PRCTI20221788 - REVISON #6 4/5/2024

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Building
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JMontgomery
04/05/2024
9:41:23 AM

City of Puyallup
Development & Permitting Services
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PCS Structural Solutions

Seattle 1011 Western Avenue, Suite 810 | Seattle, WA 98104 | 206.292.5076
Tacoma 1250 Pacific Avenue, Suite 701 | Tacoma, WA 98402 | 253.383.2797
Portland 101 SW Main Street, Suite 280 | Portland, OR 97204 | 503.232.3746
www.pcs-structural.com

FULL SIZED LEDGIBLE COLOR REPORT IS REQUIRED TO BE PROVIDED BY THE PERMITTEE ON SITE FOR ALL INSPECTIONS

STRUCTURAL CALCULATIONS

FOR

MHS GS HYBRID OR
ASI 005
401 15TH AVE SE
PUYALLUP, WASHINGTON 98372

PREPARED BY
PCS STRUCTURAL *SOLUTIONS*

TODD PAUL PARKE
48217

MARCH 18, 2024
23-225

DESIGN CRITERIA

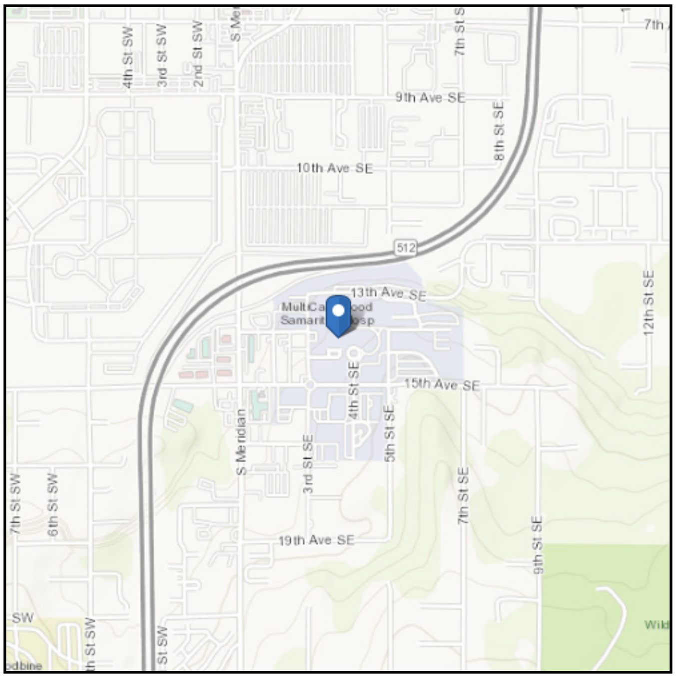
PRCTI20221788 - REVISON #6 4/5/2024

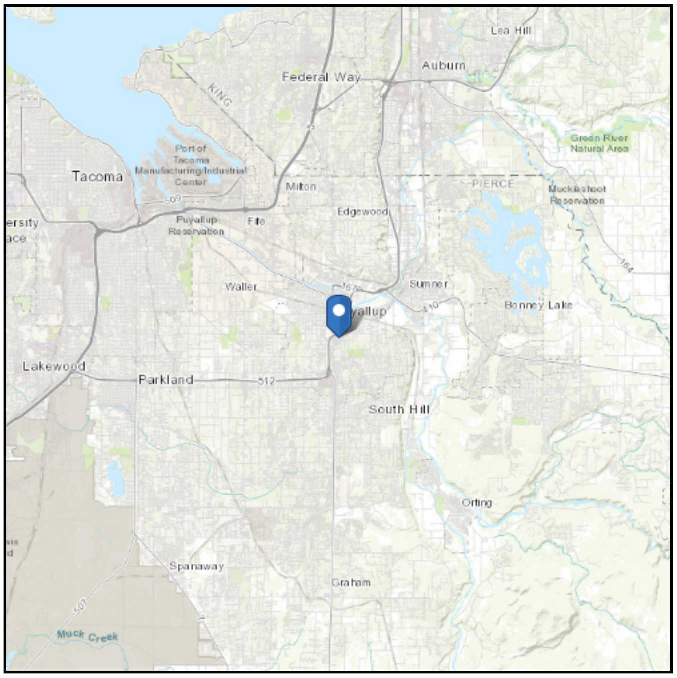
ASCE 7 Hazards Report

Address:
401 15th Ave SE
Puyallup, Washington
98372

Standard: ASCE/SEI 7-16
Risk Category: IV
Soil Class: D - Default (see Section 11.4.3)

Latitude: 47.178536
Longitude: -122.290015
Elevation: 0 ft (NAVD 88)





Wind

Results:

Wind Speed	108 Vmph
10-year MRI	67 Vmph
25-year MRI	73 Vmph
50-year MRI	78 Vmph
100-year MRI	83 Vmph

Data Source:	ASCE/SEI 7-16, Fig. 26.5-1D and Figs. CC.2-1–CC.2-4, and Section 26.5.2
Date Accessed:	Mon Mar 06 2023

Value provided is 3-second gust wind speeds at 33 ft above ground for Exposure C Category, based on linear interpolation between contours. Wind speeds are interpolated in accordance with the 7-16 Standard. Wind speeds correspond to approximately a 1.6% probability of exceedance in 50 years (annual exceedance probability = 0.00033, MRI = 3,000 years).

Site is not in a hurricane-prone region as defined in ASCE/SEI 7-16 Section 26.2.

Seismic

Site Soil Class: D - Default (see Section 11.4.3)

Results:

S_S :	1.267	S_{D1} :	N/A
S_1 :	0.436	T_L :	6
F_a :	1.2	PGA :	0.5
F_v :	N/A	PGA_M :	0.6
S_{MS} :	1.52	F_{PGA} :	1.2
S_{M1} :	N/A	I_e :	1.5
S_{DS} :	1.013	C_v :	1.353

Ground motion hazard analysis may be required. See ASCE/SEI 7-16 Section 11.4.8.

Data Accessed: Mon Mar 06 2023

Date Source: [USGS Seismic Design Maps]

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AMERICAN SOCIETY OF CIVIL ENGINEERS

Snow

Results:

Ground Snow Load, p_g : 18 lb/ft^2 → USE 25 PSF MIN. ROOF SNOW LOAD

Mapped Elevation: 0.0 ft

Data Source:

Date Accessed: Mon Mar 06 2023

Statutory requirements of the Authority Having Jurisdiction are not included.

Snow load values are mapped to a 0.5 mile resolution. This resolution can create a mismatch between the mapped elevation and the site-specific elevation in topographically complex areas. Engineers should consult the local authority having jurisdiction in locations where the reported 'elevation' and 'mapped elevation' differ significantly from each other.

The ASCE 7 Hazard Tool is provided for your convenience, for informational purposes only, and is provided "as is" and without warranties of any kind. The location data included herein has been obtained from information developed, produced, and maintained by third party providers; or has been extrapolated from maps incorporated in the ASCE 7 standard. While ASCE has made every effort to use data obtained from reliable sources or methodologies, ASCE does not make any representations or warranties as to the accuracy, completeness, reliability, currency, or quality of any data provided herein. Any third-party links provided by this Tool should not be construed as an endorsement, affiliation, relationship, or sponsorship of such third-party content by or from ASCE.

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STIFFNESS AND MODEL NOTES

PRCTI20221788 - REVISON #6 4/5/2024

PCS Structural Solutions

Project: ~~MHS HYBRID OR~~ Job No: 23-225

Subject: Calcs Sheet ____ Name: ESO

Originating Office: ☐ Seattle ☒ Tacoma ☐ Portland Date: 2024-02-29

ROOF FRAMING NOTES:

ROOF FRAMING APPROACH REVISED 2024-02-29

IN ORDER TO AVOID MEP CONFLICTS, NEW WIDE FLANGE GIRDER WILL BE "HUNG" FROM CANTILEVER BEAMS EXTENDING FROM CONCRETE WALLS ON GRIDS M + N

LOCATE NEW GIRDER BEAM PARALLEL TO GRID 1.4, 6'-1½" OFF GRID 4 PER EMAIL CORRES. 2024-02-21

ROOF FREQUENCY: PHILLIPS AZURION 7 → ROOF SUPPORTED → MOST SENSITIVE 0-20 Hz

FROM REVISED RISA MODEL w/ 5% DAMPING
↳ USE RITZ VECTOR SOLVER
↳ SOLVE DEFL 1 (DL ONLY)

PREV:

29.8% PARTICIPATION AT 5 Hz (MODE 2) - DRIVEN BY (E) BM GRID 2.0 WHOLE ROOF
14.4% PARTICIPATION AT 129 Hz (MODE 29) - DRIVEN BY WHOLE SYSTEM + EQUIP TWISTING
26.8% PARTICIPATION AT 185 Hz (MODE 30) - DRIVEN BY OUTER BMS + EQUIP. TWISTING

