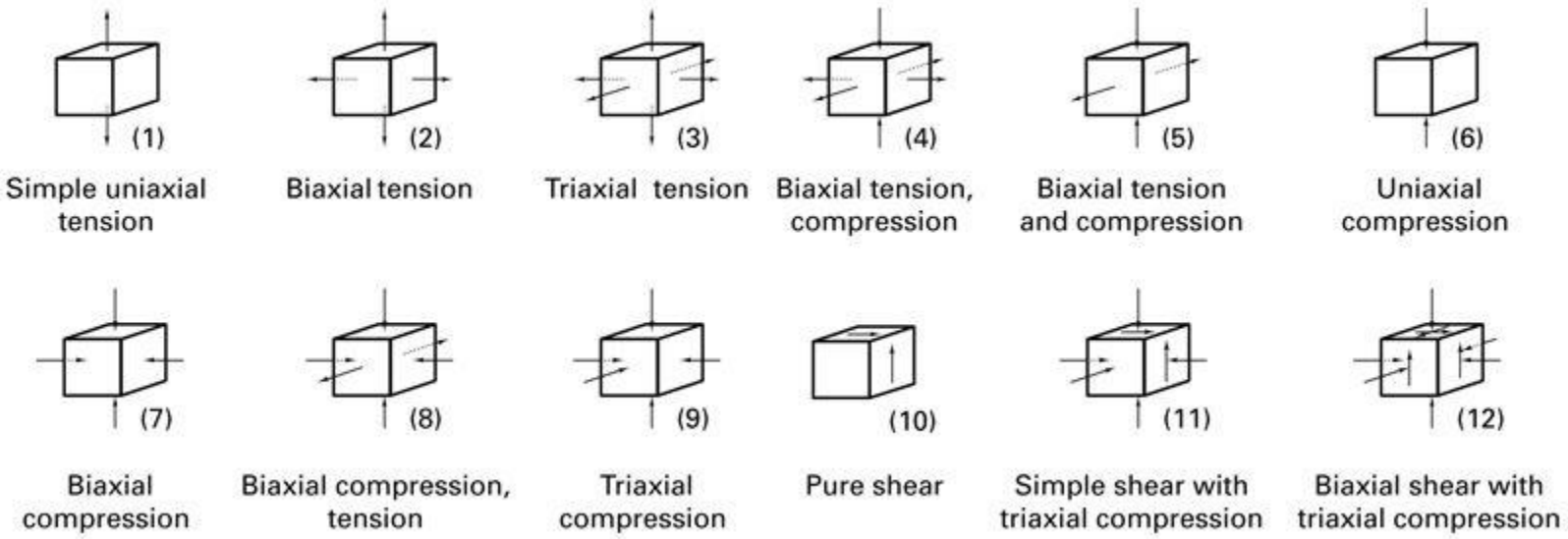
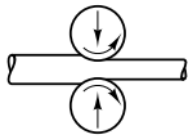
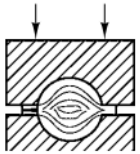
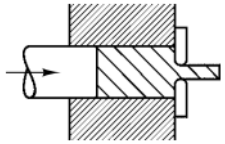
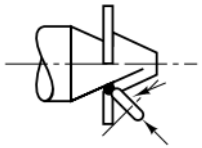
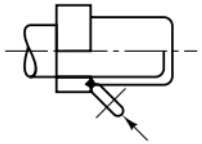
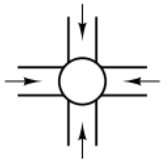
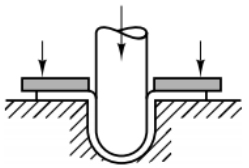
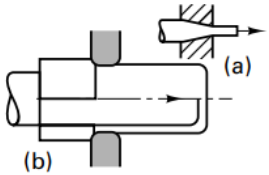
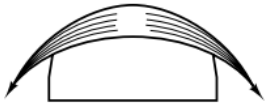
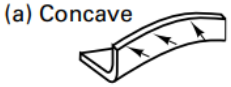
Fundamentals of Metal Forming

