kpff

July 10, 2024

Miles Woofter
woofter bolch architecture
107 SE Washington St. #228
Portland, OR 97214

Re: PCC SY-HT West Side Renovation
12000 SW 49th Ave, Portland, OR 97219
Application #: 24-020319-STR-01-CO
Response to Structural Plan Review Comments

Dear Miles:

This letter is in response to the City of Portland's Structural Checksheet created by Whitney Olsen and dated June 27, 2024. We have provided written responses to each item separately which can be submitted to the city for review. Additionally, please find attached structural calculation pages C22-1 through C36-58 dated July 10, 2024, which verify the structural adequate of the project including revisions shown on attached drawing sheets S0.02 through S6.04, dated July 10, 2024.

If you have any questions or need further information, please let me know.

Sincerely,

Nick Saari, PE, SE
Associate

STRUCTURAL
REGISTERED PROFESSIONAL
ENGINEER
79476
OREGON
MARCH 13, 2007
JOSHUA P. RICHARDS
EXPIRES 12.31.24

Attachments

Project No. 10022200424

kpff
Portland, Oregon

Project	By	Sheet No. C22-1	
Location	Date		
Client	Revised	Job No.	
	Date		

GRADE BEAM DESIGN AT GRID "I" MICROPILES

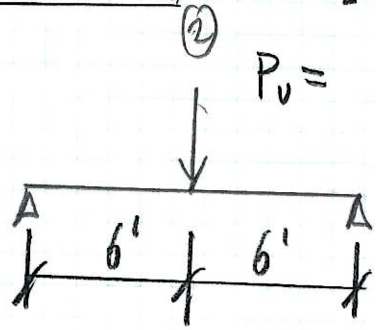
CASE 1 @ GRIDLINE 2

$P_L = 463 \text{ s.f.} \times 40 \text{ psf} = 18.5^k$

$P_U = 1.6 \times 18.5 + 1.2 \times (47 - 18.5)$

$= 64^k$

REF PLAN CHECK 1 RESPONSE PAGE C22-1

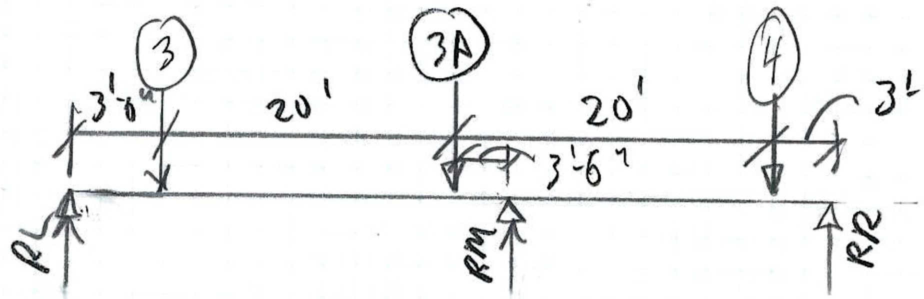


$V_U = 32^k$

$M_U = \frac{64 \times 12}{4} = \underline{192}^{k\text{-ft.}}$

MAX OVERALL BENDING

CASE 2 @ GRIDLINES 3-3A-4



	3	3a	4
$P_U =$	42^k	42^k	64^K

$R_L = 42^k$

$R_R = 53^k$

$R_M = 59^K$

$V_{U,MAX} = \underline{53^k}$ ← MAX OVERALL SHEAR

$M_{U\,MAX} = 186^{k\text{-ft.}}$

kpff Portland, Oregon	Project	By	Sheet No. C22-2
	Location	Date	
	Client	Revised	Job No.
		Date	

GRADE BEAM DESIGN CONT.

$b = 20''$ MIN. $\quad f'_c = 4{,}000$ psi

$H = 24''$

$d = 19''$ MIN.

#4 STIRRUPS: @ 8" O.C. → $\phi V_n = 78.8k > 53^k$ ✓

$A_v = 0.40 in^2/8''$

(4) #7 T & B. $\quad \phi M_n = 194^{k\text{-}ft} > 192^{k\text{-}ft}$ ✓

$A_s = 2.4 in^2$

∴ #4 TIES @ 8" o.c.
& (4) #7 CONT. T & B. ok. ✓

kpff Portland, Oregon	Project	By	Sheet No. C22-3
	Location	Date	
	Client	Revised	Job No.
		Date	

MICROPILE CONNECTION AT PILE CAP

THERE IS NO UPLIFT OR SHEAR

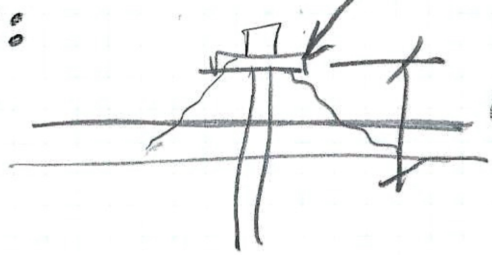
∴ DESIGN FOR MINIMUM CONNECTION.

T/10 % OF COMPRESSION CAPACITY

$T_u = 1.5 \times 100 \times 0.1 = 15$ KIPS ULT.

BEARING PL AREA 4" SQ.

FAILURE CONE:



6" → ~~SEE~~ CALC. OF SIMILAR SIMPSON PAB10.

1.Project information

Customer company:
Customer contact name:
Customer e-mail:
Comment:

Project description:
Location:
Fastening description:

2. Input Data & Anchor Parameters

General
Design method:ACI 318-19
Units: Imperial units

Anchor Information:
Anchor type: Cast-in-place
Material: AB
Diameter (inch): 1.250
Effective Embedment depth, h_{ef} (inch): 6.000
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 9.00
C_{min} (inch): 7.50
S_{min} (inch): 7.50

Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 18.00
State: Cracked
Compressive strength, f'c (psi): 4000
$\Psi_{c,V}$: 1.0
Reinforcement condition: Supplementary reinforcement not present
Supplemental edge reinforcement: Not applicable
Reinforcement provided at corners: No
Ignore concrete breakout in tension: No
Ignore concrete breakout in shear: No
Ignore 6do requirement: No
Build-up grout pad: No

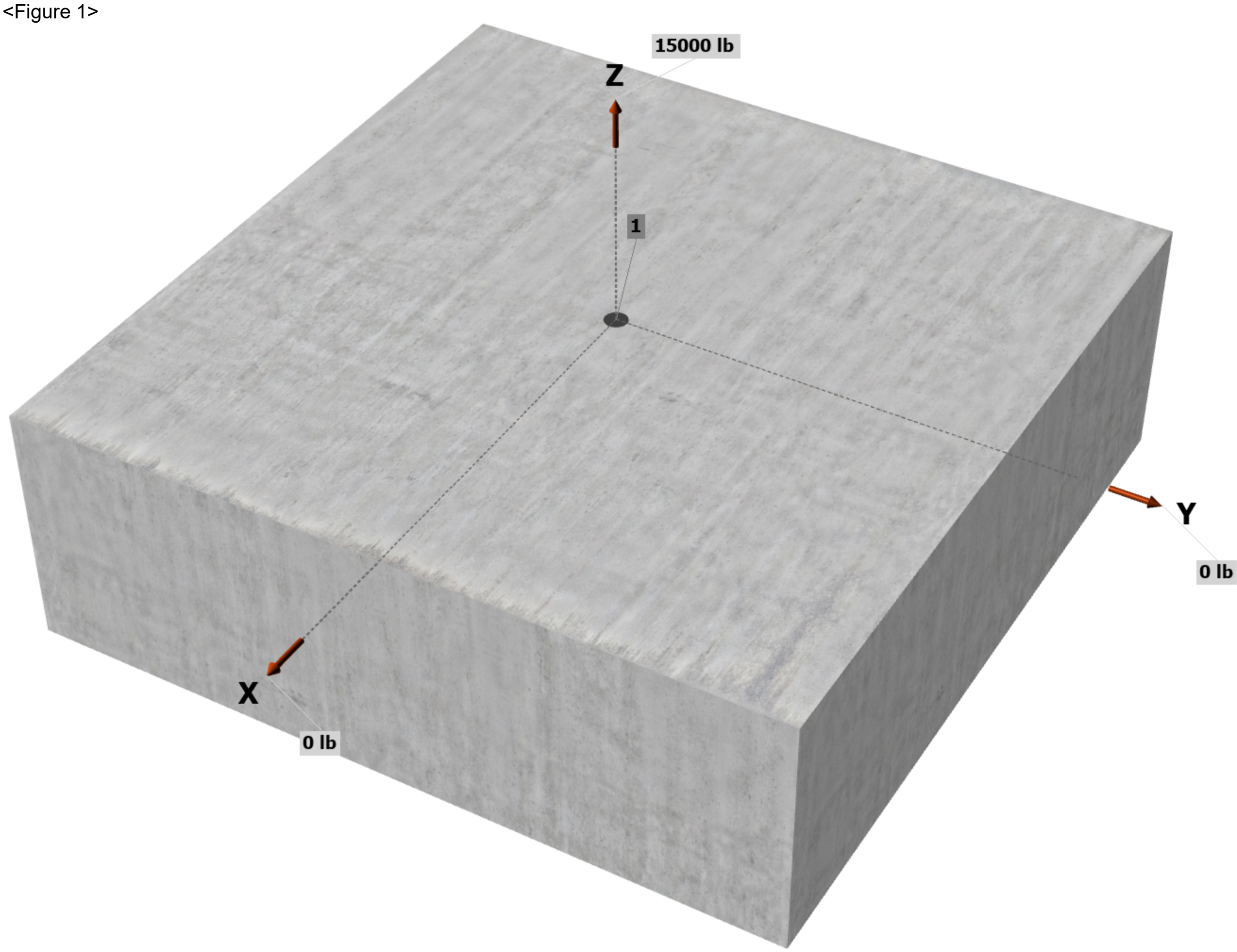
Recommended Anchor
Anchor Name: PAB Pre-Assembled Anchor Bolt - PAB10 (1 1/4"Ø)

Load and Geometry
Load factor source: ACI 318 Section 5.3
Load combination: not set
Seismic design: Yes
Anchors subjected to sustained tension: Not applicable
Ductility section for tension: 17.10.5.2 not applicable
Ductility section for shear: 17.10.6.2 not applicable
Ω_0 factor: not set
Apply entire shear load at front row: Yes
Anchors only resisting wind and/or seismic loads: Yes

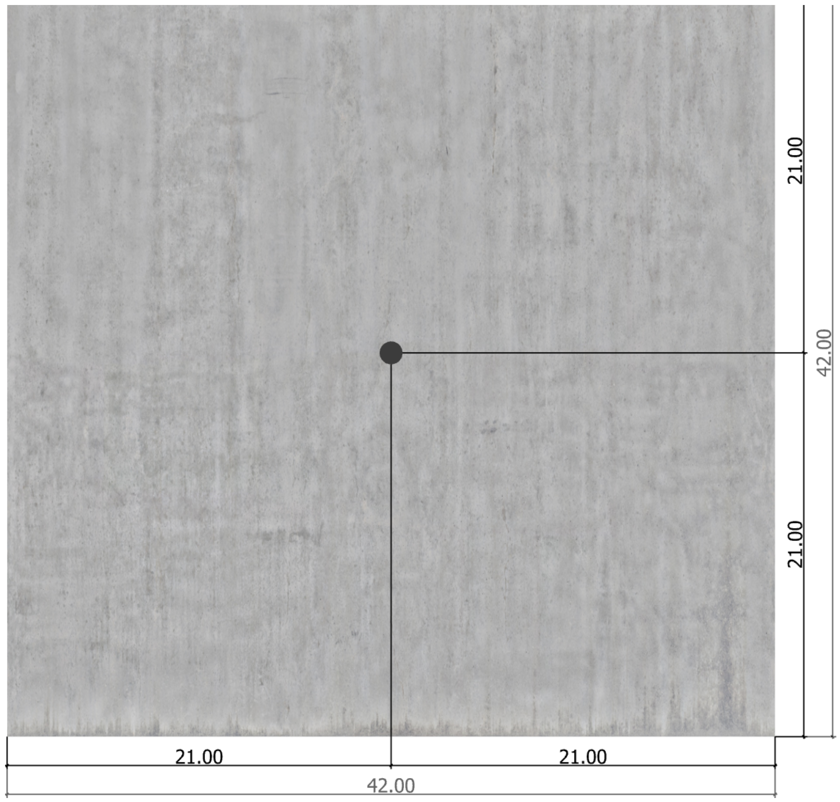
Strength level loads:

N_{ua} [lb]: 15000
V_{uax} [lb]: 0
V_{uay} [lb]: 0

<Figure 1>



<Figure 2>



3. Resulting Anchor Forces

Anchor	Tension load, N_{ua} (lb)	Shear load x, V_{uax} (lb)	Shear load y, V_{uay} (lb)	Shear load combined, $\sqrt{(V_{uax})^2+(V_{uay})^2}$ (lb)
1	15000.0	0.0	0.0	0.0
Sum	15000.0	0.0	0.0	0.0

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 15000
Resultant compression force (lb): 0
Eccentricity of resultant tension forces in x-axis, e'_{Nx} (inch): 0.00
Eccentricity of resultant tension forces in y-axis, e'_{Ny} (inch): 0.00

4. Steel Strength of Anchor in Tension (Sec. 17.6.1)

N_{sa} (lb)	ϕ	ϕN_{sa} (lb)
56200	0.75	42150

5. Concrete Breakout Strength of Anchor in Tension (Sec. 17.6.2)

$N_b = k_c \lambda_a \sqrt{f'_c} h_{ef}^{1.5}$ (Eq. 17.6.2.2.1)

k_c	λ_a	f'_c (psi)	h_{ef} (in)	N_b (lb)
24.0	1.00	4000	6.000	22308

$0.75\phi N_{cb} = 0.75\phi\,(A_{Nc} / A_{Nco})\,\Psi_{ed,N}\Psi_{c,N}\Psi_{cp,N}N_b$ (Sec. 17.5.1.2 & Eq. 17.6.2.1a)

A_{Nc} (in^2)	A_{Nco} (in^2	$c_{a,min}$ (in)	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	$0.75\phi N_{cb}$ (lb)
462.25	324.00	21.00	1.000	1.00	1.000	22308	0.70	16709

6. Pullout Strength of Anchor in Tension (Sec. 17.6.3)

$0.75\phi N_{pn} = 0.75\phi\Psi_{c,P}N_p = 0.75\phi\Psi_{c,P}8A_{brg}f'_c$ (Sec. 17.5.1.2, Eq. 17.6.3.1 & 17.6.3.2.2a)

$\Psi_{c,P}$	A_{brg} (in^2)	f'_c (psi)	ϕ	$0.75\phi N_{pn}$ (lb)
1.0	8.39	4000	0.70	141019

11. Results

Interaction of Tensile and Shear Forces (Sec. 17.8)

Tension	Factored Load, N_{ua} (lb)	Design Strength, $øN_n$ (lb)	Ratio	Status
Steel	15000	42150	0.36	Pass
Concrete breakout	**15000**	**16709**	**0.90**	**Pass (Governs)**
Pullout	15000	141019	0.11	Pass

PAB10 (1 1/4"Ø) with hef = 6.000 inch meets the selected design criteria.

12. Warnings

- Per designer input, the tensile component of the strength-level earthquake force applied to anchors does not exceed 20 percent of the total factored anchor tensile force associated with the same load combination. Therefore the ductility requirements of ACI 318 17.10.5.2 for tension need not be satisfied – designer to verify.

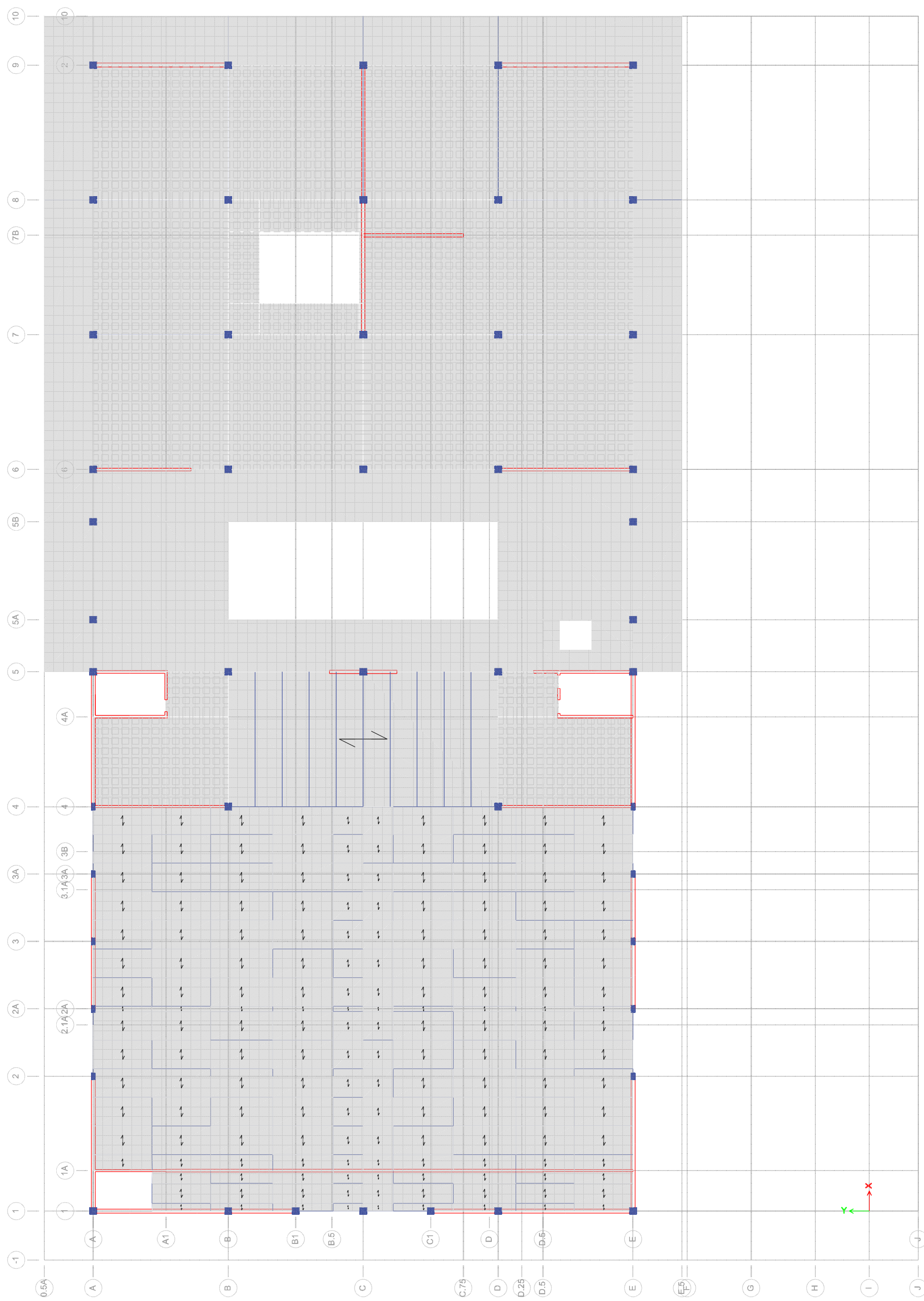
- Per designer input, the shear component of the strength-level earthquake force applied to anchors does not exceed 20 percent of the total factored anchor shear force associated with the same load combination. Therefore the ductility requirements of ACI 318 17.10.6.2 for shear need not be satisfied – designer to verify.

- Designer must exercise own judgement to determine if this design is suitable.

7/12/2024

C36-1

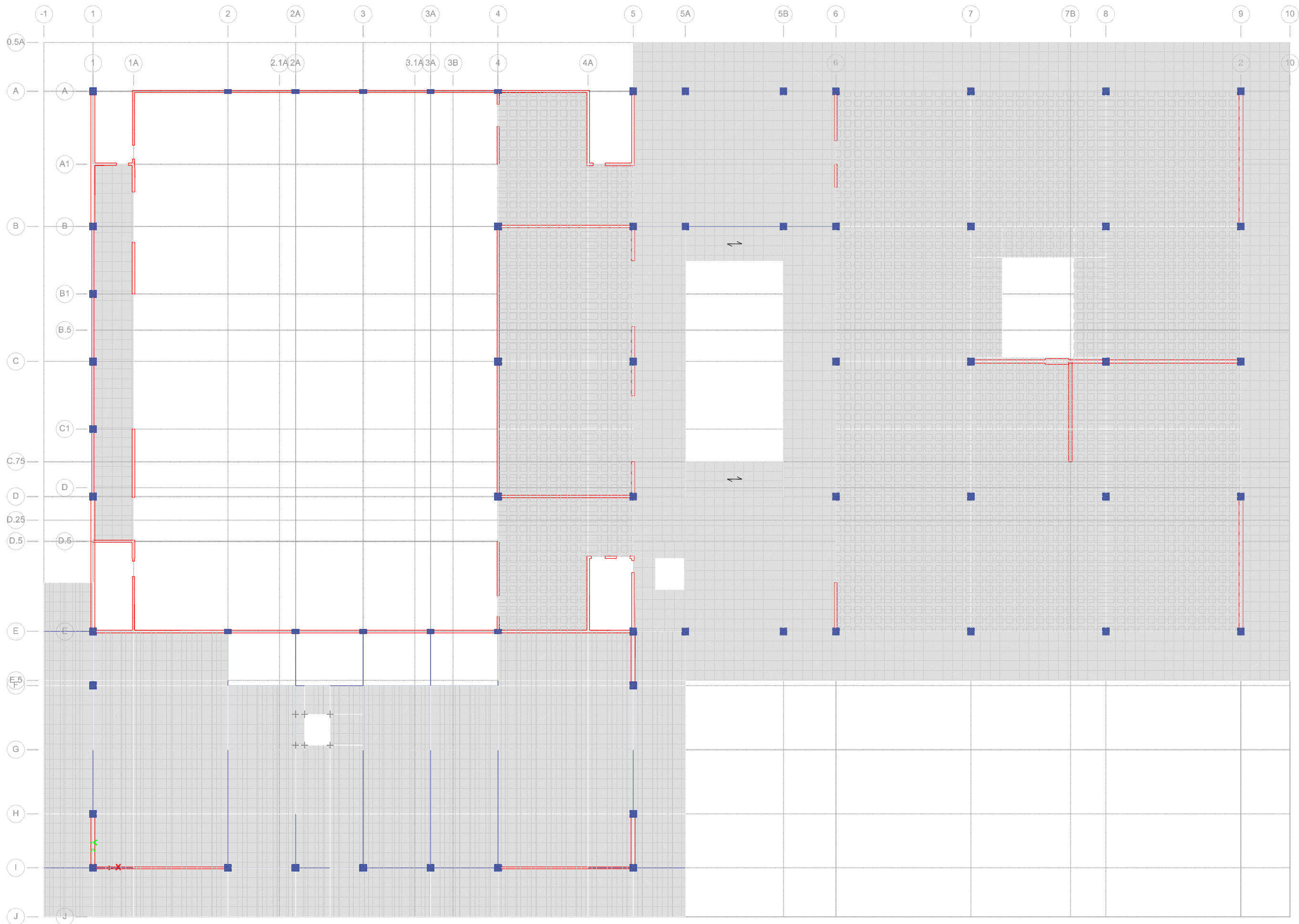
ETABS PLAN VIEWS - REF COMMENT 36



Plan View - Story4 - Z = 58 (ft)

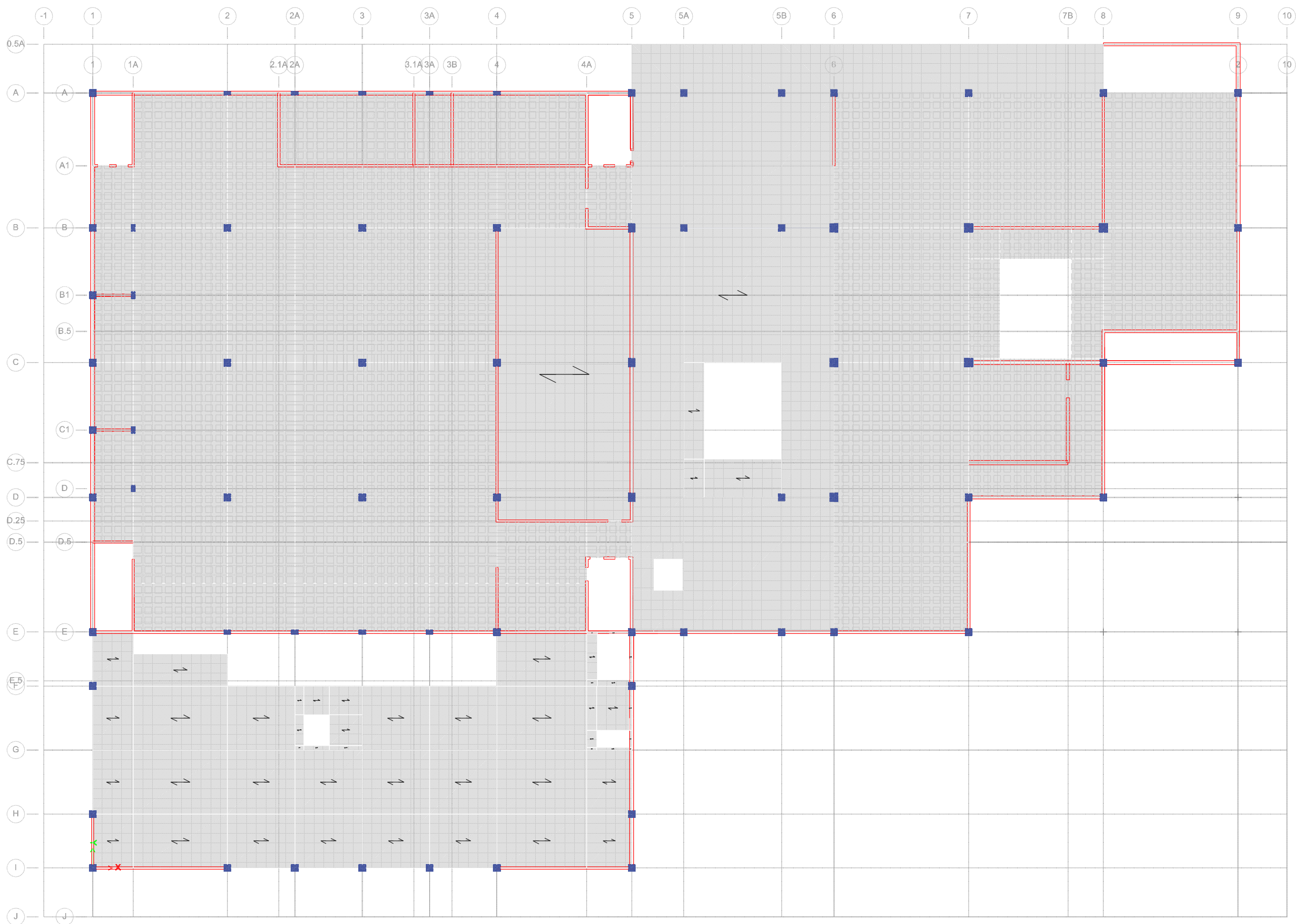
Lateral Design Updated openings.EDB

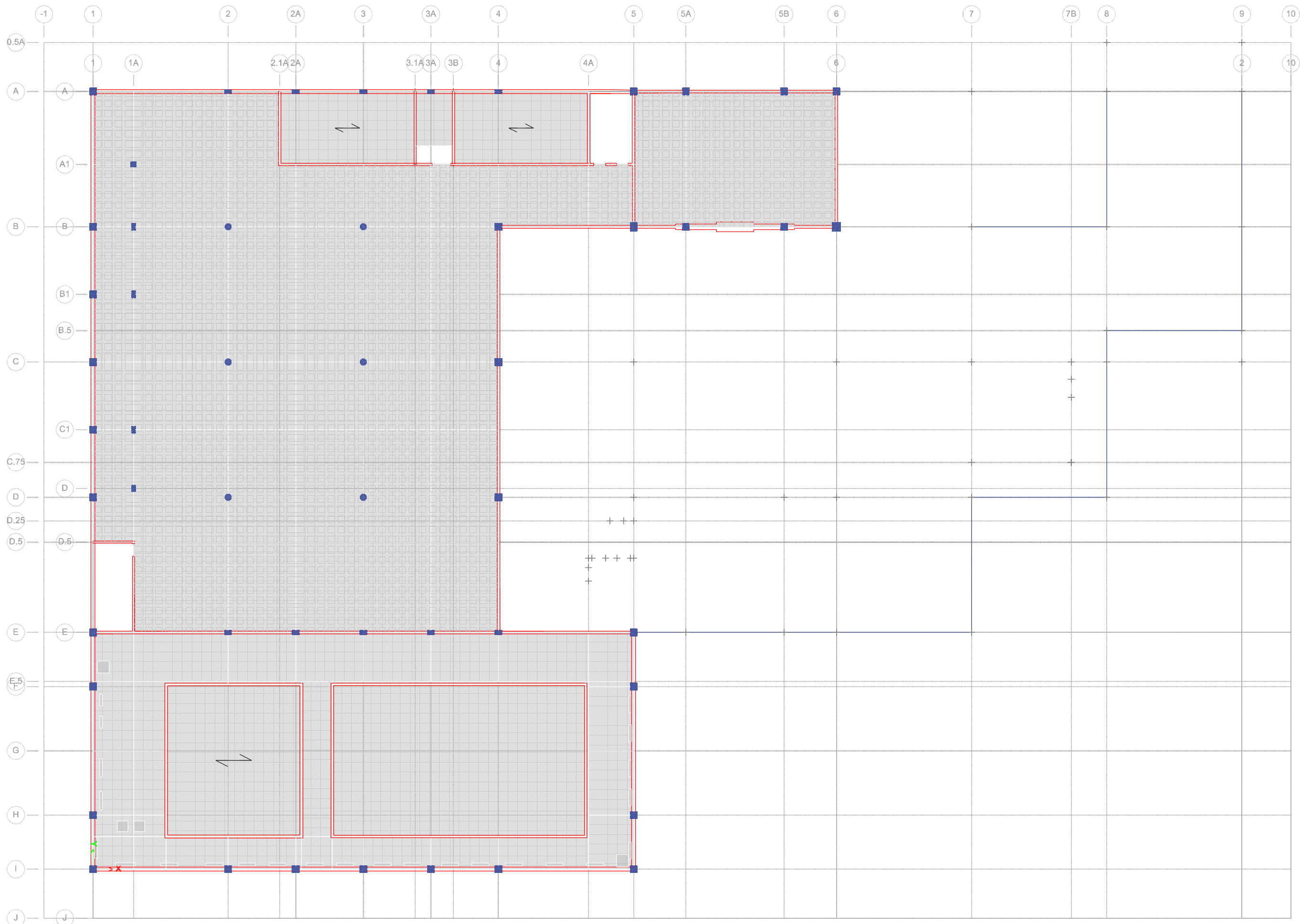
ETABS 21.2.0



Lateral Design Updated openings.EDB

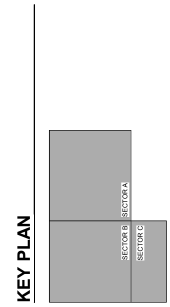
Plan View - Story3 - Z = 43.5 (ft)

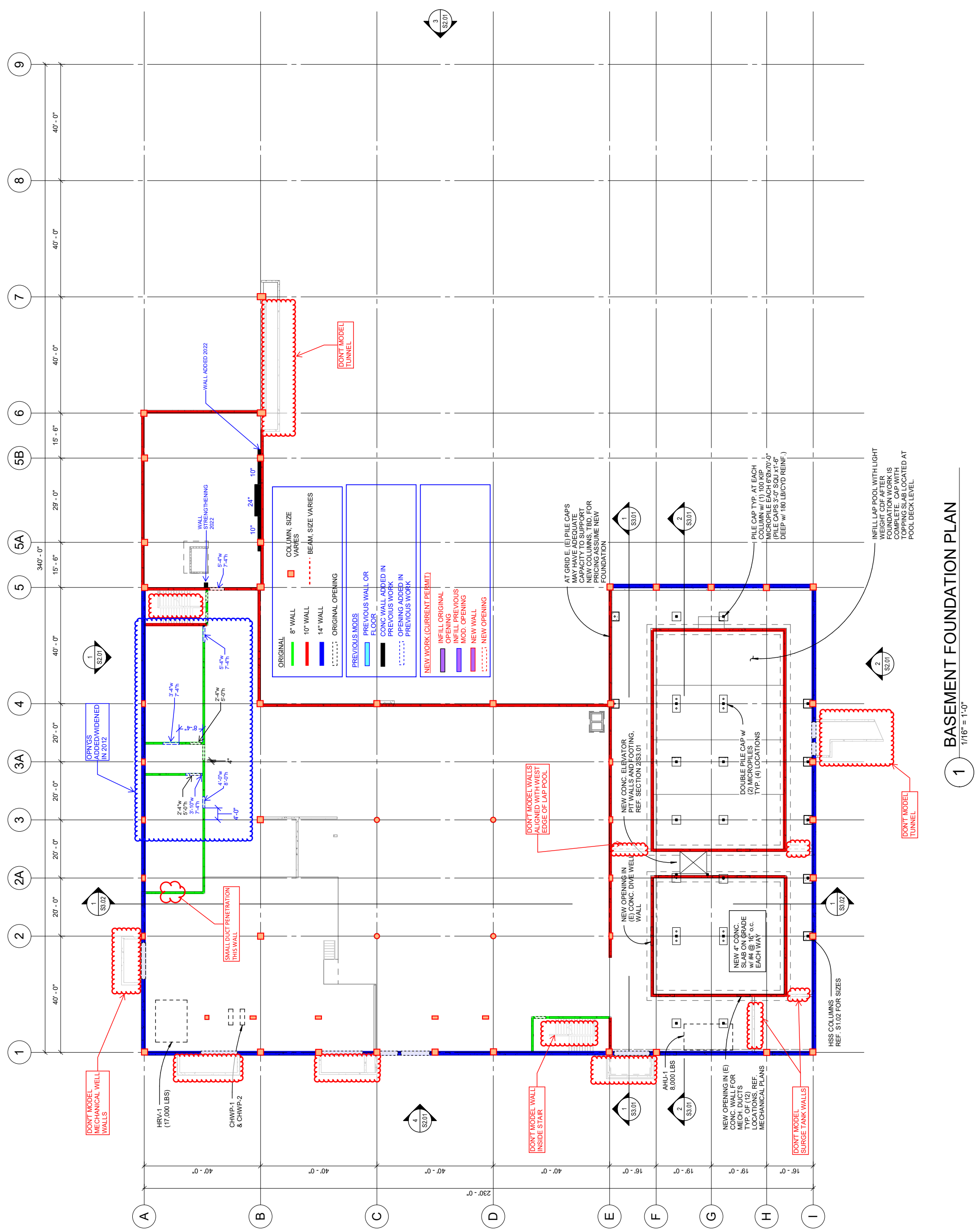

-1
1
2
2A
3
3A
4
5
5A
5B
6
7
7B
8
9
10
1A
2.1A
3.1A
3B
4A
0.5A
A
A1
B
B1
B.5
C
C1
C.75
D
D.25
D.5
E
E.5
F
G
H
I
J



Plan View - Story1 - Z = 14.5 (ft)

MARKUP OF PLANS SHOWING REVISIONS FROM TIME OF ORIGINAL CONSTRUCTION - FOR REFERENCE





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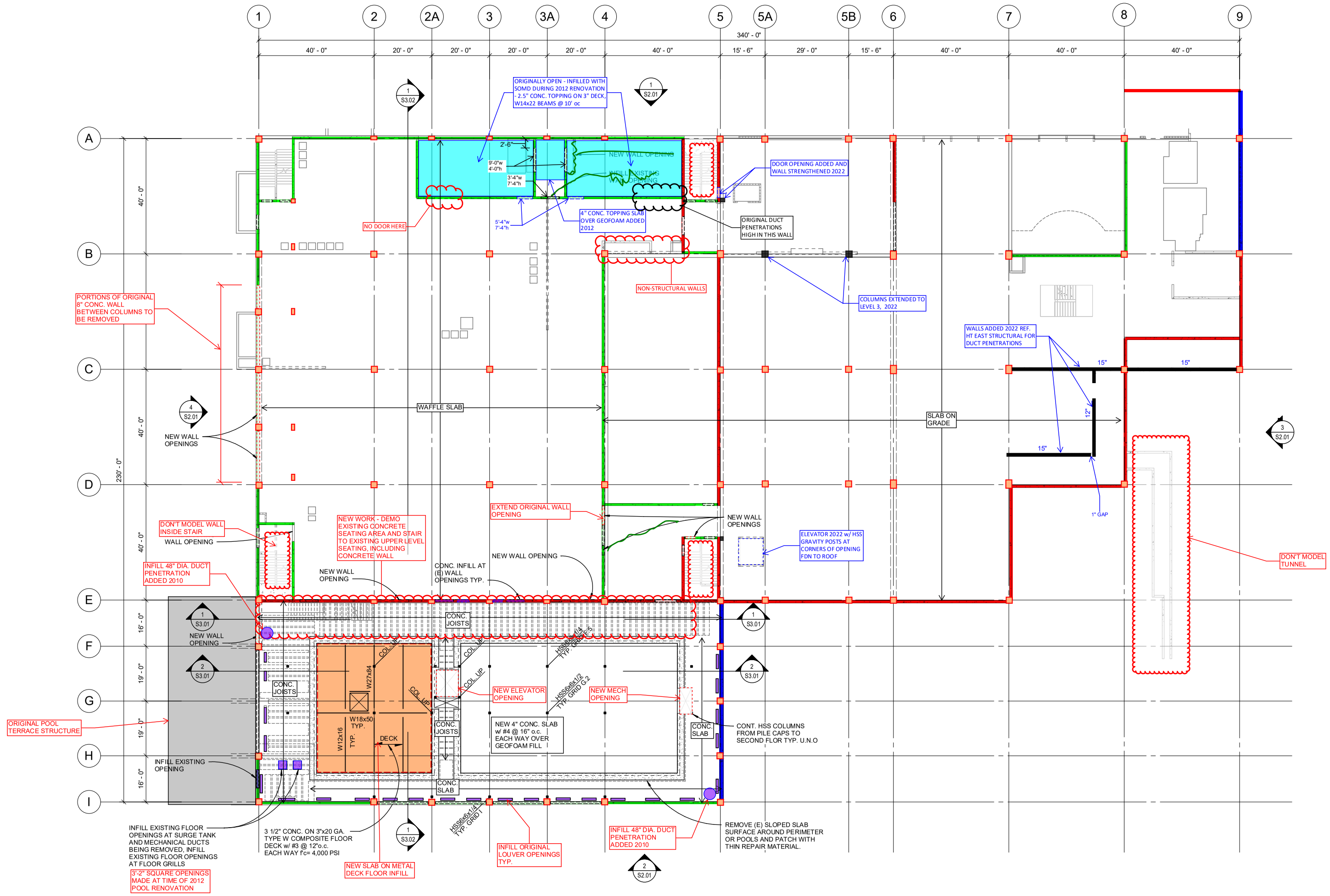
Project No. 221000
Revisions
NO.	DESCRIPTION	DATE

C36-5

BASEMENT FOUNDATION PLAN

S1.01



1 LEVEL 1 FRAMING PLAN

1/16" = 1'-0"

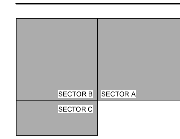
NOTES:

1. REF. ***SS080*** FOR TYPICAL STEEL DETAILS.
2. REF ***SX.XX*** FOR COLUMN SCHEDULE.
3. BEAMS ARE EQUALLY SPACED IN BAYS U.N.O.
4. BEAMS ARE CENTERED ON COLUMNS, WALLS AND/OR GRID LINES, U.N.O.
5. LOCATE BEAM CENTERLINE X" FROM EDGE OF OPENING OR SLAB/DECK EDGE U.N.O.
6. [X] INDICATES CONNECTION TYPE. REF. ***SS011 - SS012*** FOR SCHEDULES AND CONNECTION DETAILS. REF. NOTE ***X*** WHERE CONNECTION TYPES ARE NOT SHOWN.
7. [XC] INDICATES CONNECTION TYPE TO CONCRETE REF. ***SS012.01*** FOR DETAIL
8. PROVIDE THE FOLLOWING CONNECTION TYPES UNLESS NOTED OTHERWISE ON THE PLANS:

BEAM DESIGNATION	CONNECTION TYPE
W8	2D
W10	2
W12, W14	3
W16, W18	4
W21, W24	5
W27, W30	6
W33, W36	7

9. [XX] INDICATES NUMBER OF 3/4"ØxX" LONG HEADED STUDS EVENLY DISTRIBUTED ALONG BEAM LENGTH. REF. 5/S6.02 FOR TYPICAL COMPOSITE BEAM STUD SPACING DETAIL. PROVIDE STUDS @ 12" o.c. (MAX.) U.N.O.
10. [X-X-X] INDICATES NUMBER OF 3/4"ØxX" LONG HEADED STUDS EVENLY DISTRIBUTED BETWEEN WF BEAMS ON WF GIRDERS. REF. 5/S6.02 FOR TYPICAL COMPOSITE BEAM STUD SPACING DETAIL.
11. <X"> INDICATES UPWARD CAMBER AT MID SPAN.
12. D - X INDICATES SPAN DIRECTION OF DECK. REF. SCHEDULE 1/S6.02 FOR DECK INFORMATION.
13. EL. XXX'-XX" INDICATES TOP OF SLAB ELEVATION.
14. EL. XXX'-XX" INDICATES BOTTOM OF DECK ELEVATION.
15. INDICATES MOMENT CONNECTION. REF. 9/S6.03 - ***SS012.03*** FOR DETAILS.
16. INDICATES SFRS COLLECTOR CONNECTION. REF. ***SS040.02 - SS040.04*** FOR DETAILS.
17. INDICATES FULL-HEIGHT STIFFENER. REF. 3/S6.01 FOR DETAIL.
18. INDICATES DIAGONAL BRACING AT WF BEAM. REF. ***SS013.01*** AND ***SS013.02***. DOUBLE ARROW INDICTES LOW END OF BRACE.
19. X INDICATES BEAM PENETRATION. REF. SCHEDULE 3/S6.03. PROVIDE ADDITIONAL STUDS AS IDENTIFIED
20. REF. S6.03 FOR TYPICAL DECK REINFORCING AT OPENINGS.
21. (A) INDICATES ABOVE.
22. (B) INDICATES BELOW
23. (E) INDICATES EXISTING.
24. INDICATES COLUMN BELOW.
25. INDICATES ROOF TIE OFF. REF. ***SS013.08 - SS013.09*** FOR CONNECTION DETAILS.
26. INDICATES ADDITIONAL LOAD DUE TO SNOW DRIFT.
27. [XXX] INDICATES MEMBER PART OF SEISMIC FORCE RESISTING SYSTEM (SFRS). REF. GENERAL STRUCTURAL NOTES, SPECIFICATIONS, AND DETAILS FOR REQUIREMENTS.

KEY PLAN



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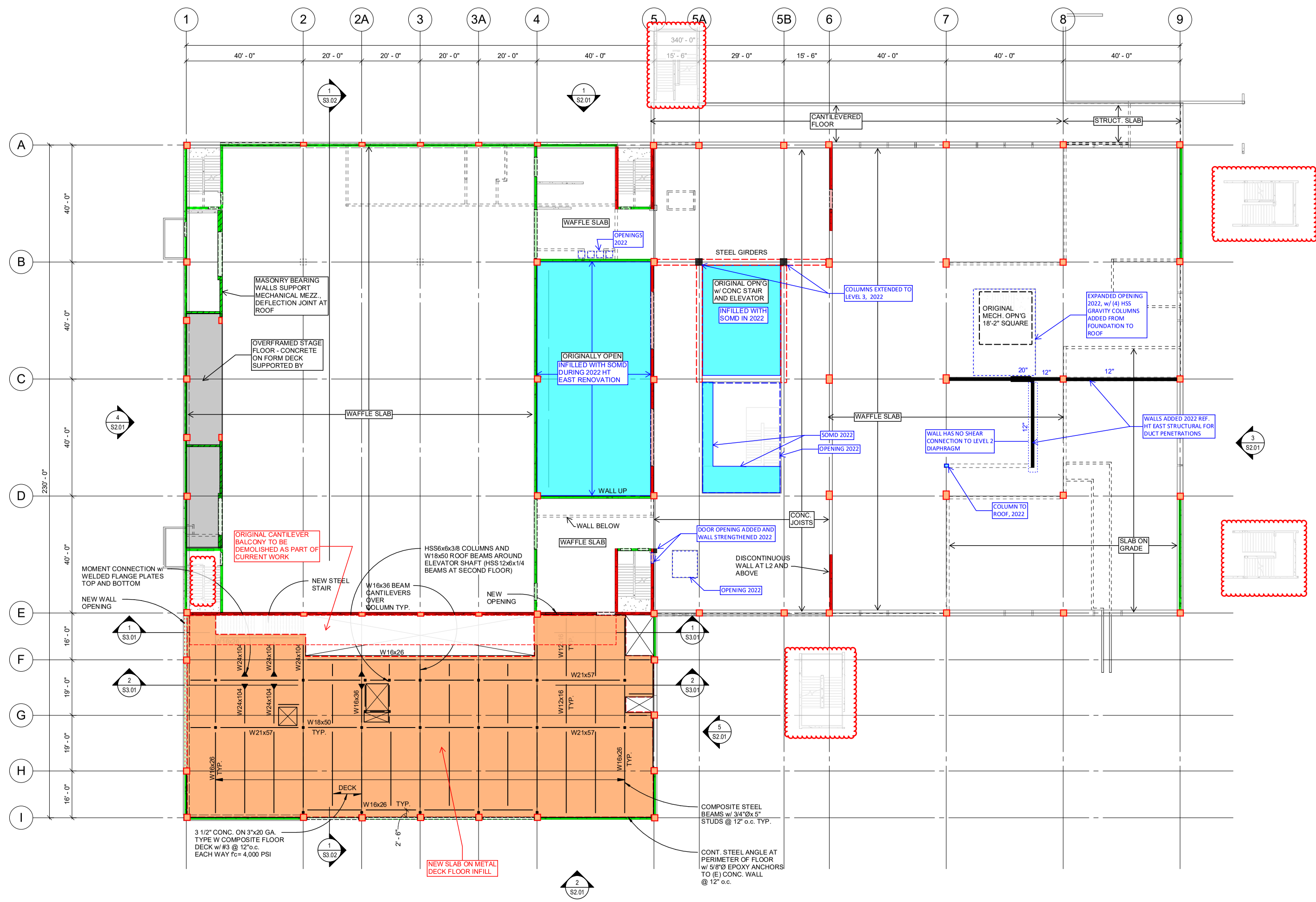
C36-6

LEVEL 1 FRAMING PLAN

S1.02



1 LEVEL 2 FRAMING PLAN

1/16" = 1'-0"

NOTES:

1. REF. **SS080** FOR TYPICAL STEEL DETAILS.
2. REF **SX.XX** FOR COLUMN SCHEDULE.
3. BEAMS ARE EQUALLY SPACED IN BAYS U.N.O.
4. BEAMS ARE CENTERED ON COLUMNS, WALLS AND/OR GRID LINES, U.N.O.
5. LOCATE BEAM CENTERLINE X" FROM EDGE OF OPENING OR SLAB/DECK EDGE U.N.O.
6. [X] INDICATES CONNECTION TYPE. REF. **SS011 - SS012** FOR SCHEDULES AND CONNECTION DETAILS. REF. NOTE ***X*** WHERE CONNECTION TYPES ARE NOT SHOWN.
7. [XC] INDICATES CONNECTION TYPE TO CONCRETE REF. **SS012.01** FOR DETAIL
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BEAM DESIGNATION	CONNECTION TYPE
W8	2D
W10	2
W12, W14	3
W16, W18	4
W21, W24	5
W27, W30	6
W33, W36	7

9. [XX] INDICATES NUMBER OF 3/4"ØxX" LONG HEADED STUDS EVENLY DISTRIBUTED ALONG BEAM LENGTH. REF. 5/S6.02 FOR TYPICAL COMPOSITE BEAM STUD SPACING DETAIL. PROVIDE STUDS @ 12" o.c. (MAX.) U.N.O.
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14. EL. XXX'-XX" INDICATES BOTTOM OF DECK ELEVATION.
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16. INDICATES SFRS COLLECTOR CONNECTION. REF. **SS040.02 - SS040.04** FOR DETAILS.
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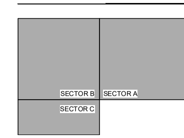
KEY PLAN



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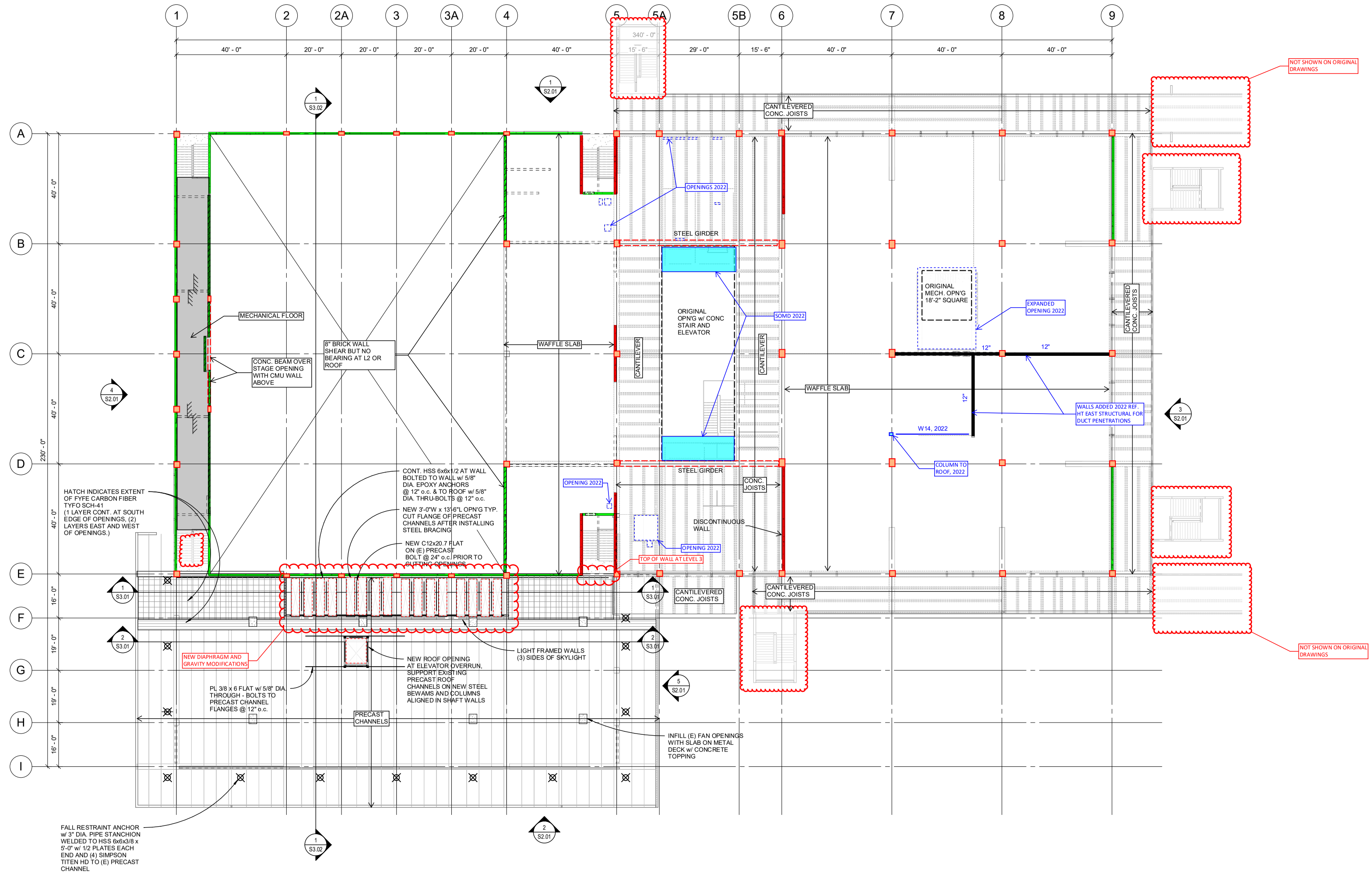
C36-7

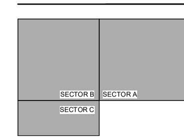
LEVEL 2 FRAMING PLAN

S1.03



1 LEVEL 3 FRAMING PLAN
1/16" = 1'-0"

KEY PLAN



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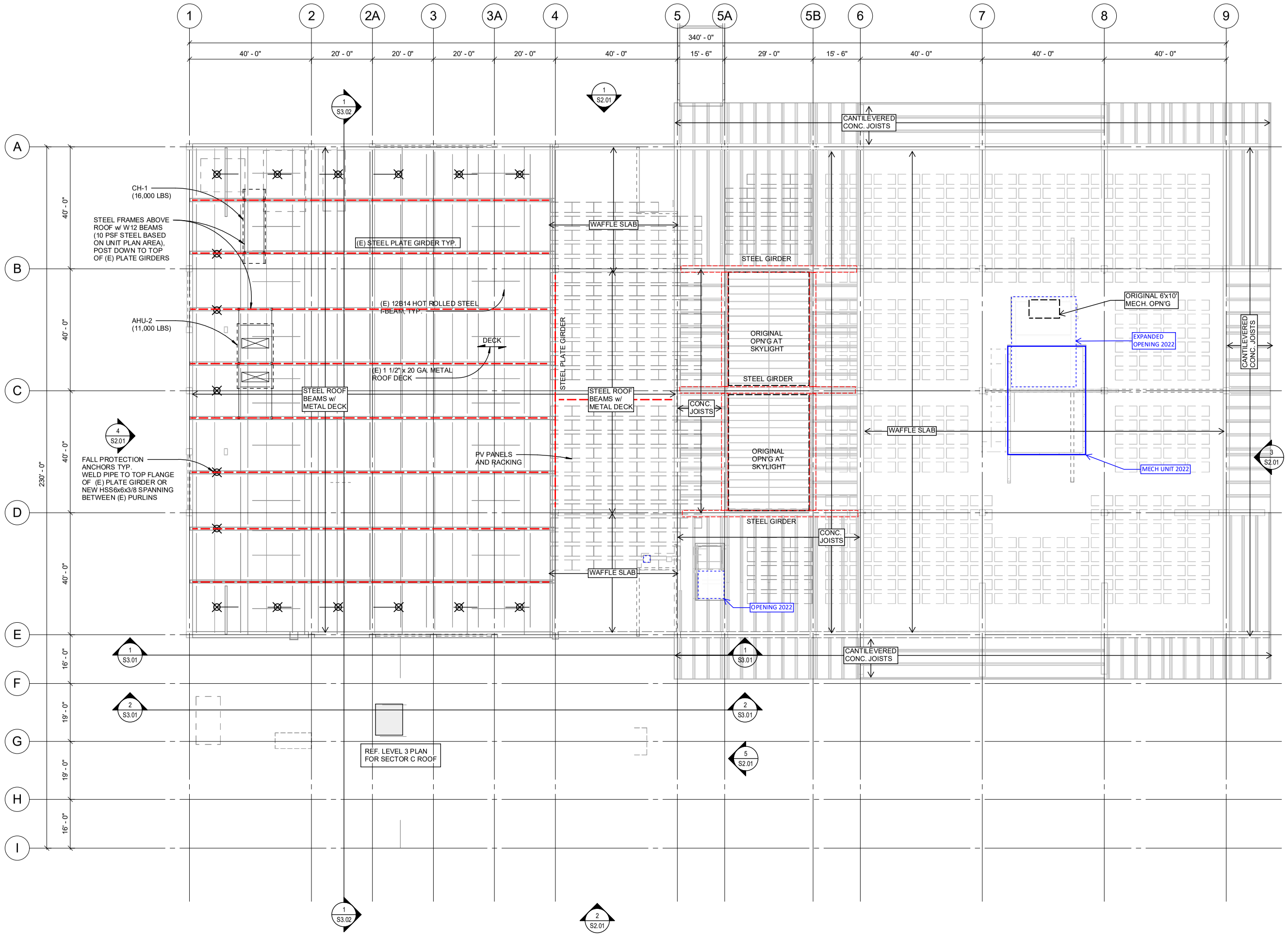
C36-8

