Table 12.5 *(Contd)*

BS 8110 ref.	*Calculations*	*Output*
3.12.11.2.7	*Cracking*	
	$3d = 3 \times 95 = 285$ mm	
	Spacing between bars $= 250 - 10 = 240$ mm $< 3d$	Therefore spacing OK
	$h = 1.25 < 250$ mm therefore no further check required	OK
3.27	*Secondary reinforcement*	
	Minimum area of steel $= 0.0024 \times 1000 \times 125$ $= 300$ mm^2 < 314 mm^2	Bottom and top 10Y at 25 mm
	Spacing between bars $= 250 - 10 = 240 < 250$	OK (314/mm^2/m)
Table 3.9	*Check for shear*	
	$V = \dfrac{0.255 \times 27.36 \times 10^3}{10^3 \times 95} = 0.16\,\text{N/mm}^2 < v_c$	Therefore OK
	Tie provision	
	Internal ties in both directions (see section 12.8.4)	
	Area required 192 mm^2 (both directions)	
	70% of primary and secondary reinforcements uninterrupted in both directions will be sufficient	
	$\dfrac{70 \times 314}{100} = 219.8\,\text{mm}^2 > 192\,\text{mm}^2 > 192\,\text{mm}^2$	OK

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Movements in masonry buildings

13.1 GENERAL

Structural design is primarily concerned with resistance to applied loads but attention has to be given to deformations which result from a variety of effects including temperature change and, in the case of masonry, variations in moisture content. Particular problems can arise when masonry elements are constrained by interconnection with those having different movements, which may result in quite severe stresses being set up. Restraint of movement of a brittle material such as masonry can lead to its fracture and the appearance of a crack. Such cracks may not be of structural significance but are unsightly and may allow water penetration and consequent damage to the fabric of the building. Remedial measures will often be expensive and troublesome so that it is essential for movement to receive attention at the design stage.

13.2 CAUSES OF MOVEMENT IN BUILDINGS

Movement in masonry may arise from the following causes:

- Moisture changes
- Temperature changes
- Strains due to applied loads
- Foundation movements
- Chemical reactions in materials

13.2.1 Moisture movements

Dimensional changes take place in masonry materials with change in moisture content. These may be irreversible following manufacture—thus clay bricks show an expansion after manufacture whilst concrete and calcium silicate products are characterized by shrinkage. All types of masonry exhibit reversible expansion or shrinkage with change in