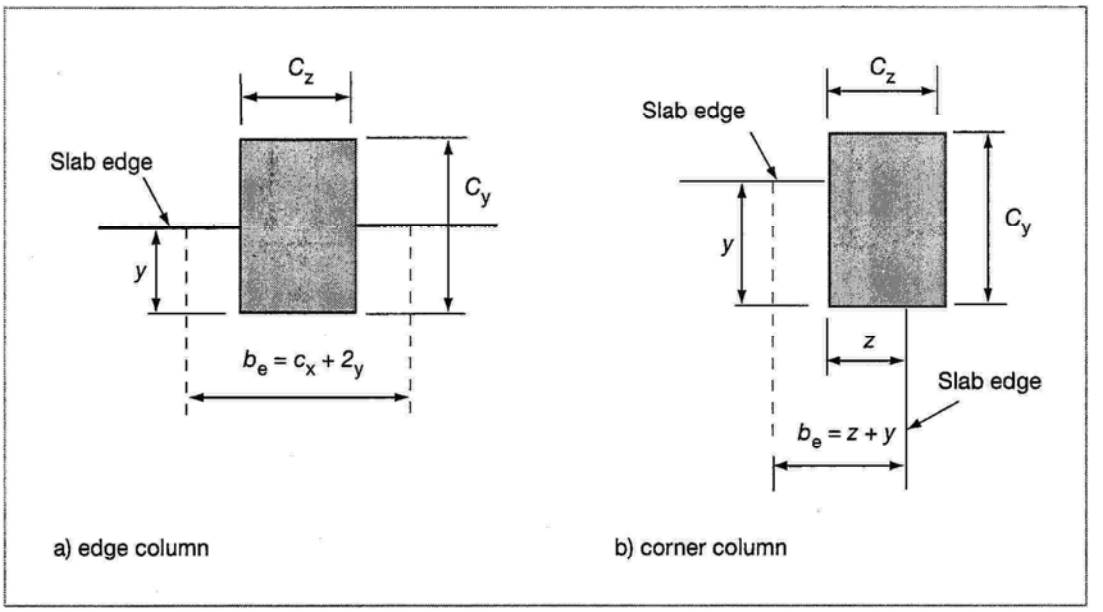



Figure 6.7 Effective width, $b_e$, of a flat slab

In general two thirds of the amount of reinforcement required to resist negative moment in the column strip should be placed in a width equal to half that of the column strip and central with the column

*Note*

These rules comply with EC2, Clause 9.4.1 (2).

At least two bottom bars should pass through the column.

*Slab at edge and corner columns*

The reinforcement perpendicular to a free edge which is required to transmit moments from the slab to an edge or corner column should be placed within the effective width as shown in Figure 6.7. Nominal reinforcement should be placed along the remainder of the edge.

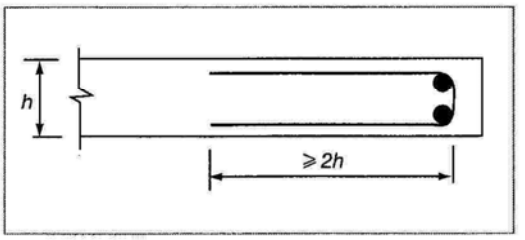



Figure 6.8 Edge reinforcement for a slab

*Edge reinforcement*

*(EC2, Clauses 9.3.1.4 and 9.3.1.4)*

Reinforcement should be placed along free (unsupported) edges of slabs and at corners that are supported on both sides. This allows the distribution of local loads which helps to prevent unacceptable cracking.

This reinforcement may be supplied in the form of U-bars as shown in Figure 6.8.

Where the corners of slabs are held down the bars should extend into the slab a minimum distance of at least one fifth of the shorter span as shown in Figure 6.9. The area of this torsion reinforcement required in each leg should be at least three quarters of the area required for the maximum mid-span design moments in the slab. Only half this area is required at a corner with only one discontinuous edge.

