3.1 Design co-ordination

The Engineer should be satisfied that the materials used by, and the requirements of, other members of the design team are compatible with those governing the masonry design, particularly with regard to tolerances, provisions for movement, lateral restraint, stability tying and water absorption of clay masonry units.

EC6[1] does not concern itself with resistance to impact and abrasion, or the provision of secure fixings for the attachment of other components. For example, hollow or lightweight blockwork can be less resistant to impact or abrasion and may require the use of special fixings, which could be a consideration in certain situations such as factories and warehouses.

3.2 Classification of environmental conditions

The choice of masonry materials is also governed by the exposure conditions to which they will be subjected. EC6 Part 2[3] gives a classification system for exposure conditions.

In order to give adequate consideration to the exposure of completed masonry, it is necessary to look at the climatic (macro) and local (micro) conditions to which the masonry is subject. The macro conditions which must be considered are:

- rainwater and snow
- the combination of wind and rain
- temperature variation
- relative humidity variation.

The effect of these factors on the micro conditions of exposure of the masonry must be taken into account, together with the effect of any applied finishes or protective cladding. EC6 Part 2[3] categorises the micro conditions of exposure as follows:

- MX1 - In a dry environment
- MX2 - Exposed to moisture or wetting
- MX3 - Exposed to moisture or wetting plus freeze/thaw cycling
- MX4 - Exposed to saturated salt air or seawater
- MX5 - In an aggressive chemical environment, (particularly where sulfates occur).

Where necessary, each class is sub-divided, e.g. MX2.1 and MX2.2 (see Table 3.1).

design. Edge restraint is provided in the form of either vertical or horizontal lateral support to the edges of masonry walls. These lateral supports (e.g. buttressing or stiffening walls, floors or roofs acting as horizontal diaphragms) must be capable of transmitting the appropriate lateral forces to the strongpoints in the structure (shear walls etc.). EC6 Part 1-1[1] has no specific requirement for these lateral loads. In the UK, it is usual practice to design the lateral support for the sum of:

i) the simple static reactions to the total applied design horizontal forces (e.g. wind loads) at the lateral support, and

ii) 2.5% of the total design vertical load that the wall or column is designed to carry applied as a horizontal force at the line of lateral support.

The resulting horizontal force is applied to all individual horizontal and vertical lateral supports and their connections. It is not to be confused with the global lateral load which is used for the overall stability of design of the structure and is distributed between the strongpoints (shear walls) in the structure (see Section 4.1).

In certain circumstances, however, it may be appropriate to design the strongpoints to resist the sum of these forces, e.g. ground-storey of podium construction, two-storey building and long-span heavily-loaded first floor.

As well as the vertical loads applied directly to a wall or pier, consideration must be given to eccentricity of load resulting from the layout of the masonry elements, the arrangement of the floor to masonry junctions and from construction deviations and differences in the material properties of individual components.

Table 5.1 Combinations of actions with values of γ_G γ_Q ψ_0

Combinations of actions	**Load Type**				
	Permanent actions G_k		**Leading variable action Q_{k1}**		**Additional variable actions Q_{ki}**
	Unfavourable $\gamma_{G,sup}$	**Favourable** $\gamma_{G,inf}$	**Unfavourable** γ_Q	**Favourable** γ_Q	γ_{Qi} ψ_0
Permanent plus variable (leading only)	1.35	1.0	1.5	0	–
Permanent plus leading variable (e.g. wind)	1.35	1.0	1.5	–	–
Permanent plus leading variable plus additional variable (e.g. wind)	1.35	1.0	1.5	–	1.5 ψ_0 [a]

Note

a Value of ψ_o from Table 4.2 (e.g. 1.5 x 0.5).