Classification of States of Stress



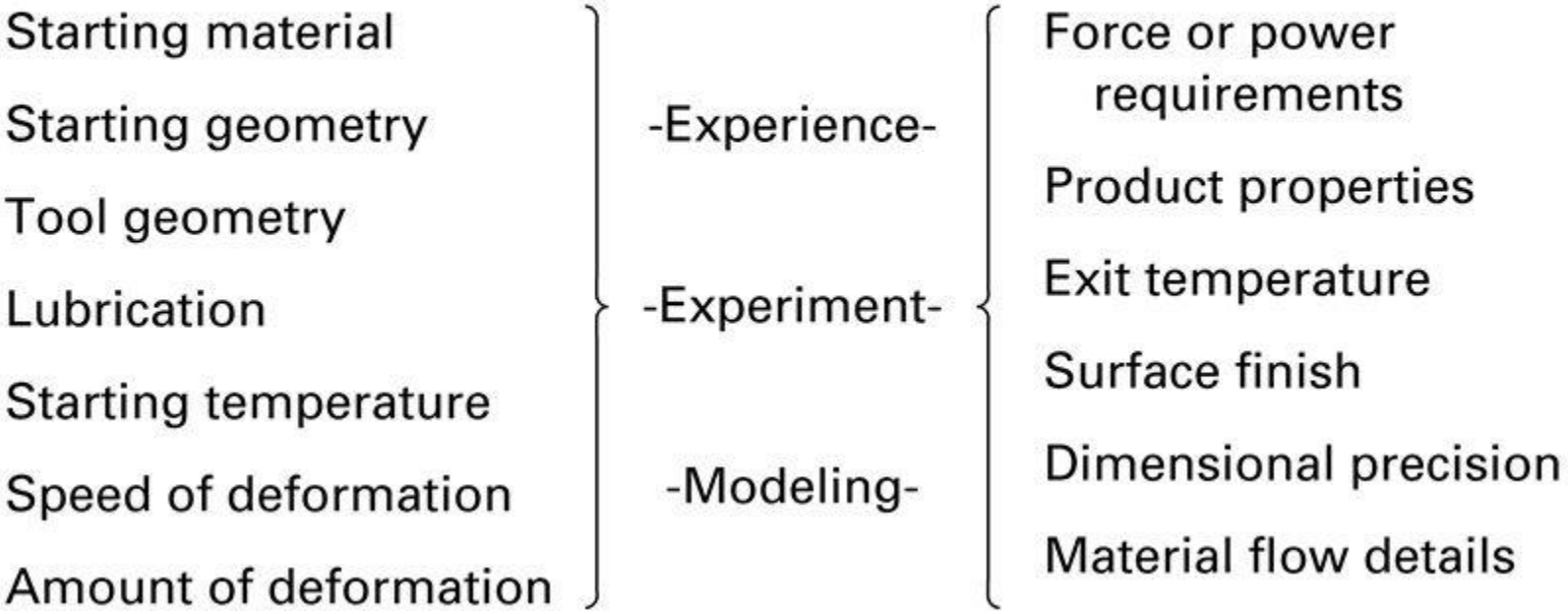
Classification of Some Forming Operations

