Square Footing Calculator   Footing at P1

Check square pad footing at location of column.
From previous sections and by inspection the dead and live loads acting vertically on this
column are:

	Roof LL or S =	1500.0	lbs

(lbs)	Dead Load	Floor Live	Roof Live
Roof	1000	0	1500
Floor	0	0	0
Totals	1000	0	1500

Roof LL or S =	1500.0	lbs
Roof DL =	1000.0	lbs
Floor LL =	0.0	psf
Floor DL =	0.0	psf
Column Width =	5.50	in
Column Breadth =	5.50	in
Column Type =	WOOD	

ASD Load Cases from ASCE 7-10:
2.) D + L =   1000 lbs
3.) D + (Lr or S) =   2500 lbs   (governs)
4.) D + .75L + .75(Lr or S) = 2125 lbs

ρ_{conc} =	150	pcf
Steel Yield Strength =	60,000	psi
Conc. Comp. Strength =	3,000	psi
Soil Bearing Pressure =	1,500	psf
Reinf. Cover =	3	in
Reinf. Bar Size =	4	
Soil Depth Above Ftg. =	12	in
ρ_{soil} =	100	pcf
Footing Width =	24	in
Footing Depth =	12	in

Bearing Calculations:

Applied Bearing Pressure	Q_{asd} =	625	psf	
Eff. Allowable SBP	Q_e =	1,250	psf	
Footing Area Required	A_{req} =	2.0	ft^2	
Area of Footing	$A_{footing}$ =	**4.0**	ft^2 ⟶	**OK**
Weight to resist Uplift w/ 1.5 F.S. U.R. =		653	lbs	

Strength Design Load Cases from ASCE 7-10:
1.) 1.4D =   1400 lbs
2.) 1.2D + 1.6L + .5(Lr or S) =   1950 lbs
3.) 1.2D + 1.6(Lr or S) + L =   3600 lbs   (governs)

Eff. Depth to Top Layer of Steel
d =   8.250 in

Beam Shear Calculations (One Way Shear):

Ult. Applied Bearing Pressure	Q_u =	900	psf	
Applied Beam Shear	V_{u1} =	150	lbs	
Allowable Beam Shear	V_{c1} =	16,267	lbs (ACI 11-3)	
Footing Depth Required	D_{req} =	0.1	in	
Footing Depth	$D_{footing}$ =	**12.0**	in ⟶	**OK**

Baseplate Bearing Calculations:

$\sqrt{A_2/A_1}$ =		4.36		
P_u =		3,600	lbs	
P_{allow} =		100,279	lbs (ACI 10.14)	
A_{req} =		1.1	in^2	
A_1 =		**30.3**	in^2 ⟶	**OK**

Punching Shear Calculations (Two Way Shear):

Critical Perimeter	b_0 =	55.0	in
Column Ratio	β_c =	1.0	
Column Location Factor	α_s =	40	
Punching Shear	V_{u2} =	2,418	lbs
Allowable Punching Shear	V_{c2-a} =	111,838	lbs (ACI 11-31)
Allowable Punching Shear	V_{c2-b} =	149,117	lbs (ACI 11-32)
Allowable Punching Shear	V_{c2-c} =	74,559	lbs (ACI 11-33)
Controlling Punching Shear	V_{c2} =	74,559	lbs
Footing Depth Required	D_{req} =	0.4	in
Footing Depth	$D_{footing}$ =	**12.0**	in ⟶ **OK**

Bending Calculations:

Cantilever length	L_{cant} =	9.25	in
Conc. Comp. Block	a =	0.58	in
Bending Moment	M_u =	6,417	in-lb
Moment Strength	M_n =	253,236	in-lb

Bending Calculations:
Unreinforced Concrete

S =		400.0	in^3
M_u =		6,417	in-lb
M_n =		65,727	in-lb (ACI 22-2)
D_{req} =		1.2	in
$D_{footing}$ =		**12.0**	in ⟶ **OK**

Reinforcement Calculations:

$M_u/\phi bd^2$	R_n =	4.4	psi
Steel Ratio	ρ =	0.0001	
Steel Req. based on Moment	$A_{s(1)}$ =	0.014	in^2
Steel Req. based on Shrink	$A_{s(2)}$ =	0.518	in^2 (ACI 7.12)
Controlling Reinf. Steel	$A_{s(req)}$ =	0.518	in^2
Required number of # bars =		2.64	
Selected Longitudinal Bars:		**3 - #4 bars each way**	
Reinforcement Area Provided	A_s =	0.59	in^2 ⟶ **OK**

Development Length Calculations:

spacing/cover dimension	c =	3.0	in
Transverse Reinf. Factor	$c + K_{tr}/d_b$ =	6 (use 2.5)	
Length Req.	L_d =	11.6	in (ACI 12-1)
Length Available	L_{d-sup} =	6.25	in

λ =	1.0	(lightweight aggregate factor)	
ψ_t =	1.0	(reinforcement location factor)	
ψ_e =	1.0	(coating factor)	
ψ_s =	0.8	(reinforcement size factor)	
K_{tr} =	0.0	(transverse reinf. Index)	

Note: Plain concrete adequate for bending, therefore development length not required.