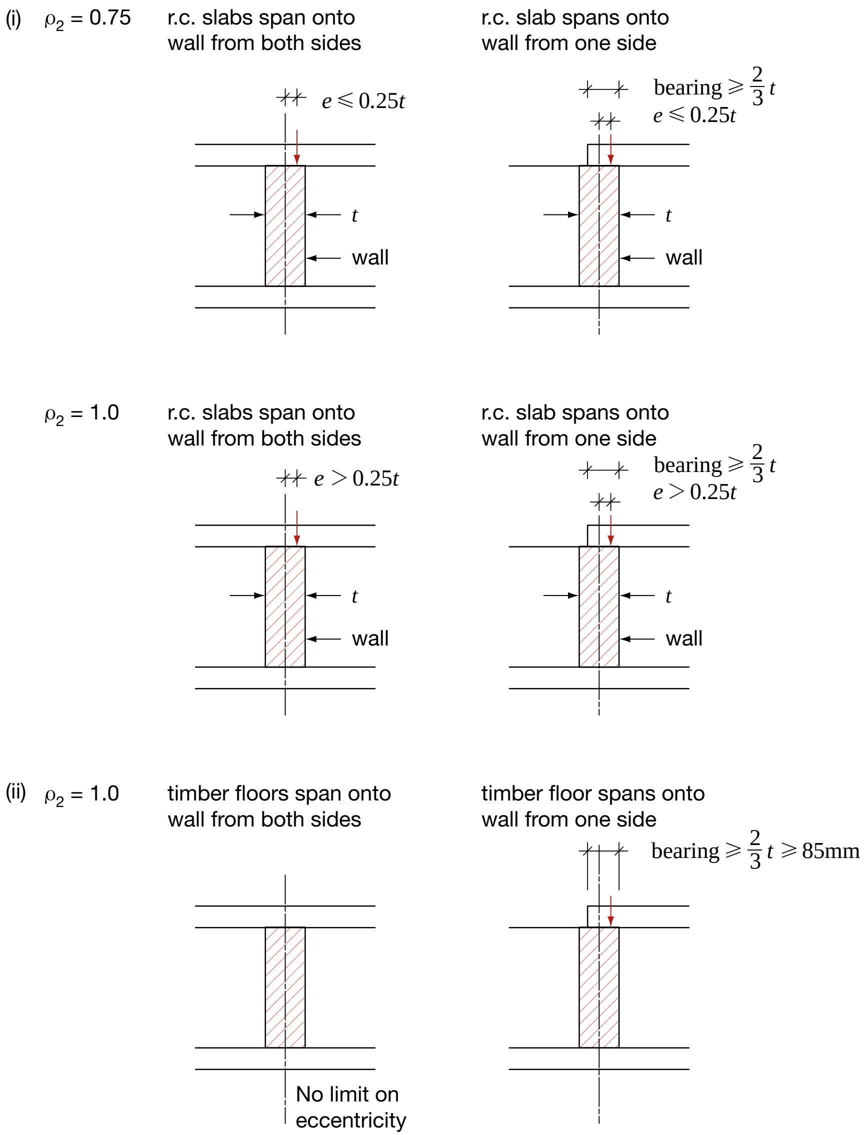

Fig 5.1a Values of effective height reduction factor, ρ_n

5.3.8 Vertical load resistance of solid walls and columns

It should be noted that there are no separate provisions for columns in EC6 Part 1-1[1]. They are simply considered as short walls.

The design resistance of a single leaf wall per unit length is N_{Rd} given by:

$$N_{Rd} = \Phi_t f_d$$

Where: Φ is a capacity reduction factor allowing for the effects of slenderness and eccentricity of loading

t is the thickness of the wall

f_d is the design compressive strength of the masonry.

When the cross-sectional area of the wall is less than 0.1m^2, f_d should be multiplied by:

$$(0.7 + 3A)$$

Where: A is the loadbearing horizontal gross cross-sectional area of the wall in square metres.

For a faced wall, the wall may be designed as a single leaf wall constructed entirely of the weaker unit with a longitudinal joint.

For a double-leaf wall, if the leaves are tied together adequately, the wall may be designed as a single leaf wall (assuming that both leaves are similarly loaded), or alternatively as a cavity wall.

Chases and recesses should be allowed for, see Section 6.4.

The slenderness reduction factor Φ is applied at the top or bottom of the wall Φ_i and at mid height of wall, Φ_m.

$$\Phi_i = 1 - 2\frac{e_i}{t}$$

Where: e_i is the eccentricity at the top or bottom of the wall, see Section 5.3.6.2

t is the thickness of the wall.

$$\Phi_m = A_1^{e - \frac{u^2}{2}}$$

Where: $A_1 = 1 - 2\frac{e_{mk}}{t}$

$$u = \frac{\lambda - 0.063}{0.73 - 1.17\frac{e_{mk}}{t}}$$

$$\lambda = \frac{h_{ef}}{t_{ef}}\sqrt{\frac{f_k}{E}}$$

As discussed in Section 5.3.6.3, e_{mk} is taken as equal to e_m where e_m is the eccentricity in the mid height of the wall.