Input information

f ' c =	5000	psi	β_1 = 0.8	Comp	
fy =	60000	psi			
bar length =	22.5	ft			
s.s. (1), Cant. (2)	1				
W_L =	1.50	k/ft		Tension	o o o o As
W_d =	2.00	k/ft			

Design

Wu = 4.8 k/ft

Mu = 3645 in-kips or 304 ft.kips

choose a c/d value

c/d= 0.3000

ρ = 0.01700

$$\rho = 0.85\beta_1 \frac{c}{d}\frac{f_c'}{f_y}$$

Find bd^2

bd^2 = 4514 in^3

$$bd^2 = \frac{M_u}{\rho\phi f_y(1-0.59\rho f_y / f_c')}$$

			Trial Sizes				
choose b =	12	in	10	15.0	12	15	18
find d =	19.4	in	21.2	17.3	19.4	17.3	
use d =	19.4		21.2	17.3	19.4	17.3	
			2.12	1.16	1.62	1.16	

Find As = 3.96 in^2

choose steel	No.	Bar size		
	4	9	4.00	in^2
		7	0.00	in^2
		------>	4.00	in^2

Chosen steel properties

No. of bars =	4		Stirrup db =	0.5	
bar size=	9		Stirrup #	4	
bar diameter =	1.128	inches			
bar area =	1	in^2	clear spacing =	1.16	inches
width (b) =	12	in			
chosen cover =	1.50		bar spacing is	ok	

Total Height is: 21.96 use 22.00 inches

Final moment capacity with the chosen dimensions and reinforcing steel=

d = 19.44

a = 4.71

c= 5.88

c/d = 0.30 Transition

ϕ = 0.9

$$a = \frac{A_s f_y}{0.85 f_c' b}$$

Mn = 4100 in-kips

Mu = 3690 in-kips