Appendix A: Flat Plate Reinforce Concrete Slab Design

Direct Design Method

Total Static Moments at Factored Loads			
Frame A		Frame B	
w_u	0.2824	w_u	0.2824
l_2	28.333	l_2	28
l_n	28	l_n	28.333
M_o	676.10	M_o	685.38
l_2/l_1	1.01	l_2/l_1	0.988
α	0	α	0
b_{Col}	168	b_{Col}	168
b_{Mid}	168	b_{Mid}	172
d_{eff}	8.3125	d_{eff}	8.9375

Frame A				Frame B			
	M^-_{int}	M^+	M^-_{int}		M^-_{int}	M^+	M^-_{int}
Total Moment	-439.47	236.64	-439.47	Total Moment	-445.50	239.88	-445.50
Column Strip	-329.60	141.98	-329.60	Column Strip	-334.12	143.93	-334.12
Middle Strip	-109.87	94.65	-109.87	Middle Strip	-111.37	95.95	-111.37

Frame A - Reinforcement		Frame B - Reinforcement	
M^- (Column Strip)	#5 @ 5.5" O/C	M^- (Column Strip)	#5 @ 6" O/C
M^+ (Column Strip)	#5 @ 14" O/C	M^+ (Column Strip)	#5 @ 14" O/C
M^- (Middle Strip)	#5 @ 15.25" O/C	M^- (Middle Strip)	#5 @ 15.75" O/C
M^+ (Middle Strip)	#5 @ 15.25" O/C	M^+ (Middle Strip)	#5 @ 15.75" O/C

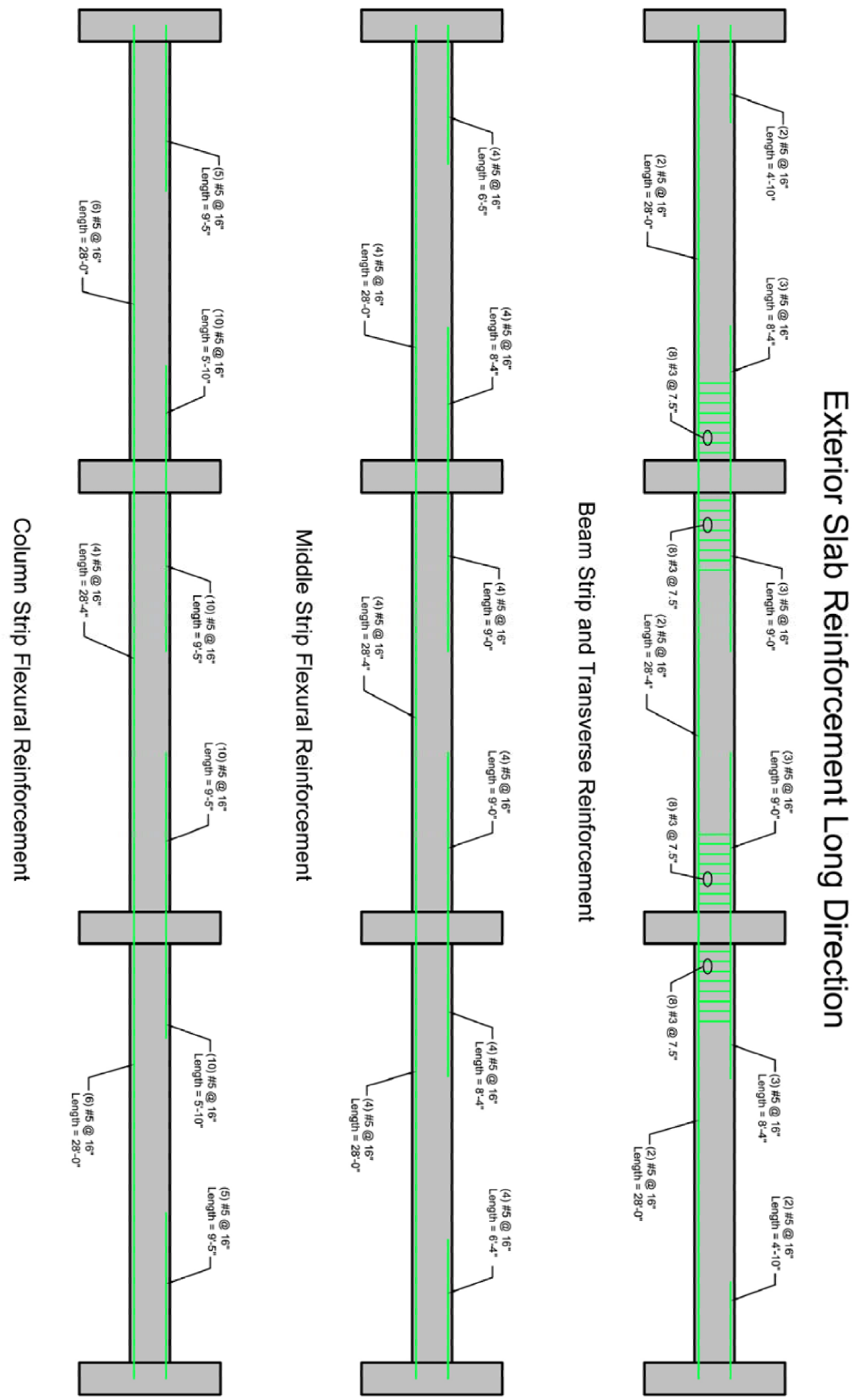
Interior Moments			
Frame A		Frame B	
M^- (0.65M_o)	439.47	M^- (0.65M_o)	445.50
M^+ (0.35M_o)	236.64	M^+ (0.35M_o)	239.88

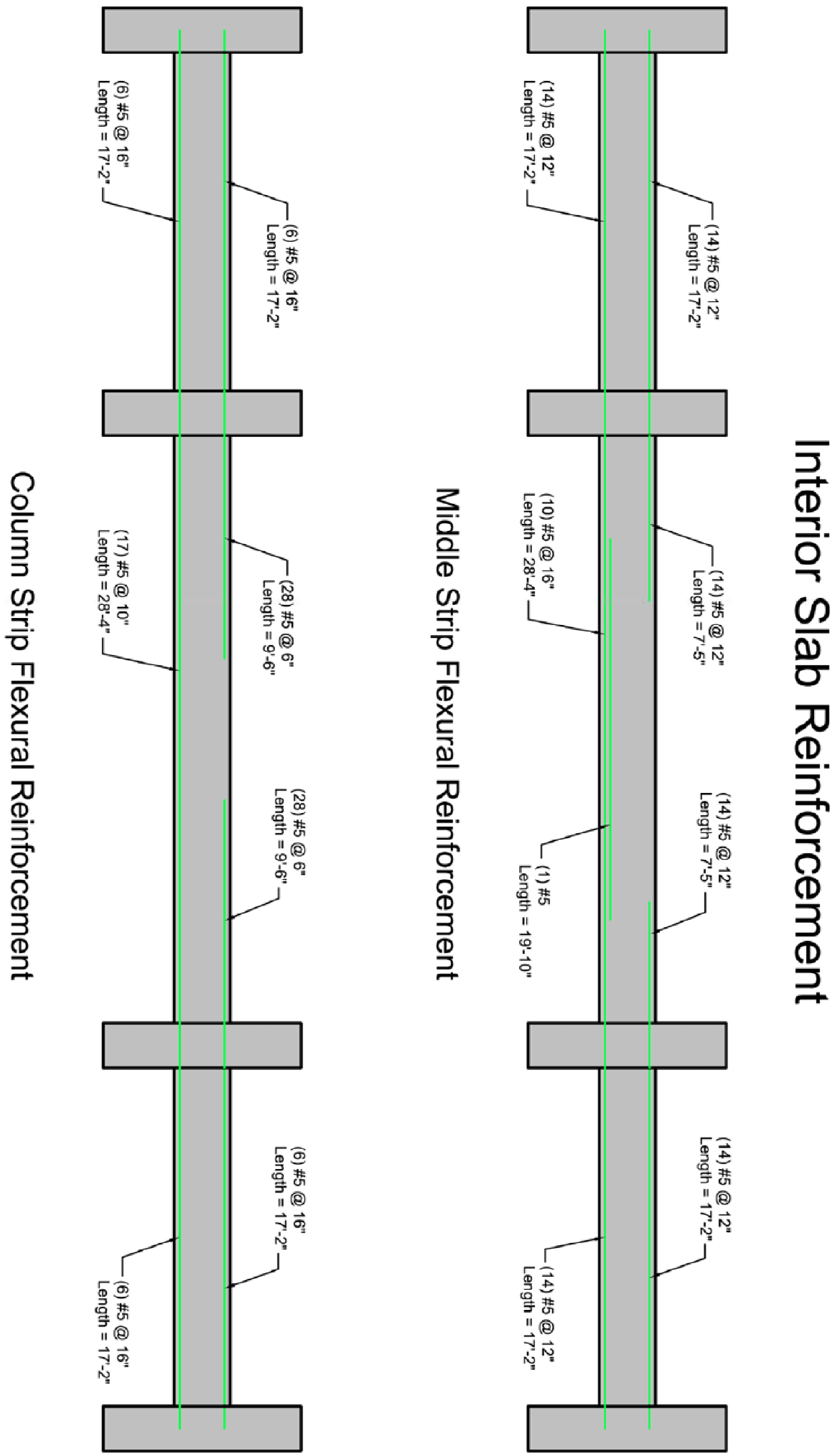
Shear Capacity in Slab			Shear Reinforcement	
V_u	52.41	OK	Bar/Wire Limit - V_c	244.19
ϕV_c	142.44		$V_u \le V_c$	USE BAR/WIRE
Punching Shear Capacity in Slab			V_s	188.68
V_u	222.9050976	NO GOOD	s = d/2	4.5
ϕV_c	128.715832		A_v	1.57
			Use (15) #3 Stirrups @ 4.5"	

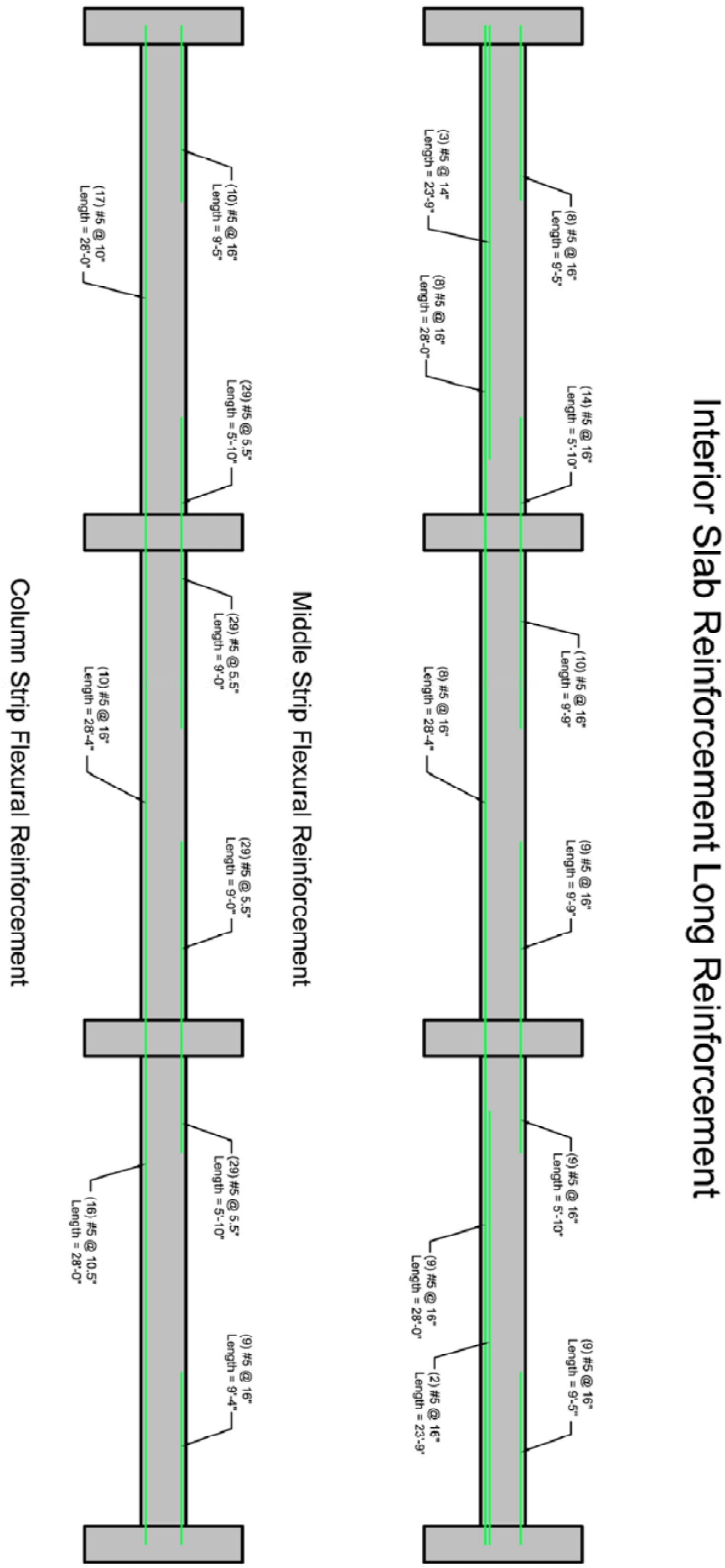
Endspan Moments			
Frame A		Frame B	
M^-_{int}	473.27	M^-_{int}	479.77
M^+	338.05	M^+	342.69
M^-_{ext}	202.83	M^-_{ext}	205.61

Frame A		Column Strip		Middle Strip	
Description		M^-	M^+	M^-	M^+
1	Moment	-329.60	141.98	-109.87	94.65
2	Width of Strip (b)	168	168	168	168
3	Effective d	8.3125	8.3125	8.3125	8.3125
4	Mn = Mu/ϕ	-366.22	157.76	-122.07	105.17
5	Mn*12/b	-26.16	11.27	-8.72	7.51
6	R = Mn/bd^2	-378.58	163.08	-126.19	108.72
7	ρ (Table A.5)	0.0067	0.0026	0.00213	0.0018
8	A_s = ρbd	9.357	3.631	2.975	2.514
9	A_{smin} = .002bt	3.36	3.36	3.36	3.36
10	N = Larger of 8 & 9/0.31	30	12	11	11
11	N_{min} = b/2t	8	8	8	8

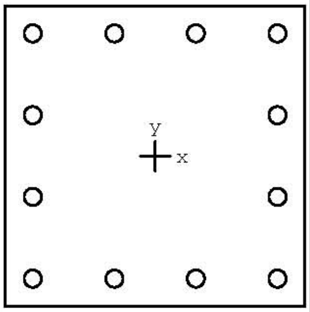
Frame B		Column Strip		Middle Strip	
Description		M^-	M^+	M^-	M^+
1	Moment	-334.12	143.93	-111.37	95.95
2	Width of Strip (b)	168	168	172	172
3	Effective d	8.9375	8.9375	8.9375	8.9375
4	Mn = Mu/ϕ	-371.25	159.92	-123.75	106.62
5	Mn*12/b	-26.52	11.42	-8.63	7.44
6	R = Mn/bd^2	-331.98	143.00	-108.08	93.12
7	ρ (Table A.5)	0.00583	0.00245	0.00188	0.0021
8	A_s = ρbd	8.754	3.679	2.890	3.228
9	A_{smin} = .002bt	3.36	3.36	3.44	3.44
10	N = Larger of 8 & 9/0.31	28	12	11	11
11	N_{min} = b/2t	8	8	9	9


Exterior Slab Reinforcement Long Direction
Beam Strip and Transverse Reinforcement
(2) #5 @ 16" Length = 4'-10"
(2) #5 @ 16" Length = 28'-0"
(3) #5 @ 16" Length = 8'-4"
(8) #3 @ 7.5"
(3) #5 @ 16" Length = 9'-0"
(2) #5 @ 16" Length = 28'-4"
Middle Strip Flexural Reinforcement
(4) #5 @ 16" Length = 6'-5"
(4) #5 @ 16" Length = 28'-0"
(4) #5 @ 16" Length = 8'-4"
(4) #5 @ 16" Length = 9'-0"
(4) #5 @ 16" Length = 28'-4"
(4) #5 @ 16" Length = 6'-4"
Column Strip Flexural Reinforcement
(5) #5 @ 16" Length = 9'-5"
(6) #5 @ 16" Length = 28'-0"
(10) #5 @ 16" Length = 5'-10"
(10) #5 @ 16" Length = 9'-5"
(4) #5 @ 16" Length = 28'-4"


Interior Slab Reinforcement
Middle Strip Flexural Reinforcement
(14) #5 @ 12"
Length = 17'-2"
(14) #5 @ 12"
Length = 17'-2"
(10) #5 @ 16"
Length = 28'-4"
(14) #5 @ 12"
Length = 7'-5"
(1) #5
Length = 19'-10"
(14) #5 @ 12"
Length = 7'-5"
(14) #5 @ 12"
Length = 17'-2"
(14) #5 @ 12"
Length = 17'-2"
Column Strip Flexural Reinforcement
(6) #5 @ 16"
Length = 17'-2"
(6) #5 @ 16"
Length = 17'-2"
(17) #5 @ 10"
Length = 28'-4"
(28) #5 @ 6"
Length = 9'-6"
(28) #5 @ 6"
Length = 9'-6"
(6) #5 @ 16"
Length = 17'-2"
(6) #5 @ 16"
Length = 17'-2"


Interior Slab Reinforcement Long Reinforcement
Middle Strip Flexural Reinforcement
(8) #5 @ 16" Length = 9'-5"
(3) #5 @ 14" Length = 23'-9"
(8) #5 @ 16" Length = 28'-0"
(14) #5 @ 16" Length = 5'-10"
(10) #5 @ 16" Length = 9'-9"
(8) #5 @ 16" Length = 28'-4"
(9) #5 @ 16" Length = 9'-9"
(9) #5 @ 16" Length = 5'-10"
(9) #5 @ 16" Length = 28'-0"
(2) #5 @ 16" Length = 23'-9"
(9) #5 @ 16" Length = 9'-5"
Column Strip Flexural Reinforcement
(10) #5 @ 16" Length = 9'-5"
(17) #5 @ 10" Length = 28'-0"
(29) #5 @ 5.5" Length = 5'-10"
(29) #5 @ 5.5" Length = 9'-0"
(10) #5 @ 16" Length = 28'-4"
(29) #5 @ 5.5" Length = 9'-0"
(29) #5 @ 5.5" Length = 5'-10"
(16) #5 @ 10.5" Length = 28'-0"
(9) #5 @ 16" Length = 9'-4"