NEW:

12.2% PARTICIPATION AT 5.7 Hz (MODE 8) - DRIVEN BY (E) BM GRID 2.0
12.0% PARTICIPATION AT 6.1 Hz (MODE 10) - DRIVEN BY NEW BM + OR
48.0% PARTICIPATION AT 120 Hz (MODE 29) - DRIVEN BY WHOLE SYSTEM

OVERALL SYSTEM IS SIMILARLY STIFF TO PREV. APPROACH AND SLIGHTLY REDUCES MASS EXCITATION IN SENSITIVE RANGE ⇒ ∴ OK FOR VIBRATION @ REVISED ROOF

($\Sigma_{m @ 0\text{-}20 Hz}$ = 42.47% PREV., VS 28.84% w/ REVISED FRM'G)

EXISTING OWJ INFO:

WEB SIZE @ 8' CHANGES FROM ¾" Ø TO ⅝" Ø
2 ¾" SEAT DEPTH

EQUIPMENT REQUIREMENTS:

PHILLIPS:

CEILING STIFFNESS

	PREFERRED	REQ'D
HORIZ.	57.1 K/IN	34.2 K/IN
VERT.	57.1 K/IN	34.2 K/IN
ROT.	177,014 K·IN/RAD	

TV RAILS: BEARING FORCES : MAX TENS = 661 #/SUPPORT
MAX SHEAR = 150 #/SUPPORT

STRYKER BOOMS:

(3) TANDEM BOOMS

BOOM LOADS:

	WEIGHT	MOMENT
SINGLE	1,100 #	5.65 K·FT
TANDEM	2,200 #	11.3 K·FT

RISA MODELING: CONT'D

RAIL DEAD LOADS:

CONTROLS

USE MAX (183# / 2 SIDES) / 165.3" = 0.56 PLI = 0.0064 KLF
(183# / 2 SIDES) / 173.8"

RAIL EQUIPMENT LOADS:

CONS. APPLY Tu AS TENS/ COMP. COUPLE, 1.0 EC

ADD DL ASSUMING EQUIPMENT CENTERED

LARC-N DL: 1763# / 4 SUPP = 441#

MONITOR: 563# / 2 SUPP = 282#

SHIELD + LIGHT: 167# / 2 SUPP = 84#

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CHECK STIFFNESS OF (E) W18 X 40:

$PL^3/48EI = 34.2^K(346'')^3/[48\cdot(29000KSI)(I=612\,IN^4)] = 1.66'' > 1.0$

$\hookrightarrow$ STIFFNESS $= 34.2^K/1.66'' = 20.6\,^K/IN < K_{REQ} = 34.2^K/IN$ ✗

$\therefore$ NEED TO STIFFEN → TRY STIFFENING W/ WT 4x33.5

$I_{W18x40+WT4x33.5} = 1445\,IN^4$ [E/C]

$\hookrightarrow K_{PROV.} = (48)(29{,}900\,KSI)(I=1445\,IN^4)/(346'')^3$

$= 50.1\,^K/IN > K_{REQ} = 34.2^K/IN$ ✓OK

FROM RISA, UNDER 34.2^K MID-SPAN, $\Delta_y = 0.505'' \leq 1''$ ✓ OK

$\therefore$ W18x40 + WT4x33.5 OK

WT4x33.5 → $A = 9.48\,IN^2$, $t_f = 0.935''$, $b_f = 8.28''$

WT CONFLICTS W/ (E) OWJ @ ≈ 5'-9" O.C.

JOIST SEAT DEPTH ≈ 2½" (ASSUMED)

DESIGN FOR ½" GAP → 3" WEB REMOVED

TRY WT6x36

$A' = 10.6\,IN^2 - (3'')(t_w = 0.430'') = 9.28\,IN^2 \approx 9.48\,IN^2$

$I_{COMBO} = 1{,}709\,IN^4 \rightsquigarrow I_{COPED} = 1709\,IN^4 - 19.8\,IN^4 = 1689\,IN^4 \geq I_{PREV} = 1445\,IN^4$ ✓OK [E/C]

SECTION REMOVED: $I_{RECT} = bh^3/12 = (0.43'')(3'')^3/12 = 0.97\,IN^4$; $A = 0.43'' \cdot 3'' = 1.29\,IN^2$,

N.A. @ 6.63" → $d = -6.63 + 17.9''/2 + 3''/2 = 3.82'' \rightsquigarrow I_{REMOVED} = I_{RECT} + Ad^2 = 0.97\,IN^4 + (1.29\,IN^2)(3.82'')^2$

$\hookrightarrow I_{REMOVED} = 19.8\,IN^4$

$\therefore$ USE (E) W18x40 + WT6x36 COPED @ (E) OWJ SEAT

General Section Property Calculator

Project File: 23225 calcs 2023-04-07eso.ec6

DESCRIPTION: Reinforced (E) W18x40 + WT6x36

Final Section Properties

Total Area : 22.017 in^2

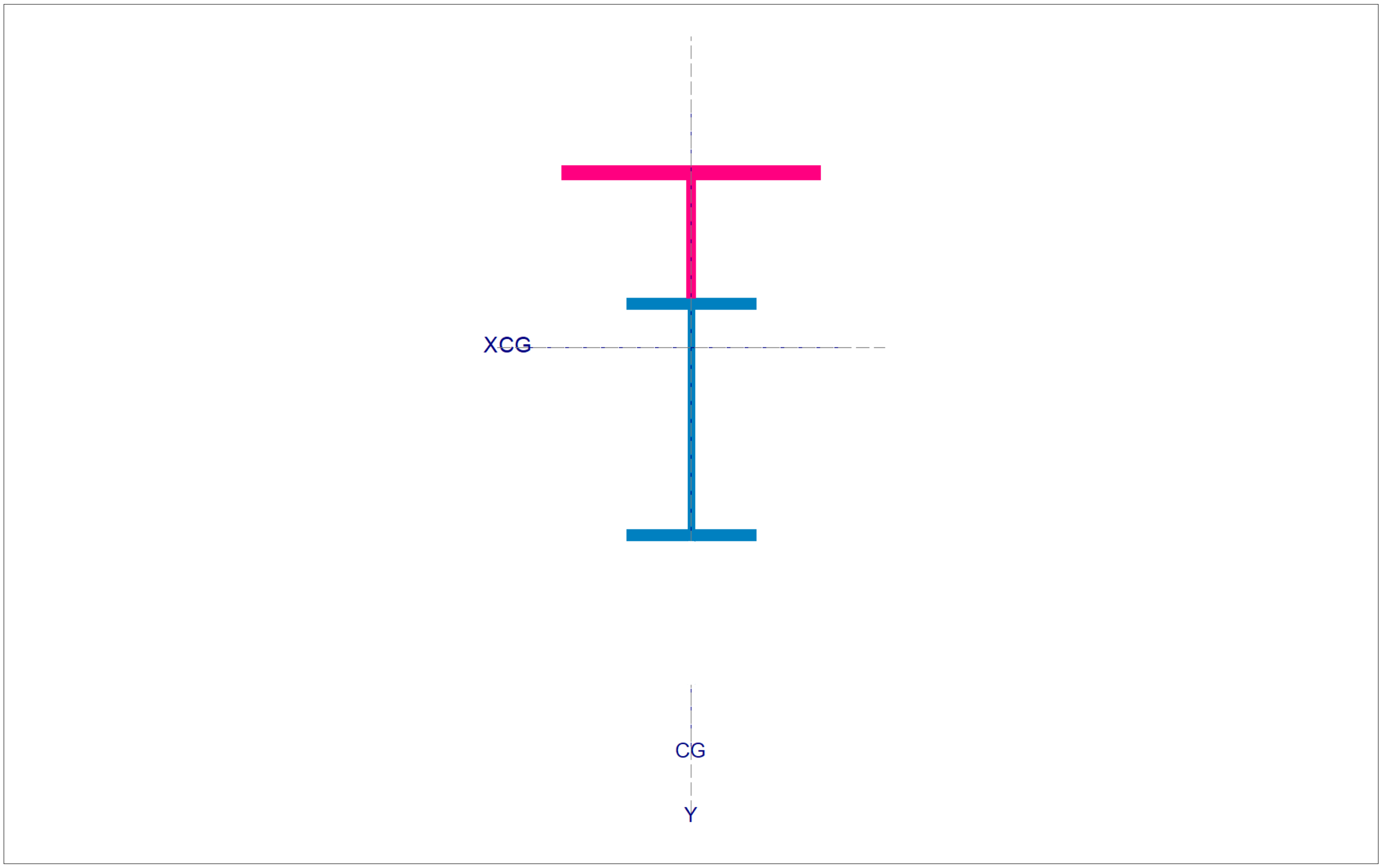
Calculated final C.G. distance from Datum :
X cg Dist. : 0.0 in
Y cg Dist. : 0.000108 in

