SECTION 6. SLENDERNESS RATIO

Slenderness ratio of a wall is the ratio of the effective height of a wall divided by the thickness. It provides a means of measuring the robustness of a wall and it is used in calculations to adjust the capacity of a wall to account for the possibility of buckling causing a premature mode of failure.

6.1 Slenderness ratio for *mortarless* walls

AS 3600 Clause 11.2 outlines the design procedures for walls and the limiting slenderness ratio depend on the design method being used (refer Section7):

a) For braced walls designed using the simplified method the maximum slenderness ratio is 30.
b) For braced walls designed as a slab the maximum slenderness ratio is 50 (refer Clause 11.1(b)).
c) For walls designed as columns see below.

AS 3600 Clause 11.5 contains provisions for the design of walls for vertical compression forces using a simplified design method where the slenderness ratio does not exceed 30. The values in the design tables in the subsequent Parts of this manual have been calculated using the simplified method.

Clause 11.4 gives the method of calculating effective height (H_{we}) depending on whether one-way or two-way buckling applies to the design. In all cases $H_{we} = kH_w$ where:

H_w is the unsupported height of a wall, and

L_1 is the length of a wall between centres of lateral restraint or from a lateral restraint to a free edge.

There are three different circumstances for braced walls in which the value of k varies:

1. **one-way buckling**
   k=0.75 for braced walls where rotational restraint is provided at both ends, and
   k=1.0 where rotational restraint is not provided at one or both ends.

2. **two-way buckling** with lateral support provided on <u>three sides</u> by floors and intersecting walls

   $k = 1/ (1+ (H_w^2/9L_1^2))$ but not less than 0.3 and not greater than k for one-way buckling

3. **two-way buckling** with lateral support provided on <u>four sides</u> by floors and intersecting walls

   $k = 1/(1+(H_w^2 / L_1^2))$ where $H_w \le L_1$

   $k = L_1 / 2H_w$ where $H_w > L_1$

Note that if a wall is designed for two way buckling then both the vertical and the horizontal reinforcement must be positioned in both faces - refer Section 3 of this design manual.

For walls with openings there two circumstances to be considered (Clause 11.4):

a) If the total area of the openings is less than 10% of the area of the wall and the height of any opening (not vertically one above the other) is less than 1/3rd of the height of the wall, then the effect of the openings can be ignored.

b) In other cases the area of the wall between the support and the opening shall be designed as supported on three sides, and the area between openings shall be designed as supported on two sides.

In Clause 11.4 it is stated that an intersecting wall with a minimum length of $0.2H_w$ can be considered a lateral restraint.

6.2 Slenderness ratio for columns

For walls designed as columns the maximum slenderness ratio as defined in Clause 10.3.1 must not exceed 120 unless a rigorous analysis has been carried out (Clause 10.5.1).

The method of calculating the effective length of a column is given in Clause 10.5.3, and the means of calculating the slenderness ratio is given in the other parts of Clause 10.5. Note that the slenderness ratio of a column is the effective length divided by the radius of gyration.