

Stress-Strain:

engineering tests {

- Tensile
- Compressive
- Shear (z)
- Torsion

(engineering)

$$\text{stress } \sigma = \frac{F}{A_0}$$

(engineering)

$$\text{strain } \epsilon = \frac{\Delta L}{L_0} \leftarrow \text{elongation}$$

Hooker's Law

$$\sigma = E \epsilon$$

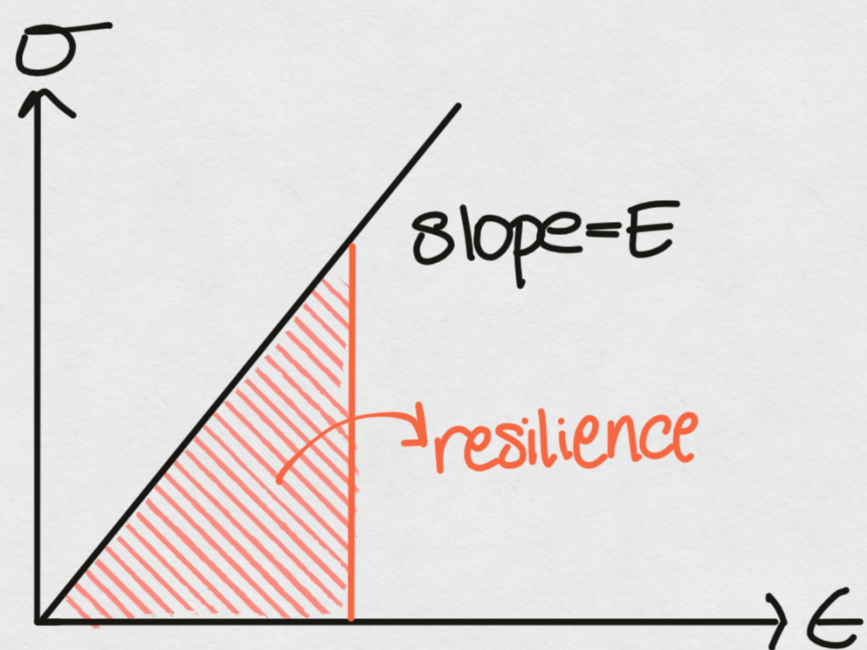
E = Young's Modulus

Modulus of Elasticity

materials resistance to elastic deformation

$E \propto \text{stiffness}$ is a consequence of atomic bondings.

a measure of resistance to separation of adjacent atoms



some materials σ - ϵ curve is nonlinear, to obtain E, tangent or secant modulus is used

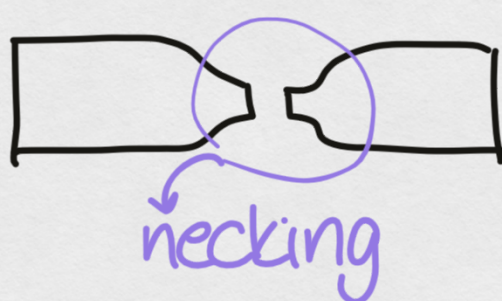
elastic = reversible

Poisson

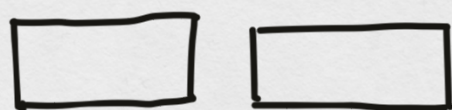
$$\nu = -\frac{\epsilon_x}{\epsilon_z} = -\frac{\epsilon_y}{\epsilon_z}$$

plastic = breaking of bonds.

Yield strength: materials resistance to plastic defo.



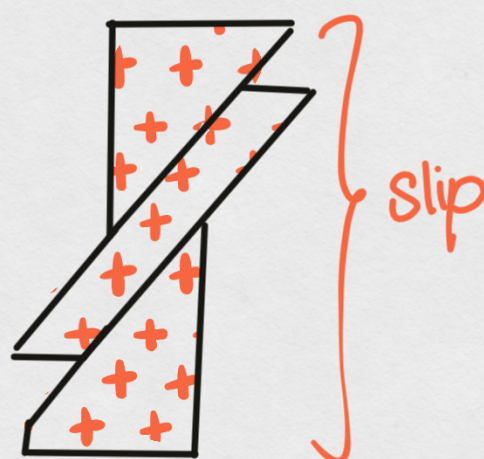
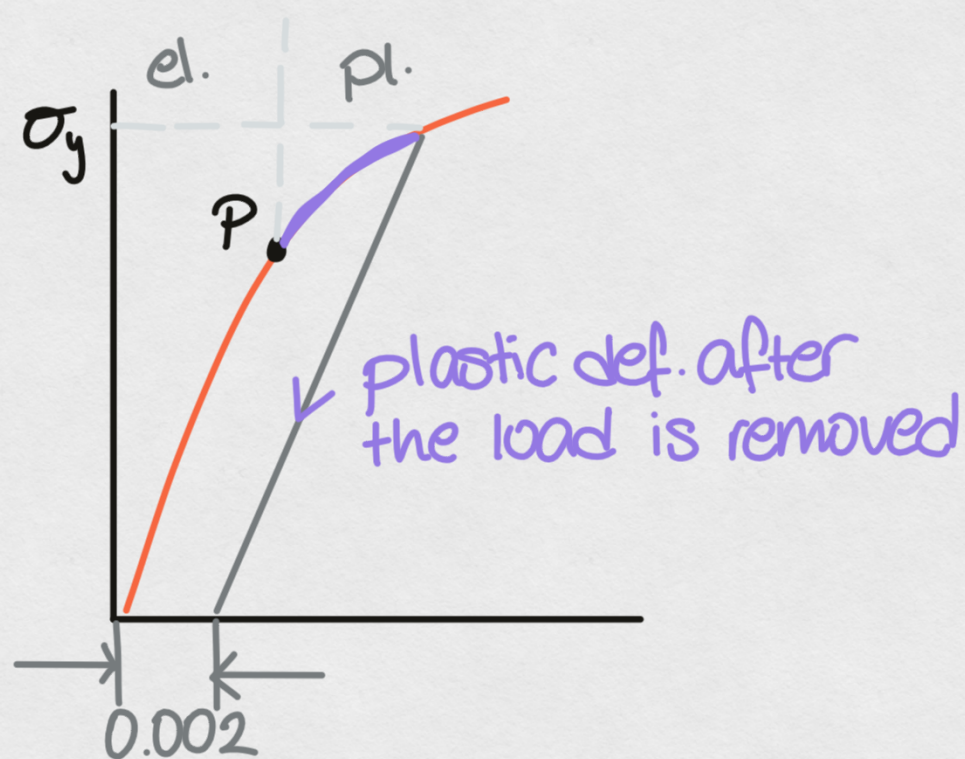
ductile



brittle.

plastic deformation occurs due to slip

slip: motion of dislocation



Yield strength is determined by 0.002 offset method.

P: proportional limit, gradual elastic to plastic