strength and on your level of expertise.

Below is a diagram showing how a plate is formed into a tube with a single (initial) pinch plate-rolling machine.



Single-pinch (initial-pinch) machines are the most common and may require inserting the work piece into the machine twice in order to prebend both ends to eliminate flat spots when rolling a full tube shape and ensure better closure of the seam. To prebend the first end, the operator inserts the plate into the machine, which clamps it and pinches it between the top roll and bottom pinch roll. A rear-bending roll, moving diagonally toward the top roll, pushes against the metal to bend the radius. The operator then removes the plate from the bender, rotates the plate 180 degrees to insert the second end into the rolls, then rolls the cylinder to completion. Recommended maximum thickness (or width instead) for prebending is usually 2/3 to 3/4 of the capacity of the machine. Bending thickness can be increased slightly if rolling a narrower width.

Double pinch pyramid machines, also called three-roll double-pinch machines, can also prebend both ends of a plate with a single insertion into the bending machine, for reduction in material handling and time. However, they cost more. The wide opening between the rolls allows short, heavy plate to be rolled. On double pinch machines, the top roll position is fixed and the two lower rolls move in a straight path or an arc toward the top roll. 4 roll versions roll metal the tightest, especially if at least 2 or 3 of the rolls are driven.

Forming a full tube shape should have little if any gap in the middle of the seam due to the "**crowning**" of the rolls. Crowning is where the rolls are slightly larger diameter in the middle, which compensates for deflection under load. If the crowning is not enough try wrapping and taping a piece of shim stock around the middle 12" of the bending roll to over-compensate for deflection. Crowning has a side effect of causing thin metal to have a gap at the ends. If a gap occurs, either in the middle or the ends, it can be pulled together using a ratchet strap, come-along, clamps or the vise grips with chain attachment.

Rolling a sheet **metal cone shape** can be formed by pre-cutting a flat metal blank with the correct inner and outer radius to form the cone (funnel) shape wanted. Usually the blank is fed on one side so that the inner radius can be held against a cone rolling attachment. The inner radius is supposed to go thru slower than the outer radius. The bending roll position should be independently adjusted lower on the drive side to match the taper of cone. Capacity increases with soft aluminum and decreases with stainless steel.

NOTE: Powered roll machines are very dangerous if used carelessly because they can crush fingers, hands, etc. Always keep hands, fingers, hair and clothing clear. Safety guarding or devices such as Light Curtains are recommended for predictable repeat uses. Safety compliance is the users responsibility. Please take it seriously. For OSHA's machinery safety website go to <http://www.osha.gov/SLTC/etools/machineguarding/index.html>

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