Edge Distances from CG. :
+X : 6.0 in
-X : -6.0 in

Ixx : 1,709.42 in^4
Iyy : 115.645 in^4
Zxx : 157.015 in^3
Zyy : 34.303 in^3
+Y : 8.450 in
-Y : -15.580 in

Sxx : - Y : 109.718 in^3
Sxx : +Y : 202.30 in^3
Syy : - X : 19.274 in^3
Syy : +X : 19.274 in^3
r xx : 8.811 in
r yy : 2.292 in

Rotation of All Components @ 0.00 deg CCW



Steel Shapes

🟦	W18x40 : 1	Area =	11.629 in^2	Rotation = Xcg = Ycg =	0 deg CCW 0.000 in -6.630 in
🟥	WT6x36 : 2	Area =	10.388 in^2	Rotation = Xcg = Ycg =	0 deg CCW 0.000 in 7.430 in

Project Title: MHS GS Hybrid OR
Engineer: ESO
Project ID: 23-225
Project Descr:

General Section Property Calculator

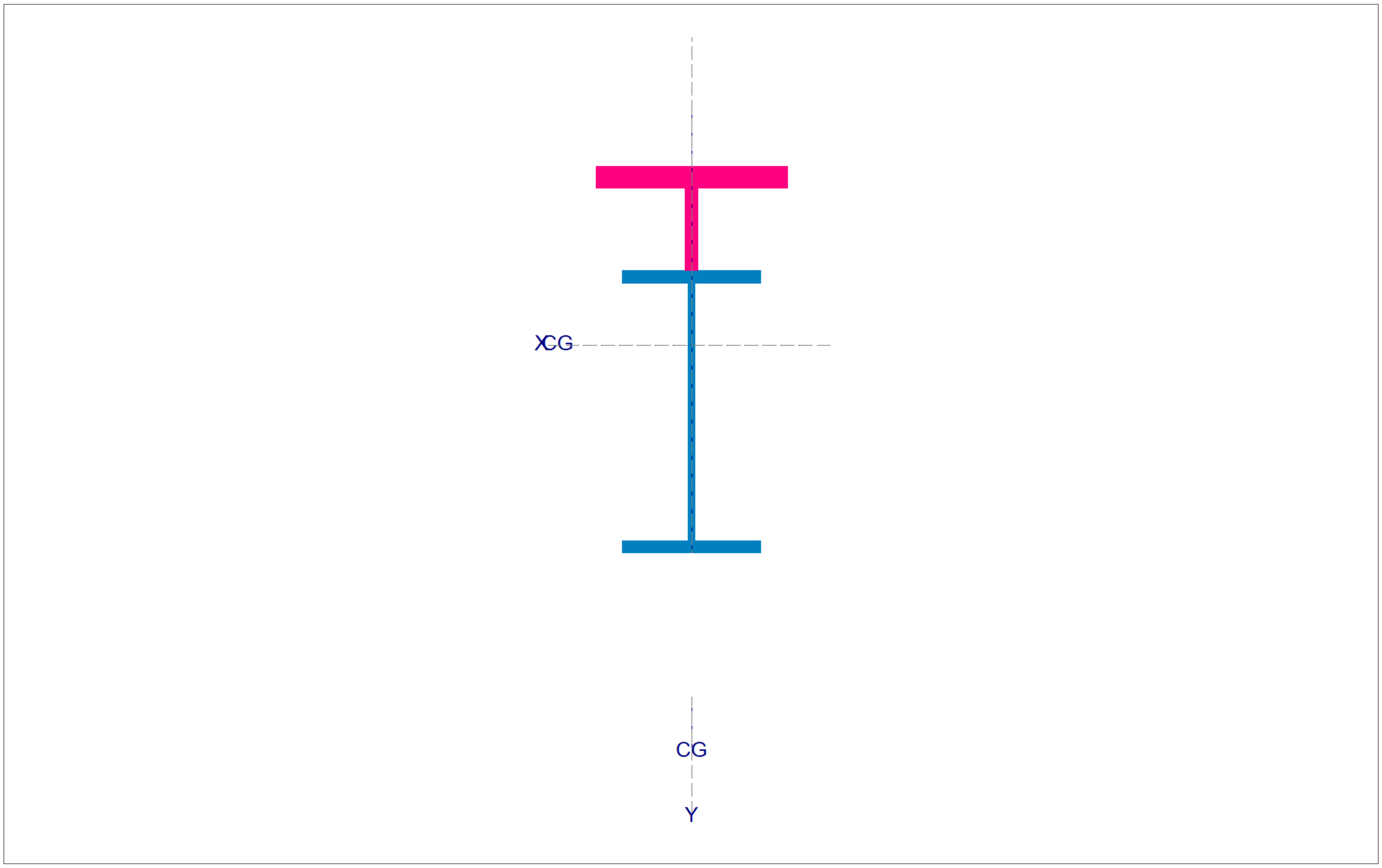
Project File: 23225 calcs 2023-04-07eso.ec6

DESCRIPTION: Reinforced (E) W18x40 + WT4x33.5

Final Section Properties

Total Area	:	21.403 in^2	Ixx	:	1,445.36 in^4	Sxx : - Y	:	98.558 in^3
			Iyy	:	63.416 in^4	Sxx : +Y	:	186.861 in^3
Calculated final C.G. distance from Datum :								
X cg Dist.	:	0.0 in	Zxx	:	138.775 in^3	Syy : - X	:	15.318 in^3
Y cg Dist.	:	.0000480 in	Zyy	:	26.246 in^3	Syy : +X	:	15.318 in^3
Edge Distances from CG. :						r xx	:	8.218 in
+X	:	4.140 in	+Y	:	7.735 in	r yy	:	1.721 in
-X	:	-4.140 in	-Y	:	-14.665 in			

Rotation of All Components @ / 0.00 deg CCW



Steel Shapes

🟦	W18x40 : 1	Area =	11.629 in^2	Rotation =	0 deg CCW
				Xcg =	0.000 in
				Ycg =	-5.715 in
🟥	WT4x33.5 : 2	Area =	9.774 in^2	Rotation =	0 deg CCW
				Xcg =	0.000 in
				Ycg =	6.799 in

PCS Structural *Solutions*

PRCTI20221788 - REVISON #6 4/5/2024

Project: ~~MHS HYBRID OR~~ Job No: 23-225

Subject: Calcs Sheet Name: ESO

Originating Office: ☐ Seattle ☒ Tacoma ☐ Portland Date: 2024-03-01

RISA RESULTS: TYPICAL STL BM (A992 STL)

NOTE: ALL FRAMING CHECKED AS GRAVITY ELEMENTS (NO STIFFNESS REDUCTION APPLIED) FOR THE PURPOSES OF STIFFNESS & DEFLECTION CHECKS

TRIAL FRAMING:

(E) W12x26 JOISTS WEST OF GRID 1.4
(E) + NEW W18x35 JOISTS EAST OF GRID 1.4
(E) W18x40 + NEW WT6x36 JUST WEST OF GRID 1.4
W21x68 OVER CONC. WALLS
W24x55 @ 6'-1½" EAST OF GRID 1.4
HSS4x4x¼ POSTS

(E) W12x16 STIFFNESS: (34.2^k LOAD OVER RAILS)

TRY TYING IN TO (6) BMS WEST OF GRID 1.4

$\Delta_{MAX} = 0.805'' \leq 1''$ ✓OK

∴ (E) W12x16 STIFFNESS OK

(E) + NEW W18x35: (34.2^k LOAD OVER RAILS)

TRY TYING IN TO (6) BMS EAST OF GRID 1.4

$\Delta_{MAX} = 0.721'' \leq 1.0$

∴ (E) + NEW W18x35 STIFFNESS OK

CHECK UNITY: WORST CASE DCR = 0.79 ≤ 1.0 ✓OK

PRCTI20221788 - REVISON #6 4/5/2024

PCS Structural Solutions

Project: ~~MHS HYBRID OR~~ Job No: 23-225

Subject: Calcs Sheet

Name: ESO

Originating Office: ☐ Seattle ☒ Tacoma ☐ Portland

Date: 2023-02-21

RISA MODELING:

STRYKER BOOMS:

CONS. USE ALL TANDEM PER CKA EMAIL 2023-02-20

$P_{TANDEM} = 2,200^{\#} = 2x\ 500^{\#}$ PAYLOAD $+ 2x\ 600^{\#}$ BOOM WT

$M_{TANDEM} = 11,300^{FT \cdot \#}$

LOADS ARE WORST CASE ALREADY → MODEL AS DL

$\therefore$ BOOM SUPPORTS OK AS L4x3x3/8, LLV, w/ L3x3x1/4 BRACES

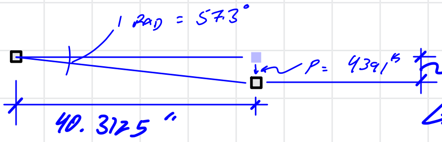
EQUIPMENT REQUIREMENTS: (CONT'D)

PHILLIPS: ROTATIONAL STIFFNESS CHECK

CEILING STIFFNESS

ROT. 177,014 K·IN/RAD

↳ RAILS @ 40.3125" O.C. → P = (177014 K·IN/RAD)/(40.3125") = 4391 K/RAD



↳ Δ = 40.3125" SIN (57.3°) = 33.92"

↳ K = 4391 K/33.92" = 129.4 K/IN

APPLY 10 K LOAD @ WEST NODE:

WEST NODE: N146 → Δ_y = −0.135"
EAST NODE: N145 → Δ_y = −0.052" } ⇒ DIFF = 0.083" OVER 40.3"

RELATIVE ROTATION: $\theta = \tan^{-1}(0.083''/40.3'')$ = 0.118° = 2.06×10^{-3} RAD

↳ ROT STIFF = (10K · 40.3")/(2.06×10^{-3} RAD) = 195,673 K·IN/RAD ✓OK

APPLY 10 K LOAD @ EAST NODE:

WEST NODE: N148 → Δ_y = −0.089"
EAST NODE: N147 → Δ_y = −0.202" } ⇒ DIFF = 0.113 X N.G.