Appendix B: Gravity Column Design & Foundations



24 x 24 in

Code: ACI 318-02

Units: English

Run axis: Biaxial

Run option: Design

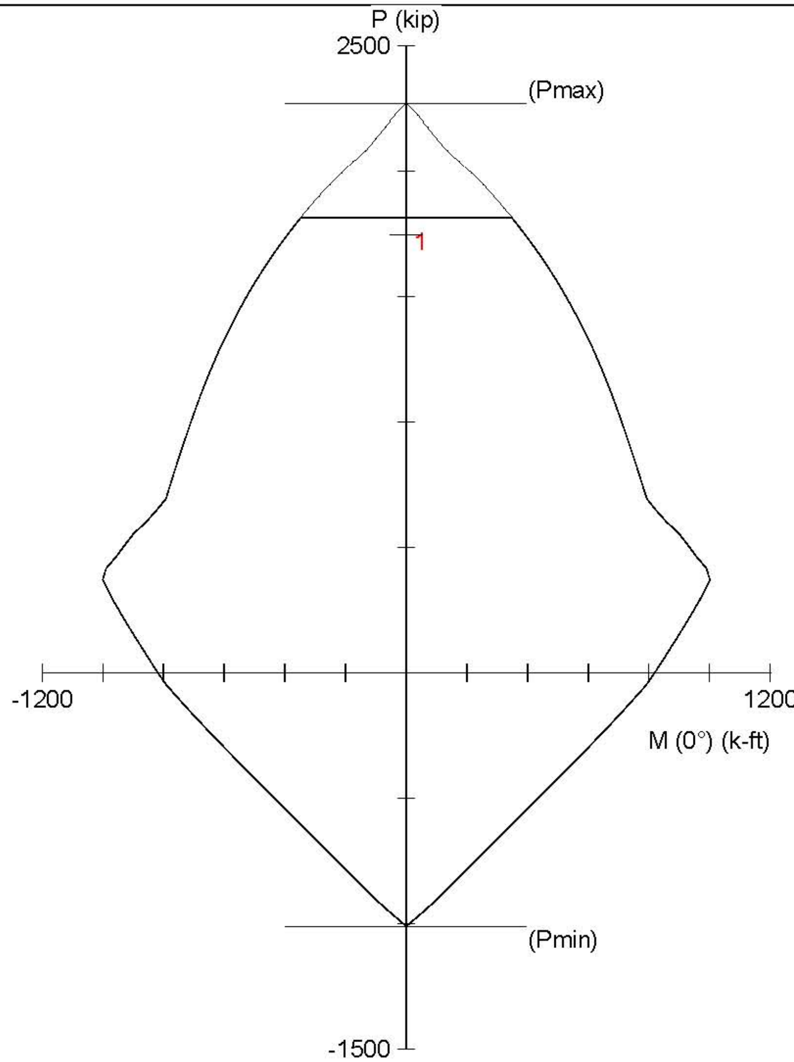
Slenderness: Not considered

Column type: Structural

Bars: ASTM A615

Date: 03/29/09

Time: 18:41:58



pcaColumn v3.64. Licensed to: Penn State University. License ID: 52411-1010265-4-22545-28F4D

File: Y:\~One Last Final Last Time\PCA Column\Interior Column.col

Project: Washington Park Condominiums

Column:		Engineer:	
f'c = 5 ksi	fy = 60 ksi	Ag = 576 in^2	12 #11 bars
Ec = 4031 ksi	Es = 29000 ksi	As = 18.72 in^2	Rho = 3.25%
fc = 4.25 ksi	fc = 4.25 ksi	Xo = 0.00 in	Ix = 27648 in^4
e_u = 0.003 in/in		Yo = 0.00 in	Iy = 27648 in^4
Beta1 = 0.8		Clear spacing = 5.12 in	Clear cover = 1.50 in
Confinement: Tied	phi(a) = 0.8, phi(b) = 0.9, phi(c) = 0.65		

General Footing Design

File: C:\Users\Benjamin\Documents\ENERCALC Data Files\washingtonpark.ec6
ENERCALC, INC. 1983-2008, Ver: 6.0.21
Lic. # : Evaluation Version — License Owner : Evaluation Version
Description : Interior Column Spread Footing

General Information

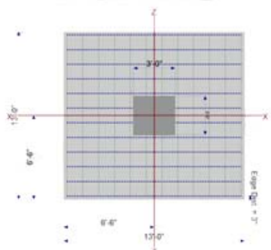
Calculations per IBC 2006, CBC 2007, ACI 318-05

Material Properties		
f'c : Concrete 28 day strength	=	4.0 ksi
Fy : Rebar Yield	=	60.0 ksi
Ec : Concrete Elastic Modulus	=	3,122.0 ksi
Concrete Density	=	145.0 pcf
φ Values Flexure	=	0.90
Shear	=	0.850
Analysis Settings		
Min Steel % Bending Reinf.	=	.00140
Min Allow % Temp Reinf.	=	.00180
Min. Overturning Safety Factor	=	1.50 : 1
Min. Overturning Safety Factor	=	1.50 : 1
AutoCalc Footing Weight as DL	:	Yes
AutoCalc Pedestal Weight as DL	:	No

Soil Design Values		
Allowable Soil Bearing	=	9.0 ksf
Increase Bearing By Footing Weight	=	No
Soil Passive Resistance (for Sliding)	=	250.0 pcf
Soil/Concrete Friction Coeff.	=	0.30
Increases based on footing Depth		
Reference Depth below Surface	=	ft
Allow. Pressure Increase per foot of depth	=	ksf
when base footing is below	=	ft
Increases based on footing Width		
Allow. Pressure Increase per foot of width	=	ksf
when footing is wider than	=	ft

Dimensions

Width along X-X Axis	=	13.0 ft
Length along Z-Z Axi	=	13.0 ft
Footing Thicknes	=	36.0 in
Load location offset from footing center...		
ex : Along X-X Axis	=	0 in
ez : Along Z-Z Axis	=	0 in
Pedestal dimensions...		
px : Along X-X Axis	=	36.0 in
pz : Along Z-Z Axis	=	36.0 in
Height		36.0 in
Rebar Centerline to Edge of Concrete.. at Bottom of footing	=	3.0 in



Reinforcing

Bars along X-X Axis		
Number of Bars	=	12.0
Reinforcing Bar Size	=	# 9
Bars along Z-Z Axis		
Number of Bars	=	12.0
Reinforcing Bar Size	=	# 9

Bandwidth Distribution Check (ACI 15.4.4.2)		
Direction Requiring Closer Separation		n/a
# Bars required within zone	=	n/a
# Bars required on each side of zone	=	n/a

Applied Loads

		D	Lr	L	S	W	E	H	
P : Column Load	=	1,080.0	140.0	282.450	14.4360				k
OB : Overburden	=								ksf
M-xx	=								k-ft
M-zz	=								k-ft
V-x	=								k
V-z	=								k

General Footing Design

File: C:\Users\Benjamin\Documents\ENERCALC Data Files\washingtonpark.ec6
ENERCALC, INC. 1983-2008, Ver: 6.0.21
Lic. # : Evaluation Version — License Owner : Evaluation Version
Description : Corner Column Spread Footing (C55)

General Information

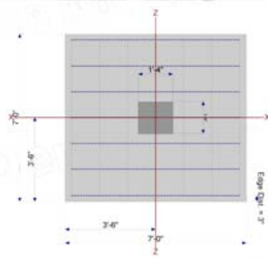
Calculations per IBC 2006, CBC 2007, ACI 318-05

Material Properties		
f'c : Concrete 28 day strength	=	4.0 ksi
Fy : Rebar Yield	=	60.0 ksi
Ec : Concrete Elastic Modulus	=	3,122.0 ksi
Concrete Density	=	145.0 pcf
φ Values Flexure	=	0.90
Shear	=	0.850
Analysis Settings		
Min Steel % Bending Reinf.	=	.00140
Min Allow % Temp Reinf.	=	.00180
Min. Overturning Safety Factor	=	1.50 : 1
Min. Overturning Safety Factor	=	1.50 : 1
AutoCalc Footing Weight as DL	:	Yes
AutoCalc Pedestal Weight as DL	:	No

Soil Design Values		
Allowable Soil Bearing	=	9.0 ksf
Increase Bearing By Footing Weight	=	No
Soil Passive Resistance (for Sliding)	=	250.0 pcf
Soil/Concrete Friction Coeff.	=	0.30
Increases based on footing Depth		
Reference Depth below Surface	=	ft
Allow. Pressure Increase per foot of depth	=	ksf
when base footing is below	=	ft
Increases based on footing Width		
Allow. Pressure Increase per foot of width	=	ksf
when footing is wider than	=	ft

Dimensions

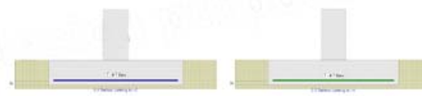
Width along X-X Axis	=	7.0 ft
Length along Z-Z Axi	=	7.0 ft
Footing Thicknes	=	18.0 in
Load location offset from footing center...		
ex : Along X-X Axis	=	0 in
ez : Along Z-Z Axis	=	0 in
Pedestal dimensions...		
px : Along X-X Axis	=	16.0 in
pz : Along Z-Z Axis	=	16.0 in
Height		36.0 in
Rebar Centerline to Edge of Concrete.. at Bottom of footing	=	3.0 in



Reinforcing

Bars along X-X Axis		
Number of Bars	=	7.0
Reinforcing Bar Size	=	# 7
Bars along Z-Z Axis		
Number of Bars	=	7.0
Reinforcing Bar Size	=	# 7

Bandwidth Distribution Check (ACI 15.4.4.2)		
Direction Requiring Closer Separation		n/a
# Bars required within zone	=	n/a
# Bars required on each side of zone	=	n/a



Applied Loads

		D	Lr	L	S	W	E	H	
P : Column Load	=	245.0	35.0	53.50	2.740	42.520	9.320		k
OB : Overburden	=								ksf
M-xx	=					37.060	11.70		k-ft
M-zz	=					5.350	7.670		k-ft
V-x	=					0.580	0.50		k
V-z	=					4.440	0.870		k

General Footing Design

File: C:\Users\Benjamin\Documents\ENERCALC Data Files\washingtonpark.ec6
ENERCALC, INC. 1983-2008, Ver: 6.0.21
Lic. # : Evaluation Version — License Owner : Evaluation Version
Description : Exterior Column Spread Footing (C65)

General Information

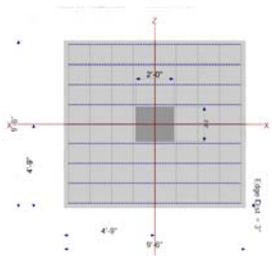
Calculations per IBC 2006, CBC 2007, ACI 318-05

Material Properties		
f'c : Concrete 28 day strength	=	4.0 ksi
Fy : Rebar Yield	=	60.0 ksi
Ec : Concrete Elastic Modulus	=	3,122.0 ksi
Concrete Density	=	145.0 pcf
φ Values Flexure	=	0.90
Shear	=	0.850
Analysis Settings		
Min Steel % Bending Reinf.	=	.00140
Min Allow % Temp Reinf.	=	.00180
Min. Overturning Safety Factor	=	1.50 : 1
Min. Overturning Safety Factor	=	1.50 : 1
AutoCalc Footing Weight as DL	:	Yes
AutoCalc Pedestal Weight as DL	:	No

Soil Design Values		
Allowable Soil Bearing	=	9.0 ksf
Increase Bearing By Footing Weight	=	No
Soil Passive Resistance (for Sliding)	=	250.0 pcf
Soil/Concrete Friction Coeff.	=	0.30
Increases based on footing Depth		
Reference Depth below Surface	=	ft
Allow. Pressure Increase per foot of depth	=	ksf
when base footing is below	=	ft
Increases based on footing Width		
Allow. Pressure Increase per foot of width	=	ksf
when footing is wider than	=	ft

Dimensions

Width along X-X Axis	=	9.50 ft
Length along Z-Z Axi	=	9.50 ft
Footing Thicknes	=	28.0 in
Load location offset from footing center...		
ex : Along X-X Axis	=	0 in
ez : Along Z-Z Axis	=	0 in
Pedestal dimensions...		
px : Along X-X Axis	=	24.0 in
pz : Along Z-Z Axis	=	24.0 in
Height		36.0 in
Rebar Centerline to Edge of Concrete.. at Bottom of footing	=	3.0 in



Reinforcing

Bars along X-X Axis		
Number of Bars	=	9.0
Reinforcing Bar Size	=	# 8
Bars along Z-Z Axis		
Number of Bars	=	9.0
Reinforcing Bar Size	=	# 8

Bandwidth Distribution Check (ACI 15.4.4.2)		
Direction Requiring Closer Separation		n/a
# Bars required within zone	=	n/a
# Bars required on each side of zone	=	n/a

Applied Loads

		D	Lr	L	S	W	E	H	
P : Column Load	=	570.0	75.0	142.0	7.40	20.20	20.280		k
OB : Overburden	=								ksf
M-xx	=								k-ft
M-zz	=								k-ft
V-x	=								k
V-z	=								k

General Footing Design

File: C:\Users\Benjamin\Documents\ENERCALC Data Files\washingtonpark.ec6
ENERCALC, INC. 1983-2008, Ver: 6.0.21
Lic. # : Evaluation Version — License Owner : Evaluation Version
Description : Exterior Column Spread Footing (C80)

General Information

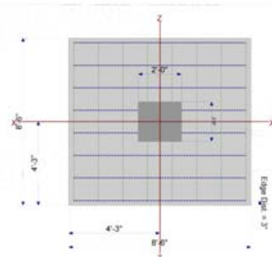
Calculations per IBC 2006, CBC 2007, ACI 318-05

Material Properties		
f'c : Concrete 28 day strength	=	4.0 ksi
Fy : Rebar Yield	=	60.0 ksi
Ec : Concrete Elastic Modulus	=	3,122.0 ksi
Concrete Density	=	145.0 pcf
φ Values Flexure	=	0.90
Shear	=	0.850
Analysis Settings		
Min Steel % Bending Reinf.	=	.00140
Min Allow % Temp Reinf.	=	.00180
Min. Overturning Safety Factor	=	1.50 : 1
Min. Overturning Safety Factor	=	1.50 : 1
AutoCalc Footing Weight as DL	:	Yes
AutoCalc Pedestal Weight as DL	:	No

Soil Design Values		
Allowable Soil Bearing	=	9.0 ksf
Increase Bearing By Footing Weight	=	No
Soil Passive Resistance (for Sliding)	=	250.0 pcf
Soil/Concrete Friction Coeff.	=	0.30
Increases based on footing Depth		
Reference Depth below Surface	=	ft
Allow. Pressure Increase per foot of depth	=	ksf
when base footing is below	=	ft
Increases based on footing Width		
Allow. Pressure Increase per foot of width	=	ksf
when footing is wider than	=	ft

Dimensions

Width along X-X Axis	=	8.50 ft
Length along Z-Z Axi	=	8.50 ft
Footing Thicknes	=	24.0 in
Load location offset from footing center...		
ex : Along X-X Axis	=	0 in
ez : Along Z-Z Axis	=	0 in
Pedestal dimensions...		
px : Along X-X Axis	=	24.0 in
pz : Along Z-Z Axis	=	24.0 in
Height		12.0 in
Rebar Centerline to Edge of Concrete.. at Bottom of footing	=	3.0 in



Reinforcing

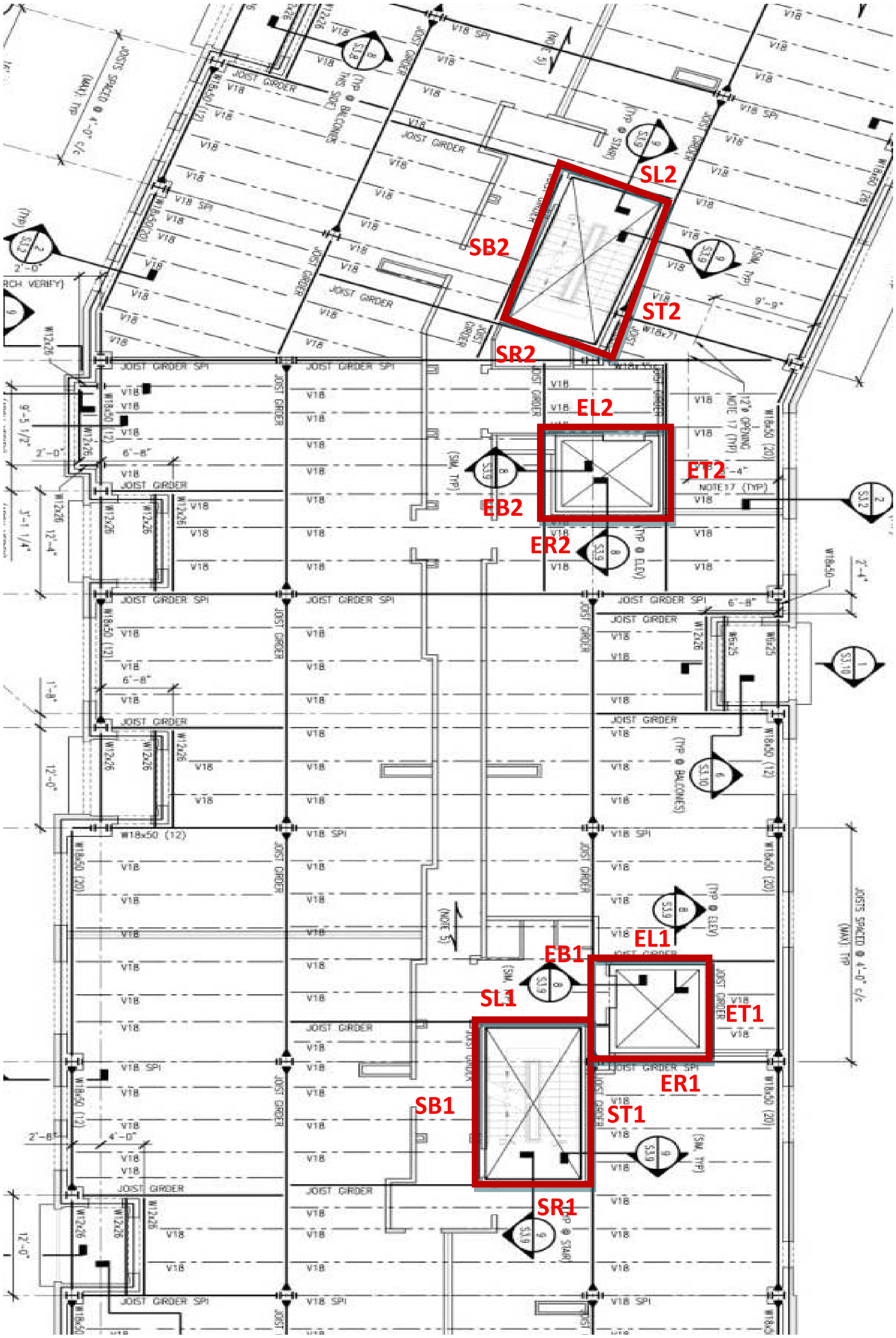
Bars along X-X Axis		
Number of Bars	=	8.0
Reinforcing Bar Size	=	# 8
Bars along Z-Z Axis		
Number of Bars	=	8.0
Reinforcing Bar Size	=	# 8

