

WALL / SLAB REINFORCEMENT DESIGN TEMPLATE

REF. 1. ACI 318 Building Code and Commentary
2. ACI 350 Code Requirements for Environmental Structures

Password: obgmbi
Please Fill in the gray boxes.

Client Name:	U.S. ARMY CORPS OF ENGINEERS	Design By:	MBI
Project Name:	FARGO – MOORHEAD , FEASIBILITY STUDY, PHASE 4	Review By:	
Work Description:	Sheyenne Aquaduct Structure - Mat Foundation	Date:	2/14/2011
		Job #:	34091004

Cross Section Properties		Material Properties		Factors					
Height	h (in)	48	in	Concrete	f'_c (ksi)	4	ksi	ϕ Flex	0.9
Width	b (in)	12	in	Steel	E (ksi)		ksi	ϕ Shear	0.75
Section as		Slab Section			f_y (ksi)	60	ksi	Governing Code	
Section Modulus	S (in ³)	4608 in ³			E (ksi)	29000	ksi	ACI 350- 01	
Design Forces									
Shear	Vu (kips)	35							
Moment	Mu (k-ft/ft)	146.78							

Flexural Reinforcement Design		Minimum Required Steel	
Cover	15	3fc' ^{1/2} /fy =	0.00316
Length Bet. Mov. Jt.	50	ρ_{min} Flex =	0.0033333
Bar index	# 5	ρ_{min} T&S =	0.005
d (Tension Reinf.)	32.6875	$\rho_{Balance}$ =	0.0285068
Design Mom. (Fact.)	146.78	Rn	0.153
		A_s Required =	1.021 in ²
		A_s Provide =	1.308 in ²
		A_s Selected =	# 9
		Spacing @	6 in
		Spacing is OK per ACI 318	
		ϕ Required =	0.0026
		Tension controlled	
		ϕ	0.9
		Same as f assumed initially, OK.	
		ϕM_n	280.95
		Design Moment, Section OK	

Cracking moment Capacity		Flexural Moment Capacity	
f_r	474.34	A_s Selected =	2.000 in ²
M_r Cracking =	182.15	M_u Flex =	280.95

Shear Reinforcement Design	
Vc	49.62
ϕ Shear	0.75
ϕV_c	37.21
Vs	9.45
Vu =	35.00

Minimum Shear Reinforcement	
11.4.6 — Minimum shear reinforcement	
11.4.6.1 — A minimum area of shear reinforcement, $A_{v,min}$, shall be provided in all reinforced concrete flexural members (prestressed and nonprestressed) where V_u exceeds $0.5\phi V_c$, except in members satisfying one or more of (a) through (f):	
(a) Footings and solid slabs;	
(b) Hollow-core units with total untopped depth not greater than 12.5 in. and hollow-core units where V_u is not greater than $0.5\phi V_{cw}$;	
(c) Concrete joist construction defined by 8.13;	
(d) Beams with h not greater than 10 in.;	
(e) Beam integral with slabs with h not greater than 24 in. and not greater than the larger of 2.5 times thickness of flange, and 0.5 times width of web;	
(f) Beams constructed of steel fiber-reinforced, normalweight concrete with f'_c not exceeding 6000 psi, h not greater than 24 in., and V_u not greater than $\phi 2\sqrt{f'_c} b_w d$.	
Is any of the requirements (a thru f) satisfied? YES	
A_v Min / s =	0.0095
A_v Min/s =	0.01
No Shear reinforcement required.	
Spacing Requirement	
s = d/2	16.34375
$4fc'^{0.5}bw*d$	99.23
smax =	17.00
A_v Min =	0.17
$A_v/s = V_s/ft*d$	0.0048
A_v Required =	0.08
A_v Provide =	0.17
Stirrup Size	# 3
# Legs	2
A_s Selected =	0.220
> A_v Provide, OK	

Calculation of Moment Capacity with Min. Reinforcement	
Analyze as a	8
1	ρ_{min} Flex. 0.00333
2	ρ_{min} Wall Ver. 0.0015
3	ρ_{min} Wall Hor. 0.0025
4	ρ_{min} Slab T&S 0.0018
5	ρ_{min} Wall Ver. 0.003
6	ρ_{min} Wall Hor. 0.005
7	ρ_{min} Slab T&S 0.0018
8	Select Reinforcement Below
A_s Selected	# 9 @ 12 in
A_s Selected	1 in ²
Than ρ_{min} 0.00000	
$A_s = \rho_{min} * bd$ or bh	1.0000 in ²
T = $A_s * f_y$	60.000 kip
a = T / (0.85 b fc')	1.471 in
M = T*(d-a/2)	159.761 kip-ft
$M_u = \phi * M$	143.785 kip-ft
One Face Only $A_s =$	0.5 in ²
T = $A_s * f_y$	30.000 kip
a = T / (0.85 b fc')	0.735
M = T*(d-a/2)	80.800 kip-ft
$M_u = \phi * M$	72.720 kip-ft