↳: ADD 9TH BM SUPP. PS

↳ Δ_{DIFF} = 0.03 ✓OK " OVER 40.3"

WEST NODE: N146 → Δ_y = −0.053"
EAST NODE: N145 → Δ_y = −0.133" } ⇒ DIFF = 0.080 OVER 40.3"

CONTROLS AFTER SUPP. ADDED FOR CASE ABOVE

RELATIVE ROTATION: $\theta = \tan^{-1}(0.08''/40.3'')$ = 0.114° = 1.99×10^{-3} RAD

↳ ROT STIFF = (10K · 40.3")/(1.99×10^{-3} RAD) = 203,012 K·IN/RAD ✓OK

(NOTE: DIFF DEFL ≤ ≈ 0.0915" OK)

PRCTI20221788 - REVISON #6 4/5/2024

Project: ~~MHS HYBRID OR~~ Job No: 23-225

Subject: Calcs Sheet Name: ESO

Originating Office: ☐ Seattle ☒ Tacoma ☐ Portland Date: 2023-03-07

EQUIPMENT REQUIREMENTS: (CONT'D)

RISA MODEL WITH CHECKED FOR CEILING DEFL @ EA. CEILING / PHILIPS EQUIP. VERT SUPPORT

STIFFNESS CHECKED BY APPLYING STAND-ALONE POINT LOAD OF 34.2^{K} AT EACH SUPPORT LOCATION

FROM RISA, $\Delta_{Y\text{-}MAX} = 0.796'' \leq 1''$ @ 34.2^{K} PT LOAD

↳ ∴ STIFFNESS REQ'S ARE MET

↳ SEE RISA RESULTS FOR ADDITIONAL MODEL INFO

PRCTI20221788 - REVISON #6 4/5/2024

Company : PCS Structural Solutions
Designer : ESO
Job Number : 23225
Model Name : OR

Checked By : ___________

SORTED ABS MAX TO ABS MIN - NO NODE DEFL AT EQUIPMENT SUPPORTS EXCEEDS 1" AT 34.2 KIP PT LOAD - THEREFORE STIFFNESS REQUIREMENTS ARE SATISFIED

INCLUDES CEILING STIFFNESS LCs

Envelope Node Displacements

	Node Label		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation [rad]	LC	Y Rotation [rad]	LC	Z Rotation [rad]	LC
1	TV-NW-CORNER	max	0.237	5	0	309	0.001	4	8.996e-5	284	4.445e-4	284	5.88e-3	5
2		min	-0.339	310	-0.796	310	-0.001	284	-9.484e-5	4	-3.703e-4	4	-8.42e-3	310
3	N167	max	0.237	5	0	309	0	284	8.996e-5	284	4.445e-4	284	5.88e-3	5
4		min	-0.339	310	-0.77	310	0	4	-9.484e-5	4	-3.703e-4	4	-8.42e-3	310
5	N163	max	0.237	5	0	309	0.003	4	8.993e-5	284	4.506e-5	283	5.698e-3	5
6		min	-0.339	310	-0.705	306	-0.004	284	-9.481e-5	4	-4.365e-5	310	-8.158e-3	310
7	N252	max	0.273	283	0	309	0.004	284	1.797e-3	283	1.103e-3	284	7.263e-3	279
8		min	-0.331	284	-0.693	279	-0.002	4	-1.913e-3	4	-5.621e-4	4	-5.84e-3	280
9	TV-SW-CORNER	max	0.237	5	0	309	0.001	284	8.992e-5	284	1.485e-4	284	5.655e-3	5
10		min	-0.339	310	-0.668	305	0	4	-9.481e-5	4	-1.106e-4	4	-8.101e-3	310
11	N297	max	0.273	283	0	309	0	4	1.797e-3	283	1.103e-3	284	7.263e-3	279
12		min	-0.331	284	-0.664	279	0	284	-1.913e-3	4	-5.621e-4	4	-5.84e-3	280
13	N158	max	0.237	5	0	309	0.018	284	8.995e-5	284	6.835e-4	4	5.819e-3	5
14		min	-0.339	310	-0.664	5	-0.015	4	-9.483e-5	4	-7.318e-4	284	-8.329e-3	310
15	N152	max	0.148	302	0	309	0.002	4	7.783e-5	284	7.422e-5	283	3.717e-3	302
16		min	-0.191	299	-0.658	302	-0.004	284	-5.354e-5	4	-7.915e-5	4	-4.534e-3	299
17	N114	max	0.182	305	0	309	0	309	3.467e-3	4	2.66e-5	283	4.532e-3	305
18		min	-0.121	307	-0.658	305	-0.142	4	0	6	-5.15e-5	310	-3.279e-3	307
19	N160	max	0.237	5	0	309	0	4	8.992e-5	284	1.485e-4	284	5.655e-3	5
20		min	-0.339	310	-0.654	305	0	284	-9.481e-5	4	-1.106e-4	4	-8.101e-3	310
21	SHIELD_SE	max	0.274	289	0	309	0.02	290	1.797e-3	283	7.617e-4	290	3.651e-3	286
22		min	-0.324	290	-0.648	280	-0.037	284	-1.913e-3	4	-8.522e-4	284	-2.52e-3	283
23	N314	max	0.148	302	0	309	0.002	4	7.783e-5	284	4.894e-5	283	6.299e-3	302
24		min	-0.191	299	-0.648	302	-0.004	284	-5.354e-5	4	-4.951e-5	310	-1.507e-3	308
25	N264	max	0.148	302	0	309	0.002	4	7.783e-5	284	7.588e-5	284	3.447e-3	299
26		min	-0.191	299	-0.646	302	-0.003	284	-5.354e-5	4	-6.348e-5	4	-7.266e-3	302
27	N151	max	0.168	296	0	309	0.002	290	7.592e-5	284	3.355e-5	290	4.158e-3	296
28		min	-0.258	292	-0.64	295	-0.005	284	-5.102e-5	4	-3.298e-5	4	-6.331e-3	292
29	N272	max	0.273	283	0	309	0.004	290	1.797e-3	283	9.195e-4	284	6.855e-3	283
30		min	-0.331	284	-0.64	284	-0.003	284	-1.913e-3	4	-1.15e-3	290	-8.593e-3	284
31	N259	max	0.274	289	0	309	0.02	290	1.797e-3	283	7.617e-4	290	3.651e-3	286
32		min	-0.328	290	-0.639	280	-0.037	284	-1.913e-3	4	-8.522e-4	284	-2.52e-3	283
33	SHIELD_SW	max	0.275	289	0	309	0.02	290	1.797e-3	283	7.617e-4	290	3.651e-3	286
34		min	-0.333	290	-0.63	280	-0.037	284	-1.913e-3	4	-8.522e-4	284	-2.52e-3	283
35	N309	max	0.168	296	0	309	0.002	290	7.592e-5	284	7.032e-5	290	6.159e-3	295
36		min	-0.258	292	-0.63	295	-0.005	284	-5.102e-5	4	-5.437e-5	284	-1.394e-3	283
37	N112	max	0.182	305	0	309	0	309	3.468e-3	4	2.658e-5	283	4.515e-3	305
38		min	-0.121	307	-0.629	305	-0.142	4	0	6	-5.122e-5	310	-3.256e-3	307
39	N295	max	0.273	283	0	309	0.015	4	1.797e-3	283	7.617e-4	290	3.651e-3	286
40		min	-0.331	284	-0.627	280	-0.029	284	-1.913e-3	4	-8.522e-4	284	-2.52e-3	283
41	N265	max	0.168	296	0	309	0.002	290	7.592e-5	284	1.098e-4	284	6.305e-3	294
42		min	-0.258	292	-0.625	295	-0.004	284	-5.102e-5	4	-5.235e-5	290	-8.794e-3	295
43	N159	max	0.237	5	0	309	0.004	4	8.993e-5	284	2.762e-5	290	5.739e-3	5
44		min	-0.339	310	-0.622	307	-0.004	284	-9.482e-5	4	-5.409e-5	306	-8.215e-3	310
45	N282	max	0.273	283	0	309	0	4	1.797e-3	283	9.195e-4	284	6.855e-3	283
46		min	-0.331	284	-0.614	284	0	283	-1.913e-3	4	-1.15e-3	290	-8.593e-3	284
47	N261	max	0.274	289	0	309	0.015	4	1.797e-3	283	7.617e-4	290	3.651e-3	286
48		min	-0.324	290	-0.613	280	-0.029	284	-1.913e-3	4	-8.522e-4	284	-2.52e-3	283
49	TV-SE-CORNER	max	0.276	289	0	309	0.004	284	1.797e-3	283	1.103e-3	284	6.155e-3	285
50		min	-0.338	290	-0.613	285	-0.002	4	-1.913e-3	4	-5.621e-4	4	-6.27e-3	286
51	N115	max	0.182	305	0	309	0	309	3.468e-3	4	2.658e-5	283	4.515e-3	305
52		min	-0.121	307	-0.607	305	-0.142	4	0	6	-5.122e-5	310	-3.256e-3	307
53	N254	max	0.274	289	0	309	0.015	4	1.797e-3	283	7.617e-4	290	3.651e-3	286
54		min	-0.328	290	-0.604	280	-0.029	284	-1.913e-3	4	-8.522e-4	284	-2.52e-3	283
55	N120	max	0.182	305	0	309	0	309	3.467e-3	4	2.675e-5	283	4.497e-3	305