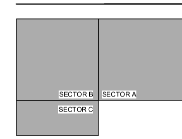
LEVEL 3 FRAMING PLAN

S1.04



1 ROOF FRAMING PLAN
1/16" = 1'-0"

KEY PLAN



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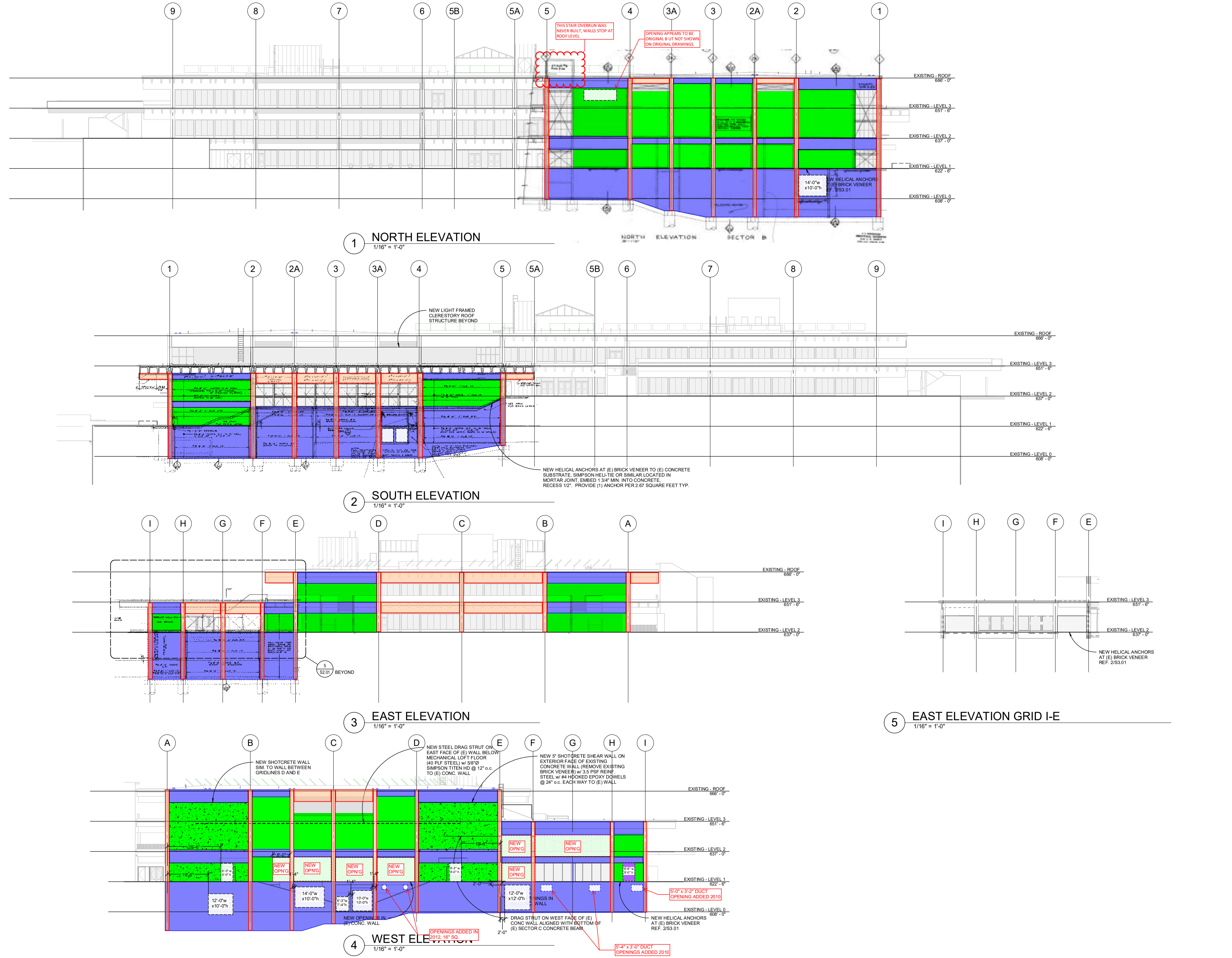
C36-9

ROOF FRAMING PLAN

S1.05



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NO.	DESCRIPTION	DATE

C36-10

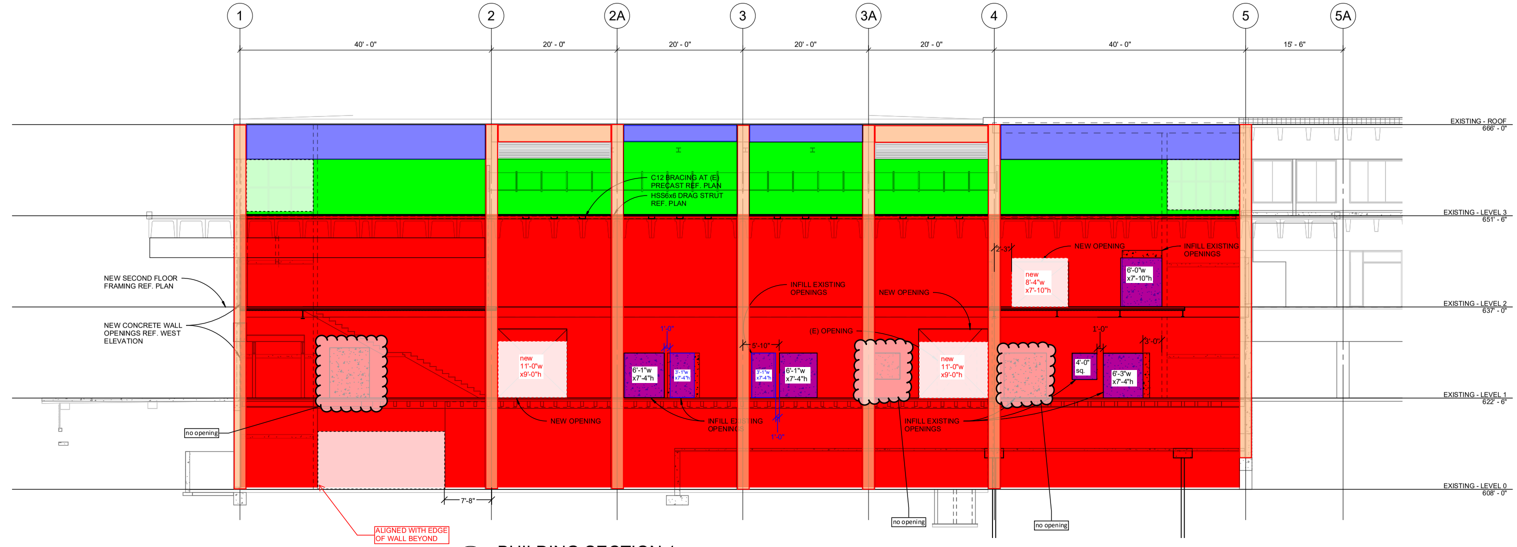
EXTERIOR ELEVATIONS

S2.01

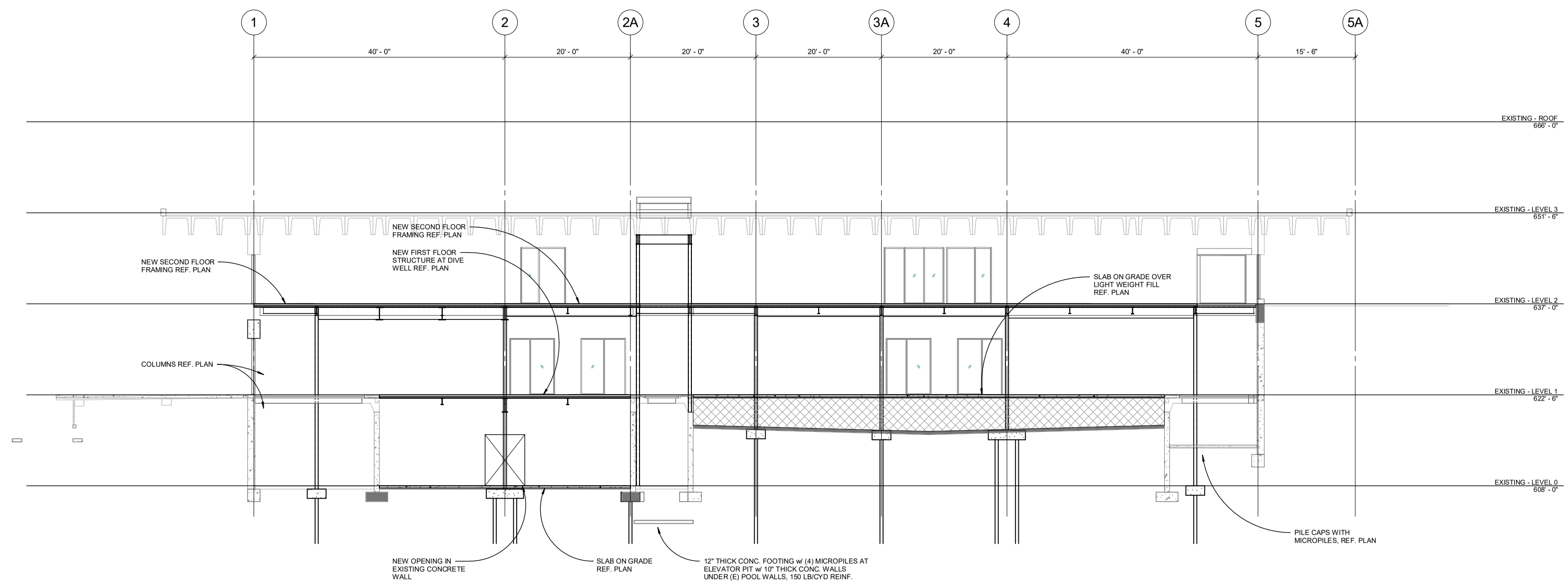
NOTES:

ALL OPENING INFILLS TO HAVE #5 REBAR @ 12" o.c. EACH WAY, WITH MATCHING EPOXY DOWELS (12" EMBED) AND f'c = 4,000 PSI.

ALL NEW OPENINGS TO BE SAWCUT w/ CORED HOLES AT CORNERS OF OPENINGS, DO NOT OVERCUT. NEW OPENINGS TO HAVE (2) LAYERS OF FYFE CARBON FIBER TYFO SCH-41, 2' WIDE ON ONE FACE OF WALL AT JAMBS AND HEAD EXTENDING 5'-0" BEYOND OPENING EACH SIDE.



1 BUILDING SECTION 1
1/8" = 1'-0"



2 BUILDING SECTION 2
1/8" = 1'-0"

w+b woofter bolch architecture
107 SE Washington Street, Suite 228
Portland, OR 97214
503 724 0111

NOT FOR CONSTRUCTION

kpff
111 SW Fifth Ave., Suite 2600
Portland, OR 97204
O: 503.227.3251
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10022200424 R-22 (ACC)

Portland Community College
12000 SW 49th Ave,
Portland, Oregon
97219

PCC SY-HT Building West Side Renovation
12000 SW 49th Ave
Portland, Oregon 97219

Date	12/15/23
Project No.	221000

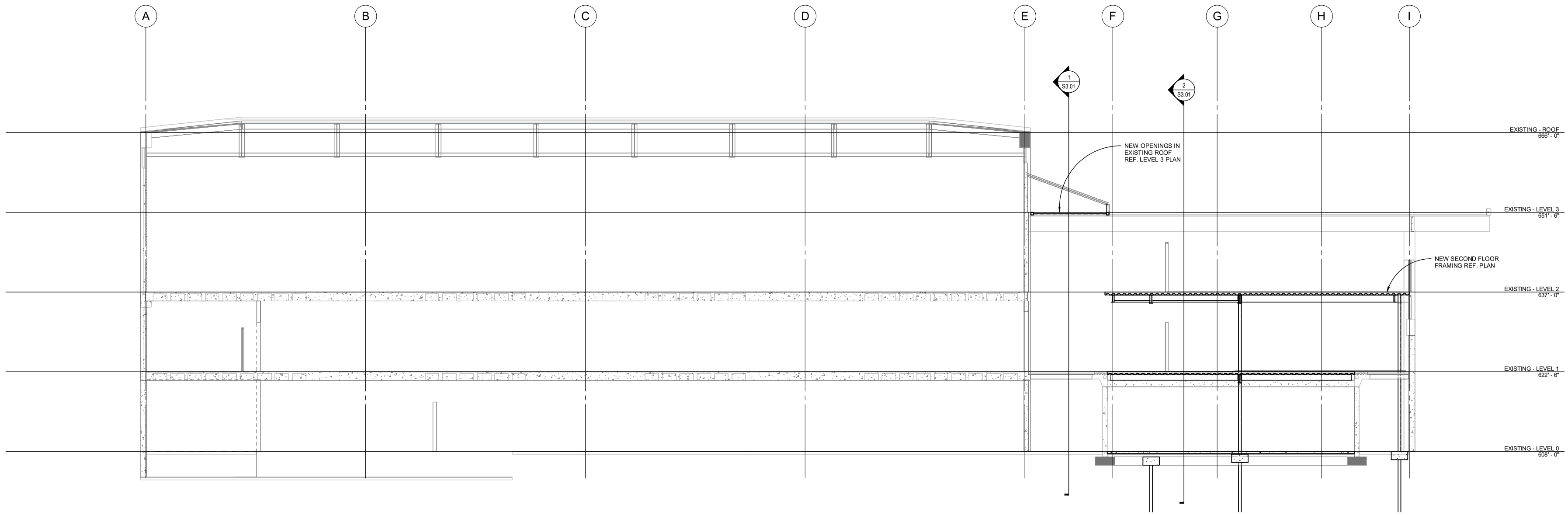
Revisions

NO.	DESCRIPTION	DATE

C36-11

BUILDING SECTIONS

S3.01



1 BUILDING SECTION 3

1/8" = 1'-0"

w+b
woofter bolch architecture
107 SE Washington Street, Suite 228
Portland, OR 97214
503 724 0111

NOT FOR CONSTRUCTION

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97219

PCC SY-HT Building West Side Renovation
12000 SW 49th Ave
Portland, Oregon 97219

Date	12/15/23
Project No.	221000

Revisions

NO.	DESCRIPTION	DATE

C36-12

BUILDING SECTIONS

S3.02

OUTPUT FROM ETABS MODEL

TABLE: Pier Forces - Design

PierLabel	**OutputCase**	**CaseType**	TOP for all **StepType**	Kip **V2**	Kip-ft **M3**	max **V**	Max **M**
P1	1.1D+0.275L+BSE-1N	Combination	Max	2502.604	481.4664	2,558	18,763
P1	1.1D+0.275L-BSE-1N	Combination	Max	-182.871	18697.7695		
P1	0.9D+BSE-1N	Combination	Max	2557.769	547.0143		
P1	0.9D-BSE-1N	Combination	Max	-127.705	18763.3174		
P2	1.1D+0.275L+BSE-1N	Combination	Max	2354.919	-1322.4391	2,355	2,008
P2	1.1D+0.275L-BSE-1N	Combination	Max	579.967	-2008.0743		
P2	0.9D+BSE-1N	Combination	Max	2249.907	-57.9497		
P2	0.9D-BSE-1N	Combination	Max	474.955	-743.585		
P3	1.1D+0.275L+BSE-1N	Combination	Max	3217.911	-85.8463	3,232	12,344
P3	1.1D+0.275L-BSE-1N	Combination	Max	-257.956	12343.7103		
P3	0.9D+BSE-1N	Combination	Max	3232.388	-216.9752		
P3	0.9D-BSE-1N	Combination	Max	-243.48	12212.5814		
P4	1.1D+0.275L+BSE-1N	Combination	Max	5421.927	53367.1918	5,422	53,367
P4	1.1D+0.275L-BSE-1N	Combination	Max	62.982	-5361.7805		
P4	0.9D+BSE-1N	Combination	Max	5352.349	52914.2383		
P4	0.9D-BSE-1N	Combination	Max	-6.597	-5814.734		
P5	1.1D+0.275L+BSE-1N	Combination	Max	1386.833	1040.8152	1,449	3,568
P5	1.1D+0.275L-BSE-1N	Combination	Max	-171.533	3568.4663		
P5	0.9D+BSE-1N	Combination	Max	1449.29	936.7658		
P5	0.9D-BSE-1N	Combination	Max	-109.076	3464.417		
P6	1.1D+0.275L+BSE-1N	Combination	Max	1183.195	1042.7639	1,186	3,977
P6	1.1D+0.275L-BSE-1N	Combination	Max	153.022	3976.9793		
P6	0.9D+BSE-1N	Combination	Max	1185.997	974.7644		
P6	0.9D-BSE-1N	Combination	Max	155.824	3908.9798		
P7	1.1D+0.275L+BSE-1N	Combination	Max	1184.397	468.8113	1,184	2,466
P7	1.1D+0.275L-BSE-1N	Combination	Max	402.398	2346.0919		
P7	0.9D+BSE-1N	Combination	Max	1156.18	588.812		
P7	0.9D-BSE-1N	Combination	Max	374.181	2466.0926		
P8	1.1D+0.275L+BSE-1N	Combination	Max	1597.869	892.6802	1,598	3,564
P8	1.1D+0.275L-BSE-1N	Combination	Max	376.211	3564.4116		
P8	0.9D+BSE-1N	Combination	Max	1583.628	843.9438		
P8	0.9D-BSE-1N	Combination	Max	361.97	3515.6752		
P1	1.1D+0.275L+BSE-2N	Combination	Max	3865.489	969.6518	3,921	28,360
P1	1.1D+0.275L-BSE-2N	Combination	Max	-162.723	28294.1065		
P1	0.9D+BSE-2N	Combination	Max	3920.655	1035.1997		
P1	0.9D-BSE-2N	Combination	Max	-107.557	28359.6544		
P2	1.1D+0.275L+BSE-2N	Combination	Max	3319.036	468.2771	3,319	1,733
P2	1.1D+0.275L-BSE-2N	Combination	Max	656.608	-560.1758		
P2	0.9D+BSE-2N	Combination	Max	3214.024	1732.7664		
P2	0.9D-BSE-2N	Combination	Max	551.596	704.3135		
P3	1.1D+0.275L+BSE-2N	Combination	Max	4860.411	-406.6323	4,875	18,238
P3	1.1D+0.275L-BSE-2N	Combination	Max	-353.39	18237.7027		
P3	0.9D+BSE-2N	Combination	Max	4874.887	-537.7612		
P3	0.9D-BSE-2N	Combination	Max	-338.914	18106.5738		
P4	1.1D+0.275L+BSE-2N	Combination	Max	7992.233	79298.8554	7,992	79,299
P4	1.1D+0.275L-BSE-2N	Combination	Max	-46.184	-8794.603		
P4	0.9D+BSE-2N	Combination	Max	7922.655	78845.9019		
P4	0.9D-BSE-2N	Combination	Max	-115.763	-9247.5565		
P5	1.1D+0.275L+BSE-2N	Combination	Max	2184.74	1387.9887	2,247	5,179
P5	1.1D+0.275L-BSE-2N	Combination	Max	-152.809	5179.4655		
P5	0.9D+BSE-2N	Combination	Max	2247.196	1283.9394		
P5	0.9D-BSE-2N	Combination	Max	-90.353	5075.4161		
P6	1.1D+0.275L+BSE-2N	Combination	Max	1777.954	1468.3802	1,781	5,870
P6	1.1D+0.275L-BSE-2N	Combination	Max	232.694	5869.7034		
P6	0.9D+BSE-2N	Combination	Max	1780.756	1400.3807		
P6	0.9D-BSE-2N	Combination	Max	235.496	5801.7038		
P7	1.1D+0.275L+BSE-2N	Combination	Max	1724.929	921.8426	1,725	3,858
P7	1.1D+0.275L-BSE-2N	Combination	Max	551.931	3737.7635		
P7	0.9D+BSE-2N	Combination	Max	1696.713	1041.8434		
P7	0.9D-BSE-2N	Combination	Max	523.715	3857.7643		
P8	1.1D+0.275L+BSE-2N	Combination	Max	2378.282	1221.5049	2,378	5,229
P8	1.1D+0.275L-BSE-2N	Combination	Max	545.795	5229.1021		
P8	0.9D+BSE-2N	Combination	Max	2364.041	1172.7685		
P8	0.9D-BSE-2N	Combination	Max	531.554	5180.3656		

SHEAR WALL GRAVITY AXIAL LOADS

pier label	t,wall in	L, wall ft	h, story ft	Atrib ft2	DL psf	LL psf	Add DL kips	Qd, slab kip	Qd, wall kip	Qd kip	Ql kip	Pmax, top kip	Pmax, bot kip	Pmin, top kip	Pmin, bot kip
P1 Roof	14	70.00	14.5	7447	257	25	59	1973	178	2150	186	2221	2416	1775	1935
P1	14	70.00	14.5	4990	69.4	100	0	2319	355	2674	499	2883	3079	2247	2407
P1_1															
P1_Base															
P2_Roof	8	40.00	6.8	2411	257	25	42	662	27	689	60	744	774	596	620
P2	8	40.00	5.8	2411	69.4	100	0	829	50	879	241	1008	1034	771	791
P3_Roof	8	56.00	9.0	4480	208	25	24	956	50	1006	112	1082	1137	860	905
P3_3	10	56.00	14.5	3024	257	100	2265.113	3042	102	3144	302	3430	3541	2738	2829
P3	10	56.00	14.5	3024	69.4	100	0	1165	152	1317	302	1421	1532	1094	1186
P4 Roof	14	80.00	14.5	4800	160	25	199	967	203	1170	120	1097	1320	870	1053
P4	14	80.00	14.5	4800	263	100	243.7996	2473	406	2879	480	3076	3299	2409	2591
P5_Roof	14	25.67	14.5	1572	208	25	0	327	65	392	39	370	442	294	353
P5_3	14	25.67	14.5	1572	179	100	0	281	65	347	157	353	424	253	312
P5	14	25.67	9.0	1572	215	100	0	619	106	725	157	796	841	616	652
P6 Roof	14	7.50	14.5	1150	208	25	6.125	245	19	264	29	278	299	221	238
P6_2	14	7.50	14.5	1150	179	100	25	476	38	514	115	576	597	446	463
P6	14	7.50	14.5	1150	215	100	17.125	741	57	798	115	888	909	701	718
P6_Base															
P7 Roof	14	15.00	14.5	900	208	25	0	187	38	225	23	212	254	168	203
P7_3	14	15.00	14.5	900	179	100	0	348	76	424	90	450	492	348	382

BSE-1N shear wall check - Damage Control -Deformation Controlled Action

Pier	Shear				Moment			
	Demand	Expected Strength**	DCR		Demand	Expected Strength*	DCR	
	Q_{UD}	Q_{CE}	Q_{UD}/Q_{CE}	m-factor	Q_{UD}	Q_{CE}	Q_{UD}/Q_{CE}	m-factor
	kips	kips			kip-ft	kip-ft		
P1	2,558	51,327	0.05	1.8	18,763	145,981	0.13	1.7
P2	2,355	4,287	0.55	1.8	2,008	85,007	0.02	1.7
P3	3,232	2,270	1.42	1.8	12,344	43,113	0.29	1.7
P4	5,422	8,790	0.62	1.8	53,367	813,515	0.07	1.7
P5	1,449	1,601	0.91	1.8	3,568	11,860	0.30	1.7
P6	1,186	1,120	1.06	1.8	3,977	8,008	0.50	1.7
P7	1,184	889	1.33	1.8	2,466	5,543	0.44	1.7
P8	1,598	1,201	1.33	1.8	3,564	18,119	0.20	1.7

BSE-2N shear wall check - Damage Control -Deformation Controlled Action

Pier	Shear				Moment			
	Demand	Expected Strength**	DCR		Demand	Expected Strength*	DCR	
	Q_{UD}	Q_{CE}	Q_{UD}/Q_{CE}	m-factor	Q_{UD}	Q_{CE}	Q_{UD}/Q_{CE}	m-factor
	kips	kips			kip-ft	kip-ft		
P1	3,921	51,327	0.08	2.5	28,360	145,981	0.19	2.1
P2	3,319	4,287	0.77	2.5	1,733	85,007	0.02	2.1
P3	4,875	2,270	2.15	2.5	18,238	43,113	0.42	2.1
P4	7,992	8,790	0.91	2.5	79,299	813,515	0.10	2.1
P5	2,247	1,601	1.40	2.5	5,179	11,860	0.44	2.1
P6	1,781	1,120	1.59	2.5	5,870	8,008	0.73	2.1
P7	1,725	889	1.94	2.5	3,858	5,543	0.70	2.1
P8	2,378	1,201	1.98	2.5	5,229	18,119	0.29	2.1

*See SP column moment capacity calculation

**See Pier Wall SHEAR Strengths sheet

Note: See M-Factor Calc for sample hand calculation. All DCRs are below the lowest possible m-factor of 1.375 (according to Table 10-1 of ASCE41-17). The m-factors calculated are slightly greater than 1.375 and therefore conservative as the rest of the walls are likely to have m-factors greater than that for P2.

M-Factor Calc

kpff Portland, Oregon	Project	By FL	Sheet No. C36-16
	Location	Date	
	Client	Revised	Job No.
		Date	

Calculating m-factors for existing walls

Using Pier P2

See "Table 10-21. Numerical Acceptance Criteria for Linear Procedures — R/C Structural Walls & Associated Components Controlled by Flexure" from ASCE 41-17

Conditions

$$\frac{(A_s - A_s')f_{yE} + P}{t_w l_w f'_{CE}} \qquad \frac{V}{t_w l_w \sqrt{f'_{CE}}}$$

$1.5 * f'_{CE} = 1.5 * 2500\,psi = 3750\,psi$ = expected compressive strength of concrete multiplied by the factor from Table 10-1 (ASCE 41-17)

$1.25 * f_{yE} = 1.25 * 40000\,psi = 50000\,psi$ = expected yield strength of reinforcing steel multiplied by the factor from Table 10-1

A_s = Area of tension reinforcement $= A_{s,total} - A_s' = 35.12\,in^2 - 5.92\,in^2 = 29.2\,in^2$

$A_{s,total} = (4\#11) + (32\#5) + (8\#14) = 35.12\,in^2$

A_s' = Area of compression reinforcement $= 4\#11 = 4(1.48\,in^2) = 5.92\,in^2$

l_w = length of the wall (in inches) $= 40' \times 12"/1' = 480"$

t_w = Thickness of wall web $= 8"$

P^* = axial force in the wall = 733 Kips

V = shear force in the wall $= \frac{2 \cdot M_n^*}{H} = \frac{2 \cdot (85007\text{ K-ft})}{5'} = 34002.8\text{ K}$

M_n = flexural capacity of the wall (in K-ft) = 85007 K-ft

H = wall height (in ft) = 5'

*P & M_n determined in SPColumn results

$$\frac{(A_s - A_s')f_{yE} + P}{t_w l_w f'_{cE}} = \frac{(29.2\ in^2 - 5.92\ in^2)50000psi + 733,000lb}{(8")(480\ in)(3750psi)}$$

$$= 0.1 < 0.132 < 0.25$$ Linear interpolation necessary

$$\frac{V}{t_w l_w \sqrt{f'_{CE}}} = \frac{34002.8 \times 10^3 lb}{(8")(480\ in)\sqrt{3750psi}} = 144.6 > 6$$

	For BSE-1N	For BSE-2N
linear interpolate	$1.45 \leftrightarrow 1.89$	$1.89 \leftrightarrow 2.34$
m-factor for flexure	1.67	2.115

} → Values obtained using linear interpolation

Getting m-factor for shear:

$$\frac{(A_s - A_s')f_{yE} + P}{t_w l_w f'_{cE}} = 0.132 > 0.05$$

	For BSE-1N	For BSE-2N
linear interpolate between	$1.5 \leftrightarrow 2$	$2 \leftrightarrow 3$
m-factor for shear	1.75	2.5

Wall shear friction on horizontal plane T&B of slab - BSE-2N only checked - Force Controlled Action

Section	T/B	Shear Demand kips	J (shear wall flexural DCR)	Force Controlled Shear Demand kips	Avf in^2	Axial kips	Shear Friction kips	DCR
P1	top	3,921	0.19	20,182	11760.0	2247	707,847	0.03
P2	top	3,319	0.02	162,827	3840.0	596	230,996	0.70
P3	top	4,875	0.42	11,524	6720.0	860	404,060	0.03
P4	top	7,992	0.10	81,991	21120.0	870	1,268,070	0.06
P5	top	2,247	0.44	5,146	4312.6	253	259,007	0.02
P6	top	1,781	0.73	2,429	2220.0	221	133,421	0.02
P7	top	1,725	0.70	2,478	2394.0	556	144,196	0.02
P8	top	2,378	0.29	8,241	3234.0	0	194,040	0.04

Total shear friction capacity includes contributions from reinforcing and axial compression acting on shear plane.

μ 1.0 roughened surface shown on existing drawings which is typical for top of wall pour to slab conditions

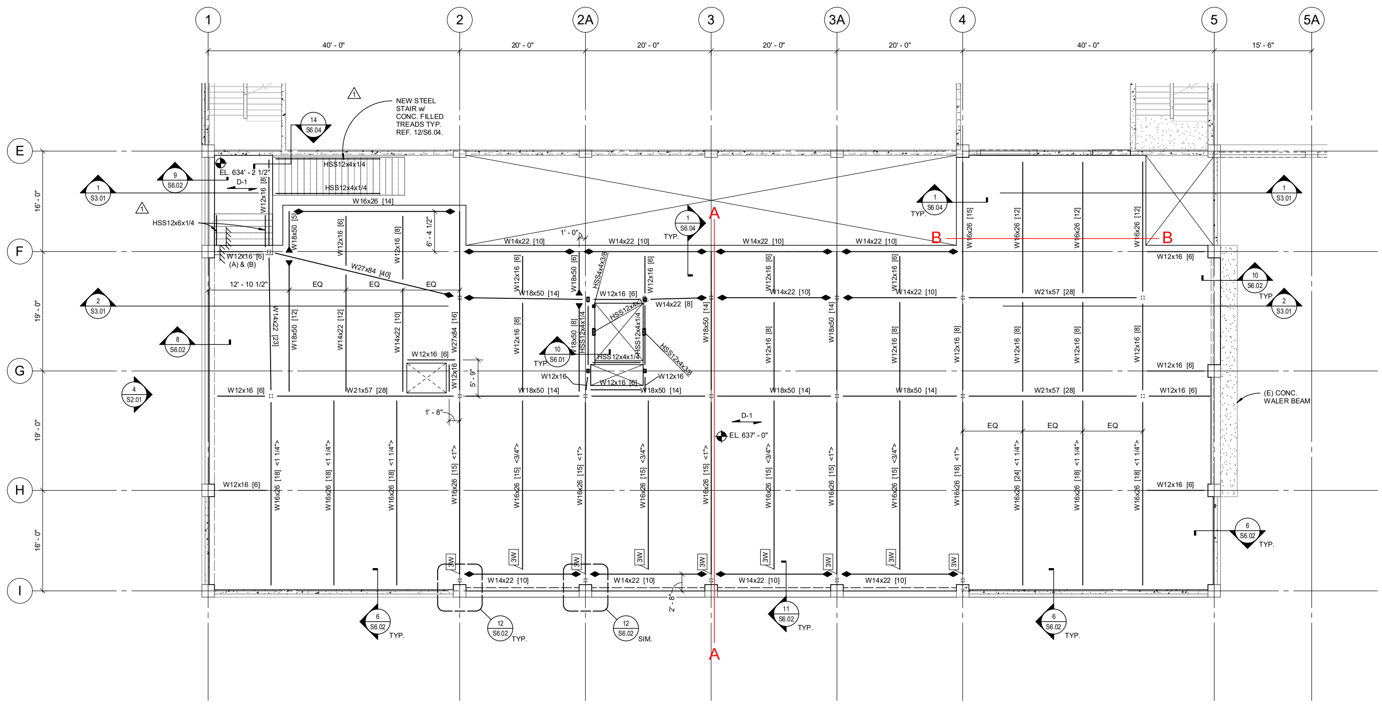
Note: C1C2 = 1.0 and is ignored in these calculations

SECTION CUT FORCES FOR NEW L2 DIAPHRAGM DESIGN AND DETERMINATION OF DRAG LOADS

TABLE: Section Cut Forces - Design

SectionCut	Output Case	Case Type	Step Type	Step Number	P	V2	V3	T	M2	M3	X	Y	Z		
					kip	kip	kip	kip-ft	kip-ft	kip-ft	ft	ft	ft		
Grid I	BSE-1N	LinStatic	Step By Step	1	-866.92	0	3.863	0	960.5781	0	79.8522	0	29		
Grid I	BSE-1N	LinStatic	Step By Step	2	280.284	0	-53.343	0	-2886.9607	0	79.8522	0	29		
Grid I	BSE-1N	LinStatic	Step By Step	3	-837.282	0	5.5	0	888.586	0	79.8522	0	29		
Grid I	BSE-1N	LinStatic	Step By Step	4	248.134	0	-55.656	0	-2805.0908	0	79.8522	0	29		
Grid I	BSE-1N	LinStatic	Step By Step	5	-896.559	0	2.225	0	1032.5703	0	79.8522	0	29		
Grid I	BSE-1N	LinStatic	Step By Step	6	312.434	0	-51.031	0	-2968.8307	0	79.8522	0	29		
Grid I	BSE-2N	LinStatic	Step By Step	1	-1300.38	0	5.794	0	1440.8672	0	79.8522	0	29		
Grid I	BSE-2N	LinStatic	Step By Step	2	420.426	0	-80.015	0	-4330.4411	0	79.8522	0	29		
Grid I	BSE-2N	LinStatic	Step By Step	3	-1255.922	0	8.251	0	1332.8789	0	79.8522	0	29		
Grid I	BSE-2N	LinStatic	Step By Step	4	372.201	0	-83.483	0	-4207.6362	0	79.8522	0	29		
Grid I	BSE-2N	LinStatic	Step By Step	5	-1344.838	0	3.338	0	1548.8555	0	79.8522	0	29		
Grid I	BSE-2N	LinStatic	Step By Step	6	468.651	0	-76.546	0	-4453.246	0	79.8522	0	29		
Grid E	BSE-1N	LinStatic	Step By Step	1	-101.124	0	-11.528	-9.318E-07	-17243.0181	0.000002974	103.9097	69.9355	29		
Grid E	BSE-1N	LinStatic	Step By Step	2	-236.293	0	80.415	0.000001051	-33821.1424	0	103.9097	69.9355	29		
Grid E	BSE-1N	LinStatic	Step By Step	3	-127.366	0	-23.025	-9.015E-07	-18015.5909	0.000002935	103.9097	69.9355	29		
Grid E	BSE-1N	LinStatic	Step By Step	4	-206.13	0	75.36	0.000001014	-30769.2345	0	103.9097	69.9355	29		
Grid E	BSE-1N	LinStatic	Step By Step	5	-74.881	0	-0.031	-9.621E-07	-16470.4453	0.000003013	103.9097	69.9355	29		
Grid E	BSE-1N	LinStatic	Step By Step	6	-266.456	0	85.471	0.000001087	-36873.0503	0	103.9097	69.9355	29		
Grid E	BSE-2N	LinStatic	Step By Step	1	-151.686	0	-17.292	-0.000001398	-25864.5272	0.000004461	103.9097	69.9355	29		
Grid E	BSE-2N	LinStatic	Step By Step	2	-354.439	0	120.623	0.000001576	-50731.7136	0	103.9097	69.9355	29		
Grid E	BSE-2N	LinStatic	Step By Step	3	-191.049	0	-34.537	-0.000001352	-27023.3864	0.000004402	103.9097	69.9355	29		
Grid E	BSE-2N	LinStatic	Step By Step	4	-309.195	0	113.04	0.000001521	-46153.8518	0	103.9097	69.9355	29		
Grid E	BSE-2N	LinStatic	Step By Step	5	-112.322	0	-0.046	-0.000001443	-24705.668	0.000004519	103.9097	69.9355	29		
Grid E	BSE-2N	LinStatic	Step By Step	6	-399.683	0	128.206	0.00000163	-55309.5754	0	103.9097	69.9355	29		
Grid 1	BSE-1N	LinStatic	Step By Step	1	32.556	0	74.928	0	418.3806	0	0	35	29	min	69.706
Grid 1	BSE-1N	LinStatic	Step By Step	2	49.6	0	271.578	0	2119.1892	0	0	35	29	Max	432.37
Grid 1	BSE-1N	LinStatic	Step By Step	3	31.493	0	80.151	0	435.9043	0	0	35	29		
Grid 1	BSE-1N	LinStatic	Step By Step	4	48.341	0	254.909	0	1972.7385	0	0	35	29		
Grid 1	BSE-1N	LinStatic	Step By Step	5	33.619	0	69.706	0	400.857	0	0	35	29		
Grid 1	BSE-1N	LinStatic	Step By Step	6	50.859	0	288.247	0	2265.6399	0	0	35	29		
Grid 1	BSE-2N	LinStatic	Step By Step	1	48.835	0	112.393	0	627.5709	0	0	35	29		
Grid 1	BSE-2N	LinStatic	Step By Step	2	74.4	0	407.367	0	3178.7838	0	0	35	29		
Grid 1	BSE-2N	LinStatic	Step By Step	3	47.24	0	120.226	0	653.8564	0	0	35	29		
Grid 1	BSE-2N	LinStatic	Step By Step	4	72.511	0	382.363	0	2959.1078	0	0	35	29		
Grid 1	BSE-2N	LinStatic	Step By Step	5	50.429	0	104.559	0	601.2855	0	0	35	29		
Grid 1	BSE-2N	LinStatic	Step By Step	6	76.289	0	432.37	0	3398.4598	0	0	35	29		
Grid 5	BSE-1N	LinStatic	Step By Step	1	-23.149	0	33.183	0.000007598	-1868.5153	0	159.6588	46.5784	29	min	21.639
Grid 5	BSE-1N	LinStatic	Step By Step	2	-45.633	0	572.666	0.0000115	1199.9704	0.000005205	159.6588	46.5784	29	Max	874.322
Grid 5	BSE-1N	LinStatic	Step By Step	3	-21.256	0	44.727	0.000007585	-1840.7294	0	159.6588	46.5784	29		
Grid 5	BSE-1N	LinStatic	Step By Step	4	-48.623	0	562.451	0.00001155	1187.6954	0.000005156	159.6588	46.5784	29		
Grid 5	BSE-1N	LinStatic	Step By Step	5	-25.041	0	21.639	0.00000761	-1896.3011	0	159.6588	46.5784	29		
Grid 5	BSE-1N	LinStatic	Step By Step	6	-42.644	0	582.881	0.00001145	1212.2455	0.000005254	159.6588	46.5784	29		
Grid 5	BSE-2N	LinStatic	Step By Step	1	-34.723	0	49.775	0.0000114	-2802.7729	0.000000521	159.6588	46.5784	29		
Grid 5	BSE-2N	LinStatic	Step By Step	2	-68.45	0	858.999	0.00001725	1799.9556	0.000007807	159.6588	46.5784	29		
Grid 5	BSE-2N	LinStatic	Step By Step	3	-31.884	0	67.09	0.00001138	-2761.0941	6.251E-07	159.6588	46.5784	29		
Grid 5	BSE-2N	LinStatic	Step By Step	4	-72.934	0	843.677	0.00001732	1781.5431	0.000007733	159.6588	46.5784	29		
Grid 5	BSE-2N	LinStatic	Step By Step	5	-37.561	0	32.459	0.00001141	-2844.4517	0	159.6588	46.5784	29		
Grid 5	BSE-2N	LinStatic	Step By Step	6	-63.966	0	874.322	0.00001718	1818.3682	0.000007881	159.6588	46.5784	29		
Midspan DIA	BSE-1N	LinStatic	Step By Step	1	-108.237	0	179.201	0	2426.35	0	80	31.1388	29	min	-9326.19
Midspan DIA	BSE-1N	LinStatic	Step By Step	2	53.415	0	-85.062	0	-6182.2286	0	80	31.1388	29	Max	3711.018
Midspan DIA	BSE-1N	LinStatic	Step By Step	3	-98.696	0	189.137	0	2378.6879	0	80	31.1388	29		
Midspan DIA	BSE-1N	LinStatic	Step By Step	4	42.531	0	-120.428	0	-6146.9963	0	80	31.1388	29		
Midspan DIA	BSE-1N	LinStatic	Step By Step	5	-117.778	0	169.266	0	2474.012	0	80	31.1388	29		
Midspan DIA	BSE-1N	LinStatic	Step By Step	6	64.299	0	-49.697	0	-6217.461	0	80	31.1388	29		
Midspan DIA	BSE-2N	LinStatic	Step By Step	1	-162.356	0	268.802	0	3639.5249	0	80	31.1388	29		
Midspan DIA	BSE-2N	LinStatic	Step By Step	2	80.122	0	-127.593	0	-9273.343	0	80	31.1388	29		
Midspan DIA	BSE-2N	LinStatic	Step By Step	3	-148.044	0	283.705	0	3568.0318	0	80	31.1388	29		
Midspan DIA	BSE-2N	LinStatic	Step By Step	4	63.796	0	-180.642	0	-9220.4944	0	80	31.1388	29		
Midspan DIA	BSE-2N	LinStatic	Step By Step	5	-176.667	0	253.899	0	3711.018	0	80	31.1388	29		
Midspan DIA	BSE-2N	LinStatic	Step By Step	6	96.448	0	-74.545	0	-9326.1915	0	80	31.1388	29		
Long way DIA	BSE-1N	LinStatic	Step By Step	1	1.24	0	9.698	0	15.3172	0	148.235	55.8333	29	min	11.6348
Long way DIA	BSE-1N	LinStatic	Step By Step	2	17.322	0	47.113	0	161.8472	0	148.235	55.8333	29	Max	248.7462
Long way DIA	BSE-1N	LinStatic	Step By Step	3	1.64	0	10.582	0	18.9996	0	148.235	55.8333	29		
Long way DIA	BSE-1N	LinStatic	Step By Step	4	17.111	0	45.619	0	157.8636	0	148.235	55.8333	29		
Long way DIA	BSE-1N	LinStatic	Step By Step	5	0.839	0	8.814	0	11.6348	0	148.235	55.8333	29		
Long way DIA	BSE-1N	LinStatic	Step By Step	6	17.533	0	48.606	0	165.8308	0	148.235	55.8333	29		
Long way DIA	BSE-2N	LinStatic	Step By Step	1	1.859	0	14.547	0	22.9758	0	148.235	55.8333	29		
Long way DIA	BSE-2N	LinStatic	Step By Step	2	25.983	0	70.669	0	242.7708	0	148.235	55.8333	29		
Long way DIA	BSE-2N	LinStatic	Step By Step	3	2.46	0	15.873	0	28.4993	0	148.235	55.8333	29		
Long way DIA	BSE-2N	LinStatic	Step By Step	4	25.666	0	68.429	0	236.7955	0	148.235	55.8333	29		
Long way DIA	BSE-2N	LinStatic	Step By Step	5	1.259	0	13.221	0	17.4523	0	148.235	55.8333	29		
Long way DIA	BSE-2N	LinStatic	Step By Step	6	26.3	0	72.909	0	248.7462	0	148.235	55.8333	29		

LEVEL 2 DIAPHRAGM ANALYSIS DIAGRAM



1 LEVEL 2 FRAMING PLAN - SECTOR C
1/8" = 1'-0"

STEEL FRAMING NOTES:

1. REF. S6.01 THRU S6.03 FOR TYPICAL STEEL DETAILS.
2. BEAMS ARE EQUALLY SPACED IN BAYS U.N.O.
3. BEAMS ARE CENTERED ON COLUMNS, WALLS AND/OR GRID LINES, U.N.O.
4. LOCATE BEAM CENTERLINE 6" FROM EDGE OF OPENING OR SLAB/DECK EDGE U.N.O.
5. [X] INDICATES CONNECTION TYPE. REF. 2 AND 3/S6.01 FOR SCHEDULES AND CONNECTION DETAILS. REF. NOTE 7 WHERE CONNECTION TYPES ARE NOT SHOWN.
6. [XC] INDICATES CONNECTION TYPE TO CONCRETE. REF. 13/S6.02 FOR DETAIL
7. PROVIDE THE FOLLOWING CONNECTION TYPES UNLESS NOTED OTHERWISE ON THE PLANS:

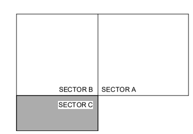
BEAM DESIGNATION	CONNECTION TYPE
W8	2D
W10	2
W12, W14	3
W16, W18	4
W21, W24	5
W27, W30	6
W33, W36	7

8. [XX] INDICATES NUMBER OF 3/4"Øx5" LONG HEADED STUDS EVENLY DISTRIBUTED ALONG BEAM LENGTH. REF. 5/S6.02 FOR TYPICAL COMPOSITE BEAM STUD SPACING DETAIL. PROVIDE STUDS @ 12" o.c. (MAX.) U.N.O.
9. [X-X-X] INDICATES NUMBER OF 3/4"Øx5" LONG HEADED STUDS EVENLY DISTRIBUTED BETWEEN WF BEAMS ON WF GIRDERS. REF. 5/S6.02 FOR TYPICAL COMPOSITE BEAM STUD SPACING DETAIL.
10. <X"> INDICATES UPWARD CAMBER AT MID SPAN.
11. D - X INDICATES SPAN DIRECTION OF DECK. REF. SCHEDULE 1/S6.02 FOR DECK INFORMATION.
12. EL. XXX'-XX" INDICATES TOP OF SLAB ELEVATION.
13. EL. XXX'-XX" INDICATES BOTTOM OF DECK ELEVATION.
14. INDICATES MOMENT CONNECTION. REF. 9/S6.03 FOR DETAILS.
15. INDICATES FULL-HEIGHT STIFFENER. REF. 3/S6.01 FOR DETAIL.
16. X INDICATES BEAM PENETRATION. REF. SCHEDULE 3/S6.03. PROVIDE ADDITIONAL STUDS AS IDENTIFIED
17. REF. S6.03 FOR TYPICAL DECK REINFORCING AT OPENINGS.
18. (A) INDICATES ABOVE.
19. (B) INDICATES BELOW
20. INDICATES COLUMN BELOW.
21. INDICATES ROOF TIE OFF. REF. S601 FOR CONNECTION DETAILS.
22. INDICATES ADDITIONAL LOAD DUE TO SNOW DRIFT.

NOTES:

1. (E) INDICATES EXISTING.
2. INDICATES EXISTING STRUCTURE.
3. CONTRACTOR TO VERIFY ALL EXISTING CONDITIONS, DIMENSIONS AND ELEVATIONS PRIOR TO FABRICATION AND ERECTION. NOTIFY ARCHITECT OF ANY SIGNIFICANT DISCREPANCIES FROM THAT SHOWN ON THE DRAWINGS.
4. CONTRACTOR TO SHORE ALL EXISTING FRAMING AS REQUIRED FOR DEMOLITION AND RE-FRAMING WORK. STRUCTURAL DEMOLITION SHALL BE SEQUENCED AS NOTED IN THE GENERAL STRUCTURAL NOTES.
5. ALL EXPOSED STRUCTURE SHALL BE VISUALLY INSPECTED FOR CRACKS AN DAMAGE BY THE CONTRACTOR AND FINDINGS REPORTED TO THE ARCHITECT.
6. REFER TO ARCHITECTURAL DRAWINGS FOR SLAB EDGE AND OPENING DIMENSIONS.

KEY PLAN



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Portland Community College
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97219

PCC SY-HT Building West Side Renovation
12000 SW 49th Ave
Portland, Oregon 97219

Date 02/23/24
Project No. 221000
Revisions

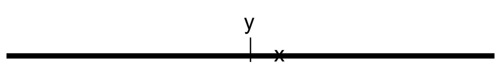
NO.	DESCRIPTION	DATE
1	Revision 1	05-24-24

C36-20

LEVEL 2 FRAMING PLAN - SECTOR C

S1.02C

Diaphragm flexure check:
Cut A-A


y
x

Contents

List of Figures

1. General Information

File Name	K:\2022\100222...\L2 Diaphragm bending check.colx
Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	Y - axis
Slenderness	Not Considered
Column Type	Architectural
Capacity Method	Critical capacity

2. Material Properties

2.1. Concrete

Type	Standard	
f'_c	6	ksi
E_c	4415.21	ksi
f_c	5.1	ksi
ε_u	0.003	in/in
β_1	0.75	

2.2. Steel

Type	Standard	
f_y	75	ksi
E_s	29000	ksi
ε_{ty}	0.00258621	in/in

3. Section

3.1. Shape and Properties

Type	Irregular	
A_g	2268	in²
I_x	2315.25	in⁴
I_y	7.93619e+007	in⁴
r_x	1.01036	in
r_y	187.061	in
X_o	0	in
Y_o	-0.0628795	in

3.2. Section Figure

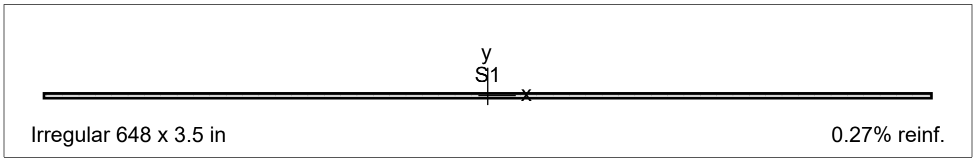


Figure 1: Column section

3.3. Solids

3.3.1. S1

Points	X	Y	Points	X	Y	Points	X	Y
	in	in		in	in		in	in
1	-324.0	-1.8	2	324.0	-1.8	3	324.0	1.7
4	-324.0	1.7						

4. Reinforcement

4.1. Bar Set: ASTM A615

Bar	Diameter	Area	Bar	Diameter	Area	Bar	Diameter	Area
	in	in^2		in	in^2		in	in^2
#3	0.38	0.11	#4	0.50	0.20	#5	0.63	0.31
#6	0.75	0.44	#7	0.88	0.60	#8	1.00	0.79
#9	1.13	1.00	#10	1.27	1.27	#11	1.41	1.56
#14	1.69	2.25	#18	2.26	4.00			

4.2. Confinement and Factors

Confinement type	Other
For #10 bars or less	#3 ties
For larger bars	#4 ties
Capacity Reduction Factors	
Axial compression, (a)	0.8
Tension controlled ϕ, (b)	1
Compression controlled ϕ, (c)	1

4.3. Arrangement

Pattern	Irregular
Bar layout	---
Cover to	---
Clear cover	---
Bars	---
Total steel area, A_s	6.05 in^2
Rho	0.27 %
Minimum clear spacing	11.56 in

(Note: Rho < 0.50%)

4.4. Bars Provided

Area	X	Y	Area	X	Y	Area	X	Y
in^2	in	in	in^2	in	in	in^2	in	in
0.11	-322.3	-0.1	0.11	-310.4	-0.1	0.11	-298.4	-0.1

Area (in^2)	X (in)	Y (in)	Area (in^2)	X (in)	Y (in)	Area (in^2)	X (in)	Y (in)
0.11	-286.5	-0.1	0.11	-274.6	-0.1	0.11	-262.6	-0.1
0.11	-250.7	-0.1	0.11	-238.8	-0.1	0.11	-226.8	-0.1
0.11	-214.9	-0.1	0.11	-202.9	-0.1	0.11	-191.0	-0.1
0.11	-179.1	-0.1	0.11	-167.1	-0.1	0.11	-155.2	-0.1
0.11	-143.3	-0.1	0.11	-131.3	-0.1	0.11	-119.4	-0.1
0.11	-107.4	-0.1	0.11	-95.5	-0.1	0.11	-83.6	-0.1
0.11	-71.6	-0.1	0.11	-59.7	-0.1	0.11	-47.8	-0.1
0.11	-35.8	-0.1	0.11	-23.9	-0.1	0.11	-11.9	-0.1
0.11	0.0	-0.1	0.11	11.9	-0.1	0.11	23.9	-0.1
0.11	35.8	-0.1	0.11	47.8	-0.1	0.11	59.7	-0.1
0.11	71.6	-0.1	0.11	83.6	-0.1	0.11	95.5	-0.1
0.11	107.4	-0.1	0.11	119.4	-0.1	0.11	131.3	-0.1
0.11	143.3	-0.1	0.11	155.2	-0.1	0.11	167.1	-0.1
0.11	179.1	-0.1	0.11	191.0	-0.1	0.11	202.9	-0.1
0.11	214.9	-0.1	0.11	226.8	-0.1	0.11	238.8	-0.1
0.11	250.7	-0.1	0.11	262.6	-0.1	0.11	274.6	-0.1
0.11	286.5	-0.1	0.11	298.4	-0.1	0.11	310.4	-0.1
0.11	322.3	-0.1						

5. Control Points

About	Point	P (kip)	X-Moment (k-ft)	Y-Moment (k-ft)	NA Depth (in)	d_t Depth (in)	ε_t	ϕ
Y	@ Max compression	3531.0	2.22	0.00	4685.77	646.31	-0.00259	1.00000
Y	@ Allowable comp.	2824.8	1.35	13568.76	718.93	646.31	-0.00030	1.00000
Y	@ f_s = 0.0	2542.2	1.23	17844.45	646.31	646.31	0.00000	1.00000
Y	@ f_s = 0.5 f_y	1741.5	0.67	23961.58	451.64	646.31	0.00129	1.00000
Y	@ Balanced point	1259.1	0.10	24277.36	347.09	646.31	0.00259	1.00000
Y	@ Tension control	662.3	-0.76	20838.49	225.82	646.31	0.00559	1.00000
Y	@ Pure bending	0.0	-1.71	10739.04	91.09	646.31	0.01829	1.00000
Y	@ Max tension	-453.8	-2.38	0.00	0.00	646.31	9.99999	1.00000
-Y	@ Max compression	3531.0	2.22	0.00	4685.77	646.31	-0.00259	1.00000
-Y	@ Allowable comp.	2824.8	1.35	-13568.76	718.93	646.31	-0.00030	1.00000
-Y	@ f_s = 0.0	2542.2	1.23	-17844.45	646.31	646.31	0.00000	1.00000
-Y	@ f_s = 0.5 f_y	1741.5	0.67	-23961.57	451.64	646.31	0.00129	1.00000
-Y	@ Balanced point	1259.1	0.10	-24277.35	347.09	646.31	0.00259	1.00000
-Y	@ Tension control	662.3	-0.76	-20838.49	225.82	646.31	0.00559	1.00000
-Y	@ Pure bending	0.0	-1.71	-10739.04	91.09	646.31	0.01829	1.00000
-Y	@ Max tension	-453.8	-2.38	0.00	0.00	646.31	9.99999	1.00000

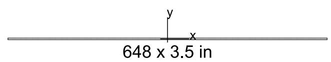
6. Factored Loads and Moments with Corresponding Capacity Ratios

NOTE: Calculations are based on "Critical Capacity" Method.