Classification of Some Forming Operations

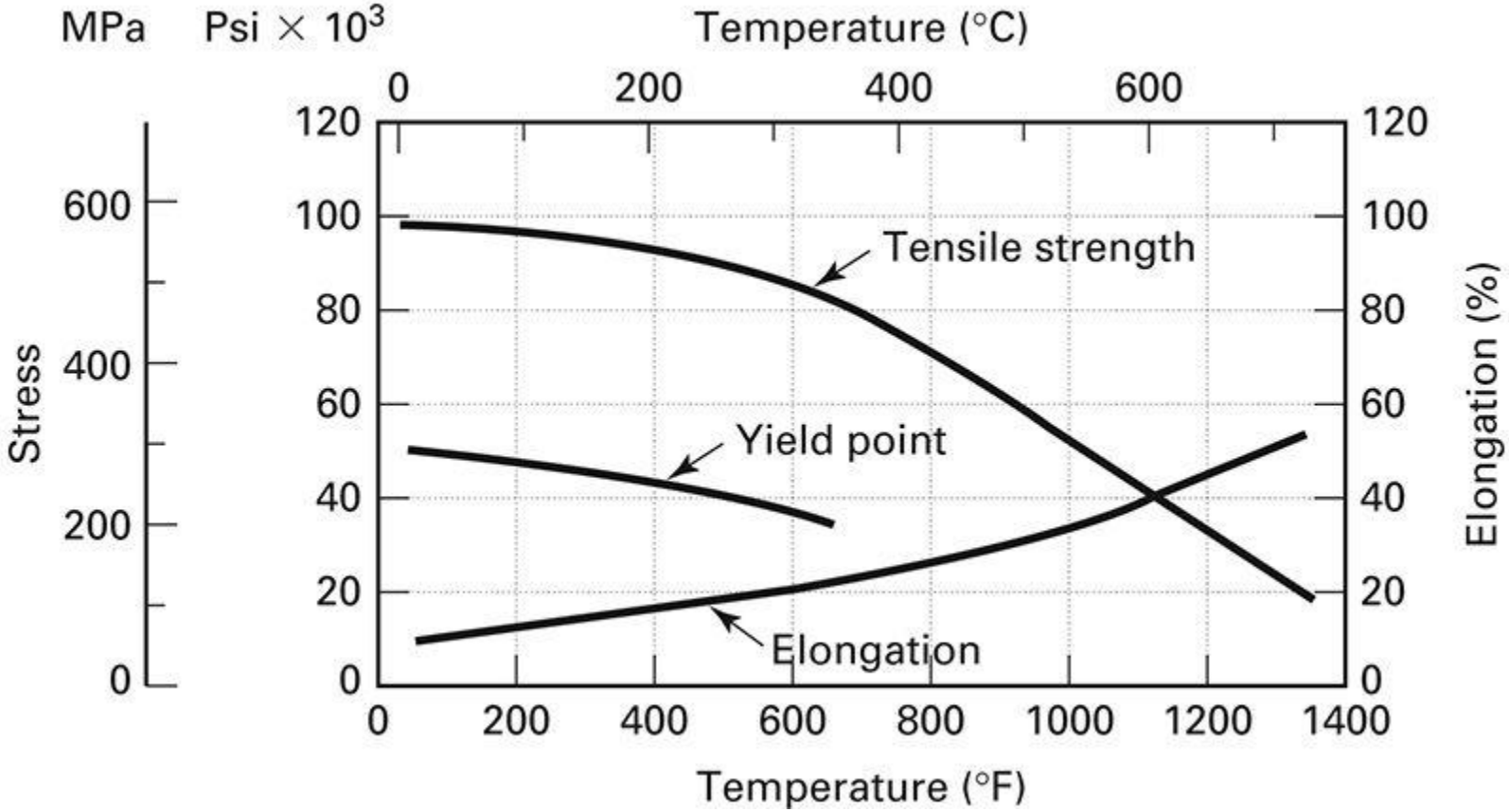
Process	Schematic Diagram	State of Stress in Main Part During Forming[a]
Rolling		7
Forging		9
Extrusion		9
Shear spinning		12
Tube spinning		9
Swaging or kneading		7
Deep drawing		In flange of blank, 5 In wall of cup, 1
Wire and tube drawing		8
Stretching		2
Straight bending		At bend, 2 and 7
Contoured flanging		At outer flange, 6 At bend, 2 and 7
		At outer flange, 1 At bend, 2 and 7

[a]Numbers correspond to those in parentheses of previous slide's table.

