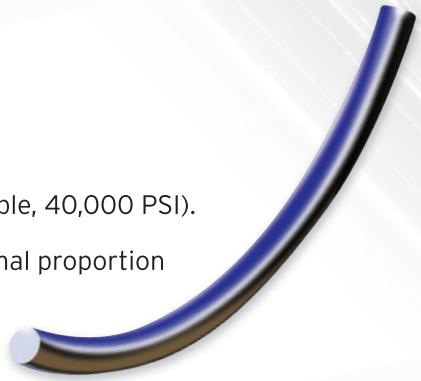
StraighTalk

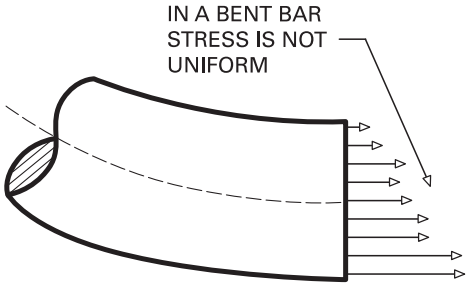
HOW DO YOU UNBEND A BAR?



How does a bent bar become straight? In order to answer this, we must explain two concepts that apply to metal: stress and strain.

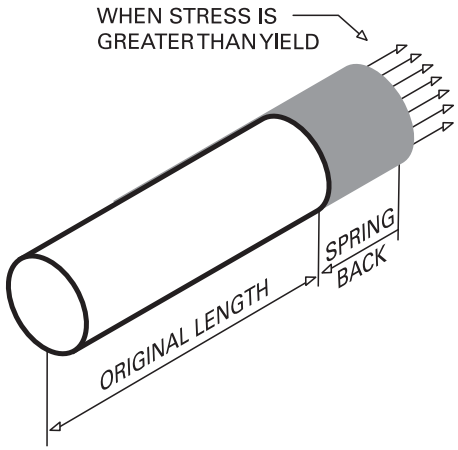
Stress is the force carried by a specific cross-sectional area of the metal. This is usually expressed in Pounds per Square Inch or PSI (for example, 40,000 PSI).

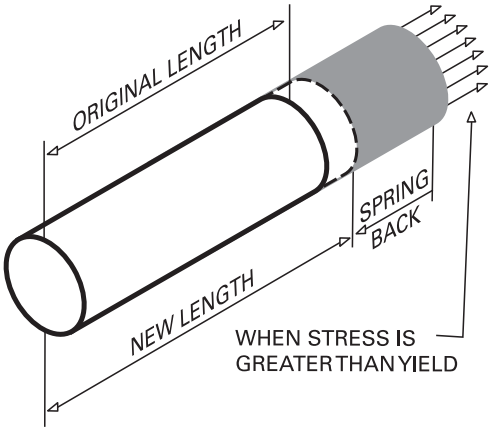
Strain is the amount the metal has been stretched. This is stated as a decimal proportion of its original length. For example, a strain of .02 means that the metal has been stretched 2% of its original length.



The processing history of a metal bar can leave it with residual stresses and strains, even after external forces are removed. If we were able to examine the stresses in the cross section of a bent bar, we would find that they vary from place to place. The same would be true of the strains. Under the influence of non-uniform stress, the bar assumes a bent shape.

Metal strain rises and falls proportionally with the stress, within limits. This means that a bar will stretch under a load and then spring back to its original length when the load is removed. We call this elastic behavior. If stress is taken higher than a limit, or yield stress, it springs back, but not to its original length. It becomes longer. This is known as plastic behavior.

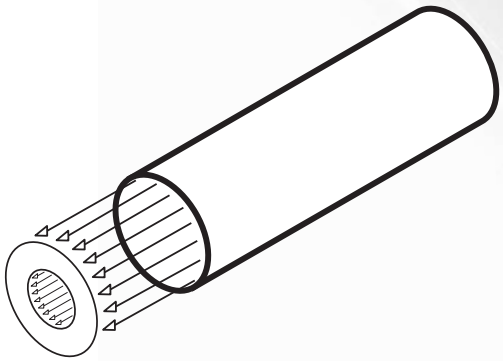


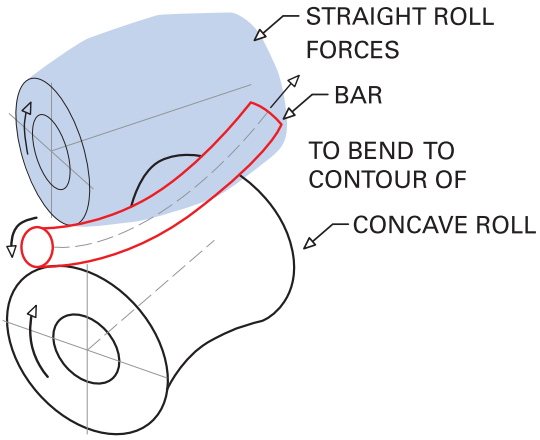


StraighTalk (continued)

Therefore, to remove the bend in the bar, we must reconfigure the pattern of residual stresses so that enough uniformity exists to hold the bar straight. If the bar is bent in one direction, we can reconfigure the stress by flexing the opposite way, but just enough so that it springs back straight. To counteract residual stresses permanently, we must bend the bar in the opposite way, enough to exceed the yield stress.

If we repeatedly flex the bar, rotate it slightly and flex it again, we will eventually produce a uniform stress pattern around the whole circumference of the bar. A two-roll straightener works just this way.





In a two-roll straightener, we use a concave-shaped roll as an anvil to control the amount of flexure we place in the bar. A straight roll forces the bar to mold itself to the contour of the concave roll. The two rolls turn to make the bar rotate while it is flexed, so that the bending stresses are uniform around the circumference. By skewing the rolls to the bar slightly, we cause the bar to advance through the rolls. This gives the bar a number of revolutions while flexed. Each successive revolution improves the residual stress uniformity, producing a straight bar.

In a two-roll straightener, the bar is:

- **Flexed** enough to counteract non-uniform stresses
- **Spun** so the residual stresses are uniform
- **Advanced** to straighten from end to end

As you see, Medart has a thorough understanding of how straightening works. If you'd like us to put this knowledge to work for you, please contact us at **724-752-2900**, or **sales@straight-to-medart.com**.