

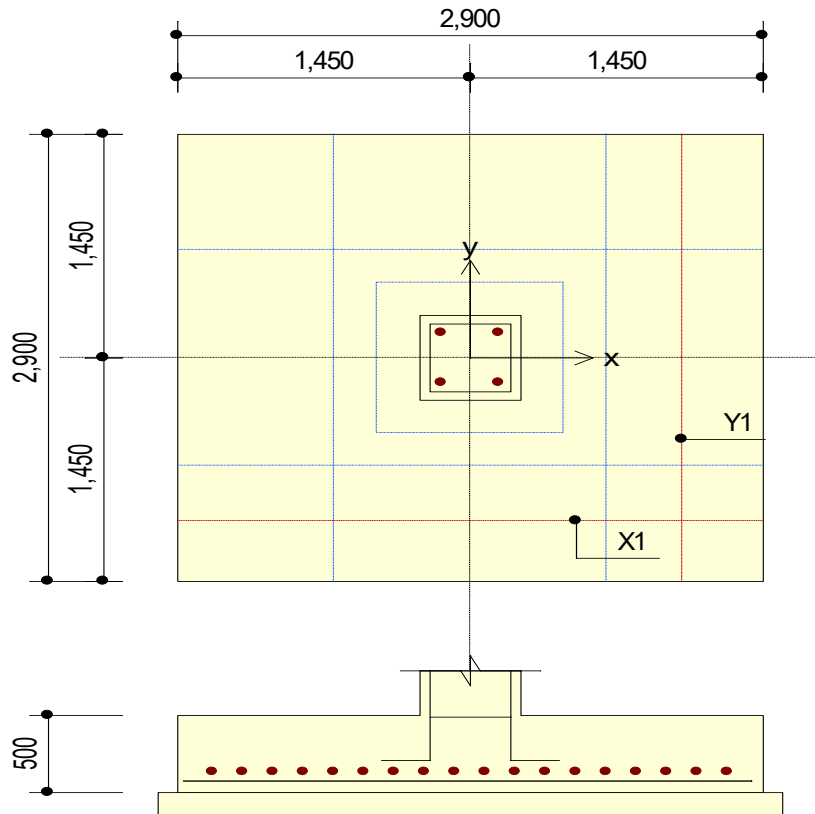
■ ZAPATA : Z-2

1. General Information

- (1) Design Code : ACI318M-14
(2) Unit System : N, mm

2. Material

- (1) F'_c : 28.00MPa
(2) F_y : 400MPa



3. Section

- (1) Section Size
• Depth : 500mm
• Cover : 75.00mm
(2) Column Section
• Shape of Column : Rectangle
• Section : 500x500mm

4. Rebar

- (1) Direction Y
- Layer 1 : #5@150 ($A_s = 1,333\text{mm}^2$)
- (2) Direction X
- Layer 1 : #5@150 ($A_s = 1,333\text{mm}^2$)

5. Foundation

- (1) Foundation Size
- L_x : 2.900m
 - L_y : 2.900m
 - f_e : 120KPa

6. Design Load

- (1) Service Load
- P_s : 874kN
 - M_{sx} : 124kN·m
 - M_{sy} : 22.00kN·m
- (2) Factored Load
- P_u : 1,310kN
 - M_{ux} : 175kN·m
 - M_{uy} : 36.00kN·m
- (3) Surcharge Load is not considered.
- (4) Self weight is considered.