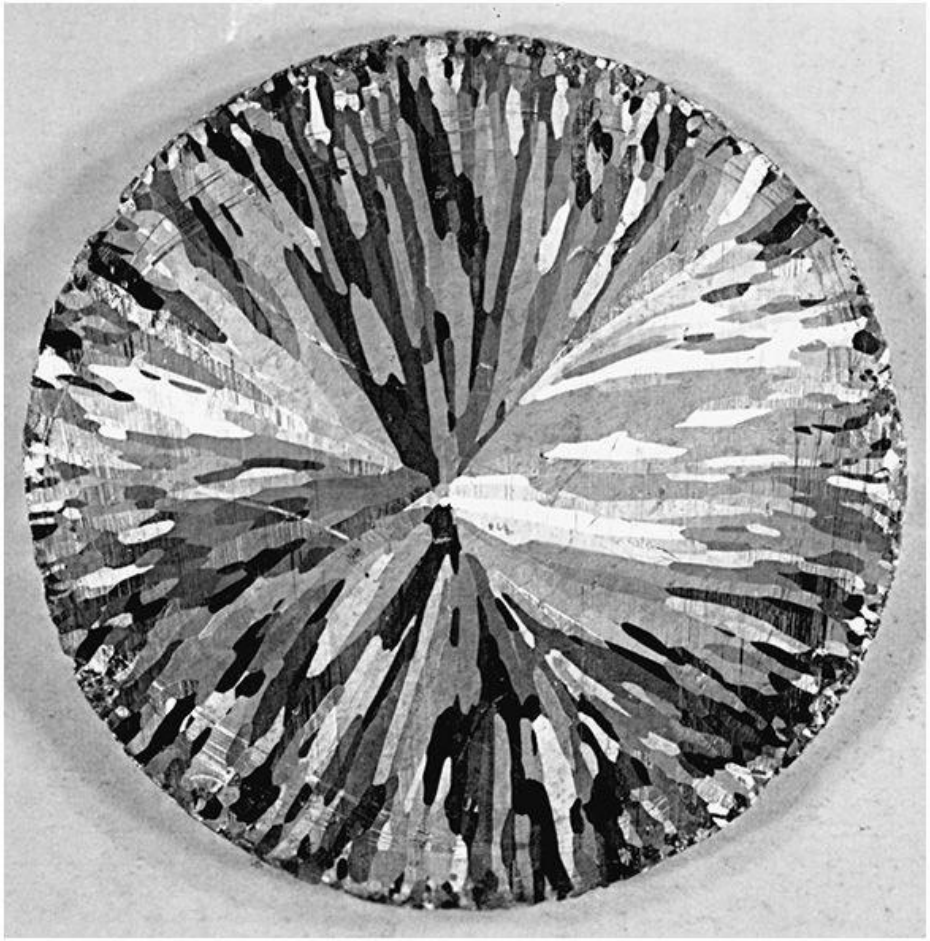
Independent and Dependent Variables Linked



