

Material Testing Formula Sheet

Note: This document is intended to provide variables, symbols, units, and formula to be utilized in Lesson 2.3 Material Testing, as well as other lessons throughout the POE course.

Variables and Symbols	Units	Formulas
π (pi) = Constant ratio between a circle's diameter and its circumference	None	3.14
Δ (delta) = Change in		This is not a variable in itself. ΔL , for instance, is change in length, and has the same units as length.
L_0 = Original length	inch (in.)	
δ (delta) = Total deformation or elongation	inch (in.)	ΔL
ϵ (Epsilon) = Normal strain	No units	$\epsilon = \frac{\delta}{L_0}$
P = Axial force	pounds (lb)	$\sigma = \frac{F}{A}$
r = Radius	in.	$A = \pi r^2$
d = Diameter	in.	$d = 2r$
A = Cross section area	in.^2	$A = \pi r^2$
σ (Sigma) = Stress, axial stress, or normal stress (force per unit area)	$\frac{\text{lb}}{\text{in.}^2}$ or psi	$\sigma = \frac{F}{A}$
τ (Tau) = Shear stress	$\frac{\text{lb}}{\text{in.}^2}$ or psi	$\tau = \frac{P}{A}$
E = Modulus of elasticity	$\frac{\text{lb}}{\text{in.}^2}$ or psi	$E = \frac{PL_0}{A\delta} = \frac{\sigma}{\epsilon}$