No.	Demand		Capacity		Parameters at Capacity			Capacity
	P_u (kip)	M_{uy} (k-ft)	ϕP_n (kip)	ϕM_{ny} (k-ft)	NA Depth (in)	ε_t	ϕ	Ratio
1	0.00	-9326.19	0.00	-10739.04	91.09	0.01829	1.000	0.94
2	0.00	3711.02	0.00	10739.04	91.09	0.01829	1.000	0.71

7. Diagrams

7.1. PM at θ=0 [deg]



General Information

Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	Y - axis
Slenderness	Not Considered
Column Type	Architectural
Capacity Method	Critical capacity

Materials

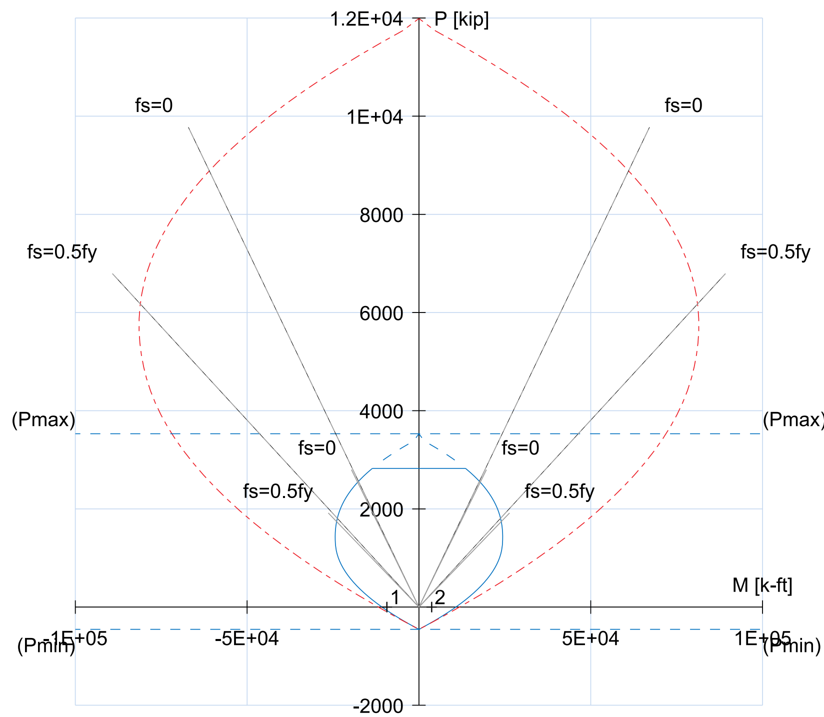
f'_c	6 ksi
E_c	4415.21 ksi
f_y	75 ksi
E_s	29000 ksi

Section

Type	Irregular
A_g	2268 in²
I_x	2315.25 in⁴
I_y	7.93619e+007 in⁴

Reinforcement

Pattern	Irregular
Bar layout	---
Cover to	---
Clear cover	---
Bars	---
Confinement type	Other
Total steel area, A_s	6.05 in²
Rho	0.27 %
Min. clear spacing	11.56 in



PM at 0.0 [deg]

No.	P_u kip	M_{uy} k-ft	ϕP_n kip	ϕM_{ny} k-ft	Capacity Ratio
1	0.0	-9326.2	0.00	-10739.04	0.94
2	0.0	3711.0	0.00	10739.04	0.71

Max. Capacity Ratio: 0.94

Diaphragm flexure check:
Cut B-B

spColumn v10.00 (TM)
Computer program for the Strength Design of Reinforced Concrete Sections

Contents

List of Figures

1. General Information

File Name	K:\2022\100...\L2 Dia long way flexure check.colx
Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	Y - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity

2. Material Properties

2.1. Concrete

Type	Standard	
f'_c	6	ksi
E_c	4415.21	ksi
f_c	5.1	ksi
ε_u	0.003	in/in
β_1	0.75	

2.2. Steel

Type	Standard	
f_y	75	ksi
E_s	29000	ksi
ε_{ty}	0.00258621	in/in

3. Section

3.1. Shape and Properties

Type	Irregular	
A_g	1316	in^2
I_x	1343.42	in^4
I_y	1.55042e+007	in^4
r_x	1.01036	in
r_y	108.542	in
X_o	180	in
Y_o	6.25	in

3.2. Section Figure

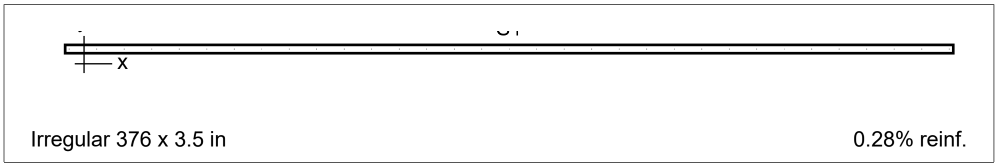


Figure 1: Column section

3.3. Solids

3.3.1. S1

Points	X	Y	Points	X	Y	Points	X	Y
	in	in		in	in		in	in
1	-8.0	4.5	2	368.0	4.5	3	368.0	8.0
4	-8.0	8.0						

4. Reinforcement

4.1. Bar Set: ASTM A615

Bar	Diameter	Area	Bar	Diameter	Area	Bar	Diameter	Area
	in	in^2		in	in^2		in	in^2
#3	0.38	0.11	#4	0.50	0.20	#5	0.63	0.31
#6	0.75	0.44	#7	0.88	0.60	#8	1.00	0.79
#9	1.13	1.00	#10	1.27	1.27	#11	1.41	1.56
#14	1.69	2.25	#18	2.26	4.00			

4.2. Confinement and Factors

Confinement type	Other
For #10 bars or less	#3 ties
For larger bars	#4 ties
Capacity Reduction Factors	
Axial compression, (a)	1
Tension controlled ϕ, (b)	1
Compression controlled ϕ, (c)	1

4.3. Arrangement

Pattern	Irregular
Bar layout	---
Cover to	---
Clear cover	---
Bars	---
Total steel area, A_s	3.63 in^2
Rho	0.28 %
Minimum clear spacing	11.27 in

(Note: Rho < 0.50%)

4.4. Bars Provided

Area	X	Y	Area	X	Y	Area	X	Y
in^2	in	in	in^2	in	in	in^2	in	in
0.11	-6.3	6.3	0.11	5.3	6.3	0.11	17.0	6.3

Area	X	Y	Area	X	Y	Area	X	Y
in^2	in	in	in^2	in	in	in^2	in	in
0.11	28.6	6.3	0.11	40.3	6.3	0.11	51.9	6.3
0.11	63.6	6.3	0.11	75.2	6.3	0.11	86.8	6.3
0.11	98.5	6.3	0.11	110.1	6.3	0.11	121.8	6.3
0.11	133.4	6.3	0.11	145.1	6.3	0.11	156.7	6.3
0.11	168.4	6.3	0.11	180.0	6.3	0.11	191.6	6.3
0.11	203.3	6.3	0.11	214.9	6.3	0.11	226.6	6.3
0.11	238.2	6.3	0.11	249.9	6.3	0.11	261.5	6.3
0.11	273.2	6.3	0.11	284.8	6.3	0.11	296.4	6.3
0.11	308.1	6.3	0.11	319.7	6.3	0.11	331.4	6.3
0.11	343.0	6.3	0.11	354.7	6.3	0.11	366.3	6.3

5. Control Points

About	Point	P	X-Moment	Y-Moment	NA Depth	d_t Depth	ε_t	ϕ
		kip	k-ft	k-ft	in	in		
Y	@ Max compression	6965.3	0.00	0.00	2713.77	374.31	-0.00259	1.00000
Y	@ Allowable comp.	6965.3	0.00	0.00	2713.77	374.31	-0.00259	1.00000
Y	@ f_s = 0.0	5151.4	0.00	20647.47	374.31	374.31	0.00000	1.00000
Y	@ f_s = 0.5 f_y	3578.5	0.00	27363.13	261.57	374.31	0.00129	1.00000
Y	@ Balanced point	2702.3	0.00	26763.68	201.02	374.31	0.00259	1.00000
Y	@ Tension control	1664.7	0.00	21950.69	130.78	374.31	0.00559	1.00000
Y	@ Pure bending	0.0	0.00	4105.97	18.04	374.31	0.05924	1.00000
Y	@ Max tension	-272.3	0.00	0.00	0.00	374.31	9.99999	1.00000
-Y	@ Max compression	6965.3	0.00	0.00	2713.77	374.31	-0.00259	1.00000
-Y	@ Allowable comp.	6965.3	0.00	0.00	2713.77	374.31	-0.00259	1.00000
-Y	@ f_s = 0.0	5151.4	0.00	-20647.47	374.31	374.31	0.00000	1.00000
-Y	@ f_s = 0.5 f_y	3578.5	0.00	-27363.14	261.57	374.31	0.00129	1.00000
-Y	@ Balanced point	2702.3	0.00	-26763.69	201.02	374.31	0.00259	1.00000
-Y	@ Tension control	1664.7	0.00	-21950.69	130.78	374.31	0.00559	1.00000
-Y	@ Pure bending	0.0	0.00	-4105.98	18.04	374.31	0.05924	1.00000
-Y	@ Max tension	-272.3	0.00	0.00	0.00	374.31	9.99999	1.00000

6. Factored Loads and Moments with Corresponding Capacity Ratios

NOTE: Calculations are based on "Critical Capacity" Method.

No.	Demand		Capacity		Parameters at Capacity			Capacity
	P_u	M_{uy}	ϕP_n	ϕM_{ny}	NA Depth	ε_t	ϕ	Ratio
	kip	k-ft	kip	k-ft	in			
1	0.00	248.75	0.00	4105.97	18.04	0.05924	1.000	0.86

7. Diagrams

7.1. PM at θ=0 [deg]

376 x 3.5 in

General Information

Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	Y - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity

Materials

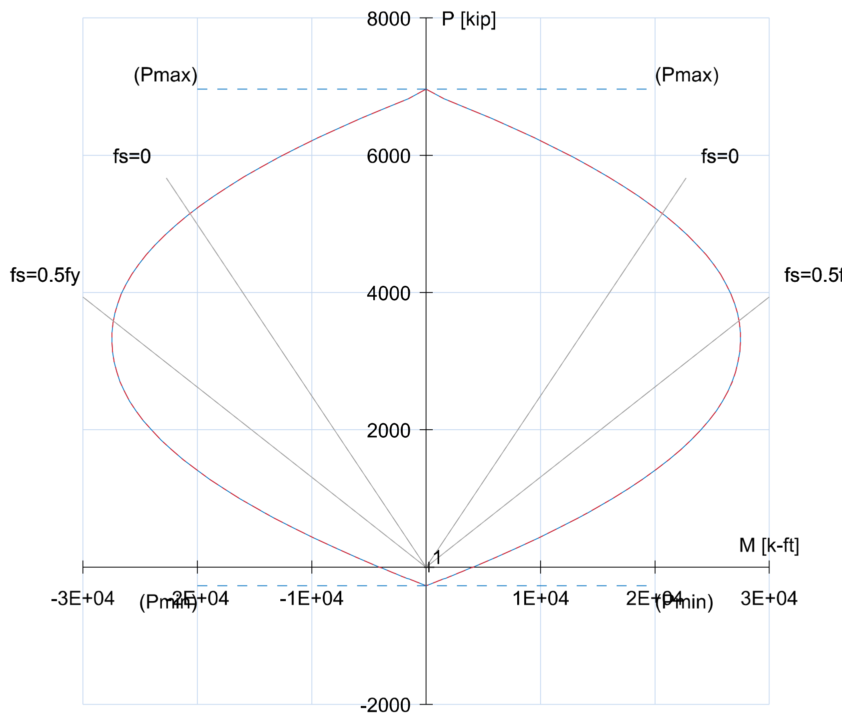
f'_c	6 ksi
E_c	4415.21 ksi
f_y	75 ksi
E_s	29000 ksi

Section

Type	Irregular
A_g	1316 in²
I_x	1343.42 in⁴
I_y	1.55042e+007 in⁴

Reinforcement

Pattern	Irregular
Bar layout	---
Cover to	---
Clear cover	---
Bars	---
Confinement type	Other
Total steel area, A_s	3.63 in²
Rho	0.28 %
Min. clear spacing	11.27 in



PM at 0.0 [deg]

No.	P_u kip	M_{uy} k-ft	ϕP_n kip	ϕM_{ny} k-ft	Capacity Ratio
1	0.0	248.8	0.00	4105.97	0.86

Max. Capacity Ratio: 0.86

Diaphragm Shear Check

kpff Portland, Oregon	Project	By FL	Sheet No. C36-35
	Location	Date	
	Client	Revised	Job No.
		Date	

Determining shear forces on diaphragm on level 2

Scaling forces from ETABS:

$$\text{Scale factor} = \frac{11{,}183k}{5{,}774k} = 1.937$$

From Vertical Distribution of Lateral Forces Per ASCE 41-17 Section 7.4.1.3.2 for Level 2, BSE-2N

From Diaphragm Forces per ASCE 41-17, Section 7.4.1.3.4 for level 2, BSE-2N

See "Diaphragm Forces from ETABS Section Cuts"

Grid	ETABS shear	Scaled shear
I	-1344.84k	-2604.67 k
E	-399.68k	-773.89k
1	432.37k	837.5k
5	874.32k	1693.56k

Checking diaphragm along grid E + I

Max diaphragm demands:

$$V_E = \frac{\lambda V_E}{L_E} = \frac{1.47(773.89k)}{(12' + 26.67' + 14' - 9.5')} = 26.35\,K \text{ Governs}$$

$$V_I = \frac{\lambda V_I}{L_I} = \frac{1.47(2604.67k)}{160'} = 23.93\,k$$

$\lambda = 1.47$ from 'Seismic Vertical Force Distribution' spreadsheet

Design shear strength of 3.5" conc. slab on metal deck (3" x 20 ga.) w/ #4 @ 12" o.c. each way ($f'_c = 4000psi$)

$$\varphi V_n = \varphi A_{CV}(2\lambda\sqrt{f'_c} + \rho_t f_y)$$

$\varphi = 1.0$

$\lambda = 1.0$

$f_y = 1.25 \times 60{,}000psi = 75{,}000psi$

$\rho_t = \frac{0.2\,in^2}{3.5" \times 12"} = 0.00476$

$A_{CV} = 3.5" \times 12" = 42in^2$

$f'_c = 1.5 \times 4000psi = 6000psi$

Factor from Table 10-1 of ASCE 41-17

$$\varphi V_n = 1.0(42in^2)(2 \times 1.0\sqrt{6000psi} + 0.00476(75000psi))$$
$$= 21500.6\ lb/ft \text{ or } 21.5\ K/ft$$

Checking Demand Capacity ratios

along Grid E: $\frac{26.35k}{21.5k} = 1.23 < 2.5$ BSE-2N

along Grid I: $\frac{23.93k}{21.5k} = 1.11 < 2.5$

Checking diaphragm along grid 1 & 5
Max diaphragm demands:

$$V_1 = \frac{\Omega V_1}{L_1} = \frac{1.47(837.5k)}{70'} = 17.59\ k/ft$$

$$V_5 = \frac{\Omega V_5}{L_5} = \frac{1.47(1693.56k)}{54'} = 46.102\ k/ft$$

$\Omega = 1.47$

Checking same design (see prev. page)

$$\phi V_n = 21.5\ k/ft$$

along Grid 1: $\frac{17.59 k/ft}{21.5 k/ft} = 0.82 < 2.5$

along Grid 5: $\frac{46.102 k/ft}{21.5 k/ft} = 2.14 < 2.5$

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		Date	

Load coming into wall on west elevation @ roof

$$(288.75\,psf)\,15912.2\,sf = 4594647.75\ lb$$

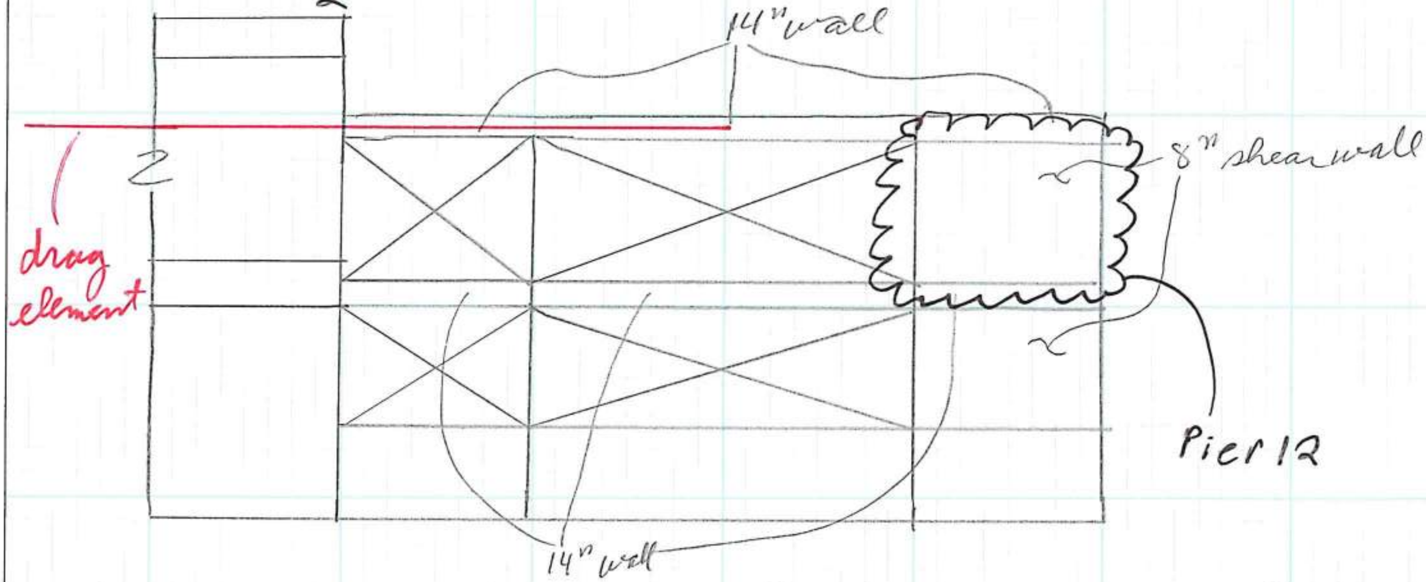
or

$$4594.648\ K$$

Mass of roof

Half of this load goes to the west side

$$\frac{4594.648K}{2} = 2297.3\ k$$



amount of shear that Pier 12 receives = 749.97 K
(according to pier forces from ETABS)
Step 2, BSE-2N

Amount of shear to be dragged into other walls

ASCE41-17 $Q_E = 2297.3\ K - 749.97\ K = 1547.33\ k$

Eq 7-35 $Q_{UF} = \frac{(1547.33\,k)\,\chi}{C_1 C_2 J} = \frac{(1547.33\,k)\,1.0}{(1.1)\,2.1} = 669.84\ K$

kpff
Portland, Oregon

Project	By	Sheet No. C36-39
Location	Date	
Client	Revised	Job No.
	Date	

Required Collector:

$$\frac{669.84K}{f_y} = \frac{669.84K}{50 ksi} = 13.40 in^2$$

Grade 50 ksi steel,
14" x 1" thick

REFER TO PAGE C36-48 FOR CONNECTION OF
DRAG PLATE TO STRUCTURE

kpff	Project:	PCC HTW	By: FYL	Sheet No. C36-40
	Location:	Portland, OR	Date: 05/24/24	
	Client:	Woofter + Bolch Architecture	Revised:	Job No.
	Subject:	BUILDING E SEISMIC FORCES	Date:	10022200424

Vertical Distribution of Lateral Forces Per ASCE 41-17 Section 7.4.1.3.2

Building Period = 0.34 s
Building Weight = 30,953 k

k = 1.000 Per ASCE 41-17 7.4.1.3.2

Stories = 3
Ground Elevation= 14.50 ft

	BSE-2N	BSE-1N
Base Shear, V =	1.055 W	0.640 W
Base Shear, V =	**32,667 k**	**19,798 k**

BSE-2N VERTICAL DISTRIBUTION

Building Height	Bldg. Wt. Σw_x	$\Sigma w_x h_x^k$	ΣC_{vx}	ΣF_x
43.50 ft	30,953 k	9.E+05	1.000	**32,667 k**

Lateral Force Acts at a Height of: 32.71 ft which equals 75.2% of Building Height

Level	Floor Height	Elevation h_x	Floor Wt. w_x	$w_x h_x^k$	C_{vx}	F_x	V_x	OTM
Roof		58.00 ft	8,643 k	3.8E+05	0.432	**14,128 k**	—	—
3	14.50 ft	43.50 ft	11,714 k	3.4E+05	0.391	**12,765 k**	14,128 k	204,853 k*ft
2	14.50 ft	29.00 ft	10,596 k	1.5E+05	0.177	**5,774 k**	26,893 k	594,804 k*ft
GROUND	14.50 ft	14.50 ft		—	—	—	32,667 k	1,068,470 k*ft

BSE-1N VERTICAL DISTRIBUTION

Building Height	Bldg. Wt. Σw_x	$\Sigma w_x h_x^k$	ΣC_{vx}	ΣF_x
43.50 ft	30,953 k	9.E+05	1.000	**19,798 k**

Lateral Force Acts at a Height of: 32.71 ft which equals 75.2% of Building Height

Level	Height	h_x	w_x	$w_x h_x^k$	C_{vx}	F_x	V_x	OTM
Roof		58.00 ft	8,643 k	3.8E+05	0.432	**8,562 k**	—	—
3	14.50 ft	43.50 ft	11,714 k	3.4E+05	0.391	**7,737 k**	8,562 k	124,153 k*ft
2	14.50 ft	29.00 ft	10,596 k	1.5E+05	0.177	**3,499 k**	16,299 k	360,487 k*ft
GROUND	14.50 ft	14.50 ft		—	—	—	19,798 k	647,558 k*ft

	Project:	PCC HTW	By: FYL	Sheet No. C36-41
	Location:	Portland, OR	Date: 05/24/24	
	Client:	Woofter + Bolch Architecture	Revised:	Job No.
	Subject:	BUILDING E SEISMIC FORCES	Date:	10022200424

Diaphragm Forces per ASCE 41-17, Section 7.4.1.3.4

Building Weight = *30,953 k*

	BSE-2E	BSE-1E
Base Shear, V =	32,667 k	19,798 k

BSE-2N DIAPHRAGM FORCES (TOTAL)

Σwx = 30,953 k; ΣFx = 32,667 k

Floor	w_x	Σw_x	F_x	ΣF_x	$\Sigma F_x / \Sigma w_x$	Equation 7-26 F_{px}
Roof	*8,643 k*	8,643 k	*14,128 k*	14,128 k	1.635	**14,128 k**
3	*11,714 k*	20,357 k	*12,765 k*	26,893 k	1.321	**15,475 k**
2	*10,596 k*	30,953 k	*5,774 k*	32,667 k	1.055	**11,183 k**
GROUND	—	—	—	—	—	—

BSE-1N DIAPHRAGM FORCES (TOTAL)

Σwx = 30,953 k; ΣFx = 19,798 k

Floor	w_x	Σw_x	F_x	ΣF_x	$\Sigma F_x / \Sigma w_x$	Equation 7-26 F_{px}
Roof	*8,643 k*	8,643 k	*8,562 k*	8,562 k	0.991	**8,562 k**
3	*11,714 k*	20,357 k	*7,737 k*	16,299 k	0.801	**9,379 k**
2	*10,596 k*	30,953 k	*3,499 k*	19,798 k	0.640	**6,777 k**
GROUND	—	—	—	—	—	—

SECTOR C ROOF DIAPHRAGM CHECK - REF. PAGE C36-44 FOR LOCATION OF SECTION CUTS

Section Cut Forces - Design

SectionCut	Output Case	Case Type	Step Type	Step Number	P (V)	V2	V3 (P)	M1	M2	M3	X	Y	Z
					kip	kip	kip	kip-ft	kip-ft	kip-ft	ft	ft	ft
EL	BSE-2NX	LinStatic	Step By Step	1	-1,270	11	584	-20	-843	-91	9.38	70.00	43.50
EL	BSE-2NX	LinStatic	Step By Step	2	-1,415	12	657	-22	-577	-100	9.38	70.00	43.50
EL	BSE-2NX	LinStatic	Step By Step	3	-1,124	10	510	-18	-1,108	-81	9.38	70.00	43.50
ER	BSE-2NX	LinStatic	Step By Step	1	-960	-1	-380	5	10,206	-5	149.59	70.00	43.50
ER	BSE-2NX	LinStatic	Step By Step	2	-1,033	-1	-454	4	10,917	-4	149.59	70.00	43.50
ER	BSE-2NX	LinStatic	Step By Step	3	-886	-1	-307	5	9,495	-6	149.59	70.00	43.50
FL	BSE-2NX	LinStatic	Step By Step	1	1,212	0	476	0	3,317	0	150.54	54.00	43.50
FL	BSE-2NX	LinStatic	Step By Step	2	1,356	0	578	0	4,048	1	150.54	54.00	43.50
FL	BSE-2NX	LinStatic	Step By Step	3	1,067	0	373	0	2,587	0	150.54	54.00	43.50
FR	BSE-2NX	LinStatic	Step By Step	1	1,133	0	509	1	2,187	1	150.54	54.00	43.50
FR	BSE-2NX	LinStatic	Step By Step	2	1,264	0	607	1	3,060	1	150.54	54.00	43.50
FR	BSE-2NX	LinStatic	Step By Step	3	1,002	0	412	1	1,315	1	150.54	54.00	43.50

Section Cut Forces - Design

SectionCut	Output Case	Case Type	Step Type	Step Number	P (P)	V2	V3 (V)	M1	M2	M3	X	Y	Z
					kip	kip	kip	kip-ft	kip-ft	kip-ft	ft	ft	ft
2	BSE-2NY	LinStatic	Step By Step	1	1,398	6	1,078	-114	-37,838	58	40.00	24.33	43.50
2	BSE-2NY	LinStatic	Step By Step	2	1,383	-1	796	45	-35,341	-24	40.00	24.33	43.50
2	BSE-2NY	LinStatic	Step By Step	3	1,413	12	1,360	-273	-40,335	141	40.00	24.33	43.50
2A1	BSE-2NY	LinStatic	Step By Step	1	-1,772	3	-55	-37	26,938	23	70.25	14.57	43.50
2A1	BSE-2NY	LinStatic	Step By Step	2	-1,747	2	207	-17	25,897	2	70.25	14.57	43.50
2A1	BSE-2NY	LinStatic	Step By Step	3	-1,797	5	-316	-57	27,979	44	70.25	14.57	43.50
2A2	BSE-2NY	LinStatic	Step By Step	1	375	0	-25	0	1,176	0	70.25	49.75	43.50
2A2	BSE-2NY	LinStatic	Step By Step	2	366	0	-5	0	1,098	0	70.25	49.75	43.50
2A2	BSE-2NY	LinStatic	Step By Step	3	385	0	-45	0	1,254	0	70.25	49.75	43.50
3	BSE-2NY	LinStatic	Step By Step	1	1,391	1	-408	-49	-53,480	-23	80.00	24.62	43.50
3	BSE-2NY	LinStatic	Step By Step	2	1,376	2	-691	-91	-53,188	-23	80.00	24.62	43.50
3	BSE-2NY	LinStatic	Step By Step	3	1,406	-1	-126	-7	-53,772	-23	80.00	24.62	43.50
4	BSE-2NY	LinStatic	Step By Step	1	-1,383	6	1,835	-57	-801	-39	120.00	18.10	43.50
4	BSE-2NY	LinStatic	Step By Step	2	-1,367	12	2,118	-171	1,586	-117	120.00	18.10	43.50
4	BSE-2NY	LinStatic	Step By Step	3	-1,398	0	1,552	57	-3,188	38	120.00	18.10	43.50

SECTOR C ROOF LEVEL SECTION CUT DESIGN/DIAPHRAGM STRENGTHENING

	BSE-2N FORCES					Force Controlled Adjustment							SHEAR CHECK					CHORDS								
													FLANGES	SIDE CONNECTIONS	REQ'D STRG.†			NEW STEEL PL**		EXISTING C.I.P. CHORD (DEF. CONTR.)						
Section cut	V_{UD}, k	M_{UD}, kip-ft	P_{UD}, k	length, ft	d, ft	χ	C_1C_2	J	V_{UF}, k	M_{UF}, kip-ft	P_{UF}, k	v_{UF}, k/ft	v_{CL}, k/ft	v_{CL}, k/ft	v_{CL}, k/ft	Q_{UD}, kips*	Q_{UF}, kips	F_{YL}, ksi	A, in^2	F_{YE}, ksi	A_S, in^2	T_{CE}, kips	DCR	m	A_g, in^2	f_{CE}, ksi
EL	-1,415	-1,108	657	40	38	1.15	1.1	2.00	740	579	343	18.5	13.9	7.2	11.3	299	156			50	1.55	77.5	3.86	3.8	236	1.27
ER	-1,033	10,917	-454	40	38	1.15	1.1	2.00	540	5,706	237	13.5	13.9	7.2	6.3	60	32			50	1.55	77.5	0.78	3.8	236	0.26
FL	1,356	4,048	578	40	38	1.15	1.1	2.00	709	2,116	302	17.7	13.9	7.2	10.5	183	95			50	1.55	77.5	2.36	3.8	236	0.77
FR	1,264	3,060	607	40	38	1.15	1.1	2.00	661	1,599	317	16.5	13.9	7.2	9.3	223	117			50	1.55	77.5	2.88	3.8	236	0.94
2	1,360	-40,335	1,413	54	50	1.15	1.1	2.00	711	21,084	739	13.2	13.9	7.2	6.0	100	52			50	6.24	312	0.32	3.8	1,488	0.07
2A1	-316	27,979	-1,797	34	32	1.15	1.1	2.00	165	14,625	939	4.9	13.9	7.2	-	24	13	36	0.3	50	6.24	312	0.08	3.8	1,488	0.02
2A2	-45	1,254	385	10	8	1.15	1.1	2.00	23	656	201	2.3	13.9	7.2	-	36	19	36	0.5							
3	-691	-53,480	1,376	54	50	1.15	1.1	2.00	361	27,956	719	6.7	13.9	7.2	-	382	200			50	6.24	312	1.22	3.8	1,488	0.26
4	2,118	-3,188	-1,367	54	50	1.15	1.1	2.00	1,107	1,666	715	20.5	13.9	7.2	13.3	620	324			50	6.24	312	1.99	3.8	1,488	0.42

!! AXIAL LOADS IN DIAPHRAGM ARE ADDITIVE TO FLEXURAL TENSION (REDUCING FLEXURAL TENSION) AT SECTIONS CUTS THROUGH CENTER OF DIAPHRAGM

† REQUIRED DIAPHRAGM SHEAR STRENGTHENING.

AT SECTIONS 2 AND 4, STRENGTHENING IS NOT REQUIRED BECAUSE THE DIAPHRAGM UNIT SHEAR DOES NOT EXCEED THE MAXIMUM EXISTING DIAPHRAGM UNIT SHEAR (AT GRIDS 1 AND 5) BY MORE THAN 10%.

INDICATES FRP FORCE CONTROLLED STRENGTHENING AT GRIDLINE F

** CAST-IN-PLACE CHORDS OR CONTINUOUS PRECAST CHORDS ARE CONSIDERED DEFORMATION CONTROLLED. FRP AND STEEL PLATE CHORD STRENGTHENING ARE FORCE CONTROLLED*

VALUE APPLIES ONLY AT GRIDLINE I EXISTING CAST IN PLACE BEAM

VALUE NOT USED AS BOTH CHORDS OF THIS SEGMENT (BETWEEN NEW SKYLIGHT AND ELEVATOR OPENINGS) ARE FORCE CONTROLLED

VALUE NOT USED AS BOTH CHORDS OF THESE SEGMENTS ARE DEFORMATION CONTROLLED.

CHORD NOTES:

THE EXISTING CHORD/BEAM ON GRIDLINE I HAS (4) #11 TOP AND BOTTOM. 1/2 OF THE REINFORCING IS USED FOR THE CHORD AREA.

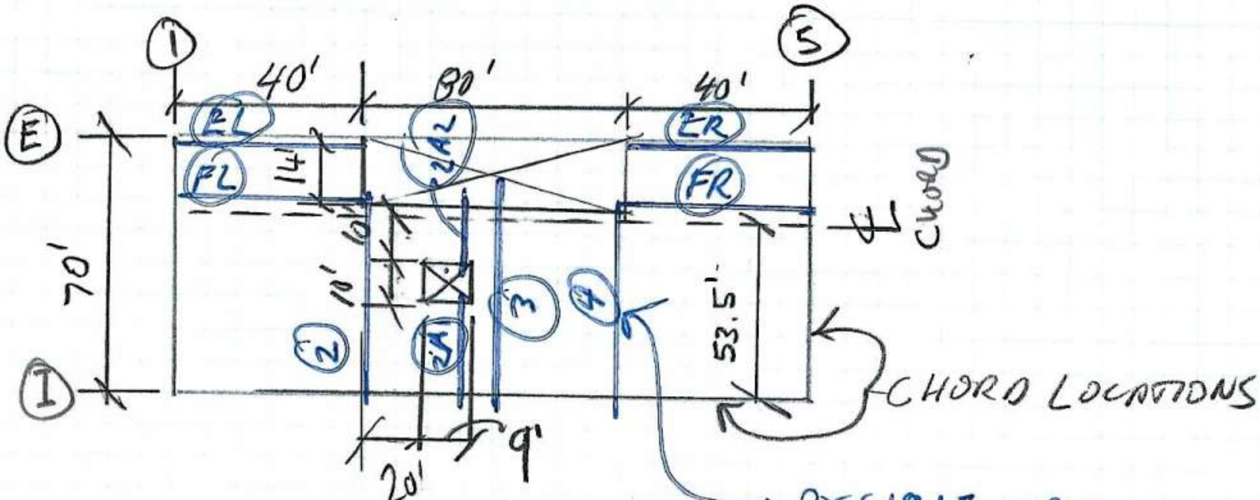
THE EXISTING CHORDS ON GRIDLINES 2 AND 4 ARE CAST-IN-PLACE CONCRETE INFILLS BETWEEN PRECAST CHANNELS, WITH (5) #5 CONTINUOUS BARS TOP (BOTTOM REINFORCING IS NOT CONSIDERED)

PER ASCE 41-17 SECTION 10.10.2.3, THE m FACTOR FOR THE CHORD IS TAKEN AS A FRAME ELEMENT. FOR THE TENSION CASE, m IS TAKEN EITHER FROM TABLE 10-10a, INTERPOLATING A VALUE OF m = 3.8 BASED ON THE TOP ROW OF THE TABLE, LIMITED SAFETY ACTING IN COMPRESSION, THE AXIAL STRESSES ARE VERY LOW AND DO NOT GOVERN

** NEW STEEL PLATES TO DEVELOP FORCE EACH END OF OPENING.

kpff Portland, Oregon	Project	By	Sheet No. C36-44
	Location	Date	
	Client	Revised	Job No.
		Date	

SECTOR C ROOF DIAPHRAGM CHECKS.



POSSIBLE CRITICAL SECTIONS LABELED BY APPROX. GRIDLINE.

CREATE SECTION CUTS IN ETABS MODEL

CAPACITY OF (E) DIAPHRAGM IN SHEAR:

4" CONC #3 @ 12" O.C. TRANS, $A = 0.00229$

(4) #4 CONT. PER 54" $A = 0.00370$

$f_y = 40$ ksi $f_{yE} = 50$ ksi

$f'_c = 5{,}000$ psi (PRECAST) $f'_{cE} = 7{,}500$ psi

$$V_{CE} = \left(\frac{2\sqrt{7{,}500}}{1000} + 50 \times 0.00229\right) \times 4 \times 12$$

$$= 13.8\ \text{k/ft.}$$

kpff Portland, Oregon	Project	By	Sheet No. C36-45
	Location	Date	
	Client	Revised	Job No.
		Date	

CAPACITY OF (E) DIAPHRAGM CONNECTIONS.

BETWEEN PRECAST CHANNELS.

$1/2" \times 1\,1/2" \times 0'\text{-}8"$ A36 BAR WELDED TO 2x2x3/16 $\angle$

W/ 8" OF 3/8" FILLET WELD

WELD $R_n = 0.6 \times 70 \times 3/8 \times \frac{1}{\sqrt{2}} \times 8 = 89^k$

PLATE $R_n = 0.6 \times 36 \times 1/2 \times 8 = 86^k$

SPACING OF CONN: 12'-0" $\therefore$ $V_{CL} = \frac{86}{12} = \underline{7.2^{k}/ft.}$

PRECAST CHANNEL TO WALL CONN @ GRIDLINE E

(4) #4 C.I.P. DOWELS @ EACH CHANNEL.
(SHEAR FRICTION)

$V_{CL} = 1.0 \times 4 \times 0.2 \times 40 = 32\ k$

$\div 4.5' = \underline{7.1^{k}/FT.}$

THIS DOES NOT INCLUDE THE CHANNELS SIDE BEARING
$\therefore$ USE $7.2^{k}/FT$ LIMIT FOR (E) DIAPHRAGM. AT

DIAPHRAGM TO WALL
USE $11.2^{k}/FT$ LIMIT (EXISTING CAPACITY)

740^k OVER 40' 540^k OVER 40'

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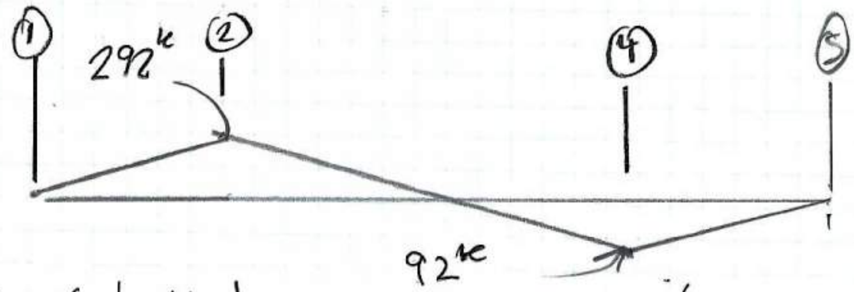
	Location	Date	
	Client	Revised	Job No.
		Date	

GRID (E) COLLECTOR



$740 - (40' \times 11.2)$

$= 292^k$

$840 - (40' \times 11.2^k)$

$= 92^k$

$A_{PL} = \frac{292}{50} = 5.8 \text{ in}^2 \quad t = \frac{5.8}{12} = 0.48$

(2) 6" LEGS → USE 1/2" Fy=50 ksi

℄ CONN. TO SLAB:

1 TO 2 $\quad 292/40' = 7.3^{k/FT}$

4 TO 5 $\quad 92 \times 40' = 2.3^{k/ft}$

℄ TO WALL: 2 TO 4 $\quad (292+92)/80' = 4.8^{k/FT}$

SLAB ANCHORS: 1/2"φ EMBED INTO 5,000 psi CONC.
X 2 3/4"

8,000 lb. EACH w/ φ=1.0

REF C36-49
FOR ANCHOR
CALCULATION

24" o.c. 4 TO 5

12" o.c. 1 TO 2

WALL ANCHORS. SAME ANCHOR CAPACITY

SPACE AT 1'-6" o.c.

AT OPNG. 2'-0" o.c. ENDS.

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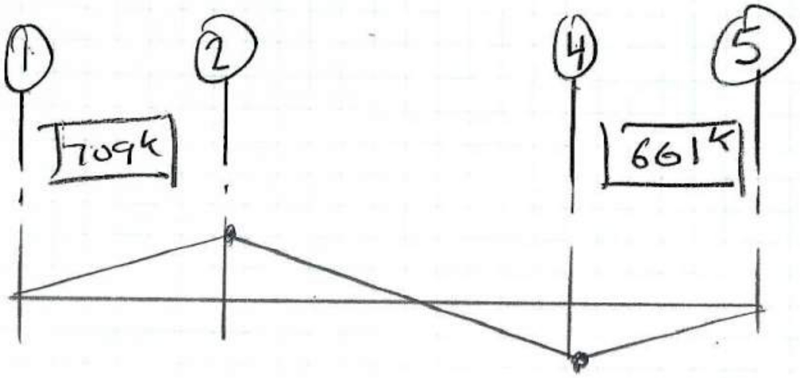
Portland, Oregon

Project		By		Sheet No. C36-47
Location		Date		Job No.
Client		Revised		
		Date		

GRID F CHORD/COLLECTOR:

COLLECTOR:

UNIFORM SHEAR SOUTH OF NEW OPENINGS



UNIFORM SHEAR = $\frac{709+661}{160'} = 8.6^{k/ft.}$

GRID 2: $709 - 40 \times 8.6 = 365^k$

GRID 4: $661 - 40 \times 8.6 = 317^k$

CHORD:

SEE EXCEL SPREADSHEET.

SECTION: 2 — 52^k ← COLLECTOR GOVERNS

3 — 200^k

4 — 324^k

CHORDS @ ELEV. OPENING:

FORCE = 19^k

PL 1/2x4 w/ 1/2" EPOXY ANCHORS @ 24" O.C. TO ROOF (8,000 Lb EACH)

REF C36-49
FOR ANCHOR
CALCULATION

kpff Portland, Oregon	Project	By	Sheet No. C36-48
	Location	Date	
	Client	Revised	Job No.
		Date	

ANCHORS AT GRID 1 DRAG PL

$1'' \times 14'' \times 50\ ksi = 700^k$.

$1/2''\phi$ ANCHORS 8^k/EACH.

N = 88 EACH END. N.G.

$3/4''\phi$ ANCHORS 18.8^k EACH.

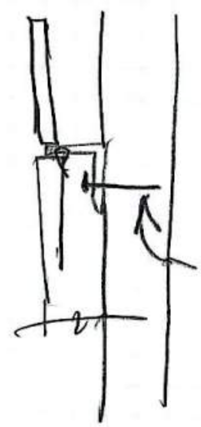
REF C36-54 FOR ANCHOR CALCULATION

N = 37 → 38 (2) ROWS @ 12" o.c.

≃ 20' PL

CONN. TO SHOTCRETE:

WALL STRENGTH EXPECTED = 31^k/FT.



ADD DRAG BARS IN WALL TO TAKE 1/2 OF LOAD

$A_s = 5.8\ in^2$ → (10) #7

SHEAR FRICTION DOWELS:

$700 = 0.6 \times A \times 60 \Rightarrow A = 19.4$

(32) #7 DBA.

$1/2''$ @ 12" → (14) x 8^k

$700 - (14) \times 8 = 588 \div (0.6 \times 60)$

$= 16.3$ → (27) #7 6" o.c.

SIMPSON Strong-Tie®

Anchor Designer™ Software
Version 3.2.2309.2

Company:		Date:	2/17/2023
Engineer:		Page:	1/5
Project:			
Address:			
Phone:			
E-mail:			

1.Project information

Customer company:
Customer contact name:
Customer e-mail:
Comment:

Project description:
Location:
Fastening description:

2. Input Data & Anchor Parameters

General
Design method:ACI 318-19
Units: Imperial units

Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B7
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 2.750
Code report: ICC-ES ESR-4057
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 4.00
c_{ac} (inch): 6.81
C_{min} (inch): 1.75
S_{min} (inch): 2.50

Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 4.00
State: Cracked
Compressive strength, f'_c (psi): 5000
$\Psi_{c,V}$: 1.0
Reinforcement condition: Supplementary reinforcement not present
Supplemental edge reinforcement: Not applicable
Reinforcement provided at corners: No
Ignore concrete breakout in tension: No
Ignore concrete breakout in shear: No
Hole condition: Dry concrete
Inspection: Continuous
Temperature range, Short/Long: 150/110°F
Reduced installation torque (for AT-3G): Not applicable
Ignore 6do requirement: Not applicable
Build-up grout pad: No

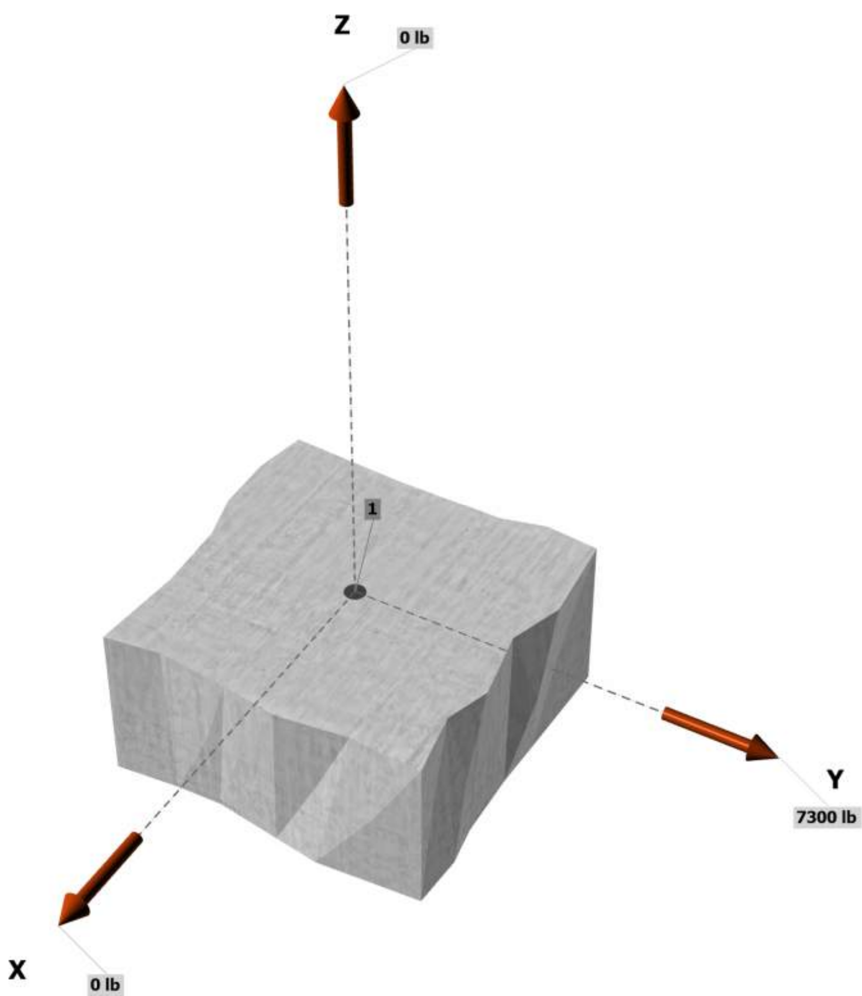
Recommended Anchor
Anchor Name: SET-3G™ - SET-3G w/ 1/2"Ø A193 Gr. B7
Code Report: ICC-ES ESR-4057

Load and Geometry
Load factor source: ACI 318 Section 5.3
Load combination: not set
Seismic design: Yes
Anchors subjected to sustained tension: No
Ductility section for tension: 17.10.5.2 not applicable
Ductility section for shear: 17.10.6.2 not applicable
Ω_0 factor: not set
Apply entire shear load at front row: Yes
Anchors only resisting wind and/or seismic loads: Yes

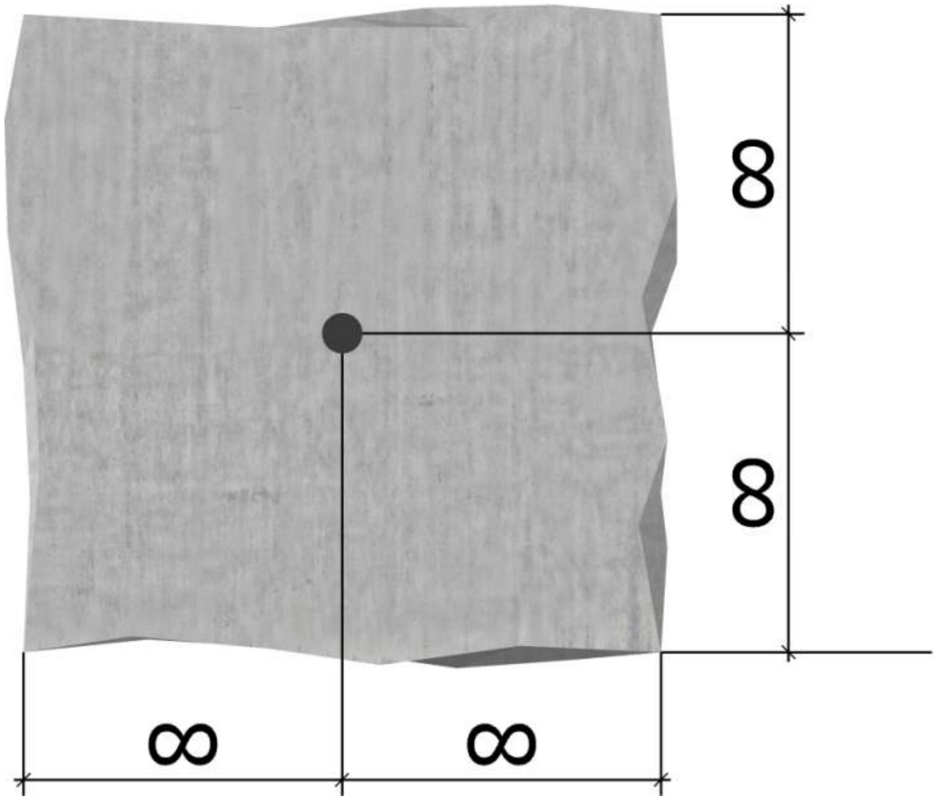
Strength level loads:

N_{ua} [lb]: 0
V_{uax} [lb]: 0
V_{uay} [lb]: 7300

<Figure 1>



<Figure 2>



3. Resulting Anchor Forces

Anchor	Tension load, N_{ua} (lb)	Shear load x, V_{uax} (lb)	Shear load y, V_{uay} (lb)	Shear load combined, $\sqrt{(V_{uax})^2+(V_{uay})^2}$ (lb)
1	0.0	0.0	7300.0	7300.0
Sum	0.0	0.0	7300.0	7300.0

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 0
Resultant compression force (lb): 0
Eccentricity of resultant tension forces in x-axis, e'_{Nx} (inch): 0.00
Eccentricity of resultant tension forces in y-axis, e'_{Ny} (inch): 0.00
Eccentricity of resultant shear forces in x-axis, e'_{Vx} (inch): 0.00
Eccentricity of resultant shear forces in y-axis, e'_{Vy} (inch): 0.00

FOR ASCE 41-17 PHI = 1.0
ANCHOR STRENGTH =
5,192/0.65 = 8.0 KIPS

8. Steel Strength of Anchor in Shear (Sec. 17.7.1)

V_{sa} (lb)	ϕ_{grout}	ϕ	$\alpha_{V,seis}$	$\phi_{grout}\alpha_{V,seis}\phi V_{sa}$ (lb)
10650	1.0	0.65	0.75	5192

10. Concrete Pryout Strength of Anchor in Shear (Sec. 17.7.3)

$\phi V_{cp} = \phi \min|k_{cp}N_a\,;\,k_{cp}N_{cb}| = \phi \min|k_{cp}(A_{Na}/A_{Na0})\Psi_{ed,Na}\Psi_{cp,Na}N_{ba}\,;\,k_{cp}(A_{Nc}/A_{Nco})\Psi_{ed,N}\Psi_{c,N}\Psi_{cp,N}N_b|$ (Sec. 17.5.1.2 & Eq. 17.7.3.1a)

k_{cp}	A_{Na} (in^2)	A_{Na0} (in^2)	$\Psi_{ed,Na}$	$\Psi_{cp,Na}$	N_{ba} (lb)	N_a (lb)
2.0	205.45	205.45	1.000	1.000	6437	6437

A_{Nc} (in^2)	A_{Nco} (in^2)	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	N_{cb} (lb)	ϕ	ϕV_{cp} (lb)
68.06	68.06	1.000	1.000	1.000	5482	5482	0.70	7675

11. Results

Interaction of Tensile and Shear Forces (Sec. 17.8)

Shear	Factored Load, V_{ua} (lb)	Design Strength, $øV_n$ (lb)	Ratio	Status
Steel	**7300**	**5192**	**1.41**	**Fail (Governs)**
Pryout	7300	7675	0.95	Pass

FAIL! Selected anchor type and embedment do not meet the selected design criteria.

12. Warnings

- Per designer input, the tensile component of the strength-level earthquake force applied to anchors does not exceed 20 percent of the total factored anchor tensile force associated with the same load combination. Therefore the ductility requirements of ACI 318 17.10.5.2 for tension need not be satisfied – designer to verify.

- Per designer input, the shear component of the strength-level earthquake force applied to anchors does not exceed 20 percent of the total factored anchor shear force associated with the same load combination. Therefore the ductility requirements of ACI 318 17.10.6.2 for shear need not be satisfied – designer to verify.

- Designer must exercise own judgement to determine if this design is suitable.

- Refer to manufacturer’s product literature for hole cleaning and installation instructions.

SIMPSON Strong-Tie® Anchor Designer™ Software
Version 3.2.2309.2

Company:		Date:	2/17/2023
Engineer:		Page:	1/5
Project:			
Address:			
Phone:			
E-mail:			

1.Project information

Customer company:
Customer contact name:
Customer e-mail:
Comment:

Project description:
Location:
Fastening description:

2. Input Data & Anchor Parameters

General
Design method:ACI 318-19
Units: Imperial units

Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B7
Diameter (inch): 0.750
Effective Embedment depth, h_{ef} (inch): 5.000
Code report: ICC-ES ESR-4057
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 6.75
c_{ac} (inch): 9.83
C_{min} (inch): 1.75
S_{min} (inch): 3.00

Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 8.00
State: Cracked
Compressive strength, f'_c (psi): 2500
$\Psi_{c,V}$: 1.0
Reinforcement condition: Supplementary reinforcement not present
Supplemental edge reinforcement: Not applicable
Reinforcement provided at corners: No
Ignore concrete breakout in tension: No
Ignore concrete breakout in shear: No
Hole condition: Dry concrete
Inspection: Continuous
Temperature range, Short/Long: 150/110°F
Reduced installation torque (for AT-3G): Not applicable
Ignore 6do requirement: Not applicable
Build-up grout pad: No

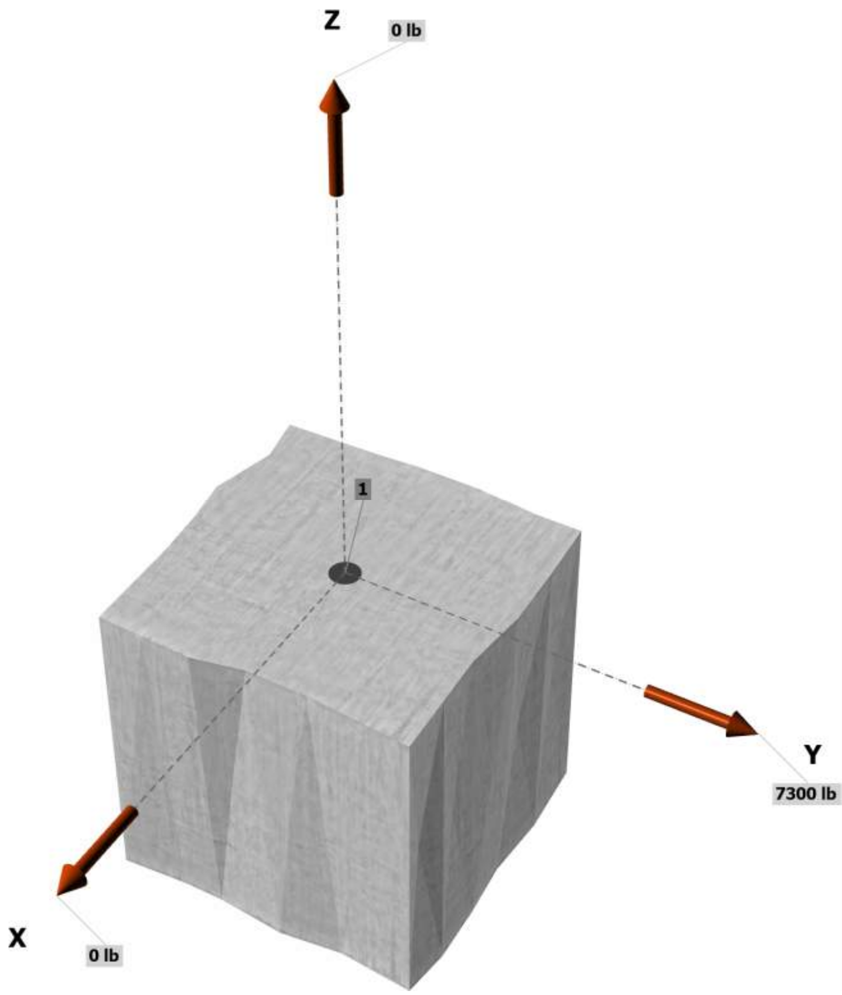
Recommended Anchor
Anchor Name: SET-3G™ - SET-3G w/ 3/4"Ø A193 Gr. B7
Code Report: ICC-ES ESR-4057

Load and Geometry
Load factor source: ACI 318 Section 5.3
Load combination: not set
Seismic design: Yes
Anchors subjected to sustained tension: No
Ductility section for tension: 17.10.5.2 not applicable
Ductility section for shear: 17.10.6.2 not applicable
Ω_0 factor: not set
Apply entire shear load at front row: Yes
Anchors only resisting wind and/or seismic loads: Yes

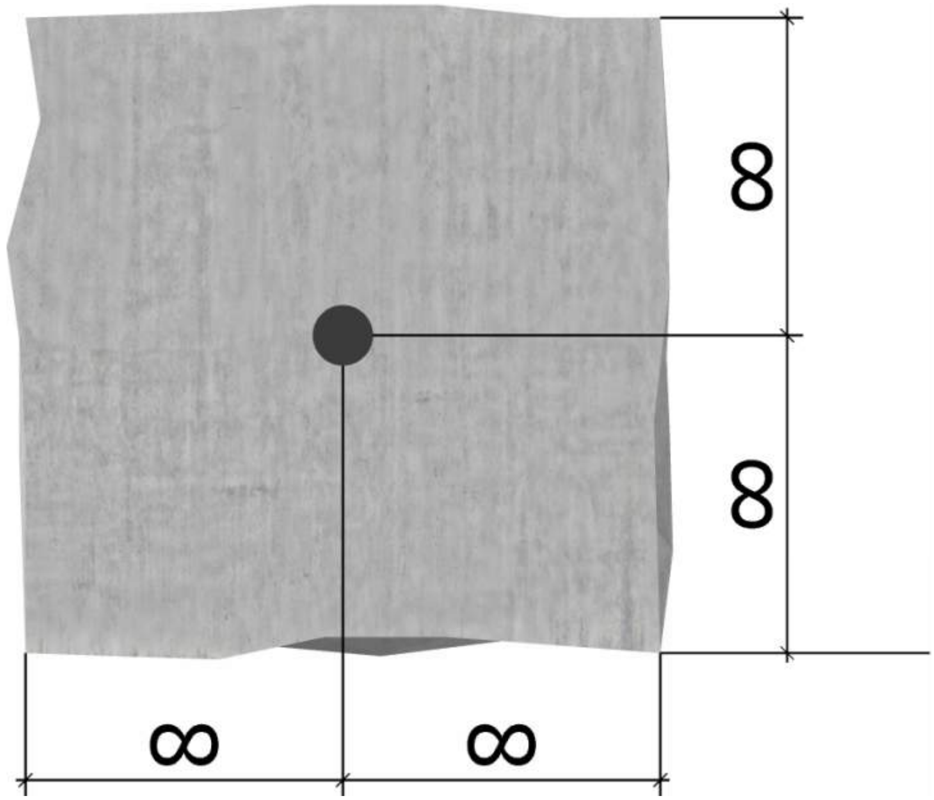
Strength level loads:

N_{ua} [lb]: 0
V_{uax} [lb]: 0
V_{uay} [lb]: 7300

<Figure 1>



<Figure 2>



3. Resulting Anchor Forces

Anchor	Tension load, N_{ua} (lb)	Shear load x, V_{uax} (lb)	Shear load y, V_{uay} (lb)	Shear load combined, $\sqrt{(V_{uax})^2+(V_{uay})^2}$ (lb)
1	0.0	0.0	7300.0	7300.0
Sum	0.0	0.0	7300.0	7300.0

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 0
Resultant compression force (lb): 0
Eccentricity of resultant tension forces in x-axis, e'_{Nx} (inch): 0.00
Eccentricity of resultant tension forces in y-axis, e'_{Ny} (inch): 0.00
Eccentricity of resultant shear forces in x-axis, e'_{Vx} (inch): 0.00
Eccentricity of resultant shear forces in y-axis, e'_{Vy} (inch): 0.00

8. Steel Strength of Anchor in Shear (Sec. 17.7.1)

V_{sa} (lb)	ϕ_{grout}	ϕ	$\alpha_{V,seis}$	$\phi_{grout}\alpha_{V,seis}\phi V_{sa}$ (lb)
25050	1.0	0.65	0.75	12212

FOR ASCE 41-17 PHI = 1.0
ANCHOR STRENGTH =
12,212/0.65 = 18.8 KIPS

10. Concrete Pryout Strength of Anchor in Shear (Sec. 17.7.3)

$\phi V_{cp} = \phi \min|k_{cp}N_a\ ;\ k_{cp}N_{cb}| = \phi \min|k_{cp}(A_{Na}/A_{Na0})\Psi_{ed,Na}\Psi_{cp,Na}N_{ba}\ ;\ k_{cp}(A_{Nc}/A_{Nco})\Psi_{ed,N}\Psi_{c,N}\Psi_{cp,N}N_b|$ (Sec. 17.5.1.2 & Eq. 17.7.3.1a)

k_{cp}	A_{Na} (in^2)	A_{Na0} (in^2)	$\Psi_{ed,Na}$	$\Psi_{cp,Na}$	N_{ba} (lb)	N_a (lb)
2.0	422.18	422.18	1.000	1.000	15433	15433

A_{Nc} (in^2)	A_{Nco} (in^2)	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	N_{cb} (lb)	ϕ	ϕV_{cp} (lb)
225.00	225.00	1.000	1.000	1.000	9503	9503	0.70	13305

11. Results

Interaction of Tensile and Shear Forces (Sec. 17.8)

Shear	Factored Load, V_{ua} (lb)	Design Strength, $øV_n$ (lb)	Ratio	Status
Steel	**7300**	**12212**	**0.60**	**Pass (Governs)**
Pryout	7300	13305	0.55	Pass

SET-3G w/ 3/4"Ø A193 Gr. B7 with hef = 5.000 inch meets the selected design criteria.

