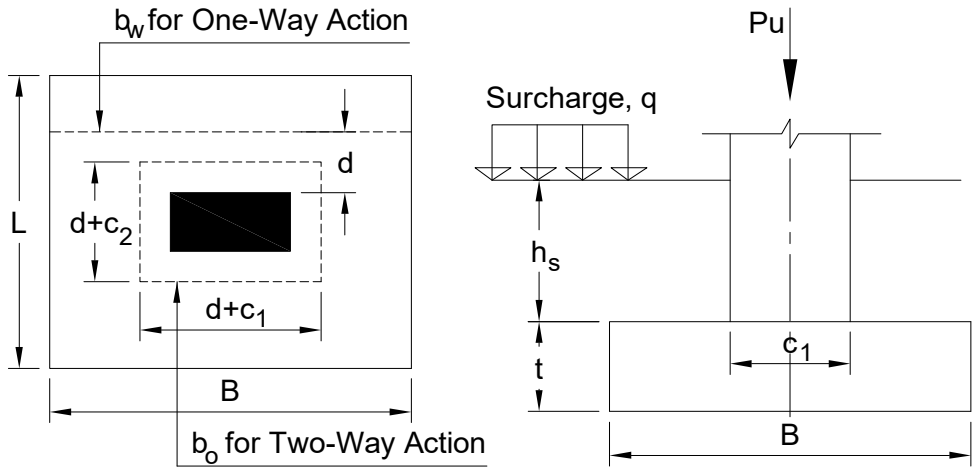
Design for Depth of Shallow Foundation as per ACI 318-11 Chapters 11 & 15



System

Width of Column, c_1=		30.0 in
Length of Column, c_2=		12.0 in
Concrete Cover, co=		5.0 in
Height of Soil above Footing, h_s=		5 ft

Load

Service Dead Load, P_D=			350 kips
Service Live Load, P_L=			275 kips
Ultimate Load, P_u=	$1.2*P_D+1.6*P_L$	=	860 kips
Service Surcharge, q=			0.1 ksf
Allowable Soil Pressure at Bottom of Footing, P_a=			4.5 ksf
Average Weight of Soil and Concrete above Footing Base, w=			130.0 pcf

Material Properties

Concrete Strength, f'_c=			3000 psi
Shear Strength Reduction Factor (According to Cl.9.3.2 of ACI318), Φ=			0.75
Modification Factor for Lightweight Concrete, λ=			1.00

Calculation of Base Area

Net Allowable Soil Pressure, P_{na}=	$P_a - q - \frac{w*h_s}{1000}$	=	3.75 ksf
Required Area of Footing, A_f=	$\frac{P_D+P_L}{P_{na}}$	=	166.7 ft^2
Assume Width of Footing, B=			13 ft
Assume Length of Footing, L=			13 ft
Check Validity=	IF(A_f > L*B; "Invalid"; "Valid")	=	Valid
Ultimate Pressure, q_s=	P_u / (B * L)	=	5.09 ksf

Calculation of Required Thickness for One-Way Action

Assume that Thickness of Footing, t=			33 in
Depth of Footing, d=	t - co	=	28 in
Critical Area of One-Way Shear, A_{1B}=	$B*\left(\frac{L-c_2/12}{2}-\frac{d}{12}\right)$	=	47.67 ft^2
Critical Area of One-Way Shear, A_{1L}=	$L*\left(\frac{B-c_1/12}{2}-\frac{d}{12}\right)$	=	37.92 ft^2
Critical Area of One-Way Shear, A_1=	MAX(A_{1B} ; A_{1L})	=	47.67 ft^2
Width of Critical Section for One-Way Shear, b_w=	IF(A_{1B}>A_{1L} ; B ; L)	=	13 ft
Ultimate Shear force at Critical Area Section, V_{u1}=	$q_s * A_1$	=	243 kips
Nominal Concrete Shear Strength, ΦV_c=	$\Phi*2*\lambda*\sqrt{f'_c}*\frac{b_w*12*d}{1000}$	=	359 kips
Check Validation =	IF(ΦV_c > V_{u1}; "O.K."; "Increase Depth")	=	O.K.

Calculation of Required Thickness for Two-Way Action

Critical Area of Two-Way Shear, A_2=	$B*L-\left(\frac{(c_1+d)*(c_2+d)}{144}\right)$	=	152.89 ft^2
Ultimate Shear force at Critical Area Section, V_{u2}=	$q_s * A_2$	=	778.2 kips
Perimeter of Critical Section for Two-Way Shear, b_0=	$2*(c_1+d) + 2*(c_2+d)$	=	196.0 in
Column Type=	SEL("ACI/Alfa S";Type;)	=	Interior
Alfa Constant, α_s=	TAB("ACI/AlfaS"; Alfa; Type=Type)	=	40.00
Ratio of Long to Short Column Dimensions, β=	MAX(c_1;c_2)/MIN(c_1;c_2)	=	2.50

Concrete Shear Strength (According to Eq. 11-31 of ACI318),

V_{c1}= $\left(2+\frac{4}{\beta}\right)*\lambda*\sqrt{f'_c}*\frac{b_0*d}{1000}$ = 1082 kips

Concrete Shear Strength (According to Eq. 11-32 of ACI318),

V_{c2}= $\left(\alpha_s*\frac{d}{b_0}+2\right)*\lambda*\sqrt{f'c}*\frac{b_0*d}{1000}$ = 2319 kips

Concrete Shear Strength (According to Eq. 11-33 of ACI318),

V_{c3}= $4*\lambda*\sqrt{f'_c}*\frac{b_0*d}{1000}$ = 1202 kips

Nominal Concrete Shear Strength, ΦV_c=	Φ * MIN(V_{c1}; V_{c2}; V_{c3})	=	812 kips
Check Validation =	IF(ΦV_c > V_{u2}; "O.K."; "Increase Depth")	=	O.K.

Calculation Summary

Width of Footing, B=	B	=	13 ft
Length of Footing, L=	L	=	13 ft
Thickness of Footing, t=	t	=	33 in