Common Types of Tension Members

- Bracing Members (Bridges, Bents)
- Trusses (Roof, Bridges)
- Cables (Chapter 3 Steel)

Steel Tension Members
How can I transition member FM1?

Limit States:

- Bolt Failure
- Block Shear
- Prestress (Strength)
- Yielding (Serviceability)
\[ \phi_{\text{run}} = f(\phi, F, A) \]

**Strongly Correct Eq.**

\[ \text{run} = f(F, A) \]
\[ t = \text{ shear lag factor} \]
\[ A_n = \text{ net area} = \text{ total area} \text{ minus bolt holes} \]
\[ A_e = \text{ net effective area} \text{ (use lowest table value)} \]
\[ f_s = \text{ ultimate strength} \text{ (table 1-1 in textbook)} \]
\[ F_{ct} = \phi F_n A_e \]
\[ \phi = 0.75 \]
\[ \phi = 0.6 \]
\[ \phi = 0.45 \]
\[ A_g = \text{ total cross-sectional area} \]
\[ F_y = \text{ yield strength of material (A36, Grade 50)} \]
\[ \frac{A_g}{F_y} = \phi F_n A_g \]
\[ \text{yield strength: } F_n = \frac{A_g}{F_y} \]
\* angles only

\[
\frac{1}{n} \leq \sum_{i=1}^{n} \frac{1}{l_i}
\]

\* variances for Welded connections (Case 3, 4)

\* for Bolted connections (Case 2, 8)

See Table 0.3.1. 1

of unsymmetrical members.

In accounts for cases where tension is not uniform because

\[
2 \quad 0
\]

both have same area

\[
\text{Shear Load Factor}
\]
Example 2: Determine the tension capacity of a 15 x 8 x 1/2 in.

Given:
- Area, $A_g = 4.00 \text{ in.}^2$
- $F_{tu} = 65 \text{ ksi}$
- $F_y = 50 \text{ ksi}$

Questions:
1. $F_{tu}$ - Tensile strength
2. $F_y$ - Yield strength

Solution:

- $A_g = 4.00 \text{ in.}^2$
- $F_{tu} = 65 \text{ ksi}$
- $F_y = 50 \text{ ksi}$

Diagram:

- 3"
- 1/2"
- 1/2"
- 3/4"
Fracture: $F_{Ag} = 0.9 (50 ksi) (4.00 in^2) = 180$ kips (yielding)

$A_e = U A_e$

$A_n = 4.80 - 2 (7/8 + 1/8) (1/2)$

$U = 8.6 \text{ or } 1 - \frac{x}{8}$

$k = 0.901 \text{ in.}$

$x = \frac{1}{10} = 0.10 \text{ in.}$

$L = \frac{8}{7} L_0$
$A_1 = 2.56 \text{ in}^2$

$R_1 = 0.75 (0.65) (0.85) (8.00)$

$\phi_{AE} = \phi_{EA}$