12. Warnings

- Per designer input, the tensile component of the strength-level earthquake force applied to anchors does not exceed 20 percent of the total factored anchor tensile force associated with the same load combination. Therefore the ductility requirements of ACI 318 17.10.5.2 for tension need not be satisfied – designer to verify.

- Per designer input, the shear component of the strength-level earthquake force applied to anchors does not exceed 20 percent of the total factored anchor shear force associated with the same load combination. Therefore the ductility requirements of ACI 318 17.10.6.2 for shear need not be satisfied – designer to verify.

- Designer must exercise own judgement to determine if this design is suitable.

- Refer to manufacturer's product literature for hole cleaning and installation instructions.

kpff

August 13, 2024

Miles Woofter
woofter bolch architecture
107 SE Washington St. #228
Portland, OR 97214

Re:	PCC SY-HT West Side Renovation
	12000 SW 49th Ave, Portland, OR 97219
	Application #: 24-020319-STR-01-CO
	Response to Structural Plan Review Comments

Dear Miles:

This letter is in response to the City of Portland's Structural Checksheet created by Whitney Olsen and dated July 23, 2024. We have provided written responses to each item separately which can be submitted to the city for review. Additionally, please find attached structural calculation pages C36.3-1 through C52.3-1 dated August 13, 2024, which verify the structural adequacy of the project including revisions shown on attached drawing sheets S1.01, S1.05, S3.10 and S6.02, dated August 13, 2024.

If you have any questions or need further information, please let me know.

Sincerely,

Nick Saari, PE, SE
Associate

STRUCTURAL
REGISTERED PROFESSIONAL
ENGINEER
79476
OREGON
MARCH 13, 2007
JOSHUA P. RICHARDS
EXPIRES 12.31.24

Attachments

Project No. 10022200424

111 SW Fifth Avenue, Suite 2600 Portland, OR 97204 503 227-3251 **kpff.com**

MATERIAL PROPERTIES AND MODIFIERS - "OLD" ETABS MODEL

1 Properties

This chapter provides property information for materials, frame sections, shell sections, and links.

1.1 Materials

Table 1.1 - Material Properties - General

Material	Type	SymType	Grade	Color	Notes
2500Psi	Concrete	Isotropic	f'c 5000 psi	Magenta	
4000Psi	Concrete	Isotropic	f'c 4000 psi	Magenta	
5000Psi	Concrete	Isotropic	f'c 5000 psi	Magenta	
A416Gr270	Tendon	Uniaxial	Grade 270	Gray8Dark	
A615Gr60	Rebar	Uniaxial	Grade 60	Yellow	
A992Fy50	Steel	Isotropic	Grade 50	Red	
M1500Psi	Masonry	Isotropic	fcm 1500 psi	Yellow	

Table 1.2 - Material Properties - Steel Data

Material	Fy lb/in2	Fu lb/in2	Fye lb/in2	Fue lb/in2	SSCurveOpt	SSHysType	SHard in/in	SMax in/in	SRup in/in	FinalSlope
A992Fy50	50000	65000	55000	71500	Simple	Kinematic	0.015	0.11	0.17	-0.1

Table 1.3 - Material Properties - Concrete Data

Material	Fc lb/in2	LtWtConc	IsUserFr	SSCurveOpt	SSHysType	SFc in/in	SCap in/in	FinalSlope	FAngle deg	DAngle deg
2500Psi	5000	No	No	Mander	Concrete	0.002219	0.005	-0.1	0	0
4000Psi	4000	No	No	Mander	Concrete	0.002219	0.005	-0.1	0	0
5000Psi	5000	No	No	Mander	Concrete	0.002219	0.005	-0.1	0	0

Table 1.4 - Material Properties - Masonry Data

Material	Fm lb/in2	SSCurveOpt	SSHysType	SFm in/in	SCap in/in	FinalSlope	FAngle deg	DAngle deg
M1500Psi	1500	Simple	Concrete	0.001922	0.005	-0.1	0	0

Table 1.5 - Material Properties - Rebar Data

Material	Fy lb/in2	Fu lb/in2	Fye lb/in2	Fue lb/in2	SSCurveOpt	SSHysType	SHard in/in	SCap in/in	FinalSlope
A615Gr60	60000	90000	66000	99000	Simple	Kinematic	0.01	0.09	-0.1

Table 1.6 - Material Properties - Tendon Data

Material	Fy lb/in2	Fu lb/in2	SSCurveOpt	SSHysType	FinalSlope
A416Gr270	245100	270000	270 ksi	Kinematic	-0.1

1.2 Shell Sections

Table 1.7 - Area Section Property Definitions - Summary

Name	Type	Element Type	Material	Total Thickness in	Deck Material	Deck Depth in
10" Wall	Wall	Shell-Thin	2500Psi	10		
14" Wall	Wall	Shell-Thin	2500Psi	14		
3" slab	Slab	Shell-Thin	4000Psi	3		
5.5" slab	Slab	Shell-Thin	5000Psi	5.5		
6" slab	Slab	Shell-Thin	4000Psi	6		

MATERIAL PROPERTIES AND MODIFIERS - "OLD" ETABS MODEL

Name	Type	Element Type	Material	Total Thickness in	Deck Material	Deck Depth in
6" Wall	Wall	Shell-Thin	4000Psi	6		
8" Wall	Wall	Shell-Thin	2500Psi	8		
Deck1	Deck	Membrane	Not Applicable	3	A992Fy50	3
Masonry	Wall	Shell-Thin	M1500Psi	7.625		
Pool Roof	Slab	Shell-Thin	4000Psi	36		
Waffle	Slab	Shell-Thin	4000Psi	19.5		

Table 1.8 - Slab Property Definitions (Part 1 of 3)

Name	Modeling Type	Property Type	Material	Overall Depth in	Slab Thickness in	Rib Width at Top in	Rib Width at Bottom in	Rib Spacing 1 in	Rib Spacing 2 in	Notional Size Type
3" slab	Shell-Thin	Slab	4000Psi		3					Auto
5.5" slab	Shell-Thin	Slab	5000Psi		5.5					Auto
6" slab	Shell-Thin	Slab	4000Psi		6					Auto
Pool Roof	Shell-Thin	Ribbed	4000Psi	36	4	16	8		54	Auto
Waffle	Shell-Thin	Waffle	4000Psi	19.5	5.5	8	12	36	36	Auto

Table 1.8 - Slab Property Definitions (Part 2 of 3)

Name	Notional Auto Factor	f11 Modifier	f22 Modifier	f12 Modifier	m11 Modifier	m22 Modifier	m12 Modifier	v13 Modifier	v23 Modifier	Mass Modifier
3" slab	1	0.5	0.5	0.5	0.01	0.01	0.01	1	1	0
5.5" slab	1	0.5	0.5	0.5	0.01	0.01	0.01	1	1	0
6" slab	1	0.5	0.5	0.5	0.01	0.01	0.01	1	1	0
Pool Roof	1	0.5	0.5	0.5	0.1	0.1	0.1	1	1	0
Waffle	1	0.5	0.5	0.5	0.01	0.01	0.01	1	1	0

Table 1.8 - Slab Property Definitions (Part 3 of 3)

Name	Weight Modifier	Color	Notes
3" slab	0	Yellow	
5.5" slab	0	Cyan	
6" slab	0	Blue	
Pool Roof	0	Green	
Waffle	0	Red	

Table 1.9 - Deck Property Definitions (Part 1 of 3)

Name	Deck Type	Slab Material	Deck Material	Slab Depth in	Rib Depth in	Rib Width Top in	Rib Width Bottom in	Rib Spacing in	Deck Shear Thickness in	Deck Unit Weight lb/ft2	Shear Stud Diameter in
Deck1	Unfilled		A992Fy50		3	7	5	12	0.036	2.3	

Table 1.9 - Deck Property Definitions (Part 2 of 3)

Name	Shear Stud Height in	Shear Stud Tensile Strength lb/in2	f11 Modifier	f22 Modifier	f12 Modifier	m11 Modifier	m22 Modifier	m12 Modifier	v13 Modifier	v23 Modifier	Mass Modifier
Deck1			1	1	1	1	1	1	1	1	0

MATERIAL PROPERTIES AND MODIFIERS - "OLD" ETABS MODEL

Table 1.9 - Deck Property Definitions (Part 3 of 3)

Name	Weight Modifier	Color	Notes
Deck1	0	Gray8Dark	

Table 1.10 - Wall Property Definitions - Specified (Part 1 of 2)

Name	Modeling Type	Material	Wall Thickness in	Include Auto Rigid Zone?	Notional Size Type	Notional Auto Factor	f11 Modifier	f22 Modifier	f12 Modifier	m11 Modifier
10" Wall	Shell-Thin	2500Psi	10	No	Auto	1	0.5	0.5	1	0.1
14" Wall	Shell-Thin	2500Psi	14	No	Auto	1	0.5	0.5	1	0.1
6" Wall	Shell-Thin	4000Psi	6	No	Auto	1	0.5	0.5	1	0.1
8" Wall	Shell-Thin	2500Psi	8	No	Auto	1	0.5	0.5	1	0.1
Masonry	Shell-Thin	M1500Psi	7.625	No			0.5	0.5	1	0.1

Table 1.10 - Wall Property Definitions - Specified (Part 2 of 2)

Name	m22 Modifier	m12 Modifier	v13 Modifier	v23 Modifier	Mass Modifier	Weight Modifier	Color	Notes
10" Wall	0.1	0.1	1	1	0	0	Magenta	
14" Wall	0.1	0.1	1	1	0	0	Blue	
6" Wall	0.1	0.1	1	1	0	0	Gray8Dark	
8" Wall	0.1	0.1	1	1	0	0	Yellow	
Masonry	0.1	0.1	1	1	0	0	Magenta	

WALL ELEVATION IMAGES USE SECTION PROPERTY COLORS NOTED HERE

2 Loads

This chapter provides loading information as applied to the model.

2.1 Load Patterns

Table 2.1 - Load Pattern Definitions

Name	Is Auto Load	Type	Self Weight Multiplier	Auto Load
BSE-2N	No	Seismic	0	User Coefficient

2.2 Auto Seismic Loading

Table 2.2 - Load Pattern Definitions - Auto Seismic - User Coefficient (Part 1 of 2)

Name	Weight Used kip	Base Shear kip	Is Auto Load	X Dir?	X Dir Plus Ecc?	X Dir Minus Ecc?	Y Dir?	Y Dir Plus Ecc?	Y Dir Minus Ecc?	Ecc Ratio	Top Story	Bottom Story
BSE-2N			No	Yes	Yes	Yes	Yes	Yes	Yes	0.05	Story4	Story1

Table 2.2 - Load Pattern Definitions - Auto Seismic - User Coefficient (Part 2 of 2)

Name	Weight Used kip	Base Shear kip	C	K
BSE-2N			1.7286	1

MATERIAL PROPERTIES AND MODIFIERS - "OLD" ETABS MODEL

User Coefficient Auto Seismic Load Calculation

This calculation presents the automatically generated lateral seismic loads for load pattern BSE-2N using the user input coefficients, as calculated by ETABS.

Direction and Eccentricity

Direction = Multiple
Eccentricity Ratio = 5% for all diaphragms

Factors and Coefficients
Equivalent Lateral Forces

Base Shear Coefficient, C

C=1.7286

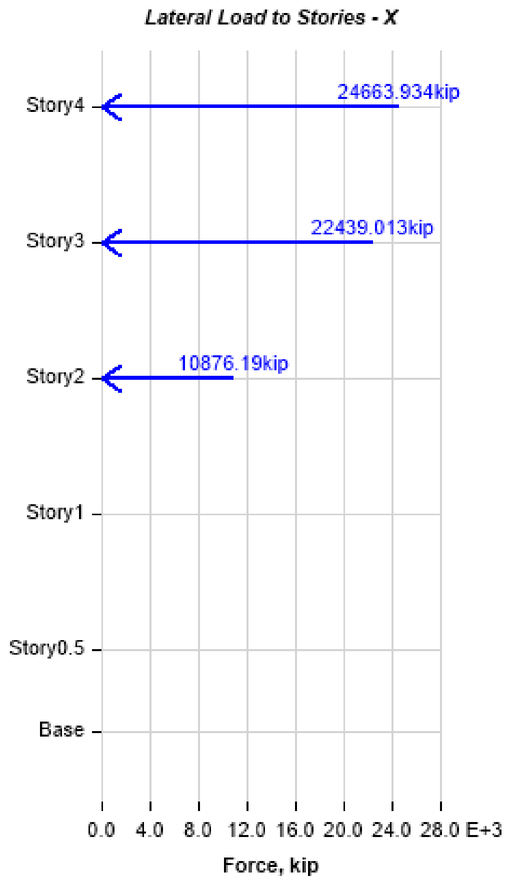
Base Shear, V V=CW

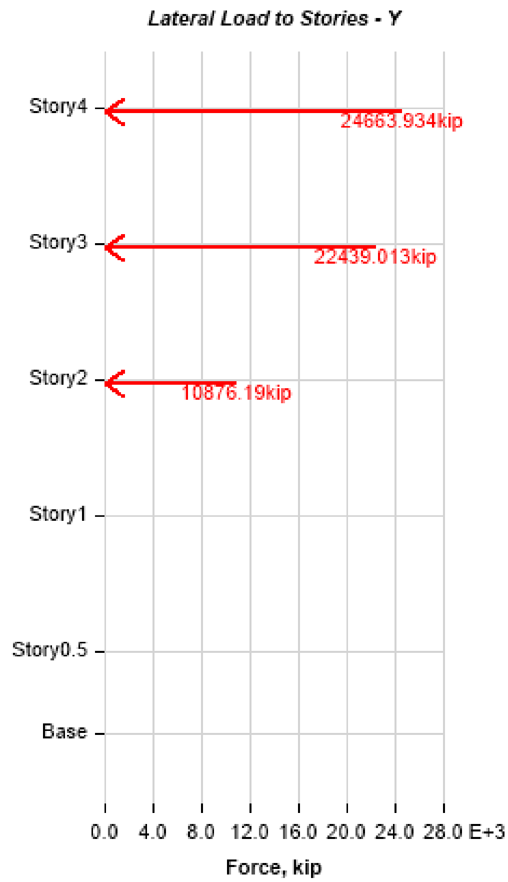
Calculated Base Shear

Direction	Period Used (sec)	C	W (kip)	V (kip)
X	0	0	33541.0949	57979.137
Y	0	0	33541.0949	57979.137
X + Ecc. Y	0	0	33541.0949	57979.137
Y + Ecc. X	0	0	33541.0949	57979.137
X - Ecc. Y	0	0	33541.0949	57979.137
Y - Ecc. X	0	0	33541.0949	57979.137

Applied Story Forces

MATERIAL PROPERTIES AND MODIFIERS - "OLD" ETABS MODEL





Story	Elevation	X-Dir	Y-Dir
	ft	kip	kip
Story4	58	24663.934	0
Story3	43.5	22439.013	0
Story2	29	10876.19	0
Story1	14.5	0	0
Story0.5	0	0	0
Base	-8.667	0	0

Story	Elevation	X-Dir	Y-Dir
	ft	kip	kip
Story4	58	0	24663.934
Story3	43.5	0	22439.013
Story2	29	0	10876.19
Story1	14.5	0	0
Story0.5	0	0	0
Base	-8.667	0	0

MATERIAL PROPERTIES AND MODIFIERS - "UPDATED" ETABS MODEL

1 Properties

This chapter provides property information for materials, frame sections, shell sections, and links.

1.1 Materials

Table 1.1 - Material Properties - General

Material	Type	SymType	Grade	Color	Notes
2500Psi	Concrete	Isotropic	f'c 2500 psi	Magenta	
4000Psi	Concrete	Isotropic	f'c 4000 psi	Magenta	
5000Psi	Concrete	Isotropic	f'c 5000 psi	Magenta	
A416Gr270	Tendon	Uniaxial	Grade 270	Gray8Dark	
A615Gr60	Rebar	Uniaxial	Grade 60	Yellow	
A992Fy50	Steel	Isotropic	Grade 50	Red	
M1500Psi	Masonry	Isotropic	fcm 1500 psi	Yellow	
Thickened walls	Concrete	Isotropic	User defined	Magenta	

Table 1.2 - Material Properties - Steel Data

Material	Fy lb/in2	Fu lb/in2	Fye lb/in2	Fue lb/in2	SSCurveOpt	SSHysType	SHard in/in	SMax in/in	SRup in/in	FinalSlope
A992Fy50	50000	65000	55000	71500	Simple	Kinematic	0.015	0.11	0.17	-0.1

Table 1.3 - Material Properties - Concrete Data

Material	Fc lb/in2	LtWtConc	IsUserFr	SSCurveOpt	SSHysType	SFc in/in	SCap in/in	FinalSlope	FAngle deg	DAngle deg
2500Psi	2500	No	No	Mander	Concrete	0.002219	0.005	-0.1	0	0
4000Psi	4000	No	No	Mander	Concrete	0.002219	0.005	-0.1	0	0
5000Psi	5000	No	No	Mander	Concrete	0.002219	0.005	-0.1	0	0
Thickened walls	3571.43	No	No	Mander	Concrete	0.002219	0.005	-0.1	0	0

Table 1.4 - Material Properties - Masonry Data

Material	Fm lb/in2	SSCurveOpt	SSHysType	SFm in/in	SCap in/in	FinalSlope	FAngle deg	DAngle deg
M1500Psi	1500	Simple	Concrete	0.001922	0.005	-0.1	0	0

Table 1.5 - Material Properties - Rebar Data

Material	Fy lb/in2	Fu lb/in2	Fye lb/in2	Fue lb/in2	SSCurveOpt	SSHysType	SHard in/in	SCap in/in	FinalSlope
A615Gr60	60000	90000	66000	99000	Simple	Kinematic	0.01	0.09	-0.1

Table 1.6 - Material Properties - Tendon Data

Material	Fy lb/in2	Fu lb/in2	SSCurveOpt	SSHysType	FinalSlope
A416Gr270	245100	270000	270 ksi	Kinematic	-0.1

1.2 Shell Sections

Table 1.7 - Area Section Property Definitions - Summary

Name	Type	Element Type	Material	Total Thickness in	Deck Material	Deck Depth in
10" Wall	Wall	Shell-Thin	2500Psi	10		
12" Wall	Wall	Shell-Thin	5000Psi	12		
14" Wall	Wall	Shell-Thin	2500Psi	14		

MATERIAL PROPERTIES AND MODIFIERS - "UPDATED" ETABS MODEL

Name	Type	Element Type	Material	Total Thickness in	Deck Material	Deck Depth in
15" Wall	Wall	Shell-Thin	5000Psi	15		
20" Wall	Wall	Shell-Thin	5000Psi	20		
3" slab	Slab	Shell-Thin	4000Psi	3		
34" Wall	Wall	Shell-Thin	5000Psi	34		
4" slab	Slab	Shell-Thin	4000Psi	4		
5.5" slab	Slab	Shell-Thin	5000Psi	5.5		
6" slab	Slab	Shell-Thin	4000Psi	6		
6" Wall	Wall	Shell-Thin	4000Psi	6		
8" Wall	Wall	Shell-Thin	2500Psi	8		
Deck1	Deck	Membrane	Not Applicable	3	A992Fy50	3
Deck3	Deck	Membrane	4000Psi	8.5	A992Fy50	3
Deck4	Deck	Membrane	4000Psi	9.5	A992Fy50	3
Masonry	Wall	Shell-Thin	M1500Psi	7.625		
Pool Roof	Slab	Shell-Thin	4000Psi	36		
Thickened	Wall	Shell-Thin	Thickened walls	14		
Waffle	Slab	Shell-Thin	4000Psi	19.5		

Table 1.8 - Slab Property Definitions (Part 1 of 3)

Name	Modeling Type	Property Type	Material	Overall Depth in	Slab Thickness in	Rib Width at Top in	Rib Width at Bottom in	Rib Spacing 1 in	Rib Spacing 2 in	Notional Size Type
3" slab	Shell-Thin	Slab	4000Psi		3					Auto
4" slab	Shell-Thin	Slab	4000Psi		4					Auto
5.5" slab	Shell-Thin	Slab	5000Psi		5.5					Auto
6" slab	Shell-Thin	Slab	4000Psi		6					Auto
Pool Roof	Shell-Thin	Ribbed	4000Psi	36	4	16	8		54	Auto
Waffle	Shell-Thin	Waffle	4000Psi	19.5	5.5	8	12	36	36	Auto

Table 1.8 - Slab Property Definitions (Part 2 of 3)

Name	Notional Auto Factor	f11 Modifier	f22 Modifier	f12 Modifier	m11 Modifier	m22 Modifier	m12 Modifier	v13 Modifier	v23 Modifier	Mass Modifier
3" slab	1	0.5	0.5	0.5	0.01	0.01	0.01	1	1	0
4" slab	1	0.5	0.5	0.5	0.01	0.01	0.01	1	1	0
5.5" slab	1	0.5	0.5	0.5	0.01	0.01	0.01	1	1	0
6" slab	1	0.5	0.5	0.5	0.01	0.01	0.01	1	1	0
Pool Roof	1	0.5	0.5	0.5	0.1	0.1	0.1	1	1	0
Waffle	1	0.5	0.5	0.5	0.01	0.01	0.01	1	1	0

Table 1.8 - Slab Property Definitions (Part 3 of 3)

Name	Weight Modifier	Color	Notes
3" slab	0	Yellow	
4" slab	0	Magenta	
5.5" slab	0	Cyan	
6" slab	0	Blue	
Pool Roof	0	Green	
Waffle	0	Red	

Table 1.9 - Deck Property Definitions (Part 1 of 3)

MATERIAL PROPERTIES AND MODIFIERS - "UPDATED" ETABS MODEL

Name	Deck Type	Slab Material	Deck Material	Slab Depth in	Rib Depth in	Rib Width Top in	Rib Width Bottom in	Rib Spacing in	Deck Shear Thickness in	Deck Unit Weight lb/ft2	Shear Stud Diameter in
Deck1	Unfilled		A992Fy50		3	7	5	12	0.036	2.3	
Deck3	Filled	4000Psi	A992Fy50	5.5	3	7	5	12	0.036	2.3	0.75
Deck4	Filled	4000Psi	A992Fy50	6.5	3	7	5	12	0.036	2.3	0.75

Table 1.9 - Deck Property Definitions (Part 2 of 3)

Name	Shear Stud Height in	Shear Stud Tensile Strength lb/in2	f11 Modifier	f22 Modifier	f12 Modifier	m11 Modifier	m22 Modifier	m12 Modifier	v13 Modifier	v23 Modifier	Mass Modifier
Deck1			1	1	1	1	1	1	1	1	0
Deck3	6	65000	1	1	1	1	1	1	1	1	0
Deck4	6	65000	1	1	1	1	1	1	1	1	0

Table 1.9 - Deck Property Definitions (Part 3 of 3)

Name	Weight Modifier	Color	Notes
Deck1	0	Gray8Dark	
Deck3	0	Red	
Deck4	0	Blue	

Table 1.10 - Wall Property Definitions - Specified (Part 1 of 2)

Name	Modeling Type	Material	Wall Thickness in	Include Auto Rigid Zone?	Notional Size Type	Notional Auto Factor	f11 Modifier	f22 Modifier	f12 Modifier
10" Wall	Shell-Thin	2500Psi	10	No	Auto	1	0.5	0.5	1
12" Wall	Shell-Thin	5000Psi	12	No	Auto	1	0.5	0.5	1
14" Wall	Shell-Thin	2500Psi	14	No	Auto	1	0.5	0.5	1
15" Wall	Shell-Thin	5000Psi	15	No	Auto	1	0.5	0.5	1
20" Wall	Shell-Thin	5000Psi	20	No	Auto	1	0.5	0.5	1
34" Wall	Shell-Thin	5000Psi	34	No	Auto	1	0.5	0.5	1
6" Wall	Shell-Thin	4000Psi	6	No	Auto	1	0.5	0.5	1
8" Wall	Shell-Thin	2500Psi	8	No	Auto	1	0.5	0.5	1
Masonry	Shell-Thin	M1500Psi	7.625	No			0.5	5	1
Thickened	Shell-Thin	Thickened walls	14	No	Auto	1	0.5	0.5	1

Table 1.10 - Wall Property Definitions - Specified (Part 2 of 2)

Name	m11 Modifier	m22 Modifier	m12 Modifier	v13 Modifier	v23 Modifier	Mass Modifier	Weight Modifier	Color	Notes
10" Wall	0.1	0.1	0.1	1	1	0	0	Magenta	
12" Wall	0.1	0.1	0.1	1	1	0	0	Green	
14" Wall	0.1	0.1	0.1	1	1	0	0	Blue	
15" Wall	0.1	0.1	0.1	1	1	0	0	Cyan	
20" Wall	0.1	0.1	0.1	1	1	0	0	Magenta	
34" Wall	0.1	0.1	0.1	1	1	0	0	Gray8Dark	
6" Wall	0.1	0.1	0.1	1	1	0	0	Gray8Dark	
8" Wall	0.1	0.1	0.1	1	1	0	0	Yellow	
Masonry	0.1	0.1	0.1	1	1	0	0	Magenta	
Thickened	0.1	0.1	0.1	1	1	0	0	Red	

WALL ELEVATION IMAGES
USE SECTION PROPERTY
COLORS NOTED HERE

2 Loads

This chapter provides loading information as applied to the model.

2.1 Load Patterns

Table 2.1 - Load Pattern Definitions

Name	Is Auto Load	Type	Self Weight Multiplier	Auto Load
BSE-2N	No	Seismic	0	User Coefficient

2.2 Auto Seismic Loading

Table 2.2 - Load Pattern Definitions - Auto Seismic - User Coefficient (Part 1 of 2)

Name	Weight Used kip	Base Shear kip	Is Auto Load	X Dir?	X Dir Plus Ecc?	X Dir Minus Ecc?	Y Dir?	Y Dir Plus Ecc?	Y Dir Minus Ecc?	Ecc Ratio	Top Story	Bottom Story
BSE-2N			No	Yes	Yes	Yes	Yes	Yes	Yes	0.05	Story4	Story1

Table 2.2 - Load Pattern Definitions - Auto Seismic - User Coefficient (Part 2 of 2)

Name	Weight Used kip	Base Shear kip	C	K
BSE-2N			1.7286	1

MATERIAL PROPERTIES AND MODIFIERS - "UPDATED" ETABS MODEL

User Coefficient Auto Seismic Load Calculation

This calculation presents the automatically generated lateral seismic loads for load pattern BSE-2N using the user input coefficients, as calculated by ETABS.

Direction and Eccentricity

Direction = Multiple
Eccentricity Ratio = 5% for all diaphragms

Factors and Coefficients
Equivalent Lateral Forces

Base Shear Coefficient, C

C=1.7286

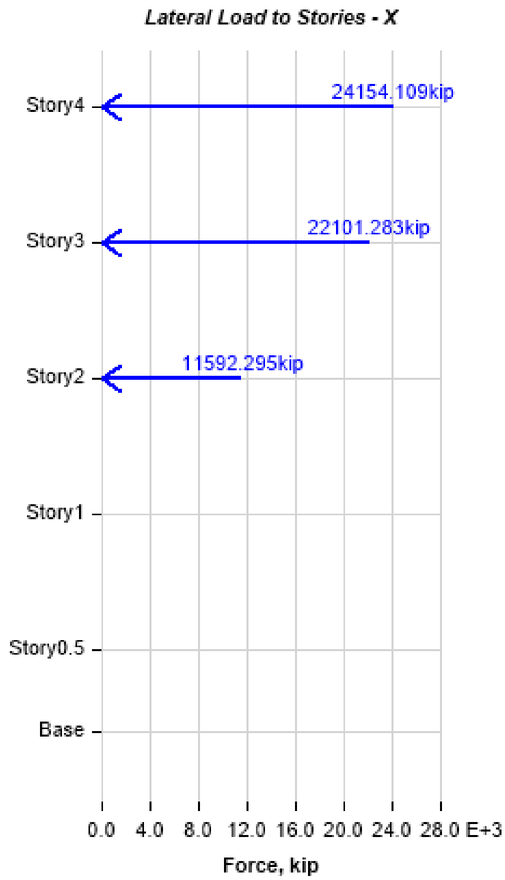
Base Shear, V V=CW

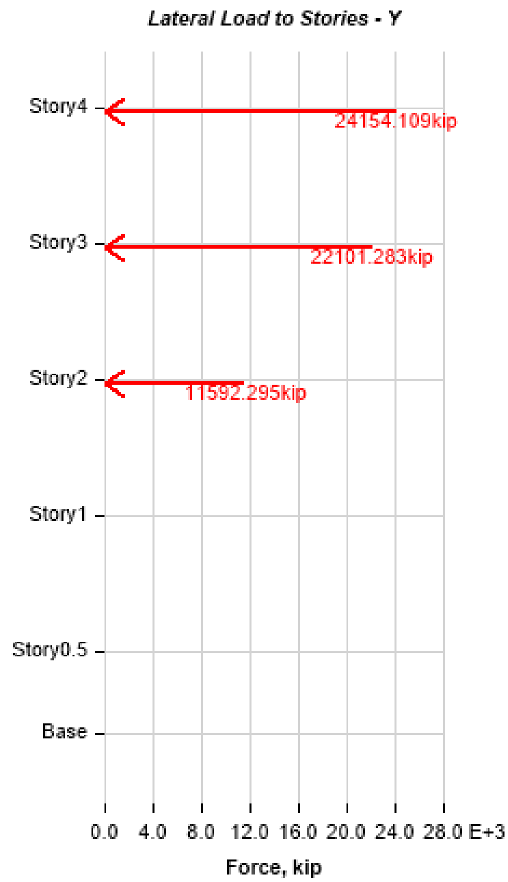
Calculated Base Shear

Direction	Period Used (sec)	C	W (kip)	V (kip)
X	0	0	33465.0508	57847.687
Y	0	0	33465.0508	57847.687
X + Ecc. Y	0	0	33465.0508	57847.687
Y + Ecc. X	0	0	33465.0508	57847.687
X - Ecc. Y	0	0	33465.0508	57847.687
Y - Ecc. X	0	0	33465.0508	57847.687

Applied Story Forces

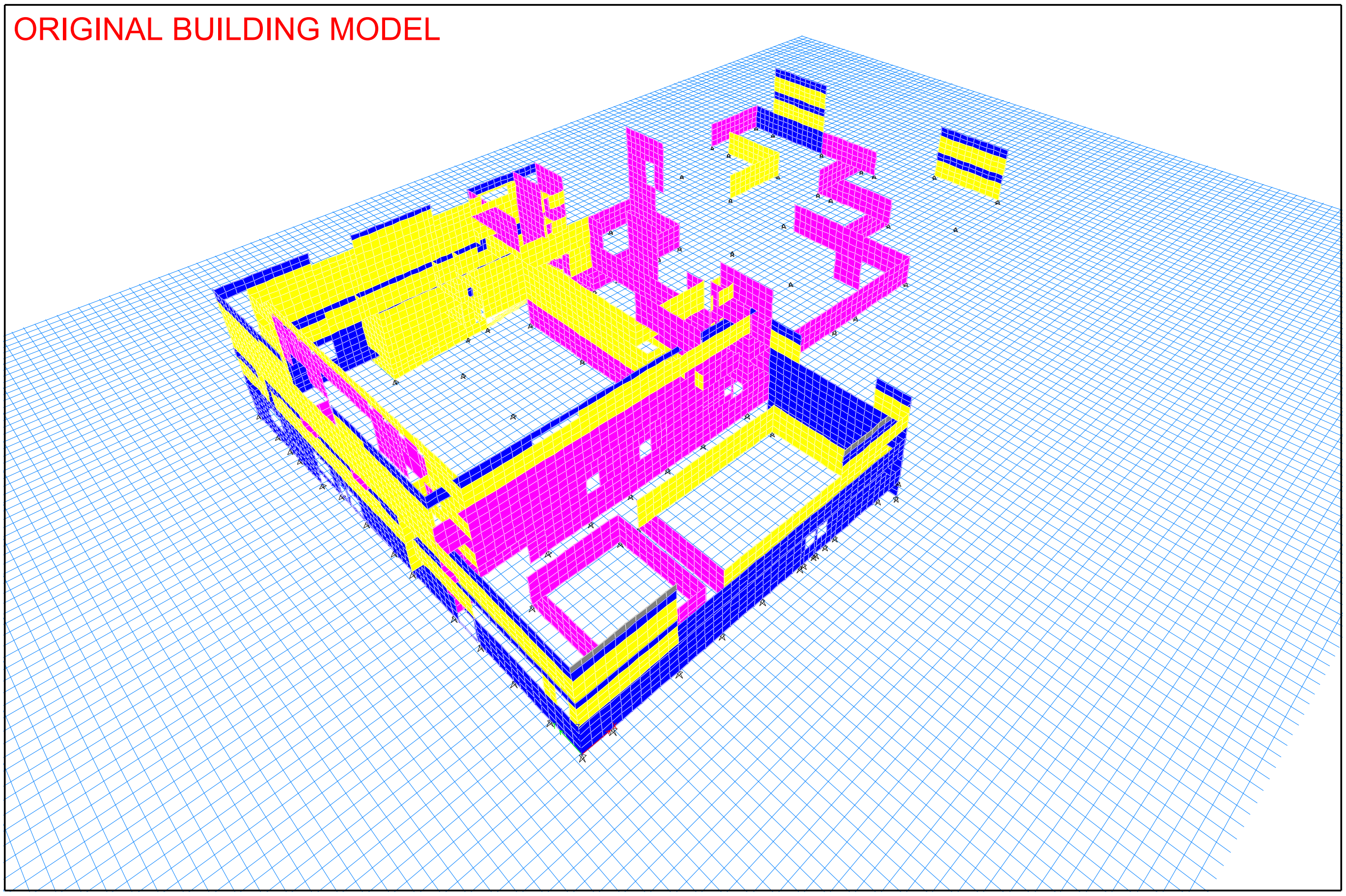
MATERIAL PROPERTIES AND MODIFIERS - "UPDATED" ETABS MODEL





Story	Elevation	X-Dir	Y-Dir
	ft	kip	kip
Story4	58	24154.109	0
Story3	43.5	22101.283	0
Story2	29	11592.295	0
Story1	14.5	0	0
Story0.5	0	0	0
Base	-8.667	0	0

Story	Elevation	X-Dir	Y-Dir
	ft	kip	kip
Story4	58	0	24154.109
Story3	43.5	0	22101.283
Story2	29	0	11592.295
Story1	14.5	0	0
Story0.5	0	0	0
Base	-8.667	0	0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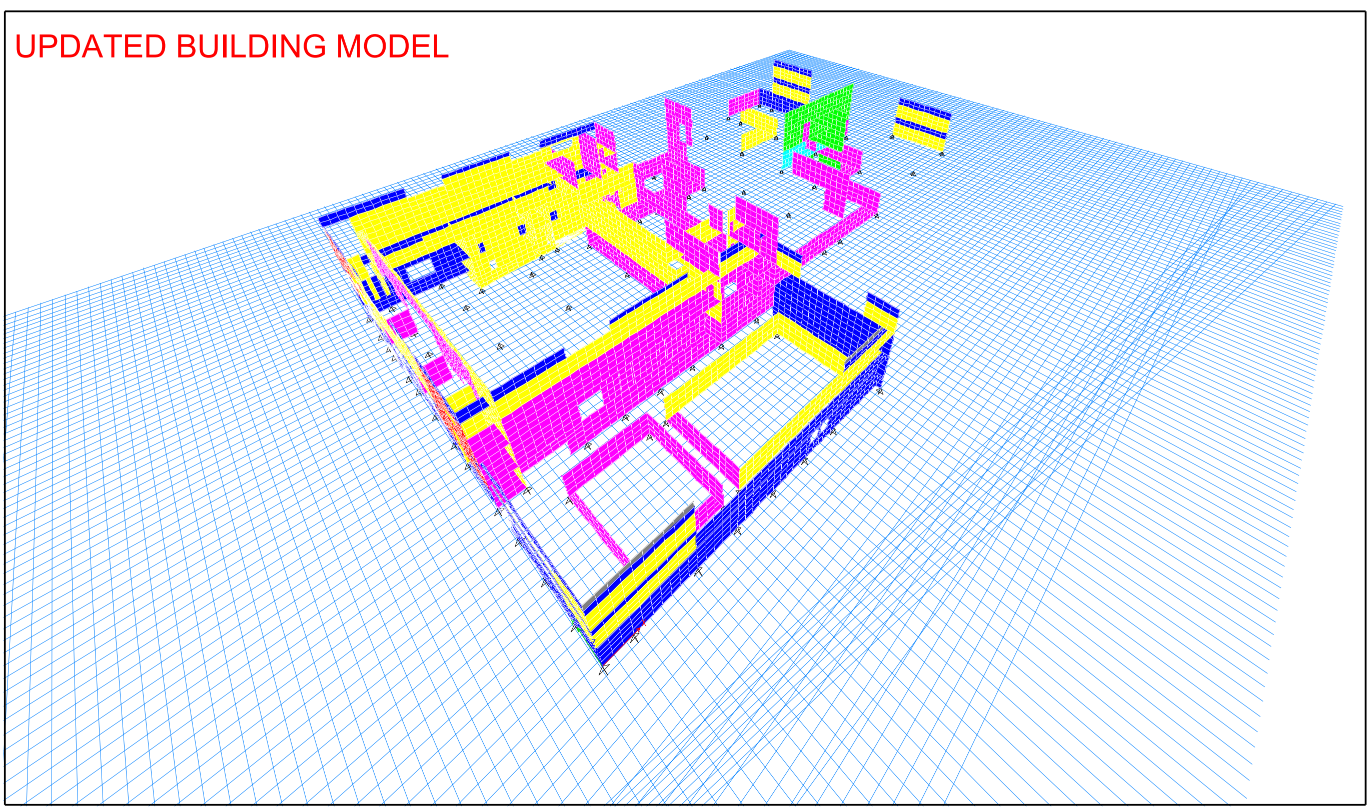
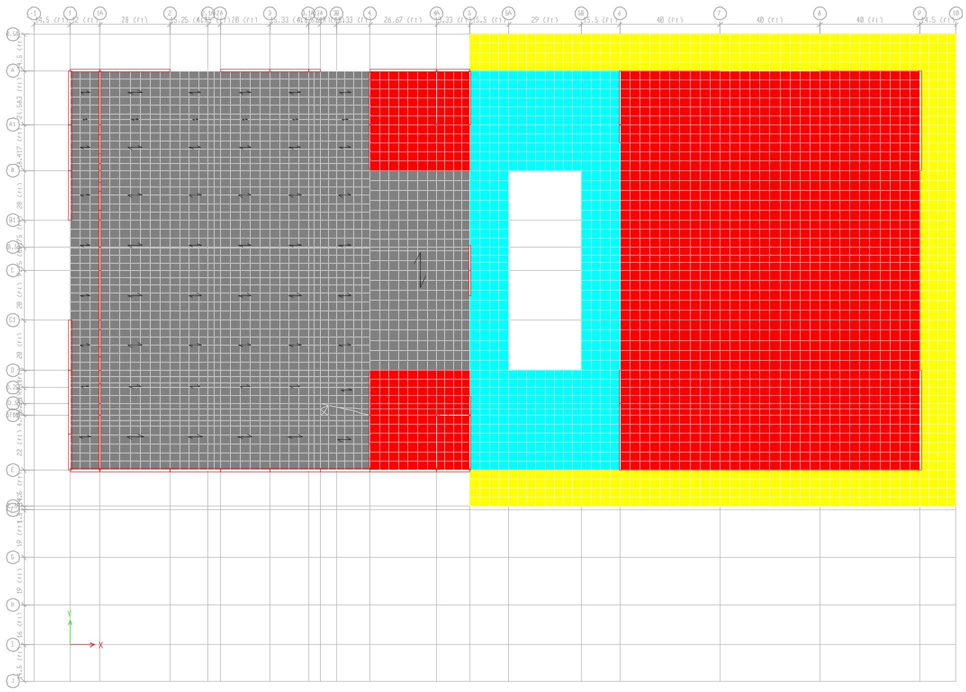

UPDATED BUILDING MODEL

ORIGINAL BUILDING MODEL

ROOF LEVEL



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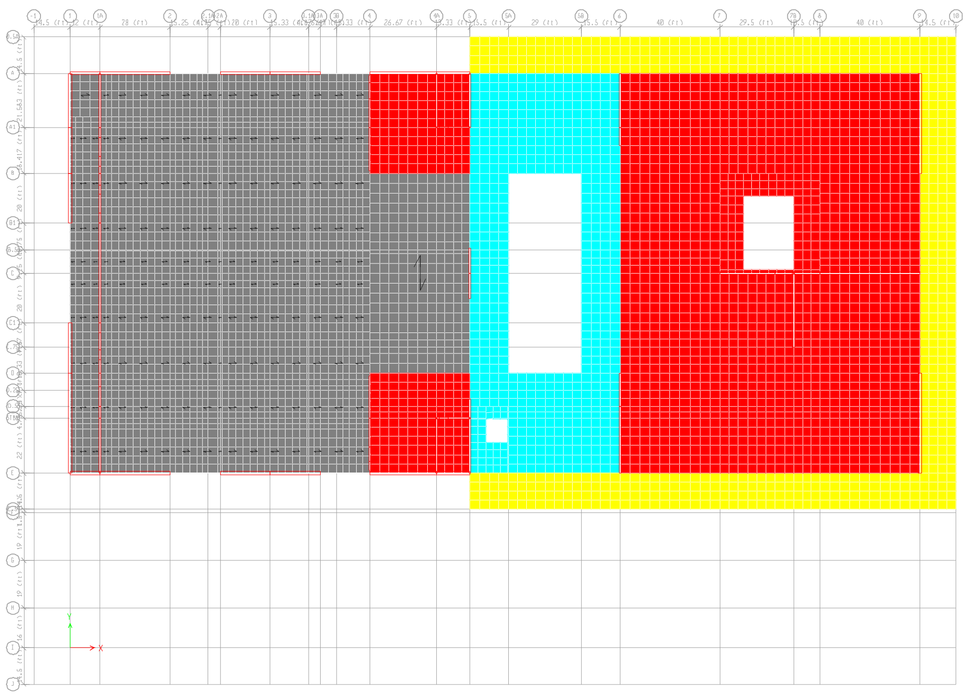

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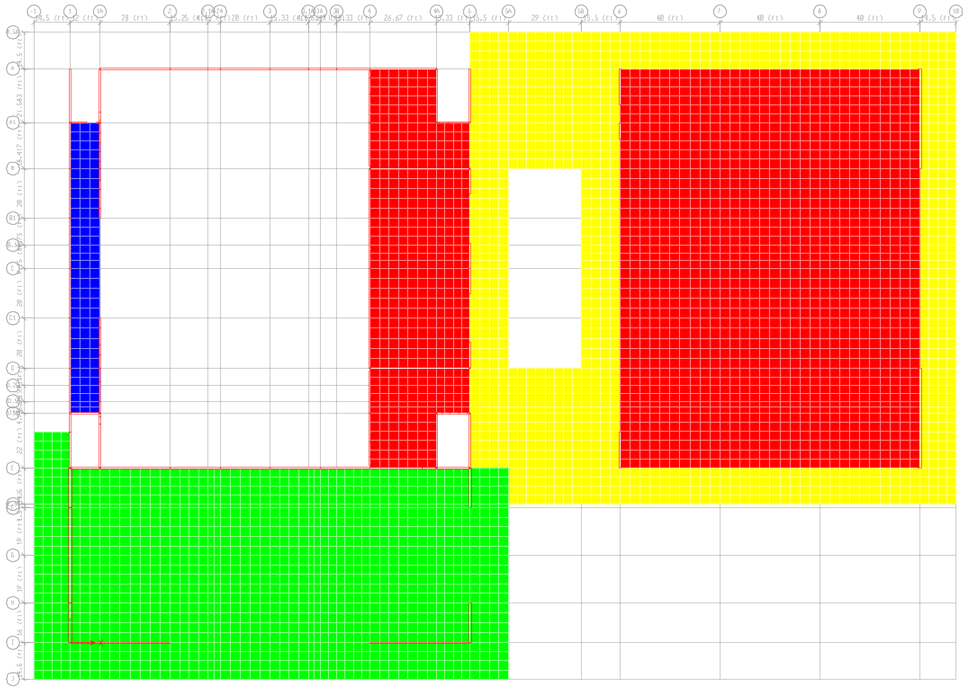

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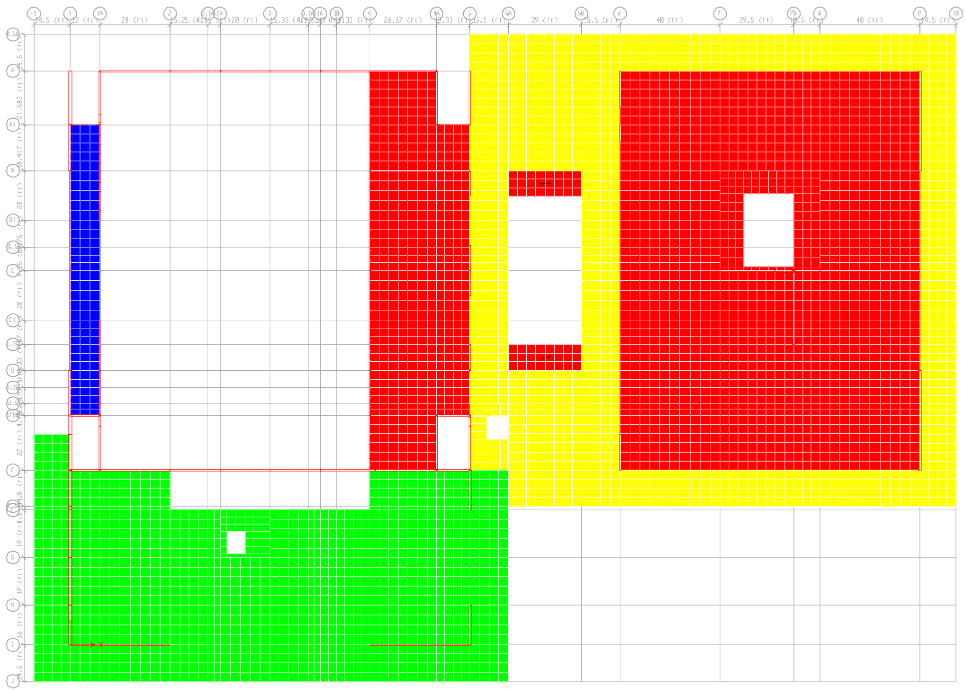

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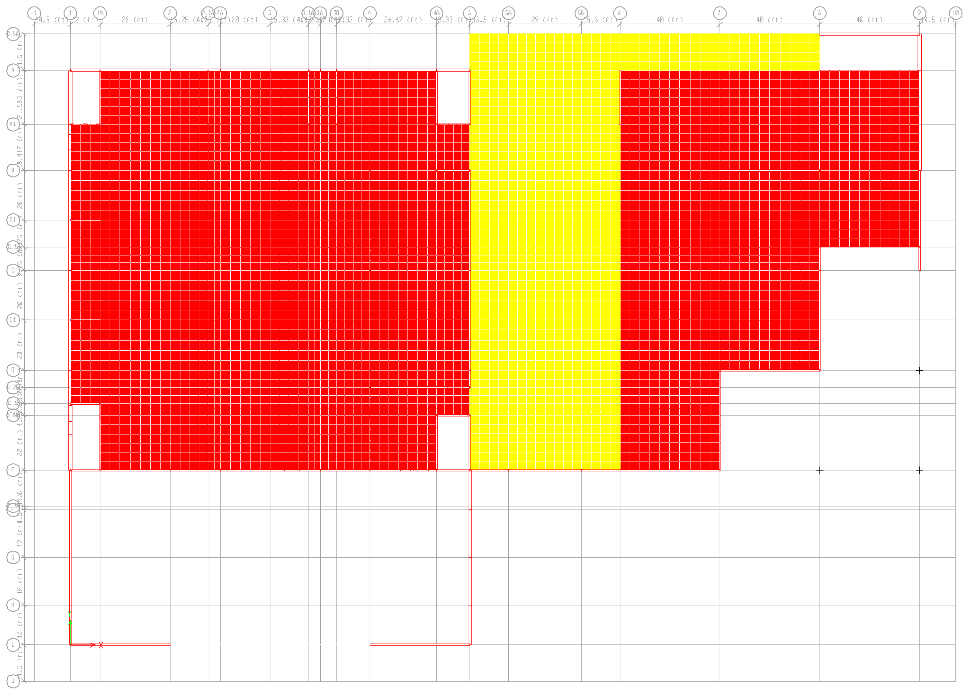

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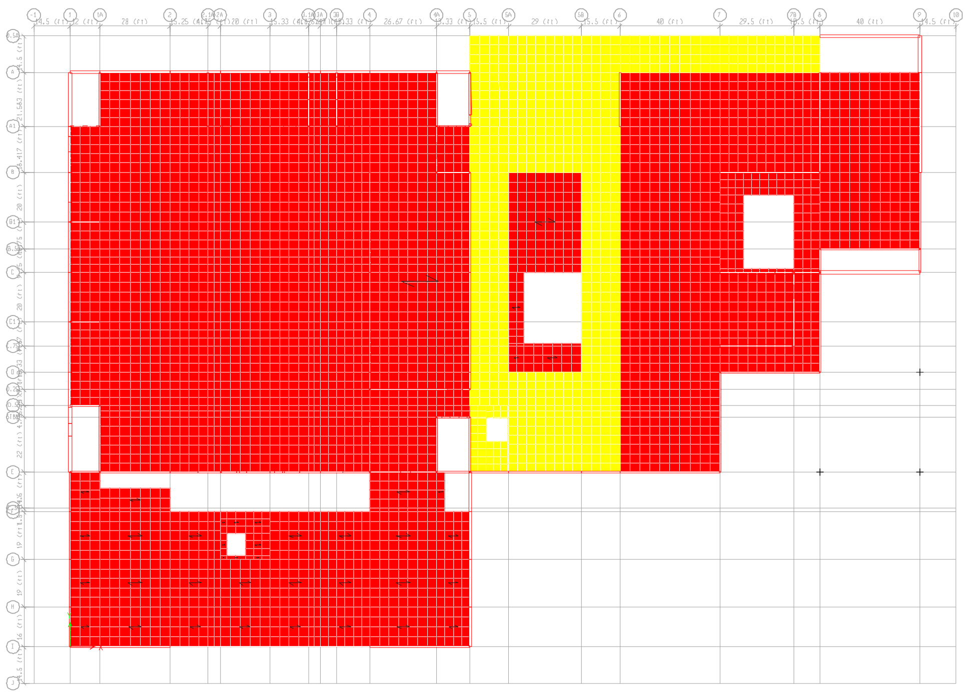

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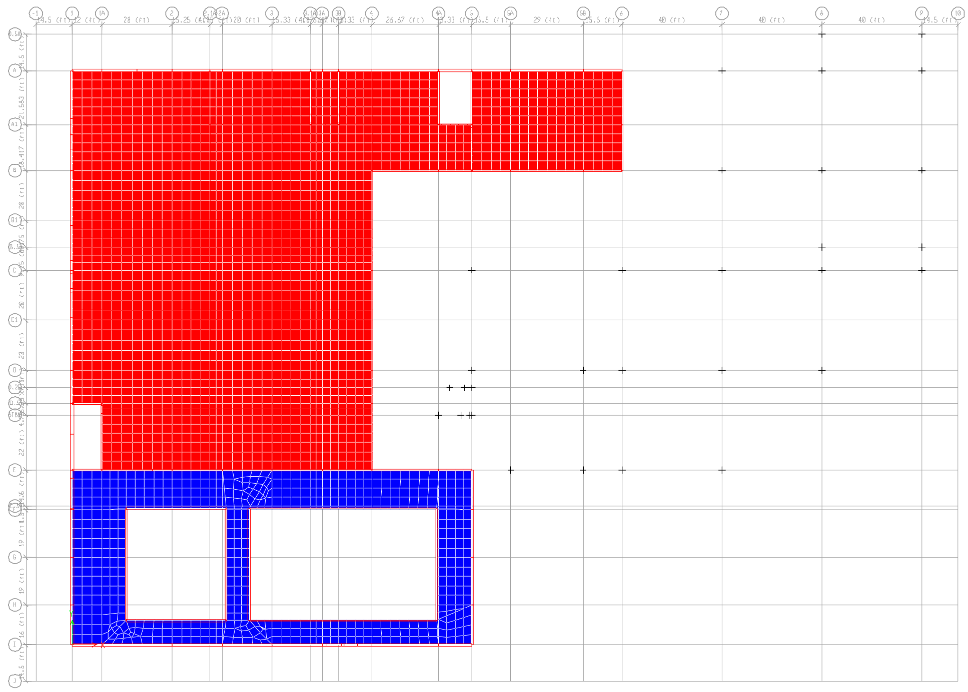

