where w is the total ultimate load per unit area in kN/m^2,
d is the effective depth of the slab at the column in mm
h is the thickness of the slab at the column in mm, and areas are in m^2.

Check also that:

$$\frac{1250\ w\ (\text{area supported by column})}{(\text{column perimeter})\ d} \leqslant 0.8\sqrt{f_{cu}} \text{ or } 5\text{N/mm}^2$$

whichever is the lesser.

3.7.7 Adequacy of chosen sections to accommodate the reinforcement, bending moments and shear forces

In the initial stage the reinforcement needs to be checked only at midspan and at the supports of critical spans.

Beams and one-way solid slabs
Bending moments and shear forces in continuous structures can be obtained from Table 6 when:

(a) the imposed load does not exceed the dead load
(b) there are at least three spans and
(c) the spans do not differ in length by more than 15% of the longest span.

Table 6 Ultimate bending moments and shear forces

	Uniformly distributed loads F = total design ultimate load on span	Central point loads W = design ultimate point load
Bending moments		
at support	0.100 FL	0.150 WL
at midspan	0.080 FL	0.175 WL
Shear forces	0.65 F	0.65 W

where L is the span.

Alternatively, bending moments and shear forces may be obtained by moment distribution.

Two-way solid slabs on linear supports
If the longer span l_y does not exceed 1.5 times the shorter span l_x, the average moment per metre width may be taken as:

$$w\frac{l_x\ l_y}{24} \text{ kNm per metre}$$

where w is the ultimate load in kN/m^2, and l_x and l_y are in metres.
If $l_y > 1.5\ l_x$ the slab should be treated as acting one-way.

Solid flat slabs
Determine the moments per unit width in the column strips in each direction as 1.5 times those for one-way slabs.

One-way ribbed slabs
Assess the bending moments at midspan on a width equal to the rib spacing, assuming simple supports throughout.

Two-way ribbed slabs on linear supports
If the longer span does not exceed 1.5 times the shorter span, estimate the average rib moment in both directions as:

$$w \frac{l_x l_y}{24} c \text{ kNm per rib}$$

where c is the rib spacing in metres.

If $l_y > 1.5l_x$ the slab should be treated as acting one-way.

Coffered slabs on column supports
Assess the average bending moment at midspan on a width equal to the rib spacing using Table 6. For the column strips increase this by 15%.

Tension reinforcement
Reinforcement can now be calculated by the following formula:

$$A_s = \frac{M}{0.87 f_y \times 0.8d}$$

where M is the design ultimate bending moment under ultimate load at the critical section and d is the effective depth.*

Compression reinforcement
If, for a rectangular section, $M > 0.15 f_{cu} bd^2$, compression reinforcement is required:

$$A'_s = \frac{M - 0.15 f_{cu} bd^2}{0.87 f_y (d - d')}$$

where A'_s is the area of the compression steel, d' is the depth to its centroid, b is the width of the section and d its effective depth.*

If, for flanged sections, $M > 0.4 f_{cu} b_f h_f (d - 0.5h_f)$ the section should be redesigned. b_f and h_f are the width and the thickness of the flange. h_f should not be taken as more than $0.5d$.

Bar arrangements
When the areas of the main reinforcement in the members have been calculated, check that the bars can be arranged with the required cover in a practicable manner avoiding congested areas.

In beams, this area should generally be provided by not less than 2 nor more than 8 bars. In slabs, the bar spacing should not be less than 150mm nor more than 300mm; the bars should not be less than size 10 nor normally more than size 20.

3.8 The next step

At this stage general arrangement drawings, including sections through the entire structure, should be prepared and sent to other members of the design team for comments, together with a brief statement of the principal design assumptions, e.g. imposed loadings, weights of finishes, fire ratings and durability.

The scheme may have to be amended in the light of comments received. The amended design should form the basis for the architect's drawings and may also be used for preparing reinforcement estimates for budget costings.

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*Consistent units need to be used in the formula.