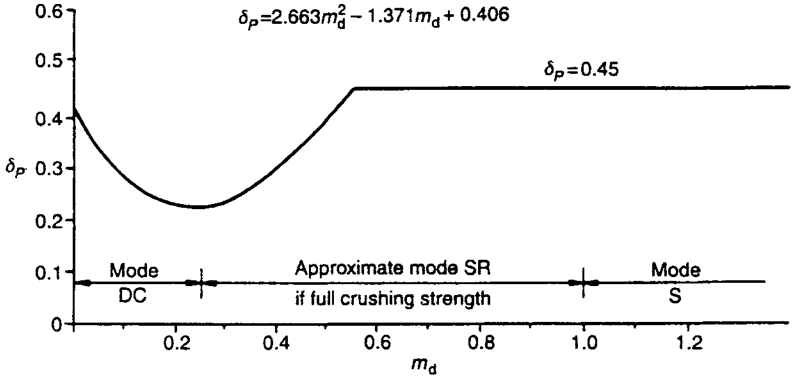

Fig. 8.12 Plot of δ_p against m_d. From Wood (1978).

Then the value of the non-dimensional parameterd ϕ_s is calculated using the equation

$$\phi_s = 2/(\sqrt{m_e} + 1/\sqrt{m_e}) \tag{8.17}$$

This parameter was derived for square panels with identical beams and columns, and a correction factor Δ_ϕ must be determined for non-rectangular panels with unequal beams and columns, using Fig. 8.13 in which μ_p is defined

$$\mu_p = \frac{\text{lowest beam plastic moment}}{\text{lowest column plastic moment}} \tag{8.18}$$

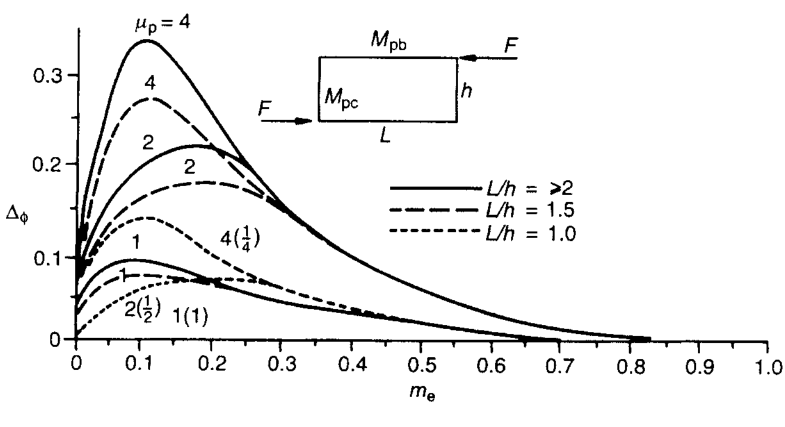

Fig. 8.13 Design chart for racking loads: optional correction Δ_ϕ added to Φ_S (μ=M_{pb}/M_{pc}). From Wood (1978).

- If $\mu_p \geqslant 1$ (strong beams) use the chart directly.
- If $\mu_p<1$ (weak beams) and $L/h=1$ use μ_p value in brackets.
- If $\mu_p<1$ (weak beams) and $L/h>1$ use $\mu_p=1$ curve.

Finally the design strength F can be determined using

$$F = (\phi_s + \Delta_\phi)\,[4\,(\text{smaller } M_p)/h + \tfrac{1}{2}\delta_p f_k tL/\gamma_m]/1.2 \tag{8.19}$$

where the factor 1.2 is an additional factor of safety introduced by Wood for design purposes and M_p is the effective plastic moment given by $Z\sigma_y/\gamma_{ms}$. For design purposes the design strength must be equal to or greater than the design load as shown in Chapter 4.

(c) Example

Assume the following dimensions and properties:

- Panel height=2m
- Panel length=4m
- Panel thickness=110mm
- Characteristic strength of panel=10N/mm^2
- Partial safety factor for masonry=3.1
- Section modulus for each column=600 cm^3
- Section modulus for each beam=800 cm^3
- Yield stress of steel=250N/mm^2
- Partial safety factor for steel=1.15
- Effective plastic moment for beam=$(800\times10^3)\times250/(1.15\times10^6)$
  =174kN/m
- Effective plastic moment for column=130kN/m
- μ_p=134
- L/h=2

These give

$$m_d = \frac{8 \times 130 \times 10^6 \times 3.1}{10 \times 110 \times 4^2 \times 10^6} = 0.18$$

From Fig. 8.12, δ_p=0.25. So

$$m_e = 0.24/0.25 = 0.96$$

$$\phi_s = 2/(\sqrt{0.96} + 1/\sqrt{0.96}) = 1.0$$

From Fig. 8.13, Δ_ϕ =0.