Envelope Node Displacements (Continued)

	Node Label		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation [rad]	LC	Y Rotation [rad]	LC	Z Rotation [rad]	LC
56		min	-0.121	307	-0.6	305	-0.142	4	0	6	-5.162e-5	310	-3.233e-3	307
57	N267	max	0.275	289	0	309	0.015	4	1.797e-3	283	7.617e-4	290	3.651e-3	286
58		min	-0.333	290	-0.595	280	-0.029	284	-1.913e-3	4	-8.522e-4	284	-2.52e-3	283
59	TV-NE-CORNER	max	0.276	289	0	309	0.004	290	1.797e-3	283	9.195e-4	284	6.85e-3	289
60		min	-0.338	290	-0.592	290	-0.003	284	-1.913e-3	4	-1.15e-3	290	-8.492e-3	290
61	N162	max	0.276	289	0	309	0.015	4	1.797e-3	283	7.617e-4	290	3.651e-3	286
62		min	-0.338	290	-0.591	286	-0.029	284	-1.913e-3	4	-8.522e-4	284	-2.52e-3	283
63	N161	max	0.276	289	0	309	0	4	1.797e-3	283	1.103e-3	284	6.155e-3	285
64		min	-0.338	290	-0.588	285	0	284	-1.913e-3	4	-5.621e-4	4	-6.27e-3	286
65	N166	max	0.237	5	0	309	0.002	4	8.994e-5	284	2.797e-4	4	5.78e-3	5
66		min	-0.339	310	-0.579	308	-0.002	283	-9.482e-5	4	-3.277e-4	284	-8.272e-3	310
67	N119	max	0.046	279	0	309	0.143	4	1.707e-3	283	5.133e-5	280	1.168e-3	279
68		min	-0.038	283	-0.579	279	-0.068	283	-3.58e-3	4	-4.794e-5	4	-9.055e-4	283
69	STRYKER-W	max	0.182	305	0	309	0	309	3.468e-3	4	2.658e-5	283	4.515e-3	305
70		min	-0.121	307	-0.578	305	-0.142	4	0	6	-5.122e-5	310	-3.256e-3	307
71	N149	max	0.168	296	0	309	0.001	290	7.592e-5	284	1.666e-4	284	4.136e-3	296
72		min	-0.258	292	-0.576	294	-0.002	284	-5.102e-5	4	-7.309e-5	290	-6.42e-3	292
73	N306	max	0.168	296	0	309	0.001	290	7.592e-5	284	2.547e-5	284	1.937e-3	293
74		min	-0.258	292	-0.574	294	-0.002	284	-5.102e-5	4	-3.081e-5	290	-7.183e-3	294
75	N117	max	0.182	305	0	309	0	309	3.47e-3	4	2.671e-5	283	4.532e-3	305
76		min	-0.121	307	-0.573	306	-0.141	4	0	6	-5.104e-5	310	-3.279e-3	307
77	N168	max	0.276	289	0	309	0	4	1.797e-3	283	9.195e-4	284	6.85e-3	289
78		min	-0.338	290	-0.566	290	0	283	-1.913e-3	4	-1.15e-3	290	-8.492e-3	290
79	N116	max	0.046	279	0	309	0.144	4	1.711e-3	283	5.128e-5	280	1.183e-3	279
80		min	-0.038	283	-0.565	279	-0.069	283	-3.579e-3	4	-4.785e-5	4	-9.007e-4	283
81	N113	max	0.046	279	0	309	0.143	4	1.711e-3	283	5.128e-5	280	1.183e-3	279
82		min	-0.038	283	-0.564	279	-0.068	283	-3.579e-3	4	-4.785e-5	4	-9.007e-4	283
83	N148	max	0.148	302	0	309	0.001	310	7.783e-5	284	2.775e-5	284	3.664e-3	302
84		min	-0.191	299	-0.557	300	-0.002	306	-5.354e-5	4	-3.657e-5	306	-4.71e-3	299
85	N118	max	0.046	279	0	309	0.145	4	1.715e-3	283	5.073e-5	280	1.168e-3	279
86		min	-0.038	283	-0.552	279	-0.069	283	-3.578e-3	4	-4.779e-5	4	-9.056e-4	283
87	STRYKER-E	max	0.046	279	0	309	0.144	4	1.711e-3	283	5.128e-5	280	1.183e-3	279
88		min	-0.038	283	-0.551	279	-0.069	283	-3.579e-3	4	-4.785e-5	4	-9.007e-4	283
89	SHIELD_NE	max	0.274	289	0	309	0.046	284	1.797e-3	283	7.617e-4	290	3.651e-3	286
90		min	-0.324	290	-0.55	283	-0.055	290	-1.913e-3	4	-8.522e-4	284	-2.52e-3	283
91	N121	max	0.182	305	0	309	0	309	3.468e-3	4	2.658e-5	283	4.515e-3	305
92		min	-0.121	307	-0.55	305	-0.142	4	0	6	-5.122e-5	310	-3.256e-3	307
93	N125	max	0.046	279	0	309	0.143	4	1.707e-3	283	5.086e-5	280	1.199e-3	279
94		min	-0.039	283	-0.549	279	-0.068	283	-3.58e-3	4	-4.78e-5	4	-9.045e-4	284
95	N150	max	0.148	302	0	309	0.001	290	7.783e-5	284	1.116e-4	284	3.69e-3	302
96		min	-0.191	299	-0.549	301	-0.002	284	-5.354e-5	4	-6.086e-5	290	-4.624e-3	299
97	N313	max	0.148	302	0	309	0.001	290	7.783e-5	284	6.743e-5	284	5.702e-3	300
98		min	-0.191	299	-0.547	301	-0.002	284	-5.354e-5	4	-5.821e-5	306	-6.268e-3	306
99	N110	max	0.182	305	0	309	0	309	3.468e-3	4	2.658e-5	283	4.515e-3	305
100		min	-0.121	307	-0.545	306	-0.141	4	0	6	-5.122e-5	310	-3.256e-3	307
101	N289	max	0.273	283	0	309	0.038	284	1.797e-3	283	7.617e-4	290	3.651e-3	286
102		min	-0.331	284	-0.542	283	-0.048	290	-1.913e-3	4	-8.522e-4	284	-2.52e-3	283
103	N258	max	0.274	289	0	309	0.046	284	1.797e-3	283	7.617e-4	290	3.651e-3	286
104		min	-0.328	290	-0.54	283	-0.055	290	-1.913e-3	4	-8.522e-4	284	-2.52e-3	283
105	N312	max	0.148	302	0	309	0.001	310	7.783e-5	284	8.579e-6	284	2.899e-3	299
106		min	-0.191	299	-0.54	300	-0.002	306	-5.354e-5	4	-5.666e-6	290	-7.236e-3	300
107	N111	max	0.046	279	0	309	0.145	4	1.711e-3	283	5.128e-5	280	1.183e-3	279
108		min	-0.038	283	-0.537	279	-0.069	283	-3.579e-3	4	-4.785e-5	4	-9.007e-4	283
109	N122	max	0.046	279	0	309	0.144	4	1.711e-3	283	5.128e-5	280	1.183e-3	279
110		min	-0.039	283	-0.536	279	-0.069	283	-3.579e-3	4	-4.785e-5	4	-9.007e-4	283