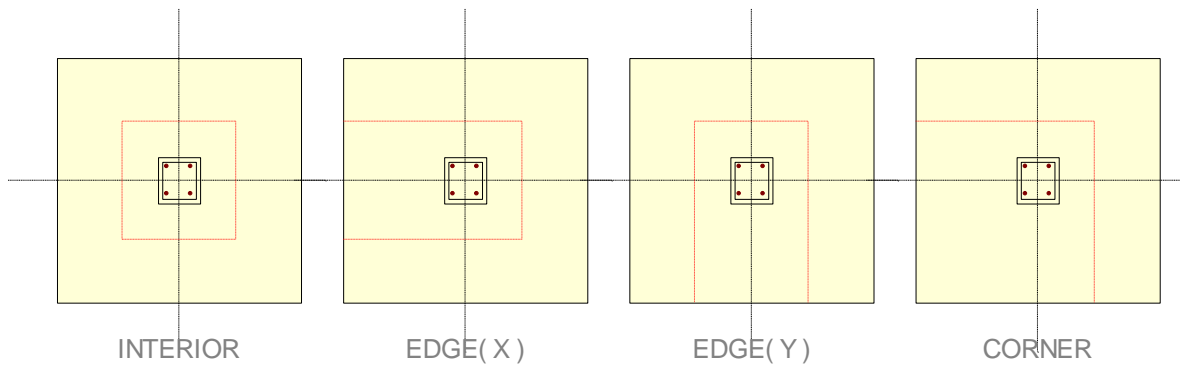
7. Check Soil Capacity

- (1) Calculate actual soil stress (KPa)
- $q_{s.\text{top-left}} = 110$ $q_{s.\text{top-right}} = 111$
 - $q_{s.\text{bot-left}} = 79.39$ $q_{s.\text{bot-right}} = 90.22$
 - $q_{s.\text{max}} = 151$
 - $q_{s.\text{max}} / f_e = 0.92 \rightarrow \text{O.K}$
- (2) Calculate factored soil stress (KPa)
- $q_{u.\text{top-left}} = 204$ $q_{u.\text{top-right}} = 221$
 - $q_{u.\text{bot-left}} = 118$ $q_{u.\text{bot-right}} = 135$
 - $q_{u.\text{max}} = 221$ $q_{u.\text{min}} = 118$

8. Check Shear

- (1) Calculate one-way shear
- $\phi = 0.750$
 - $V_{ux} = 352\text{kN}$ $\phi V_{cx} = 755\text{kN}$
 - $V_{ux} / \phi V_{cx} = 0.466 \rightarrow \text{O.K}$
 - $V_{uy} = 404\text{kN}$ $\phi V_{cy} = 727\text{kN}$
 - $V_{uy} / \phi V_{cy} = 0.557 \rightarrow \text{O.K}$
- (2) Calculate two-way shear

-	b_0 (mm)	V_{c1} (kN)	V_{c2} (kN)	V_{c3} (kN)	V_c (kN)	V_u (kN)	ϕV_c (kN)	Ratio
Interior	3,768	4,188	4,107	2,541	2,541	1,172	1,906	0.615
Edge(X)	4,784	5,318	3,744	3,226	3,226	1,009	2,419	0.417
Edge(Y)	4,784	5,318	3,744	3,226	3,226	1,022	2,419	0.422
Corner	3,842	4,270	2,718	2,591	2,591	697	1,943	0.359



- $\phi = 0.750$
- $d = 417\text{mm}$
- $V_{c1} = 0.17 \left(1 + \frac{2}{\beta} \right) \sqrt{f'_c} b_0 d$
- $V_{c2} = 0.083 \left(\frac{a_s d}{b_0} + 2 \right) \sqrt{f'_c} b_0 d$
- $V_{c3} = 0.33 \sqrt{f'_c} b_0 d$
- $V_c = \min(V_{c1}, V_{c2}, V_{c3})$
- $V_u = 1,172\text{kN}$
- $V_u / \phi V_c = 0.615 \rightarrow \text{O.K}$

9. Check Moment Capacity

(1) Calculate moment capacity (Direction X)

- $\phi = 0.900$
- $M_{uy} = 117\text{kN}\cdot\text{m}$ $\phi M_{ny} = 194\text{kN}\cdot\text{m}$
- $M_{uy} / \phi M_{ny} = 0.602 \rightarrow \text{O.K}$

(2) Calculate moment capacity (Direction Y)

- $\phi = 0.900$
- $M_{ux} = 129\text{kN}\cdot\text{m}$ $\phi M_{nx} = 186\text{kN}\cdot\text{m}$
- $M_{ux} / \phi M_{nx} = 0.694 \rightarrow \text{O.K}$

10. Check Rebar

(1) Calculate minimum rebar area required

- $A_{s,min} = 0.00180D = 900\text{mm}^2$

(2) Calculate minimum rebar space required (Direction Y)

- $A_s = 200\text{mm}^2$ (#5@150)
- $s_{req.} = 222\text{mm}$
- $s_x = 150\text{mm} < s_{req.} = 222\text{mm} \rightarrow \text{O.K}$

(3) Calculate minimum rebar space required (Direction X)

- $A_s = 200\text{mm}^2$ (#5@150)
- $s_{req.} = 222\text{mm}$
- $s_y = 150\text{mm} < s_{req.} = 222\text{mm} \rightarrow \text{O.K}$

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