SECTION 2. DESIGN OF *mortarless* WALLS IN COMPRESSION

The tables in this section can be used to directly establish the compression load capacity of a mortarless masonry wall of a wide range of heights and lengths constructed with 200 ***mortarless*** masonry units of Grade 15 or 20, fully grouted with concrete of Grade C25/30. Note that to comply with the Code the grout strength must be at least equal to the unconfined compressive strength of the masonry units but the minimum grout strength for compliance with BS 5628-2:2005 is C25/30. Remember also that ***mortarless*** walls should generally be designed as unreinforced for compression and reinforced for bending.

DESIGN PROCEDURE:

1. Calculate ultimate limit state load on wall.

2. Select a mortarless block size and strength (grade) based on local availability and price, and any other requirements (architect's requirements, fire rating, sound rating, thermal rating etc). The block grade is the unconfined compressive strength calculated using the mid-height cross sectional area of the face shells, and this will be either 15MPa or 20MPa, but check that the selected block grade is available locally for the project.

3. Determine the nature of the lateral restraints to both vertical and both horizontal edges of the wall panel.

4. Use the tables in Section 1 above to check that the minimum requirements for robustness will be satisfied, i.e. that either the maximum permissible height or the maximum permissible length is not exceeded. Note that only one maximum (length or height) is not to be exceeded, and note that it is the actual clear height or length that should be checked against the values in the tables.

5. Calculate the effective eccentricity at the top edge of the wall to represent the applied bending moment. (see below)

6. Use the table below in this section to determine whether wall height or wall length should be used to determine compression load capacity and use the appropriate table in Section 2.1 or 2.2 to determine the maximum design load. Alternatively, use the tables in Section 2.1 or 2.2 to determine the load capacity based on height and the load capacity based on length, and adopt the larger of the two values .

7. If the load capacity is not adequate, make the necessary adjustments and check again.

Fire, sound attenuation etc:

8. Finally check that the wall satisfies all other requirements in terms of durability, slenderness, thickness etc.

Effective eccentricity of applied compression load

When designing walls for compression it is necessary to calculate the eccentricity of the design compression load applied to the top of the wall. It is permissible to use simplified methods to calculate the effective eccentricity, however the bending moment may also be calculated using moment distribution methods. (Refer BS 5628-1:2005 Clause 27)

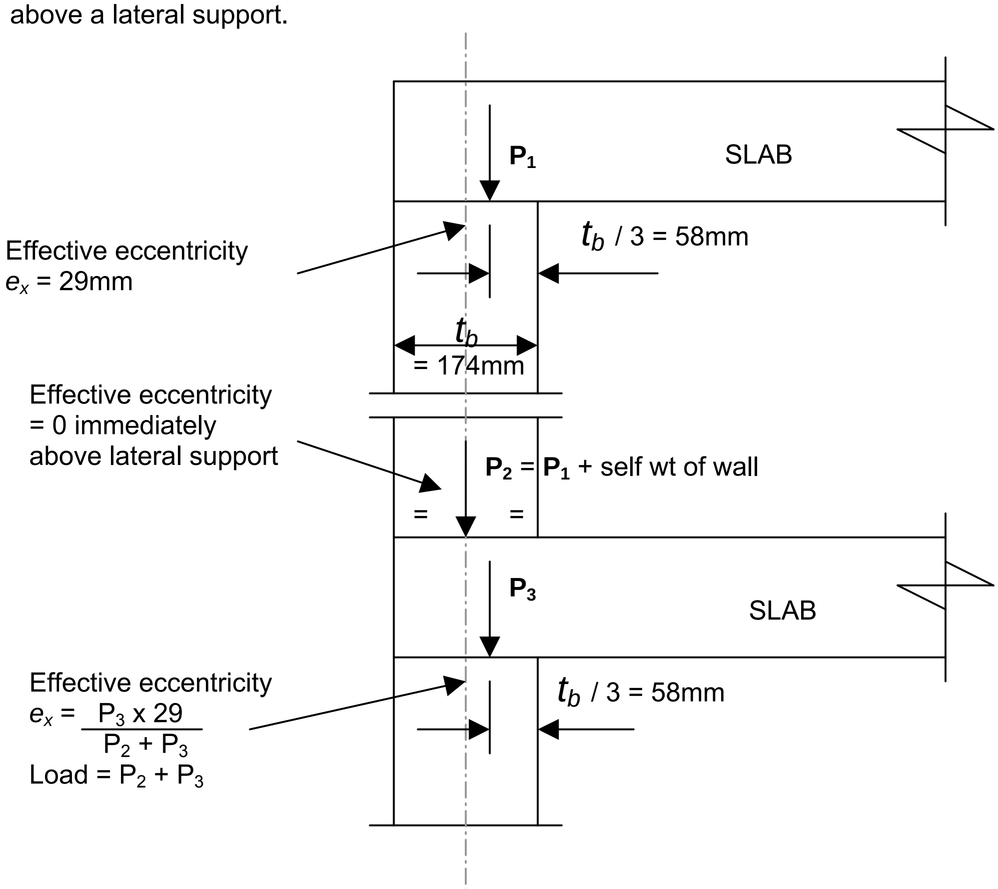
The simplified method of calculating the effective eccentricity is outlined below. When using this method it is permissible to assume that the effective eccentricity at the base of the wall (immediately above the lateral restraint) is zero as indicated in the diagram.

