ACI 2019 / ASCE 7-22
CONCRETE SHEARWALL ANALYSIS AND DESIGN
RCWALLPRO

Project : Name
Building : Building EV
Wall ID : 1

REQUIRED INPUT ARE INDICATED BY BLUE COLOR NUMBERS OR WITH BLUE SHADING

INPUT

Concrete Strength, f'c:	4	ksi	Conc E, Econc:	**3605**	ksi	
Rebar Yield Strength, fy:	60	ksi	Steel E, Es:	29000	ksi	
Total Wall Length, Ltot:	360	in	< includes end sections >			
End 1 Length, L_1:	32	in	< length of left end section >			
End 2 Length, L_2:	32	in	< length of right end section >			
Wall Thickness, T_0:	20	in	< thickness between end sects >			
End 1 Thickness, T_1:	32	in	< thickness @ left end section >			
End 2 Thickness, T_2:	32	in	< thickness @ right end section >			
Wall Vert. Steel, As_0:	2	layers - #	7	@	12	in, o.c.
Wall Horiz. Steel, As_h:	2	layers - #	7	@	12	in, o.c.
End 1 Rebar, As_1:	28	- #	11	< total x pieces #y bar >		
End 2 Rebar, As_2:	28	- #	11	< total x pieces #y bar >		
Wall Dead Load, P_DL:	320	kips	< NOT including wall self wt >			
Wall Live Load, P_LL:	235	kips				
Wall Seismic Load, P_EQ:	455	kips	< Seismic axial load @ wall center >			

Design Spectral Acceleration Parameter, **SDs** ASCE 7 Chapter 11	1.5	g	
Building Importance Factor, **I** - ASCE 7 Table 1.5-2	1.5	ndim	
Deflection Amplification Factor, **Cd** - ASCE 7 Table 12.2-1	5	ndim	
Cracked Section Modification Factor for Ig, **Kcr**	0.5	ndim	Ns min
Number of story above the base /critical section, **Ns**	6.216	ndim	6.216

STORY HEIGHTS & UNFACTORED FORCES

Story	Story Height	Story EQ Force	Story EQ Shear	Height Above Base	Story EQ OTM	Dist From Top	Story Moment	Moment Diagram
No.	feet	kips	kips	feet	k-ft	feet	k-ft	k-ft
10			0.0	74.00	0	0.00	0	0
9			0.0	74.00	0	0.00	0	0
8			0.0	74.00	0	0.00	0	0
7			0.0	74.00	0	0.00	0	0
6			0.0	74.00	0	0.00	0	0
5			0.0	74.00	0	0.00	0	0
4	26.00	650.0	650.0	74.00	48100	26.00	16900	16900
3	16.00	27.0	677.0	48.00	1296	42.00	10832	27732
2	16.00	57.0	734.0	32.00	1824	58.00	11744	39476
1	16.00	29.0	763.0	16.00	464	74.00	12208	51684
Total:	74.00	763.0			51684			

Note Story shear input must include the shear due to wall selfweight

WALL SECTION PROPERTIES AND DEFLECTIONS

Int. Wall Length < wall length betw end sects >, L_0:	296	in
Total Gross Area, ATOT:	7968	in^2
Centroid Distance to End 1, NAXIS	180	in
Gross Moment of Inertia, I_GROSS:	98482	X 10^3 in^4
Elastic Bending Deflection, d_eb:	0.446	in
Elastic Shear Deflection : d_v	0.065	in
Comb. Bending and Shear Defl. at Top of Wall, d_e tot :	0.512	in

WALL LOADING

Wall Geometry	SYMMETRIC		
Wall Self Weight, P_SW:	614	kips	
Factored Shear, Vu:	763	kips	

COMBINED BENDING WITH MAXIMUM AXIAL LOAD

Wall Axial Load, P'u:	2091	kips	**< P'u = 1.2D + L + Ev + Eh>**
Factored EQ Moment, Mu:	51684	kip-ft	
Factored Axial Force	0.07	Ag.fc'	
Max Compressive Strength w/ Ties _Pn max	26969	kips	Pn max = 0.8 Po
Ratio of Pu / Pn max=	0.08		OK

COMBINED BENDING WITH MINIMUM AXIAL LOAD

Wall Axial Load, P'u min:	106	kips	**< P'u = 0.9D -Ev -Eh>**
Factored EQ Moment, Mu:	51684	kip-ft	
Factored Axial Force	0.00	Ag.fc'	

