

2007 CBC / ACI 05 / ASCE 7-05 / 2006 IBC

CONCRETE SHEARWALL ANALYSIS AND DESIGN

RCWALLPRO by STRUCTECH

Your company name

Your company address

Your company phone/fax

Project :Your project

Building :Your building

Wall ID :WALL # 40

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

INPUT

Concrete Strength, f'c:	35	MPa	Conc E, Econc:	27983	MPa
Rebar Yield Strength, fy:	420	MPa	Steel E, Es:	200000	MPa
Total Wall Length, Ltot:	18300	mm	< includes end sections >		
End 1 Length, L_1:	1200	mm	< length of left end section >		
End 2 Length, L_2:	1200	mm	< length of right end section >		
Wall Thickness, T_0:	800	mm	< thickness between end sects >		
End 1 Thickness, T_1:	1200	mm	< thickness @ left end section >		
End 2 Thickness, T_2:	1200	mm	< thickness @ right end section >		
Wall Vert. Steel, As_0:	2	-	DIA	25	@ 150 mm, o.c.
Wall Horiz. Steel, As_h:	2	-	DIA	25	@ 150 mm, o.c.
End 1 Rebar, As_1:	36	-	DIA	57	< total x pieces DIA y bar
End 2 Rebar, As_2:	36	-	DIA	57	< total x pieces DIA y bar
Wall Dead Load, P_DL:	1450	kN	< NOT including wall self wt >		
Wall Live Load, P_LL:	1060	kN			
Wall Seismic Load, P_EQ:	0	kN	< Seismic axial load @ wall center >		
Cracked Section Modification Factor for Ig, Kcr				0.5	ndim
Shear Distribution Coefficient, Wv				1.33	ndim
Design Spectral Acceleration Parameter, SDs ASCE Chapter 16				1.5	g
Building Importance Factor, I - ASCE 7 Table 11.5-1				1.5	ndim
Deflection Amplification Factor, Cd - ASCE 7 Table 12.2-1				5	ndim

WALL SECTION PROPERTIES AND DEFLECTIONS

Int. Wall Length < wall length betw end sects >, L_0:	15900	mm
Total Gross Area, ATOT:	15600000	mm^2
Centroid Distance to End 1, NAXIS	9150	mm
Gross Moment of Inertia, I_GROSS:	4.79E+14	mm^4
Elastic Bending Deflection, d_eb:	775	mm
Elastic Shear Deflection : d_v	13	mm
Comb. Bending and Shear Defl. at Top of Wall, d-e tot :	789	mm

STORY HEIGHTS & UNFACTORED FORCES

Story	Story	Story	Story	Height	Story	Dist	Story	Moment
No.	Height	EQ	EQ	Above	EQ	From	Moment	Diagram
	m	Force	Shear	Base	OTM	Top		
		kN	kN	m	kN-m	m	kN-m	kN-m
40	4.87	272.0	272.0	194.80	52986	4.87	1324.6	1324.6
39	4.87	272.0	544.0	189.93	51661	9.74	2649.3	3973.9
38	4.87	272.0	816.0	185.06	50336	14.61	3973.9	7947.8
37	4.87	272.0	1088.0	180.19	49012	19.48	5298.6	13246
36	4.87	272.0	1360.0	175.32	47687	24.35	6623.2	19870
35	4.87	272.0	1632.0	170.45	46362	29.22	7947.8	27817
34	4.87	272.0	1904.0	165.58	45038	34.09	9272.5	37090
33	4.87	272.0	2176.0	160.71	43713	38.96	10597	47687
32	4.87	272.0	2448.0	155.84	42388	43.83	11922	59609
31	4.87	272.0	2720.0	150.97	41064	48.70	13246	72855
30	4.87	272.0	2992.0	146.10	39739	53.57	14571	87426
29	4.87	272.0	3264.0	141.23	38415	58.44	15896	103322
28	4.87	272.0	3536.0	136.36	37090	63.31	17220	120542
27	4.87	272.0	3808.0	131.49	35765	68.18	18545	139087
26	4.87	272.0	4080.0	126.62	34441	73.05	19870	158957
25	4.87	272.0	4352.0	121.75	33116	77.92	21194	180151
24	4.87	272.0	4624.0	116.88	31791	82.79	22519	202670
23	4.87	272.0	4896.0	112.01	30467	87.66	23844	226513
22	4.87	272.0	5168.0	107.14	29142	92.53	25168	251682
21	4.87	272.0	5440.0	102.27	27817	97.40	26493	278174
20	4.87	272.0	5712.0	97.40	26493	102.27	27817	305992
19	4.87	272.0	5984.0	92.53	25168	107.14	29142	335134
18	4.87	272.0	6256.0	87.66	23844	112.01	30467	365601
17	4.87	272.0	6528.0	82.79	22519	116.88	31791	397392
16	4.87	272.0	6800.0	77.92	21194	121.75	33116	430508
15	4.87	272.0	7072.0	73.05	19870	126.62	34441	464949
14	4.87	272.0	7344.0	68.18	18545	131.49	35765	500714
13	4.87	272.0	7616.0	63.31	17220	136.36	37090	537804
12	4.87	272.0	7888.0	58.44	15896	141.23	38415	576218
11	4.87	272.0	8160.0	53.57	14571	146.10	39739	615958
10	4.87	272.0	8432.0	48.70	13246	150.97	41064	657021
9	4.87	272.0	8704.0	43.83	11922	155.84	42388	699410
8	4.87	272.0	8976.0	38.96	10597	160.71	43713	743123
7	4.87	272.0	9248.0	34.09	9272	165.58	45038	788161
6	4.87	272.0	9520.0	29.22	7948	170.45	46362	834523
5	4.87	272.0	9792.0	24.35	6623	175.32	47687	882210
4	4.87	272.0	10064.0	19.48	5299	180.19	49012	931222
3	4.87	272.0	10336.0	14.61	3974	185.06	50336	981558
2	4.87	272.0	10608.0	9.74	2649	189.93	51661	1E+06
1	4.87	272.0	10880.0	4.87	1325	194.80	52986	1E+06
Total:	194.80	10880			1086205			

