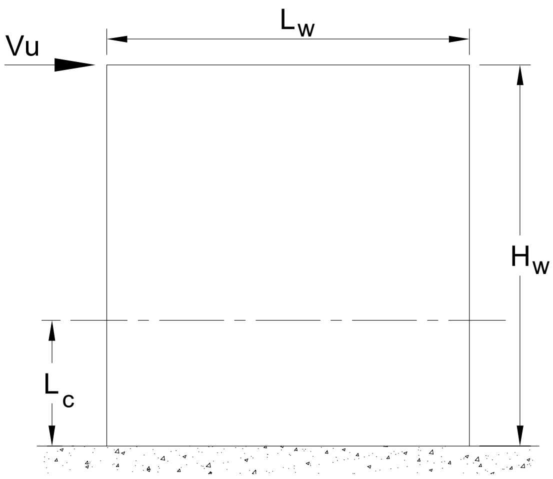
Shear Design of Wall as per ACI 318-11 Chapter 11



System

Height of Wall, h_w=			12.0 ft
Width of Wall, L_w=			8.0 ft
Over All Wall Depth, d=	$0.8 * L_w$	=	6.4 ft
Thickness of Wall, h=			8.0 in
Concrete Cover, co=			2.0 in
Effective Depth of Wall Section, d_c=	$h - co = 8.0 - 2.0$	=	6.0 in

Load

Ultimate Bending Moment, M_u=	19200 kip*ft
Ultimate Shear Force, V_u=	200 kips
Ultimate Normal Force, N_u=	0 kips

Material Properties

Concrete Strength, f'_c=	3000 psi
Yield Strength of Reinforcement, f_y=	60000 psi
Shear Strength Reduction Factor (According to Cl.9.3.2 of ACI318), Φ=	0.75
Modification Factor for Lightweight Concrete, λ=	1.00

Check Shear Reinforcement Requirement

Maximum Shear Strength of Wall (According to Cl.11.9.3 of ACI318),

ΦV_n=	$\Phi * 10 * \sqrt{f'_c} * h * d * 12 / 1000$	=	252 kips
Check Validity=	IF($V_u \le \Phi V_n$;"Valid" ;"Invalid")	=	Valid
Critical Section of Shear Force, L_c=	$MIN(L_w/2; h_w/2)$	=	4.00 ft

Concrete Shear Strength (According to Eq.11-27 of ACI318),

$$V_{c1} = 3.3 * \lambda * \sqrt{f'_c} * \frac{h * d * 12}{1000} + \frac{N_u * d}{4 * Lw} = 111 \text{ kips}$$

Concrete Shear Strength (According to Eq.11-28 of ACI318),

$$V_{c2}=\left(0.6*\lambda*\sqrt{f'_c}+\frac{L_w*12*\left(1.25*\lambda*\sqrt{f'_c}+\frac{0.2*N_u}{L_w*12*h}\right)}{M_u/V_u-L_w*12/2}\right)*\frac{h*d*12}{1000} = 104\ \text{kips}$$

Concrete Shear Strength, V_c= MIN(V_{c1}; V_{c2}) = 104 kips

Shear Reinforcement: IF(V_u<Φ*V_c/2;"Not Required" ;"Required") = Required

Determine Horizontal Shear Reinforcement

Identification of, Bar= SEL("ACI/Bar" ;Bar;) = No.4

Provided Reinforcement, A_{sb}= TAB("ACI/Bar"; Asb; Bar=Bar) = 0.20 in^2

Number of Bars, n= 2

Area of Shear Reinforcement, A_h= $n * A_{sb}$ = 0.40 in^2

Spacing between Bars (According to Eq.11-29 of ACI318),

$$s_{hi}=\frac{\Phi*fy/1000*d*12*A_h}{V_u-\Phi*V_c} = 11.3\ \text{in}$$

Provided Reinforcement Spacing, s_h= 10 in

Check Validity= IF($s_h \le s_{hi}$; "Valid"; "Invalid") = Valid

Ratio of Horizontal Shear Reinforcement (According to Cl.11.9.9.2 of ACI318),

$$\rho_{hi}=\frac{A_h}{h*s_h} = 0.005$$

ρ_h= MAX(ρ_{hi} ; 0.0025) = 0.005

Calculation of Vertical Shear Reinforcement

Ratio of Vertical Shear Reinforcement (According to Eq.11-30 of ACI318),

$$\rho_{vi}=0.0025+0.5*\left(2.5-\frac{h_w}{L_w}\right)*\left(\rho_h-0.0025\right) = 0.0037$$

ρ_v= MAX(ρ_{vi} ; 0.0025) = 0.0037

Identification of, Bar= SEL("ACI/Bar" ;Bar;) = No.4

Provided Reinforcement, A_{sb}= TAB("ACI/Bar"; Asb; Bar=Bar) = 0.20 in^2

Number of Bars, n= 2

Area of Shear Reinforcement, A_v= $n * A_{sb}$ = 0.40 in^2

Spacing between Bars (According to Eq.11-29 of ACI318),

$$s_{vi}=\frac{A_v}{\rho_v*h}=\frac{0.40}{0.0037*8.0} = 13.5\ \text{in}$$

Provided Reinforcement Spacing, s_v= 13 in

Check Validity= IF($s_v \le s_{vi}$; "Valid"; "Invalid") = Valid

Design Summary

Horizontal Shear Reinforcement, A_h= A_h = 0.40 in^2

Spacing Between Horizontal Shear Reinforcement, s_h=	s_h	=	10 in
Vertical Shear Reinforcement, A_v=	A_v	=	0.40 in^2
Spacing Between Horizontal Shear Reinforcement, s_v=	s_v	=	13 in