Bandwidth Distribution Check (ACI 15.4.4.2)		
Direction Requiring Closer Separation		n/a
# Bars required within zone	=	n/a
# Bars required on each side of zone	=	n/a

Applied Loads

		D	Lr	L	S	W	E	H	
P : Column Load	=	440.0	60.0	110.0	5.50	12.020	14.60		k
OB : Overburden	=								ksf
M-xx	=								k-ft
M-zz	=								k-ft
V-x	=								k
V-z	=								k

Appendix C: Reinforced Concrete Shear Wall Design


SL2
SB2
ST2
SR2
EL2
ET2
EB2
ER2
EL1
EB1
SL1
ET1
ER1
SB1
ST1
SR1

Seismic

	Load Case	Axial (P)	Shear (V2)	Shear (V3)	Torsion (T)	Torsion (T)	Moment (M2)	Moment (M3)	Moment (M3)
SR1 (Max P)	SEISMICXY	-339.55	-2.08	1.6	-154.116	-12.843	-51.14	2364.212	197.018
SR1 (Max V2)	SEISMICYX	18.04	45.34	-0.65	-225.241	-18.770	-17.943	9443.836	786.986
SR1 (Max M3)	SEISMICYX	18.04	45.34	-0.65	-225.241	-18.770	-17.943	9443.836	786.986
SL1 (Max P)	SEISMICXYY	371.44	32.28	0.21	37.681	3.140	-42.439	2844.864	237.072
SL1 (Max V2)	SEISMICYX	59.19	75.07	0.19	264.901	22.075	-4.456	9084.273	757.023
SL1(Max M3)	SEISMICYX	59.19	75.07	0.19	264.901	22.075	-4.456	9084.273	757.023
SB1 (Max P)	SEISMICYX	576.64	-25.37	-4.54	134.114	11.176	48.999	1690.543	140.879
SB1 (Max V2)	SEISMICXYY	144.02	49.2	-0.72	1339.123	111.594	203.426	16214.961	1351.247
SB1(Max M3)	SEISMICXYY	159.99	44.42	-0.27	-337.621	-28.135	20.712	20808.273	1734.023
ST1 (Max P)	SEISMICYX	-653.87	28.59	-9.03	-72.904	-6.075	50.491	3268.891	272.408
ST1 (Max V2)	SEISMICXY	-67.7	117.69	0.48	-965.801	-80.483	48.758	14420.651	1201.721
ST1(Max M3)	SEISMICXYY	-216.9	98.71	-3.58	456.107	38.009	18.692	30459.802	2538.317

	Load Case	Axial (P)	Shear (V2)	Shear (V3)	Torsion (T)	Torsion (T)	Moment (M2)	Moment (M3)	Moment (M3)
ER1 (Max P)	SEISMICXY	-215.4	7.17	2.69	-96.846	-8.071	-28.592	1818.786	151.566
ER1 (Max V2)	SEISMICYX	2.05	63.14	0.19	-259.607	-21.634	-5.197	8976.801	748.067
ER1 (Max M3)	SEISMICYX	2.05	63.14	0.19	-259.607	-21.634	-5.197	8976.801	748.067
EL1 (Max P)	SEISMICXY	234.04	19.85	2.72	-13.398	-1.117	-46.475	1337.336	111.445
EL1 (Max V2)	SEISMICYX	74.46	40.25	1.89	193.955	16.163	10.347	8893.151	741.096
EL1(Max M3)	SEISMICYX	74.46	40.25	1.89	193.955	16.163	10.347	8893.151	741.096
EB1 (Max P)	SEISMICY	281.68	12.86	-2.61	-112.166	-9.347	36.039	1237.315	103.110
EB1 (Max V2)	SEISMICXYY	100.31	21.14	-1.28	-148.705	-12.392	13.041	3519.549	293.296
EB1(Max M3)	SEISMICXY	49.05	17.18	-1.05	-168.69	-14.058	6.809	3796.498	316.375
ET1 (Max P)	SEISMICYX	-414.81	-3.86	-6.99	102.986	8.582	40.663	971.678	80.973
ET1 (Max V2)	SEISMICXY	-67.69	44.62	-0.99	188.964	15.747	9.423	7727.589	643.966
ET1(Max M3)	SEISMICXY	-67.69	44.62	-0.99	188.964	15.747	9.423	7727.589	643.966

	Load Case	Axial (P)	Shear (V2)	Shear (V3)	Torsion (T)	Torsion (T)	Moment (M2)	Moment (M3)	Moment (M3)
ER2 (Max P)	SEISMICYXX	-201.78	-3.89	2.95	40.727	3.394	-26.736	-771.408	-64.284
ER2 (Max V2)	SEISMICY	-34.06	68.26	0.59	-227.941	-18.995	-3.207	8783.707	731.976
ER2 (Max M3)	SEISMICY	-34.06	68.26	0.59	-227.941	-18.995	-3.207	8783.707	731.976
EL2 (Max P)	SEISMICXYY	176.51	-13.03	1.39	-20.225	-1.685	-25.443	-379.311	-31.609
EL2 (Max V2)	SEISMICY	35.92	18.43	-0.46	237.647	19.804	-4.973	4692.472	391.039
EL2(Max M3)	SEISMICY	35.92	18.43	-0.46	237.647	19.804	-4.973	4692.472	391.039
EB2 (Max P)	SEISMICY	352.3	17.83	-6.12	81.942	6.829	46.645	442.158	36.847
EB2 (Max V2)	SEISMICXYY	-11	37.87	0.61	-143.531	-11.961	-7.401	5179.077	431.590
EB2(Max M3)	SEISMICXYY	-11	37.87	0.61	-143.531	-11.961	-7.401	5179.077	431.590
ET2 (Max P)	SEISMICY	-354.17	-17.32	-6.03	85.993	7.166	64.236	975.804	81.317
ET2 (Max V2)	SEISMICYX	-217.12	-22.56	1.77	119.972	9.998	234.993	13.388	1.116
ET2(Max M3)	SEISMICXY	12.59	22.35	0.81	114.25	9.521	3.023	4869.599	405.800

	Load Case	Axial (P)	Shear (V2)	Shear (V3)	Torsion (T)	Torsion (T)	Moment (M2)	Moment (M3)	Moment (M3)
SR2 (Max P)	SEISMICYXX	-381.85	-11.67	0.08	-59.82	-4.985	-45.568	48.112	4.009
SR2 (Max V2)	SEISMICY	190.75	82.3	-0.1	-229.747	-19.146	20.446	8985.545	748.795
SR2 (Max M3)	SEISMICY	190.75	82.3	-0.1	-229.747	-19.146	20.446	8985.545	748.795
SL2 (Max P)	SEISMICXYY	342.88	1.58	2.38	-107.826	-8.986	-53.481	-1333.371	-111.114
SL2 (Max V2)	SEISMICY	-111.99	43.53	0.01	263.148	21.929	35.504	9521.877	793.490
SL2(Max M3)	SEISMICY	-111.99	43.53	0.01	263.148	21.929	35.504	9521.877	793.490
SB2 (Max P)	SEISMICY	566.88	7.15	-3.92	30.375	2.531	50.525	-9455.641	-787.970
SB2 (Max V2)	SEISMICXYY	21.77	62.71	0.36	1370.778	114.232	-25.687	16639.196	1386.600
SB2(Max M3)	SEISMICXYY	34.44	60.66	-1.35	-409.844	-34.154	-6.166	22283.546	1856.962
ST2 (Max P)	SEISMICY	-645.64	-70.67	-8.81	-103.792	-8.649	51.625	-14426.134	-1202.178
ST2 (Max V2)	SEISMICXYY	-17.67	109.19	-0.01	-1079.338	-89.945	20.401	18927.567	1577.297
ST2(Max M3)	SEISMICXYY	4.54	105.65	0.71	505.164	42.097	-3.403	32186.766	2682.231

Wind

	Load Case	Axial (P)	Shear (V2)	Shear (V3)	Torsion (T)	Torsion (T)	Moment (M2)	Moment (M3)	Moment (M3)
SR1 (Max P)	DCON22	225.39	98.16	-0.25	-120.687	-10.057	-4.19	14890.736	1240.895
SR1 (Max V2)	DCON11	123.94	116.03	-0.77	-235.382	-19.615	-28.314	19310.616	1609.218
SR1 (Max M3)	DCON11	123.94	116.03	-0.77	-235.382	-19.615	-28.314	19310.616	1609.218
SL1 (Max P)	DCON17	238.17	93.89	-1.42	156.283	13.024	-27.058	10702.278	891.857
SL1 (Max V2)	DCON11	83.88	134.71	0.11	320.575	26.715	-6.576	16379.607	1364.967
SL1(Max M3)	DCON11	83.88	134.71	0.11	320.575	26.715	-6.576	16379.607	1364.967
SB1 (Max P)	DCON11	908.89	-25.28	1.02	178.942	14.912	97.327	2308.359	192.363
SB1 (Max V2)	DCON13	177.82	-81.56	0.5	-613.175	-51.098	91.345	1831.518	152.627
SB1(Max M3)	DCON3	30.64	36.1	0.52	-215.701	-17.975	5.684	13626.37	1135.531
ST1 (Max P)	DCON12	1116.71	-22.78	3.39	105.204	8.767	-102.905	-4359.221	-363.268
ST1 (Max V2)	DCON18	372.38	-126.92	-3.7	713.341	59.445	-121.967	-7251.846	-604.321
ST1(Max M3)	DCON3	-53.99	74.88	-0.4	213.458	17.788	3.824	19179.699	1598.308

	Load Case	Axial (P)	Shear (V2)	Shear (V3)	Torsion (T)	Torsion (T)	Moment (M2)	Moment (M3)	Moment (M3)
ER1 (Max P)	DCON26	196.09	12	0.86	198.889	16.574	29.825	-2924.067	-243.672
ER1 (Max V2)	DCON11	47.51	134.92	-0.23	-252.975	-21.081	-3.728	16499.134	1374.928
ER1 (Max M3)	DCON11	47.51	134.92	-0.23	-252.975	-21.081	-3.728	16499.134	1374.928
EL1 (Max P)	DCON17	269.7	69.45	1.38	72.966	6.081	-19.986	11521.463	960.122
EL1 (Max V2)	DCON5	206.5	80.06	1.79	154.854	12.905	6.638	14899.96	1241.663
EL1(Max M3)	DCON11	81.4	79.89	2.98	289.333	24.111	28.705	16311.792	1359.316
EB1 (Max P)	DCON11	604.5	33.19	1.71	3.901	0.325	82.061	948.66	79.055
EB1 (Max V2)	DCON59	428.83	38.4	0.78	247.125	20.594	169.56	397.374	33.115
EB1(Max M3)	DCON25	81.4	6.77	-0.62	-215.461	-17.955	9.46	4156.354	346.363
ET1 (Max P)	DCON12	733.41	25.47	2.08	-207.526	-17.294	-78.558	-138.927	-11.577
ET1 (Max V2)	DCON74	151.6	-66.61	1.3	-60.198	-5.017	-10.413	-7166.857	-597.238
ET1(Max M3)	DCON74	151.6	-66.61	1.3	-60.198	-5.017	-10.413	-7166.857	-597.238

	Load Case	Axial (P)	Shear (V2)	Shear (V3)	Torsion (T)	Torsion (T)	Moment (M2)	Moment (M3)	Moment (M3)
ER2 (Max P)	DCON18	147.18	-108.12	-0.46	215.701	17.975	18.675	-13588.956	-1132.413
ER2 (Max V2)	DCON5	-58.35	141.24	0.59	-298.35	-24.863	-4.49	17910.506	1492.542
ER2 (Max M3)	DCON5	-58.35	141.24	0.59	-298.35	-24.863	-4.49	17910.506	1492.542
EL2 (Max P)	DCON17	118.66	10.55	-2.15	593.977	49.498	-69.353	4478.591	373.216
EL2 (Max V2)	DCON13	-9.33	53.46	-0.92	286.033	23.836	-7.837	7945.794	662.150
EL2(Max M3)	DCON5	30.19	42.85	-1.1	355.635	29.636	-9.778	8756.796	729.733
EB2 (Max P)	DCON5	692.49	27.98	-2.08	190.049	15.837	98.334	355.225	29.602
EB2 (Max V2)	DCON17	292.51	49	1.87	336.019	28.002	114.352	1038.699	86.558
EB2(Max M3)	DCON3	17.41	27.35	-0.22	-55.3	-4.608	-0.608	3508.527	292.377
ET2 (Max P)	DCON6	664.33	30.36	3.27	-267.122	-22.260	-125.391	-2849.345	-237.445
ET2 (Max V2)	DCON5	-509.11	-40.47	0.91	173.139	14.428	363.865	-38.908	-3.242
ET2(Max M3)	DCON17	-492.62	-8.15	-2.16	241.834	20.153	97.103	4844.513	403.709

	Load Case	Axial (P)	Shear (V2)	Shear (V3)	Torsion (T)	Torsion (T)	Moment (M2)	Moment (M3)	Moment (M3)
SR2 (Max P)	DCON20	470.46	146.44	2.83	-238.606	-19.884	62.256	15768.584	1314.049
SR2 (Max V2)	DCON13	440.82	190.09	2.46	-338.927	-28.244	57.654	20921.703	1743.475
SR2 (Max M3)	DCON13	440.82	190.09	2.46	-338.927	-28.244	57.654	20921.703	1743.475
SL2 (Max P)	DCON15	269.95	-72.41	-1.47	-351.921	-29.327	-73.499	-15275.676	-1272.973
SL2 (Max V2)	DCON61	-109.89	159.6	0.82	411.263	34.272	85.731	26739.088	2228.257
SL2(Max M3)	DCON61	-109.89	159.6	0.82	411.263	34.272	85.731	26739.088	2228.257
SB2 (Max P)	DCON13	1078.89	-44.82	2.71	5.955	0.496	135.276	-23324.788	-1943.732
SB2 (Max V2)	DCON20	633.11	-72.23	5.38	-1170.244	-97.520	327.926	-18686.789	-1557.232
SB2(Max M3)	DCON68	793.77	-61.35	2.44	112.489	9.374	104.515	-25840.677	-2153.390
ST2 (Max P)	DCON14	1409.83	147.11	4.28	180.263	15.022	-140.453	34039.847	2836.654
ST2 (Max V2)	DCON15	515.75	171.31	-5.5	-976.881	-81.407	-177.286	17604.327	1467.027
ST2(Max M3)	DCON19	1064.65	153.98	3.4	273.862	22.822	-107.185	37310.669	3109.222

SR1					
Design Conditions		Horizontal Shear Reinforcement		Vertical Shear Reinforcement	
f'_c	4000	ρ_t	0.0025	ρ_t	0.0025
f_y	60000	spacing	18	spacing	18
t	18	V_u	116.03	V_u	116.03
h	96.33	V_c	218.58	V_c	218.58
l_u	10	V_s	-63.87	V_s	-63.87
V_u	116.03	$1/2\phi V_c$	81.97	$1/2\phi V_c$	81.97
d	96	A_v	0.180	A_v	0.180
		Use (2) #5 @ 18"		Use (2) #5 @ 18"	

SR2					
Design Conditions		Horizontal Shear Reinforcement		Vertical Shear Reinforcement	
f'_c	4000	ρ_t	0.0025	ρ_t	0.0025
f_y	60000	spacing	18	spacing	18
t	18	V_u	190.09	V_u	190.09
h	96.33	V_c	218.58	V_c	218.58
l_u	10	V_s	34.88	V_s	34.88
V_u	190.09	$1/2\phi V_c$	81.97	$1/2\phi V_c$	81.97
d	96	A_v	0.180	A_v	0.180
		Use (2) #5 @ 18"		Use (2) #5 @ 18"	

SL1					
Design Conditions		Horizontal Shear Reinforcement		Vertical Shear Reinforcement	
f'_c	4000	ρ_t	0.0025	ρ_t	0.0025
f_y	60000	spacing	18	spacing	18
t	18	V_u	134.71	V_u	134.71
h	96.33	V_c	218.58	V_c	218.58
l_u	10	V_s	-38.96	V_s	-38.96
V_u	134.71	$1/2\phi V_c$	81.97	$1/2\phi V_c$	81.97
d	96	A_v	0.180	A_v	0.180
		Use (2) #5 @ 18"		Use (2) #5 @ 18"	

SL2					
Design Conditions		Horizontal Shear Reinforcement		Vertical Shear Reinforcement	
f'_c	4000	ρ_t	0.0025	ρ_t	0.0025
f_y	60000	spacing	18	spacing	18
t	18	V_u	159.6	V_u	159.6
h	96.33	V_c	218.58	V_c	218.58
l_u	10	V_s	-5.78	V_s	-5.78
V_u	159.6	$1/2\phi V_c$	81.97	$1/2\phi V_c$	81.97
d	96	A_v	0.180	A_v	0.180
		Use (2) #5 @ 18"		Use (2) #5 @ 18"	

SB1					
Design Conditions		Horizontal Shear Reinforcement		Vertical Shear Reinforcement	
f'_c	4000	ρ_t	0.0025	ρ_t	0.0025
f_y	60000	spacing	18	spacing	18
t	18	V_u	81.56	V_u	81.56
h	96.33	V_c	427.14	V_c	427.14
l_u	19.542	V_s	-318.40	V_s	-318.40
V_u	81.56	$1/2\phi V_c$	160.18	$1/2\phi V_c$	160.18
d	187.6032	A_v	0.180	A_v	0.180
		Use (2) #5 @ 18"		Use (2) #5 @ 18"	

SB2					
Design Conditions		Horizontal Shear Reinforcement		Vertical Shear Reinforcement	
f'_c	4000	ρ_t	0.0025	ρ_t	0.0025
f_y	60000	spacing	18	spacing	18
t	18	V_u	72.23	V_u	72.23
h	96.33	V_c	427.14	V_c	427.14
l_u	19.542	V_s	-330.84	V_s	-330.84
V_u	72.23	$1/2\phi V_c$	160.18	$1/2\phi V_c$	160.18
d	187.6032	A_v	0.180	A_v	0.180
		Use (2) #5 @ 18"		Use (2) #5 @ 18"	

ST1					
Design Conditions		Horizontal Shear Reinforcement		Vertical Shear Reinforcement	
f'_c	4000	ρ_t	0.0025	ρ_t	0.0025
f_y	60000	spacing	18	spacing	18
t	18	V_u	126.92	V_u	126.92
h	96.33	V_c	427.14	V_c	427.14
l_u	19.542	V_s	-257.92	V_s	-257.92
V_u	126.92	$1/2\phi V_c$	160.18	$1/2\phi V_c$	160.18
d	187.6032	A_v	0.180	A_v	0.180
		Use (2) #5 @ 18"		Use (2) #5 @ 18"	

