RC Flat Slabs

General:

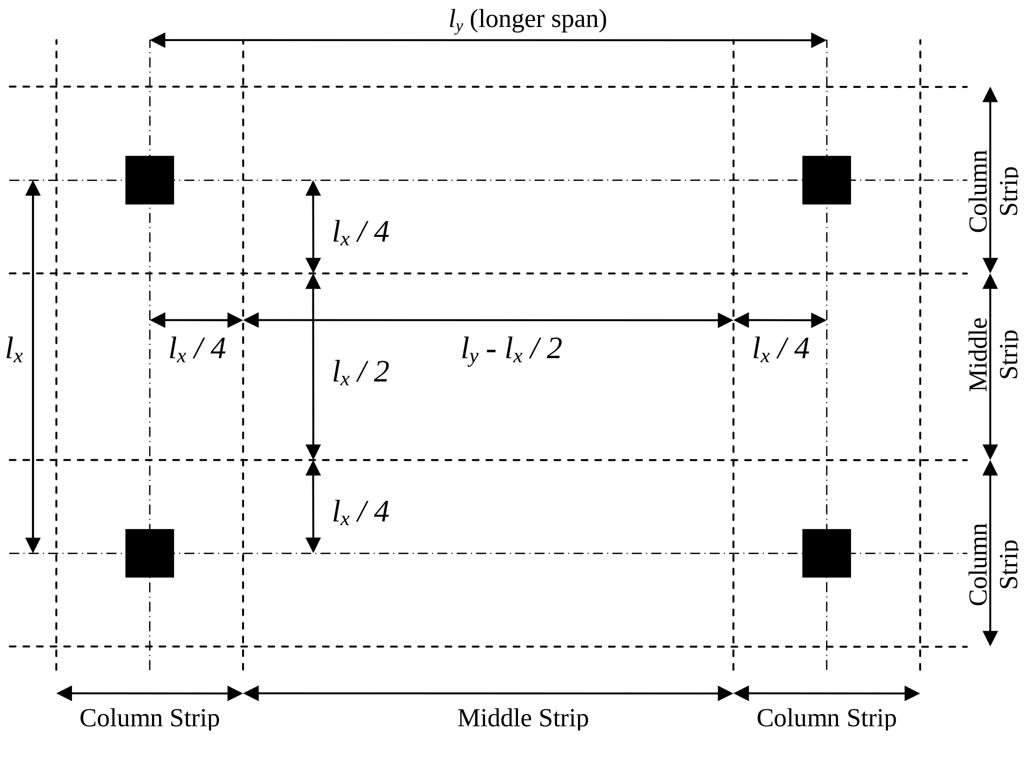
A flat slab is a slab (with or without drops) supported (generally without beams) by columns (with or without column heads). Generally: $l_x \le l_y \le 2l_x$.

Mosley & Bungey (pp198) illustrate different arrangements of drops/heads. This document does not consider:

- Column heads or drop slabs
- Openings in slabs
- Edge or corner panels
- Design based on analyses other than the simplified method.

Slab Arrangement:

The slab is divided into middle and column strips as illustrated (Figure 3.12 of code):



Analysis:

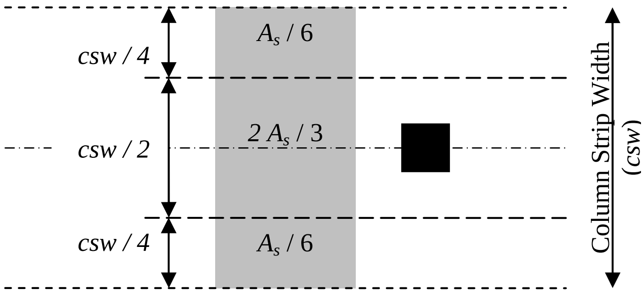
Table 3.12 of the code (K' = 0.132) may be used (only when lateral stability does not rely on the flat slab) to assess the moments & shears in <u>*each direction*</u> (provided in the RC Slabs document). The limitations of the use of this table must be met in addition, at least three rows of panels (AES) in each direction.

Moments at the supports, calculated from the table, may be reduced by $0.15Fh_c$ where h_c is the effective diameter of the column (diameter of circle of area equal to that of the column).

The moments for each direction established, they are distributed among the strips as:

	Column Strip	Middle Strip
Negative moment	75%	25%
Positive moment	55%	45%

Two thirds of the reinforcement required to resist the negative design moment in the column strip should be placed in a width equal to half that of the column strip and central with the column, as shown:



Moment Transfer:
In flat slabs, some of the moment in the slab over the column is transferred (called M_t) from the slab to the column (monolithic construction). The simplified arrangement assumes this to be about $0.15Fh_c$. This transferred moment increases the shear forces at the face of the column.

Shear Forces:
Shear is critical in flat slabs the design shear force (V_{eff}) is the column reaction (V_t) multiplied by 1.15 to account for M_t. Design procedure is that for punching shear.

Deflection:
The basic span-effective depth ratios are multiplied by 0.9 for flat slabs. The modification for tension reinforcement is based on the total moment at mid-span and the average of the middle and column strip reinforcement.

Crack Control:
Design for crack control is achieved by minimising the spacing between bars. For slabs, the maximum spacing is: $s_{max} \leq 3d$ or 750 mm, whichever is smaller. No other check is required if:

1. $f_y = 250$ N/mm^2 and $h \leq 250$ mm, or
2. $f_y = 460$ N/mm^2 and $h \leq 200$ mm, or
3. Reinforcement percentage ($100A_s/bd$), $\rho \leq 0.3$

If none of the above apply, then for:

1. $\rho \geq 1$: $s_{max} \leq 47000 / f_s \leq 300$, or, conservatively 130 mm
2. $0.3 \leq \rho \leq 1$: s_{max} of (1) / ρ