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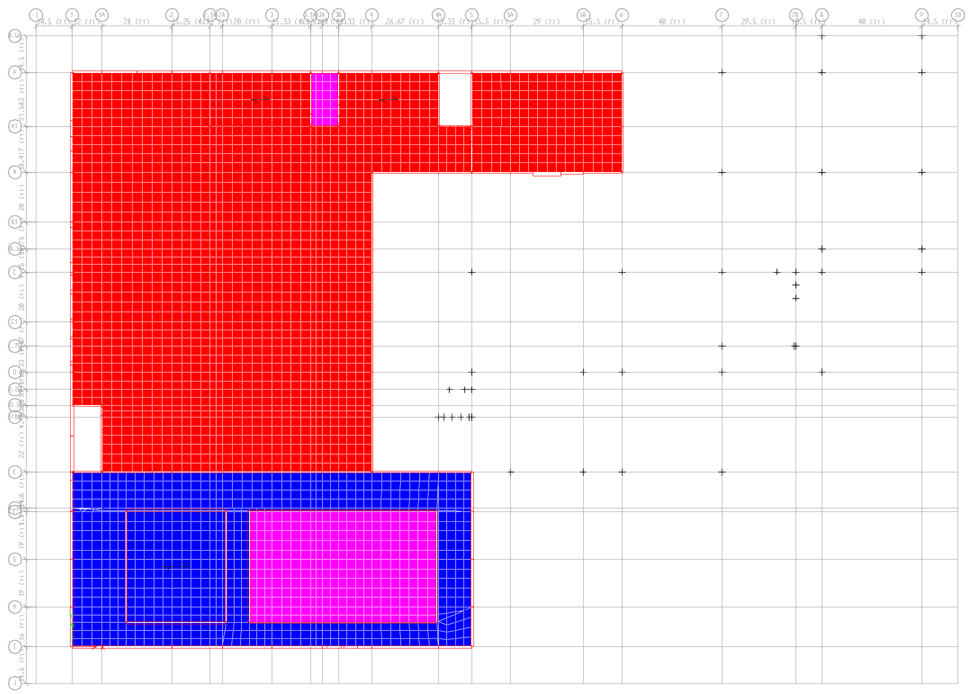

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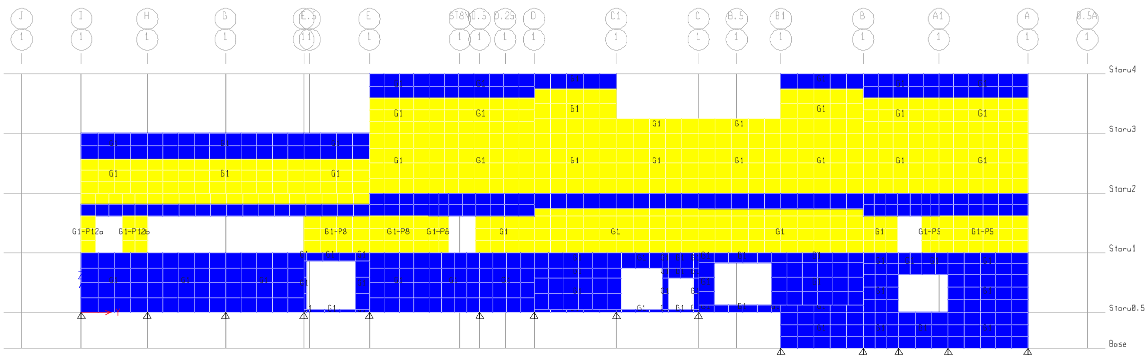

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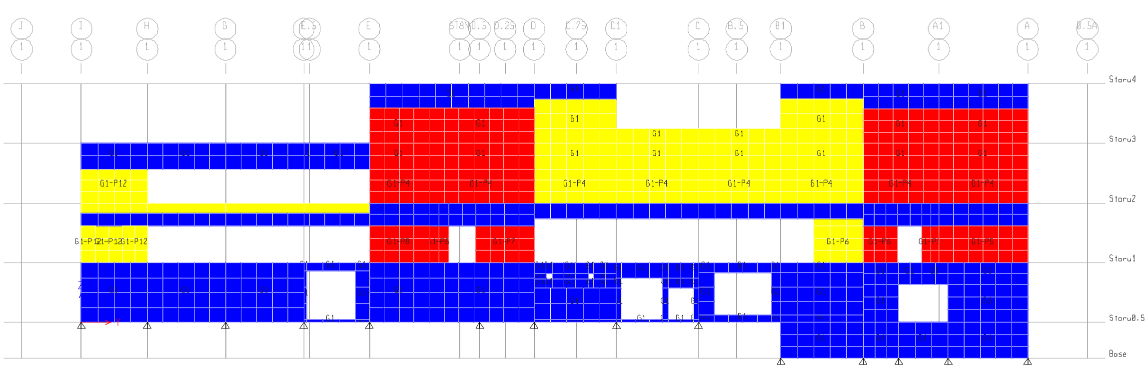

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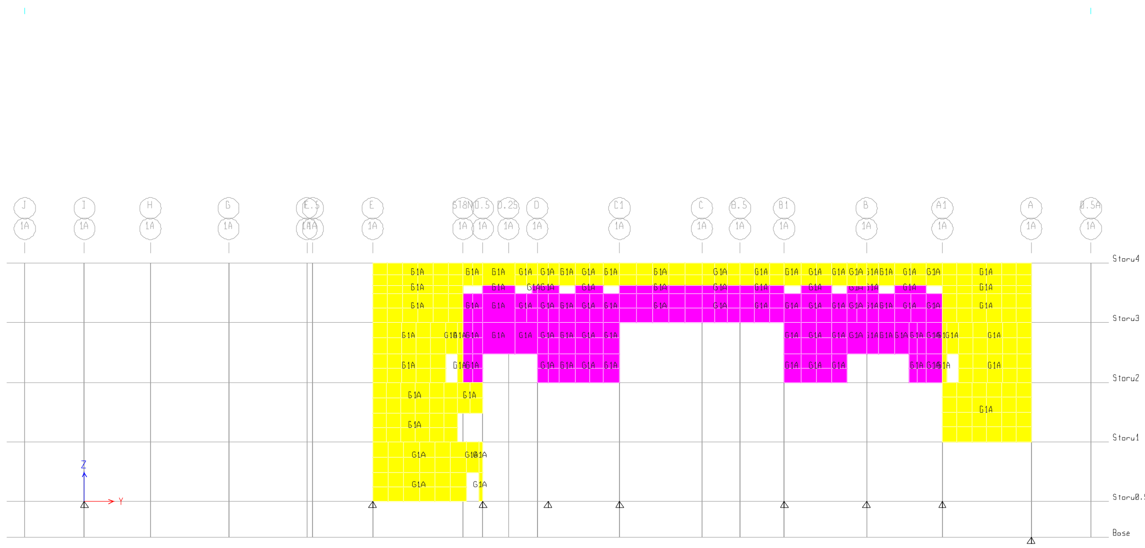

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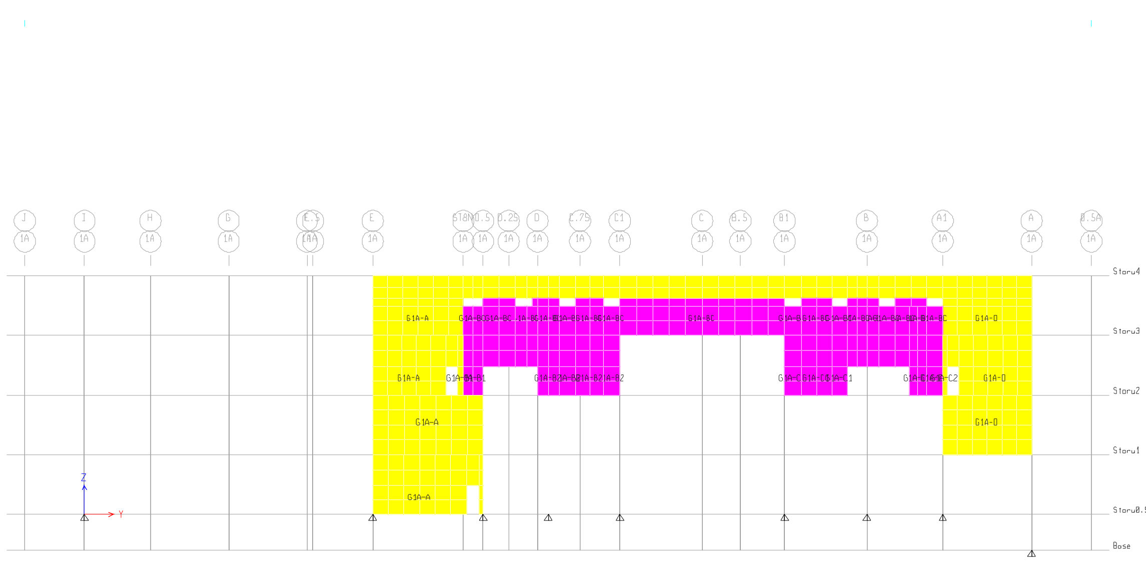

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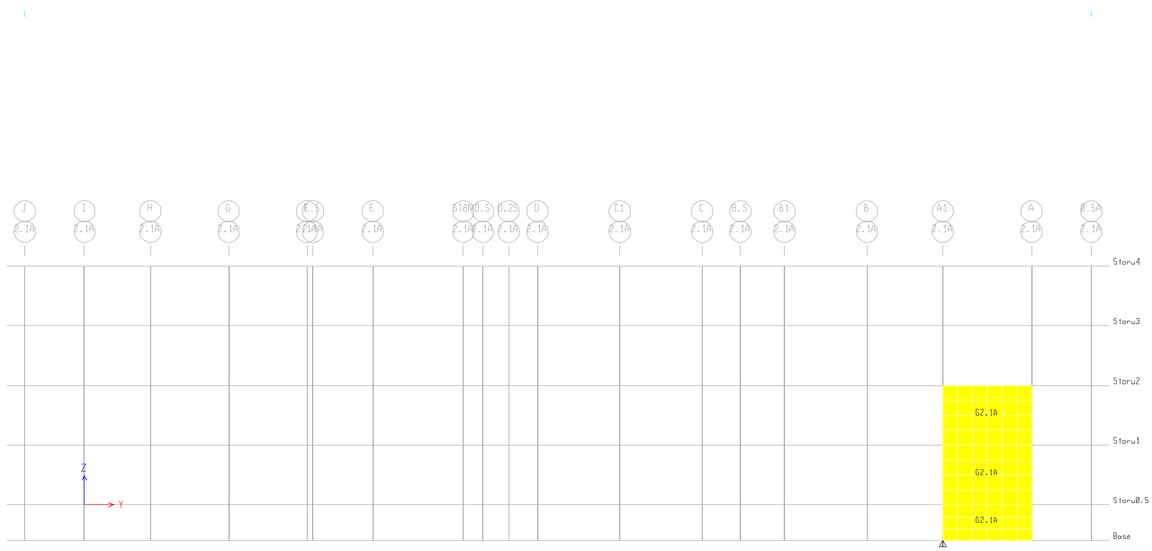

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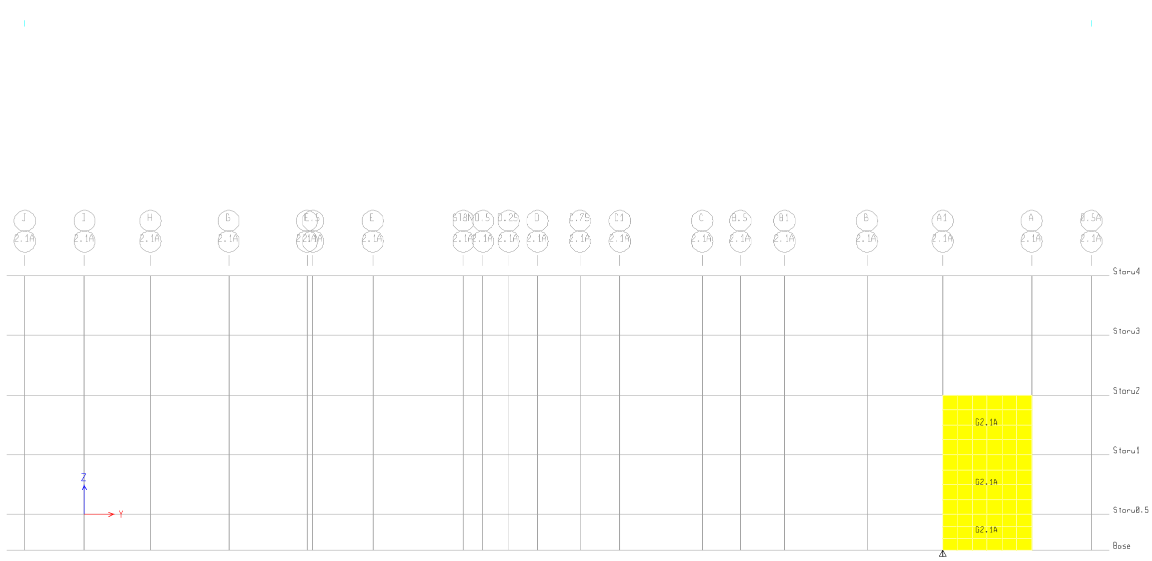

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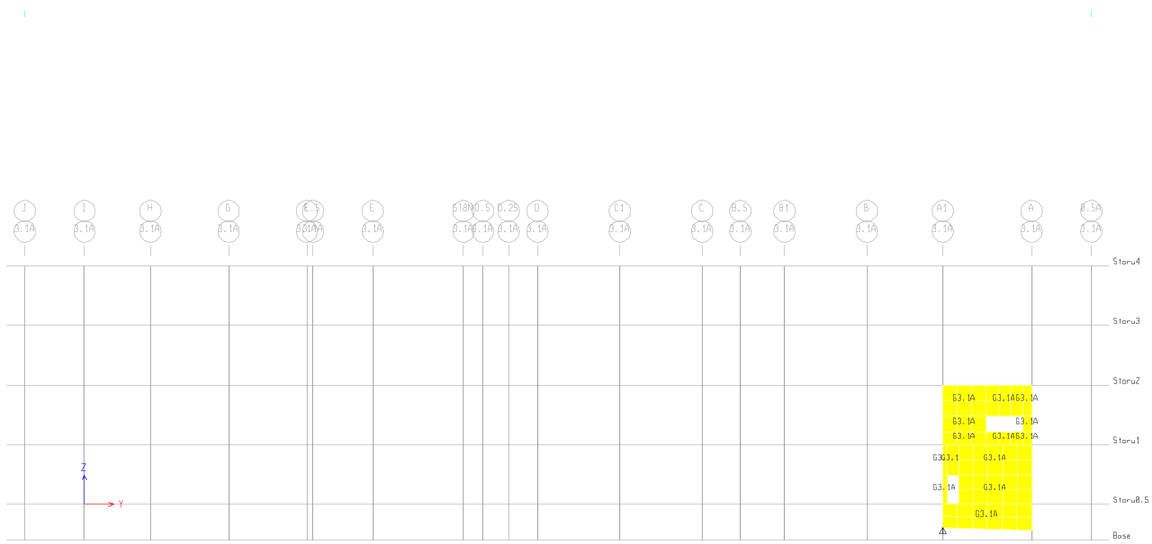

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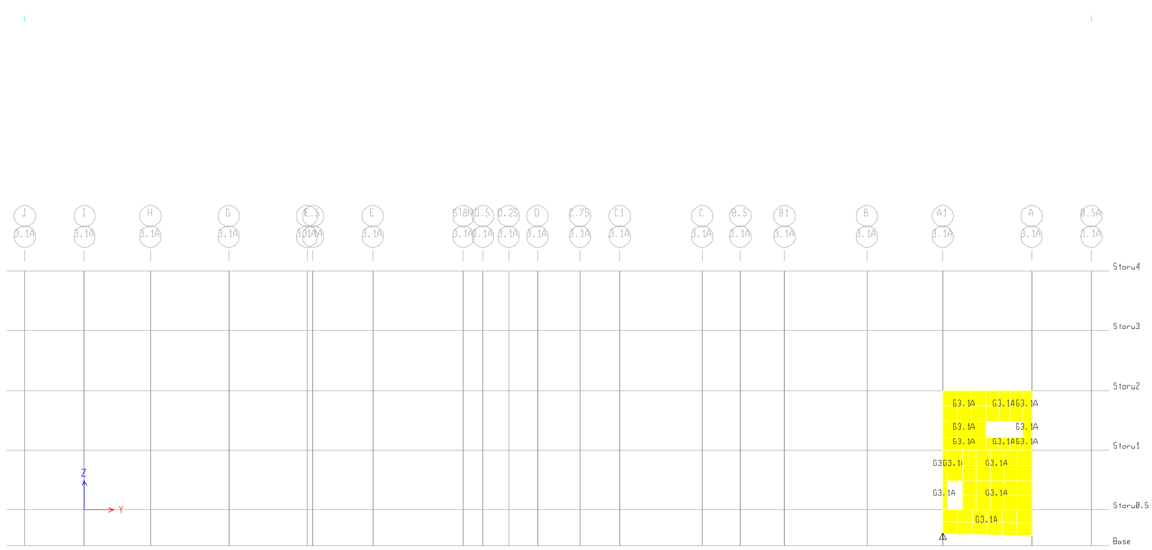

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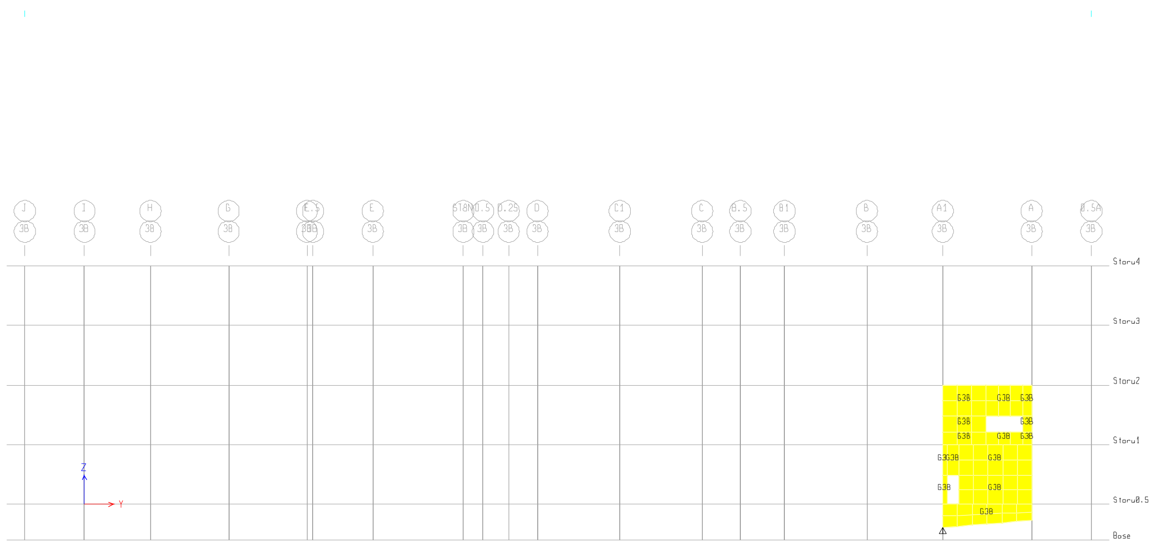

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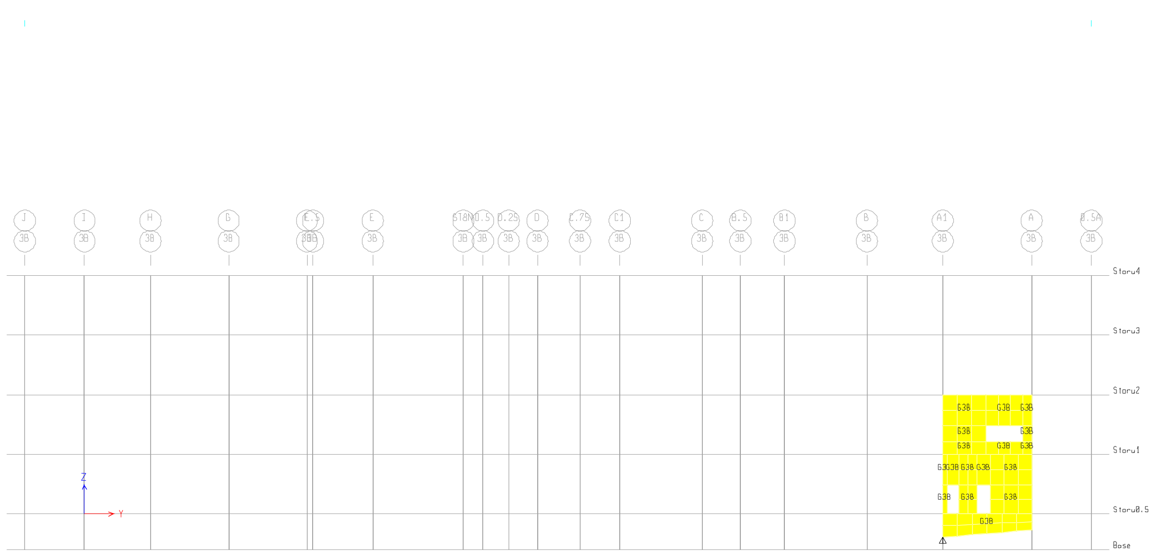

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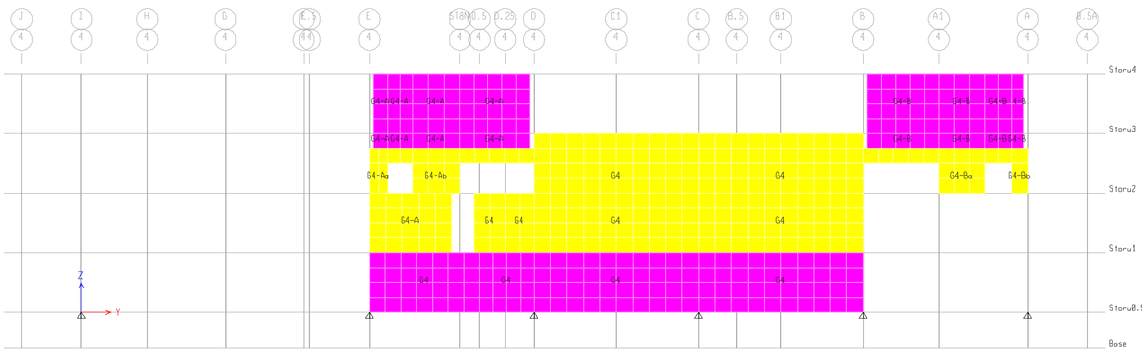

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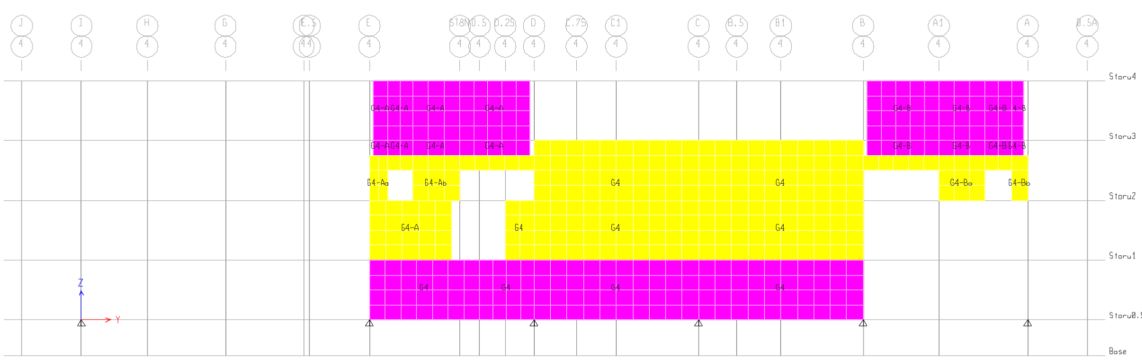

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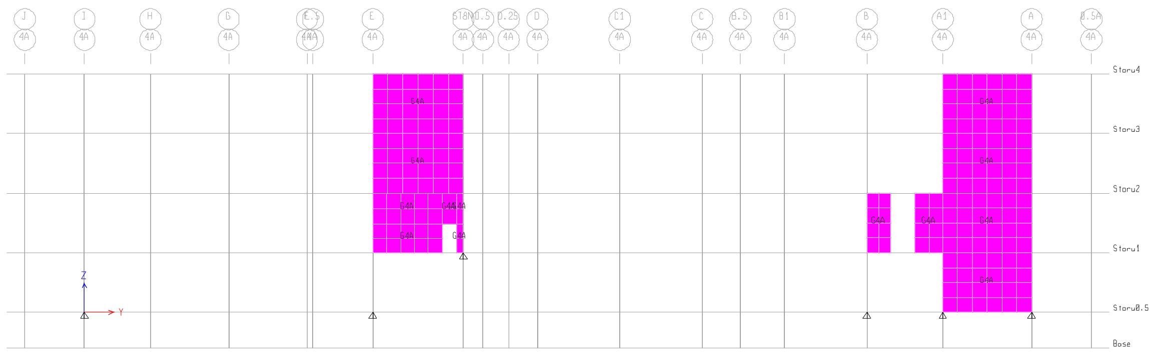

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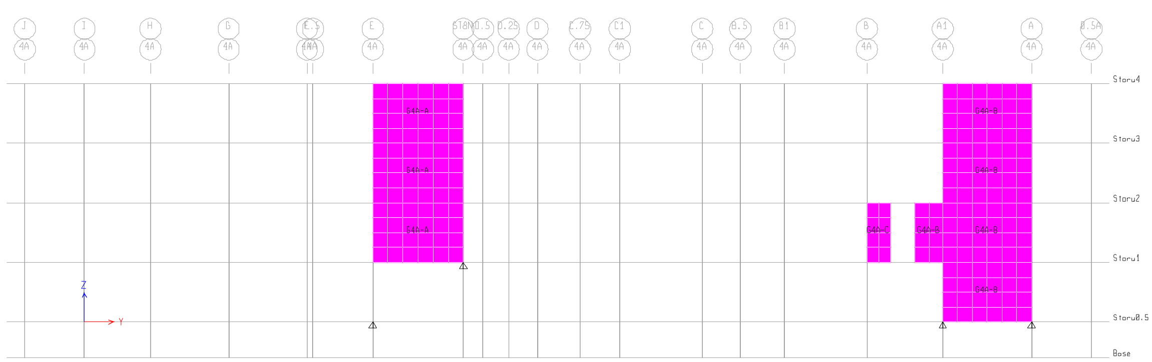

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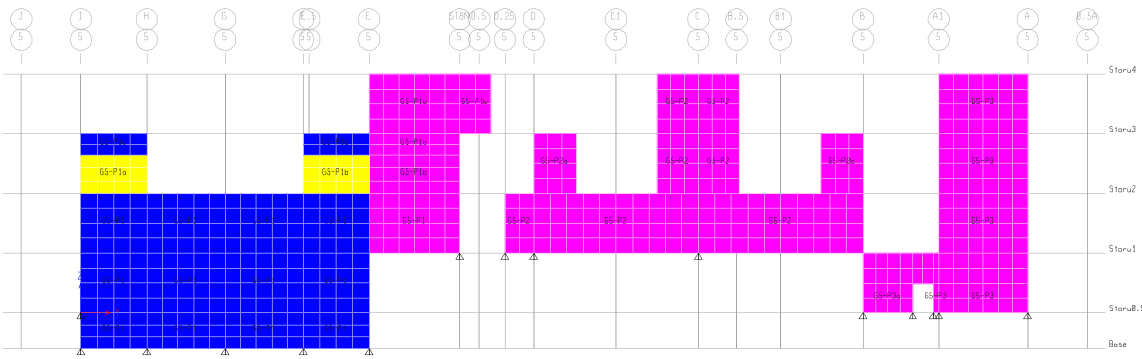

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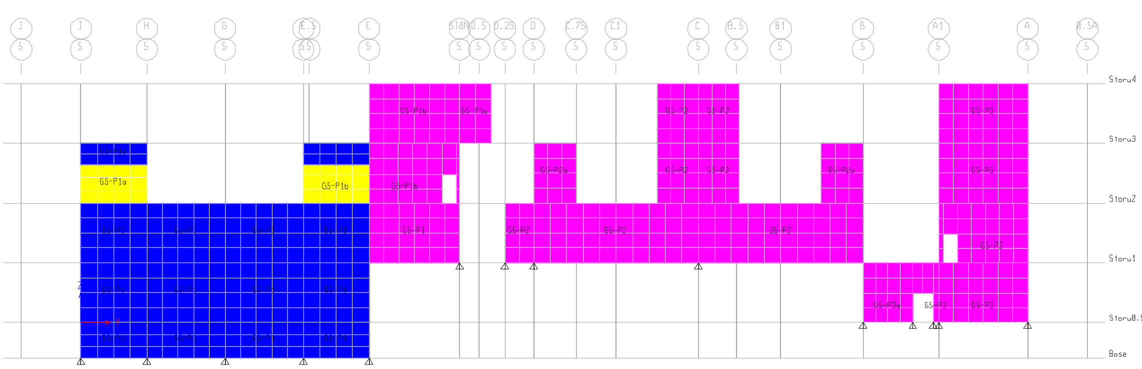

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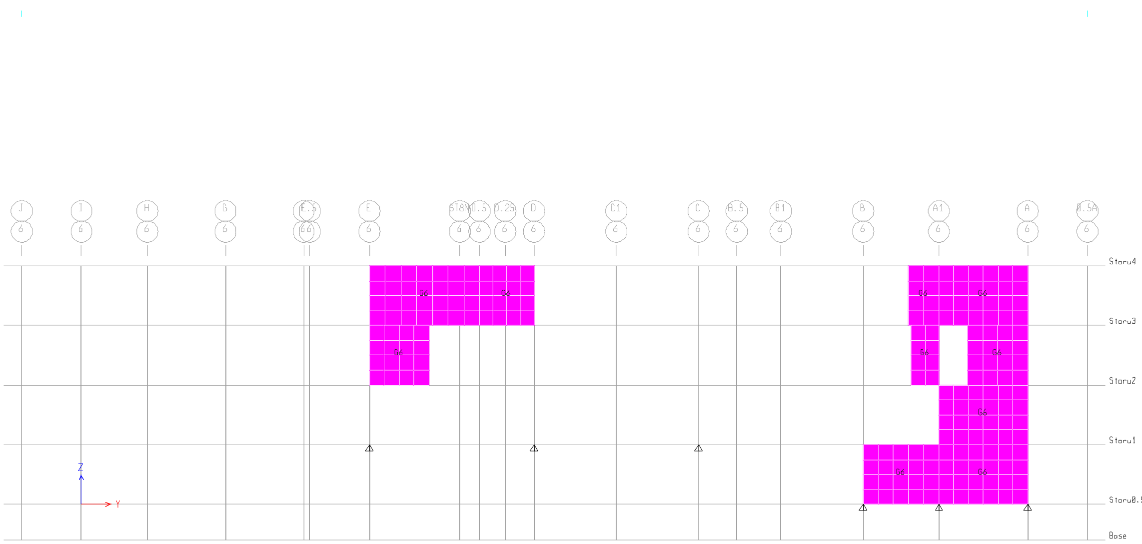

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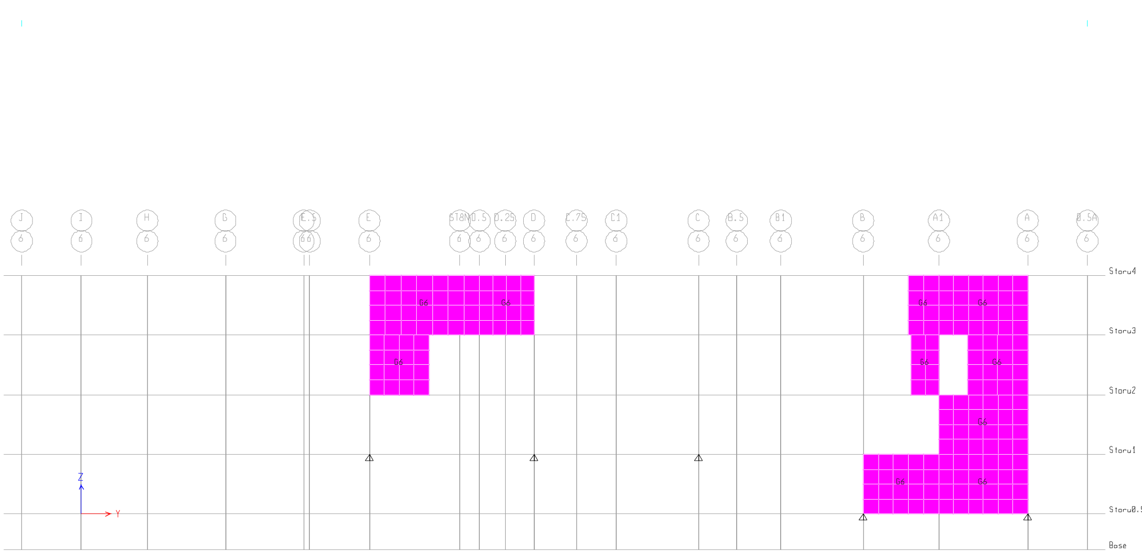

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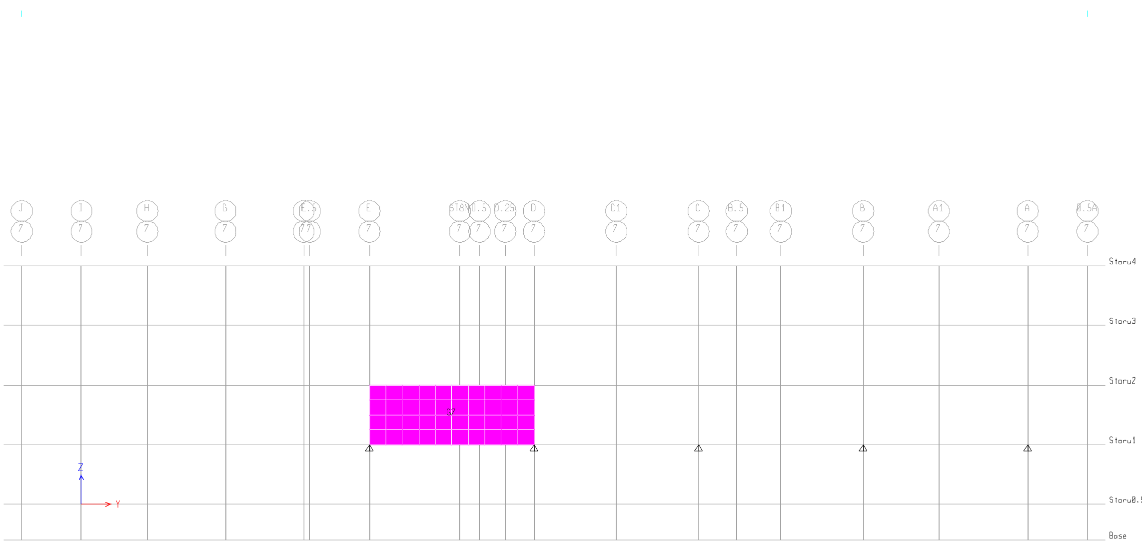

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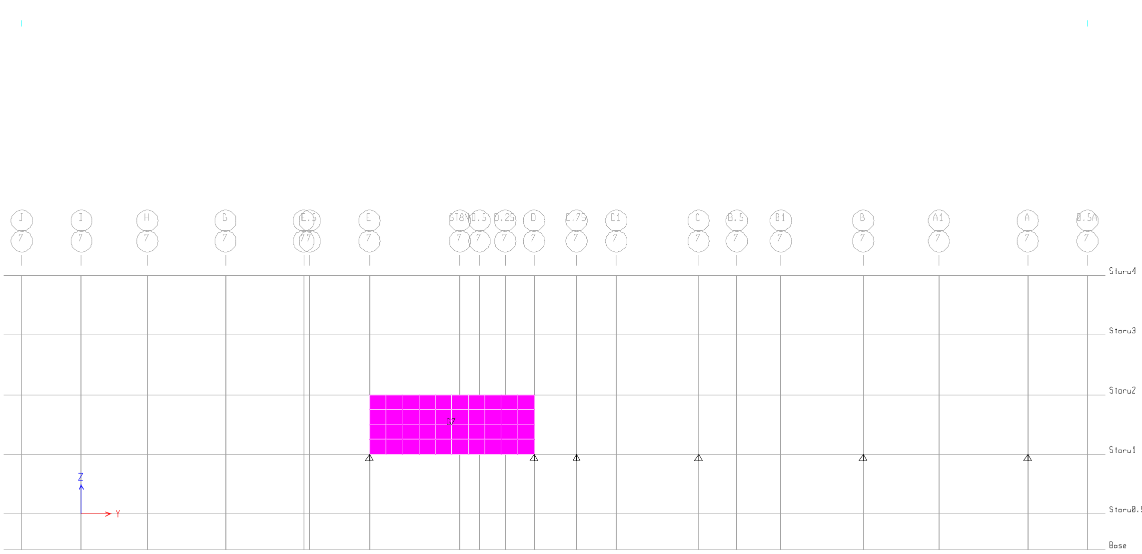

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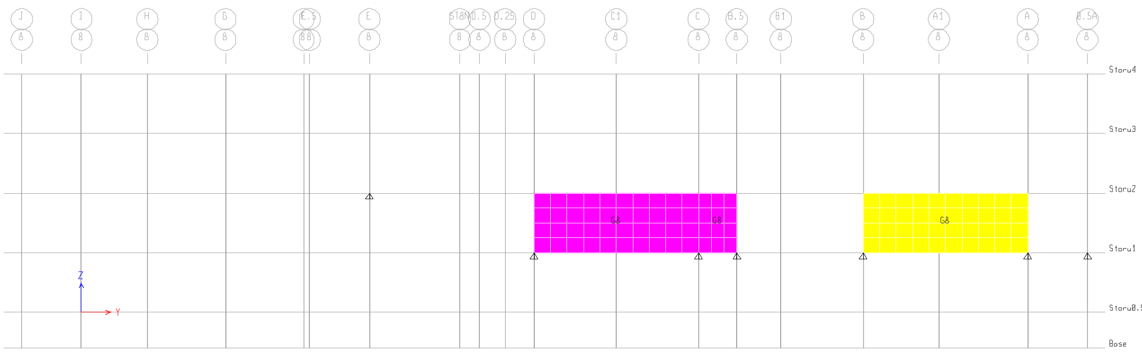

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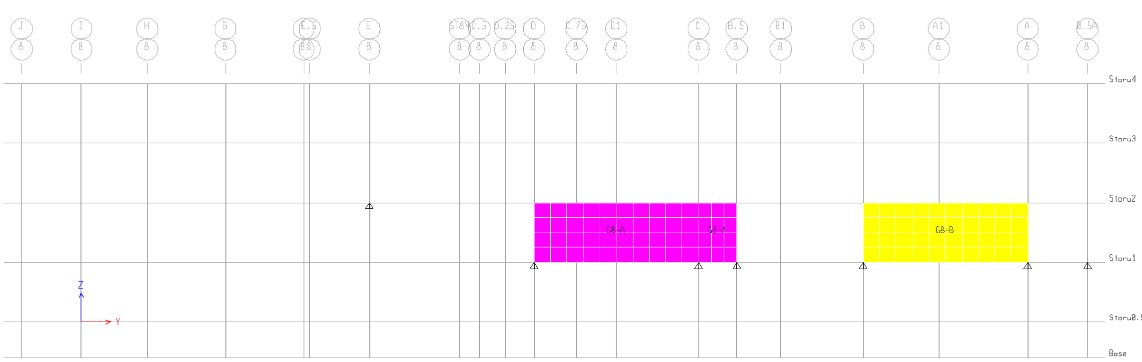

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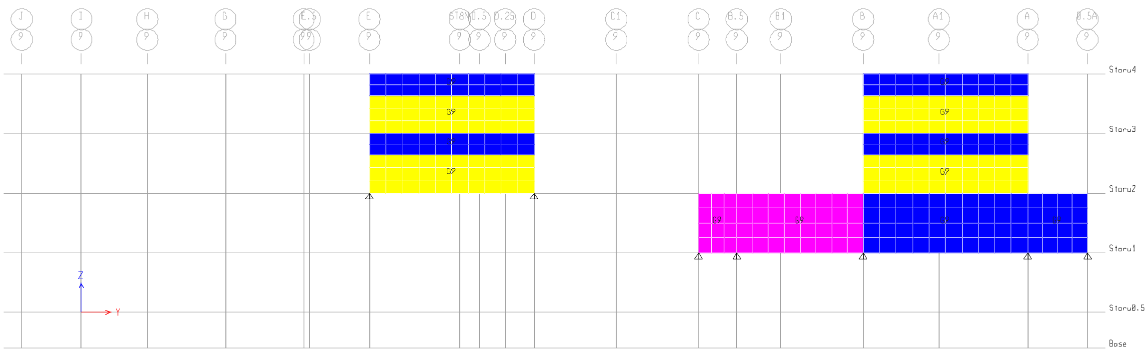

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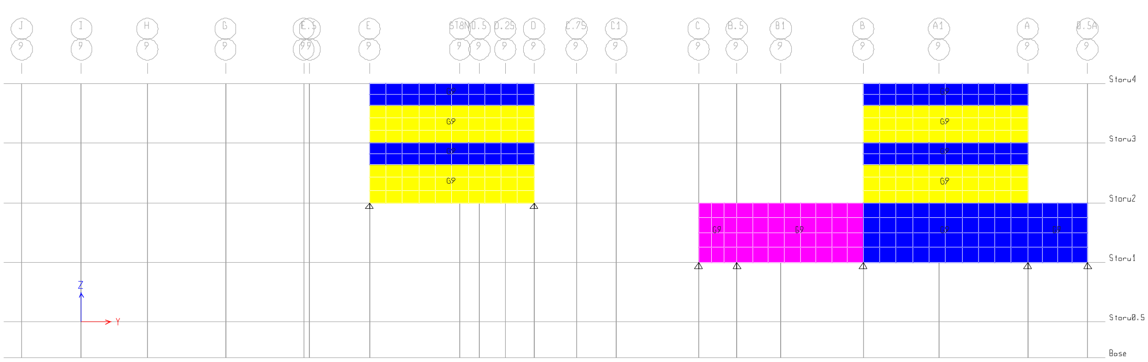

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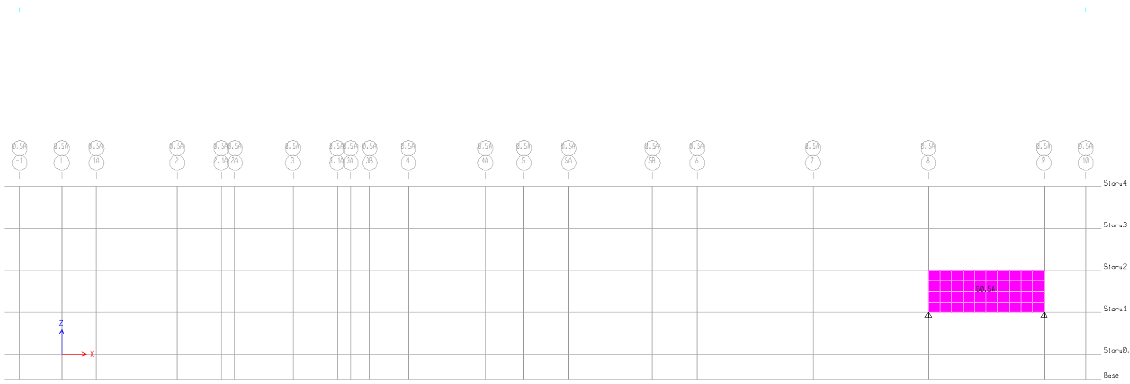

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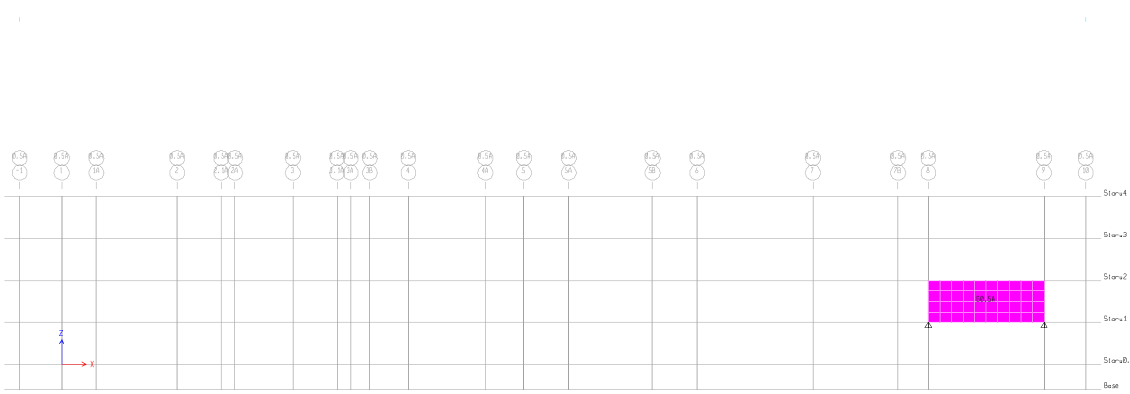

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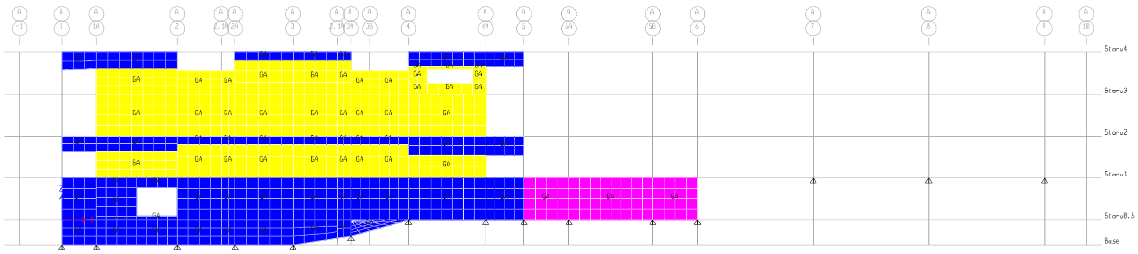

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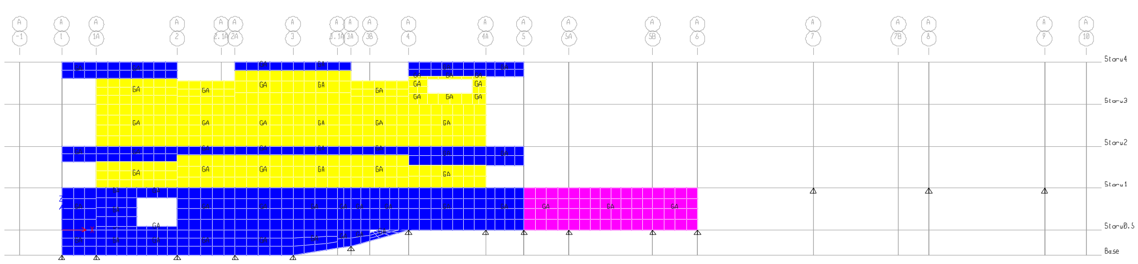

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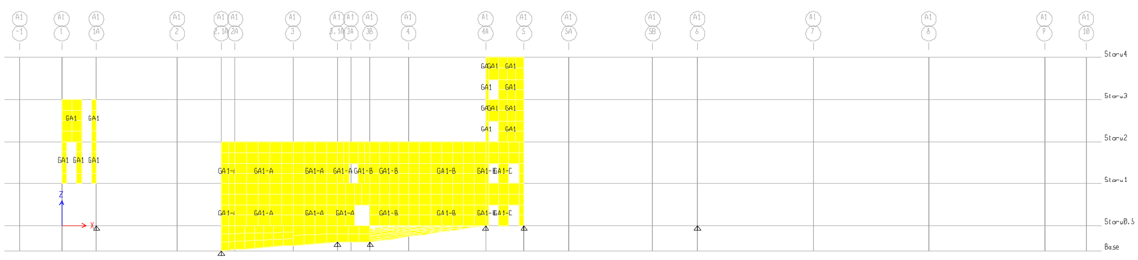

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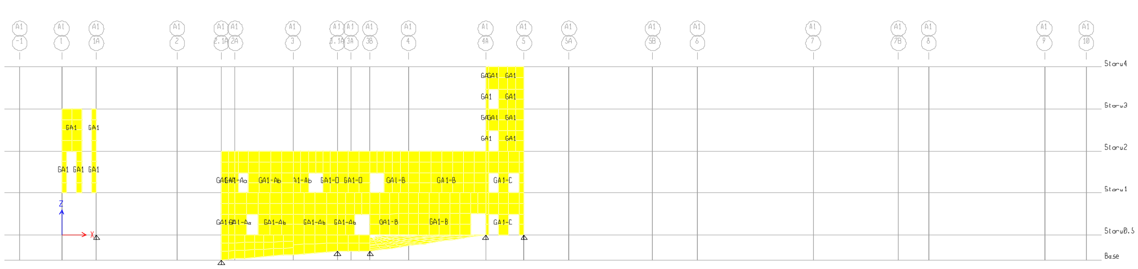

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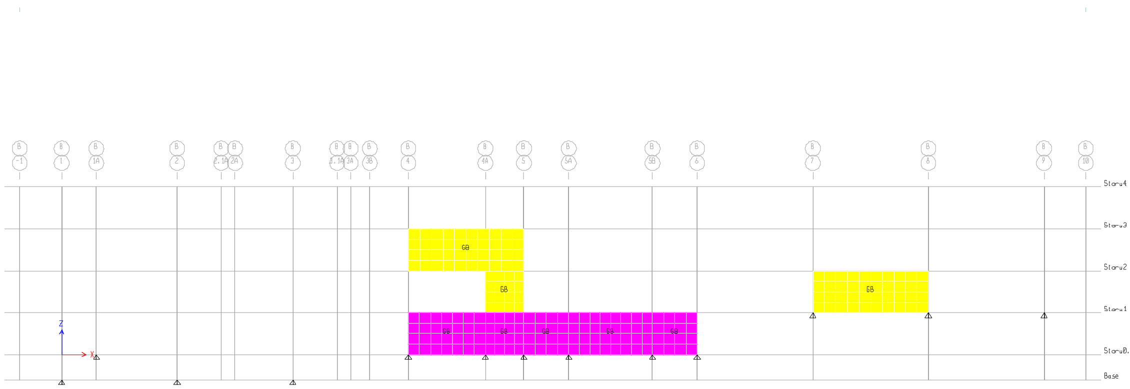

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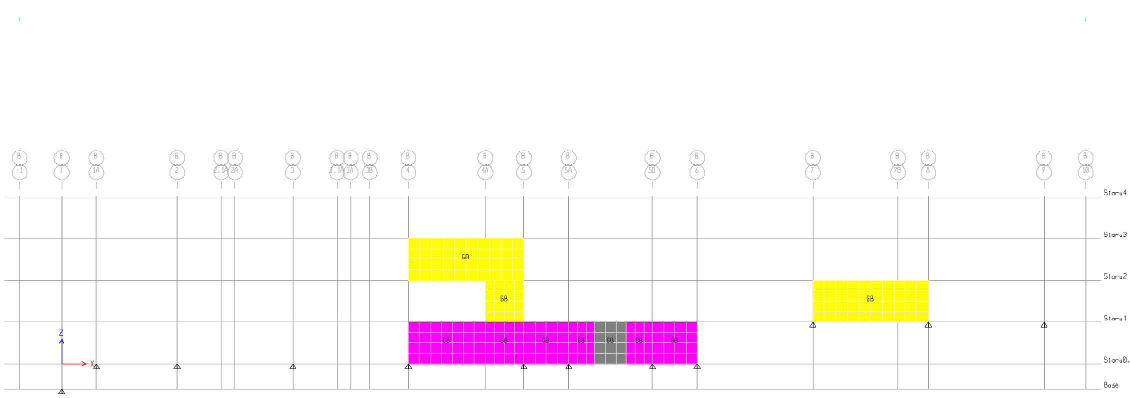

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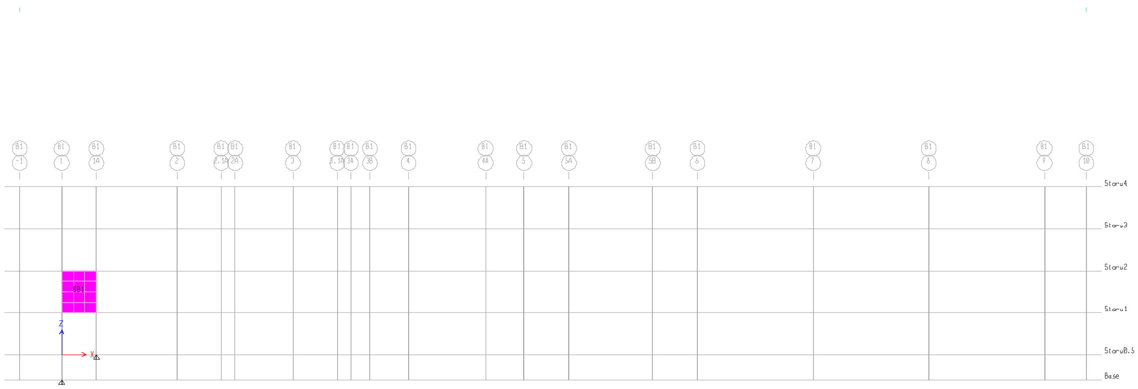

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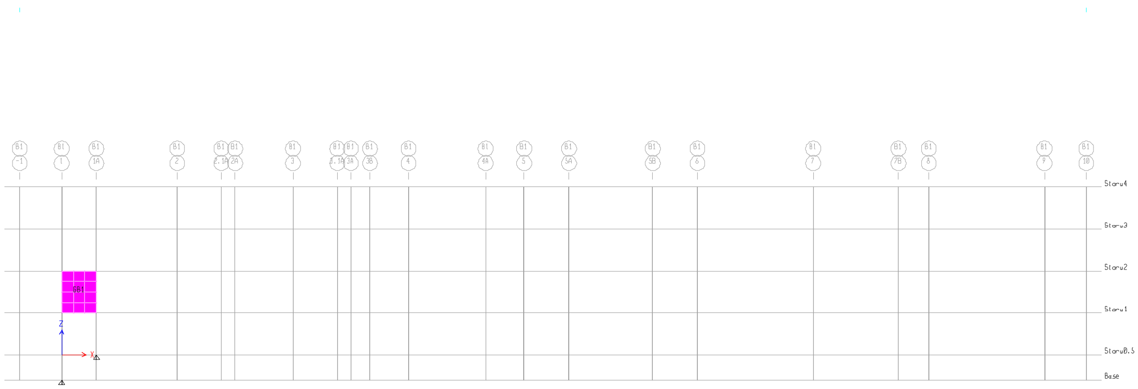
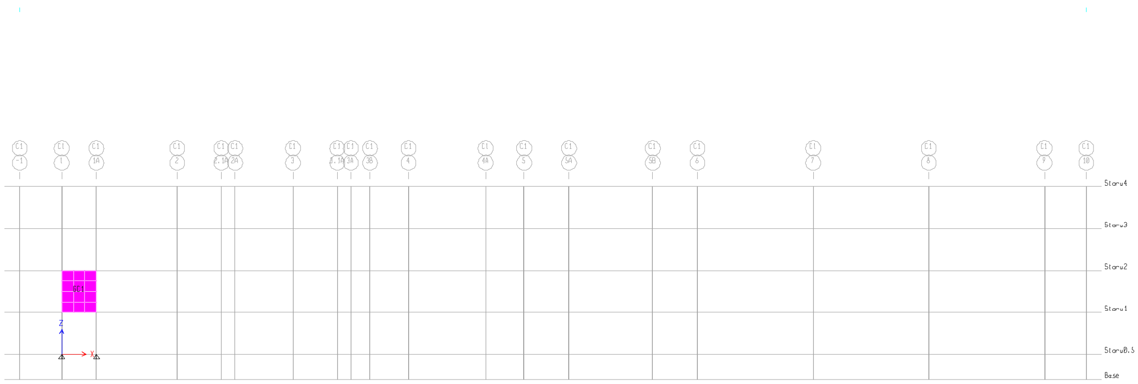