ST2					
Design Conditions		Horizontal Shear Reinforcement		Vertical Shear Reinforcement	
f'_c	4000	ρ_t	0.0025	ρ_t	0.0025
f_y	60000	spacing	18	spacing	18
t	18	V_u	171.31	V_u	171.31
h	96.33	V_c	427.14	V_c	427.14
l_u	19.542	V_s	-198.73	V_s	-198.73
V_u	171.31	$1/2\phi V_c$	160.18	$1/2\phi V_c$	160.18
d	187.6032	A_v	0.180	A_v	0.180
		Use (2) #5 @ 18"		Use (2) #5 @ 18"	

ER1					
Design Conditions		Horizontal Shear Reinforcement		Vertical Shear Reinforcement	
f'_c	4000	ρ_t	0.0025	ρ_t	0.0025
f_y	60000	spacing	18	spacing	18
t	18	V_u	134.92	V_u	134.92
h	96.33	V_c	218.58	V_c	218.58
l_u	10	V_s	-38.68	V_s	-38.68
V_u	134.92	$1/2\phi V_c$	81.97	$1/2\phi V_c$	81.97
d	96	A_v	0.180	A_v	0.180
		Use (2) #5 @ 18"		Use (2) #5 @ 18"	

ER2					
Design Conditions		Horizontal Shear Reinforcement		Vertical Shear Reinforcement	
f'_c	4000	ρ_t	0.0025	ρ_t	0.0025
f_y	60000	spacing	18	spacing	18
t	18	V_u	141.42	V_u	141.42
h	96.33	V_c	218.58	V_c	218.58
l_u	10	V_s	-30.02	V_s	-30.02
V_u	141.42	$1/2\phi V_c$	81.97	$1/2\phi V_c$	81.97
d	96	A_v	0.180	A_v	0.180
		Use (2) #5 @ 18"		Use (2) #5 @ 18"	

EL1					
Design Conditions		Horizontal Shear Reinforcement		Vertical Shear Reinforcement	
f'_c	4000	ρ_t	0.0025	ρ_t	0.0025
f_y	60000	spacing	18	spacing	18
t	18	V_u	80.06	V_u	80.06
h	96.33	V_c	218.58	V_c	218.58
l_u	10	V_s	-111.83	V_s	-111.83
V_u	80.06	$1/2\phi V_c$	81.97	$1/2\phi V_c$	81.97
d	96	A_v	0.180	A_v	0.180
		Use (2) #5 @ 18"		Use (2) #5 @ 18"	

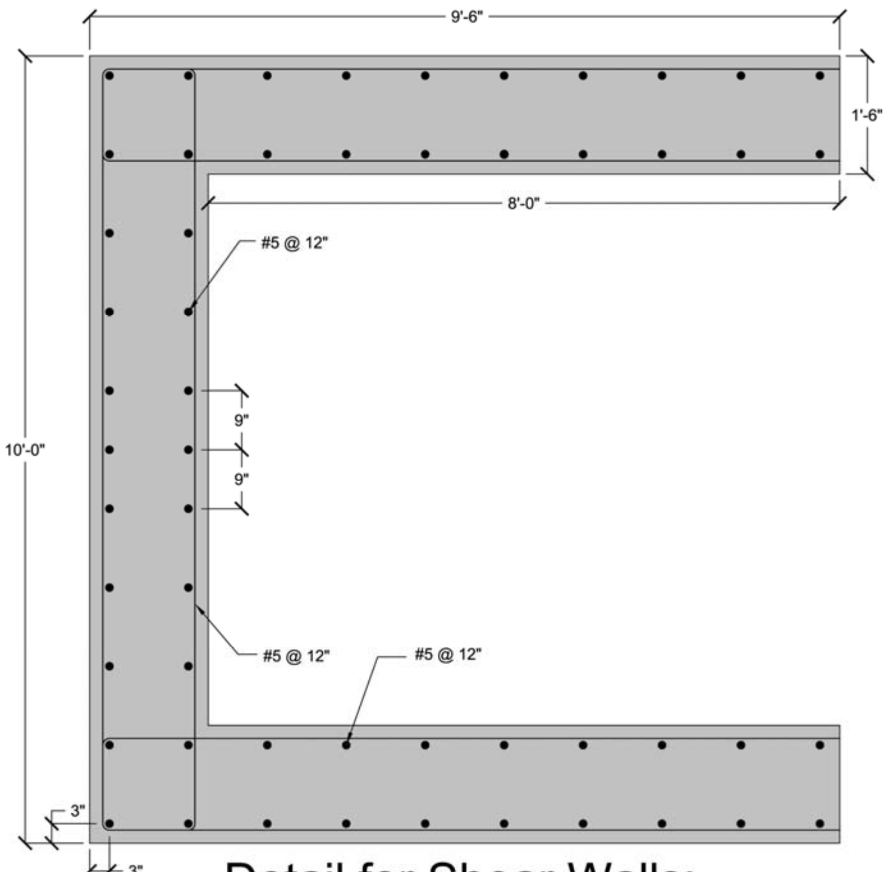
EL2					
Design Conditions		Horizontal Shear Reinforcement		Vertical Shear Reinforcement	
f'_c	4000	ρ_t	0.0025	ρ_t	0.0025
f_y	60000	spacing	18	spacing	18
t	18	V_u	53.46	V_u	53.46
h	96.33	V_c	218.58	V_c	218.58
l_u	10	V_s	-147.30	V_s	-147.30
V_u	53.46	$1/2\phi V_c$	81.97	$1/2\phi V_c$	81.97
d	96	A_v	0.180	A_v	0.180
		Use (2) #5 @ 18"		Use (2) #5 @ 18"	

EB1					
Design Conditions		Horizontal Shear Reinforcement		Vertical Shear Reinforcement	
f'_c	4000	ρ_t	0.0025	ρ_t	0.0025
f_y	60000	spacing	18	spacing	18
t	18	V_u	38.4	V_u	38.4
h	96.33	V_c	262.29	V_c	262.29
l_u	12	V_s	-211.09	V_s	-211.09
V_u	38.4	$1/2\phi V_c$	98.36	$1/2\phi V_c$	98.36
d	115.2	A_v	0.180	A_v	0.180
		Use (2) #5 @ 18"		Use (2) #5 @ 18"	

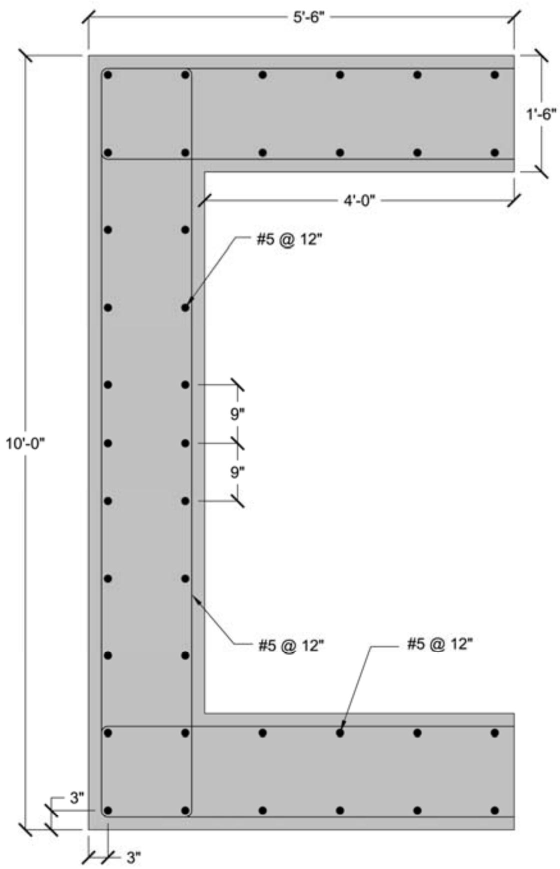
EB2					
Design Conditions		Horizontal Shear Reinforcement		Vertical Shear Reinforcement	
f'_c	4000	ρ_t	0.0025	ρ_t	0.0025
f_y	60000	spacing	18	spacing	18
t	18	V_u	49	V_u	49
h	96.33	V_c	218.58	V_c	218.58
l_u	10	V_s	-153.24	V_s	-153.24
V_u	49	$1/2\phi V_c$	81.97	$1/2\phi V_c$	81.97
d	96	A_v	0.180	A_v	0.180
		Use (2) #5 @ 18"		Use (2) #5 @ 18"	

ET1					
Design Conditions		Horizontal Shear Reinforcement		Vertical Shear Reinforcement	
f'_c	4000	ρ_t	0.0025	ρ_t	0.0025
f_y	60000	spacing	18	spacing	18
t	18	V_u	66.61	V_u	66.61
h	96.33	V_c	262.29	V_c	262.29
l_u	12	V_s	-173.48	V_s	-173.48
V_u	66.61	$1/2\phi V_c$	98.36	$1/2\phi V_c$	98.36
d	115.2	A_v	0.180	A_v	0.180
		Use (2) #5 @ 18"		Use (2) #5 @ 18"	

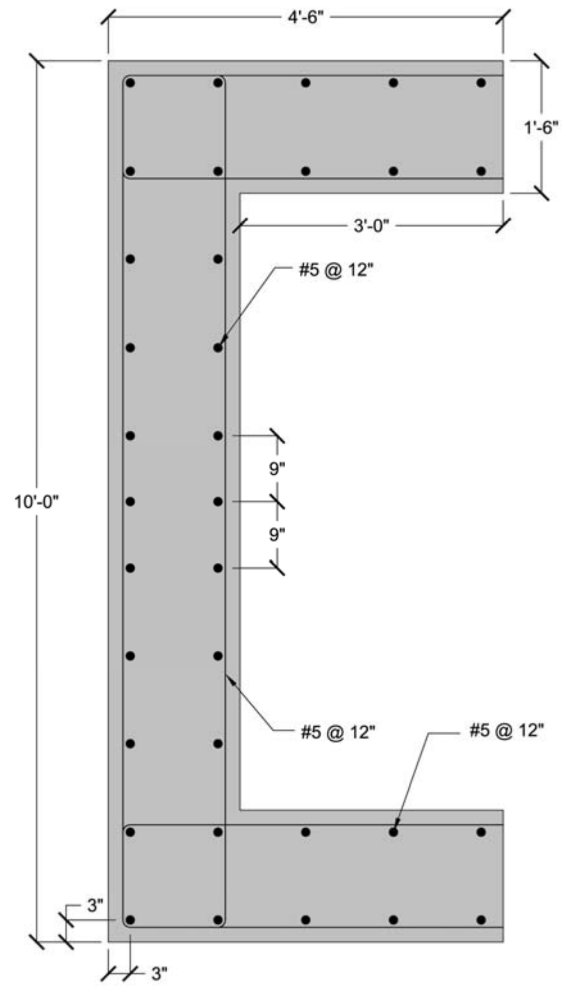
ET2					
Design Conditions		Horizontal Shear Reinforcement		Vertical Shear Reinforcement	
f'_c	4000	ρ_t	0.0025	ρ_t	0.0025
f_y	60000	spacing	18	spacing	18
t	18	V_u	40.47	V_u	40.47
h	96.33	V_c	218.58	V_c	218.58
l_u	10	V_s	-164.62	V_s	-164.62
V_u	40.47	$1/2\phi V_c$	81.97	$1/2\phi V_c$	81.97
d	96	A_v	0.180	A_v	0.180
		Use (2) #5 @ 18"		Use (2) #5 @ 18"	



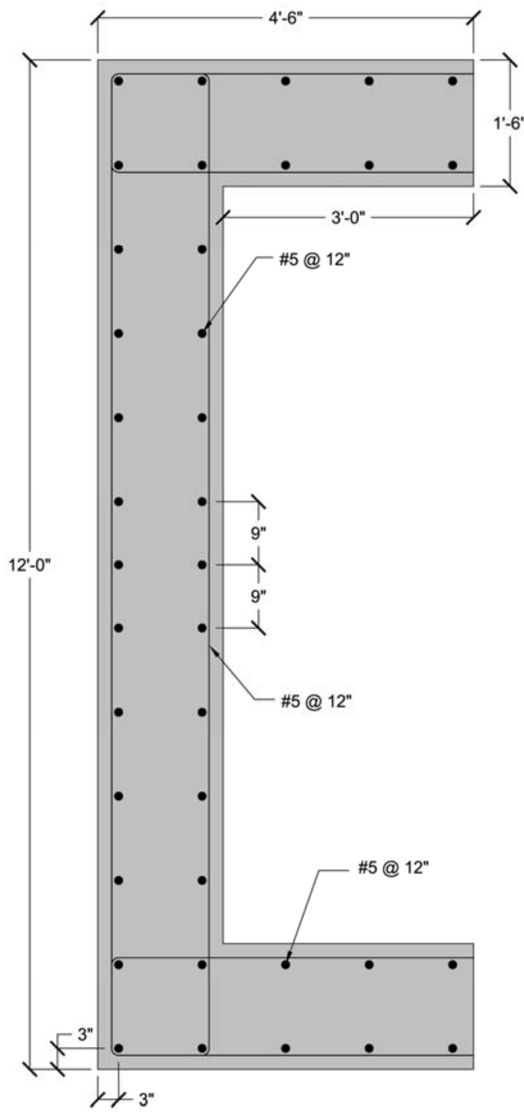
Detail for Shear Walls:
SL1, SR1, SL2, & SR2



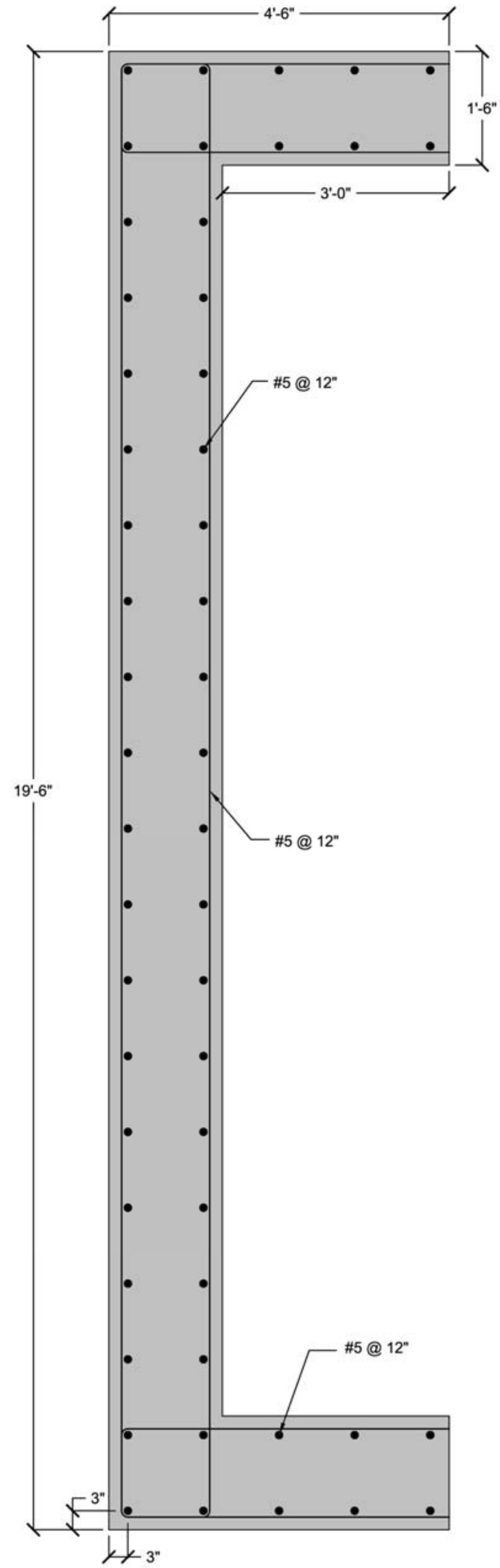
Detail for Shear Walls:
ER1 & EL1



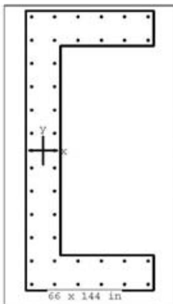
Detail for Shear Walls:
EB2, ER2, EL2, & ET2



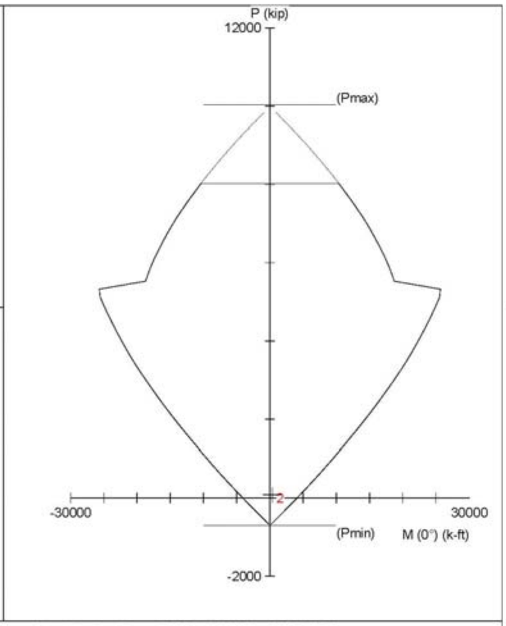
Detail for Shear Walls:
EB1 & ET1



Detail for Shear Walls:
SB1, ST1, SB2 & ST2



Code: ACI 318-02
Units: English
Run axis: Biaxial
Run option: Investigation
Slenderness: Not considered
Column type: Structural
Bars: ASTM A615
Date: 04/02/09
Time: 16:32:35



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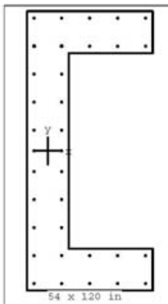
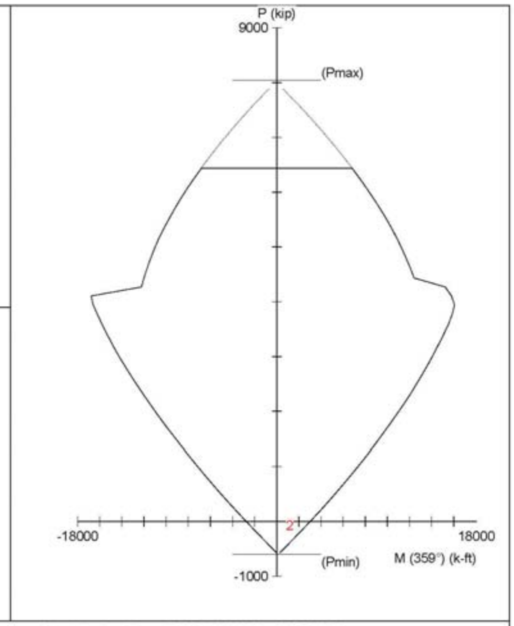
File: Y:\~One Last Final Last Time\PCA Column\Shear Walls\EB1.col
Project:
Column: Engineer:

f'c = 4 ksi	fy = 60 ksi	Ag = 4320 in^2	42 #5 bars
Ec = 3605 ksi	Es = 29000 ksi	As = 13.02 in^2	Rho = 0.30%
fc = 3.4 ksi	fc = 3.4 ksi	Xo = 13.20 in	Ix = 1.13841e+007 in^4
e_u = 0.003 in/in		Yo = 0.00 in	Iy = 1.53084e+006 in^4
Beta1 = 0.85		Clear spacing = 8.37 in	Clear cover = N/A
Confinement: Tied	phi(a) = 0.8, phi(b) = 0.9, phi(c) = 0.65		