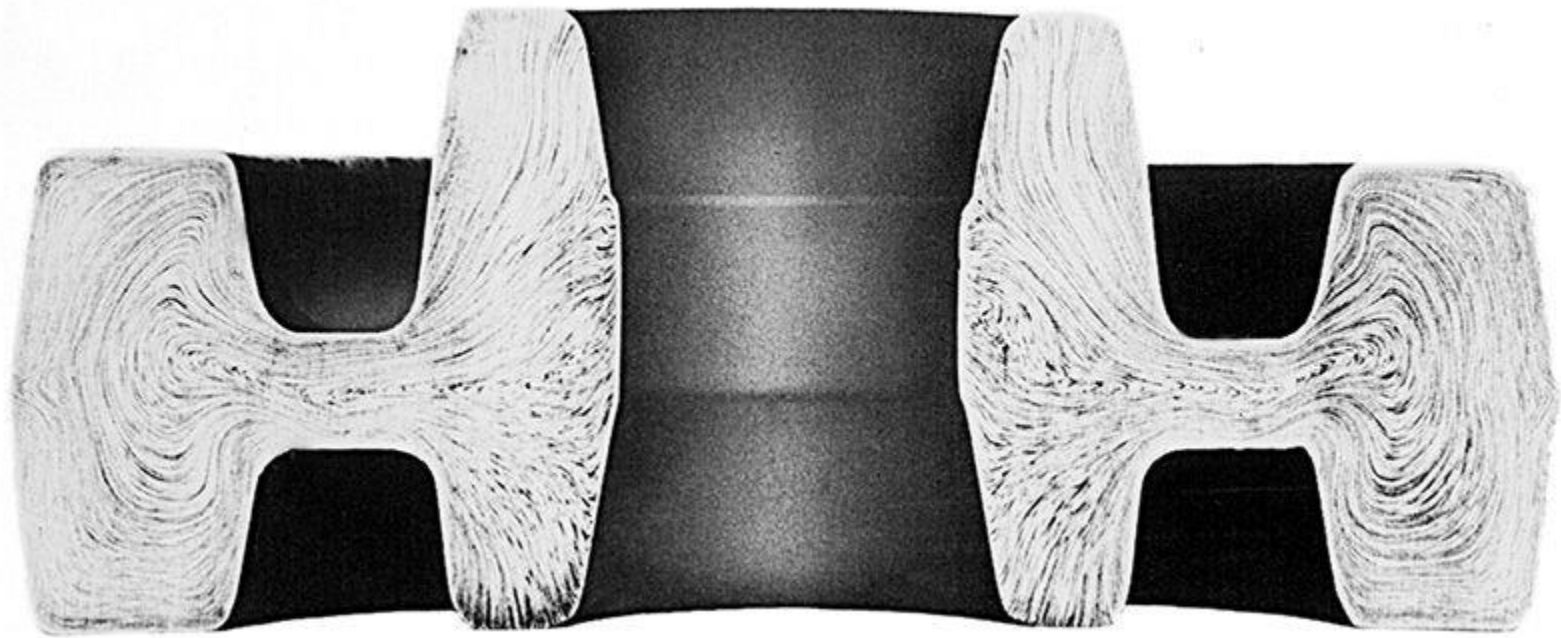
Effects of Temperature



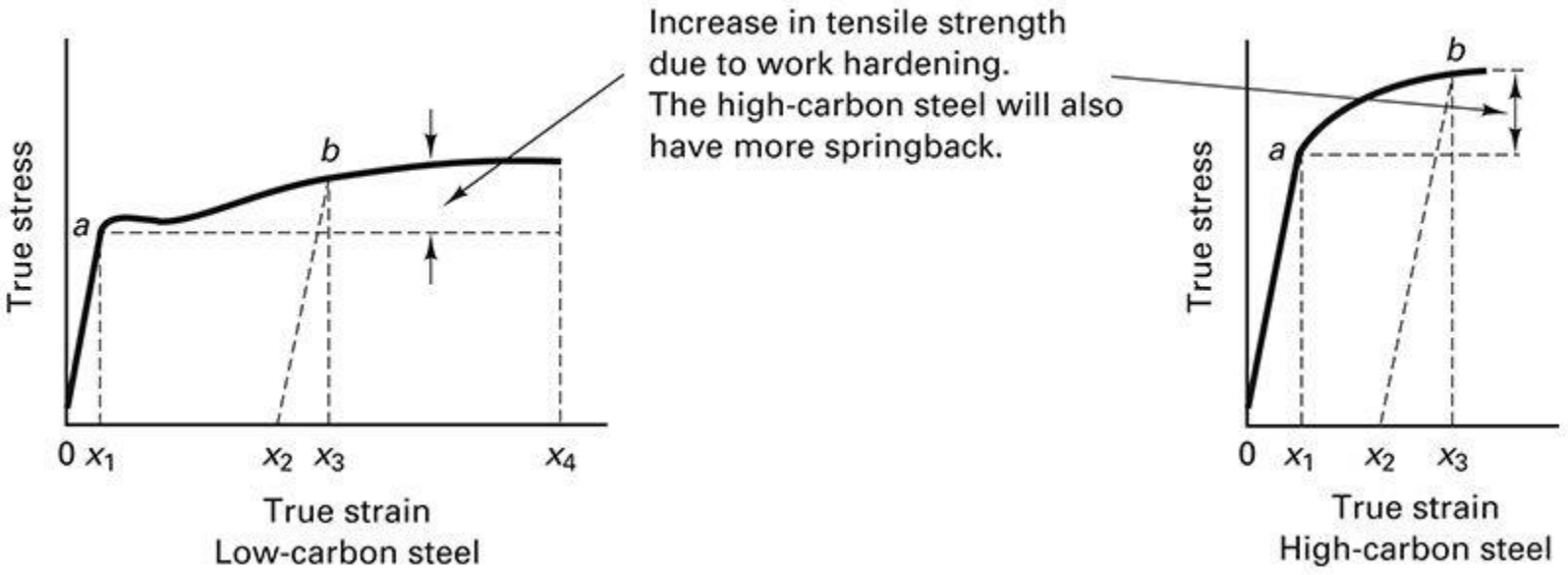
Cast Structure



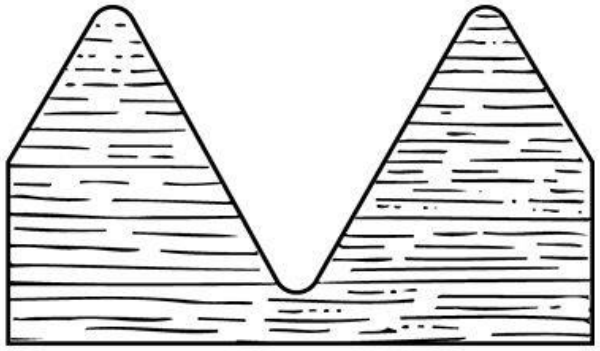
Flow Structure



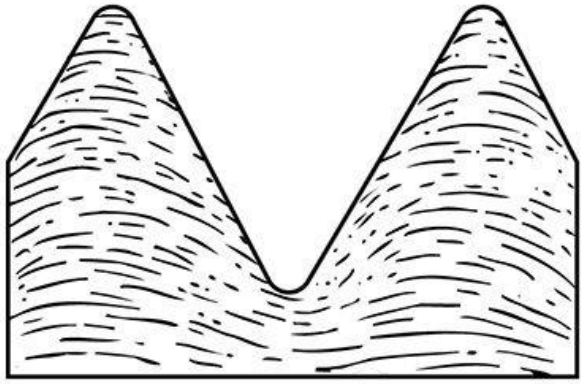
Springback


Increase in tensile strength due to work hardening. The high-carbon steel will also have more springback.
True stress
a
b
0 x_1 x_2 x_3 x_4
True strain
Low-carbon steel
True stress
a
b
0 x_1 x_2 x_3
True strain
High-carbon steel

