- Separately compute \( \chi \) for each limit state where

\[
\begin{align*}
\bar{L}_p & \leq \bar{L}_p \implies 1.7 \bar{L}_p \geq \frac{G}{E_f} \\
\bar{A}_m &= \frac{2}{5} \cdot 3.7 \bar{A}_m \geq \frac{G}{E_f} \\
\text{then } M &= M_p
\end{align*}
\]

- if one or more of these is violated, \( M < M_p \)

Result: \( M = M_p \)

Due 5/18, next Tuesday

Check beams working

Homework #10: 9.2, 9.4, and 9.15
The compact limits are violated and take lowest Mn
\begin{align*}
W_0 &= \text{Local Buckling} \\
\text{For Reissner-Mindlin Sh.p.} & \quad \frac{\pi^2}{L^2} \\
\text{For Elastic Buckling Sh.p.} & \quad 0.09E
\end{align*}

\begin{align*}
W_n &= \frac{3\pi^2}{e^2} \\
L_n \cong \sqrt{n} & \quad (\pi \approx 3.14)
\end{align*}

\begin{align*}
\left( \text{Universal interpolation between } L_p \text{ and } L_r \right) \\
W_n &= W_p - (W_p - W_r) \frac{L_p - L_r}{L_p - L_r} \\
&= W_p - (W_p - W_r) \frac{\text{if } L_p < L_r}{\text{if } L_r < L_p}
\end{align*}
\[ W_n = W_p - (W_p - W_m) \left( \frac{x_p - x_m}{x_r - x_p} \right) \]

(i) \( x_r > x_p \), \( x_r < x_m \)

\[ W_n = W_p \]

(ii) \( x_r < x_p \)

\[ \frac{x_r - x_m}{x_r - x_p} \]

\[ W_n = \text{Re Fy5x} \]
Eoquentions for LT8 are based on buckling theory.

\( L_p \)

\( L_r \)

\( G = 1.3 \)

\( C_6 = 1.0 \)

\( M_r = \text{fl}_5 \)

(\text{saw as fl}_6\)

- Leifert trouser buckling

- \( \lambda > \lambda_c \)
Because with moment gradient can resist hinge load.

Often we choose "moment gradient".
\[ C_6 = 2.5 \text{max} + 3 \text{max} + 4 \text{max} + 3 \text{max} \]

\[ C_6 = \frac{12.5 \text{max}}{} \]

- Maximum moment with two breaking points
- Moment @ quarter-points between internal braces

\[ C_6 = f \]

- Location of the maximum moment varies depending on how much the moment varies

- Gradient maximum, \( C_6 \)

- This effect is incorporated through the moment
\[
\begin{align*}
\text{(ii)} & \quad f_L < L_P \\
\text{Interpolation} & \\
W_n &= C_6 \left[ M_P - \frac{(M_P - M_0)(L_P - L_0)}{L_P - L_0} \right] < W_P
\end{align*}
\]

\[
\begin{align*}
\text{(i)} & \quad f_L < L_P < L_R \\
W_n &= M_P \\
W_n &= M_P
\end{align*}
\]
Summary

For sinusoidal properties:

\[ J, C_{u} \rightarrow \text{Section properties} \]

\[ E = \text{Shear modulus} = 11,720 \text{ kips} \]

\[ M_{w} = C_{b} \left( \frac{I_{y}^{2}}{I_{w}^{2}} + \frac{I_{y}^{2}}{I_{w}^{2}} \right) \]

\[ \text{Shear force} \]

\[ \text{Moment} \]

\[ \text{Lateral force} \]
at least

Separately compute RN for each vertex

- if one or more are violated, \( W_n \leq W_p \)

- if all 3 are satisfied, \( W_n = W_p \)

\[ L_b \leq L_p \]

\[ R_m \leq R_p \]

Circle \( \forall x \leq y \)
Solution:

(a) The beam is braced at its ends only.

(b) The beam is also braced at midspan.

Load is concentrated load placed at midspan.

Length = 24 in.

Width = 6 in.

Depth = 50

Find capcity of simply-supported beam.

Example - Analysis of Beam with Inertial Load and Support.
(a) Determine governing Eq. (5).

\[ L_p = 9.29', \quad L_r = 12' \]

\[ \text{Lt8} \]

(b) \( L_b = 24' \) given in Lt8 table.

\[ L_p < L_b < L_r \]

\[ \text{Check Bracing Distance:} \]

\[ \frac{h}{2} = 7.20 \leq \frac{h}{2} = 8.70 \frac{E_t}{E} = 29,000 \frac{29,000}{50} = 9.15 \]

\[ \sqrt{\frac{L_b}{2}} \text{ won't occur} \]
(3) Calculate $C_0$

\[ \phi_{mn} = C_0 \left[ \phi_{mp} - \frac{L_{r-L_p}}{L_{r-L_p}} \right] \leq C_0 \]

\[ \phi_{mn} = C_0 \left[ \phi_{mp} - \phi_{mp} \right] \leq C_0 \]

\[ \phi_{mn} = C_0 \left[ \phi_{mp} - \frac{(L_{r-L_p})}{L_{r-L_p}} \right] \leq C_0 \]

\[ \phi_{mn} = C_0 \left[ \phi_{mp} - \frac{(L_{r-L_p})}{L_{r-L_p}} \right] \leq C_0 \]
\[ C_b = 1.316 \]

\[
\frac{2.5(2x) + 3(x) + 4(2x) + 3Lx)}{12.5 (2x)} = C_b
\]

\[
\frac{2.5 \max x + 3 \max x + 3 \max x + 3 \max x}{12.5 \max x} = C_b
\]

\[
W_{max} = 2x
\]

\[
W_{c} = x
\]

\[
W_{g} = 2x
\]

\[
W_{a} = x
\]