

MEMBER NAME : S09

1. General Information

- (1) Design Code : NSR-10
(2) Code Unit : N, mm

2. Material

- (1) F'_c : 28.00MPa
(2) F_y : 420MPa

3. Design Load

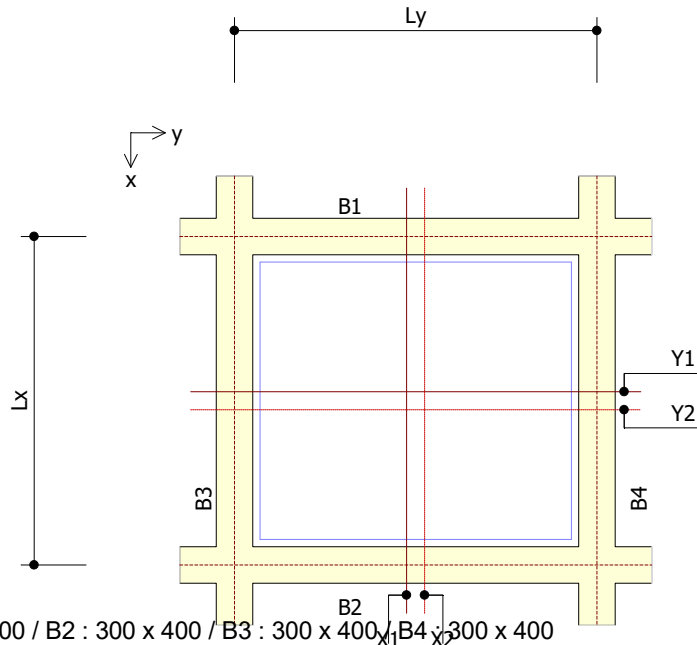
- (1) Dead Load : 1.961KPa
(2) Live Load : 1.961KPa

4. Section Size

- (1) Span(X) : 2.700m
(2) Span(Y) : 2.980m
(3) Thickness : 125mm
(4) Cover : 30.00mm
(5) Use clear span : Yes

5. Slab Type & Support

- (1) Slab Type : 2-Way Slab
(2) Support Type : Case-2
(3) Boundary Beams : B1 : 300 x 400 / B2 : 300 x 400 / B3 : 300 x 400 / B4 : 300 x 400



6. Calculation Summary

(1) Check Thickness of Slab

Category	Value	Criteria	Ratio	Note
Minimum Thickness Required (mm)	125	90.00	0.720	

(2) Calculate Moment & Shear (X Direction)

Category	Value	Criteria	Ratio	Note
Moment Capacity (Top) (kN·m)	1.754	5.296	0.331	
Moment Capacity (Middle) (kN·m)	0.920	5.296	0.174	
Moment Capacity (Bottom) (kN·m)	1.754	5.296	0.331	
Rebar Ratio (Top)	0.00252	0.00180	0.713	
Rebar Ratio (Middle)	0.00252	0.00180	0.713	
Rebar Ratio (Bottom)	0.00252	0.00180	0.713	
Shear Capacity (Top) (kN)	3.990	60.88	0.0655	
Shear Capacity (Middle) (kN)	0.000	60.88	0.000	
Shear Capacity (Bottom) (kN)	3.990	60.88	0.0655	

(3) Calculate Moment & Shear (Y Direction)

Category	Value	Criteria	Ratio	Note
Moment Capacity (Left) (kN·m)	1.438	4.729	0.304	
Moment Capacity (Center) (kN·m)	0.723	4.729	0.153	
Moment Capacity (Right) (kN·m)	1.438	4.729	0.304	
Rebar Ratio (Left)	0.00252	0.00180	0.713	
Rebar Ratio (Center)	0.00252	0.00180	0.713	
Rebar Ratio (Right)	0.00252	0.00180	0.713	
Shear Capacity (Left) (kN)	2.904	54.45	0.0533	
Shear Capacity (Center) (kN)	0.000	54.45	0.000	
Shear Capacity (Right) (kN)	2.904	54.45	0.0533	

7. Determine the design type of slab

(1) Calculate span ratio [Use clear span]

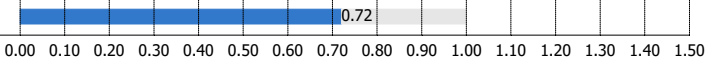
- $L_x = 2.400\text{m}$
- $L_y = 2.680\text{m}$
- Span Ratio (L_x / L_y) = 0.896 $\geq 0.5 \rightarrow$ 2-Way Slab

8. Check Load

(1) Calculate factored load

- LCB01 = 2.746KPa (1.4D)
- LCB02 = 5.492KPa (1.2D+1.6L)
- $\omega_u = 5.492\text{KPa}$

9. Check Thickness of Slab*Calculation Summary (Check Thickness of Slab)*

Category	Value	Criteria	Ratio	Note
Minimum Thickness Required (mm)	125	90.00	0.720	
Minimum Thickness Required				

(1) Calculate factors

- $\beta = I_{ny} / I_{nx} = 1.117$
- $\alpha_m = 5.456$ ($\alpha_1 = 5.725$, $\alpha_2 = 5.725$, $\alpha_3 = 5.187$, $\alpha_4 = 5.187$)

(2) Calculate minimum thickness required

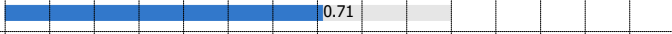
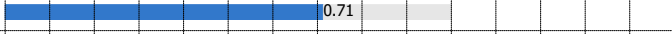
- $h_{req} = \frac{I_n (0.8 + (f_y / 1400))}{36 + 9\beta} = 90.00\text{mm}$
- **$h = 125\text{mm} > h_{req} = 90.00\text{mm} \rightarrow \text{O.K}$**

