13.6 Bending — Laterally Unsupported Members

Where continuous lateral support is not provided to the compression flange of a member subjected to uniaxial strong axis bending, the factored moment resistance, M_r, may be taken as follows:

(a) For doubly symmetric Class 1 and 2 sections, except closed square and circular sections
  (i) when $M_u > 0.67 M_p$

$$M_r = 1.15 \phi M_p \left(1 - \frac{0.28 M_p}{M_u}\right) \text{ but not greater than } \phi M_p$$

  (ii) when $M_u \leq 0.67 M_p$ $M_p \sim Z f_y$

$$M_r = \phi M_u$$

where the critical elastic moment of the unbraced member is given by

$$M_u = \frac{\omega_2 \pi}{L} \sqrt{E I_y G J + \left(\frac{\pi E}{L}\right)^2 I_y C_w}$$

where
L   = length of unbraced portion of beam
ω_2 = $1.75 + 1.05\kappa + 0.3\kappa^2 \leq 2.5$, for unbraced lengths subject to end moments
    = 1.0 when the bending moment at any point within the unbraced length is larger than the larger end moment or when there is no effective lateral support for the compression flange at one of the ends of the unsupported length

where
C_w = 0.0 for hollow structural sections
κ = the ratio of the smaller factored moment to the larger factored moment at opposite ends of the unbraced length, positive for double curvature and negative for single curvature

(b) For doubly symmetric Class 3 and 4 sections, except closed square and circular sections, and for channels
  (i) when $M_u > 0.67 M_y$

$$M_r = 1.15 \phi M_y \left(1 - \frac{0.28 M_y}{M_u}\right)$$

but not greater than ϕM_y for Class 3 sections and the value given in Clause 13.5 (c) (iii) for Class 4 sections
  (ii) when $M_u \leq 0.67 M_y$

$$M_r = \phi M_u$$

where M_u and ω_2 are as defined in Clause 13.6 (a)(ii)

(c) For closed square and circular sections, M_r shall be determined in accordance with Clause 13.5.
(d) For cantilever beams, a rational method of analysis taking into account the lateral support conditions at the support and tip of the cantilever should be used.
(e) For monosymmetric shapes, a rational method of analysis such as that given in the Structural Stability Research Council's *Guide to Stability Design Criteria for Metal Structures* should be used.
(f) For biaxial bending, the member shall meet the following criterion: