Nominal Moment Strength- doubly symmetric I-section (major axis)

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A) *Compact Web* ➔

1-*Compact Flange*

For $L_b \le L_p$, $\quad M_{n1} = M_p$

For $L_p < L_b \le L_r$,

$$M_{n2} = C_b \left[M_p - (M_p - 0.7F_y S_x)\left(\frac{L_b - L_p}{L_r - L_p}\right)\right] \le M_p$$

For $L_b > L_r$, $\quad M_{n3} = F_{cr} S_x \le M_p$

where

$$F_{cr} = \frac{C_b \pi^2 E}{(L_b/r_{ts})^2}\sqrt{1 + 0.078\frac{J}{S_x h_0}\left(\frac{L_b}{r_{ts}}\right)^2}$$

2-*Non-Compact Flange*

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$$M_n = M_p - (M_p - 0.7F_y S_x)\left(\frac{\lambda - \lambda_p}{\lambda_r - \lambda_p}\right)$$

Note: ***A beam can fail by reaching Mp and becoming fully plastic, or it can fail by***

1. *lateral-torsional buckling (LTB), either elastically or inelastically;*
2. *flange local buckling (FLB), elastically or inelastically;*
3. *web local buckling (WLB), elastically or inelastically.*

In general, a noncompact beam may fail by lateral-torsional buckling (LTB), flange local buckling (FLB), or web local buckling (WLB). The strength corresponding to each of these three limit states must be computed, and ***the smallest value will control.***

$\boldsymbol{L_p}$ = *upper limit for plastic moment capacity*, $\boldsymbol{L_r}$ = *upper limit for lateral-torsional buckling inelastic range*, $\boldsymbol{\lambda}$ = *width-to-thickness ratio*