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

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

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			

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