*Trimming holes in a slab*

- Where holes, or groups of holes are considered to be of structural significance (i.e. in flat slabs, etc.), the design data should indicate any special reinforcement.
- Where holes or groups of holes are considered to be structurally insignificant, then the following rules apply:
  - (i) minimum unsupported edge distance = width of hole $w_1$
  - (ii) maximum width of isolated opening measured at right-angles to span = 1000mm

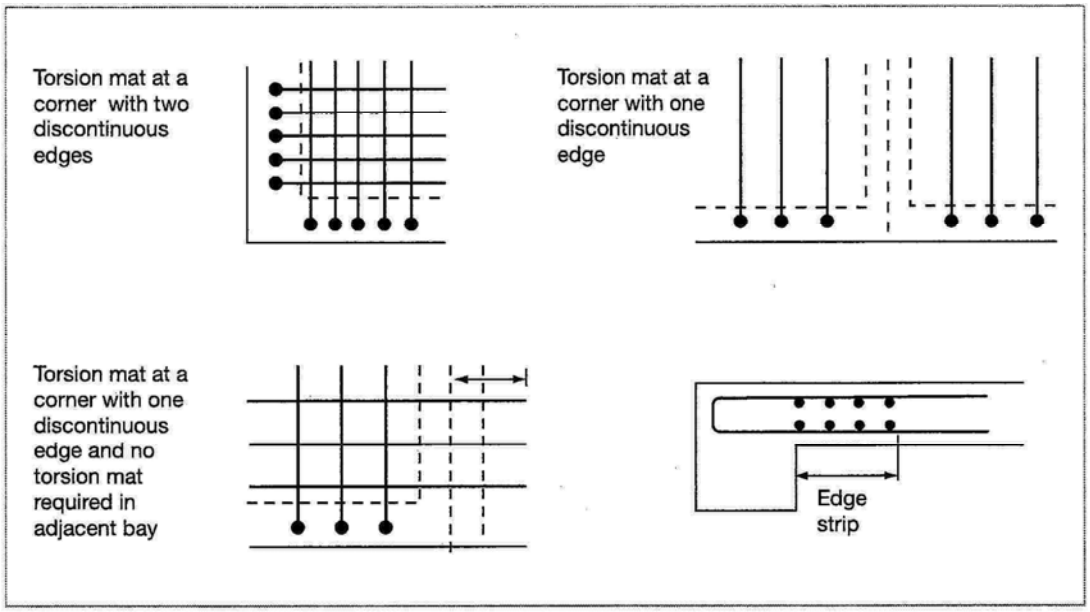
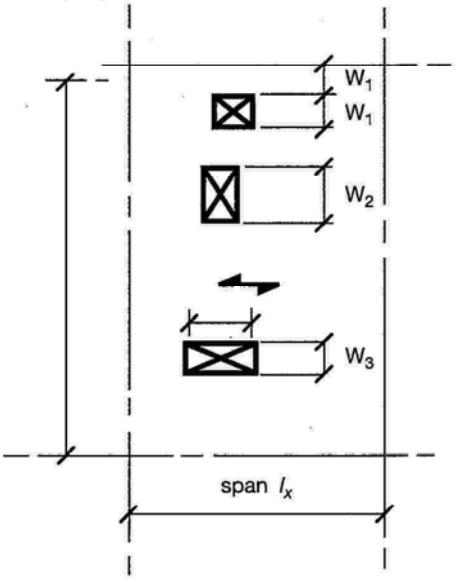



Figure 6.9 Torsion reinforcement at slab corners

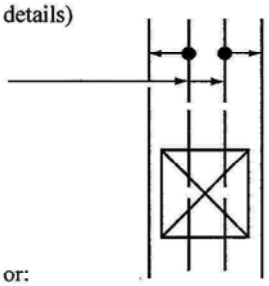
(iii) maximum length of isolated opening measured parallel to span = 0.25 span $l_x$

(iv) maximum total width $(w_1 + w_2 + w_3)$ of multiple holes measured at right-angles to the span $l_x$ = 0.25 span $l_y$