Envelope Node Displacements (Continued)

	Node Label		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation [rad]	LC	Y Rotation [rad]	LC	Z Rotation [rad]	LC
111	N293	max	0.273	283	0	309	0.02	4	1.797e-3	283	7.617e-4	290	3.651e-3	286
112		min	-0.331	284	-0.532	280	-0.018	283	-1.913e-3	4	-8.522e-4	284	-2.52e-3	283
113	SHIELD_NW	max	0.275	289	0	309	0.046	284	1.797e-3	283	7.617e-4	290	3.651e-3	286
114		min	-0.333	290	-0.531	283	-0.055	290	-1.913e-3	4	-8.522e-4	284	-2.52e-3	283
115	N263	max	0.274	289	0	309	0.038	284	1.797e-3	283	7.617e-4	290	3.651e-3	286
116		min	-0.324	290	-0.526	283	-0.048	290	-1.913e-3	4	-8.522e-4	284	-2.52e-3	283
117	N124	max	0.046	279	0	309	0.145	4	1.715e-3	283	5.127e-5	280	1.199e-3	279
118		min	-0.039	283	-0.524	280	-0.069	283	-3.578e-3	4	-4.794e-5	4	-9.044e-4	284
119	N260	max	0.274	289	0	309	0.02	4	1.797e-3	283	7.617e-4	290	3.651e-3	286
120		min	-0.324	290	-0.518	280	-0.018	283	-1.913e-3	4	-8.522e-4	284	-2.52e-3	283
121	N123	max	0.182	305	0	309	0	309	3.47e-3	4	2.659e-5	283	4.497e-3	305
122		min	-0.121	307	-0.517	306	-0.141	4	0	6	-5.152e-5	310	-3.233e-3	307
123	N257	max	0.274	289	0	309	0.038	284	1.797e-3	283	7.617e-4	290	3.651e-3	286
124		min	-0.328	290	-0.516	283	-0.048	290	-1.913e-3	4	-8.522e-4	284	-2.52e-3	283
125	N255	max	0.274	289	0	309	0.02	4	1.797e-3	283	7.617e-4	290	3.651e-3	286
126		min	-0.328	290	-0.509	280	-0.018	283	-1.913e-3	4	-8.522e-4	284	-2.52e-3	283
127	N154	max	0.148	302	0	309	0.003	4	7.783e-5	284	5.209e-5	299	3.746e-3	302
128		min	-0.191	299	-0.508	303	-0.004	284	-5.354e-5	4	-5.474e-5	284	-4.444e-3	299
129	N269	max	0.275	289	0	309	0.038	284	1.797e-3	283	7.617e-4	290	3.651e-3	286
130		min	-0.333	290	-0.507	283	-0.048	290	-1.913e-3	4	-8.522e-4	284	-2.52e-3	283
131	N153	max	0.168	296	0	309	0.003	4	7.592e-5	284	1.409e-5	290	4.178e-3	296
132		min	-0.258	292	-0.502	296	-0.003	284	-5.102e-5	4	-2.411e-5	284	-6.252e-3	292
133	N266	max	0.275	289	0	309	0.02	4	1.797e-3	283	7.617e-4	290	3.651e-3	286
134		min	-0.333	290	-0.5	280	-0.018	283	-1.913e-3	4	-8.522e-4	284	-2.52e-3	283
135	N157	max	0.276	289	0	309	0.038	284	1.797e-3	283	7.617e-4	290	3.651e-3	286
136		min	-0.338	290	-0.498	289	-0.048	290	-1.913e-3	4	-8.522e-4	284	-2.52e-3	283
137	N164	max	0.276	289	0	309	0.02	4	1.797e-3	283	7.617e-4	290	3.651e-3	286
138		min	-0.338	290	-0.495	286	-0.018	283	-1.913e-3	4	-8.522e-4	284	-2.52e-3	283
139	N315	max	0.148	302	0	309	0.003	4	7.783e-5	284	1.136e-4	4	3.776e-3	302
140		min	-0.191	299	-0.495	303	-0.003	284	-5.354e-5	4	-1.472e-4	284	-4.345e-3	299
141	N310	max	0.168	296	0	309	0.002	4	7.592e-5	284	1.035e-4	4	4.203e-3	296
142		min	-0.258	292	-0.487	296	-0.003	284	-5.102e-5	4	-1.216e-4	284	-6.153e-3	292
143	PB1-NE-CORNER	max	0.168	296	0	309	0.001	284	7.592e-5	284	1.035e-4	4	4.203e-3	296
144		min	-0.258	292	-0.486	297	-0.001	4	-5.102e-5	4	-1.216e-4	284	-6.153e-3	292
145	N291	max	0.273	283	0	309	0.026	4	1.797e-3	283	7.617e-4	290	3.651e-3	286
146		min	-0.331	284	-0.475	283	-0.028	290	-1.913e-3	4	-8.522e-4	284	-2.52e-3	283
147	PB1-NW-CORNER	max	0.148	302	0	309	0.001	284	7.783e-5	284	1.136e-4	4	3.776e-3	302
148		min	-0.191	299	-0.474	304	-0.001	4	-5.354e-5	4	-1.472e-4	284	-4.345e-3	299
149	N155	max	0.168	296	0	309	0	284	7.592e-5	284	1.035e-4	4	4.203e-3	296
150		min	-0.258	292	-0.469	297	0	290	-5.102e-5	4	-1.216e-4	284	-6.153e-3	292
151	N145	max	0.168	296	0	309	0.001	292	7.592e-5	284	2.43e-5	284	4.069e-3	296
152		min	-0.258	292	-0.464	292	-0.001	283	-5.102e-5	4	-2.166e-5	4	-6.697e-3	292
153	N156	max	0.148	302	0	309	0	283	7.783e-5	284	1.136e-4	4	3.776e-3	302
154		min	-0.191	299	-0.464	304	0	4	-5.354e-5	4	-1.472e-4	284	-4.345e-3	299
155	N262	max	0.274	289	0	309	0.026	4	1.797e-3	283	7.617e-4	290	3.651e-3	286
156		min	-0.324	290	-0.46	283	-0.028	290	-1.913e-3	4	-8.522e-4	284	-2.52e-3	283
157	N256	max	0.274	289	0	309	0.026	4	1.797e-3	283	7.617e-4	290	3.651e-3	286
158		min	-0.328	290	-0.45	283	-0.028	290	-1.913e-3	4	-8.522e-4	284	-2.52e-3	283
159	N307	max	0.273	283	0	309	0.025	284	1.797e-3	283	9.195e-4	284	6.855e-3	283
160		min	-0.331	284	-0.447	283	-0.032	290	-1.913e-3	4	-1.15e-3	290	-8.593e-3	284
161	N146	max	0.148	302	0	309	0.001	310	7.783e-5	284	3.804e-5	306	3.639e-3	302
162		min	-0.191	299	-0.443	299	-0.001	306	-5.354e-5	4	-2.624e-5	310	-4.797e-3	299
163	N268	max	0.275	289	0	309	0.026	4	1.797e-3	283	7.617e-4	290	3.651e-3	286
164		min	-0.333	290	-0.441	283	-0.028	290	-1.913e-3	4	-8.522e-4	284	-2.52e-3	283
165	N147	max	0.168	296	0	309	0.001	4	7.592e-5	284	1.338e-4	292	4.105e-3	296

Envelope Node Displacements (Continued)

