

12.6.5 Ultimate limit states induced by structural deformation (buckling)

12.6.5.1 Slenderness of columns and walls

(1) The slenderness of a column or wall is given by

$$\lambda = l_0 / i \quad (12.8)$$

where:

i is the minimum radius of gyration

l_0 is the effective length of the member which can be assumed to be:

$$l_0 = \beta \cdot l_w \quad (12.9)$$

where:

l_w clear height of the member

β coefficient which depends on the support conditions:

for columns $\beta = 1$ should in general be assumed;

for cantilever columns or walls $\beta = 2$;

for other walls β -values are given in Table 12.1.

Table 12.1: Values of β for different edge conditions

Lateral restraint	Sketch	Expression	Factor β	
along two edges			$\beta = 1,0$ for any ratio of l_w/b	
Along three edges		$\beta = \frac{1}{1 + \left(\frac{l_w}{3b}\right)^2}$	b/l_w	β
Along four edges		$\beta = \frac{1}{1 + \left(\frac{l_w}{b}\right)^2}$	0,2	0,26
			0,4	0,59
			0,6	0,76
			0,8	0,85
			1,0	0,90
			1,5	0,95
			2,0	0,97
			5,0	1,00
			b/l_w	β
			0,2	0,10
Along four edges		$\beta = \frac{b}{2l_w}$	0,4	0,20
			0,6	0,30
			0,8	0,40
			1,0	0,50
			1,5	0,69
			2,0	0,80
			5,0	0,96
			b/l_w	β
			0,2	0,10
			0,4	0,20

(A) - Floor slab (B) - Free edge (C) - Transverse wall

Note: The information in Table 12.1 assumes that the wall has no openings with a height exceeding 1/3 of the wall height l_w or with an area exceeding 1/10 of the wall area. In walls laterally restrained along 3 or 4 sides with openings exceeding these limits, the parts between the openings should be considered as laterally restrained along 2 sides only and be designed accordingly.

(2) The β -values should be increased appropriately if the transverse bearing capacity is affected by chases or recesses.

(3) A transverse wall may be considered as a bracing wall if:

- its total depth is not less than $0,5 h_w$, where h_w is the overall depth of the braced wall;
- it has the same height l_w as the braced wall under consideration;
- its length l_{ht} is at least equal to $l_w / 5$, where l_w denotes the clear height of the braced wall;

- within the length l_{ht} the transverse wall has no openings.

(4) In the case of a wall connected along the top and bottom in flexurally rigid manner by insitu concrete and reinforcement, so that the edge moments can be fully resisted, the values for β given in Table 12.1 may be factored by 0,85.

(5) The slenderness of walls in plain concrete cast insitu should generally not exceed $\lambda = 86$ (i.e. $l_0/h_w = 25$).