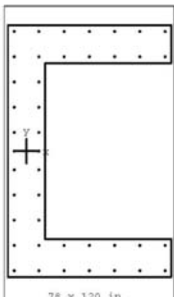
Code: ACI 318-02
Units: English
Run axis: Biaxial
Run option: Investigation
Slenderness: Not considered
Column type: Structural
Bars: ASTM A615
Date: 04/02/09
Time: 16:32:00



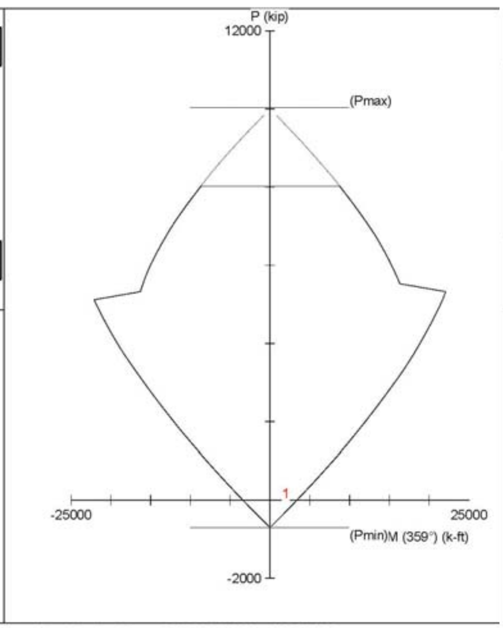
pcaColumn v3.64. Licensed to: Penn State University. License ID: 52411-1010265-4-22545-28F4D

File: Y:\~One Last Final Last Time\PCA Column\Shear Walls\EB2.col
Project:
Column: Engineer:

f'c = 4 ksi	fy = 60 ksi	Ag = 3456 in^2	34 bars
Ec = 3605 ksi	Es = 29000 ksi	As = 11.12 in^2	Rho = 0.32%
fc = 3.4 ksi	fc = 3.4 ksi	Xo = 10.13 in	Ix = 5.99789e+006 in^4
e_u = 0.003 in/in		Yo = 0.00 in	Iy = 788778 in^4
Beta1 = 0.85		Clear spacing = 8.37 in	Clear cover = N/A
Confinement: Tied	phi(a) = 0.8, phi(b) = 0.9, phi(c) = 0.65		



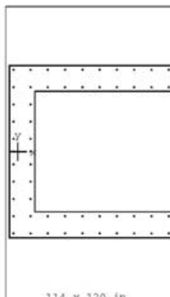
Code: ACI 318-02
Units: English
Run axis: Biaxial
Run option: Investigation
Slenderness: Not considered
Column type: Structural
Bars: ASTM A615
Date: 04/02/09
Time: 16:31:24



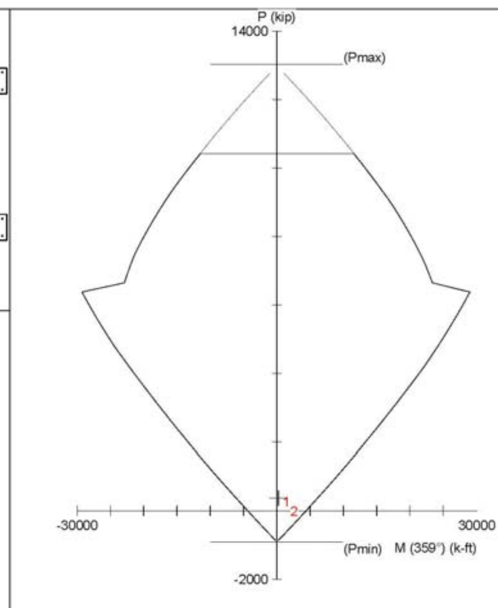
pcaColumn v3.64. Licensed to: Penn State University. License ID: 52411-1010265-4-22545-28F4D

File: Y:\~One Last Final Last Time\PCA Column\Shear Walls\EL1.col
Project:
Column: Engineer:

f'c = 4 ksi	fy = 60 ksi	Ag = 4320 in^2	42 #5 bars
Ec = 3605 ksi	Es = 29000 ksi	As = 13.02 in^2	Rho = 0.30%
fc = 3.4 ksi	fc = 3.4 ksi	Xo = 19.50 in	Ix = 8.26848e+006 in^4
e_u = 0.003 in/in		Yo = 0.00 in	Iy = 2.349e+006 in^4
Beta1 = 0.85		Clear spacing = 8.37 in	Clear cover = N/A
Confinement: Tied	phi(a) = 0.8, phi(b) = 0.9, phi(c) = 0.65		



Code: ACI 318-02
Units: English
Run axis: Biaxial
Run option: Investigation
Slenderness: Not considered
Column type: Structural
Bars: ASTM A615
Date: 04/02/09
Time: 16:30:32



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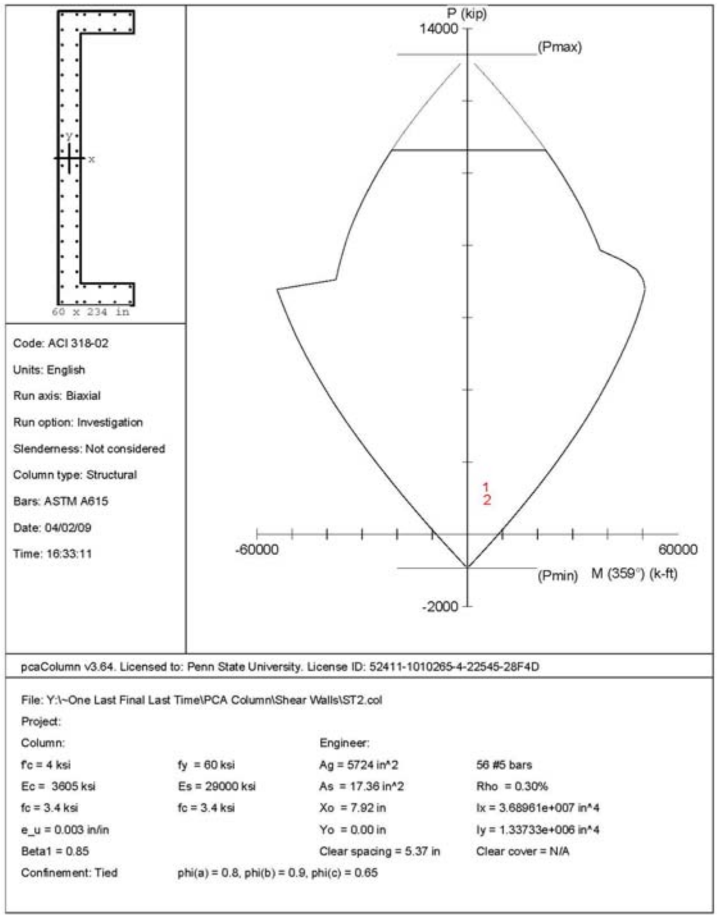
File: Y:\~One Last Final Last Time\PCA Column\Shear Walls\SL1.col
Project:
Column: Engineer:

f'c = 4 ksi	fy = 60 ksi	Ag = 5616 in^2	54 #5 bars
Ec = 3605 ksi	Es = 29000 ksi	As = 16.74 in^2	Rho = 0.30%
fc = 3.4 ksi	fc = 3.4 ksi	Xo = 38.08 in	Ix = 1.16744e+007 in^4
e_u = 0.003 in/in		Yo = 0.00 in	Iy = 7.0312e+006 in^4
Beta1 = 0.85		Clear spacing = 8.37 in	Clear cover = N/A
Confinement: Tied	phi(a) = 0.8, phi(b) = 0.9, phi(c) = 0.65		


60 x 234 in
x
y
P (kip)
14000
(Pmax)
-60000
60000
(Pmin)
M (359°) (k-ft)
-2000
1
2
Code: ACI 318-02
Units: English
Run axis: Biaxial
Run option: Investigation
Slenderness: Not considered
Column type: Structural
Bars: ASTM A615
Date: 04/02/09
Time: 16:33:11
pcaColumn v3.64. Licensed to: Penn State University. License ID: 52411-1010265-4-22545-28F4D
File: Y:\~One Last Final Last Time\PCA Column\Shear Walls\ST2.col
Project:
Column:
Engineer:
f'c = 4 ksi
fy = 60 ksi
Ag = 5724 in^2
56 #5 bars
Ec = 3605 ksi
Es = 29000 ksi
As = 17.36 in^2
Rho = 0.30%
fc = 3.4 ksi
fc = 3.4 ksi
Xo = 7.92 in
Ix = 3.68961e+007 in^4
e_u = 0.003 in/in
Yo = 0.00 in
Iy = 1.33733e+006 in^4
Beta1 = 0.85
Clear spacing = 5.37 in
Clear cover = N/A
Confinement: Tied
phi(a) = 0.8, phi(b) = 0.9, phi(c) = 0.65

Appendix D: Reinforced Concrete Coupling Beams

Max Wind Loading

Beam 7 (Stair 2)

Story	Spandrel	V2	T	T (k-ft)	M3	M3 (k-ft)
ROOF	B7	17.42	15.332	1.28	427.857	35.65
8TH	B7	36.62	29.197	2.43	880.943	73.41
7TH	B7	38.92	25.029	2.09	891.973	74.33
6TH	B7	43.56	27.373	2.28	987.327	82.28
5TH	B7	48.16	29.403	2.45	1093.734	91.14
4TH	B7	51.54	30.838	2.57	1171.626	97.64
3RD	B7	52.73	31.164	2.60	1197.096	99.76
2ND	B7	55.02	36.935	3.08	1302.006	108.50
1ST	B7	34.11	37.581	3.13	754.077	62.84

Beam 3 (Stair 1)

Story	Spandrel	V2	T	T (k-ft)	M3	M3 (k-ft)
ROOF	B3	13.84	14.6	1.22	350.214	29.18
8TH	B3	17.94	17.529	1.46	426.54	35.55
7TH	B3	25.26	20.065	1.67	577.218	48.10
6TH	B3	26.29	16.408	1.37	596.334	49.69
5TH	B3	28.39	17.294	1.44	645.447	53.79
4TH	B3	29.69	17.778	1.48	675.866	56.32
3RD	B3	29.63	17.589	1.47	674.034	56.17
2ND	B3	30.05	19.578	1.63	713.036	59.42
1ST	B3	17.98	22.762	1.90	398.137	33.18

Beam 6 (Stair 2)

Story	Spandrel	V2	T	T (k-ft)	M3	M3 (k-ft)
ROOF	B6	9.88	14.189	1.18	221.635	18.47
8TH	B6	21.32	20.515	1.71	467.015	38.92
7TH	B6	23.12	18.848	1.57	481.977	40.16
6TH	B6	25.76	19.859	1.65	530.306	44.19
5TH	B6	28.43	21.238	1.77	585.923	48.83
4TH	B6	30.5	22.02	1.84	628.673	52.39
3RD	B6	31.72	21.938	1.83	652.691	54.39
2ND	B6	34.12	27.837	2.32	726.798	60.57
1ST	B6	24.24	18.973	1.58	490.55	40.88

Beam 1 (Stair 2)

Story	Spandrel	V2	T	T (k-ft)	M3	M3 (k-ft)
ROOF	B1	9.29	14.429	1.20	271.292	22.61
8TH	B1	17.92	20.702	1.73	510.432	42.54
7TH	B1	16.37	17.192	1.43	440.335	36.69
6TH	B1	16.25	17.558	1.46	432.294	36.02
5TH	B1	15.95	17.813	1.48	425.019	35.42
4TH	B1	15.11	17.425	1.45	402.745	33.56
3RD	B1	13.49	16.345	1.36	358.989	29.92
2ND	B1	12.03	18.038	1.50	335.52	27.96
1ST	B1	5.79	9.032	0.75	147.824	12.32

Max Seismic Loading

Beam 7 (Stair 2)

Story	Spandrel	V2	T	T (k-ft)	M3	M3 (k-ft)
ROOF	B7	8.1	8.843	0.737	199.78	16.648
8TH	B7	17.13	16.272	1.356	408.416	34.035
7TH	B7	16.22	13.443	1.120	357.852	29.821
6TH	B7	17.52	14.176	1.181	385.435	32.120
5TH	B7	18.65	14.581	1.215	410.713	34.226
4TH	B7	19.17	14.672	1.223	422.046	35.171
3RD	B7	18.78	14.082	1.174	414.241	34.520
2ND	B7	15.98	9.604	0.800	345.729	28.811
1ST	B7	15.96	32.673	2.723	386.997	32.250

Beam 3 (Stair 2)

Story	Spandrel	V2	T	T (k-ft)	M3	M3 (k-ft)
ROOF	B3	8.93	9.636	0.803	216.517	18.043
8TH	B3	17.94	17.529	1.461	426.54	35.545
7TH	B3	16.38	14.456	1.205	360.657	30.055
6TH	B3	17.34	14.867	1.239	380.642	31.720
5TH	B3	18.15	15.234	1.270	398.658	33.222
4TH	B3	18.35	15.125	1.260	402.991	33.583
3RD	B3	17.63	14.248	1.187	387.947	32.329
2ND	B3	14.66	10.689	0.891	316.09	26.341
1ST	B3	13.97	20.051	1.671	338.212	28.184

Beam 6 (Stair 2)

Story	Spandrel	V2	T	T (k-ft)	M3	M3 (k-ft)
ROOF	B6	4.61	6.35	0.529	101.482	8.457
8TH	B6	9.89	12.079	1.007	214.281	17.857
7TH	B6	9.71	10.577	0.881	194.939	16.245
6TH	B6	10.45	10.826	0.902	208.99	17.416
5TH	B6	11.1	11.208	0.934	222.179	18.515
4TH	B6	11.38	11.127	0.927	227.52	18.960
3RD	B6	11.22	10.654	0.888	224.81	18.734
2ND	B6	9.84	8.505	0.709	192.466	16.039
1ST	B6	10.51	12.656	1.055	235.97	19.664

Beam 1 (Stair 2)

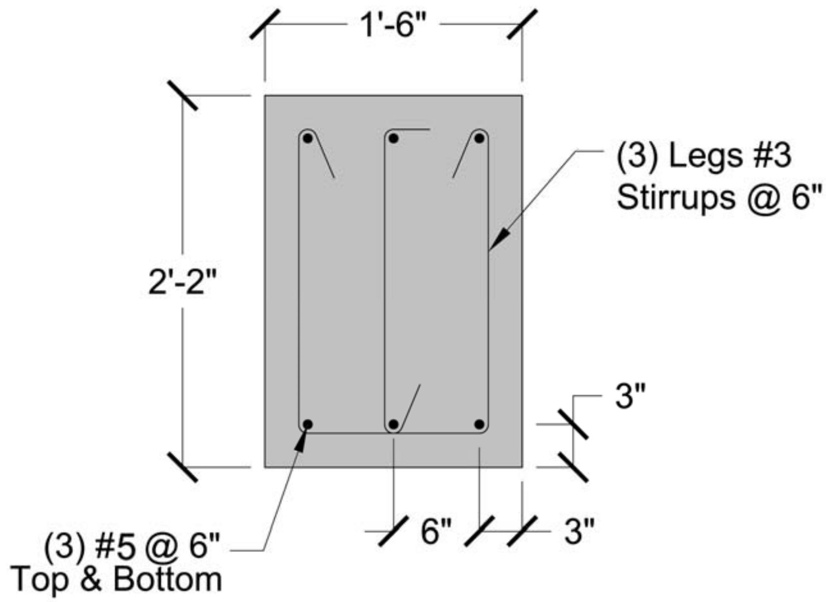
Story	Spandrel	V2	T	T (k-ft)	M3	M3 (k-ft)
ROOF	B1	4.43	7.225	0.602	122.52	10.210
8TH	B1	8.7	12.698	1.058	236.452	19.704
7TH	B1	7.32	10.367	0.864	183.989	15.332
6TH	B1	7.42	10.503	0.875	186.107	15.509
5TH	B1	7.46	10.561	0.880	187.151	15.596
4TH	B1	7.23	10.159	0.847	181.282	15.107
3RD	B1	6.64	9.353	0.779	166.557	13.880
2ND	B1	5.2	7.096	0.591	127.848	10.654
1ST	B1	4.97	6.535	0.545	139.007	11.584