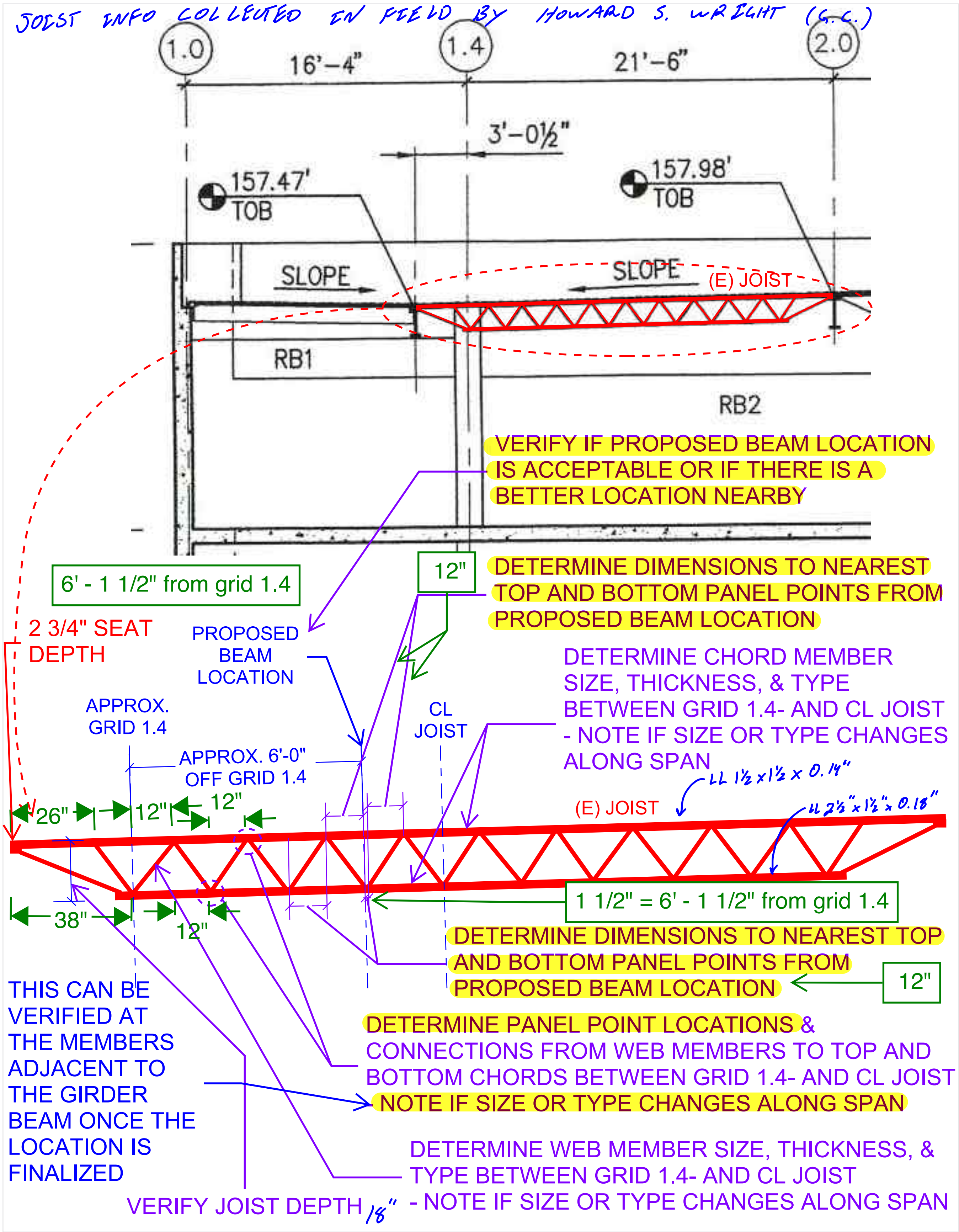
	Node Label		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation [rad]	LC	Y Rotation [rad]	LC	Z Rotation [rad]	LC
166		min	-0.258	292	-0.438	293	-0.001	284	-5.102e-5	4	-2.142e-5	283	-6.546e-3	292
167	N304	max	0.168	296	0	309	0.001	292	7.592e-5	284	2.447e-5	283	4.033e-3	296
168		min	-0.258	292	-0.435	292	-0.001	283	-5.102e-5	4	-4.939e-5	292	-6.845e-3	292
169	N165	max	0.276	289	0	309	0.026	4	1.797e-3	283	7.617e-4	290	3.651e-3	286
170		min	-0.338	290	-0.433	289	-0.028	290	-1.913e-3	4	-8.522e-4	284	-2.52e-3	283
171	N305	max	0.168	296	0	309	0.001	4	7.592e-5	284	4.67e-5	292	6.66e-3	292
172		min	-0.258	292	-0.425	293	-0.001	284	-5.102e-5	4	-8.593e-6	290	-7.379e-3	296
173	N311	max	0.148	302	0	309	0.001	310	7.783e-5	284	5.387e-5	306	3.614e-3	302
174		min	-0.191	299	-0.422	299	-0.001	306	-5.354e-5	4	-3.525e-5	310	-4.882e-3	299
175	N308	max	0.276	289	0	309	0.025	284	1.797e-3	283	9.195e-4	284	6.85e-3	289
176		min	-0.338	290	-0.403	289	-0.032	290	-1.913e-3	4	-1.15e-3	290	-8.492e-3	290
177	PB1-SW-CORNER	max	0.148	302	0	309	0	306	7.783e-5	284	5.387e-5	306	3.614e-3	302
178		min	-0.191	299	-0.346	298	0	310	-5.354e-5	4	-3.525e-5	310	-4.882e-3	299
179	N144	max	0.148	302	0	309	0	4	7.783e-5	284	5.387e-5	306	3.614e-3	302
180		min	-0.191	299	-0.34	298	0	283	-5.354e-5	4	-3.525e-5	310	-4.882e-3	299
181	PB1-SE-CORNER	max	0.168	296	0	309	0	283	7.592e-5	284	2.447e-5	283	4.033e-3	296
182		min	-0.258	292	-0.309	291	0	292	-5.102e-5	4	-4.939e-5	292	-6.845e-3	292
183	N101	max	0	309	0	309	0.174	298	1.626e-3	291	1.814e-4	298	0	309
184		min	-0.176	4	-0.304	298	-0.064	291	-4.507e-3	298	-3.752e-5	291	-4.374e-3	4
185	N143	max	0.168	296	0	309	0	290	7.592e-5	284	2.447e-5	283	4.033e-3	296
186		min	-0.258	292	-0.304	291	0	284	-5.102e-5	4	-4.939e-5	292	-6.845e-3	292
187	N98	max	0	309	0	309	0.174	298	1.627e-3	291	1.765e-4	298	0	309
188		min	-0.176	4	-0.264	4	-0.064	291	-4.507e-3	298	-3.659e-5	291	-4.372e-3	4
189	N95	max	0	309	0	309	0.174	298	1.611e-3	291	1.8e-4	298	0	309
190		min	-0.176	4	-0.258	4	-0.064	291	-4.428e-3	298	-3.729e-5	291	-4.373e-3	4
191	N99	max	0	309	0	309	0.177	298	1.611e-3	291	1.8e-4	298	0	309
192		min	-0.176	4	-0.257	298	-0.065	291	-4.428e-3	298	-3.729e-5	291	-4.373e-3	4
193	N100	max	0	309	0	309	0.179	298	1.596e-3	291	1.766e-4	298	0	309
194		min	-0.176	4	-0.21	298	-0.065	291	-4.348e-3	298	-3.661e-5	291	-4.374e-3	4
195	STRYKER-S	max	0	309	0	309	0.177	298	1.611e-3	291	1.8e-4	298	0	309
196		min	-0.176	4	-0.208	298	-0.065	291	-4.428e-3	298	-3.729e-5	291	-4.373e-3	4
197	N94	max	0	309	0	309	0.177	298	1.611e-3	291	1.8e-4	298	0	309
198		min	-0.176	4	-0.208	4	-0.065	291	-4.428e-3	298	-3.729e-5	291	-4.373e-3	4
199	N126	max	0	309	0	309	0.179	298	1.611e-3	291	1.8e-4	298	0	309
200		min	-0.176	4	-0.161	298	-0.065	291	-4.428e-3	298	-3.729e-5	291	-4.373e-3	4
201	N96	max	0	309	0	309	0.179	298	1.596e-3	291	1.823e-4	298	0	309
202		min	-0.176	4	-0.151	4	-0.065	291	-4.349e-3	298	-3.756e-5	291	-4.372e-3	4

EXISTING JOIST ANALYSIS

PRCTI20221788 - REVISON #6 4/5/2024

Structural Solutions

Project: MHS GS HYBRID OR
Job No: 23225
Subject: ALT FRAMING
Sheet
Name: ESO
Originating Office: ☐ Seattle ☒ Tacoma ☐ Portland
Date: 2024-02-06



JOIST INFO COLLECTED IN FIELD BY HOWARD S. WRIGHT (G.C.)

VERIFY IF PROPOSED BEAM LOCATION IS ACCEPTABLE OR IF THERE IS A BETTER LOCATION NEARBY

DETERMINE DIMENSIONS TO NEAREST TOP AND BOTTOM PANEL POINTS FROM PROPOSED BEAM LOCATION

DETERMINE CHORD MEMBER SIZE, THICKNESS, & TYPE BETWEEN GRID 1.4- AND CL JOIST - NOTE IF SIZE OR TYPE CHANGES ALONG SPAN

DETERMINE DIMENSIONS TO NEAREST TOP AND BOTTOM PANEL POINTS FROM PROPOSED BEAM LOCATION

THIS CAN BE VERIFIED AT THE MEMBERS ADJACENT TO THE GIRDER BEAM ONCE THE LOCATION IS FINALIZED

DETERMINE PANEL POINT LOCATIONS & CONNECTIONS FROM WEB MEMBERS TO TOP AND BOTTOM CHORDS BETWEEN GRID 1.4- AND CL JOIST NOTE IF SIZE OR TYPE CHANGES ALONG SPAN

DETERMINE WEB MEMBER SIZE, THICKNESS, & TYPE BETWEEN GRID 1.4- AND CL JOIST - NOTE IF SIZE OR TYPE CHANGES ALONG SPAN

VERIFY JOIST DEPTH 18"

PRCTI20221788 - REVISON #6 4/5/2024

PCS Structural *Solutions*

Project: ~~MHS HYBRID OR~~ Job No: 23-225

Subject: Calcs Sheet Name: ESO

Originating Office: ☐ Seattle ☒ Tacoma ☐ Portland Date: 2024-03-07

EXISTING JOISTS :

PER DESIGN DWGS, 18K3 @ 5'-9.2" O.C.