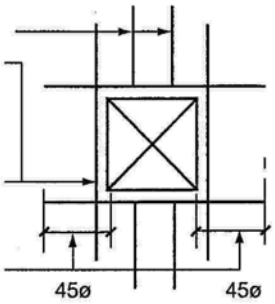

(v) small isolated holes with sides 150mm or less can generally be ignored structurally. Significant holes should be drawn to scale and shown on the reinforcement drawing

(vi) larger isolated holes with sides 500mm or less either: displace affected bars equally either side of hole (see MS1 for spacing details)

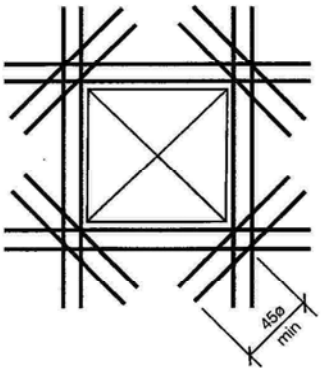


or:

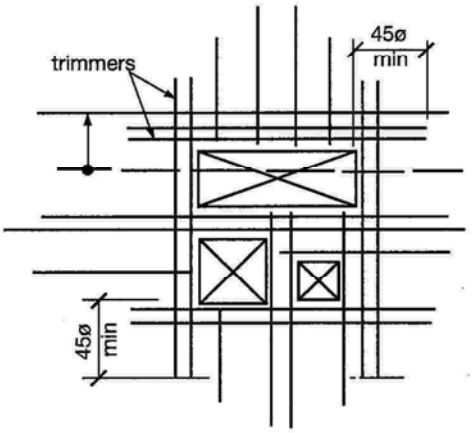
cut or slide back affected bars to face of hole. Compensating bars of equal area should be provided to trim all sides. Trimmers should extend a minimum 45ø (nominal anchorage length) beyond the hole



(vii) large isolated holes with sides 500 – 1000 mm. Treat as (vi) above, but in addition trim top of holes with similar bars. If depth of slab exceeds 250mm, where practical, provide diagonal reinforcement of similar area in top and bottom, but consideration should be given to the congestion of multiple layers




(viii) groups of holes within boundary of 500mm or less. Trim as single hole using methods described in (vi) above. Bars should pass alongside holes where possible




(ix) groups of holes within boundary of 500 – 1000 mm or less. Trim as single hole using methods described in (vi) and (vii) above

### *Secondary reinforcement (EC2, Clause 9.3.1)*

Distribution reinforcement is provided at right angles to the main tensile reinforcement in all circumstances where other main reinforcement is not already included.

Fabric reinforcement (either as loose bars or a welded mat) may be required to control cracking due to shrinkage and temperature in:

- the whole of the top surface of the slab
- the bottom of solid areas around columns of coffered slab construction
- the bottom of solid areas of troughed slabs adjacent to beams.

If welded fabric is used for coffered and troughed slabs it is essential to check that sufficient depth has been given to fit all the layers of reinforcement at the laps in the fabric. This must include, for coffered slabs, two layers of main tension bars together with at least two layers of fabric. Normally the top main tension bars will be positioned to lie within the width of the ribs, even in the solid area of the slab as shown in Model Detail MS8. Although this allows the bars to be fitted with sufficient cover it reduces the effective lever arm.

Supplementary reinforcement may be required in coffered and troughed slabs for fire protection. This should be provided by links and lacer bars for coffered slabs and welded fabric, D49, for troughed slabs as indicated in Model Detail MS8.

Additional reinforcement may be required in prestressed concrete to resist bursting tensile forces in end zones, and to control cracking from restraint to shrinkage due to formwork, before the prestress is applied.

### *Fabric reinforcement*

#### *General*

See 4.2.5 and 5.1.10.

#### *Suspended solid floor construction*

Where the lever arm is important, the orientation should indicate the level of the primary reinforcement.

For clarity on plan it is recommended that the top sheets of fabric be drawn separately from the bottom sheets, preferably on the same drawing. Fabric is identified by a chain double-dashed line.