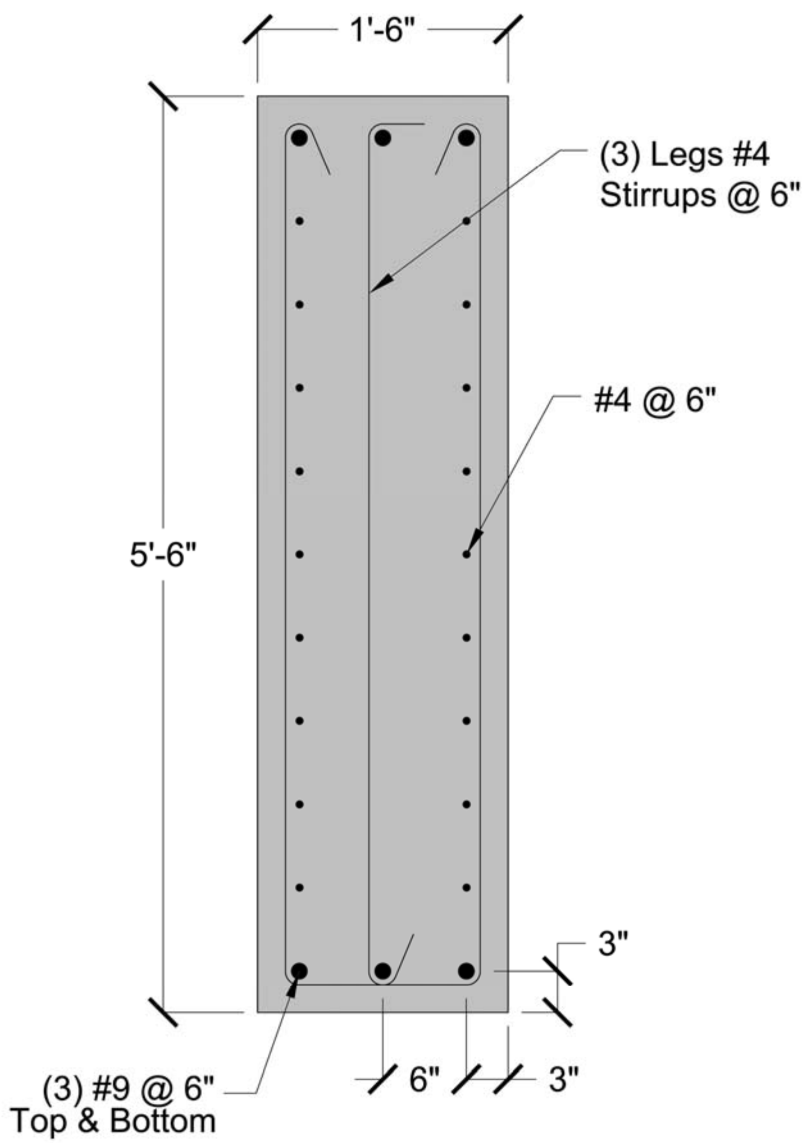
Coupling Beam 7 (Stair 2)											
Story	l_n (in)	h (in)	l_n/h	A_{cw}	V_n	d	As_{min}	Av_{min}	Flexural Reinf.	Shear Reinf.	Skin Reinf.
ROOF	40	58	0.69	1044	264.113	55	4.400	0.495	(3) #8 @ 6" T & B	(2) Legs of #5 @ 11"	#4 @ 6.5"
8TH	40	54	0.74	972	614.747	51	4.080	0.459	(3) #8 @ 6" T & B	(2) Legs of #5 @ 11"	#4 @ 6.5"
7TH	40	26	1.54	468	295.989	23	1.840	0.320	(3) #5 @ 6" T & B	(2) Legs of #4 @ 16"	None
6TH	40	26	1.54	468	295.989	23	1.840	0.320	(3) #5 @ 6" T & B	(2) Legs of #4 @ 16"	None
5TH	40	26	1.54	468	295.989	23	1.840	0.320	(3) #5 @ 6" T & B	(2) Legs of #4 @ 16"	None
4TH	40	26	1.54	468	295.989	23	1.840	0.320	(3) #5 @ 6" T & B	(2) Legs of #4 @ 16"	None
3RD	40	26	1.54	468	295.989	23	1.840	0.320	(3) #5 @ 6" T & B	(2) Legs of #4 @ 16"	None
2ND	40	26	1.54	468	295.989	23	1.840	0.320	(3) #5 @ 6" T & B	(2) Legs of #4 @ 16"	None
1ST	40	66	0.61	1188	751.357	63	5.040	0.567	(3) #9 @ 6" T & B	(2) Legs of #5 @ 11"	#4 @ 6.5"

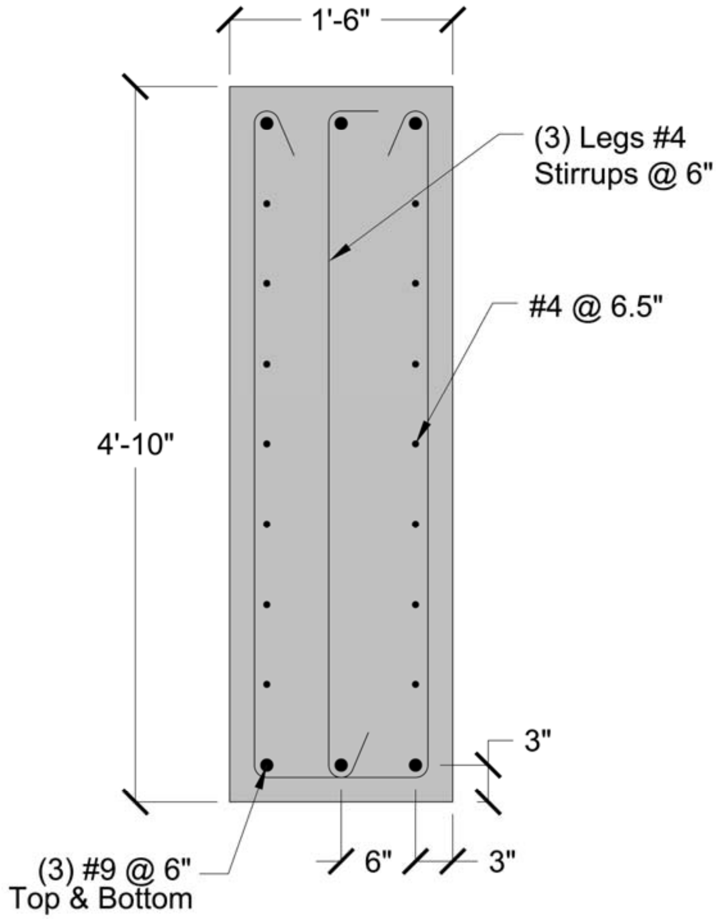
Coupling Beam 6 (Elevator 2)											
Story	l_n (in)	h (in)	l_n/h	A_{cw}	V_n	d	As_{min}	Av_{min}	Flexural Reinf.	Shear Reinf.	Skin Reinf.
ROOF	46	58	0.79	1044	660.284	55	4.400	0.495	(3) #8 @ 6" T & B	(2) Legs of #5 @ 11"	#4 @ 6"
8TH	46	54	0.85	972	614.747	51	4.080	0.459	(3) #8 @ 6" T & B	(2) Legs of #5 @ 11"	#4 @ 6"
7TH	46	26	1.77	468	295.989	23	1.840	0.320	(3) #5 @ 6" T & B	(2) Legs of #4 @ 16"	None
6TH	46	26	1.77	468	295.989	23	1.840	0.320	(3) #5 @ 6" T & B	(2) Legs of #4 @ 16"	None
5TH	46	26	1.77	468	295.989	23	1.840	0.320	(3) #5 @ 6" T & B	(2) Legs of #4 @ 16"	None
4TH	46	26	1.77	468	295.989	23	1.840	0.320	(3) #5 @ 6" T & B	(2) Legs of #4 @ 16"	None
3RD	46	26	1.77	468	295.989	23	1.840	0.320	(3) #5 @ 6" T & B	(2) Legs of #4 @ 16"	None
2ND	46	26	1.77	468	295.989	23	1.840	0.320	(3) #5 @ 6" T & B	(2) Legs of #4 @ 16"	None
1ST	46	66	0.70	1188	751.357	63	5.040	0.567	(3) #9 @ 6" T & B	(2) Legs of #5 @ 11"	#4 @ 6"

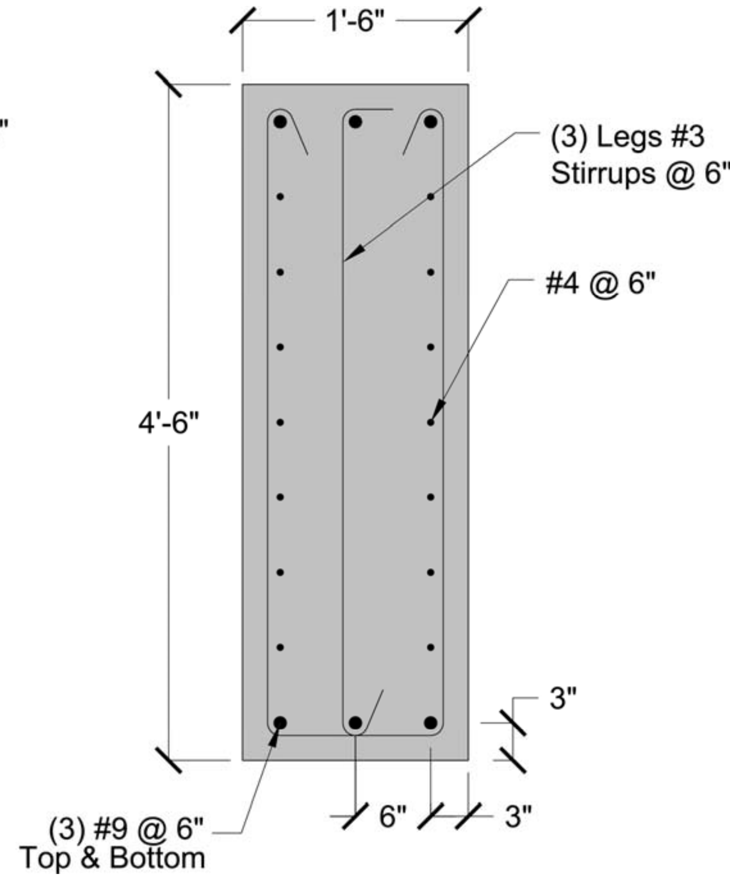
Coupling Beam 3 (Stair 1)											
Story	l_n (in)	h (in)	l_n/h	A_{cw}	V_n	d	As_{min}	Av_{min}	Flexural Reinf.	Shear Reinf.	Skin Reinf.
ROOF	40	58	0.69	1044	660.284	55	4.400	0.495	(3) #8 @ 6" T & B	(2) Legs of #5 @ 11"	#4 @ 6"
8TH	40	54	0.74	972	614.747	51	4.080	0.459	(3) #8 @ 6" T & B	(2) Legs of #5 @ 11"	#4 @ 6"
7TH	40	26	1.54	468	295.989	23	1.840	0.320	(3) #5 @ 6" T & B	(2) Legs of #4 @ 16"	None
6TH	40	26	1.54	468	295.989	23	1.840	0.320	(3) #5 @ 6" T & B	(2) Legs of #4 @ 16"	None
5TH	40	26	1.54	468	295.989	23	1.840	0.320	(3) #5 @ 6" T & B	(2) Legs of #4 @ 16"	None
4TH	40	26	1.54	468	295.989	23	1.840	0.320	(3) #5 @ 6" T & B	(2) Legs of #4 @ 16"	None
3RD	40	26	1.54	468	295.989	23	1.840	0.320	(3) #5 @ 6" T & B	(2) Legs of #4 @ 16"	None
2ND	40	26	1.54	468	295.989	23	1.840	0.320	(3) #5 @ 6" T & B	(2) Legs of #4 @ 16"	None
1ST	40	66	0.61	1188	751.357	63	5.040	0.567	(3) #9 @ 6" T & B	(2) Legs of #5 @ 11"	#4 @ 6"

Coupling Beam 1 (Elevator 1)											
Story	l_n (in)	h (in)	l_n/h	A_{cw}	V_n	d	As_{min}	Av_{min}	Flexural Reinf.	Shear Reinf.	Skin Reinf.
ROOF	46	58	0.79	1044	660.284	55	4.400	0.495	(3) #8 @ 6" T & B	(2) Legs of #5 @ 11"	#4 @ 6"
8TH	46	54	0.85	972	614.747	51	4.080	0.459	(3) #8 @ 6" T & B	(2) Legs of #5 @ 11"	#4 @ 6"
7TH	46	26	1.77	468	295.989	23	1.840	0.320	(3) #5 @ 6" T & B	(2) Legs of #4 @ 16"	None
6TH	46	26	1.77	468	295.989	23	1.840	0.320	(3) #5 @ 6" T & B	(2) Legs of #4 @ 16"	None
5TH	46	26	1.77	468	295.989	23	1.840	0.320	(3) #5 @ 6" T & B	(2) Legs of #4 @ 16"	None
4TH	46	26	1.77	468	295.989	23	1.840	0.320	(3) #5 @ 6" T & B	(2) Legs of #4 @ 16"	None
3RD	46	26	1.77	468	295.989	23	1.840	0.320	(3) #5 @ 6" T & B	(2) Legs of #4 @ 16"	None
2ND	46	26	1.77	468	295.989	23	1.840	0.320	(3) #5 @ 6" T & B	(2) Legs of #4 @ 16"	None
1ST	46	66	0.70	1188	751.357	63	5.040	0.567	(3) #9 @ 6" T & B	(2) Legs of #5 @ 11"	#4 @ 6"


1'-6"
(3) Legs #3
Stirrups @ 6"
2'-2"
3"
6"
3"
(3) #5 @ 6"
Top & Bottom


1'-6"
(3) Legs #4
Stirrups @ 6"
#4 @ 6"
5'-6"
3"
6"
3"
(3) #9 @ 6"
Top & Bottom


1'-6"
(3) Legs #4
Stirrups @ 6"
#4 @ 6.5"
4'-10"
3"
(3) #9 @ 6"
Top & Bottom
6"
3"


1'-6"
(3) Legs #3
Stirrups @ 6"
#4 @ 6"
4'-6"
3"
(3) #9 @ 6"
Top & Bottom
6"
3"

Appendix E: Concrete Moment Frame – Columns and Beams

Column C55 (Column Line 9) for Seismic								
Story	Floor	Load	P	V2	V3	T	M2	M3
Max P	1st	SEISMICYX	-9.32	0.24	-0.65	0.00	8.39	-3.13
Max V2	Roof	SEISMICXY	1.27	0.49	0	0.42	0.45	7.67
Max T	6th	SEISMICXYY	2.16	0.38	-0.3	1.58	2.01	-0.40
Max M2	2nd	SEISMICYX	-8.91	-0.26	0.87	0.29	11.70	-3.94
Max M3	2nd	SEISMICXY	1.27	0.49	0	0.42	0.45	7.67

Column C55 (Column Line 9) for Wind								
Story	Floor	Load	P	V2	V3	T	M2	M3
Max P	1st	DCON14	42.52	-0.12	1.15	0.00	-1.55	0.17
Max V2	Roof	DCON21	0.49	0.58	-0.23	-1.17	1.09	-4.08
Max T	5th	DCON14	25.02	0.13	-4.41	2.57	17.96	-0.22
Max M2	2nd	DCON13	-39.7	-0.18	4.44	-1.84	37.06	-2.30
Max M3	2nd	DCON15	22.83	0.51	-2.19	0.48	-18.57	5.35

Column C80 (Column Line 9) for Seismic								
Story	Floor	Load	P	V2	V3	T	M2	M3
Max P	1st	SEISMICYXX	-14.6	-0.66	0.11	0.00	-1.44	8.54
Max V2	Roof	SEISMICXYY	-1.64	2.52	0.04	1.44	0.47	11.33
Max T	6th	SEISMICXYY	-7.37	2.16	-0.02	1.58	0.30	-8.11
Max M2	2nd	SEISMICYX	-2.68	0.33	0.55	0.29	11.89	3.28
Max M3	2nd	SEISMICXYY	-13.84	1.74	-0.08	0.95	-1.52	16.89

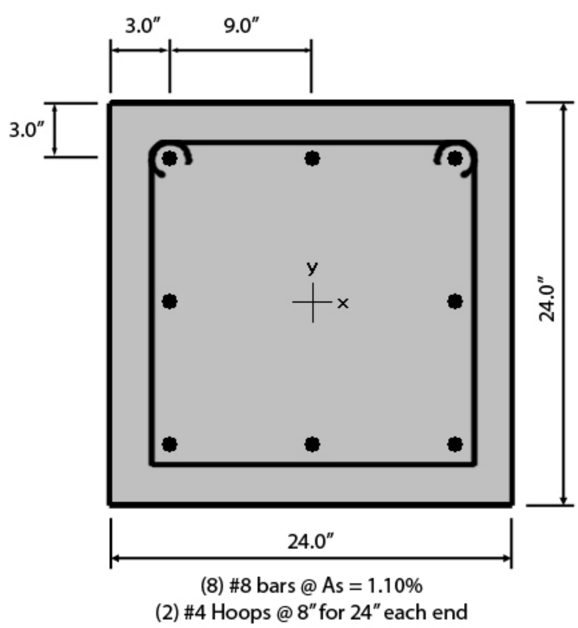
Column C80 (Column Line 9) for Wind								
Story	Floor	Load	P	V2	V3	T	M2	M3
Max P	1st	DCON20	13.02	0.15	-0.79	0.00	10.29	-1.94
Max V2	5th	DCON19	-6.55	2.34	-0.1	2.22	-0.90	-10.33
Max T	5th	DCON14	-5.22	2	-0.12	2.57	-1.29	-9.03
Max M2	2nd	DCON13	9.95	-1.99	0.79	-1.84	14.07	-13.01
Max M3	2nd	DCON19	-11.89	2.2	-0.62	1.59	-10.88	14.62

Column C65 (Column Line 9) for Seismic								
Story	Floor	Load	P	V2	V3	T	M2	M3
Max P	1st	SEISMICXYY	20.28	-0.71	0.17	0.00	-0.23	0.96
Max V2	Roof	SEISMICXYY	2.34	1.5	0.57	1.44	2.89	6.47
Max T	6th	SEISMICXYY	10.36	1.36	0.45	1.58	2.77	7.54
Max M2	2nd	SEISMICYX	3.73	0.06	0.59	0.29	11.88	-1.20
Max M3	2nd	SEISMICXYY	19.24	1.3	0.33	0.95	2.84	14.96

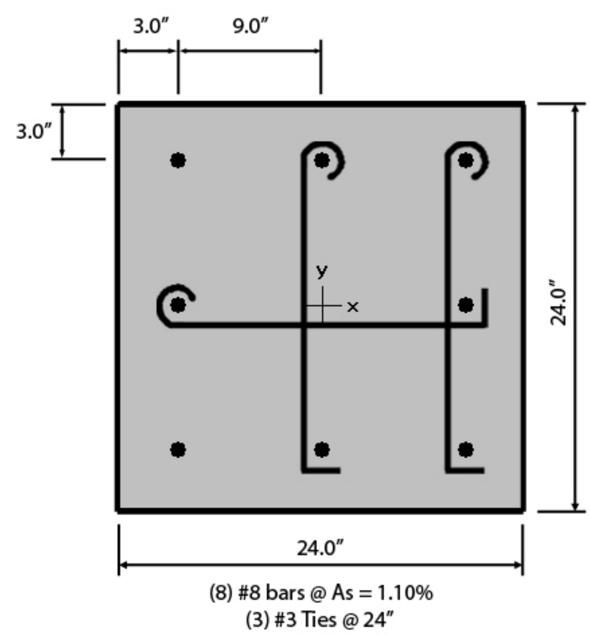
Column C65 (Column Line 9) for Wind								
Story	Floor	Load	P	V2	V3	T	M2	M3
Max P	1st	DCON19	20.2	-0.25	0.88	0.00	-1.18	0.33
Max V2	2nd	DCON19	18.59	1.69	-0.14	1.59	-6.21	-1.01
Max T	5th	DCON14	8.63	1.22	0.27	2.57	-0.57	6.10
Max M2	1st	DCON13	-16.99	0.2	-1.13	0.00	14.64	-2.63
Max M3	2nd	DCON19	18.59	1.69	-0.14	1.59	-7.56	15.03