If the load is applied to the wall via joist hangers, the load should be assumed to be applied to the face of the wall.

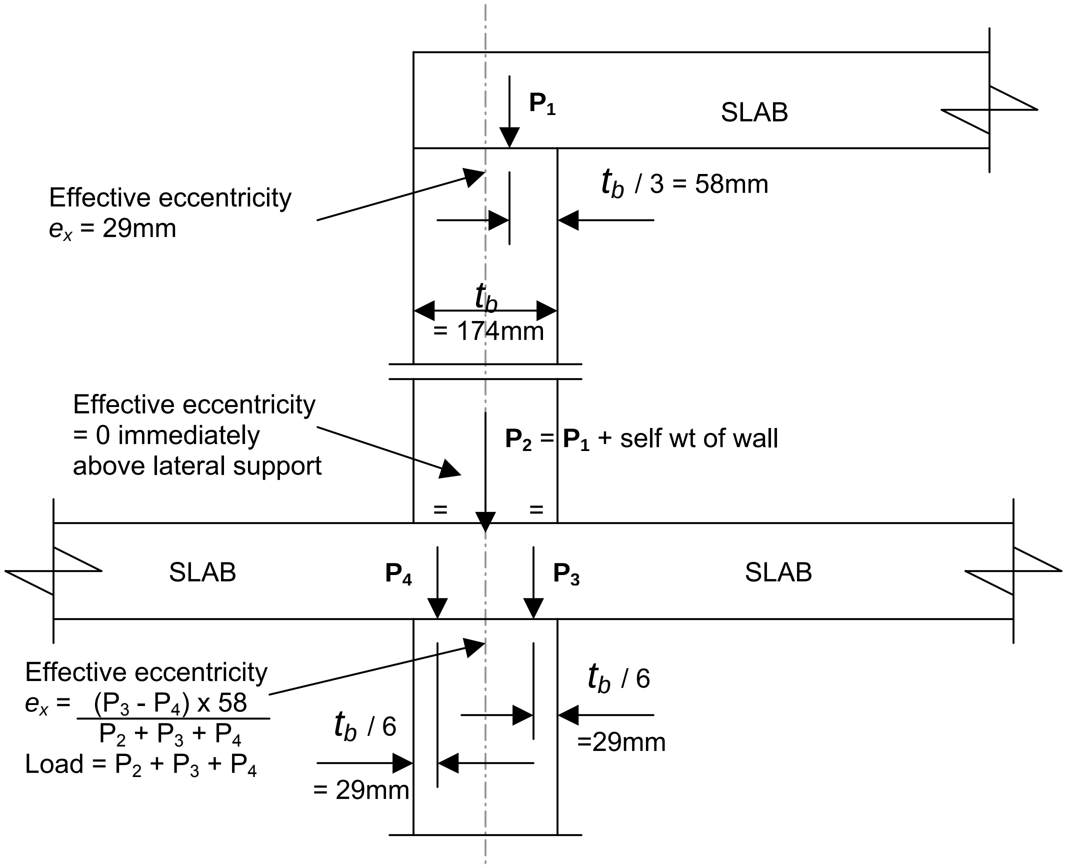
Simplified method of calculating effective eccentricity:

Note that BS 5628-1:2005 Clause 27 permits the designer to use his or her discretion as to whether the eccentricity should be calculated or whether the following simplified procedure is adopted:

- The effective eccentricity is calculated assuming the load transmitted to a wall by a single floor or roof acts at ⅓ rd of the bearing depth from the loaded face of the wall.
- Where a floor or roof is continuous over the wall, each side of the floor or roof shall be taken as being individually supported on ½ the total bearing area.
- The resulting eccentricity e_x at any level shall be calculated on the assumption that the total vertical load is axial immediately above the joint under consideration, i.e. immediately above a lateral support.



Note: in the above diagram t_b is the equivalent bedded thickness of the wall = 174mm



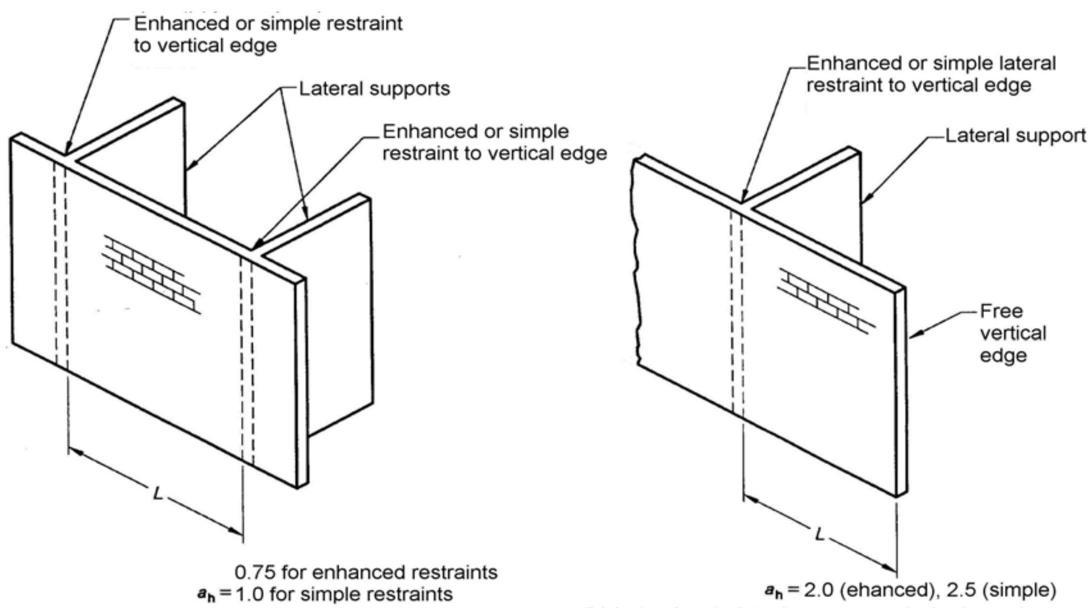
Note: in the above diagram t_b is the equivalent bedded thickness of the wall = 174mm

Determining whether the height or the length governs the design of a wall in compression

Walls may be very tall but if they are adequately restrained laterally by fully tied intersecting walls at relatively close centres then they are much stiffer than unrestrained walls and the compression load capacity may be dependent on the effective length of the wall panel rather than the effective height. Use the Table below to ascertain whether H or L should be used when determining the design load capacity of a wall that is not stiffened with engaged piers.

a_v	a_h	*H* is used to determine the design slenderness ratio and hence to determine the compression capacity of the wall unless:
0.75	0.75	$L < 1.00 H$
0.75	1.0	$L < 0.75 H$
0.75	2.0	$L < 0.37 H$
0.75	2.5	$L < 0.30 H$
1.0	0.75	$L < 1.33 H$
1.0	1.0	$L < 1.00 H$
1.0	2.0	$L < 0.50 H$
1.0	2.5	$L < 0.40 H$

Value of a_h:



(a) Lateral restraint along both vertical edges

(b) Lateral restraint along one vertical edge only

Value of a_v:

a_v = 0.75 if the wall panel has an enhanced level of lateral restraint along both the top and bottom edges
a_v = 1.0 if the wall panel has a simple level of lateral restraint along both the top and bottom edges.