WALL LOADING AND AXIAL LOAD LIMIT - ACI

Wall Geometry SYMMETRIC
Wall Self Weight, P_SW: 72933 kN
Factored Shear, Vu: 10880 kN

COMBINED BENDING WITH MAXIMUM AXIAL LOAD

Wall Axial Load, P'u: 112635 kN < P'u = 1.2D + L + Ev + Eh>
Factored Axial Force 0.21 Ag.fc'
Factored EQ Moment, Mu: 1086205 kN-m
Compressive Strength, Po 461152 kN
Ratio of Pu /Po = 0.244 OK, CAN BE USED AS SHEARWALL

COMBINED BENDING WITH MINIMUM AXIAL LOAD

Wall Axial Load, P'u: 44630 kN < P'u = 0.9D - Ev - Eh>
Factored Axial Force 0.08 Ag.fc'
Factored EQ Moment, Mu: 1086205 kN-m

NOMINAL FLEXURAL CAPACITY M'N @ P'u

Wall Vert Steel, Rhov: 0.00818 ndim
Wall Horiz Steel, Rhoh: 0.00818 ndim
End 1 Steel, As_1: 91887 mm^2
End 2 Steel, As_2: 91887 mm^2
Beta1: 0.80 ndim
Conc Yld Strain, eecy: 0.00300 ndim
Steel Yld Strain, eesy: 0.0021 ndim

UNDER MAXIMUM AXIAL LOAD

Compr Zone Length, c: 6081 mm Iterate c until Sum of Forces = 0
Sum of Forces, ftot: 0 kN OK M'n: 1688713 kN-m
Maximum Steel Strain, Et 0.006 ndim
Strength Red. Factor, Phi 0.90 ndim
Phi M'n: 1519841 kN-m OK > Mu at P'u

UNDER MINIMUM AXIAL LOAD

Compr Zone Length, c: 3414 mm Iterate c until Sum of Forces = 0
Sum of Forces, ftot: 0 kN OK M'n: 1343944 kN-m
Strength Red. Factor, Phi 0.90 ndim
Phi M'n: 1209549 kN-m OK > Mu at P'u

BOUNDARY ELEMENT REQUIREMENT PER ACI SECTION 21.7.6

Total Elastic Displacement at Top of Wall, $d_{e\ tot}$:	789	mm
Approximate Design/Expected Inelastic Displacement, d_u :	5259	mm
Displacement/Height Ratio	0.027	ndim
Maximum Compr Zone Length, C_{max} Per Eq. (21-8)	1130	mm
Minimum Boundary Zone Length, L_{BZ_ACI} :	4251	mm
Maximum Height Above The Base, H_{BZ_ACI}	24959	mm
Maximum Hoop Spacing S_x Per Eq. (21-5)	100	mm
Max. Horizontal Spacing of Hoop/Crossties, h_x	350	mm
Thickness, T_{BZ_ACI}	1200	mm
Hoops Vertical Spacing, S_{v_ACI}	150	mm
Dist. from Face of Concrete to Center of Hoops, D_{c_ACI}	38	mm
Req. Area of Hoops in Longitudinal Dir., A_{sh_x} :	4697	mm ²
Req. Area of Hoops in Transverse Dir., A_{sh_y} :	1265	mm ²

BOUNDARY ELEMENT IS REQUIRED PER ACI

SHEAR DEMAND AND CAPACITY

Wall's Height to Length Ratio	10.6
Coefficient $ALFA_C$	0.166

SHEAR STRENGTH REDUCTION FACTOR FOR SPECIAL CONCRETE WALL PER ACI SEC. 9.3.4

Approximate Shear Demand Corresponding to Maximum M_n , V_f	11530	kN
Nominal Shear Strength, V_n	64695	kN
Ratio of V_p/V_n	0.18	ndim
Shear Strength Reduction Factor, $\Phi_{v_}$	0.75	ndim
Shear Capacity, $\Phi_{v_} V_n$:	48521	kN
Maximum Usable Shear Capacity, $\Phi_{v_} V_n$ max:	53916	kN
Shear Demand/Capacity, $V_u/(\Phi_{v_} V_n)$	0.22	ndim

OK

OK

END OF CALCULATIONS

To report any 'bug' in the spreadsheet, please contact structech@gmail.com.

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