FAQs

1. **Design a simply supported floor slab for a room 8m x 3.5m clear in size supported on 230mm thick wall, if the superimposed load is 3 kN/m². Consider other dead loads also. Use M20 and Fe415 as materials. Draw the section of slab showing reinforcement details also.**

Size of slab = 8m x 3.5m clear

= 8.23m x 3.73m effective

The ratio l_y/l_x = 8.23/3.73 = 2.21 > 2 it is one way slab.

a. Load calculations:

i. Dead loads

Assume thickness of slab from l_x/d = 20;

d = $l_x/20$

= 186.50mm

D = 186.5 + 15 + 8/2

= 205.5mm

Assume D = 150mm

Self-weight of slab	= 0.15 x 25	=	3.75 kN/m²
Weight of floor finish	= 0.025 x 24	=	0.60 kN/m²
Weight of partitions (as per IS875)		=	1.96 kN/m²
Total dead loads		$\mathbf{w_d}$ =	**6.31 k N/m²**
ii. Live load on slab		$\mathbf{w_l}$ =	**3.00 kN/m²**
iii. Total load on slab		**w** =	**9.31 kN/m²**

b. Effective span l_x = 3.5 + 0.23 = 3.73m

= 3.5 + 0.15 = 3.65m whichever is less

Hence l_x = 3.65m

c. Bending moment calculations

M_u = 1.5 x 9.31 x 3.65^2/8 = 23.26 kNm

d. Effective depth of slab

Consider 1m width of the slab and by equating M_u to M_{ulim}

M_{ulim} = $0.138f_{ck}bd^2$ = M_u

d = 91.80mm

D = 91.80 + 15 + 8/2 = 110.80mm < 150mm

Hence safe against flexure.

Keep D = 150mm; d = 131mm

e. Area of reinforcement

a. Main Steel:

$\mathbf{M_u}$ = $\mathbf{0.87 f_y A_{st}(d\text{-}o.416x_u)}$

$A_{st,\ reg}$ = 553.60mm^2

b. Check for Minimum steel as per IS 456:2000

A_{st} = 0.12% cross sectional area

= 157.2 mm^2 < 553.60mm^2

Hence $A_{st\ reg}$ = 553.60mm^2

Provide 10mm diameter bar

Spacing = 141.87mm

Provide 8mm diameter bar at 125mm c/c

$A_{st\ pro}$ = 628.32mm^2

c. Distribution Steel

A_{st} = 0.12% cross sectional area

= 157.2 mm^2

Use 6mm dia MS bar

Spacing = 176mm

Provide 6mm dia MS bar at 150mm c/c

f. Check for deflection

As per cl.23.2.1 of IS 456:2000

l/d = 20 x M.F

p_t = 0.46%

f_s = 0.58 f_y $A_{st\ reg}$ / $A_{st\ pro}$ = 213.77 N/mm^2

As per Fig.4; M.F = 1.5

Hence d = 123.33mm < 131mm; Hence safe against deflection.