5.6 Combined bending and compression

Compression members which are also subject to bending will have to be designed to take into account the effects of interaction. The following checks are suggested for members which have at least one axis of symmetry: (i) the local capacity at points of greatest bending moment and axial load and (ii) an overall buckling check.

5.6.1 Local Capacity Check

The local capacity check is ascertained by satisfying the following at the points of greatest bending moment and axial load:

$$\frac{F_c}{P_{cs}} + \frac{M_x}{M_{cx}} + \frac{M_y}{M_{cy}} \leq 1 \qquad \textbf{(5.23)}$$

F_c = applied axial load

P_{cs} = short strut capacity defined by $A_{eff}.P_{yd}$ (eqn.7.15)

M_x, M_y = applied bending moments about x and y axis

M_{cx} = Moment resistance of the beam about x axis in the absence of F_c and M_y

M_{cy} = Moment resistance of the beam about y axis in the absence of F_c and M_x.

5.6.2 Overall buckling check

For members not subject to lateral buckling, the following relationship should be satisfied:

$$\frac{F_c}{P_c} + \frac{M_x}{C_{bx}.M_{cx}\left(1-\frac{F_c}{P_{EX}}\right)} + \frac{M_y}{C_{by}.M_{cy}\left(1-\frac{F_c}{P_{EY}}\right)} \leq 1 \qquad \textbf{(5.24)}$$

For beams subject to lateral buckling, the following relationship should be satisfied:

$$\frac{F_c}{P_c} + \frac{M_x}{M_b} + \frac{M_y}{C_{by}.M_{cy}\left(1 - \frac{F_c}{P_{EY}}\right)} \leq 1 \qquad \textbf{(5.25)}$$

Where

P_c = axial buckling resistance in the absence of moments (see eq. 5.16)

P_{EX}, P_{EY} = flexural buckling load in compression for bending about the x- axis and for bending about the y-axis respectively.

C_{bx}, C_{by} = C_b factors (defined in the previous chapter) with regard to moment variation about x and y axis respectively.

M_b = lateral buckling resistance moment about the x axis defined in the previous chapter.