Machined vs. Rolled Threads

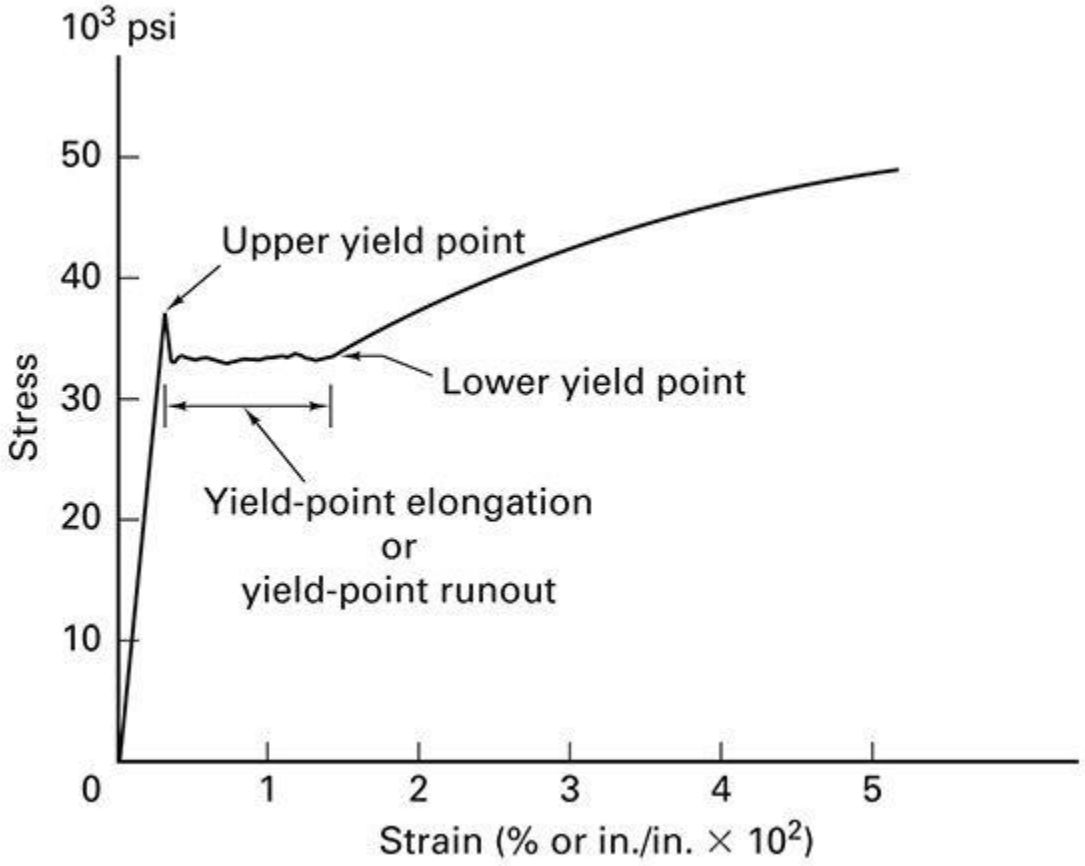


(a)

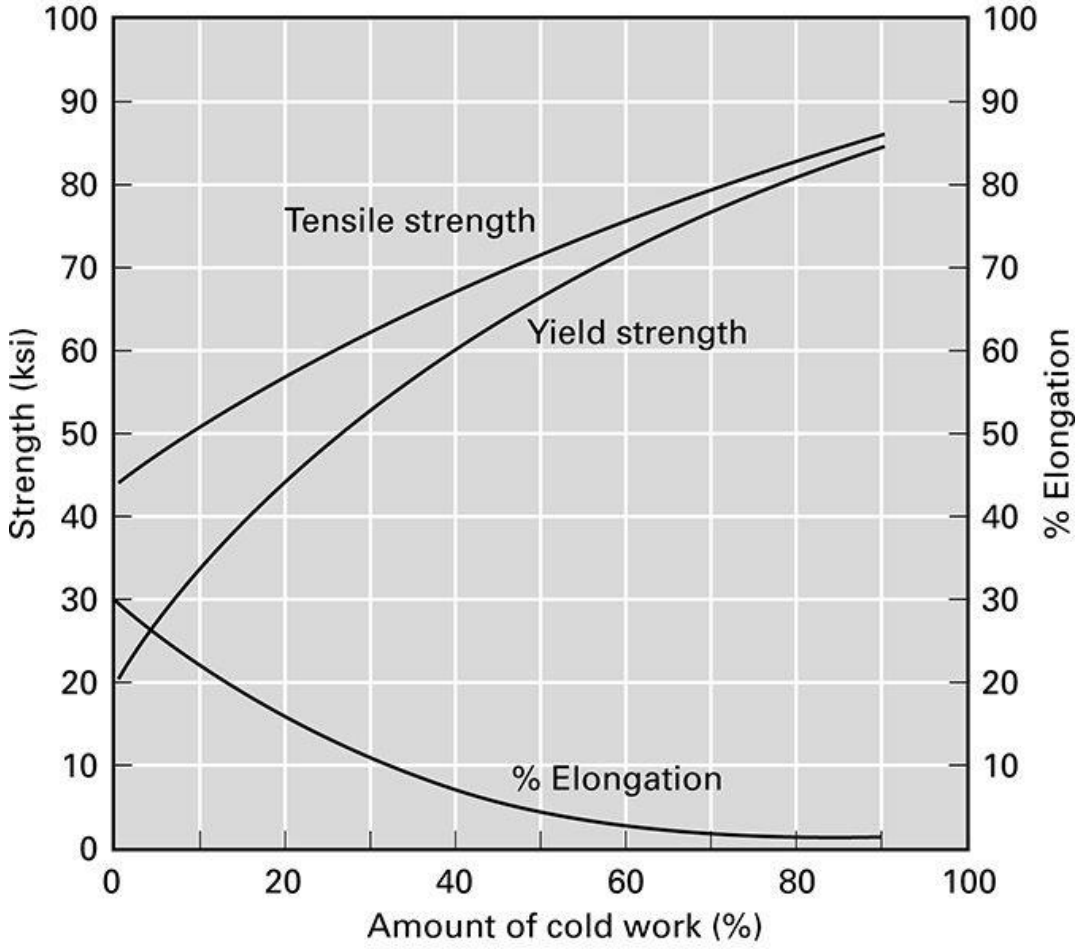


(b)

Luders Bands



Mechanical Properties vs. Cold Work



Yield Strength vs. Temperature