Table 5.13 Span/effective depth ratios for beams			
Location	$\frac{A_s}{bd} \geqslant 1.5\%$	$\frac{A_s}{bd} = 0.5\%$	$\frac{A_s}{bd} \leqslant 0.35\%$
Simply supported beam	14	20	30
End span of continuous beam	18	26	39
Interior span	20	30	45
Cantilever	6	8	12

Notes

a Values may be interpolated.

b For flanged sections where the ratio of the flange width to the rib width exceeds 3, the values should be multiplied by 0.8.

c For spans exceeding 7m supporting partitions liable to be damaged by excessive deflections, the value should be multiplied by 7/span (in metres).

d The above assumes f_{yk} = 500MPa. If other values of f_{yk} are used then multiply the above by $500/f_{yk}$.

e A_s/bd is calculated at the location of maximum span moment.

5.5.2 Slenderness, fire resistance and durability

The size of column, concrete grade and the cover to reinforcement should be determined by taking into account the requirements of slenderness, fire resistance and durability. To facilitate concreting the minimum dimension of a column should not normally be less than 200mm.

5.5.2.1 Slenderness

The slenderness of a column is defined by the ratio of the effective height to the dimension of the section perpendicular to the axis of bending considered. Using the notation given in Figure 5.16, a column is slender if:

$$\frac{l_{oz}}{b} > 4.38\left(1.7 - \frac{M_{1z}}{M_{2z}}\right)\xi \quad \text{OR} \quad \frac{l_{oy}}{h} > 4.38\left(1.7 - \frac{M_{1y}}{M_{2y}}\right)\xi$$

(for circular columns, diameter D: $\frac{l_o}{D} > 3.79\left(1.7 - \frac{M_{1z}}{M_{2z}}\right)\xi$)

Where: M_{1z} and M_{1y} are the numerically smaller end moments about the z- and y- axes respectively
M_{2z} and M_{2y} are the numerically larger end moments about the z- and y- axes respectively

$$\xi = 0.69\sqrt{\frac{(1 + 2\omega)(A_c f_{ck})}{N_{Ed}}} \geqslant 1.0$$

$$\omega = 1.53\frac{A_s f_{yk}}{A_c f_{ck}}$$ (When A_s is not known ω_{min} may be taken as $0.003\frac{f_{yk}}{f_{ck}}$)

It should be noted that, for most columns in framed structures, M_1 will have the opposite sign to M_2.

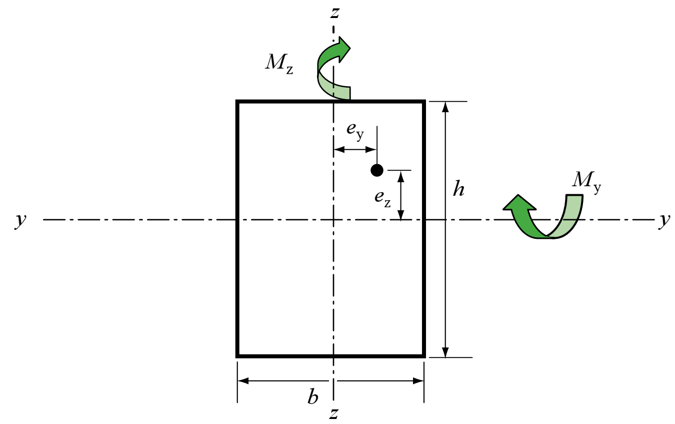

Fig 5.16 Axes and eccentricities for columns

This figure has been deleted as the slenderness limits indicated by it have been found to be generally less conservative than EC2. The equations on page 58 should be used instead.

Fig 5.17 Slenderness limits for braced columns

iv) check sufficient stiffness of shear walls for second order effects
v) check that cover and concrete comply with durability requirements
vi) calculate axial loads and moments according to Section 5.6.3
vii) design section and reinforcement.

The thickness of the wall should not be less than 150mm, but to facilitate concreting 180mm is preferable.

5.6.2 Slenderness, fire resistance and durability

5.6.2.1 Slenderness

The slenderness of a wall is defined by the ratio of the effective height to the thickness of the wall, h.

$$\frac{l_{oz}}{h} > 4.38\left(1.7 - \frac{M_{1z}}{M_{2z}}\right)\xi$$

Where: M_{1z} and M_{2z} are the numerically smaller and larger end moments respectively

N_{Ed} is the effective axial load per metre length of the wall calculated according to Section 5.6.4 below.

$$\xi = 0.69\sqrt{\frac{(1+2\omega)(1000hf_{ck})}{N_{Ed}}} \geqslant 1.0$$

$$\omega = 1.53\frac{A_s f_{yk}}{1000hf_{ck}}$$

A_s is the area of steel (mm² per m).

(When A_s is not known ω_{min} may be taken as $0.003\frac{f_{yk}}{f_{ck}}$)

It should be noted that, for most walls in framed structures, M_{1z} will have the opposite sign to M_{2z}.

The effective height may be obtained by multiplying the clear height between floors by the factor obtained from Table 5.19.

Table 5.19 Effective height factors for walls

End condition at top	End condition at bottom		
	1	2	3
1	0.75	0.80	0.90
2	0.80	0.85	0.95
3	0.90	0.95	1.00

Notes

a Condition 1 Wall connected monolithically to slabs on either side that are at least as deep as the overall thickness of the wall. Where the wall is connected to a foundation, this should be designed to carry moment, in order to satisfy this condition.

b Condition 2 Wall connected monolithically to slabs on either side that are shallower than the overall thickness of the wall, but not less than half the wall thickness.

c Condition 3 Wall connected to members that do not provide more than nominal restraint to rotation.