NOMINAL FLEXURAL CAPACITY M'N @ P'u & DEMAND/CAPACITY RATIO

Wall Vert Steel, Rhov:	0.00500	ndim				
Wall Horiz Steel, Rhoh:	0.00500	ndim				
End 1 Steel, As_1:	43.68	in^2				
End 2 Steel, As_2:	43.68	in^2				
Beta1:	0.85	ndim				
Conc Yld Strain, eecy:	0.003	ndim				
Steel Yld Strain, eesy:	0.0021	ndim				
UNDER MAXIMUM AXIAL LOAD						
Compr Zone Length, c:	44.59	in	Iterate C until Sum of Forces = 0			
Sum of Forces, ftot:	0	kips	OK	M'n:	123414	k-ft
Maximum Steel Strain, Et	0.021	ndim				
Strength Red. Factor, Phi	0.90	ndim				
Phi M'n:	111073	kip-ft	OK > Mu at P'u			
UNDER MINIMUM AXIAL LOAD						
Compr Zone Length, c_min:	29.43	in	Iterate C until Sum of Forces = 0			
Sum of Forces, ftot:	0	kips	OK	M'n:	98056	k-ft
Maximum Steel Strain, Et_min	0.034	ndim				
Strength Red. Factor, Phi	0.90	ndim				
Phi M'n:	88250	kip-ft	OK > Mu at P'u			
Bending Max Demand/Capacity, Mu/(Phi_Mn)			0.59		ndim	OK

PROBABLE FLEXURAL STRENGTH Mpr @ P'u

125 % Steel Yld Stress, Fy_25	75	ksi

UNDER MAXIMUM AXIAL LOAD

Compr Zone Length, c:	79	in	Iterate C until Sum of Forces = 0		
Sum of Forces, ftot:	0	kips	OK	Mpr:	140964 k-ft
Maximum Steel Strain, E_pr	0.011	ndim			

UNDER MINIMUM AXIAL LOAD

Compr Zone Length, c_min:	36.25	in	Iterate C until Sum of Forces = 0		
Sum of Forces, ftot:	0	kips	OK	Mpr_min:	120992 k-ft
Maximum Steel Strain, Epr_min	0.027	ndim			

BOUNDARY ELEMENT REQUIREMENT PER ACI SECTION 18.10.6

This Section is for Walls with Entire Wall Hw/Lw > = 2

Total Elastic Displacment at Top of Wall, d_e tot:	0.51	in	
Approximate Design/Expected Inelastic Displacement, d_u:	3.41	in	
Design Displacement/Height (Design Drift) Ratio	0.004	ndim	
Drift Capacity Ratio per Eq. 18.10.6.2 b Assuming Max Permitted Vu	0.032	ndim	
Maximum Compr Zone Length, C_max Per Eq. (18.10.6.2)	80.00	in	Limit for no boundary zone
Minimum Boundary Zone Length, L_BZ_min:	0.00	in	
Minimum Height Above The Base, H_BZ_ACI	0.00	in	
Min Boundary Zone Thickness When Required, b (18.10.6.2 b ii)	20.03	in	See Section b iii for exception
Max. Dist BetwVert Bars Intersected by Hoops/Crossties, hx	14.00	in	
Input Boundary Zone Thickness T_BZ_ACI	36.00	in	
Input Boundary Zone Length L_BZ_ACI	48.00	in	
Hoops Vertical Spacing, S_v_ACI	4.00	in	**Must be < So**
Dist. from Face of Concrete to Center of Hoops, D_c_ACI	1.50	in	
Maximum Hoop Spacing **So** Per Eq. (18.7.5.3)	4.00	in	For Grade 60
Req. Area of Hoops in Longitudinal Dir., Ash_x:	0.00	in^2	
Req. Area of Hoops in Transverse Dir., Ash_y:	0.00	in^2	

Max. Hoops Vertical Spacing If Boundary Element is Not Required: 8.00 inches for Vert Bar w Fy=60 ksi

BOUNDARY ELEMENT IS NOT REQUIRED; SEE SECTIONS 18.2.3/4 & 18.10.6.5 FOR OTHER REQUIREMENT

SHEAR DEMAND AND CAPACITY

Wall's Height to Length Ratio	2.5	ndim	
Coefficient ALFA_C	2.0	ndim	
Shear Distribution Coefficient, **Wv**	1.5072	ndim	
Nominal Shear Strength,Vn	3071	kips	
Shear Strength Reduction Factor Table 21.2.1 Phi_v	**0.75**	ndim	
Design Shear Capacity, Phi_v Vn:	2303	kips	
Shear Overstrength Factor, Omega_v	**2.73**	ndim	
Design Shear Force Ve	**2289**	kips	
Shear Demand/Capacity, Ve/(Phi_v Vn)	**0.99**	**ndim**	**OK**
Max Usable Shear Capacity for Individual Wall or Segment, Phi_v Vn max:	3415	kips	**OK SEE INPUT DESCRIPTIONS**

END OF CALCULATIONS