

DESIGN OF GROUND FLOOR SLAB (One way slab)

DATA

Clear Shorted Span of slab		=	3000	mm
	l_y	=	3	m
Clear Longer Span of slab		=	7	m
	l_x			
Ratio of shorter / longer span		=	0.43	GO to One way slab
Minimum Depth of Slab		=	l/24	one end continuous
		=	125	mm
	h	=	200	mm
		=	0.2	m
Clear cover to main reinf.	d'	=	30	mm
Dia of main reinforcement	ϕ	=	12	mm
Effective depth of slab	d	=	200-30-12/2	
		=	164 mm	
Density of Concrete	γ_c	=	24	kN/m ³
Compressive strength of concrete	f_c'	=	27.4	N/mm ²
Yield Strength of steel	f_y	=	420	N/mm ²

Table (9.5a) ACI-318

LOADINGS

Considering the width of slab as		=	1000	mm
	b			
Self weight of slab		=	0.2 x 24	
		=	4.800 kN/m ²	
Dead load due to electrical accessories		=	1.000 kN/m ²	
Total Dead load	DL	=	5.800 kN/m ²	

Live load

Live load on the slab		=	7.50	kN/m ²
Total live load	LL	=	7.50 kN/m ²	
Factored load	W_u	=	1.2 x DL + 1.6 x LL	
	W_u	=	18.96 kN/m ²	
Factored positive bending moment	M_{u+ve}	=	18.96x3 ² / 14	
		=	12.19 kN/m	
Factored negative bending moment	M_{u-ve}	=	18.96x3 ² / 10	
		=	17.06 kN/m	
	$M_{u_{max}}$	=	17.06 kN/m	
Factored shear force	Q_u	=	18.96 x 3 x 1/2	
	Q_u	=	28.44 kN	

Main Reinforcement

Strength reduction factor		=	0.9	
	ϕ			
	R_u	=	$M_u / \phi \times b \times d^2$	
	R_u	=	0.705	
Percentage of steel required	pt	=	$1 / m \times (1 - \sqrt{1 - (2R_u \times m / f_y)})$	
	m	=	$f_y / 0.85 \times f_c'$	
		=	18.03	
	p	=	0.170%	
But Minimum percentage of steel	p _{min}	=	0.180%	
Dia of the reinforcement assumed	d _b	=	12	mm
Area of steel required	A _{str}	=	295 mm ²	
Spacing of	12 dia bars required	=	383 mm	
Provide	12 dia bars @	200	mm C/C	
Percentage of steel provided	p _{prov.}	=	0.345%	

CI 9.3.2 ACI 318-08

CI 7.12.2.1 ACI 318-08

Hence Ok

Shrinkage and Temperature Reinforcement

Effective Area of concrete	=	b*d=	200000 mm ²
Minimum percentage of steel	=	0.18	%
Area of steel required	Ast	=	360 For Both Faces
Assuming dia of bar	dbt	=	10 mm
Spacing of	10 mm dia bar	=	436 mm (For Single Face)
Provide	10 dia bars @	200 mm C/C	

CI 7.12.2.1 ACI 318-08

Check for Shear :-

Allowable shear force by concrete	ϕV_c	=	$0.75 \times [(1/6) \times \text{sqrt}(f_c') \times b \times d]$	
	ϕV_c	=	107.3 kN	> 28.44

Factored shear force is less than allowable shear force provided by concrete. So safe.