ORIGINAL BUILDING MODEL

UPDATED BUILDING MODEL

ORIGINAL BUILDING MODEL



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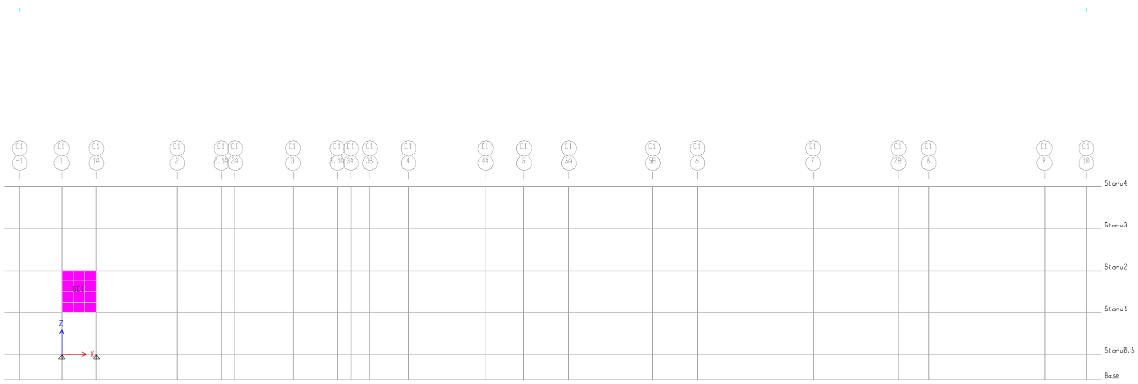

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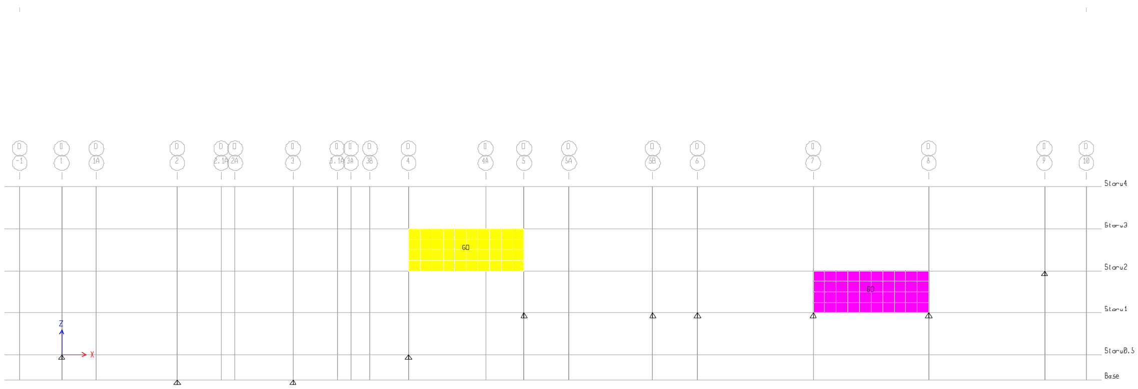

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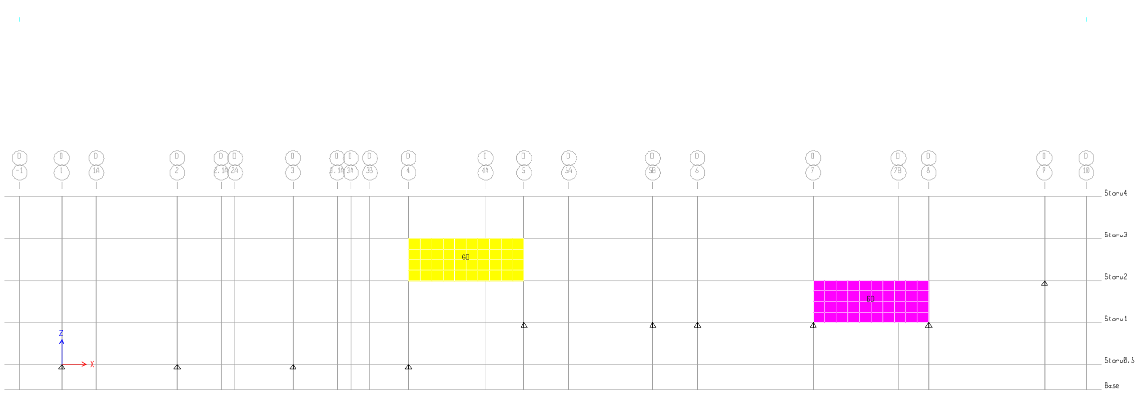

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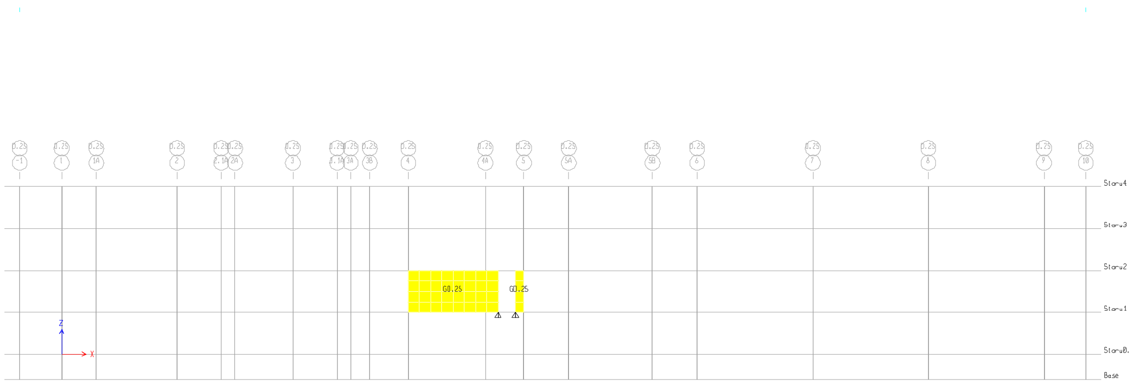

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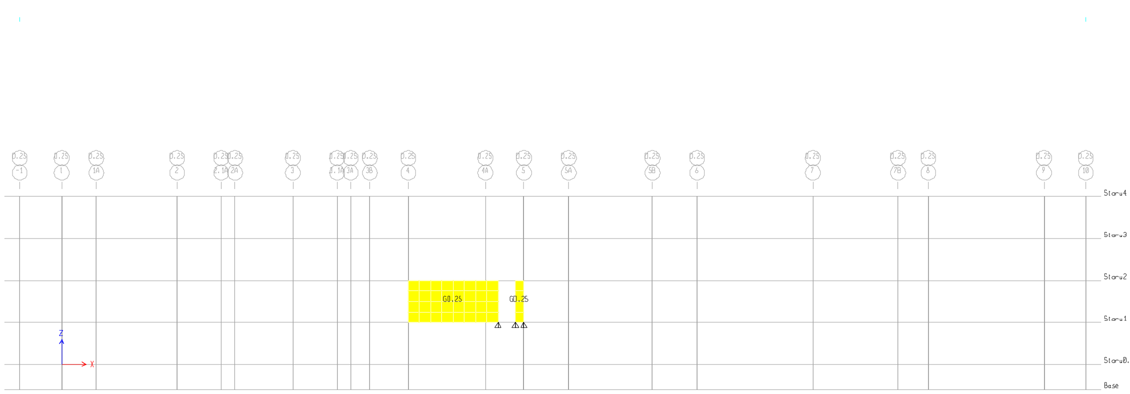

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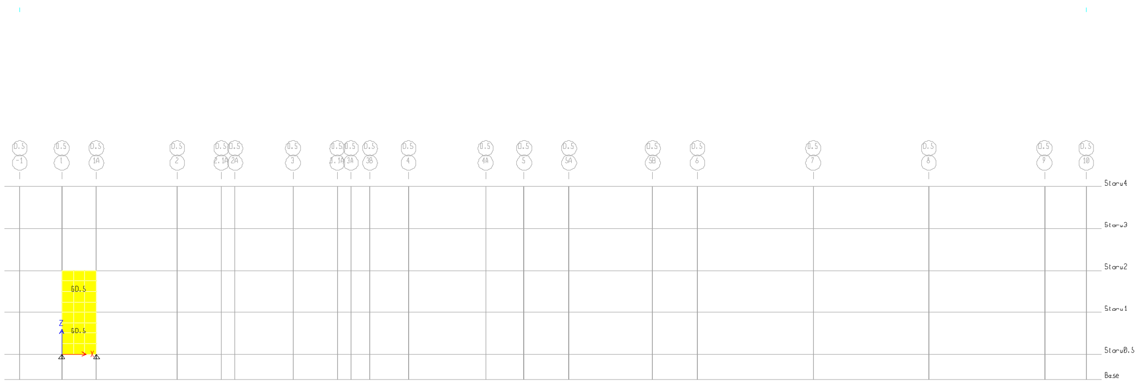

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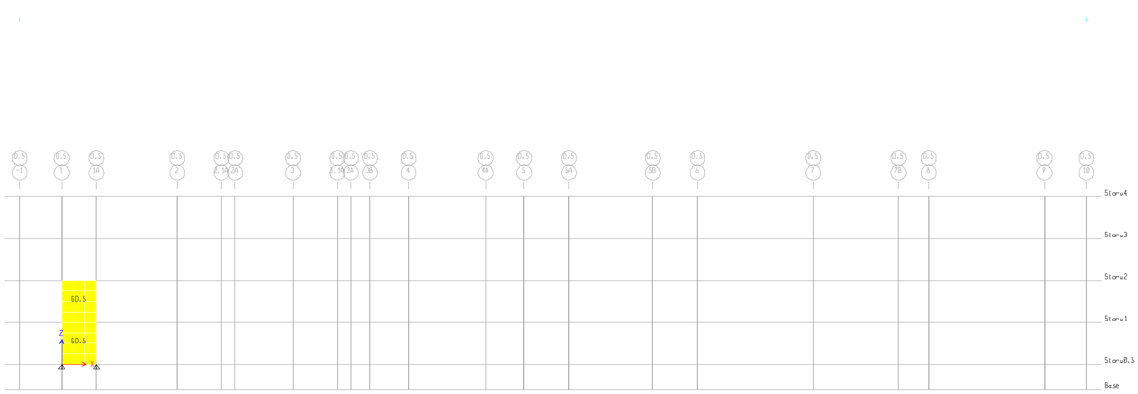

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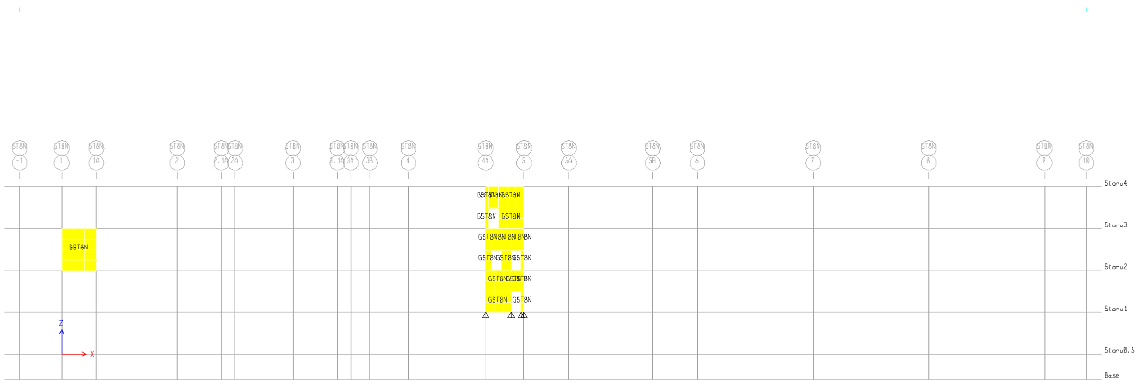

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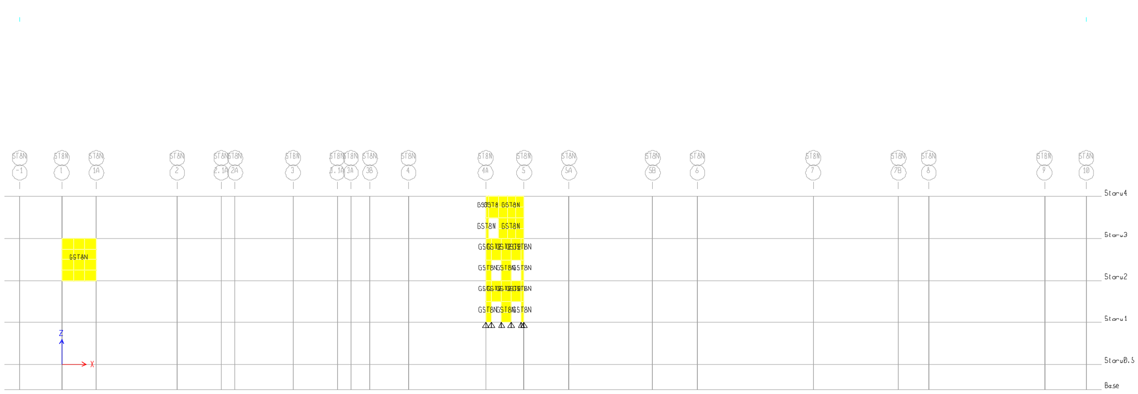

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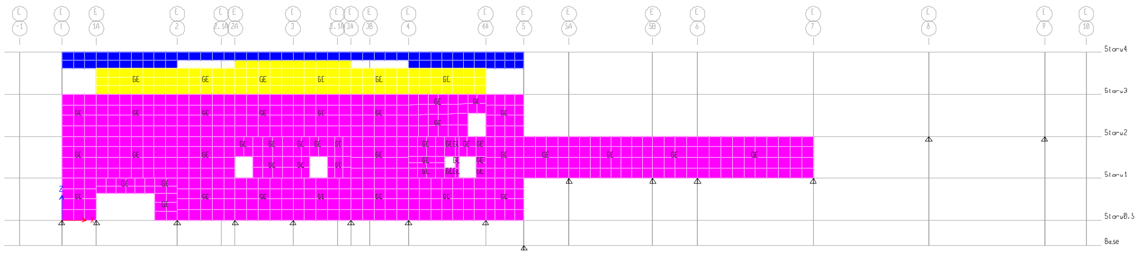

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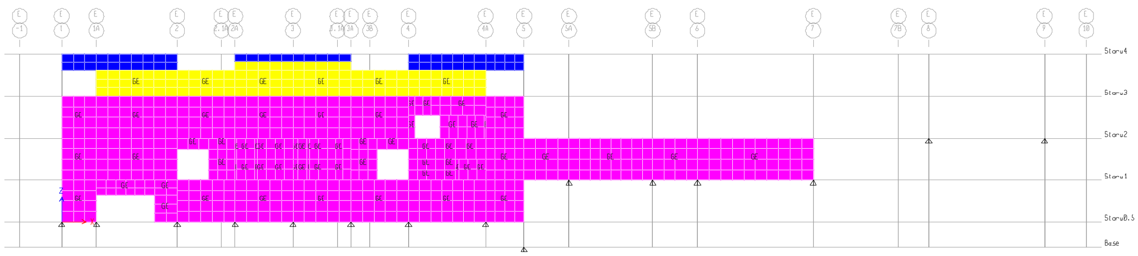

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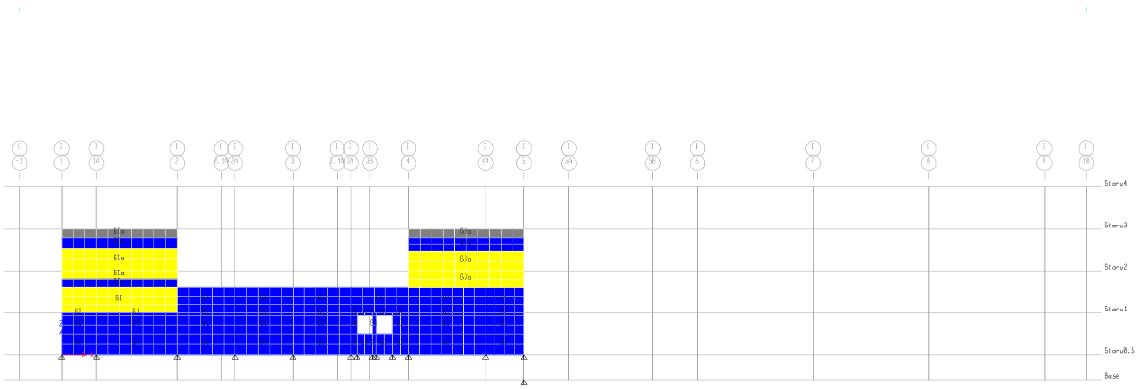

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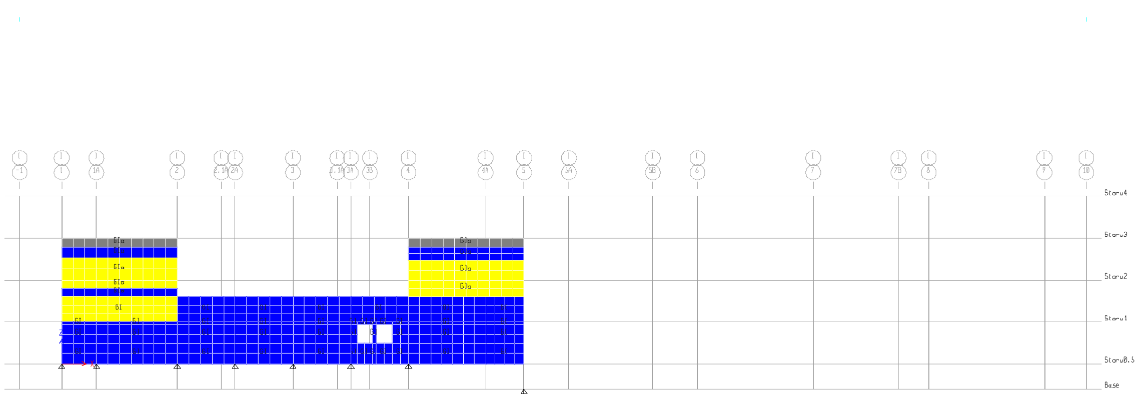
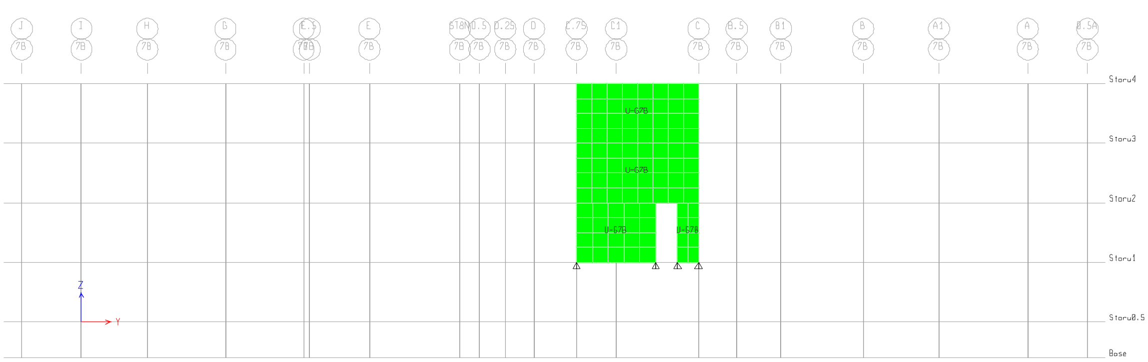


WALL DIDN'T EXIST IN ORIGINAL BUILDING

UPDATED BUILDING MODEL



WALL DIDN'T EXIST IN ORIGINAL BUILDING

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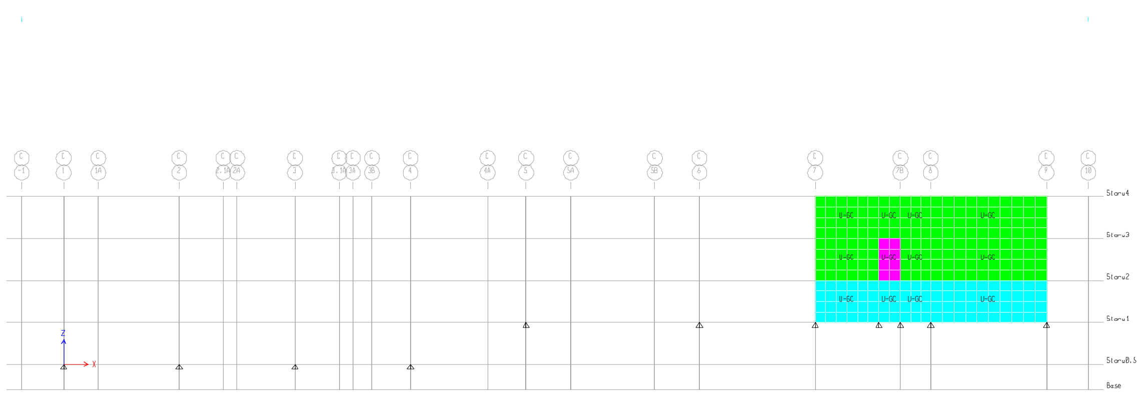

WALL DIDN'T EXIST IN ORIGINAL BUILDING

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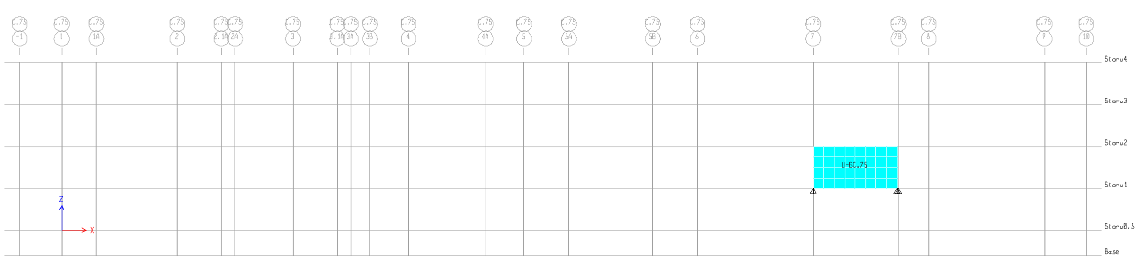


ORIGINAL CONDITIONS MODEL - SEE C36.3 PAGES FOR PIER LOCATIONS

TABLE: Pier Forces - ORIGINAL BUILDING CONFIGURATION ETABS OUTPUT								
Story	**Pier**	**Output Case**	**Case Type**	**Step Type**	**Location**	**P**	**V2**	**M3**
						kip	kip	kip-ft
Story2	G0.5A	BSE 2N ENVELOPE	Combination	Max	Bottom	60	239	6,388
Story4	G1	BSE 2N ENVELOPE	Combination	Max	Bottom	21	1,914	20,173
Story3	G1	BSE 2N ENVELOPE	Combination	Max	Bottom	1,454	8,628	96,784
Story2	G1	BSE 2N ENVELOPE	Combination	Max	Bottom	340	5,825	30,239
Story1	G1	BSE 2N ENVELOPE	Combination	Max	Bottom	4,635	11,062	206,157
Story0.5	G1	BSE 2N ENVELOPE	Combination	Max	Bottom	1,240	2,835	23,414
Story4	G1A	BSE 2N ENVELOPE	Combination	Max	Bottom	404	3,738	54,846
Story3	G1A	BSE 2N ENVELOPE	Combination	Max	Bottom	369	1,862	15,924
Story2	G1A	BSE 2N ENVELOPE	Combination	Max	Bottom	563	1,575	2,110
Story1	G1A	BSE 2N ENVELOPE	Combination	Max	Bottom	72	775	3,550
Story2	G1-P12a	BSE 2N ENVELOPE	Combination	Max	Bottom	338	287	658
Story2	G1-P12b	BSE 2N ENVELOPE	Combination	Max	Bottom	511	672	2,035
Story2	G1-P5	BSE 2N ENVELOPE	Combination	Max	Bottom	630	854	3,723
Story2	G1-P8	BSE 2N ENVELOPE	Combination	Max	Bottom	832	2,977	9,930
Story2	G2.1A	BSE 2N ENVELOPE	Combination	Max	Bottom	422	654	2,104
Story1	G2.1A	BSE 2N ENVELOPE	Combination	Max	Bottom	512	374	2,855
Story0.5	G2.1A	BSE 2N ENVELOPE	Combination	Max	Bottom	489	372	4,544
Story2	G3.1A	BSE 2N ENVELOPE	Combination	Max	Bottom	144	534	770
Story1	G3.1A	BSE 2N ENVELOPE	Combination	Max	Bottom	145	438	2,437
Story0.5	G3.1A	BSE 2N ENVELOPE	Combination	Max	Bottom	8	28	5,872
Story2	G3B	BSE 2N ENVELOPE	Combination	Max	Bottom	144	574	1,011
Story1	G3B	BSE 2N ENVELOPE	Combination	Max	Bottom	258	514	2,925
Story0.5	G3B	BSE 2N ENVELOPE	Combination	Max	Bottom	126	116	-19,298
Story3	G4	BSE 2N ENVELOPE	Combination	Max	Bottom	719	7,101	-4,990
Story2	G4	BSE 2N ENVELOPE	Combination	Max	Bottom	2,375	8,746	65,208
Story1	G4	BSE 2N ENVELOPE	Combination	Max	Bottom	2,467	9,723	86,417
Story4	G4A	BSE 2N ENVELOPE	Combination	Max	Bottom	228	1,357	-33,545
Story3	G4A	BSE 2N ENVELOPE	Combination	Max	Bottom	1,417	1,583	404
Story2	G4A	BSE 2N ENVELOPE	Combination	Max	Bottom	302	940	56,952
Story1	G4A	BSE 2N ENVELOPE	Combination	Max	Bottom	707	626	8,427
Story4	G4-A	BSE 2N ENVELOPE	Combination	Max	Bottom	265	2,087	17,190
Story3	G4-A	BSE 2N ENVELOPE	Combination	Max	Bottom	529	2,195	12,365
Story2	G4-A	BSE 2N ENVELOPE	Combination	Max	Bottom	129	1,118	8,476
Story3	G4-Aa	BSE 2N ENVELOPE	Combination	Max	Bottom	177	401	1,120
Story3	G4-Ab	BSE 2N ENVELOPE	Combination	Max	Bottom	376	953	2,908
Story4	G4-B	BSE 2N ENVELOPE	Combination	Max	Bottom	-4	2,258	20,191
Story3	G4-B	BSE 2N ENVELOPE	Combination	Max	Bottom	75	1,600	11,913
Story3	G4-Ba	BSE 2N ENVELOPE	Combination	Max	Bottom	-27	552	28
Story3	G4-Bb	BSE 2N ENVELOPE	Combination	Max	Bottom	81	259	448
Story2	G5-P1	BSE 2N ENVELOPE	Combination	Max	Bottom	809	5,784	51,713
Story1	G5-P1	BSE 2N ENVELOPE	Combination	Max	Bottom	2,110	3,661	19,909
Story0.5	G5-P1	BSE 2N ENVELOPE	Combination	Max	Bottom	1,920	3,360	30,158
Story3	G5-P1a	BSE 2N ENVELOPE	Combination	Max	Bottom	25	1,530	5,234
Story4	G5-P1b	BSE 2N ENVELOPE	Combination	Max	Bottom	-648	2,648	23,515
Story3	G5-P1b	BSE 2N ENVELOPE	Combination	Max	Bottom	37	3,845	32,194
Story4	G5-P2	BSE 2N ENVELOPE	Combination	Max	Bottom	47	682	10,261
Story3	G5-P2	BSE 2N ENVELOPE	Combination	Max	Bottom	86	996	24,532
Story2	G5-P2	BSE 2N ENVELOPE	Combination	Max	Bottom	553	7,265	44,343
Story3	G5-P2a	BSE 2N ENVELOPE	Combination	Max	Bottom	-434	991	5,497
Story3	G5-P2b	BSE 2N ENVELOPE	Combination	Max	Bottom	934	635	4,343
Story4	G5-P3	BSE 2N ENVELOPE	Combination	Max	Bottom	-138	1,568	4,484
Story3	G5-P3	BSE 2N ENVELOPE	Combination	Max	Bottom	8	1,261	9,090
Story2	G5-P3	BSE 2N ENVELOPE	Combination	Max	Bottom	427	1,114	15,893
Story1	G5-P3	BSE 2N ENVELOPE	Combination	Max	Bottom	708	782	11,885
Story1	G5-P3a	BSE 2N ENVELOPE	Combination	Max	Bottom	-233	1,079	2,733

TABLE: Pier Forces - ORIGINAL BUILDING CONFIGURATION ETABS OUTPUT								
Story	Pier	Output Case	Case Type	Step Type	Location	P	V2	M3
						kip	kip	kip-ft
Story4	G6	BSE 2N ENVELOPE	Combination	Max	Bottom	1,846	3,015	139,077
Story3	G6	BSE 2N ENVELOPE	Combination	Max	Bottom	1,843	3,783	4,154
Story2	G6	BSE 2N ENVELOPE	Combination	Max	Bottom	1,812	1,252	25,180
Story1	G6	BSE 2N ENVELOPE	Combination	Max	Bottom	1,602	1,249	17,603
Story2	G7	BSE 2N ENVELOPE	Combination	Max	Bottom	550	2,814	13,694
Story2	G8	BSE 2N ENVELOPE	Combination	Max	Bottom	92	3,253	29,532
Story4	G9	BSE 2N ENVELOPE	Combination	Max	Bottom	33	8,456	62,655
Story3	G9	BSE 2N ENVELOPE	Combination	Max	Bottom	166	14,915	142,642
Story2	G9	BSE 2N ENVELOPE	Combination	Max	Bottom	13	6,735	180,234
Story4	GA	BSE 2N ENVELOPE	Combination	Max	Bottom	1,593	10,507	35,424
Story3	GA	BSE 2N ENVELOPE	Combination	Max	Bottom	1,852	11,225	81,175
Story2	GA	BSE 2N ENVELOPE	Combination	Max	Bottom	2,558	12,343	135,722
Story1	GA	BSE 2N ENVELOPE	Combination	Max	Bottom	1,275	13,250	432,644
Story0.5	GA	BSE 2N ENVELOPE	Combination	Max	Bottom	3,507	5,483	1,467
Story4	GA1	BSE 2N ENVELOPE	Combination	Max	Bottom	570	1,973	4,924
Story3	GA1	BSE 2N ENVELOPE	Combination	Max	Bottom	1,070	1,530	-18,893
Story2	GA1	BSE 2N ENVELOPE	Combination	Max	Bottom	103	14	-228
Story2	GA1-A	BSE 2N ENVELOPE	Combination	Max	Bottom	615	2,117	8,003
Story1	GA1-A	BSE 2N ENVELOPE	Combination	Max	Bottom	962	1,856	10,697
Story2	GA1-B	BSE 2N ENVELOPE	Combination	Max	Bottom	1,433	3,725	6,096
Story1	GA1-B	BSE 2N ENVELOPE	Combination	Max	Bottom	2,241	2,636	17,390
Story2	GA1-C	BSE 2N ENVELOPE	Combination	Max	Bottom	497	142	561
Story1	GA1-C	BSE 2N ENVELOPE	Combination	Max	Bottom	156	69	243
Story3	GB	BSE 2N ENVELOPE	Combination	Max	Bottom	-259	4,504	20,096
Story2	GB	BSE 2N ENVELOPE	Combination	Max	Bottom	134	4,826	33,887
Story1	GB	BSE 2N ENVELOPE	Combination	Max	Bottom	-264	2,425	33,523
Story2	GB.5	BSE 2N ENVELOPE	Combination	Max	Bottom	-209	1,709	9,159
Story2	GB1	BSE 2N ENVELOPE	Combination	Max	Bottom	6	306	752
Story2	GC1	BSE 2N ENVELOPE	Combination	Max	Bottom	-20	347	827
Story3	GD	BSE 2N ENVELOPE	Combination	Max	Bottom	9	4,300	11,913
Story2	GD	BSE 2N ENVELOPE	Combination	Max	Bottom	-250	1,902	9,083
Story2	GD.25	BSE 2N ENVELOPE	Combination	Max	Bottom	398	2,882	21,121
Story2	GD.5	BSE 2N ENVELOPE	Combination	Max	Bottom	95	337	2,491
Story1	GD.5	BSE 2N ENVELOPE	Combination	Max	Bottom	-245	469	2,922
Story4	GE	BSE 2N ENVELOPE	Combination	Max	Bottom	1,989	11,179	-23,205
Story3	GE	BSE 2N ENVELOPE	Combination	Max	Bottom	2,241	16,728	36,176
Story2	GE	BSE 2N ENVELOPE	Combination	Max	Bottom	3,802	21,457	326,330
Story1	GE	BSE 2N ENVELOPE	Combination	Max	Bottom	3,326	13,479	134,314
Story2	GI	BSE 2N ENVELOPE	Combination	Max	Bottom	1,471	6,247	-417
Story1	GI	BSE 2N ENVELOPE	Combination	Max	Bottom	1,973	5,219	-16,542
Story3	GIa	BSE 2N ENVELOPE	Combination	Max	Bottom	179	3,090	15,500
Story2	GIa	BSE 2N ENVELOPE	Combination	Max	Bottom	359	3,017	21,017
Story3	GIb	BSE 2N ENVELOPE	Combination	Max	Bottom	562	3,105	13,709
Story2	GIb	BSE 2N ENVELOPE	Combination	Max	Bottom	813	3,013	16,869
Story4	GST8N	BSE 2N ENVELOPE	Combination	Max	Bottom	379	1,656	4,120
Story3	GST8N	BSE 2N ENVELOPE	Combination	Max	Bottom	86	885	103,220
Story2	GST8N	BSE 2N ENVELOPE	Combination	Max	Bottom	-8	479	6,669

UPDATED CONDITIONS MODEL - SEE C36.3 PAGES FOR PIER LOCATIONS

TABLE: Pier Forces - UPDATED BUILDING CONFIGURATION ETABS OUTPUT								
Story	Pier	Output Case	Case Type	Step Type	Location	P	V2	M3
						kip	kip	kip-ft
Story2	G0.5A	BSE 2N ENVELOPE	Combination	Max	Bottom	81	199	5,236
Story4	G1	BSE 2N ENVELOPE	Combination	Max	Bottom	78	1,844	33,026
Story3	G1	BSE 2N ENVELOPE	Combination	Max	Bottom	486	7,608	52,107
Story1	G1	BSE 2N ENVELOPE	Combination	Max	Bottom	3,440	10,294	106,023
Story0.5	G1	BSE 2N ENVELOPE	Combination	Max	Bottom	1,138	2,816	64,253
Story4	G1A	BSE 2N ENVELOPE	Combination	Max	Bottom	314	3,806	51,515
Story3	G1A	BSE 2N ENVELOPE	Combination	Max	Bottom	271	2,648	21,695
Story2	G1A	BSE 2N ENVELOPE	Combination	Max	Bottom	372	2,705	19,031
Story1	G1A	BSE 2N ENVELOPE	Combination	Max	Bottom	272	842	6,254
Story3	G1-P12	BSE 2N ENVELOPE	Combination	Max	Bottom	305	1,095	2,632
Story2	G1-P12	BSE 2N ENVELOPE	Combination	Max	Bottom	670	1,333	5,644
Story3	G1-P4	BSE 2N ENVELOPE	Combination	Max	Bottom	556	6,154	65,730
Story2	G1-P5	BSE 2N ENVELOPE	Combination	Max	Bottom	431	1,432	7,271
Story2	G1-P6	BSE 2N ENVELOPE	Combination	Max	Bottom	645	1,418	6,764
Story2	G1-P7	BSE 2N ENVELOPE	Combination	Max	Bottom	189	2,125	8,907
Story2	G1-P8	BSE 2N ENVELOPE	Combination	Max	Bottom	742	2,395	10,209
Story2	G2.1A	BSE 2N ENVELOPE	Combination	Max	Bottom	305	767	5,065
Story1	G2.1A	BSE 2N ENVELOPE	Combination	Max	Bottom	412	363	3,508
Story0.5	G2.1A	BSE 2N ENVELOPE	Combination	Max	Bottom	386	361	5,040
Story2	G3.1A	BSE 2N ENVELOPE	Combination	Max	Bottom	92	509	2,490
Story1	G3.1A	BSE 2N ENVELOPE	Combination	Max	Bottom	89	397	2,310
Story0.5	G3.1A	BSE 2N ENVELOPE	Combination	Max	Bottom	5	30	6,952
Story2	G3B	BSE 2N ENVELOPE	Combination	Max	Bottom	-18	516	3,132
Story1	G3B	BSE 2N ENVELOPE	Combination	Max	Bottom	119	315	1,973
Story0.5	G3B	BSE 2N ENVELOPE	Combination	Max	Bottom	87	77	-10,031
Story3	G4	BSE 2N ENVELOPE	Combination	Max	Bottom	456	6,870	-2,396
Story2	G4	BSE 2N ENVELOPE	Combination	Max	Bottom	1,412	7,991	41,987
Story1	G4	BSE 2N ENVELOPE	Combination	Max	Bottom	1,903	8,784	88,214
Story4	G4A	BSE 2N ENVELOPE	Combination	Max	Bottom	456	1,238	-5,077
Story3	G4A	BSE 2N ENVELOPE	Combination	Max	Bottom	1,030	1,811	-3,563
Story2	G4A	BSE 2N ENVELOPE	Combination	Max	Bottom	210	1,460	40,586
Story1	G4A	BSE 2N ENVELOPE	Combination	Max	Bottom	930	588	10,111
Story4	G4-A	BSE 2N ENVELOPE	Combination	Max	Bottom	74	2,151	27,145
Story3	G4-A	BSE 2N ENVELOPE	Combination	Max	Bottom	127	2,056	32,902
Story2	G4-A	BSE 2N ENVELOPE	Combination	Max	Bottom	286	1,025	7,734
Story3	G4-Aa	BSE 2N ENVELOPE	Combination	Max	Bottom	31	372	982
Story3	G4-Ab	BSE 2N ENVELOPE	Combination	Max	Bottom	546	905	2,345
Story4	G4-B	BSE 2N ENVELOPE	Combination	Max	Bottom	8	2,420	30,628
Story3	G4-B	BSE 2N ENVELOPE	Combination	Max	Bottom	17	1,588	34,194
Story3	G4-Ba	BSE 2N ENVELOPE	Combination	Max	Bottom	-41	587	-175
Story3	G4-Bb	BSE 2N ENVELOPE	Combination	Max	Bottom	72	277	467
Story2	G5-P1	BSE 2N ENVELOPE	Combination	Max	Bottom	935	6,333	51,081
Story1	G5-P1	BSE 2N ENVELOPE	Combination	Max	Bottom	2,623	3,911	12,207
Story0.5	G5-P1	BSE 2N ENVELOPE	Combination	Max	Bottom	2,862	3,865	30,566
Story3	G5-P1a	BSE 2N ENVELOPE	Combination	Max	Bottom	21	1,329	4,487
Story4	G5-P1b	BSE 2N ENVELOPE	Combination	Max	Bottom	-484	2,216	20,242
Story3	G5-P1b	BSE 2N ENVELOPE	Combination	Max	Bottom	243	3,472	24,566
Story4	G5-P2	BSE 2N ENVELOPE	Combination	Max	Bottom	65	543	8,166
Story3	G5-P2	BSE 2N ENVELOPE	Combination	Max	Bottom	91	1,020	23,030
Story2	G5-P2	BSE 2N ENVELOPE	Combination	Max	Bottom	473	7,404	40,376
Story3	G5-P2a	BSE 2N ENVELOPE	Combination	Max	Bottom	-181	952	5,371
Story3	G5-P2b	BSE 2N ENVELOPE	Combination	Max	Bottom	896	609	4,128
Story4	G5-P3	BSE 2N ENVELOPE	Combination	Max	Bottom	-148	1,021	3,711
Story3	G5-P3	BSE 2N ENVELOPE	Combination	Max	Bottom	-45	1,205	8,795
Story2	G5-P3	BSE 2N ENVELOPE	Combination	Max	Bottom	1	563	6,560
Story1	G5-P3	BSE 2N ENVELOPE	Combination	Max	Bottom	858	815	12,050
Story1	G5-P3a	BSE 2N ENVELOPE	Combination	Max	Bottom	-309	1,031	2,636

TABLE: Pier Forces - UPDATED BUILDING CONFIGURATION ETABS OUTPUT								
Story	Pier	Output Case	Case Type	Step Type	Location	P	V2	M3
						kip	kip	kip-ft
Story4	G6	BSE 2N ENVELOPE	Combination	Max	Bottom	1,498	2,684	108,683
Story3	G6	BSE 2N ENVELOPE	Combination	Max	Bottom	1,398	2,811	-1,887
Story2	G6	BSE 2N ENVELOPE	Combination	Max	Bottom	1,287	933	18,974
Story1	G6	BSE 2N ENVELOPE	Combination	Max	Bottom	250	888	7,589
Story2	G7	BSE 2N ENVELOPE	Combination	Max	Bottom	604	2,873	13,481
Story2	G8	BSE 2N ENVELOPE	Combination	Max	Bottom	-137	4,503	28,730
Story4	G9	BSE 2N ENVELOPE	Combination	Max	Bottom	26	6,567	48,641
Story3	G9	BSE 2N ENVELOPE	Combination	Max	Bottom	121	11,579	110,167
Story2	G9	BSE 2N ENVELOPE	Combination	Max	Bottom	-18	5,435	140,661
Story4	GA	BSE 2N ENVELOPE	Combination	Max	Bottom	754	6,531	26,557
Story3	GA	BSE 2N ENVELOPE	Combination	Max	Bottom	1,001	7,000	71,525
Story2	GA	BSE 2N ENVELOPE	Combination	Max	Bottom	1,542	8,402	97,933
Story1	GA	BSE 2N ENVELOPE	Combination	Max	Bottom	757	9,403	296,925
Story0.5	GA	BSE 2N ENVELOPE	Combination	Max	Bottom	2,537	4,075	4,590
Story4	GA1	BSE 2N ENVELOPE	Combination	Max	Bottom	499	1,216	3,192
Story3	GA1	BSE 2N ENVELOPE	Combination	Max	Bottom	955	820	-16,500
Story2	GA1	BSE 2N ENVELOPE	Combination	Max	Bottom	67	24	-239
Story2	GA1-Aa	BSE 2N ENVELOPE	Combination	Max	Bottom	203	165	466
Story1	GA1-Aa	BSE 2N ENVELOPE	Combination	Max	Bottom	332	249	720
Story2	GA1-Ab	BSE 2N ENVELOPE	Combination	Max	Bottom	204	846	3,483
Story1	GA1-Ab	BSE 2N ENVELOPE	Combination	Max	Bottom	658	950	2,726
Story2	GA1-B	BSE 2N ENVELOPE	Combination	Max	Bottom	1,024	2,238	3,226
Story1	GA1-B	BSE 2N ENVELOPE	Combination	Max	Bottom	1,496	1,631	8,115
Story2	GA1-C	BSE 2N ENVELOPE	Combination	Max	Bottom	441	112	425
Story1	GA1-C	BSE 2N ENVELOPE	Combination	Max	Bottom	155	69	245
Story2	GA1-D	BSE 2N ENVELOPE	Combination	Max	Bottom	443	828	2,620
Story3	GB	BSE 2N ENVELOPE	Combination	Max	Bottom	-199	3,117	13,440
Story2	GB	BSE 2N ENVELOPE	Combination	Max	Bottom	12	3,529	23,924
Story1	GB	BSE 2N ENVELOPE	Combination	Max	Bottom	-269	1,706	8,248
Story2	GB.5	BSE 2N ENVELOPE	Combination	Max	Bottom	-363	872	7,001
Story2	GB1	BSE 2N ENVELOPE	Combination	Max	Bottom	101	241	1,340
Story2	GC1	BSE 2N ENVELOPE	Combination	Max	Bottom	-61	276	1,432
Story3	GD	BSE 2N ENVELOPE	Combination	Max	Bottom	-16	2,815	7,538
Story2	GD	BSE 2N ENVELOPE	Combination	Max	Bottom	-187	859	3,764
Story2	GD.25	BSE 2N ENVELOPE	Combination	Max	Bottom	742	2,161	16,923
Story2	GD.5	BSE 2N ENVELOPE	Combination	Max	Bottom	187	304	1,622
Story1	GD.5	BSE 2N ENVELOPE	Combination	Max	Bottom	-122	316	2,279
Story4	GE	BSE 2N ENVELOPE	Combination	Max	Bottom	517	6,524	14,744
Story3	GE	BSE 2N ENVELOPE	Combination	Max	Bottom	2,228	9,969	-831
Story2	GE	BSE 2N ENVELOPE	Combination	Max	Bottom	4,296	13,977	205,238
Story1	GE	BSE 2N ENVELOPE	Combination	Max	Bottom	4,472	8,862	90,990
Story2	GI	BSE 2N ENVELOPE	Combination	Max	Bottom	1,612	6,742	36,528
Story1	GI	BSE 2N ENVELOPE	Combination	Max	Bottom	1,826	5,106	85,060
Story3	GIa	BSE 2N ENVELOPE	Combination	Max	Bottom	407	2,992	15,222
Story2	GIa	BSE 2N ENVELOPE	Combination	Max	Bottom	836	3,399	20,813
Story3	GIb	BSE 2N ENVELOPE	Combination	Max	Bottom	419	2,709	12,642
Story2	GIb	BSE 2N ENVELOPE	Combination	Max	Bottom	610	2,865	15,515
Story4	GST8N	BSE 2N ENVELOPE	Combination	Max	Bottom	227	967	2,534
Story3	GST8N	BSE 2N ENVELOPE	Combination	Max	Bottom	204	594	93,773
Story2	GST8N	BSE 2N ENVELOPE	Combination	Max	Bottom	-49	229	2,141
Story4	U-G7B	BSE 2N ENVELOPE	Combination	Max	Bottom	1,315	2,070	10,295
Story3	U-G7B	BSE 2N ENVELOPE	Combination	Max	Bottom	3,659	4,794	44,413
Story2	U-G7B	BSE 2N ENVELOPE	Combination	Max	Bottom	4,039	2,228	37,056
Story4	U-GC	BSE 2N ENVELOPE	Combination	Max	Bottom	-395	9,568	88,612
Story3	U-GC	BSE 2N ENVELOPE	Combination	Max	Bottom	-436	16,155	225,918
Story2	U-GC	BSE 2N ENVELOPE	Combination	Max	Bottom	-260	15,749	312,389
Story2	U-GC.75	BSE 2N ENVELOPE	Combination	Max	Bottom	922	1,150	14,776

COMPARISON OF ORIGINAL BUILDING SHEAR TO UPDATED BUILDING SHEAR

PIER	STORY	ORIGINAL SHEAR	UPDATED SHEAR	CHANGE	PERCENT	NOTES
G0.5A	Story2	239	199	-40	-17%	
G1	Story4	1,914	1,844	-69	-4%	
G1	Story3	8,628	7,608	-1,020	-12%	CALCULATIONS FOR GRIDLINE 1 WALL
G1	Story2	5,825	0	-	-	PREVIOUSLY SUBMITTED
G1	Story1	11,062	10,294	-768	-7%	
G1	Story0.5	2,835	2,816	-18	-1%	
G1A	Story4	3,738	3,806	68	2%	
G1A	Story3	1,862	2,648	786	42%	SEE DETAILED CHECKS
G1A	Story2	1,575	2,705	1,131	72%	
G1A	Story1	775	842	67	9%	
G1-P12a	Story2	287	0	-	-	
G1-P12b	Story2	672	0	-	-	CALCULATIONS FOR GRIDLINE 1 WALL
G1-P5	Story2	854	1,432	578	68%	PREVIOUSLY SUBMITTED
G1-P8	Story2	2,977	2,395	-582	-20%	
G2.1A	Story2	654	767	113	17%	SEE DETAILED CHECKS
G2.1A	Story1	374	363	-11	-3%	
G2.1A	Story0.5	372	361	-11	-3%	
G3.1A	Story2	534	509	-24	-5%	
G3.1A	Story1	438	397	-40	-9%	
G3.1A	Story0.5	28	30	3	10%	
G3B	Story2	574	516	-59	-10%	
G3B	Story1	514	315	-199	-39%	
G3B	Story0.5	116	77	-40	-34%	
G4	Story3	7,101	6,870	-231	-3%	
G4	Story2	8,746	7,991	-755	-9%	
G4	Story1	9,723	8,784	-939	-10%	
G4A	Story4	1,357	1,238	-119	-9%	
G4A	Story3	1,583	1,811	228	14%	SEE DETAILED CHECKS
G4A	Story2	940	1,460	521	55%	
G4A	Story1	626	588	-38	-6%	
G4-A	Story4	2,087	2,151	64	3%	
G4-A	Story3	2,195	2,056	-139	-6%	
G4-A	Story2	1,118	1,025	-94	-8%	
G4-Aa	Story3	401	372	-28	-7%	
G4-Ab	Story3	953	905	-48	-5%	
G4-B	Story4	2,258	2,420	162	7%	
G4-B	Story3	1,600	1,588	-11	-1%	
G4-Ba	Story3	552	587	35	6%	
G4-Bb	Story3	259	277	18	7%	

PIERS NOTED THUS WERE PREVIOUSLY CHECKED FOR INCREASED LOADS USING ASCE 41 - REFER TO STRUCTURAL CALCULATIONS FROM PLAN CHECK 2 TYPICAL

ON FOLLOWING PAGE, TYP.

COMPARISON OF ORIGINAL BUILDING SHEAR TO UPDATED BUILDING SHEAR

PIER	STORY	ORIGINAL SHEAR	UPDATED SHEAR	CHANGE	PERCENT	NOTES
G5-P1	Story2	5,784	6,333	549	9%	
G5-P1	Story1	3,661	3,911	250	7%	
G5-P1	Story0.5	3,360	3,865	504	15%	SEE DETAILED CHECKS
G5-P1a	Story3	1,530	1,329	-201	-13%	
G5-P1b	Story4	2,648	2,216	-432	-16%	
G5-P1b	Story3	3,845	3,472	-373	-10%	
G5-P2	Story4	682	543	-138	-20%	
G5-P2	Story3	996	1,020	24	2%	
G5-P2	Story2	7,265	7,404	138	2%	
G5-P2a	Story3	991	952	-39	-4%	
G5-P2b	Story3	635	609	-26	-4%	
G5-P3	Story4	1,568	1,021	-547	-35%	
G5-P3	Story3	1,261	1,205	-56	-4%	
G5-P3	Story2	1,114	563	-551	-49%	
G5-P3	Story1	782	815	33	4%	
G5-P3a	Story1	1,079	1,031	-48	-4%	
G6	Story4	3,015	2,684	-331	-11%	
G6	Story3	3,783	2,811	-972	-26%	
G6	Story2	1,252	933	-320	-26%	
G6	Story1	1,249	888	-361	-29%	
G7	Story2	2,814	2,873	59	2%	
G8	Story2	3,253	4,503	1,249	38%	SEE DETAILED CHECKS
G9	Story4	8,456	6,567	-1,889	-22%	
G9	Story3	14,915	11,579	-3,337	-22%	
G9	Story2	6,735	5,435	-1,299	-19%	
GA	Story4	10,507	6,531	-3,976	-38%	
GA	Story3	11,225	7,000	-4,225	-38%	
GA	Story2	12,343	8,402	-3,941	-32%	
GA	Story1	13,250	9,403	-3,848	-29%	
GA	Story0.5	5,483	4,075	-1,407	-26%	
GA1	Story4	1,973	1,216	-758	-38%	
GA1	Story3	1,530	820	-711	-46%	
GA1	Story2	14	24	10	68%	FORCE IS NEGLIGIBLE
GA1-A	Story2	2,117	0	-	-	SEE DETAILED CHECKS - PIER GA1-A AT STORY 2 AND STORY 1 IS
GA1-A	Story1	1,856	0	-	-	DIVIDED INTO GA1-Aa AND GA1-Ab IN UPDATED MODEL
GA1-B	Story2	3,725	2,238	-1,487	-40%	
GA1-B	Story1	2,636	1,631	-1,005	-38%	
GA1-C	Story2	142	112	-29	-21%	
GA1-C	Story1	69	69	-1	-1%	

COMPARISON OF ORIGINAL BUILDING SHEAR TO UPDATED BUILDING SHEAR

PIER	STORY	ORIGINAL SHEAR	UPDATED SHEAR	CHANGE	PERCENT	NOTES
GB	Story3	4,504	3,117	-1,387	-31%	
GB	Story2	4,826	3,529	-1,297	-27%	
GB	Story1	2,425	1,706	-719	-30%	
GB.5	Story2	1,709	872	-837	-49%	
GB1	Story2	306	241	-66	-21%	
GC1	Story2	347	276	-71	-20%	
GD	Story3	4,300	2,815	-1,485	-35%	
GD	Story2	1,902	859	-1,042	-55%	
GD.25	Story2	2,882	2,161	-722	-25%	
GD.5	Story2	337	304	-33	-10%	
GD.5	Story1	469	316	-153	-33%	
GE	Story4	11,179	6,524	-4,655	-42%	
GE	Story3	16,728	9,969	-6,759	-40%	
GE	Story2	21,457	13,977	-7,480	-35%	
GE	Story1	13,479	8,862	-4,617	-34%	
GI	Story2	6,247	6,742	495	8%	
GI	Story1	5,219	5,106	-112	-2%	
GIa	Story3	3,090	2,992	-98	-3%	
GIa	Story2	3,017	3,399	382	13%	GRIDLINE I CALCULATIONS PREVIOUSLY SUBMITTED
GIb	Story3	3,105	2,709	-396	-13%	
GIb	Story2	3,013	2,865	-148	-5%	
GST8N	Story4	1,656	967	-689	-42%	
GST8N	Story3	885	594	-291	-33%	
GST8N	Story2	479	229	-250	-52%	

COMPARISON OF ORIGINAL BUILDING SHEAR TO UPDATED BUILDING SHEAR

PIER	STORY	ORIGINAL SHEAR	UPDATED SHEAR	CHANGE	PERCENT	NOTES		
NEW SHEAR WALLS ADDED RECENTLY DURING HT EAST RENOVATION - (SELECT CALCULATION PAGES FOR HT EAST ATTACHED FOR REFERENCE)								
U-G7B	Story4		2,070			440	249	**0.57**
U-G7B	Story3		4,794			842	577	**0.69**
U-G7B	Story2		2,228			761	268	**0.35**
U-GC	Story4		9,568			1373	1,151	**0.84**
U-GC	Story3		16,155			2459	1,944	**0.79**
U-GC	Story2		15,749			2472	1,895	**0.77**
U-GC.75	Story2		1,150			264	138	**0.52**
						HT EAST DESIGN SHEAR Cs = 0.16 & RHO = 1.3 BSE-2N FACTOR = 1.7286 CONVERSION FACTOR =	CONVERT BSE-2N TO RHO x Cs = 1.3 * 0.16 0.120	**RATIO ORIGINAL DESIGN FORCE/CALCULATED UPDATED DESIGN FORCE < 1.0 INDICATES OK**
SHEAR WALL PIERS IN UPDATED MODEL THAT DON'T MATCH ORIGINAL PIERS DUE TO MODIFICATIONS								
G1-P12	Story3		1,095			CALCULATIONS FOR GRIDLINE 1 WALL PREVIOUSLY SUBMITTED		
G1-P12	Story2		1,333					
G1-P4	Story3		6,154					
G1-P6	Story2		1,418					
G1-P7	Story2		2,125					
GA1-Aa	Story2		165			SEE DETAILED CHECKS		
GA1-Aa	Story1		249					
GA1-Ab	Story2		846					
GA1-Ab	Story1		950					
GA1-D	Story2		828					

TO COMPARE BSE-2N FORCE LEVEL TO IBC FORCE LEVEL USED IN HT EAST RENOVATION

SEE "FOR REFERENCE" CALCULATIONS AT THE END OF THIS CALCULATION SECTION

DETAILED CHECKS							BSE-2N							
Pier	Level	Shear	Length	Thickness	v_{UD}	NOTE	v_{nE}	DCR	m	M_{UD}	M_{NE}	SP COL	DCR	m
		KIPS	FT	IN	KSI		KSI			KIP-FT	KIP-FT			
G1A	Story4	3,806				DIVIDE INTO PIERS, SEE BELOW								
G1A	Story3	2,648												
G1A	Story2	2,705												
G1A	Story1	842												
G1A-A	*Story 4*	*109*	*22*	*8*	*0.052*		0.309	0.17	2.5	717	2,962	X	0.24	2.25
G1A-BC	*Story 4*	*3,452*	*116.42*	*7.625*	*0.324*	BRICK WALL	0.168	1.93	2.5	20,265	NEGLIGIBLE BENDING DCR			
G1A-D	*Story 4*	*299*	*21.5*	*8*	*0.145*		0.309	0.47	2.5	884	2,962	SIM	0.30	2.25
G1A-A	*Story 3*	*778*	*17.67*	*8*	*0.459*		0.309	1.48	2.5	2,445	1,827	SIM	1.34	2.25
G1A-B1	*Story 3*	*205*	*6*	*7.625*	*0.373*	BRICK WALLS	0.168	2.22	2.5	288	132	X	2.18	3.75
G1A-B2	*Story 3*	*559*	*20*	*7.625*	*0.305*		0.168	1.82	2.5	1,069	797	SIM	1.34	3.75
G1A-C1	*Story 3*	*468*	*15.25*	*7.625*	*0.335*		0.168	2.00	2.5	1,163	797	X	1.46	3.75
G1A-C2	*Story 3*	*303*	*9.17*	*7.625*	*0.361*		0.168	2.15	2.5	1,145	338	X	3.39	3.75
G1A-D	*Story 3*	*368*	*17.5*	*8*	*0.219*		0.309	0.71	2.5	1,350	1,827	X	0.74	2.25
G1A-A	*Story 2*	*1,866*	*26.75*	*8*	*0.727*		0.309	2.35	2.5	8,070	4,395	X	1.84	2.25
G1A-D	*Story 2*	*846*	*20.5*	*8*	*0.430*		0.309	1.39	2.5	4,717	2,962	SIM	1.59	2.25
G1A-A	*Story 1*	*808*	*22.75*	*8*	*0.370*		0.309	1.20	2.5	5,913	2,962	SIM	2.00	2.25
G2.1A	Story2	767	*21.5*	*8*	*0.371*		0.309	1.20	2.5	5,065	2,962	SIM	1.71	2.25
G4A	Story3	1,811				DIVIDED INTO PIERS								
G4A	Story2	1,460												
G4A-A	*Story 3*	*1,199*	*22*	*10*	*0.454*		0.309	1.47	2.5	9,527	4,749	X	2.01	2.25
G4A-B	*Story 3*	*612*	*21.5*	*10*	*0.237*		0.309	0.77	2.5	11,356	4,749	X	2.39	3.25
G4A-A	*Story 2*	*947*	*22*	*10*	*0.359*		0.309	1.16	2.5	11,515	5,352	X	2.15	2.25
G4A-B	*Story 2*	*511*	*29.25*	*10*	*0.146*		0.309	0.47	2.5	8,541	4,395	SIM	1.94	2.25
G4A-C	*Story 2*	*6*	*5.75*	*10*	*0.009*		0.309	0.03	2.5	470	466	SIM	1.01	2.25
G5-P1	Story0.5	3,865	*70*	*12*	*0.383*		0.309	1.24	2.5	30,566	NEGLIGIBLE BENDING DCR			
G8	Story2	4,503				DIVIDED INTO PIERS								
G8-A	*"*	*2,932*	*49.25*	*10*	*0.496*		0.309	1.61	2.5	24,263	18,033	X	1.35	2.25
G8-B	*"*	*1,819*	*40*	*8*	*0.474*		0.309	1.53	2.5	7,280	9,847	X	0.74	2.25
GA1-Aa	Story2	165	*5.75*	*8*	*0.299*	REF. GA1-A OF "ORIGINAL" ANALYSIS	0.309	0.97	2.5	466	212	X	2.20	2.25
GA1-Aa	Story1	249	*8.75*	*8*	*0.297*		0.309	0.96	2.5	720	524	X	1.37	2.25
GA1-Ab	Story2	846	*21*	*8*	*0.420*		0.309	1.36	2.5	3,483	2,962	SIM	1.18	2.25
GA1-Ab	Story1	950	*33.17*	*8*	*0.298*		0.309	0.97	2.5	3,428	4,395	SIM	0.78	2.25
GA1-D	Story2	828	*16.17*	*8*	*0.533*		0.309	1.73	2.5	2,620	1,827	SIM	1.43	2.25

RESULTS: ALL CALCULATED DCR ARE LESS THAN THE ASCE 41 m FACTOR THEREFORE THE SHEAR WALLS MEET THE ACCEPTANCE CRITERIA/REQUIRED DUCTILITY.

