Three options are given in the code in Table 12. Before these options are discussed it would be proper to consider whether the walls A and B in the ground floor, carrying heaviest precompression, can be designated as protected elements.

12.9.2 Protected wall

A protected wall must be capable of resisting 34 kN/m^2 from any direction. Let us examine wall A first.

(a) Wall A

Load combination=$0.95G_k$+$0.35Q_k$+ $0.35W_k$ (clause 22)

G_k=the load just below the first floor. So

$$\text{axial stress} = \frac{10^3[0.95 \times (168.08 - 7.4) + 0.35 \times 22.68]}{102.5 \times 1000} \pm 0.35 \times 0.365$$

(see tables 12.1 and 12.3)

$$= 1.57 \pm 0.1277$$

$$= 1.442 \text{ or } 1.70\,\text{kN/mm}^2 > 0.1\,\text{N/mm}^2$$

Therefore

$$n = (1.442 \times 102.5 \times 1000)/1000 = 147.8\,\text{kN/m}$$

(b) Lateral strength of wall with two returns

$$q_{\text{lat}} = k \times 8_{tn}/h^2 \gamma_m = k \times 7.6_{tn}/h^2 \quad \text{(clause 36.8 and Table 10)}$$

$$1/h = 4.25/2.85 = 1.49$$

hence k=2.265. (Note that in clause 37.1.1 a factor of 7.6, which is equal to 8/1.05, has now been suggested.)

$$q_{\text{lat}} = (2.265 \times 8 \times 102.5 \times 147.8)/[(2.85)^2 \times 1.05]$$

$$= 33.8\,\text{kN/m}^2 < 34\,\text{kN/m}^2$$

Hence this wall cannot strictly be classified as a protected member.

Since wall A, carrying a higher precompression, just fails to resist 34 kN/m^2 pressure, wall B, with a lower precompression, obviously would not meet the requirement for a protected member.

Further, for both walls

$$h/t = (2.85 \times 10^3)/102.5 = 27.8 > 25$$

Neither wall A nor B can resist 34kN/m^2. Even if they did, they do not fulfil the requirement of clause 36.8 that

$$h/t \leqslant 25$$

It may be commented that the basis of this provision in the code is obscure and conflicts with the results of tests on laterally loaded walls. Other options therefore need to be considered in designing against accidental damage.

12.9.3 Accidental damage: options

(a) Option 1

Option 1 requires the designer to establish that all vertical and horizontal elements are removable one at a time without leading to collapse of any significant portion of the structure. So far as the horizontal members are concerned, this option is superfluous if concrete floor or roof slabs are used, since their structural design must conform to the clause 2.2.2.2(b) of BS 8110:1985.

(b) Option 3

For the horizontal ties option 3 requirements are very similar to BS 8110:1985. In addition to this, full vertical ties need to be provided. This option further requires that the minimum thickness of wall should be 150 mm, which makes it a costly exercise. No doubt it would be difficult to provide reinforcements in 102.5mm wall. However, there could be several ways whereby this problem could be overcome. This option is impracticable in brickwork although possibly feasible for hollow block walls.

(c) Option 2

The only option left is option 2, which can be used in this case. The horizontal ties are required by BS 8110:1985 to be provided in any case. In addition the designer has to prove that the vertical elements one at a time can be removed without causing collapse.

12.9.4 Design calculations for option 2: BS 5628

(a) Horizontal ties

Basic horizontal tie force, F_t=60kN or $20+4N_s$ whichever is less. N_s=number of storeys. Then

$$20 + 4N_s = 20 + 4 \times 7 = 48\,\text{kN} < 60\,\text{kN}$$

Hence use 48kN.