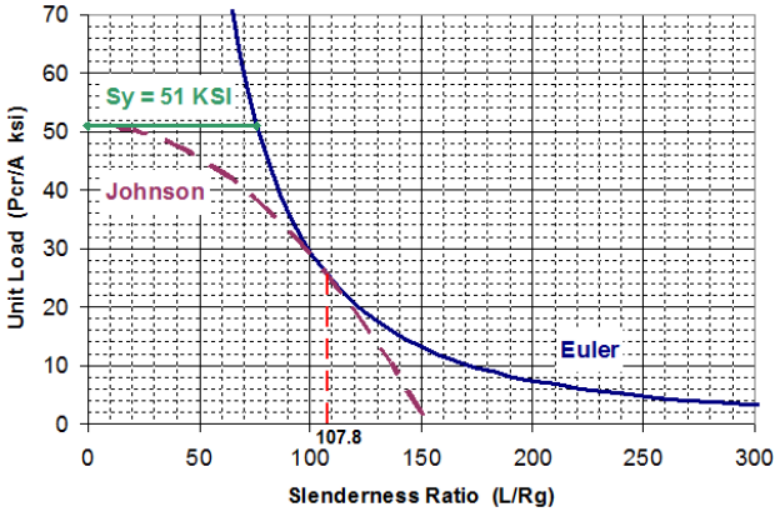
Columns Flow/Logic

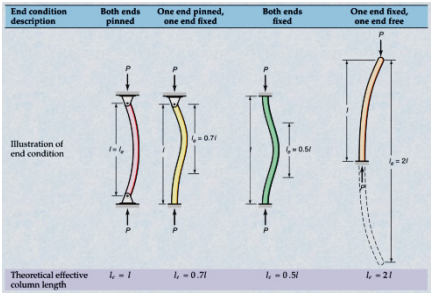


A. You always need:

1. The Material Modulus of Elasticity and Yield Strength
2. The Length
3. The Cross Section
4. The End Conditions

B. Find out if your Column is short or long. First Compute the Critical or Transition Slenderness Ratio = $\sqrt{\frac{2\pi^2 E}{S_y}}$

C. Compute the Slenderness Ratio of your column. Calculate the Area Moment of Inertia, I, and the Area, A. Then the Radius of Gyration, Rg = $\sqrt{I/A}$



Next, calculate the Effective Length, based on the End Conditions,
Le = L * Coefficient from Table 9.1 in Hamrock (use the Theoretical values).
Finally, your Slenderness Ratio = Le/Rg.

D. If Le/Rg > Transition Slenderness Ratio, use the Euler Equation to compute the buckling load or stress.
If Le/Rg < Transition Slenderness Ratio, use the Johnson Equation to compute the buckling stress. Buckling load = Buckling stress * Area.

E. The Factor of Safety = Buckling Load / Actual Load, or Buckling Stress / Actual Stress.
FOS is NOT Sy/anything.

Johnson: $\sigma_{cr_J} = S_y - \frac{S_y^2}{4\pi^2 E}\left(\frac{l_e}{r_g}\right)^2$

Euler: $\sigma_{cr} = \frac{\pi^2 E}{\left(l_e / r_g\right)^2}$