1. WORST CASE CALCULATED m FACTORS WERE USED FOR ALL WALLS AS SHOWN IN PLAN CHECK 2 RESPONSE CALCULATION PACKAGE. AT WALL G4A-B THE m FACTOR WAS CALCULATED SINCE THE DCR EXCEEDED THE WORST-CASE m FACTOR. REF. ATTACHED CALCULATION

2. WHERE "DIVIDED INTO PIERS" IS INDICATED, THE COMPARISON PAGE INCLUDES A SINGLE COMBINED PIER AT THE LEVEL INDICATED WHICH HAS BEEN DIVIDED INTO INDIVIDUAL PIERS TO ALLOW ASCE 41 ACCEPTANCE CHECKS. COMBINED PIERS ARE ADEQUATE FOR VERIFYING THAT THE SEISMIC LOAD HAS NOT INCREASED BY 10% IN CASES WHERE THE PIER GEOMETRY IS THE SAME IN THE ORIGINAL AND UPDATED MODELS.

SEE SP COLUMN FOR BENDING CAPACITY. FOR DCR CHECK CONSERVATIVELY AXIAL LOAD IS TAKEN AS ZERO UNLESS OTHERWISE SHOWN IN SP COLUMN OUTPUT. "SIM" CONDITIONS USED CAPACITY FROM A SIMILAR (BUT LOWER CAPACITY) WALL CHECKED WITH SP COLUMN. REFER TO SP COLUMN CALCULATIONS FOR SPECIFICS.

$$\frac{(A_s - A'_s) f_{yE} + P^b}{t_w l_w f'_{cE}} < 0.1 \text{ (AS SHOWN IN PREVIOUS CALCULATIONS)}$$

$$\frac{V^c}{t_w l_w \sqrt{f'_{cE}}} = \frac{M_{NE} / (H/2)}{t_w l_w \sqrt{f'_{cE}}} = \frac{4{,}749 / (29'/2)}{10\text{"}\times 21.5'\times 12\text{"}/'\times \frac{\text{SQRT}(1.5\times 2{,}500)}{1{,}000}} = 2.07$$

PER ASCE 41-17 TABLE 10-21, INTERPOLATE BETWEEN LIFE SAFETY AND COLLAPSE PREVENTION FOR BSE-2N; m = 3.25

INTERPOLATE m FACTORS BETWEEN IO/LS AND LS/CP

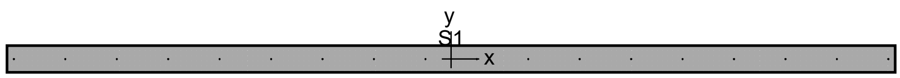
Conditions			Primary		
			IO	LS	CP
i. Structural walls and wall segments					
$\frac{(A_s - A'_s) f_{yE} + P^b}{t_w l_w f'_{cE}}$	$\frac{V^c}{t_w l_w \sqrt{f'_{cE}}}$	Confined Boundary[d]			
≤0.1	≤4	Yes	2	4	6
≤0.1	≥6	Yes	2	3	4
≥0.25	≤4	Yes	1.5	3	4
≥0.25	≥6	Yes	1.25	2	2.5
≤0.1	≤4	No	2	2.5	4
≤0.1	≥6	No	1.5	2	2.5

THIS PIER
SIM PIER

G1A-A	Story 4
G1A-BC	Story 4
G1A-D	Story 4
G1A-A	Story 3
G1A-B1	Story 3
G1A-B2	Story 3
G1A-C1	Story 3
G1A-C2	Story 3
G1A-D	Story 3
G1A-A	Story 2
G1A-D	Story 2
G1A-A	Story 1
G2.1A	Story2
G4A	Story3
G4A	Story2
G4A-A	Story 3
G4A-B	Story 3
G4A-A	Story 2
G4A-B	Story 2
G4A-C	Story 2
G5-P1	Story0.5
G8	Story2
G8-A	"
G8-B	"
GA1-Aa	Story2
GA1-Aa	Story1
GA1-Ab	Story2
GA1-Ab	Story1
GA1-D	Story2

1. Section

1.1. Section Figure



Irregular 264 x 8 in　　0.26% reinf.

Figure 1: Column section

2. Reinforcement

2.1. Confinement and Factors

Confinement type	Other
For #10 bars or less	#3 ties
For larger bars	#4 ties
Capacity Reduction Factors	
Axial compression, (a)	1
Tension controlled ϕ, (b)	1
Compression controlled ϕ, (c)	1

2.2. Bars Provided

Area	X	Y	Area	X	Y	Area	X	Y
in^2	in	in	in^2	in	in	in^2	in	in
0.31	-130.0	0.0	0.31	-114.7	0.0	0.31	-99.4	0.0
0.31	-84.1	0.0	0.31	-68.8	0.0	0.31	-53.5	0.0
0.31	-38.2	0.0	0.31	-22.9	0.0	0.31	-7.6	0.0
0.31	7.6	0.0	0.31	22.9	0.0	0.31	38.2	0.0
0.31	53.5	0.0	0.31	68.8	0.0	0.31	84.1	0.0
0.31	99.4	0.0	0.31	114.7	0.0	0.31	130.0	0.0

3. Control Points

About	Point	P	X-Moment	Y-Moment	NA Depth	d_t Depth	ε_t	ϕ
		kip	k-ft	k-ft	in	in		
Y	@ Max compression	6993.2	0.00	0.00	616.05	262.00	-0.00172	1.00000
Y	@ Allowable comp.	6993.2	0.00	0.00	616.05	262.00	-0.00172	1.00000
Y	@ f_s = 0.0	5858.9	0.00	10338.57	262.00	262.00	0.00000	1.00000
Y	@ f_s = 0.5 f_y	4533.2	0.00	17607.15	203.52	262.00	0.00086	1.00000
Y	@ Balanced point	3665.8	0.00	19611.29	166.38	262.00	0.00172	1.00000
Y	@ Tension control	2138.4	0.00	17691.46	101.76	262.00	0.00472	1.00000
Y	@ Pure bending	0.0	0.00	2961.68	11.41	262.00	0.06587	1.00000
Y	@ Max tension	-279.0	0.00	0.00	0.00	262.00	9.99999	1.00000
-Y	@ Max compression	6993.2	0.00	0.00	616.05	262.00	-0.00172	1.00000
-Y	@ Allowable comp.	6993.2	0.00	0.00	616.05	262.00	-0.00172	1.00000
-Y	@ f_s = 0.0	5858.9	0.00	-10338.57	262.00	262.00	0.00000	1.00000
-Y	@ f_s = 0.5 f_y	4533.2	0.00	-17607.15	203.52	262.00	0.00086	1.00000
-Y	@ Balanced point	3665.8	0.00	-19611.29	166.38	262.00	0.00172	1.00000
-Y	@ Tension control	2138.4	0.00	-17691.45	101.76	262.00	0.00472	1.00000
-Y	@ Pure bending	0.0	0.00	-2961.68	11.41	262.00	0.06587	1.00000
-Y	@ Max tension	-279.0	0.00	0.00	0.00	262.00	9.99999	1.00000

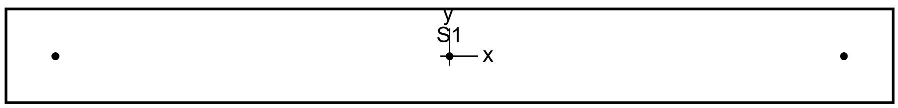
G1A-A	Story 4
G1A-BC	Story 4
G1A-D	Story 4
G1A-A	Story 3
G1A-B1	Story 3
G1A-B2	Story 3
G1A-C1	Story 3
G1A-C2	Story 3
G1A-D	Story 3
G1A-A	Story 2
G1A-D	Story 2
G1A-A	Story 1
G2.1A	Story2
G4A	Story3
G4A	Story2
G4A-A	Story 3
G4A-B	Story 3
G4A-A	Story 2
G4A-B	Story 2
G4A-C	Story 2
G5-P1	Story0.5
G8	Story2
G8-A	"
G8-B	"
GA1-Aa	Story2
GA1-Aa	Story1
GA1-Ab	Story2
GA1-Ab	Story1
GA1-D	Story2

C37.3-11

THIS PIER
SIM PIER

1. Section

1.1. Section Figure



Irregular 72 x 7.625 in

0.17% reinf.

Figure 1: Column section

1.2. Solids

1.2.1. S1

Points	X	Y	Points	X	Y	Points	X	Y
	in	in		in	in		in	in
1	-36.0	-3.8	2	36.0	-3.8	3	36.0	3.8
4	-36.0	3.8						

2. Reinforcement

2.1. Confinement and Factors

Confinement type	Other
For #10 bars or less	#3 ties
For larger bars	#4 ties
Capacity Reduction Factors	
Axial compression, (a)	1
Tension controlled ϕ, (b)	1
Compression controlled ϕ, (c)	1

2.2. Bars Provided

Area	X	Y	Area	X	Y	Area	X	Y
in^2	in	in	in^2	in	in	in^2	in	in
0.31	-32.0	0.0	0.31	0.0	0.0	0.31	32.0	0.0

3. Control Points

About	Point	P	X-Moment	Y-Moment	NA Depth	d_t Depth	ε_t	ϕ
		kip	k-ft	k-ft	in	in		
Y	@ Max compression	978.2	0.10	0.00	159.89	68.00	-0.00172	1.00000
Y	@ Allowable comp.	978.2	0.10	0.00	159.89	68.00	-0.00172	1.00000
Y	@ f_s = 0.0	776.4	0.06	483.22	68.00	68.00	0.00000	1.00000
Y	@ f_s = 0.5 f_y	597.3	0.04	717.81	52.82	68.00	0.00086	1.00000
Y	@ Balanced point	479.2	0.01	780.97	43.18	68.00	0.00172	1.00000
Y	@ Tension control	280.7	-0.02	682.06	26.41	68.00	0.00472	1.00000
Y	@ Pure bending	0.0	-0.08	131.85	3.32	68.00	0.05851	1.00000
Y	@ Max tension	-46.5	-0.11	0.00	0.00	68.00	9.99999	1.00000
-Y	@ Max compression	978.2	0.10	0.00	159.89	68.00	-0.00172	1.00000
-Y	@ Allowable comp.	978.2	0.10	0.00	159.89	68.00	-0.00172	1.00000
-Y	@ f_s = 0.0	776.4	0.06	-483.22	68.00	68.00	0.00000	1.00000
-Y	@ f_s = 0.5 f_y	597.3	0.04	-717.81	52.82	68.00	0.00086	1.00000
-Y	@ Balanced point	479.2	0.01	-780.97	43.18	68.00	0.00172	1.00000
-Y	@ Tension control	280.7	-0.02	-682.06	26.41	68.00	0.00472	1.00000
-Y	@ Pure bending	0.0	-0.08	-131.85	3.32	68.00	0.05851	1.00000
-Y	@ Max tension	-46.5	-0.11	0.00	0.00	68.00	9.99999	1.00000

G1A-A	Story 4
G1A-BC	Story 4
G1A-D	Story 4
G1A-A	Story 3
G1A-B1	Story 3
G1A-B2	Story 3
G1A-C1	Story 3
G1A-C2	Story 3
G1A-D	Story 3
G1A-A	Story 2
G1A-D	Story 2
G1A-A	Story 1
G2.1A	Story2
G4A	Story3
G4A	Story2
G4A-A	Story 3
G4A-B	Story 3
G4A-A	Story 2
G4A-B	Story 2
G4A-C	Story 2
G5-P1	Story0.5
G8	Story2
G8-A	"
G8-B	"
GA1-Aa	Story2
GA1-Aa	Story1
GA1-Ab	Story2
GA1-Ab	Story1
GA1-D	Story2

C37.3-12

THIS PIER
SIM PIER

1. Section

1.1. Section Figure

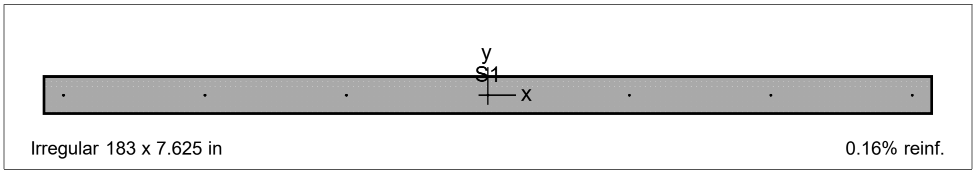


Figure 1: Column section

1.2. Solids

1.2.1. S1

Points	X	Y	Points	X	Y	Points	X	Y
	in	in		in	in		in	in
1	-91.5	-3.8	2	91.5	-3.8	3	91.5	3.8
4	-91.5	3.8						

2. Reinforcement

2.1. Confinement and Factors

Confinement type	Other
For #10 bars or less	#3 ties
For larger bars	#4 ties
Capacity Reduction Factors	
Axial compression, (a)	1
Tension controlled ϕ, (b)	1
Compression controlled ϕ, (c)	1

2.2. Bars Provided

Area	X	Y	Area	X	Y	Area	X	Y
in^2	in	in	in^2	in	in	in^2	in	in
0.31	-87.5	0.0	0.31	-58.3	0.0	0.31	-29.2	0.0
0.31	0.0	0.0	0.31	29.2	0.0	0.31	58.3	0.0
0.31	87.5	0.0						

3. Control Points

About	Point	P	X-Moment	Y-Moment	NA Depth	d_t Depth	ε_t	ϕ
		kip	k-ft	k-ft	in	in		
Y	@ Max compression	2476.9	0.24	0.00	420.89	179.00	-0.00172	1.00000
Y	@ Allowable comp.	2476.9	0.24	0.00	420.89	179.00	-0.00172	1.00000
Y	@ f_s = 0.0	2041.9	0.16	2714.63	179.00	179.00	0.00000	1.00000
Y	@ f_s = 0.5 f_y	1578.7	0.11	4412.07	139.04	179.00	0.00086	1.00000
Y	@ Balanced point	1273.0	0.05	4876.77	113.67	179.00	0.00172	1.00000
Y	@ Tension control	742.3	-0.05	4362.69	69.52	179.00	0.00472	1.00000
Y	@ Pure bending	0.0	-0.19	797.02	7.37	179.00	0.06987	1.00000
Y	@ Max tension	-108.5	-0.25	0.00	0.00	179.00	9.99999	1.00000
-Y	@ Max compression	2476.9	0.24	0.00	420.89	179.00	-0.00172	1.00000
-Y	@ Allowable comp.	2476.9	0.24	0.00	420.89	179.00	-0.00172	1.00000
-Y	@ f_s = 0.0	2041.9	0.16	-2714.63	179.00	179.00	0.00000	1.00000
-Y	@ f_s = 0.5 f_y	1578.7	0.11	-4412.07	139.04	179.00	0.00086	1.00000
-Y	@ Balanced point	1273.0	0.05	-4876.77	113.67	179.00	0.00172	1.00000
-Y	@ Tension control	742.3	-0.05	-4362.69	69.52	179.00	0.00472	1.00000
-Y	@ Pure bending	0.0	-0.19	-797.02	7.37	179.00	0.06987	1.00000
-Y	@ Max tension	-108.5	-0.25	0.00	0.00	179.00	9.99999	1.00000

C37.3-13

G1A-A	Story 4
G1A-BC	Story 4
G1A-D	Story 4
G1A-A	Story 3
G1A-B1	Story 3
G1A-B2	Story 3
G1A-C1	Story 3
G1A-C2	Story 3
G1A-D	Story 3
G1A-A	Story 2
G1A-D	Story 2
G1A-A	Story 1
G2.1A	Story2
G4A	Story3
G4A	Story2
G4A-A	Story 3
G4A-B	Story 3
G4A-A	Story 2
G4A-B	Story 2
G4A-C	Story 2
G5-P1	Story0.5
G8	Story2
G8-A	"
G8-B	"
GA1-Aa	Story2
GA1-Aa	Story1
GA1-Ab	Story2
GA1-Ab	Story1
GA1-D	Story2

THIS PIER
SIM PIER

1. Section

1.1. Section Figure

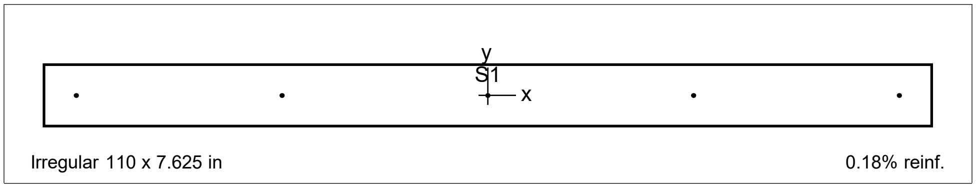


Figure 1: Column section

1.2. Solids

1.2.1. S1

Points	X in	Y in	Points	X in	Y in	Points	X in	Y in
1	-55.0	-3.8	2	55.0	-3.8	3	55.0	3.8
4	-55.0	3.8						

2. Reinforcement

2.1. Confinement and Factors

Confinement type	Other
For #10 bars or less	#3 ties
For larger bars	#4 ties
Capacity Reduction Factors	
Axial compression, (a)	1
Tension controlled ϕ, (b)	1
Compression controlled ϕ, (c)	1

2.2. Bars Provided

Area in^2	X in	Y in	Area in^2	X in	Y in	Area in^2	X in	Y in
0.31	-51.0	0.0	0.31	-25.5	0.0	0.31	0.0	0.0
0.31	25.5	0.0	0.31	51.0	0.0			

3. Control Points

About	Point	P kip	X-Moment k-ft	Y-Moment k-ft	NA Depth in	d_t Depth in	ε_t	ϕ
Y	@ Max compression	1500.7	0.17	0.00	249.24	106.00	-0.00172	1.00000
Y	@ Allowable comp.	1500.7	0.17	0.00	249.24	106.00	-0.00172	1.00000
Y	@ f_s = 0.0	1216.3	0.11	1051.19	106.00	106.00	0.00000	1.00000
Y	@ f_s = 0.5 f_y	938.5	0.07	1639.59	82.34	106.00	0.00086	1.00000
Y	@ Balanced point	754.9	0.03	1802.97	67.31	106.00	0.00172	1.00000
Y	@ Tension control	435.6	-0.04	1595.22	41.17	106.00	0.00472	1.00000
Y	@ Pure bending	0.0	-0.13	337.94	5.13	106.00	0.05894	1.00000
Y	@ Max tension	-77.5	-0.18	0.00	0.00	106.00	9.99999	1.00000
-Y	@ Max compression	1500.7	0.17	0.00	249.24	106.00	-0.00172	1.00000
-Y	@ Allowable comp.	1500.7	0.17	0.00	249.24	106.00	-0.00172	1.00000
-Y	@ f_s = 0.0	1216.3	0.11	-1051.19	106.00	106.00	0.00000	1.00000
-Y	@ f_s = 0.5 f_y	938.5	0.07	-1639.59	82.34	106.00	0.00086	1.00000
-Y	@ Balanced point	754.9	0.03	-1802.97	67.31	106.00	0.00172	1.00000
-Y	@ Tension control	435.6	-0.04	-1595.22	41.17	106.00	0.00472	1.00000
-Y	@ Pure bending	0.0	-0.13	-337.94	5.13	106.00	0.05894	1.00000
-Y	@ Max tension	-77.5	-0.18	0.00	0.00	106.00	9.99999	1.00000

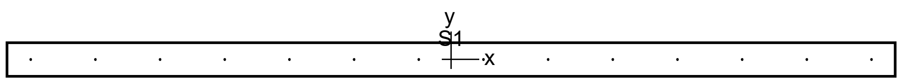
C37.3-14

G1A-A	Story 4
G1A-BC	Story 4
G1A-D	Story 4
G1A-A	Story 3
G1A-B1	Story 3
G1A-B2	Story 3
G1A-C1	Story 3
G1A-C2	Story 3
G1A-D	Story 3
G1A-A	Story 2
G1A-D	Story 2
G1A-A	Story 1
G2.1A	Story2
G4A	Story3
G4A	Story2
G4A-A	Story 3
G4A-B	Story 3
G4A-A	Story 2
G4A-B	Story 2
G4A-C	Story 2
G5-P1	Story0.5
G8	Story2
G8-A	"
G8-B	"
GA1-Aa	Story2
GA1-Aa	Story1
GA1-Ab	Story2
GA1-Ab	Story1
GA1-D	Story2

THIS PIER
SIM PIER

1. Section

1.1. Section Figure



Irregular 210 x 8 in

0.26% reinf.

Figure 1: Column section

1.2. Solids

1.2.1. S1

Points	X	Y	Points	X	Y	Points	X	Y
	in	in		in	in		in	in
1	-105.0	-4.0	2	105.0	-4.0	3	105.0	4.0
4	-105.0	4.0						

2. Reinforcement

2.1. Confinement and Factors

Confinement type	Other
For #10 bars or less	#3 ties
For larger bars	#4 ties
Capacity Reduction Factors	
Axial compression, (a)	1
Tension controlled ϕ, (b)	1
Compression controlled ϕ, (c)	1

2.2. Bars Provided

Area	X	Y	Area	X	Y	Area	X	Y
in²	in	in	in²	in	in	in²	in	in
0.31	-99.4	0.0	0.31	-84.1	0.0	0.31	-68.8	0.0
0.31	-53.5	0.0	0.31	-38.2	0.0	0.31	-22.9	0.0
0.31	-7.6	0.0	0.31	7.6	0.0	0.31	22.9	0.0
0.31	38.2	0.0	0.31	53.5	0.0	0.31	68.8	0.0
0.31	84.1	0.0	0.31	99.4	0.0			

3. Control Points

About	Point	P	X-Moment	Y-Moment	NA Depth	d_t Depth	ε_t	ϕ
		kip	k-ft	k-ft	in	in		
Y	@ Max compression	5558.2	0.00	0.00	480.64	204.41	-0.00172	1.00000
Y	@ Allowable comp.	5558.2	0.00	0.00	480.64	204.41	-0.00172	1.00000
Y	@ f_s = 0.0	4569.3	0.00	7037.40	204.41	204.41	0.00000	1.00000
Y	@ f_s = 0.5 f_y	3534.0	0.00	11299.01	158.78	204.41	0.00086	1.00000
Y	@ Balanced point	2856.7	0.00	12412.76	129.81	204.41	0.00172	1.00000
Y	@ Tension control	1664.0	0.00	11043.19	79.39	204.41	0.00472	1.00000
Y	@ Pure bending	0.0	0.00	1826.79	8.88	204.41	0.06605	1.00000
Y	@ Max tension	-217.0	0.00	0.00	0.00	204.41	9.99999	1.00000
-Y	@ Max compression	5558.2	0.00	0.00	480.64	204.41	-0.00172	1.00000
-Y	@ Allowable comp.	5558.2	0.00	0.00	480.64	204.41	-0.00172	1.00000
-Y	@ f_s = 0.0	4569.3	0.00	-7037.40	204.41	204.41	0.00000	1.00000
-Y	@ f_s = 0.5 f_y	3534.0	0.00	-11299.01	158.78	204.41	0.00086	1.00000
-Y	@ Balanced point	2856.7	0.00	-12412.76	129.81	204.41	0.00172	1.00000
-Y	@ Tension control	1664.0	0.00	-11043.18	79.39	204.41	0.00472	1.00000
-Y	@ Pure bending	0.0	0.00	-1826.79	8.88	204.41	0.06605	1.00000
-Y	@ Max tension	-217.0	0.00	0.00	0.00	204.41	9.99999	1.00000

G1A-A	Story 4
G1A-BC	Story 4
G1A-D	Story 4
G1A-A	Story 3
G1A-B1	Story 3
G1A-B2	Story 3
G1A-C1	Story 3
G1A-C2	Story 3
G1A-D	Story 3
G1A-A	Story 2
G1A-D	Story 2
G1A-A	Story 1
G2.1A	Story2
G4A	Story3
G4A	Story2
G4A-A	Story 3
G4A-B	Story 3
G4A-A	Story 2
G4A-B	Story 2
G4A-C	Story 2
G5-P1	Story0.5
G8	Story2
G8-A	"
G8-B	"
GA1-Aa	Story2
GA1-Aa	Story1
GA1-Ab	Story2
GA1-Ab	Story1 X
GA1-D	Story2

C37.3-15

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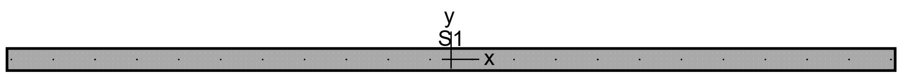
1. Section

1.1. Section Figure



Irregular 321 x 8 in   0.27% reinf.

Figure 1: Column section

1.2. Solids

1.2.1. S1

Points	X	Y	Points	X	Y	Points	X	Y
	in	in		in	in		in	in
1	-160.5	-4.0	2	160.5	-4.0	3	160.5	4.0
4	-160.5	4.0						

2. Reinforcement

2.1. Confinement and Factors

Confinement type	Other
For #10 bars or less	#3 ties
For larger bars	#4 ties
Capacity Reduction Factors	
Axial compression, (a)	1
Tension controlled ϕ, (b)	1
Compression controlled ϕ, (c)	1

2.2. Bars Provided

Area	X	Y	Area	X	Y	Area	X	Y
in²	in	in	in²	in	in	in²	in	in
0.31	-159.0	0.0	0.31	-143.9	0.0	0.31	-128.7	0.0
0.31	-113.6	0.0	0.31	-98.4	0.0	0.31	-83.3	0.0
0.31	-68.1	0.0	0.31	-53.0	0.0	0.31	-37.9	0.0
0.31	-22.7	0.0	0.31	-7.6	0.0	0.31	7.6	0.0
0.31	22.7	0.0	0.31	37.9	0.0	0.31	53.0	0.0
0.31	68.1	0.0	0.31	83.3	0.0	0.31	98.4	0.0
0.31	113.6	0.0	0.31	128.7	0.0	0.31	143.9	0.0
0.31	159.0	0.0						

3. Control Points

About	Point	P	X-Moment	Y-Moment	NA Depth	d_t Depth	ε_t	ϕ
		kip	k-ft	k-ft	in	in		
Y	@ Max compression	8504.8	0.00	0.00	751.26	319.50	-0.00172	1.00000
Y	@ Allowable comp.	8504.8	0.00	0.00	751.26	319.50	-0.00172	1.00000
Y	@ f_s = 0.0	7146.6	0.00	15088.24	319.50	319.50	0.00000	1.00000
Y	@ f_s = 0.5 f_y	5530.6	0.00	25954.17	248.18	319.50	0.00086	1.00000
Y	@ Balanced point	4472.4	0.00	28970.38	202.89	319.50	0.00172	1.00000
Y	@ Tension control	2608.1	0.00	26194.64	124.09	319.50	0.00472	1.00000
Y	@ Pure bending	0.0	0.00	4395.17	13.88	319.50	0.06605	1.00000
Y	@ Max tension	-341.0	0.00	0.00	0.00	319.50	9.99999	1.00000
-Y	@ Max compression	8504.8	0.00	0.00	751.26	319.50	-0.00172	1.00000
-Y	@ Allowable comp.	8504.8	0.00	0.00	751.26	319.50	-0.00172	1.00000
-Y	@ f_s = 0.0	7146.6	0.00	-15088.24	319.50	319.50	0.00000	1.00000
-Y	@ f_s = 0.5 f_y	5530.6	0.00	-25954.17	248.18	319.50	0.00086	1.00000
-Y	@ Balanced point	4472.4	0.00	-28970.38	202.89	319.50	0.00172	1.00000
-Y	@ Tension control	2608.1	0.00	-26194.64	124.09	319.50	0.00472	1.00000

About	Point	P	X-Moment	Y-Moment	NA Depth	d_t Depth	ε_t	ϕ
		kip	k-ft	k-ft	in	in		
-Y	@ Pure bending	0.0	0.00	-4395.17	13.88	319.50	0.06605	1.00000
-Y	@ Max tension	-341.0	0.00	0.00	0.00	319.50	9.99999	1.00000

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G1A-A	Story 4
G1A-BC	Story 4
G1A-D	Story 4
G1A-A	Story 3
G1A-B1	Story 3
G1A-B2	Story 3
G1A-C1	Story 3
G1A-C2	Story 3
G1A-D	Story 3
G1A-A	Story 2
G1A-D	Story 2
G1A-A	Story 1
G2.1A	Story2
G4A	Story3
G4A	Story2
G4A-A	Story 3
G4A-B	Story 3
G4A-A	Story 2
G4A-B	Story 2
G4A-C	Story 2
G5-P1	Story0.5
G8	Story2
G8-A	"
G8-B	"
GA1-Aa	Story2
GA1-Aa	Story1
GA1-Ab	Story2
GA1-Ab	Story1
GA1-D	Story2

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1. Section

1.1. Section Figure

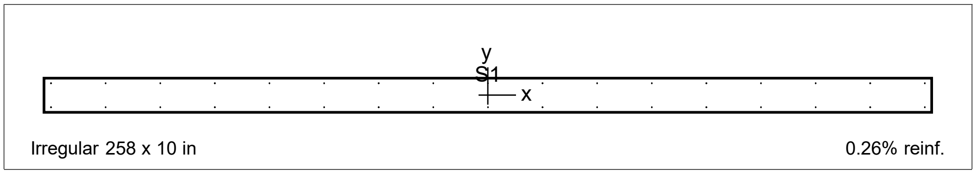

Figure 1: Column section

1.2. Solids

1.2.1. S1

Points	X	Y	Points	X	Y	Points	X	Y
	in	in		in	in		in	in
1	-129.0	-5.0	2	129.0	-5.0	3	129.0	5.0
4	-129.0	5.0						

2. Reinforcement

2.1. Confinement and Factors

Confinement type	Other
For #10 bars or less	#3 ties
For larger bars	#4 ties
Capacity Reduction Factors	
Axial compression, (a)	1
Tension controlled ϕ, (b)	1
Compression controlled ϕ, (c)	1

2.2. Bars Provided

Area	X	Y	Area	X	Y	Area	X	Y
in^2	in	in	in^2	in	in	in^2	in	in
0.20	-127.0	3.5	0.20	-111.1	3.5	0.20	-95.3	3.5
0.20	-79.4	3.5	0.20	-63.5	3.5	0.20	-47.6	3.5
0.20	-31.8	3.5	0.20	-15.9	3.5	0.20	0.0	3.5
0.20	15.9	3.5	0.20	31.8	3.5	0.20	47.6	3.5
0.20	63.5	3.5	0.20	79.4	3.5	0.20	95.3	3.5
0.20	111.1	3.5	0.20	127.0	3.5	0.20	-127.0	-3.5
0.20	-111.1	-3.5	0.20	-95.3	-3.5	0.20	-79.4	-3.5
0.20	-63.5	-3.5	0.20	-47.6	-3.5	0.20	-31.8	-3.5
0.20	-15.9	-3.5	0.20	0.0	-3.5	0.20	15.9	-3.5
0.20	31.8	-3.5	0.20	47.6	-3.5	0.20	63.5	-3.5
0.20	79.4	-3.5	0.20	95.3	-3.5	0.20	111.1	-3.5
0.20	127.0	-3.5						

3. Control Points

About	Point	P	X-Moment	Y-Moment	NA Depth	d_t Depth	ε_t	ϕ
		kip	k-ft	k-ft	in	in		
Y	@ Max compression	8542.1	0.00	0.00	601.95	256.00	-0.00172	1.00000
Y	@ Allowable comp.	8542.1	0.00	0.00	601.95	256.00	-0.00172	1.00000
Y	@ f_s = 0.0	7155.3	0.00	12352.10	256.00	256.00	0.00000	1.00000
Y	@ f_s = 0.5 f_y	5536.6	0.00	21025.18	198.86	256.00	0.00086	1.00000
Y	@ Balanced point	4477.4	0.00	23417.19	162.57	256.00	0.00172	1.00000
Y	@ Tension control	2611.6	0.00	21118.94	99.43	256.00	0.00472	1.00000
Y	@ Pure bending	0.0	0.00	3529.88	11.12	256.00	0.06607	1.00000
Y	@ Max tension	-340.0	0.00	0.00	0.00	256.00	9.99999	1.00000
-Y	@ Max compression	8542.1	0.00	0.00	601.95	256.00	-0.00172	1.00000
-Y	@ Allowable comp.	8542.1	0.00	0.00	601.95	256.00	-0.00172	1.00000

About	Point	P	X-Moment	Y-Moment	NA Depth	d_t Depth	ε_t	ϕ
		kip	k-ft	k-ft	in	in		
-Y	@ f_s = 0.0	7155.3	0.00	-12352.10	256.00	256.00	0.00000	1.00000
-Y	@ f_s = 0.5 f_y	5536.6	0.00	-21025.18	198.86	256.00	0.00086	1.00000
-Y	@ Balanced point	4477.4	0.00	-23417.19	162.57	256.00	0.00172	1.00000
-Y	@ Tension control	2611.6	0.00	-21118.94	99.43	256.00	0.00472	1.00000
-Y	@ Pure bending	0.0	0.00	-3529.88	11.12	256.00	0.06607	1.00000
-Y	@ Max tension	-340.0	0.00	0.00	0.00	256.00	9.99999	1.00000

4. Axial Loads and Corresponding Moment Capacities

No	ϕP_n	ϕM_{ny}	NA Depth	d_t Depth	ε_t	ϕ
	kip	k-ft	in	in		
1	125.0	4749.31	15.219	256.000	0.04746	1.000
2	125.0	-4749.31	15.219	256.000	0.04746	1.000
3	188.0	5352.19	17.359	256.000	0.04124	1.000
4	188.0	-5352.19	17.359	256.000	0.04124	1.000

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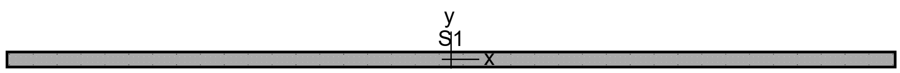
G1A-A	Story 4
G1A-BC	Story 4
G1A-D	Story 4
G1A-A	Story 3
G1A-B1	Story 3
G1A-B2	Story 3
G1A-C1	Story 3
G1A-C2	Story 3
G1A-D	Story 3
G1A-A	Story 2
G1A-D	Story 2
G1A-A	Story 1
G2.1A	Story2
G4A	Story3
G4A	Story2
G4A-A	Story 3
G4A-B	Story 3
G4A-A	Story 2
G4A-B	Story 2
G4A-C	Story 2
G5-P1	Story0.5
G8	Story2
G8-A	"
G8-B	"
GA1-Aa	Story2
GA1-Aa	Story1
GA1-Ab	Story2
GA1-Ab	Story1
GA1-D	Story2

1. Section

1.1. Section Figure



Irregular 591 x 10 in

0.26% reinf.

Figure 1: Column section

1.2. Solids

1.2.1. S1

Points	X	Y	Points	X	Y	Points	X	Y
	in	in		in	in		in	in
1	-295.5	-5.0	2	295.5	-5.0	3	295.5	5.0
4	-295.5	5.0						

2. Reinforcement

2.1. Confinement and Factors

Confinement type	Other
For #10 bars or less	#3 ties
For larger bars	#4 ties
Capacity Reduction Factors	
Axial compression, (a)	1
Tension controlled ϕ, (b)	1
Compression controlled ϕ, (c)	1

2.2. Bars Provided

Area	X	Y	Area	X	Y	Area	X	Y
in²	in	in	in²	in	in	in²	in	in
0.20	-294.0	3.5	0.20	-278.1	3.5	0.20	-262.2	3.5
0.20	-246.3	3.5	0.20	-230.4	3.5	0.20	-214.5	3.5
0.20	-198.6	3.5	0.20	-182.8	3.5	0.20	-166.9	3.5
0.20	-151.0	3.5	0.20	-135.1	3.5	0.20	-119.2	3.5
0.20	-103.3	3.5	0.20	-87.4	3.5	0.20	-71.5	3.5
0.20	-55.6	3.5	0.20	-39.7	3.5	0.20	-23.8	3.5
0.20	-7.9	3.5	0.20	7.9	3.5	0.20	23.8	3.5
0.20	39.7	3.5	0.20	55.6	3.5	0.20	71.5	3.5
0.20	87.4	3.5	0.20	103.3	3.5	0.20	119.2	3.5
0.20	135.1	3.5	0.20	151.0	3.5	0.20	166.9	3.5
0.20	182.8	3.5	0.20	198.6	3.5	0.20	214.5	3.5
0.20	230.4	3.5	0.20	246.3	3.5	0.20	262.2	3.5
0.20	278.1	3.5	0.20	294.0	3.5	0.20	-294.0	-3.5
0.20	-278.1	-3.5	0.20	-262.2	-3.5	0.20	-246.3	-3.5
0.20	-230.4	-3.5	0.20	-214.5	-3.5	0.20	-198.6	-3.5
0.20	-182.8	-3.5	0.20	-166.9	-3.5	0.20	-151.0	-3.5
0.20	-135.1	-3.5	0.20	-119.2	-3.5	0.20	-103.3	-3.5
0.20	-87.4	-3.5	0.20	-71.5	-3.5	0.20	-55.6	-3.5
0.20	-39.7	-3.5	0.20	-23.8	-3.5	0.20	-7.9	-3.5
0.20	7.9	-3.5	0.20	23.8	-3.5	0.20	39.7	-3.5
0.20	55.6	-3.5	0.20	71.5	-3.5	0.20	87.4	-3.5
0.20	103.3	-3.5	0.20	119.2	-3.5	0.20	135.1	-3.5
0.20	151.0	-3.5	0.20	166.9	-3.5	0.20	182.8	-3.5
0.20	198.6	-3.5	0.20	214.5	-3.5	0.20	230.4	-3.5
0.20	246.3	-3.5	0.20	262.2	-3.5	0.20	278.1	-3.5
0.20	294.0	-3.5						

3. Control Points

About	Point	P	X-Moment	Y-Moment	NA Depth	d_t Depth	ε_t	ϕ
		kip	k-ft	k-ft	in	in		
Y	@ Max compression	19549.7	0.00	0.00	1386.11	589.50	-0.00172	1.00000
Y	@ Allowable comp.	19549.7	0.00	0.00	1386.11	589.50	-0.00172	1.00000
Y	@ f_s = 0.0	16467.7	0.00	63147.92	589.50	589.50	0.00000	1.00000
Y	@ f_s = 0.5 f_y	12747.1	0.00	109446.81	457.92	589.50	0.00086	1.00000
Y	@ Balanced point	10315.6	0.00	122276.82	374.35	589.50	0.00172	1.00000
Y	@ Tension control	6019.5	0.00	110672.19	228.96	589.50	0.00472	1.00000
Y	@ Pure bending	0.0	0.00	18033.22	25.21	589.50	0.06716	1.00000
Y	@ Max tension	-760.0	0.00	0.00	0.00	589.50	9.99999	1.00000
-Y	@ Max compression	19549.7	0.00	0.00	1386.11	589.50	-0.00172	1.00000
-Y	@ Allowable comp.	19549.7	0.00	0.00	1386.11	589.50	-0.00172	1.00000
-Y	@ f_s = 0.0	16467.7	0.00	-63147.92	589.50	589.50	0.00000	1.00000
-Y	@ f_s = 0.5 f_y	12747.1	0.00	-109446.81	457.92	589.50	0.00086	1.00000
-Y	@ Balanced point	10315.6	0.00	-122276.82	374.35	589.50	0.00172	1.00000
-Y	@ Tension control	6019.5	0.00	-110672.19	228.96	589.50	0.00472	1.00000
-Y	@ Pure bending	0.0	0.00	-18033.22	25.21	589.50	0.06716	1.00000
-Y	@ Max tension	-760.0	0.00	0.00	0.00	589.50	9.99999	1.00000

G1A-A	Story 4
G1A-BC	Story 4
G1A-D	Story 4
G1A-A	Story 3
G1A-B1	Story 3
G1A-B2	Story 3
G1A-C1	Story 3
G1A-C2	Story 3
G1A-D	Story 3
G1A-A	Story 2
G1A-D	Story 2
G1A-A	Story 1
G2.1A	Story2
G4A	Story3
G4A	Story2
G4A-A	Story 3
G4A-B	Story 3
G4A-A	Story 2
G4A-B	Story 2
G4A-C	Story 2
G5-P1	Story0.5
G8	Story2
G8-A	"
G8-B	"
GA1-Aa	Story2
GA1-Aa	Story1
GA1-Ab	Story2
GA1-Ab	Story1
GA1-D	Story2

C37.3-21

THIS PIER
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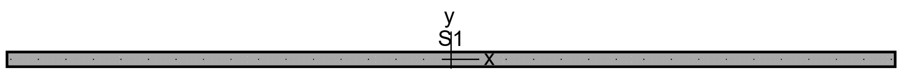
1. Section

1.1. Section Figure



Irregular 480 x 8 in

0.27% reinf.

Figure 1: Column section

1.2. Solids

1.2.1. S1

Points	X	Y	Points	X	Y	Points	X	Y
	in	in		in	in		in	in
1	-240.0	-4.0	2	240.0	-4.0	3	240.0	4.0
4	-240.0	4.0						

2. Reinforcement

2.1. Confinement and Factors

Confinement type	Other
For #10 bars or less	#3 ties
For larger bars	#4 ties
Capacity Reduction Factors	
Axial compression, (a)	1
Tension controlled ϕ, (b)	1
Compression controlled ϕ, (c)	1

2.2. Bars Provided

Area	X	Y	Area	X	Y	Area	X	Y
in²	in	in	in²	in	in	in²	in	in
0.31	-238.0	0.0	0.31	-223.1	0.0	0.31	-208.3	0.0
0.31	-193.4	0.0	0.31	-178.5	0.0	0.31	-163.6	0.0
0.31	-148.8	0.0	0.31	-133.9	0.0	0.31	-119.0	0.0
0.31	-104.1	0.0	0.31	-89.3	0.0	0.31	-74.4	0.0
0.31	-59.5	0.0	0.31	-44.6	0.0	0.31	-29.8	0.0
0.31	-14.9	0.0	0.31	0.0	0.0	0.31	14.9	0.0
0.31	29.8	0.0	0.31	44.6	0.0	0.31	59.5	0.0
0.31	74.4	0.0	0.31	89.3	0.0	0.31	104.1	0.0
0.31	119.0	0.0	0.31	133.9	0.0	0.31	148.8	0.0
0.31	163.6	0.0	0.31	178.5	0.0	0.31	193.4	0.0
0.31	208.3	0.0	0.31	223.1	0.0	0.31	238.0	0.0

3. Control Points

About	Point	P	X-Moment	Y-Moment	NA Depth	d_t Depth	ε_t	ϕ
		kip	k-ft	k-ft	in	in		
Y	@ Max compression	12718.9	0.00	0.00	1123.95	478.00	-0.00172	1.00000
Y	@ Allowable comp.	12718.9	0.00	0.00	1123.95	478.00	-0.00172	1.00000
Y	@ f_s = 0.0	10693.5	0.00	33633.17	478.00	478.00	0.00000	1.00000
Y	@ f_s = 0.5 f_y	8275.9	0.00	57949.55	371.30	478.00	0.00086	1.00000
Y	@ Balanced point	6693.9	0.00	64689.22	303.55	478.00	0.00172	1.00000
Y	@ Tension control	3900.0	0.00	58516.61	185.65	478.00	0.00472	1.00000
Y	@ Pure bending	0.0	0.00	9846.51	21.20	478.00	0.06466	1.00000
Y	@ Max tension	-511.5	0.00	0.00	0.00	478.00	9.99999	1.00000
-Y	@ Max compression	12718.9	0.00	0.00	1123.95	478.00	-0.00172	1.00000
-Y	@ Allowable comp.	12718.9	0.00	0.00	1123.95	478.00	-0.00172	1.00000
-Y	@ f_s = 0.0	10693.5	0.00	-33633.17	478.00	478.00	0.00000	1.00000
-Y	@ f_s = 0.5 f_y	8275.9	0.00	-57949.55	371.30	478.00	0.00086	1.00000

About	Point	P	X-Moment	Y-Moment	NA Depth	d_t Depth	ε_t	ϕ
		kip	k-ft	k-ft	in	in		
-Y	@ Balanced point	6693.9	0.00	-64689.22	303.55	478.00	0.00172	1.00000
-Y	@ Tension control	3900.0	0.00	-58516.61	185.65	478.00	0.00472	1.00000
-Y	@ Pure bending	0.0	0.00	-9846.51	21.20	478.00	0.06466	1.00000
-Y	@ Max tension	-511.5	0.00	0.00	0.00	478.00	9.99999	1.00000

G1A-A	Story 4
G1A-BC	Story 4
G1A-D	Story 4
G1A-A	Story 3
G1A-B1	Story 3
G1A-B2	Story 3
G1A-C1	Story 3
G1A-C2	Story 3
G1A-D	Story 3
G1A-A	Story 2
G1A-D	Story 2
G1A-A	Story 1
G2.1A	Story2
G4A	Story3
G4A	Story2
G4A-A	Story 3
G4A-B	Story 3
G4A-A	Story 2
G4A-B	Story 2
G4A-C	Story 2
G5-P1	Story0.5
G8	Story2
G8-A	"
G8-B	"
GA1-Aa	Story2
GA1-Aa	Story1
GA1-Ab	Story2
GA1-Ab	Story1
GA1-D	Story2

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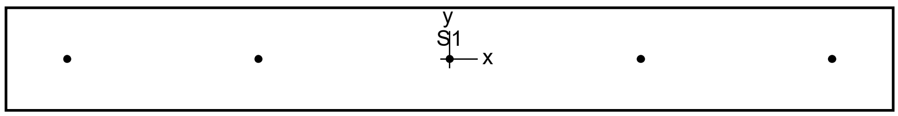
1. Section

1.1. Section Figure



Irregular 69 x 8 in

0.28% reinf.