10. Check Capacity of Slab

(1) Calculate Moment & Shear [Direction X]

Calculation Summary (Calculate Moment & Shear (X Direction))

Category	Value	Criteria	Ratio	Note
Moment Capacity (Top) (kN·m)	1.754	5.296	0.331	
Moment Capacity (Middle) (kN·m)	0.920	5.296	0.174	
Moment Capacity (Bottom) (kN·m)	1.754	5.296	0.331	
Rebar Ratio (Top)	0.00252	0.00180	0.713	
Rebar Ratio (Middle)	0.00252	0.00180	0.713	
Rebar Ratio (Bottom)	0.00252	0.00180	0.713	
Shear Capacity (Top) (kN)	3.990	60.88	0.0655	
Shear Capacity (Middle) (kN)	0.000	60.88	0.000	
Shear Capacity (Bottom) (kN)	3.990	60.88	0.0655	

Moment Capacity (Top)	
Moment Capacity (Middle)	
Moment Capacity (Bottom)	
Rebar Ratio (Top)	
Rebar Ratio (Middle)	
Rebar Ratio (Bottom)	
Shear Capacity (Top)	
Shear Capacity (Middle)	
Shear Capacity (Bottom)	

Check Items	TOP	MIDDLE	BOTTOM
Bar-1	#3@450	#3@450	#3@450

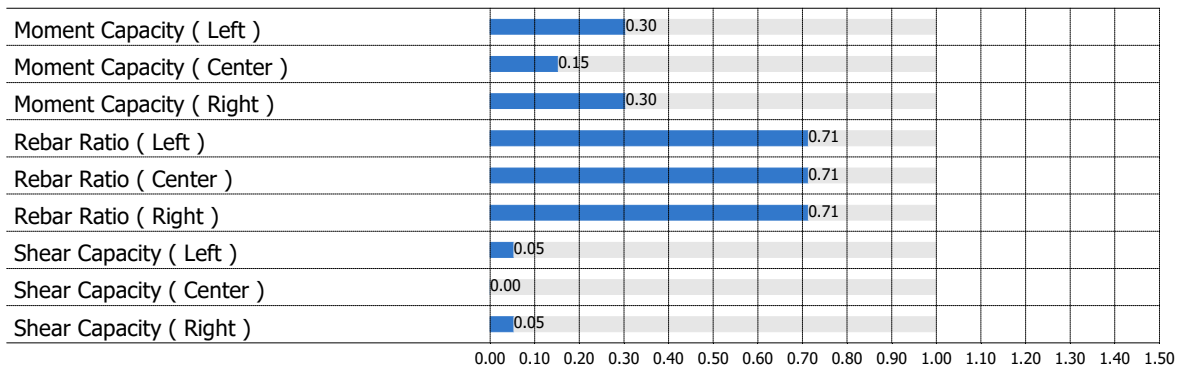
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Bar-2	#3@450	#3@450	#3@450
Bar-3	-	-	-
Moment Coefficient (DL)	0.000	0.0222	0.000
Moment Coefficient (LL)	0.000	0.0343	0.000
Moment Coefficient (FL)	0.0554	0.000	0.0554
Shear Coefficient	0.605	0.000	0.605
M_u (kN·m/m)	1.754	0.920	1.754
V_u (kN/m)	3.990	0.000	3.990
ϕM_n (kN·m/m)	5.296	5.296	5.296
ϕV_n (kN/m)	60.88	60.88	60.88
$M_u / \phi M_n$	0.331	0.174	0.331
$V_u / \phi V_n$	0.0655	0.000	0.0655
ρ_{min} / ρ	0.713	0.713	0.713

(2) Calculate Moment & Shear [Direction Y]

Calculation Summary (Calculate Moment & Shear (Y Direction))

Category	Value	Criteria	Ratio	Note
Moment Capacity (Left) (kN·m)	1.438	4.729	0.304	
Moment Capacity (Center) (kN·m)	0.723	4.729	0.153	
Moment Capacity (Right) (kN·m)	1.438	4.729	0.304	
Rebar Ratio (Left)	0.00252	0.00180	0.713	
Rebar Ratio (Center)	0.00252	0.00180	0.713	
Rebar Ratio (Right)	0.00252	0.00180	0.713	
Shear Capacity (Left) (kN)	2.904	54.45	0.0533	
Shear Capacity (Center) (kN)	0.000	54.45	0.000	
Shear Capacity (Right) (kN)	2.904	54.45	0.0533	



Check Items	LEFT	CENTER	RIGHT
Bar-1	#3@450	#3@450	#3@450
Bar-2	#3@450	#3@450	#3@450
Bar-3	-	-	-
Moment Coefficient (DL)	0.000	0.0138	0.000
Moment Coefficient (LL)	0.000	0.0217	0.000
Moment Coefficient (FL)	0.0365	0.000	0.0365
Shear Coefficient	0.395	0.000	0.395
M_u (kN·m/m)	1.438	0.723	1.438
V_u (kN/m)	2.904	0.000	2.904
ϕM_n (kN·m/m)	4.729	4.729	4.729
ϕV_n (kN/m)	54.45	54.45	54.45
$M_u / \phi M_n$	0.304	0.153	0.304

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$V_u / \phi V_n$	0.0533	0.000	0.0533
ρ_{min} / ρ	0.713	0.713	0.713