Concrete Column Loading								
Type	Area	Self Wt.	Dead	Live	Quake	Wind	Snow	LC
Corner (C55)	118.75	49.027	194.750	53.438	9.320	42.520	2.731	415.37
Exterior 1 (C65)	314.71	49.027	516.124	141.620	20.280	20.200	7.238	855.74
Exterior 2 (C80)	240.33	49.027	394.141	108.149	14.600	13.020	5.528	663.55

Type	Flexural Reinf.	Shear Reinf.		Transverse Reinf.
		Av_{min}	0.240	
Corner (C55)	(8) #8 @ 9"	Use (2) #4 Hoops @ 8" for 24" each end		Use (3) #3 Ties @ 24"
Exterior 1 (C65)	(8) #8 @ 9"	Use (2) #4 Hoops @ 8" for 24" each end		Use (3) #3 Ties @ 24"
Exterior 2 (C80)	(8) #8 @ 9"	Use (2) #4 Hoops @ 8" for 24" each end		Use (3) #3 Ties @ 24"



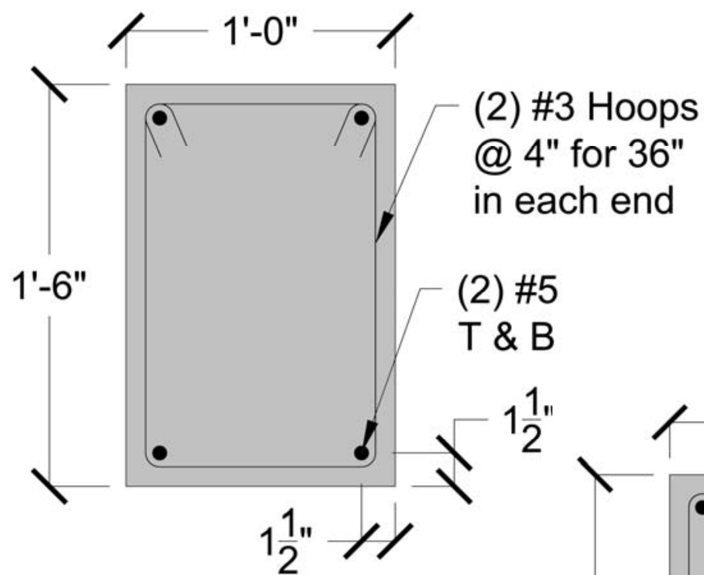
Exterior Column Reinforcement Detail – Column Ends



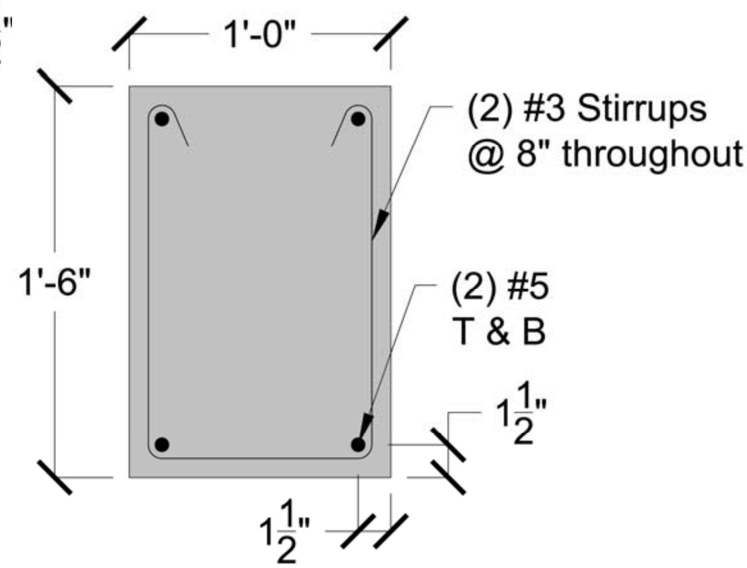
Exterior Column Reinforcement Detail – Throughout Column

Beam 9 (Earthquake)				
Story	Spandrel	V2	T (k-ft)	M3 (k-ft)
ROOF	B9	3.86	0.10	29.52
8TH	B9	1.82	0.17	13.79
7TH	B9	1.72	0.17	13.06
6TH	B9	1.72	0.18	13.04
5TH	B9	1.63	0.18	12.39
4TH	B9	1.5	0.17	11.41
3RD	B9	1.35	0.15	9.89
2ND	B9	1.05	0.13	5.98
1ST	B9	0.62	0.08	4.74

Beam 9 (Wind)				
Story	Spandrel	V2	T (k-ft)	M3 (k-ft)
ROOF	B9	3.95	0.11	30.68
8TH	B9	4.91	0.24	37.51
7TH	B9	5.04	0.23	38.55
6TH	B9	5.27	0.26	40.22
5TH	B9	5.3	0.26	40.48
4TH	B9	5.19	0.26	39.66
3RD	B9	4.83	0.25	36.88
2ND	B9	4.22	0.22	32.26
1ST	B9	2.75	0.14	21.04



Moment Frame Beam Reinforcement Detail – Beam Ends



Moment Frame Beam Reinforcement Detail – Throughout Beam

Roof Floor B9

Given:		Estimation of d		Torsional Reinforcement	
M_u	30.68	$bd^2 \geq 20M_u$	7.151	$T_u \leq ¼\phi 4\sqrt{f'_c}(A_c^2/P_c)$	36.885
V_u	3.95	Use d =	15.5	Reinf. Needed?	no
T_u	0.11	Calculation of A_s (Flexure)		Transverse Shear Reinforcement	
ϕ	0.9	A_s	0.882	V_c	23.527
b	12	**Use (2) #5 Bars T & B**		$V_u \geq ½\phi V_c$	no
h	18				
f'_c	4000	Shear Reinforcement			
f_y	60000	$V_s \leq 4\sqrt{f'_c}bd$	yes		
		S_{max} = d/4 = 3.875", use 4"		S_{max} = d/2 = 7.75", use 8"	
		Av_{min}	0.120	Av_{min}	0.120
		Use (2) #3 Hoops @ 4" for 36" @ each end		**Use (2) #3 Strirrups @ 8" throughout length**	

Eighth Floor B9

Given:		Estimation of d		Torsional Reinforcement	
M_u	37.51	$bd^2 \geq 20M_u$	7.907	$T_u \leq ¼\phi 4\sqrt{f'_c}(A_c^2/P_c)$	36.885
V_u	4.91	Use d =	15.5	Reinf. Needed?	no
T_u	0.24	Calculation of A_s (Flexure)		Transverse Shear Reinforcement	
ϕ	0.9	A_s	0.882	V_c	23.527
b	12	**Use (2) #5 Bars T & B**		$V_u \geq ½\phi V_c$	no
h	18				
f'_c	4000	Shear Reinforcement			
f_y	60000	$V_s \leq 4\sqrt{f'_c}bd$	yes		
		S_{max} = d/4 = 3.875", use 4"		S_{max} = d/2 = 7.75", use 8"	
		Av_{min}	0.120	Av_{min}	0.120
		Use (2) #3 Hoops @ 4" for 36" @ each end		**Use (2) #3 Strirrups @ 8" throughout length**	

Seventh Floor B9

Given:		Estimation of d		Torsional Reinforcement	
M_u	38.55	$bd^2 \geq 20M_u$	8.016	$T_u \leq ¼\phi 4\sqrt{f'_c}(A_c^2/P_c)$	36.885
V_u	5.04	Use d =	15.5	Reinf. Needed?	no
T_u	0.23	Calculation of A_s (Flexure)		Transverse Shear Reinforcement	
ϕ	0.9	A_s	0.882	V_c	23.527
b	12	**Use (2) #5 Bars T & B**		$V_u \geq ½\phi V_c$	no
h	18				
f'_c	4000	Shear Reinforcement			
f_y	60000	$V_s \leq 4\sqrt{f'_c}bd$	yes		
		S_{max} = d/4 = 3.875", use 4"		S_{max} = d/2 = 7.75", use 8"	
		Av_{min}	0.120	Av_{min}	0.120
		Use (2) #3 Hoops @ 4" for 36" @ each end		**Use (2) #3 Strirrups @ 8" throughout length**	

Sixth Floor B9

Given:		Estimation of d		Torsional Reinforcement	
M_u	40.22	$bd^2 \geq 20M_u$	8.187	$T_u \leq ¼\phi 4\sqrt{f'_c}(A_c^2/P_c)$	36.885
V_u	5.27	Use d =	15.5	Reinf. Needed?	no
T_u	0.26	Calculation of A_s (Flexure)		Transverse Shear Reinforcement	
ϕ	0.9	A_s	0.882	V_c	23.527
b	12	**Use (2) #5 Bars T & B**		$V_u \geq ½\phi V_c$	no
h	18				
f'_c	4000	Shear Reinforcement			
f_y	60000	$V_s \leq 4\sqrt{f'_c}bd$	yes		
		S_{max} = d/4 = 3.875", use 4"		S_{max} = d/2 = 7.75", use 8"	
		Av_{min}	0.120	Av_{min}	0.120
		Use (2) #3 Hoops @ 4" for 36" @ each end		**Use (2) #3 Strirrups @ 8" throughout length**	

Fifth Floor B9

Given:		Estimation of d		Torsional Reinforcement	
M_u	40.48	$bd^2 \geq 20M_u$	8.214	$T_u \leq ¼\phi 4\sqrt{f'_c}(A_c^2/P_c)$	36.885
V_u	5.3	Use d =	15.5	Reinf. Needed?	no
T_u	0.26	Calculation of A_s (Flexure)		Transverse Shear Reinforcement	
ϕ	0.9	A_s	0.882	V_c	23.527
b	12	**Use (2) #5 Bars T & B**		$V_u \geq ½\phi V_c$	no
h	18				
f'_c	4000	Shear Reinforcement			
f_y	60000	$V_s \leq 4\sqrt{f'_c}bd$	yes		
		S_{max} = d/4 = 3.875", use 4"		S_{max} = d/2 = 7.75", use 8"	
		Av_{min}	0.120	Av_{min}	0.120
		Use (2) #3 Hoops @ 4" for 36" @ each end		**Use (2) #3 Strirrups @ 8" throughout length**	

Fourth Floor B9

Given:		Estimation of d		Torsional Reinforcement	
M_u	39.66	$bd^2 \geq 20M_u$	8.130	$T_u \leq ¼\phi 4\sqrt{f'_c}(A_c^2/P_c)$	36.885
V_u	5.19	Use d =	15.5	Reinf. Needed?	no
T_u	0.26	Calculation of A_s (Flexure)		Transverse Shear Reinforcement	
ϕ	0.9	A_s	0.882	V_c	23.527
b	12	**Use (2) #5 Bars T & B**		$V_u \geq ½\phi V_c$	no
h	18				
f'_c	4000	Shear Reinforcement			
f_y	60000	$V_s \leq 4\sqrt{f'_c}bd$	yes		
		S_{max} = d/4 = 3.875", use 4"		S_{max} = d/2 = 7.75", use	
		Av_{min}	0.120	Av_{min}	0.120
		Use (2) #3 Hoops @ 4" for 36" @ each end		**Use (2) #3 Strirrups @ 8" throughout length**	

Third Floor B9

Given:		Estimation of d		Torsional Reinforcement	
M_u	36.88	$bd^2 \geq 20M_u$	7.840	$T_u \leq ¼\phi 4\sqrt{f'_c}(A_c^2/P_c)$	36.885
V_u	4.83	Use d =	15.5	Reinf. Needed?	no
T_u	0.25	Calculation of A_s (Flexure)		Transverse Shear Reinforcement	
ϕ	0.9	A_s	0.882	V_c	23.527
b	12	**Use (2) #5 Bars T & B**		$V_u \geq ½\phi V_c$	no
h	18				
f'_c	4000	Shear Reinforcement			
f_y	60000	$V_s \leq 4\sqrt{f'_c}bd$	yes		
		S_{max} = d/4 = 3.875", use 4"		S_{max} = d/2 = 7.75", use	
		Av_{min}	0.120	Av_{min}	0.120
		Use (2) #3 Hoops @ 4" for 36" @ each end		**Use (2) #3 Strirrups @ 8" throughout length**	

Second Floor B9

Given:		Estimation of d		Torsional Reinforcement	
M_u	32.26	$bd^2 \geq 20M_u$	7.333	$T_u \leq ¼\phi 4\sqrt{f'_c}(A_c^2/P_c)$	36.885
V_u	4.22	Use d =	15.5	Reinf. Needed?	no
T_u	0.22	Calculation of A_s (Flexure)		Transverse Shear Reinforcement	
ϕ	0.9	A_s	0.882	V_c	23.527
b	12	**Use (2) #5 Bars T & B**		$V_u \geq ½\phi V_c$	no
h	18				
f'_c	4000	Shear Reinforcement			
f_y	60000	$V_s \leq 4\sqrt{f'_c}bd$	yes		
		S_{max} = d/4 = 3.875", use 4"		S_{max} = d/2 = 7.75", use	
		Av_{min}	0.120	Av_{min}	0.120
		Use (2) #3 Hoops @ 4" for 36" @ each end		**Use (2) #3 Strirrups @ 8" throughout length**	

Eighth Floor B9

Given:		Estimation of d		Torsional Reinforcement	
M_u	21.04	$bd^2 \geq 20M_u$	5.922	$T_u \leq ¼\phi 4\sqrt{f'_c}(A_c^2/P_c)$	36.885
V_u	2.75	Use d =	15.5	Reinf. Needed?	no
T_u	0.14	Calculation of A_s (Flexure)		Transverse Shear Reinforcement	
ϕ	0.9	A_s	0.882	V_c	23.527
b	12	**Use (2) #5 Bars T & B**		$V_u \geq ½\phi V_c$	no
h	18				
f'_c	4000	Shear Reinforcement			
f_y	60000	$V_s \leq 4\sqrt{f'_c}bd$	yes		
		S_{max} = d/4 = 3.875", use 4"		S_{max} = d/2 = 7.75", use	
		Av_{min}	0.120	Av_{min}	0.120
		Use (2) #3 Hoops @ 4" for 36" @ each end		**Use (2) #3 Strirrups @ 8" throughout length**	

Appendix F: Vibration Damper Cut sheets

KINETICS™
Free Standing Spring Isolators Model FDS 1 and 2

Description

Kinetics Model FDS Spring Vibration Isolators consist of high deflection, free-standing, unhoused, large diameter, laterally stable steel springs assembled into an upper load plate and leveling assembly. To assure stability, the spring isolators have lateral spring stiffness greater than 1.0 times the rated vertical stiffness and are designed to provide a minimum of 50% overload capacity. Springs are epoxy powder coated, with a 1000-hour salt spray rating per ASTM B-117. In lighter capacities, FDS Spring Isolators have molded neoprene bottom load plate assemblies. In heavier capacities, springs are welded to the load plate assemblies and are furnished with a neoprene noise isolation pad. FDS Isolators have provisions for bolting the isolator to the structure. FDS isolators are available with deflections to 2" (51 mm) and with load capacities to 18,000 lbs. (8165 kg) as standard products. Custom isolators with higher deflection and greater load capacities are also available. Kinetics Model FDS Spring Isolators are highly effective for control of both high and low frequency vibration produced by reciprocating air or refrigeration compressors, pumps, packaged air handling and air conditioning equipment, centrifugal and axial fans, internal combustion engines, etc.

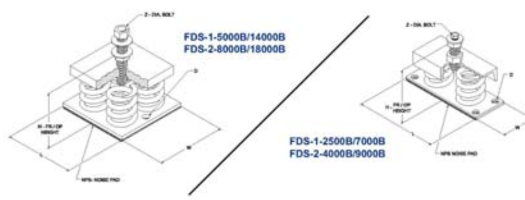
Application

Kinetics Model FDS spring mounts are recommended for use in isolating floor mounted sources of noise and vibration located near critically quiet areas.

Model FDS spring mounts are typically used to reduce the transmission of noise and vibration from low speed mechanical equipment into a building structure. Operating static deflections are available to 2" (51 mm) to compensate for long span floor structures.

Model FDS spring mounts are used in a wide range of applications, some requiring Kinetics equipment bases in addition to spring isolators, and can be used to support and isolate the following equipment types: reciprocating air or refrigeration compressors, close coupled and base mounted pumps, packaged air handling and refrigeration equipment, centrifugal fans, internal combustion engines, and similar equipment. Model FDS Isolators are for use on equipment that is not subject to lateral forces such as wind.

