However, since four 20 mm diameter legs are needed, this is not practical in mild steel. High yield steel would not be much better: pro rata for HY steel,

$$A_{sv} \text{ required} = \frac{1121.89 \times 250}{460} = 609.72\,\text{mm}^2$$

Therefore try assuming a more practical diameter and determine the required centres by transposing the formula. Assuming 10 mm diameter MS double links, $A_{sv} = 314\,\text{mm}^2$. Thus

$$A_{sv} = \frac{b_v s_v (v - v_c)}{0.87 f_{yv}}$$

$$s_v = \frac{0.87 f_{yv} A_{sv}}{b_v (v - v_c)} = \frac{0.87 \times 250 \times 314}{300(3.26 - 0.85)} = 94\,\text{mm} < 0.75d$$

Provide 10 mm diameter MS double links at 90 mm centres.

Alternatively, assuming 10 mm diameter HY double links,

$$s_v = \frac{0.87 \times 460 \times 314}{300(3.26 - 0.85)} = 173.81\,\text{mm} < 0.75d$$

Provide 10 mm diameter HY double links at 170 mm centres.

It should be appreciated that it may be practical to increase the spacing of links towards mid-span as the shear force reduces.

3.9.11 Design summary for concrete beams

The design procedure for simply supported singly reinforced concrete beams may be summarized as follows:

(a) Calculate the ultimate loads, shear force and bending moment acting on the beam.

(b) Check the bending ULS by reference to the BS 8110 simplified stress block formulae. This will determine an adequate depth for the beam singly reinforced and the area of tension reinforcement required.

(c) Ensure that the cracking SLS is satisfied by compliance with the recommendations for minimum reinforcement content and bar spacing.

(d) Check the deflection SLS by reference to the recommended span to depth ratios.

(e) Check the shear ULS by providing the relevant link reinforcement in accordance with the guidance given in BS 8110.

3.10 Slabs

BS 8110 deals with suspended slabs as opposed to ground bearing slabs. For guidance on the design of the latter, reference should be made to other sources such as the literature published by the British Cement Association, formerly known as the Cement and Concrete Association.

Suspended slabs may be designed to span in either one or two directions depending on how they are supported at the edges.

In the context of BS 8110, slabs are classified into three groups:

Solid slabs These, as the name implies, consist of solid concrete reinforced where necessary to resist tension (Figure 3.18).

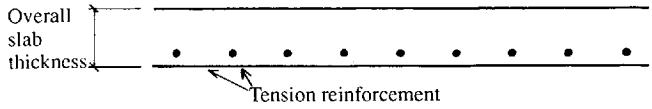

Figure 3.18 *Cross-section through a solid slab*

Ribbed slabs For spans exceeding 4 m the self-weight of solid slabs can begin to affect their economy. In such circumstances consideration should be given to the use of ribbed slabs. These are formed in any one of the following ways:

(a) As a series of *in situ* concrete ribs cast between hollow or solid block formers which remain part of the completed slab (Figure 3.19).

(b) As a series of *in situ* concrete ribs cast monolithically with the concrete topping on removable forms (Figure 3.20).

(c) As an apparently solid slab but containing permanent formers to create voids within the cross-section (Figure 3.21).

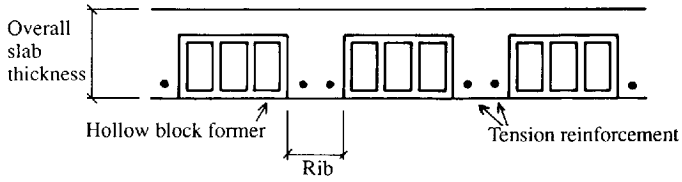

Figure 3.19 *Cross-section through a ribbed slab cast with integral hollow block formers*

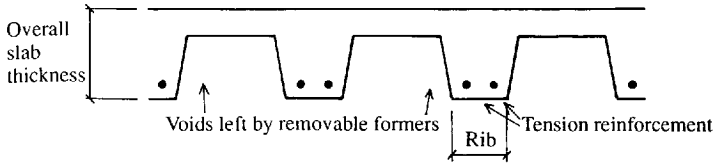

Figure 3.20 *Cross-section through a ribbed slab cast on removable formers*

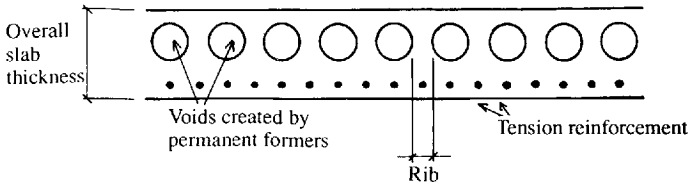

Figure 3.21 *Cross-section through a hollow slab cast with permanent void formers*