Figure 1: Column section

1.2. Solids

1.2.1. S1

Points	X	Y	Points	X	Y	Points	X	Y
	in	in		in	in		in	in
1	-34.5	-4.0	2	34.5	-4.0	3	34.5	4.0
4	-34.5	4.0						

2. Reinforcement

2.1. Confinement and Factors

Confinement type	Other
For #10 bars or less	#3 ties
For larger bars	#4 ties
Capacity Reduction Factors	
Axial compression, (a)	1
Tension controlled ϕ, (b)	1
Compression controlled ϕ, (c)	1

2.2. Bars Provided

Area	X	Y	Area	X	Y	Area	X	Y
in²	in	in	in²	in	in	in²	in	in
0.31	-29.8	0.0	0.31	-14.9	0.0	0.31	0.0	0.0
0.31	14.9	0.0	0.31	29.8	0.0			

3. Control Points

About	Point	P	X-Moment	Y-Moment	NA Depth	d_t Depth	ε_t	ϕ
		kip	k-ft	k-ft	in	in		
Y	@ Max compression	1832.1	0.00	0.00	151.07	64.25	-0.00172	1.00000
Y	@ Allowable comp.	1832.1	0.00	0.00	151.07	64.25	-0.00172	1.00000
Y	@ f_s = 0.0	1438.4	0.00	882.30	64.25	64.25	0.00000	1.00000
Y	@ f_s = 0.5 f_y	1110.7	0.00	1270.78	49.91	64.25	0.00086	1.00000
Y	@ Balanced point	893.9	0.00	1362.16	40.80	64.25	0.00172	1.00000
Y	@ Tension control	518.8	0.00	1176.54	24.95	64.25	0.00472	1.00000
Y	@ Pure bending	0.0	0.00	212.33	3.37	64.25	0.05420	1.00000
Y	@ Max tension	-77.5	0.00	0.00	0.00	64.25	9.99999	1.00000
-Y	@ Max compression	1832.1	0.00	0.00	151.07	64.25	-0.00172	1.00000
-Y	@ Allowable comp.	1832.1	0.00	0.00	151.07	64.25	-0.00172	1.00000
-Y	@ f_s = 0.0	1438.4	0.00	-882.30	64.25	64.25	0.00000	1.00000
-Y	@ f_s = 0.5 f_y	1110.7	0.00	-1270.78	49.91	64.25	0.00086	1.00000
-Y	@ Balanced point	893.9	0.00	-1362.16	40.80	64.25	0.00172	1.00000
-Y	@ Tension control	518.8	0.00	-1176.54	24.95	64.25	0.00472	1.00000
-Y	@ Pure bending	0.0	0.00	-212.33	3.37	64.25	0.05420	1.00000
-Y	@ Max tension	-77.5	0.00	0.00	0.00	64.25	9.99999	1.00000

THE FOLLOWING PAGES ARE FROM THE RECENT PCC HT EAST SEISMIC RENOVATION WORK (HACKER/ABHT) AND ARE PROVIDED FOR REFERENCE ONLY AS THE SOURCE OF THE DESIGN SHEAR FORCES USED FOR THE HT EAST SHEAR WALL DESIGN

FOR REFERENCE ONLY

Green Highlights mean that the "New" Condition force is lower than the "Existing" Condition Force
Yellow Highlights mean that the "New" Condition force is greater than the "Existing" Condition Force
Red Highlights mean that the "New" Condition force is greater than a 10% increase over the "Existing" Condition Force

model comparison

X-Direction Force (E-W)	(E-W) Gridline A			(E-W) NW Stair Core South Wall			(E-W) SW Stair Core North Wall		
X-Direction Walls (E-W)	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison
Roof	1496.027	1026.89	-31.36%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
3rd Floor	1645.147	1117.235	-32.09%	0	0	#DIV/0!	#N/A	#N/A	#N/A
2nd Floor	1719.736	1242.703	-27.74%	40.092	34.311	-14.42%	34.703	32.116	-7.45%
1st Floor	2210.847	1593	-27.95%	0	#N/A	#N/A	20.738	10.544	-49.16%

X-Direction Force (E-W)	(N-S) Gridline 1			(N-S) NW Stair Core East Wall			(N-S) SW Stair Core East Wall		
Z-Direction Walls (N-S)	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison
Roof	87.446	58.861	-32.69%	53.783	41.501	-22.84%	28.868	21.085	-26.96%
3rd Floor	104.664	89.78	-14.22%	53.786	41.482	-22.88%	46.347	41.13	-11.26%
2nd Floor	97.082	138.128	42.28%	70.836	47.665	-32.71%	23.414	15.311	-34.61%
1st Floor	375.028	357.2	-4.75%	0	#N/A	#N/A	31.388	26.76	-14.74%

Z-Direction Force (N-S)	(E-W) Gridline A			(E-W) NW Stair Core South Wall			(E-W) SW Stair Core North Wall		
X-Direction Walls (E-W)	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison
Roof	514.862	456.48	-11.34%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
3rd Floor	601.749	528.952	-12.10%	0	0	#DIV/0!	#N/A	#N/A	#N/A
2nd Floor	607.324	544.1	-10.41%	28.84	27.643	-4.15%	31.782	31.31	-1.49%
1st Floor	559.792	501.22	-10.46%	0	#N/A	#N/A	10.723	10.62	-0.96%

Z-Direction Force (N-S)	(N-S) Gridline 1			(N-S) NW Stair Core East Wall			(N-S) SW Stair Core East Wall		
Z-Direction Walls (N-S)	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison
Roof	954.129	929.814	-2.55%	8.521	8.791	3.17%	13.186	16.24	23.16%
3rd Floor	1418.4	1390.624	-1.96%	8.453	8.766	3.70%	34.027	33.54	-1.43%
2nd Floor	1626	1602.568	-1.44%	33.425	33.333	-0.28%	72.859	71.433	-1.96%
	1656.977	1627.2	-1.80%	0	#N/A	#N/A	36.135	36.972	2.32%

Green Highlights mean that the "Ne
Yellow Highlights mean that the "N
Red Highlights mean that the "New

model comparison

X-Direction Force (E-W)	(E-W) West Gridline E			(E-W) South Sector C Wall			(E-W) Classroom South Wall		
X-Direction Walls (E-W)	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison
Roof	1566.61	1017.787	-35.03%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
3rd Floor	2439	1711.7	-29.82%	611.171	512.44	-16.15%	#N/A	#N/A	#N/A
2nd Floor	2606	1909.3	-26.73%	615.686	515.86	-16.21%	937.789	693.109	-26.09%
1st Floor	1812.757	1325	-26.91%	615.474	516.1	-16.15%	548.269	398.7	-27.28%

X-Direction Force (E-W)	(N-S) East Sector C Wall			(N-S) South Gridline 4			(N-S) Middle Gridline 4		
Z-Direction Walls (N-S)	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison
Roof	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
3rd Floor	44.6	38	-14.80%	32.099	21.401	-33.33%	161.945	104.5	-35.47%
2nd Floor	41.062	42.29	2.99%	82.635	55.428	-32.92%	227.797	157.75	-30.75%
1st Floor	5.938	17.94	202.12%	160.372	104.62	-34.76%	375.991	258.4	-31.27%

Z-Direction Force (N-S)	(E-W) West Gridline E			(E-W) South Sector C Wall			(E-W) Classroom South Wall		
X-Direction Walls (E-W)	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison
Roof	516.635	455.574	-11.82%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
3rd Floor	462	437.1	-5.39%	179.276	155.08	-13.50%	#N/A	#N/A	#N/A
2nd Floor	472	438.4	-7.12%	193.481	169.157	-12.57%	76.66	61.32	-20.01%
1st Floor	274.062	259.8	-5.20%	194.825	172.3	-11.56%	70.579	62.273	-11.77%

Z-Direction Force (N-S)	(N-S) East Sector C Wall			(N-S) South Gridline 4			(N-S) Middle Gridline 4		
Z-Direction Walls (N-S)	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison
Roof	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
3rd Floor	542.488	582.042	7.29%	51.418	50.701	-1.39%	750.506	740.5	-1.33%
2nd Floor	596.54	653	9.46%	190.537	193.15	1.37%	964.486	927.5	-3.83%
	587.883	622.7	5.92%	204.013	206.5	1.22%	1007.885	978.2	-2.95%

FOR REFERENCE ONLY

Green Highlights mean that the "Ne
Yellow Highlights mean that the "N
Red Highlights mean that the "New

model comparison

X-Direction Force (E-W)	(E-W) NE Stair Core South Wall			(E-W) North Region 7 Wall			(E-W) Basement South Region 7		
X-Direction Walls (E-W)	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison
Roof	116.227	79.198	-31.86%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
3rd Floor	178.646	105.013	-41.22%	628.919	386.9	-38.48%	#N/A	#N/A	#N/A
2nd Floor	147.776	104.14	-29.53%	58.101	56.725	-2.37%	422.247	305.285	-27.70%
1st Floor	38.848	27.62	-28.90%	158.049	133.83	-15.32%	0	#N/A	#N/A

X-Direction Force (E-W)	(N-S) West Classroom West Wall			(N-S) West Classroom East Wall			(N-S) East Classroom West Wall		
Z-Direction Walls (N-S)	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison
Roof	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
3rd Floor	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2nd Floor	44.795	38.235	-14.64%	6.418	7.149	11.39%	20.726	12.8	-38.24%
1st Floor	69.82	55.4	-20.65%	15.632	11.95	-23.55%	23.282	16.4	-29.56%

Z-Direction Force (N-S)	(E-W) NE Stair Core South Wall			(E-W) North Region 7 Wall			(E-W) Basement South Region 7		
X-Direction Walls (E-W)	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison
Roof	4.138	4.8	16.00%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
3rd Floor	61.616	43.533	-29.35%	94.882	72.44	-23.65%	#N/A	#N/A	#N/A
2nd Floor	32.95	28.4	-13.81%	65.9	67.42	2.31%	16.24	32.157	98.01%
1st Floor	19.665	16.42	-16.50%	103.736	95.93	-7.52%	0	#N/A	#N/A

Z-Direction Force (N-S)	(N-S) West Classroom West Wall			(N-S) West Classroom East Wall			(N-S) East Classroom West Wall		
Z-Direction Walls (N-S)	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison
Roof	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
3rd Floor	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2nd Floor	101.384	97.351	-3.98%	38.278	36.73	-4.04%	36.982	35.253	-4.68%
	41.343	47.53	14.97%	29.803	31.873	6.95%	24.197	26.142	8.04%

FOR REFERENCE ONLY

Green Highlights mean that the "Ne
Yellow Highlights mean that the "N
Red Highlights mean that the "New

model comparison

X-Direction Force (E-W)	(E-W) 1st Floor South Region 7			(E-W) SE Stair Core North Wall			(E-W) East Gridline E		
X-Direction Walls (E-W)	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison
Roof	#N/A	#N/A	#N/A	130.556	77.765	-40.44%	#N/A	#N/A	#N/A
3rd Floor	661.069	410.461	-37.91%	53.986	32.082	-40.57%	#N/A	#N/A	#N/A
2nd Floor	#N/A	#N/A	#N/A	57.092	47.327	-17.10%	1059.108	811.668	-23.36%
1st Floor	0	#N/A	#N/A	0	#N/A	#N/A	13.366	#N/A	#N/A

X-Direction Force (E-W)	(N-S) NE Stair Core East Wall			(N-S) South Middle Gridline 5			(N-S) Middle Gridline 5		
Z-Direction Walls (N-S)	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison
Roof	122.268	63.137	-48.36%	#N/A	#N/A	#N/A	11.937	8.941	-25.10%
3rd Floor	122.254	74.123	-39.37%	70.14	41.705	-40.54%	32.797	24.48	-25.36%
2nd Floor	127.58	84.436	-33.82%	#N/A	#N/A	#N/A	35.273	52.433	48.65%
1st Floor	50.854	35.3	-30.59%	0	#N/A	#N/A	0	#N/A	#N/A

Z-Direction Force (N-S)	(E-W) 1st Floor South Region 7			(E-W) SE Stair Core North Wall			(E-W) East Gridline E		
X-Direction Walls (E-W)	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison
Roof	#N/A	#N/A	#N/A	15.426	23.239	50.65%	#N/A	#N/A	#N/A
3rd Floor	21.507	65.532	204.70%	2.136	3.363	57.44%	#N/A	#N/A	#N/A
2nd Floor	#N/A	#N/A	#N/A	81.223	70.648	-13.02%	257.532	282.635	9.75%
1st Floor	0	#N/A	#N/A	0	#N/A	#N/A	1	#N/A	#N/A

Z-Direction Force (N-S)	(N-S) NE Stair Core East Wall			(N-S) South Middle Gridline 5			(N-S) Middle Gridline 5		
Z-Direction Walls (N-S)	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison
Roof	91.454	85.33	-6.70%	#N/A	#N/A	#N/A	79.539	69.463	-12.67%
3rd Floor	63.734	64.314	0.91%	53.291	54.54	2.34%	180.776	177.757	-1.67%
2nd Floor	19.484	9.43	-51.60%	#N/A	#N/A	#N/A	885.158	859.208	-2.93%
	103.595	109	5.22%	0	#N/A	#N/A	0	#N/A	#N/A

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Red Highlights mean that the "New

model comparison

X-Direction Force (E-W)	(E-W) Gridline D East Wall			(E-W) Gridline B1 East Wall			(E-W) Gridline B East Wall		
X-Direction Walls (E-W)	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison
Roof	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
3rd Floor	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2nd Floor	373.099	218.516	-41.43%	427.537	438.202	2.49%	566.961	535.131	-5.61%
1st Floor	0	#N/A	#N/A	0	#N/A	#N/A	0	#N/A	#N/A

X-Direction Force (E-W)	(N-S) North Middle Gridline 5			(N-S) Gridline 4.5 Wall + NE Stair Core West Wall			(N-S) SE Stair Core East Wall		
Z-Direction Walls (N-S)	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison
Roof	#N/A	#N/A	#N/A	206.656	126.155	-38.95%	141.523	92.699	-34.50%
3rd Floor	62.27	35.145	-43.56%	224.632	149.304	-33.53%	14.583	8.049	-44.81%
2nd Floor	#N/A	#N/A	#N/A	134.935	91.857	-31.93%	67.093	69.081	2.96%
1st Floor	0	#N/A	#N/A	70.825	52.125	-26.40%	0	#N/A	#N/A

Z-Direction Force (N-S)	(E-W) Gridline D East Wall			(E-W) Gridline B1 East Wall			(E-W) Gridline B East Wall		
X-Direction Walls (E-W)	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison
Roof	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
3rd Floor	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2nd Floor	199.55	50.487	-74.70%	150.177	165	9.87%	175.674	172.093	-2.04%
1st Floor	0	#N/A	#N/A	0	#N/A	#N/A	0	#N/A	#N/A

Z-Direction Force (N-S)	(N-S) North Middle Gridline 5			(N-S) Gridline 4.5 Wall + NE Stair Core West Wall			(N-S) SE Stair Core East Wall		
Z-Direction Walls (N-S)	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison
Roof	#N/A	#N/A	#N/A	217.233	197.944	-8.88%	240.713	239.468	-0.52%
3rd Floor	82.939	76.379	-7.91%	193.983	175.934	-9.30%	204.695	189.588	-7.38%
2nd Floor	#N/A	#N/A	#N/A	267.679	259.1	-3.20%	334.207	297.067	-11.11%
	0	#N/A	#N/A	11.444	17.26	50.82%	0	#N/A	#N/A

FOR REFERENCE ONLY

Green Highlights mean that the "Ne
Yellow Highlights mean that the "N
Red Highlights mean that the "New

model comparison

X-Direction Force (E-W)	(E-W) Gridline 0.5D East Wall			(E-W) Gridline C East Wall		
X-Direction Walls (E-W)	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison
Roof	#N/A	#N/A	#N/A	#N/A	1065.074	#N/A
3rd Floor	#N/A	#N/A	#N/A	#N/A	1884.817	#N/A
2nd Floor	#N/A	175	#N/A	#N/A	1879.62	#N/A
1st Floor	0	#N/A	#N/A	0	#N/A	#N/A

X-Direction Force (E-W)	(N-S) SE Stair Core West Wall			(N-S) Gridline 6 North Wall			(N-S) Gridline 6 South Wall		
Z-Direction Walls (N-S)	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison
Roof	138.043	78.201	-43.35%	12.71	8.175	-35.68%	39.232	13.205	-66.34%
3rd Floor	131.232	80.822	-38.41%	78.018	23.469	-69.92%	46.787	31.803	-32.03%
2nd Floor	55.408	35.725	-35.52%	38.005	26.445	-30.42%	#N/A	#N/A	#N/A
1st Floor	0	#N/A	#N/A	0	#N/A	#N/A	0	#N/A	#N/A

Z-Direction Force (N-S)	(E-W) Gridline 0.5D East Wall			(E-W) Gridline C East Wall		
X-Direction Walls (E-W)	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison
Roof	#N/A	#N/A	#N/A	#N/A	24.387	#N/A
3rd Floor	#N/A	#N/A	#N/A	#N/A	84.4	#N/A
2nd Floor	#N/A	7	#N/A	#N/A	181.543	#N/A
1st Floor	0	#N/A	#N/A	0	#N/A	#N/A

Z-Direction Force (N-S)	(N-S) SE Stair Core West Wall			(N-S) Gridline 6 North Wall			(N-S) Gridline 6 South Wall		
Z-Direction Walls (N-S)	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison
Roof	149.752	138.128	-7.76%	196.753	201.508	2.42%	489.392	447.901	-8.48%
3rd Floor	91.38	82.031	-10.23%	533.858	422.53	-20.85%	326.577	233.191	-28.60%
2nd Floor	16.827	15.909	-5.46%	276.503	266.965	-3.45%	#N/A	#N/A	#N/A
	0	#N/A	#N/A	0	#N/A	#N/A	0	#N/A	#N/A

FOR REFERENCE ONLY

model comparison

Green Highlights mean that the "Ne
Yellow Highlights mean that the "N
Red Highlights mean that the "New

X-Direction Force (E-W)
X-Direction Walls (E-W)
Roof
3rd Floor
2nd Floor
1st Floor

X-Direction Force (E-W)	(N-S) Gridline 7 South Wall			(N-S) Gridline 8 South Wall			(N-S) Gridline 8 North Wall		
Z-Direction Walls (N-S)	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison
Roof	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
3rd Floor	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2nd Floor	253.9	271.268	6.84%	181.495	136.479	-24.80%	17.846	22.093	23.80%
1st Floor	0	#N/A	#N/A	0	#N/A	#N/A	0	#N/A	#N/A

Z-Direction Force (N-S)
X-Direction Walls (E-W)
Roof
3rd Floor
2nd Floor
1st Floor

Z-Direction Force (N-S)	(N-S) Gridline 7 South Wall			(N-S) Gridline 8 South Wall			(N-S) Gridline 8 North Wall		
Z-Direction Walls (N-S)	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison
Roof	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
3rd Floor	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2nd Floor	665.522	721.272	8.38%	450.075	275.374	-38.82%	442.59	458.396	3.57%
	0	#N/A	#N/A	0	#N/A	#N/A	0	#N/A	#N/A

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Green Highlights mean that the "N
Yellow Highlights mean that the "N
Red Highlights mean that the "New

model comparison

X-Direction Force (E-W)
X-Direction Walls (E-W)
Roof
3rd Floor
2nd Floor
1st Floor

X-Direction Force (E-W)	(N-S) Gridline 9 North Wall			(N-S) Gridline 9 South Wall			(N-S) Gridline 7.5 South Wall		
Z-Direction Walls (N-S)	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison
Roof	58.288	50.984	-12.53%	38.924	52.684	35.35%	#N/A	45	#N/A
3rd Floor	196.978	150.116	-23.79%	49.832	20.524	-58.81%	#N/A	56	#N/A
2nd Floor	647.854	551.952	-14.80%	49.832	20.524	-58.81%	#N/A	21	#N/A
1st Floor	0	#N/A	#N/A	0	#N/A	#N/A	0	#N/A	#N/A

Z-Direction Force (N-S)
X-Direction Walls (E-W)
Roof
3rd Floor
2nd Floor
1st Floor

Z-Direction Force (N-S)	(N-S) Gridline 9 North Wall			(N-S) Gridline 9 South Wall			(N-S) Gridline 7.5 South Wall		
Z-Direction Walls (N-S)	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison	Existing Shear Force	New Max Shear Force	Shear Force Comparison
Roof	635.621	554.184	-12.81%	501.158	446.382	-10.93%	#N/A	312	#N/A
3rd Floor	1672.738	1412.845	-15.54%	316.79	259.668	-18.03%	#N/A	668	#N/A
2nd Floor	2145.084	1862.961	-13.15%	316.79	259.668	-18.03%	#N/A	541	#N/A
	0	#N/A	#N/A	0	#N/A	#N/A	0	#N/A	#N/A

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A B H T STRUCTURAL ENGINEERS

fy	60.000	ksi	
d	288.000	in	
s	12	in	
Avreq	0.2848	in^2	per spacing, s

use:

Av	0.62	in^2	#5s each face
Vns	892.8	kip	
ϕVns	535.68	kip	
ϕVn	828.93	kip	
D/C	0.8484		

11.6 Reinforcement limits

Vu	703.3	kip
.5ϕVc	146.6	kip

Vu exceeds limit, table 11.6.1 does not apply

calculate equation 11.6.2, to see if controls over chapter 18 provisions

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ρ_t	0.0025		
ρ_l	0.0025		
	same limit		
lw	360	in	
h	12	in	
hw	522	in	
ρ_t	10.8	in^2	transverse to plane
ρ_l	10.8	in^2	in plane
A_t	0.36	in^2	min vertical per foot
A_l	0.248	in^2	min horizontal per foot

(2) #5 min vertical
(2) #5 min horizontal
see additional calculations for individual wall segments/sections

Grid line .5D wall (short single story east west wall)

ACI 318-14
18.10.2

ρ_l	0.0025	minimum longitudinal reinforcing ratio
ρ_t	0.0025	minimum longitudinal reinforcing ratio
smax	18 in	

18.10.2.2, two curtains of reinforcement will be provided at each wall

18.10.2.3 reinforcement in structural walls shall be developed/spliced for fy, noted on drawings/details

18.10.4 Shear Strength

18.10.4.1 Vn shall not exceed

lw	30	ft	
hw	14.5	ft	
hw/lw	0.483333333		
α	3		
ρ_l	0.0025		
ρ_t	0.0025		
f'c	5000	psi	
fy	60000	psi	
h	15	in	thickness of wall
Acv	5400	in^2	
Vn	1955.51	kip	

18.10.4.3 as hw/lw does not exceed 2.0, ρ_l shall be at least ρ_t

18.10.4.4 vertical wall segment max of 8*sqrt(f'c)*Acv
Vn 3054.70 kip

max at any one individual vertical section of 10*sqrt(f'c)
Vn 0.7071 kip*Acw

18.10.4.5 horizontal wall segments and coupling beams
Vn 0.7071 kip*Acw

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11.3 Design Limits

11.3.1.1 minimum thickness

1	4	in	
2	6.96	in	

minimum shear wall thickness for this project is 12"

ϕ	0.6		due to use of special structural walls, per 21.2.4

11.5.4 In-plane shear

11.5.4.2 through 11.5.4.8

h	15	in	thickness of wall
lw	30	ft	length of wall
d=.8lw	24	ft	effective depth

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11.5.4.3 limit

f'c	5000	psi
h	15	in
d	288	in
10*	10	
Vn	3054.70	kip

exceeds the shear at the base of wall

11.5.4.5 2*sqrt(f'c)*h*d

Vc	610.94	kip	
Mu	3824.665	kip-ft	maximum factored moment (includes rho = 1.3)
Vu	263.77	kip	max factored shear, includes rho
ϕ	0.6		
Vu	263.77	kip	
Vnc	610.94	kip	
ϕVnc	366.56	kip	
ϕVns_req	-102.79	kip	shear design force for steel reinforcing
ϕ	0.6		
fy	60.000	ksi	
d	288.000	in	
s	12	in	
Avreq	-0.0714	in^2	per spacing, s

use:

Av	0.62	in^2	#5s each face
Vns	892.8	kip	
ϕVns	535.68	kip	
ϕVn	902.24	kip	
D/C	0.2923		

11.6 Reinforcement limits

Vu	263.77	kip
.5ϕVc	183.3	kip

Vu exceeds limit, table 11.6.1 does not apply

calculate equation 11.6.2, to see if controls over chapter 18 provisions

ρ_t	0.0025		
ρ_l	0.0025		
	same limit		
lw	360	in	
h	15	in	
hw	522	in	
ρ_t	13.5	in^2	transverse to plane
ρ_l	13.5	in^2	in plane
A_t	0.45	in^2	min vertical per foot
A_l	0.310	in^2	min horizontal per foot

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(2) #5 min vertical
(2) #5 min horizontal
see additional calculations for individual wall segments/sections

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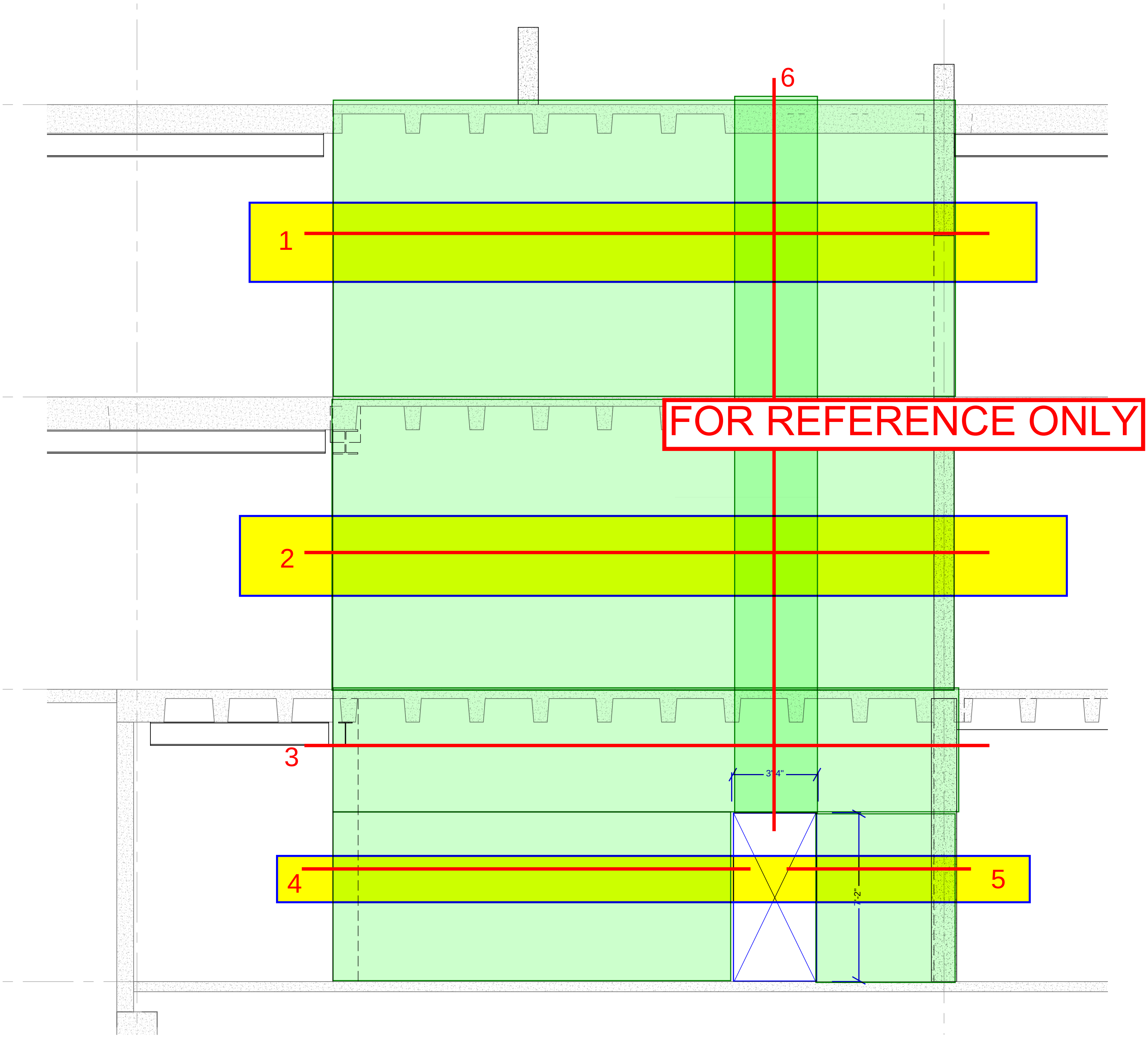
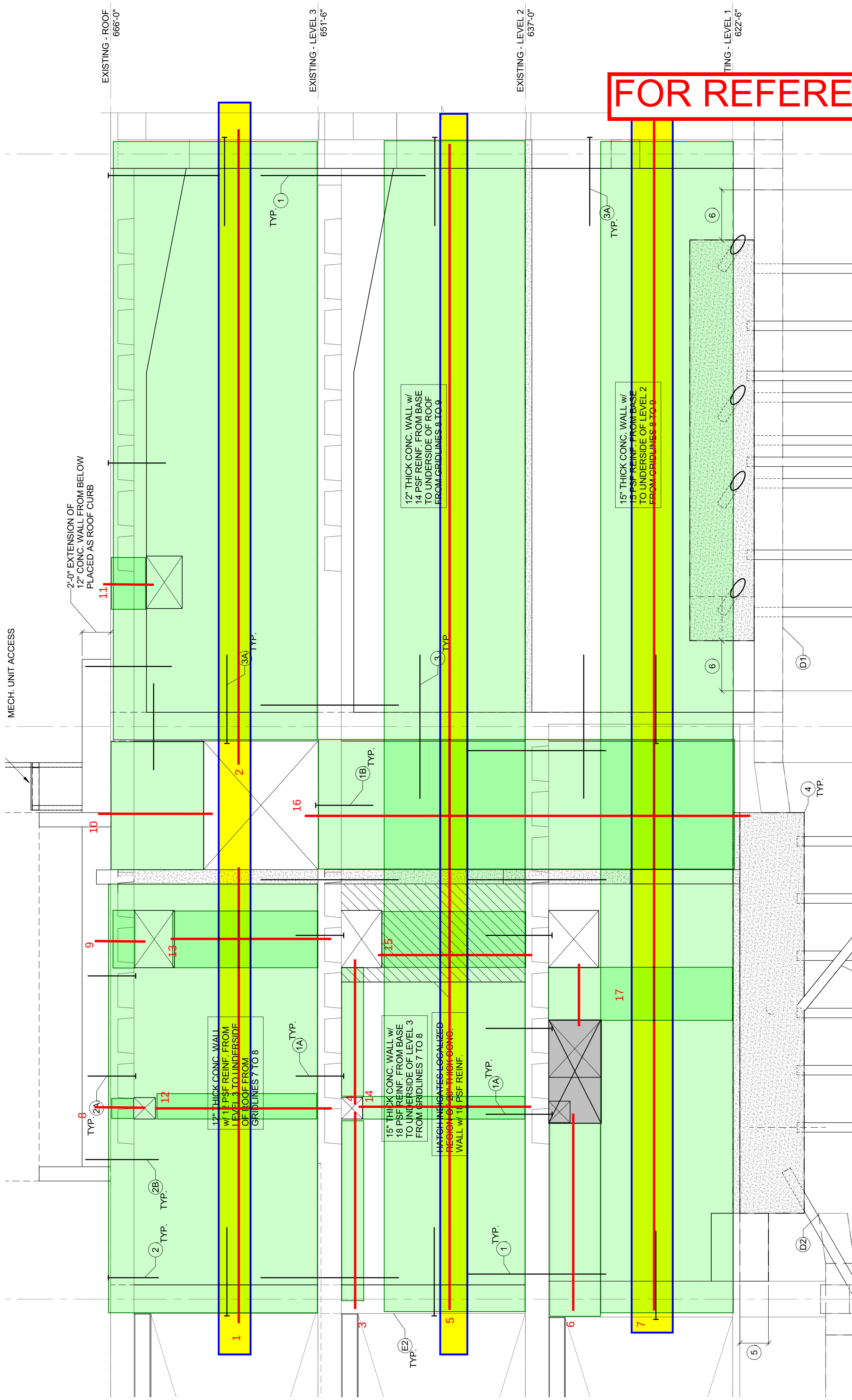
ELEVATION VIEWS OF SHEAR WALLS SHOWING INDIVIDUAL SEGMENT NUMBERS FOR USE WITH CALCULATIONS. INDIVIDUAL SEGMENTS WERE INVESTIGATED FOR REBAR DETAILING AND ADDITIONAL CODE REQUIRED CHECKS. SECTIONS WERE CHECKED WITH HAND CALCULATIONS AND SP COLUMN



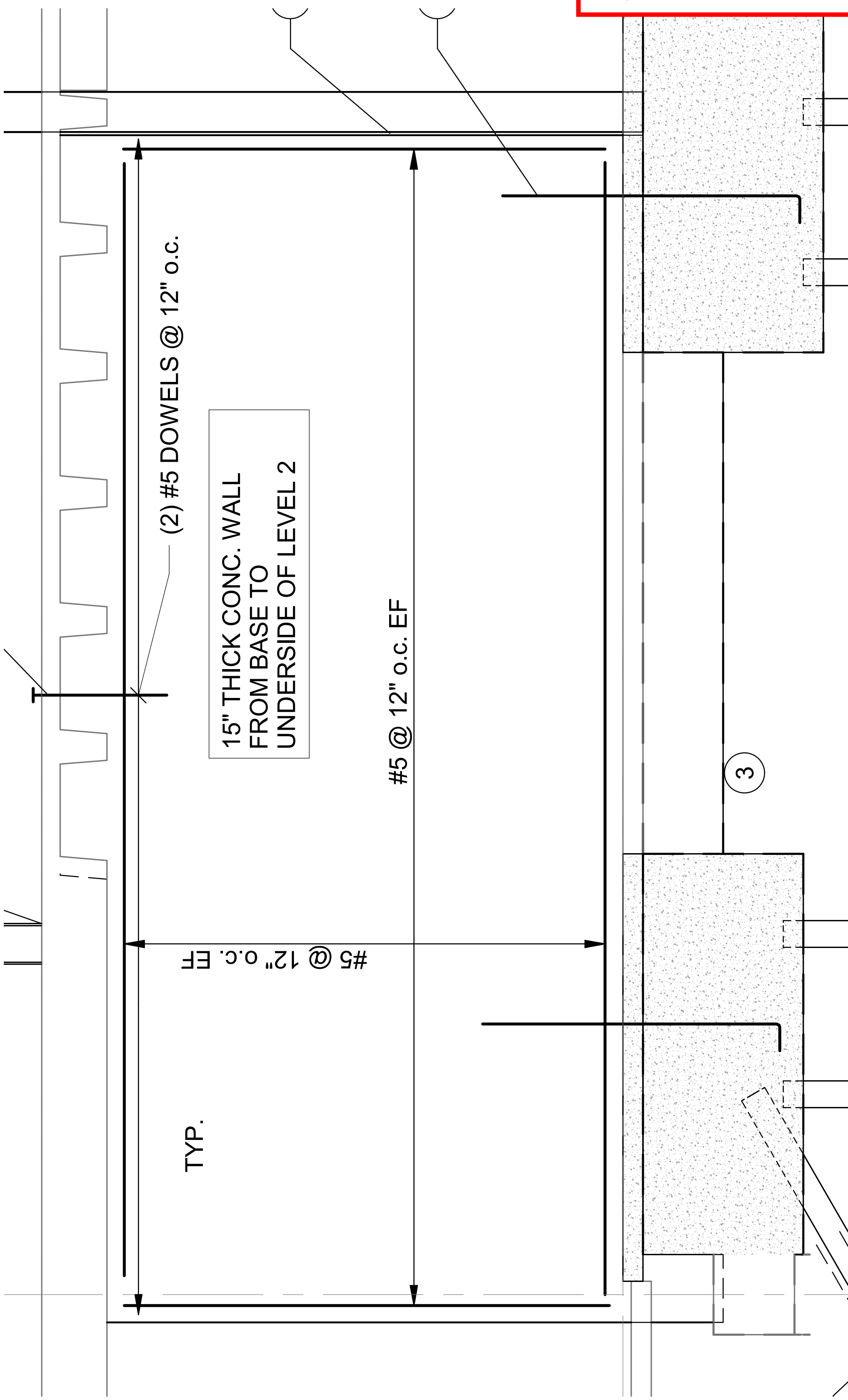
NORH SOUTH CONCRETE SHEAR WALL SHOWN
ON ELEVATION 1/S-304

FOR REFERENCE ONLY



"GRID C" EAST-WEST CONCRETE SHEAR WALL SHOWN ON ELEVATION 1/S-305

FOR REFERENCE ONLY



EAST-WEST CONCRETE SHEAR WALL SHOWN ON ELEVATION 1/S-306

-NOTE AS NO INDIVIDUAL SEGMENTS, REF. GENERAL CALCS AND SP COLUMN FILES

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CONCRETE SHEAR WALL INDIVIDUAL SEGMENT CALCULATIONS

FOR REFERENCE ONLY

Project: PCC HT		Job No. 18518
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Wall 7.5 Cuts:
the loads include rho = 1.3 and are seismic loads from 100/30 case

LC1	1.33D+L+E
LC2	.77D+E
LC3	1.33D+L-E
LC4	.77D-E
	max

Forces from risa model, see attahced

MARK	1					
	F1 (KIP)	F2 (KIP)	M3 (K-FT)	F1 (KIP)	F2 (KIP)	M3 (K-FT)
LC1	-440	195	6361			
LC2	-440	115	6302			
LC3	440	155	-6360			
LC4	440	116	-6331			
abs(max)	440	195	6361			

check shear capacity

φ	f'c	fy	b	d	φVnc	Av	s	φVns	φVn	D/C
	psi	psi	in	in	kip	in^2	in	kip	kip	
0.6	5000	60000	12	288	293.2513	0.62	12	535.68	828.9313	0.530804

Boundary element check

b	h	S	P/A	M/S	total
in	in	in^3	ksi	ksi	ksi
12	360	259200	0.045139	0.294491	0.33963

MARK	2					
	max			mid (22')		
	F1 (KIP)	F2 (KIP)	M3 (K-FT)	F1 (KIP)	F2 (KIP)	M3 (K-FT)
LC1	-842	365	18571	-842	324	12188
LC2	-842	213	18458	-842	183	12188
LC3	842	285	-18571	842	244	-12188
LC4	842	213	-18515	842	183	-12188
	842	365	18571	842	324	12188

check shear capacity

φ	f'c	fy	b	d	φVnc	Av	s	φVns	φVn	D/C
	psi	psi	in	in	kip	in^2	in	kip	kip	
0.6	5000	60000	12	288	293.2513	0.88	10	912.384	1205.635	0.698387

Boundary element check

b	h	S	P/A	M/S	total	limits
in	in	in^3	ksi	ksi	ksi	
12	360	259200	0.084491	0.859769	0.944259	1000
			0.075	0.564259	0.639259	750

A	I	y	S	P/A	M/S	total	*T section analysis
						ksi	
5616	77444700	56.04	1381954	0.064993	0.161259	0.226252	

MARK	3					
	max			top		
	F1 (KIP)	F2 (KIP)	M3 (K-FT)	F1 (KIP)	F2 (KIP)	M3 (K-FT)
LC1	-760	492	24092	-760	454	18624
LC2	-760	279	24092	-760	250	18624
LC3	760	373	-24143	760	333	-18624
LC4	760	280	-24143	760	250	-18675
	760	492	24143	760	454	18675

check shear capacity

φ	f'c	fy	b	d	φVnc	Av	s	φVns	φVn	D/C
	psi	psi	in	in	kip	in^2	in	kip	kip	
0.6	5000	60000	12	288	293.2513	0.62	12	535.68	828.9313	0.916843

Boundary element check

b	h	S	P/A	M/S	total
in	in	in^3	ksi	ksi	ksi
12	360	259200	0.113889	1.117731	1.23162

A	I	y	S	P/A	M/S	total	*T section analysis
						ksi	
5616	77444700	57.81	1339642	0.087607	0.216264	0.303871	

MARK	4					
	max			top		
	F1 (KIP)	F2 (KIP)	M3 (K-FT)	F1 (KIP)	F2 (KIP)	M3 (K-FT)
LC1	-622	-697	10295			
LC2	-629	-832	10889			
LC3	651	1264	-12375			
LC4	648	1202	-12113			
	651	1264	12375	0	0	0

check shear capacity

φ	f'c	fy	b	d	φVnc	Av	s	φVns	φVn	D/C
	psi	psi	in	in	kip	in^2	in	kip	kip	
0.6	5000	60000	12	203.2	206.9051	0.88	12	536.448	743.3531	0.875761
									0.875761	

Boundary element check

b	h	S	P/A	M/S	total
in	in	in^3	ksi	ksi	ksi
12	254	129032	0.414698	1.150877	1.565575

MARK	5					
	max					
	F1 (KIP)	F2 (KIP)	M3 (K-FT)	F1 (KIP)	F2 (KIP)	M3 (K-FT)
LC1	-139	1223	311			
LC2	-132	1136	314			
LC3	110	-859	-371			
LC4	113	-899	-358			
	139	1223	371			

check shear capacity

φ	f'c	fy	b	d	φVnc	Av	s	φVns	φVn	D/C
	psi	psi	in	in	kip	in^2	in	kip	kip	
0.6	5000	60000	12	52.8	53.76274	0.62	12	98.208	151.9707	0.91465

Boundary element check

b	h	S	P/A	M/S	total
in	in	in^3	ksi	ksi	ksi
12	66	8712	1.544192	0.511019	2.055211

A	I	y	S	P/A	M/S	total	*T section analysis
						ksi	
2052	627348	40.56	15467.16	0.596004	0.287836	0.88384	

MARK	6					
	LEFT			RIGHT		
	F1 (KIP)	F2 (KIP)	M3 (K-FT)	F1 (KIP)	F2 (KIP)	M3 (K-FT)
LC1	1081	-44	-1528	1115	-40	2167
LC2	1053	-55	-1431	1075	-44	2084
LC3	-970	78	1301	-940	64	-1900
LC4	-981	73	1350	-959	67	-2020
	1081	78	1528	1115	67	2167

check additional requirements for coupling beam, if applies

ACI 318-11, 21.9.7		21.9.7.1					21.9.7.2	
Ln	h	Ln/h	Vu	f'c	b	Acw	limit	ok?
ft	ft			psi	in	in^2	kip	
3.333333	36.33333	0.091743	1115	5000	12	5232	1479.833	**ok**

check shear capacity

φ	f'c	fy	b	d	φVnc	Av	s	φVns	φVn	D/C
			in	in						
0.6	5000	60000	12	348.8	355.1599	0.62	12	1081.28	1436.44	0.776225

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ABHT STRUCTURAL ENGINEERS

Wall C Cuts:
the loads include rho = 1.3 and are seismic loads from 100/30 case

LC1	1.33D+L+E
LC2	.77D+E
LC3	1.33D+L-E
LC4	.77D-E

From Site Specific Analysis

S_ds	0.639
Ev	0.1278
1.2D+	1.3278
.9D-	0.7722

whole wall for comparison in calculations

hw	lw	hw/lw	α
43.5	80	0.54375	3

MARK 1		max F1 (KIP)	F2 (KIP)	M3 (K-FT)	F1 (KIP)	F2 (KIP)	M3 (K-FT)
	LC1	-550	416	4998			
	LC2	-557	201	4600			
	LC3	572	692	-3480			
	LC4	568	485	-3778			
		572	692	4998	0	0	0

in plane shear design per ACI 318-14 11.5.4
minimum distributed web reinforcement per ACI 318-14 18.10.2.1

FOR REFERENCE ONLY

18.10.2.1 ρ mn	ϕ	f'c psi	fy psi	thick h in	length lw in	.8lw d in	Acv in^2	Asmin in^2	hw ft	lw ft	hw/lw	α
0.0025	0.6	5000	60000	12	348	278.4	4176	10.44	14.5	29	0.54375	3

limit 18.10.4.1 kip	limit 18.10.4.4 kip	min steel in^2/ft	ϕVnc kip	Av in^2	d in	s in	ϕVns kip	ϕVn kip	D/C
1512.3	2362.302	0.36	283.4763	0.88	174	12	765.6	1049.076	0.545242

b in	h in	S in^3	boundary check P/A ksi	M/S ksi	total ksi
12	348	242208	0.166	0.248	0.413

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MARK 2		max F1 (KIP)	F2 (KIP)	M3 (K-FT)	F1 (KIP)	F2 (KIP)	M3 (K-FT)
	LC1	-823	948	5043			
	LC2	-817	580	5805			
	LC3	801	464	-8100			
	LC4	805	263	-7504			
		823	948	8100	0	0	0

ρ mn	ϕ	f'c psi	fy psi	h in	lw in	d in	Acv in^2	Asmin in^2	hw ft	lw ft	hw/lw	α
0.0025	0.6	5000	60000	12	456	364.8	5472	13.68	14.5	40	0.54375	3

18.10.4.1 kip	18.10.4.4 kip	ϕVnc	Av in^2	d in	s in	ϕVns kip	ϕVn kip	D/C
1981.6	3095.431	371.4517	0.88	364.8	12	1605.12	1976.572	0.416378

b in	h in	S in^3	P/A ksi	M/S ksi	total ksi
12	456	415872	0.173	0.234	0.407

MARK 3		max F1 (KIP)	F2 (KIP)	M3 (K-FT)	F1 (KIP)	F2 (KIP)	M3 (K-FT)
	LC1	-144	67	261			
	LC2	-148	-119	214			
	LC3	158	619	163			
	LC4	155	485	124			
		158	619	261	0	0	0

minimum area of shear reinforcing, carried down through wall section

ϕ	f'c psi	fy psi	b in	d in	ϕVnc kip	Av in^2	s s	ϕVns kip	ϕVn kip	D/C
0.6	5000	60000	15	105.6	134.4069	0.88	12	464.64	599.0469	0.263752

b in	h in	S in^3	P/A ksi	M/S ksi	total ksi
15	132	43560	0.312626	0.0719	0.384527

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MARK	4	max F1 (KIP)	F2 (KIP)	M3 (K-FT)	F1 (KIP)	F2 (KIP)	M3 (K-FT)
	LC1	-325	238	727			
	LC2	-318	71	600			
	LC3	316	441	325			
	LC4	321	312	-324			
		325	441	727	0	0	0

minimum area of shear reinforcing, carried down through wall section

ϕ	f'c	fy	b	d	ϕVnc	Av	s	ϕVns	ϕVn	D/C
	psi	psi	in	in	kip	in^2	in	kip	kip	
0.6	5000	60000	15	86.4	109.9692	0.88	12	380.16	490.1292	0.66309

b	h	S	P/A	M/S	total
in	in	in^3	ksi	ksi	ksi
15	108	29160	0.272222	0.299	0.571399

FOR REFERENCE ONLY

MARK	5	max F1 (KIP)	F2 (KIP)	M3 (K-FT)	F1 (KIP)	F2 (KIP)	M3 (K-FT)
	LC1	-2459	2449	54975			
	LC2	-2459	1233	55177			
	LC3	2459	2130	-55937			
	LC4	2459	1233	-55734			
		2459	2449	55937			

18.10.2.1

ρ mn	ϕ	f'c	fy	thick h	length lw	.8lw d	Acv	Asmin	hw	lw	hw/lw	α
		psi	psi	in	in	in	in^2	in^2	ft	ft		
0.0025	0.6	5000	60000	15	960	768	14400	36	14.5	80	0.54375	3

limit 18.10.4.1	limit 18.10.4.4	ϕVnc	Av	d	s	ϕVns	ϕVn	D/C
kip	kip		in^2	in	in	kip	kip	
5214.7	8145.87	977.5044	0.88	768	12	2027.52	3005.024	0.818296

b	h	S	P/A	M/S	total
in	in	in^3	ksi	ksi	ksi
12	960	1843200	0.212587	0.364173	0.57676

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MARK	6	max F1 (KIP)	F2 (KIP)	M3 (K-FT)	F1 (KIP)	F2 (KIP)	M3 (K-FT)
	LC1	-150	-59	-385			
	LC2	-65	-357	-824			
	LC3	-163	1136	2576			
	LC4	-102	927	2048			
		163	1136	2576	0	0	0

minimum area of shear reinforcing, carried down through wall section

ϕ	f'c psi	fy psi	b in	d in	ϕVnc kip	Av in^2	s in	ϕVns kip	ϕVn kip	D/C
0.6	5000	60000	15	130.4	165.9721	0.88	12	573.76	739.7321	0.22035

b in	h in	S in^3	P/A ksi	M/S ksi	total ksi
15	163	66422.5	0.4646	0.4654	0.930006

FOR REFERENCE ONLY

MARK	7	max F1 (KIP)	F2 (KIP)	M3 (K-FT)	F1 (KIP)	F2 (KIP)	M3 (K-FT)
	LC1	-2472	3148	88806			
	LC2	-2472	1590	90547			
	LC3	2472	2750	-92074			
	LC4	2472	1592	-91759			
		2472	3148	92074	0	0	0

18.10.2.1 ρ mn	ϕ	f'c psi	fy psi	thick h in	length lw in	.8lw d in	Acv in^2	Asmin in^2	hw ft	lw ft	hw/lw	α
0.0025	0.6	5000	60000	15	960	768	14400	36	14.5	80	0.54375	3

limit 18.10.4.1 kip	limit 18.10.4.4 kip	ϕVnc	Av in^2	d in	s in	ϕVns kip	ϕVn kip	D/C
5214.7	8145.87	977.5044	0.88	768	12	2027.52	3005.024	0.822622

b in	h in	S in^3	P/A ksi	M/S ksi	total ksi
12	960	1843200	0.273264	0.59944	0.873

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		LEFT			RIGHT		
MARK	**8**	**F1 (KIP)**	**F2 (KIP)**	**M3 (K-FT)**	**F1 (KIP)**	**F2 (KIP)**	**M3 (K-FT)**
	LC1	39	63	-34	34	44	49
	LC2	40	67	-33	36	51	47
	LC3	-39	-80	29	-42	-69	-42
	LC4	-39	-76	30	-41	-64	-43
		40	80	34	42	69	49

ACI 318-14, 18.10.7		18.10.7.1					18.10.7.2	
Ln	h	Ln/h	Vu	f'c	b	Acw	limit	ok?
ft	ft		kip	psi	in	in^2	kip	
2	1.416666667	1.411765	42	4000	32	544	137.6223	**ok**

(3) rows of single leg stirrups

ϕ	f'c	fy	b	d	ϕVnc	Av	s	ϕVns	ϕVn	D/C
	psi	psi	in	in	kip	in^2	in	kip	kip	
0.6	4000	40000	32	13.6	33.02936	0.33	15	7.1808	40.21016	1.044512

FOR REFERENCE ONLY

Reference plan and elevation for additional concrete curb
detailed to provide shear capacity
(additional dowels up into curb with welded PL on end)

		LEFT			RIGHT		
MARK	**9**	**F1 (KIP)**	**F2 (KIP)**	**M3 (K-FT)**	**F1 (KIP)**	**F2 (KIP)**	**M3 (K-FT)**
	LC1	-9	47	-40	35	109	22
	LC2	6	50	-48	28	113	27
	LC3	-49	-62	70	-8	-126	-42
	LC4	-37	-59	64	-14	-123	-38
		49	62	70	35	126	42

ACI 318-14, 18.10.7		18.10.7.1					18.10.7.2	
Ln	h	Ln/h	Vu	f'c	b	Acw	limit	ok?
ft	ft		kip	psi	in	in^2	kip	
4	1.416666667	2.823529	49	4000	32	544	137.6223	**ok**

(3) rows of single leg stirrups

ϕ	f'c	fy	b	d	ϕVnc	Av	s	ϕVns	ϕVn	D/C
	psi	psi	in	in	kip	in^2	in	kip	kip	
0.6	4000	40000	32	14	34.00081	0.33	15	7.392	41.39281	1.18378

Reference plan and elevation for additional concrete curb
detailed to provide shear capacity
(additional dowels up into curb with welded PL on end)

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		LEFT			RIGHT		
MARK	**10**	**F1 (KIP)**	**F2 (KIP)**	**M3 (K-FT)**	**F1 (KIP)**	**F2 (KIP)**	**M3 (K-FT)**
	LC1	134	-17	-913	264	96	1114
	LC2	167	-20	-916	231	95	1061
	LC3	-234	24	947	-142	-94	-906
	LC4	-219	23	930	-165	-94	-950
		234	24	947	264	96	1114

ACI 318-14, 18.10.7		18.10.7.1					18.10.7.2	
Ln	h	Ln/h	Vu	f'c	b	Acw	limit	ok?
ft	ft		kip	psi	in	in^2	kip	
9	6.5	1.384615	264	5000	12	936	264.7408	**ok**

ϕ	f'c	fy	b	d	ϕVnc	Av	s	ϕVns	ϕVn	D/C
	psi	psi	in	in	kip	in^2	in	kip	kip	
0.6	5000	60000	12	62.4	63.53779	0.88	9	219.648	283.1858	0.93225

FOR REFERENCE ONLY

		LEFT			RIGHT		
MARK	**11**	**F1 (KIP)**	**F2 (KIP)**	**M3 (K-FT)**	**F1 (KIP)**	**F2 (KIP)**	**M3 (K-FT)**
	LC1	48	-84	-175	92	-40	177
	LC2	60	-70	-186	83	-28	180
	LC3	-94	33	213	-58	-2	-191
	LC4	-85	43	207	-64	7	-188
		94	84	213	92	40	191

ACI 318-14, 18.10.7		18.10.7.1					18.10.7.2	
Ln	h	Ln/h	Vu	f'c	b	Acw	limit	ok?
ft	ft		kip	psi	in	in^2	kip	
4	2.5	1.6	94	4000	24	720	182.1472	**ok**

ϕ	f'c	fy	b	d	ϕVnc	Av	s	ϕVns	ϕVn	D/C
	psi	psi	in	in	kip	in^2	in	kip	kip	
0.6	4000	60000	24	24	43.71533	0.4	12	28.8	72.51533	1.296278

use (2) #11s in shear friction that are not being utilized for bending

ϕ	fy	Avf	μ	α	use 1.4	ϕVn
	psi	in^2				kip
0.6	60000	3.12	1.4	45	1.697056	157.248

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		LEFT			RIGHT		
MARK	**12**	**F1 (KIP)**	**F2 (KIP)**	**M3 (K-FT)**	**F1 (KIP)**	**F2 (KIP)**	**M3 (K-FT)**
	LC1	261	115	-245	266	116	251
	LC2	261	102	-237	263	102	260
	LC3	-258	-66	216	-253	-66	-270
	LC4	-259	-76	217	-256	-76	-257
		261	115	245	266	116	270

ACI 318-14, 18.10.7		18.10.7.1					18.10.7.2	
Ln	h	Ln/h	Vu	f'c	b	Acw	limit	ok?
ft	ft		kip	psi	in	in^2	kip	
2.5	13	0.192308	266	5000	12	1872	529.4816	**ok**

ϕ	f'c	fy	b	d	ϕVnc	Av	s	ϕVns	ϕVn	D/C
	psi	psi	in	in	kip	in^2	in	kip	kip	
0.6	5000	60000	12	124.8	127.0756	0.62	12	232.128	359.2036	0.740527

FOR REFERENCE ONLY

		LEFT			RIGHT		
MARK	**13**	**F1 (KIP)**	**F2 (KIP)**	**M3 (K-FT)**	**F1 (KIP)**	**F2 (KIP)**	**M3 (K-FT)**
	LC1	398	46	-180	445	45	1428
	LC2	406	32	-181	434	26	1412
	LC3	-429	5	130	-405	26	-1400
	LC4	-422	-5	148	-414	12	-1388
		429	46	181	445	45	1428

ACI 318-14, 18.10.7		18.10.7.1					18.10.7.2	
Ln	h	Ln/h	Vu	f'c	b	Acw	limit	ok?
ft	ft		kip	psi	in	in^2	kip	
4	13	0.307692	445	5000	12	1872	529.4816	**ok**

ϕ	f'c	fy	b	d	ϕVnc	Av	s	ϕVns	ϕVn	D/C
	psi	psi	in	in	kip	in^2	in	kip	kip	
0.6	5000	60000	12	124.8	127.0756	0.88	12	329.472	456.5476	0.974707

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		LEFT			RIGHT		
MARK	**14**	**F1 (KIP)**	**F2 (KIP)**	**M3 (K-FT)**	**F1 (KIP)**	**F2 (KIP)**	**M3 (K-FT)**
	LC1	252	52	-739	258	51	-281
	LC2	292	72	-665	295	72	-110
	LC3	-396	-127	434	-390	-127	-309
	LC4	-368	-112	495	-365	-113	-179
		396	127	739	390	127	309

ACI 318-14, 18.10.7		18.10.7.1					18.10.7.2	
Ln	h	Ln/h	Vu	f'c	b	Acw	limit	ok?
ft	ft		kip	psi	in	in^2	kip	
2.5	11	0.227273	396	5000	15	1980	560.0286	**ok**

ϕ	f'c	fy	b	d	ϕVnc	Av	s	ϕVns	ϕVn	D/C
	psi	psi	in	in	kip	in^2	in	kip	kip	
0.6	5000	60000	15	105.6	134.4069	0.88	12	278.784	413.1909	0.958395

FOR REFERENCE ONLY

		LEFT			RIGHT		
MARK	**15**	**F1 (KIP)**	**F2 (KIP)**	**M3 (K-FT)**	**F1 (KIP)**	**F2 (KIP)**	**M3 (K-FT)**
	LC1	572	110	-1178	609	87	988
	LC2	590	128	-1218	614	114	972
	LC3	-633	-172	1507	-629	-187	-960
	LC4	-622	-160	1445	-625	-168	-987
		633	172	1507	629	187	988

ACI 318-14, 18.10.7		18.10.7.1					18.10.7.2	
Ln	h	Ln/h	Vu	f'c	b	Acw	limit	ok?
ft	ft		kip	psi	in	in^2	kip	
4.5	11.5	0.391304	633	5000	**20**	2760	780.6459	**ok**

ϕ	f'c	fy	b	d	ϕVnc	Av	s	ϕVns	ϕVn	D/C
	psi	psi	in	in	kip	in^2	in	kip	kip	
0.6	5000	60000	20	110.4	187.355	1.2	10	476.928	664.283	0.952907

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		LEFT			RIGHT		
MARK	**16**	**F1 (KIP)**	**F2 (KIP)**	**M3 (K-FT)**	**F1 (KIP)**	**F2 (KIP)**	**M3 (K-FT)**
	LC1	1423	143	-6634	1640	18	2574
	LC2	1574	124	-7400	1690	-44	1607
	LC3	-1938	-90	9951	-1846	231	656
	LC4	-1835	-98	9282	-1805	181	72
		1938	143	9951	1846	231	2574

ACI 318-14, 18.10.7		18.10.7.1					18.10.7.2	
Ln	h	Ln/h	Vu	f'c	b	Acw	limit	ok?
ft	ft		kip	psi	in	in^2	kip	
7	29	0.241379	1938	5000	15	5220	3691.097	**ok**

ϕ	f'c	fy	b	d	ϕVnc	Av	s	ϕVns	ϕVn	D/C
	psi	psi	in	in	kip	in^2	in	kip	kip	
0.6	5000	60000	15	344	437.8405	1.2	9	1651.2	2089.041	0.927699

FOR REFERENCE ONLY

		critical section		
MARK	**17**	**F1 (KIP)**	**F2 (KIP)**	**M3 (K-FT)**
	LC1	-203	4	388
	LC2	-231	-209	456
	LC3	240	525	-464
	LC4	231	412	-447
		240	525	464

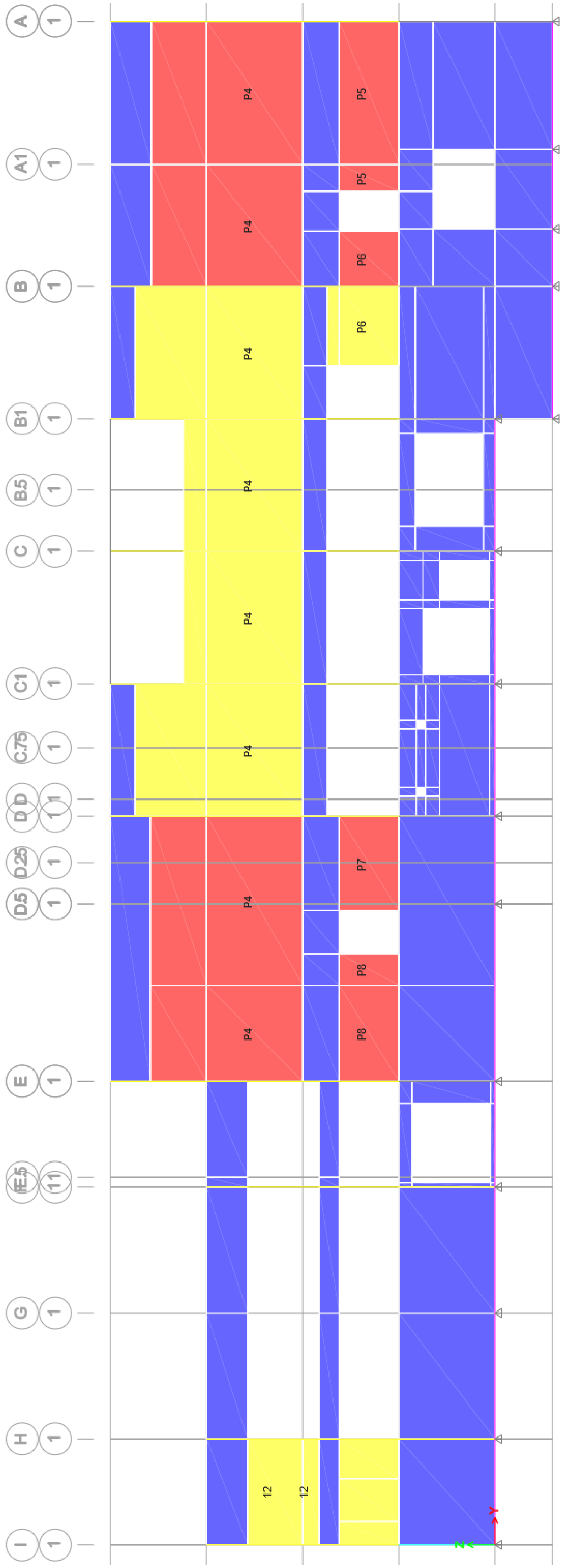
ϕ	f'c	fy	b	d	ϕVnc	Av	s	ϕVns	ϕVn	D/C
	psi	psi	in	in	kip	in^2	in	kip	kip	
0.6	5000	60000	15	41	52.18448	0.8	10	196.8	248.9845	0.964

based on BE, requirements, there will be more
shear reinforcing than this

b	h	S	P/A	M/S	total
in	in	in^3	ksi	ksi	ksi
15	44	4840	0.006	0.962	0.968
15	44	4840	0.000	1.131	1.131
15	44	4840	0.795	1.150	1.946
15	44	4840	0.624	1.108	1.733

C52.3-1

Gridline 1 Pier labels



PIER LABELS CORRESPOND TO PLAN CHECK 2 CALCULATIONS IN REFERENCE TO THE DRAG PLATE ON GRIDLINE 1

NOTE THAT A DRAG PLATE THAT WAS PREVIOUSLY SHOWN AT GRIDLINE 1 ON THE INSIDE/EAST FACE OF WALL WAS REMOVED FROM THE DRAWINGS IN PLAN CHECK 2.

THAT DRAG PLATE WAS A HOLDOVER FROM EARLY DESIGN THAT SHOULD HAVE BEEN REMOVED - THE EXISTING STRUCTURE HAS A CONTINUOUS CONCRETE BEAM AT LEVEL 2 FROM A TO I THAT IS CONTINUOUSLY CONNECTED TO THE SECOND FLOOR LEVEL