Isolator Type	Spring Color	Rated Capacity		Rated Deflection		Rated O.D.		Free Height		L		W		D		H		Z	
		lbs.	kg	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
FDS-1-35	Blue	35	16	1.52	39	1.75	44	3.19	81	2.63	67	2.63	67	0.69	17	4.19	106	0.38	10
FDS-1-70	Green	70	32	1.36	35	1.75	44	3.19	81	2.63	67	2.63	67	0.69	17	4.19	106	0.38	10
FDS-1-120	Gray	120	54	1.18	30	1.75	44	3.19	81	2.63	67	2.63	67	0.69	17	4.19	106	0.38	10
FDS-1-220	Brown	220	100	1.07	27	1.75	44	3.19	81	2.63	67	2.63	67	0.69	17	4.19	106	0.38	10
FDS-1-370	Orange	370	168	0.96	24	1.75	44	3.19	81	2.63	67	2.63	67	0.69	17	4.19	106	0.38	10
FDS-1-500	Beige	500	227	1.00	25	1.75	44	3.19	81	2.63	67	2.63	67	0.69	17	4.19	106	0.38	10
FDS-1-600	Chrome	600	272	1.00	25	1.75	44	3.19	81	2.63	67	2.63	67	0.69	17	4.19	106	0.38	10
FDS-1-700	Beige/Wh	700	318	1.00	25	1.75	44	3.19	81	2.63	67	2.63	67	0.69	17	4.19	106	0.38	10
FDS-1-805	Chr/Wh	805	365	1.01	26	1.75	44	3.19	81	2.63	67	2.63	67	0.69	17	4.19	106	0.38	10
FDS-1-250	Blue	250	113	1.79	45	3.00	76	4.20	107	3.88	98	3.88	98	1.00	25	5.44	138	0.38	10
FDS-1-450	Green	450	204	1.54	39	3.00	76	4.20	107	3.88	98	3.88	98	1.00	25	5.44	138	0.38	10
FDS-1-625	Black	625	283	1.44	37	3.00	76	4.20	107	3.88	98	3.88	98	1.00	25	5.44	138	0.38	10
FDS-1-800	Grey	800	363	1.31	33	3.00	76	4.20	107	3.88	98	3.88	98	1.00	25	5.44	138	0.38	10
FDS-1-1000	Red	1000	454	1.15	29	3.00	76	4.20	107	3.88	98	3.88	98	1.00	25	5.44	138	0.38	10
FDS-1-1250	Brown	1250	567	1.09	28	3.00	76	4.20	107	3.88	98	3.88	98	1.00	25	5.44	138	0.38	10
FDS-1-1700	Orange	1700	771	0.95	24	3.00	76	4.20	107	3.88	98	3.88	98	1.00	25	5.44	138	0.38	10
FDS-1-2200	Org/Grey	2200	998	1.00	26	3.00	76	4.20	107	3.88	98	3.88	98	1.00	25	5.44	138	0.38	10
FDS-1-2465	Blue	2465	1118	1.00	25	3.00	76	4.20	107	3.88	98	3.88	98	1.00	25	5.44	138	0.38	10
FDS-1-2865	Blue/Grey	2865	1300	1.00	25	3.00	76	4.20	107	3.88	98	3.88	98	1.00	25	5.44	138	0.38	10
FDS-1-3500	Blue/Brn	3500	1588	1.00	25	3.00	76	4.20	107	3.88	98	3.88	98	1.00	25	5.44	138	0.38	10
FDS-1-120B	Grey	120	54	1.18	30	1.75	44	3.19	81	4.50	114	2.50	64	0.56	14	4.25	108	0.38	10
FDS-1-220B	Grey	220	100	1.07	27	1.75	44	3.19	81	4.50	114	2.50	64	0.56	14	4.25	108	0.38	10
FDS-1-370B	Grey	370	168	0.96	24	1.75	44	3.19	81	4.50	114	2.50	64	0.56	14	4.25	108	0.38	10
FDS-1-500B	Grey	500	227	1.00	25	1.75	44	3.19	81	4.50	114	2.50	64	0.56	14	4.25	108	0.38	10
FDS-1-600B	Grey	600	272	1.00	25	1.75	44	3.19	81	4.50	114	2.50	64	0.56	14	4.25	108	0.38	10
FDS-1-700B	Grey/Grey	700	318	1.00	25	1.75	44	3.19	81	4.50	114	2.50	64	0.56	14	4.25	108	0.38	10
FDS-1-805B	Grey/Grey	805	365	1.01	26	1.75	44	3.19	81	4.50	114	2.50	64	0.56	14	4.25	108	0.38	10
FDS-1-250B	Grey	250	113	1.79	45	3.00	76	4.20	107	7.00	178	4.00	102	0.69	17	5.63	143	0.38	10
FDS-1-450B	Grey	450	204	1.54	39	3.00	76	4.20	107	7.00	178	4.00	102	0.69	17	5.63	143	0.38	10
FDS-1-625B	Grey	625	283	1.44	37	3.00	76	4.20	107	7.00	178	4.00	102	0.69	17	5.63	143	0.38	10
FDS-1-800B	Grey	800	363	1.31	33	3.00	76	4.20	107	7.00	178	4.00	102	0.69	17	5.63	143	0.38	10
FDS-1-1000B	Grey	1000	454	1.15	29	3.00	76	4.20	107	7.00	178	4.00	102	0.69	17	5.63	143	0.38	10
FDS-1-1250B	Grey	1250	567	1.09	28	3.00	76	4.20	107	7.00	178	4.00	102	0.69	17	5.63	143	0.38	10
FDS-1-1700B	Grey	1700	771	0.95	24	3.00	76	4.20	107	7.00	178	4.00	102	0.69	17	5.63	143	0.38	10
FDS-1-2200B	Grey/Grey	2200	998	1.00	26	3.00	76	4.20	107	7.00	178	4.00	102	0.69	17	5.63	143	0.38	10
FDS-1-2465B	Grey	2465	1118	1.00	25	3.00	76	4.20	107	7.00	178	4.00	102	0.69	17	5.63	143	0.38	10
FDS-1-2865B	Grey/Grey	2865	1300	1.00	25	3.00	76	4.20	107	7.00	178	4.00	102	0.69	17	5.63	143	0.38	10
FDS-1-3500B	Grey/Grey	3500	1588	1.00	25	3.00	76	4.20	107	7.00	178	4.00	102	0.69	17	5.63	143	0.38	10
FDS-1-2500B	Grey/Grey	2500	1134	1.09	28	3.00	76	4.20	107	10.00	254	4.00	102	0.69	17	6.25	159	0.50	13
FDS-1-3400B	Grey/Grey	3400	1542	0.95	24	3.00	76	4.20	107	10.00	254	4.00	102	0.69	17	6.25	159	0.50	13
FDS-1-4400B	Grey/Grey	4400	1996	1.00	26	3.00	76	4.20	107	10.00	254	4.00	102	0.69	17	6.25	159	0.50	13
FDS-1-4930B	Grey/Grey	4930	2236	1.00	25	3.00	76	4.20	107	10.00	254	4.00	102	0.69	17	6.25	159	0.50	13
FDS-1-5730B	Grey/Grey	5730	2599	1.00	25	3.00	76	4.20	107	10.00	254	4.00	102	0.69	17	6.25	159	0.50	13
FDS-1-7000B	Grey/Grey	7000	3175	1.00	25	3.00	76	4.20	107	10.00	254	4.00	102	0.69	17	6.25	159	0.50	13
FDS-1-5000B	Grey	5000	2268	1.09	28	3.00	76	4.20	107	8.00	203	8.00	203	0.69	17	6.88	175	0.50	13
FDS-1-6800B	Grey	6800	3084	0.95	24	3.00	76	4.20	107	8.00	203	8.00	203	0.69	17	6.88	175	0.50	13
FDS-1-8800B	Grey/Grey	8800	3992	1.00	26	3.00	76	4.20	107	8.00	203	8.00	203	0.69	17	6.88	175	0.50	13
FDS-1-9860B	Grey	9860	4472	1.00	25	3.00	76	4.20	107	8.00	203	8.00	203	0.69	17	6.88	175	0.63	16
FDS-1-11460B	Grey/Grey	11460	5198	1.00	25	3.00	76	4.20	107	8.00	203	8.00	203	0.69	17	6.88	175	0.63	16
FDS-1-14000B	Grey/Grey	14000	6350	1.00	25	3.00	76	4.20	107	8.00	203	8.00	203	0.69	17	6.88	175	0.63	16



Specifications

Vibration isolators shall be free standing, unhoused, laterally stable steel springs. Springs shall have a lateral stiffness greater than 1.0 times the rated vertical stiffness and shall be designed to provide a minimum 50% overload capacity.

Springs shall be assembled or welded between top and bottom load plates. The upper load plate shall be provided with steel leveling bolts, lock nut and washer for attachment to the supported equipment. The lower load plate shall incorporate a non-skid noise isolation pad and shall have provisions for bolting the isolator to the supporting structure, as required.

Springs shall be selected to provide operating static deflections shown on the Vibration Isolation Schedule or as otherwise indicated on the project documents. Springs shall be color coded or otherwise identified to indicate load capacity.

Spring isolation mounts for floor-mounted equipment shall be Model FDS, as manufactured by Kinetics Noise Control, Inc.

KINETICS Noise Control

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6300 Irelan Place
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Phone: 614-889-0480
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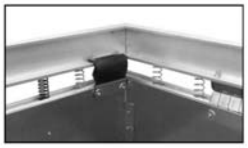
www.kineticsnoise.com
sales@kineticsnoise.com

Kinetics Noise Control, Inc. is continually upgrading the quality of our products. We reserve the right to make changes to this and all products without notice.

FDS 1-2 10/07

KINETICS™
Roof Curb Rail
Model KSR



A noise and vibration control system that goes beyond internal isolation.

Description
Kinetics KSR Isolation Rails are the next generation isolation system designed and engineered to isolate packaged rooftop equipment from the roof structure. Designed for easy installation, minimum interference with equipment overhang and with accessible springs, the Kinetics KSR goes well beyond internal isolation by reducing casing-radiated vibration caused by turbulent air flow as well as compressor and fan vibration.

KSR rails have a positive elastomeric air and weather seal permitting the inside of the unit to be used as a return air plenum. The KSR mates with the inside of the manufacturer's curb eliminating any internal interference. The KSR also features an impressive family of options including:

- Aluminum weather seal flashing
- Seismic restraint
- Airborne noise control package
- Duct blockoffs

Application
Kinetics Model KSR Isolation Rails are specifically designed and engineered for use as a noise and vibration isolation system for roof curb-mounted mechanical equipment.

Model KSR isolation rails are compatible with most roof-supported equipment and standard roof curb systems without modification and provide support, noise and vibration isolation, and an air and water seal for supported equipment.

Typical applications include support and isolation for unitary-packaged air-handling and refrigeration equipment, and exhaust fans, ordinarily mounted directly on non-isolated roof curb systems.

Model KSR isolation rails significantly reduce noise and vibration transmitted from rooftop equipment into roof structures by using equipment weight as an inertia mass to load high-deflection, free-standing, stable springs integrated with the continuous aluminum isolation rail system.

Specifications
Spring components shall be (1"/25 mm), (2"/51 mm) deflection, free-standing, unhoused, laterally stable steel springs. Springs shall have a lateral stiffness greater than 1.0 times the rated vertical stiffness and shall be designed for 50% overload to solid.

Springs shall be color coded to indicate load capacity.

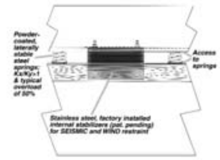
Rails shall provide continuous support for the rooftop equipment and shall be designed to provide isolation against casing-radiated vibration in the rooftop equipment housing and structureborne vibration from rotating and mechanical equipment in the rooftop package.

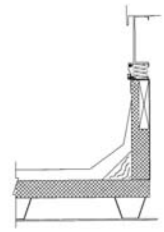
Rail assembly shall consist of extruded aluminum top and bottom members connected by spring isolators and a continuous air- and water-tight seal. The seal shall be a beaded elastomeric material retained in a keyway along the top extrusion. The weather strip shall be sealed along the bottom with an aluminum fascia strip.

Rail assemblies shall incorporate means for attachment to the building and the supported equipment and shall incorporate additional stiffening members if necessary to assure stability.

Vibration isolators shall be selected by the manufacturer for each specific application to comply with deflection requirements as shown on the Vibration Isolation Schedule or as indicated on the project documents.

Roof Curb Rails shall be Model KSR as manufactured by Kinetics Noise Control, Inc.





KINETICS Noise Control

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KSR 4/05

Appendix G: Concrete Slab Fasteners

SIMPSON Strong-Tie ANCHOR SYSTEMS

TITEN® *Concrete and Masonry Screws*

Titen® screws are 3/16" and 1/4" diameter masonry screws for attaching all types of components to concrete and masonry. Available in hex and phillips head designs in three colors. Use with appropriately sized Titen drill bits included with each box.

Warning: Industry studies show that hardened fasteners can experience performance problems in wet or corrosive environments. Accordingly, use these products in dry, interior and non-corrosive environments only.

MATERIAL: Heat-treated carbon steel

FINISH: Zinc plated with a baked on ceramic coating

CODES: Florida FL 2355.1

INSTALLATION:

Caution: Oversized holes in the base material will reduce or eliminate the mechanical interlock of the threads with the base material and will reduce the anchor's load capacity.

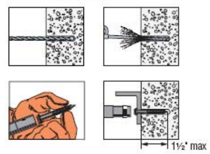
- Drill a hole in the base material using the appropriate diameter carbide drill bit as specified in the table. Drill the hole to the specified embedment depth plus 1/2" to allow the thread tapping dust to settle and blow it clean using compressed air. Overhead installations need not be blown clean. Alternatively, drill the hole deep enough to accommodate embedment depth and dust from drilling and tapping.
- Position fixture, insert screw and tighten using drill and installation tool fitted with a hex socket or phillips bit.

Preservative-treated wood applications: Suitable for use in non-ammonia formulations of CCA, ACQ-C, ACQ-D, CA-B, SBX/DOT and zinc borate. Use in dry, interior environments only. Use caution not to damage ceramic barrier coating during installation. Recommendations are based on testing and experience at time of publication and may change. Simpson Strong-Tie cannot provide estimates on service life of screws. Contact Simpson Strong-Tie for additional information.

Titen® Phillips flat head screw (PF)

Titen® Hex head screw (H)

Installation Sequence



Mechanical Anchors

Titen® Tension and Shear Load Values in Normal-Weight Concrete

Titen Dia. in. (mm)	Drill Bit Dia. in.	Embed. Depth in. (mm)	Critical Spacing in. (mm)	Critical Edge Dist. in. (mm)	Tension Load: f'c ≥ 2000 psi (13.8 MPa) Concrete – Ultimate lbs. (kN)	Tension Load: f'c ≥ 2000 psi (13.8 MPa) Concrete – Allowable lbs. (kN)	Tension Load: f'c ≥ 4000 psi (27.6 MPa) Concrete – Ultimate lbs. (kN)	Tension Load: f'c ≥ 4000 psi (27.6 MPa) Concrete – Allowable lbs. (kN)	Shear Load: f'c ≥ 2000 psi (13.8 MPa) Concrete – Ultimate lbs. (kN)	Shear Load: f'c ≥ 2000 psi (13.8 MPa) Concrete – Allowable lbs. (kN)
3/16 (4.8)	5/32	1 (25.4)	2¼ (57.2)	1⅛ (28.6)	500 (2.2)	125 (0.6)	640 (2.8)	160 (0.7)	1,020 (4.5)	255 (1.1)
3/16 (4.8)	5/32	1½ (38.1)	2¼ (57.2)	1⅛ (28.6)	1,220 (5.4)	305 (1.4)	1,850 (8.2)	460 (2.0)	1,670 (7.4)	415 (1.8)
¼ (6.4)	3/16	1 (25.4)	3 (76.2)	1½ (38.1)	580 (2.6)	145 (0.6)	726 (3.2)	180 (0.8)	900 (4.0)	225 (1.0)
¼ (6.4)	3/16	1½ (38.1)	3 (76.2)	1½ (38.1)	1,460 (6.5)	365 (1.6)	2,006 (8.9)	500 (2.2)	1,600 (7.1)	400 (1.8)

1. Maximum anchor embedment is 1½" (38.1 mm).
2. Concrete must be minimum 1.5 x embedment.

Titen® Phillips head screw available in white, standard blue and silver

Titen® Tension and Shear Load Values in Face Shell of Hollow and Grout-Filled CMU

Titen Dia. in. (mm)	Drill Bit Dia. in.	Embed. Depth in. (mm)	Critical Spacing in. (mm)	Critical Edge Dist. in. (mm)	Values for 6" or 8" Lightweight, Medium-Weight or Normal-Weight CMU: Tension Load – Avg. Ult. lbs. (kN)	Tension Load – Allow. lbs. (kN)	Shear Load – Avg. Ult. lbs. (kN)	Shear Load – Allow. lbs. (kN)
3/16 (4.8)	5/32	1 (25.4)	2¼ (57.2)	1⅛ (28.6)	542 (2.4)	110 (0.5)	1,016 (4.5)	205 (0.9)
¼ (6.4)	3/16	1 (25.4)	3 (76.2)	1½ (38.1)	740 (3.3)	150 (0.7)	1,242 (5.5)	250 (1.1)

*See page 10 for an explanation of the load table icons

1. The tabulated allowable loads are based on a safety factor of 5.0 for installations under the IBC and IRC. For installations under the UBC use a safety factor of 4.0 (multiply the tabulated allowable loads by 1.25).
2. See notes 1 and 2 above.

Bulk packaging available for large-volume applications

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SIMPSON Strong-Tie ANCHOR SYSTEMS

LSES *Lag Screw Expansion Shield*

The Lag Screw Expansion Shield is a die cast zinc alloy expansion shield for anchoring lag screws in a variety of base materials, including concrete, concrete block, brick and mortar joints. Radial ribs provide additional holding power in softer material.

MATERIAL: Die cast Zamac 3 Alloy

INSTALLATION:

Caution: Oversized holes may make it impossible to set the anchor and will reduce the anchor's load capacity.

- Drill a hole in the base material using the appropriate-diameter carbide drill bit as specified in the table. Drill the hole to the specified embedment depth plus 1/8" for flush mounting and blow it clean using compressed air. Alternatively, drill the hole deep enough to accommodate embedment depth and dust from drilling. Overhead installations need not be blown clean.
- Insert anchor into hole. Tap with hammer until flush with surface of base material.
- Position fixture; insert screw and tighten.

LSES

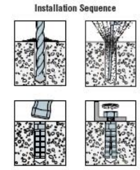
LSES Product Data and Tension Loads in Normal-Weight Concrete

Size (in.)	Model No.	Drill Bit Dia. (in.)	Embed. Depth (in.)	Allowable Tension Load (lbs.) f'c ≥ 3000 psi	Quantity: Box	Quantity: Carton
¼ Short	LSES25S	½	1	90	100	500
5/16 Short	LSES31S	½	1¼	100	100	500
⅜ Short	LSES37S	⅝	1¾	220	50	250
½ Short	LSES50S	¾	2	250	25	125
¼ Long	LSES25L	½	1½	120	50	250
5/16 Long	LSES31L	½	1¾	150	50	250
⅜ Long	LSES37L	⅝	2½	260	50	200
½ Long	LSES50L	¾	3	310	25	100

*See page 10 for an explanation of the load table icons

1. The allowable loads listed are based on a safety factor of 4.0.
2. The minimum concrete thickness is 1½ times the embedment depth.
3. Screw is not included.

Installation Sequence



Mechanical Anchors

ESA *Expansion Screw Anchor*

The ESA was the original internally-threaded mechanical anchor design. The malleable lead shield allows for secure mounting.

MATERIAL: Cone – Die Cast Zamac 3 alloy; Expander Shield – 3 - 5% antimonial lead

INSTALLATION:

- Drill a hole in the base material using the appropriate diameter carbide drill bit as specified in the table. Drill the hole to the specified embedment depth plus 1/8" for flush mounting. Blow the hole clean using compressed air. Overhead installations need not be blown clean.
- Insert anchor into hole.
- Using a piloted setting punch, drive expander shield over cone.
- Position fixture; insert fastener and tighten.

CODES: Meets Federal Specifications A-A-1922A, Type 1, except ESA50.

ESA

Piloted Setting Punch

Installation Sequence

ESA Product Data and Tension Loads in Normal-Weight Concrete

Internal Thread Size (dia. - threads per inch)	Model No.	Drill Bit Dia. (in.)	Embed. Depth (in.)	Allowable Tension Load (lbs.) f'c ≥ 3000 psi	Quantity: Box	Quantity: Carton
#10 - 24	ESA10	⅜	⅝	140	100	1600
¼ - 20	ESA25	½	⅞	190	100	500
⅜ - 16	ESA37	¾	1¼	380	50	200
½ - 13	ESA50	⅞	1½	400	50	200

1. The allowable loads listed are based on a safety factor of 4.0.
2. The minimum concrete thickness is 1½ times the embedment depth.
3. Machine bolt is not included.
4. One piloted setting punch is included in each box.

*See page 10 for an explanation of the load table icons

Piloted Setting Punch Product Data

Model No.	For Use With	Box Qty.
PSP10	ESA10	10
PSP25	ESA25	10
PSP37	ESA37	10
PSP50	ESA50	10

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