MAY BE 18K6 PER KEN CHARLES @ SJI (EMAIL 2024-02-13)

TOTAL SPAN ≈ $24'-7\frac{3}{8}"$

JOIST LOADING: $A_{eff} = 200 ft^2$ OUTSIDE "a" ZONE ≈ 13.88'

		DL	Lr	SL	WL	
ROOF LOADING:	TRY	15	20	25	+16/-38.7	PSF
	↳ w =	86.5	116	144	+93/-224	PLF

$w_{max} = DL + 0.75 S + 0.45 WL = 237$ PLF

FROM 1994 K-SERIES LOAD TABLES BY SJI,

18K3 SPANNING 24.61' = 294/214 TOTAL/LIVE
18K6 SPANNING 24.61' = 435/305 TOTAL/LIVE

∴ 18K3 OK

NEW JOIST SPANS = $3'-0\frac{1}{2}" + 6'-1\frac{1}{2}" = 9'-2"$
$+ 21.5' - (6'-1\frac{1}{2}") = 15.375'$

FROM QUICK BM CHECK OF ORIGINAL + NEW SHEARS

ORIGINAL SHEAR ⇒ $V_{a @ 9'-2"} = 0.36^k$;
NEW MAX SHEAR (LONG SPAN) = 2.04^k ;

∴ NEED MORE IN-DEPTH MODEL ⇒ USE RISA

PRCTI20221788 - REVISON #6 4/5/2024

PCS Structural Solutions

Project: ~~MHS HYBRID OR~~ Job No: 23-225
Subject: Calcs Sheet
Name: ESO
Originating Office: ☐ Seattle ☒ Tacoma ☐ Portland
Date: 2024-03-07

EXISTING JOISTS: CONT'D

RISA MODEL NOTES:

TOP CHORD: FIELD MEASURED BY G.C. => $LL 1\frac{1}{2}" \times 1\frac{1}{2}" \times 0.14"$ w/ 0.75" GAP

BOT CHORD: FIELD MEASURED BY G.C. => $LL 2\frac{1}{2}" \times 1\frac{1}{2}" \times 0.18"$ w/ 0.75" GAP

TYP. WEB → 0.75" Ø ROUND

CHANGES TO 5/8" Ø ROUND @ 8'
↳ ASSUME SYMMETRICAL ABOUT ℄ = 5/8" TO ≈ 16.61'

FROM RISA MODEL, TOP CHORD + END DIAGONALS ARE OVERSTRESSED.

HOWEVER, FROM SJI LOAD TABLES, LOADS ARE ACCEPTABLE

ADDITIONALLY, ALL MEMBER DCR ≤ 1.0 IN REVISED CONDITION

END WEB MEMBER = $LL 1\frac{1}{2}" \times 2\frac{1}{2}" \times 0.25"$ NO GAP OK

MAX END RXN, $P_a = 5.38^k \le 0.928(3)(L) \Rightarrow L_{3/16 \text{ FILLET}} \geq 1.94"$: (2) SIDES @ 1"

MAX RXN @ INTERMEDIATE END = $2.18^k \le 0.928(3)(L) \Rightarrow L_{3/16 \text{ FILLET}} \geq 0.77"$

MAX JOIST END RXN =

SHORT JOIST: 1.50^k DOWN, 1.51^k UP (P_a)
LONG JOIST: 2.42^k DOWN, 2.40^k UP (P_a) $\le \frac{1}{8}" \times 2\frac{1}{2}"$ WELD
$= 0.928(2)(2\frac{1}{2}")(2 \text{ SIDES}) = 9.28^k$ ✓ OK

PROV. ADD'L BRIDGING EA. END

EXISTING JOISTS: CONT'D

CHECK CONN @ HANGING COL:

$P_u = \pm 2.42^K \le 0.928(4)(3\frac{1}{2}") = 13.0^K$ ✓ SIDE WELDS

$M = 2.42^K (e = 3") = 7.26^{K \cdot IN}$

$T/C = M/d = 7.26^{K \cdot IN} / 3.5" = 2.08^K \le 0.928(4)(3") = 11.1^K$ ✓ TOP+BOT

∴ PROV 1/4" EFFECTIVE EVERYWHERE

ANGLE BENDING:

$M_n/\Omega = (F_y bh^2/4)/1.67$

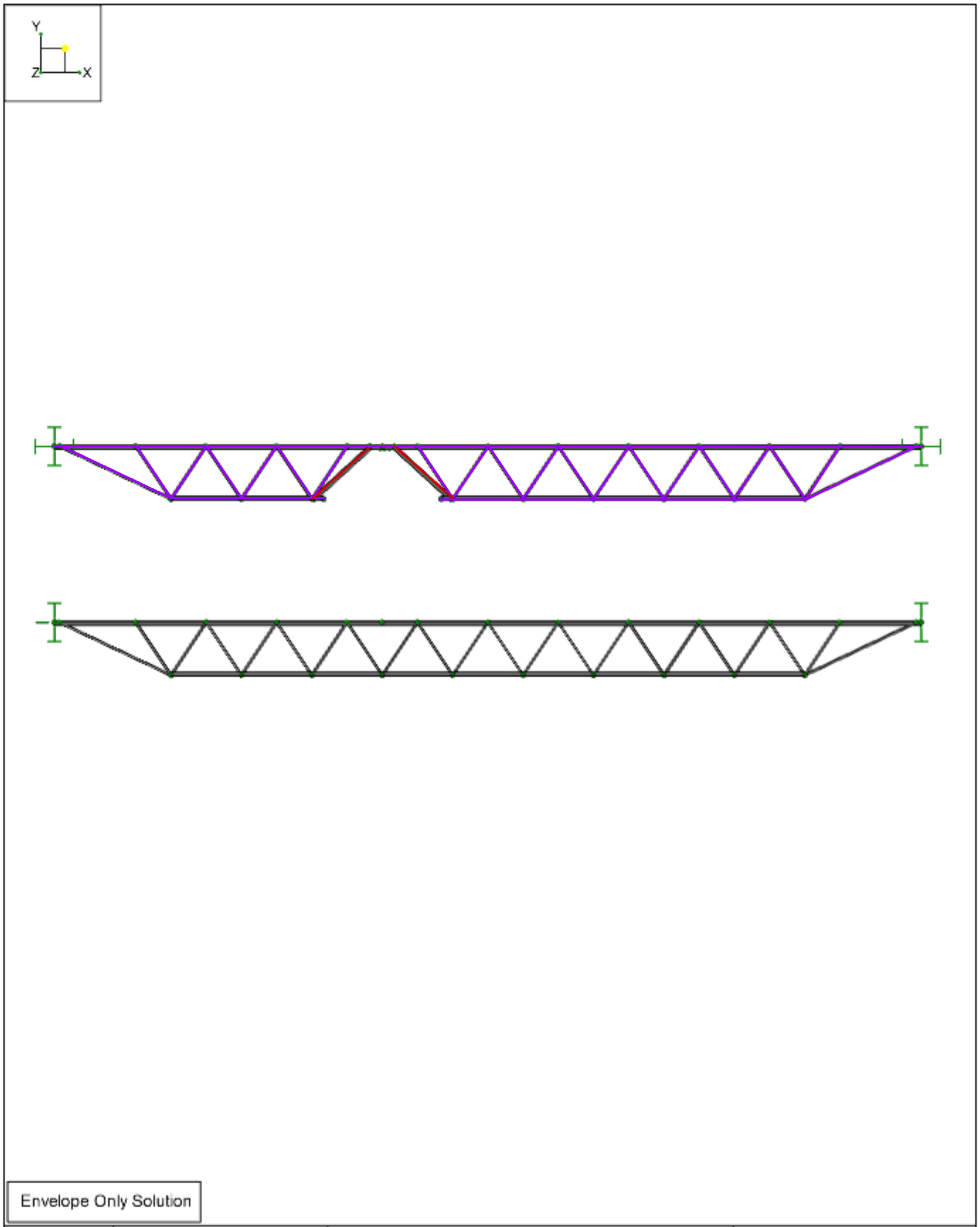
$= [(36 KSI)(4")(5/8")^2/4]/1.67 = 8.42^{K \cdot IN} \ge M_u = 7.26^{K \cdot IN}$ ✓ OK

∴ L 5x3½x5/8 x 0'-4" OK

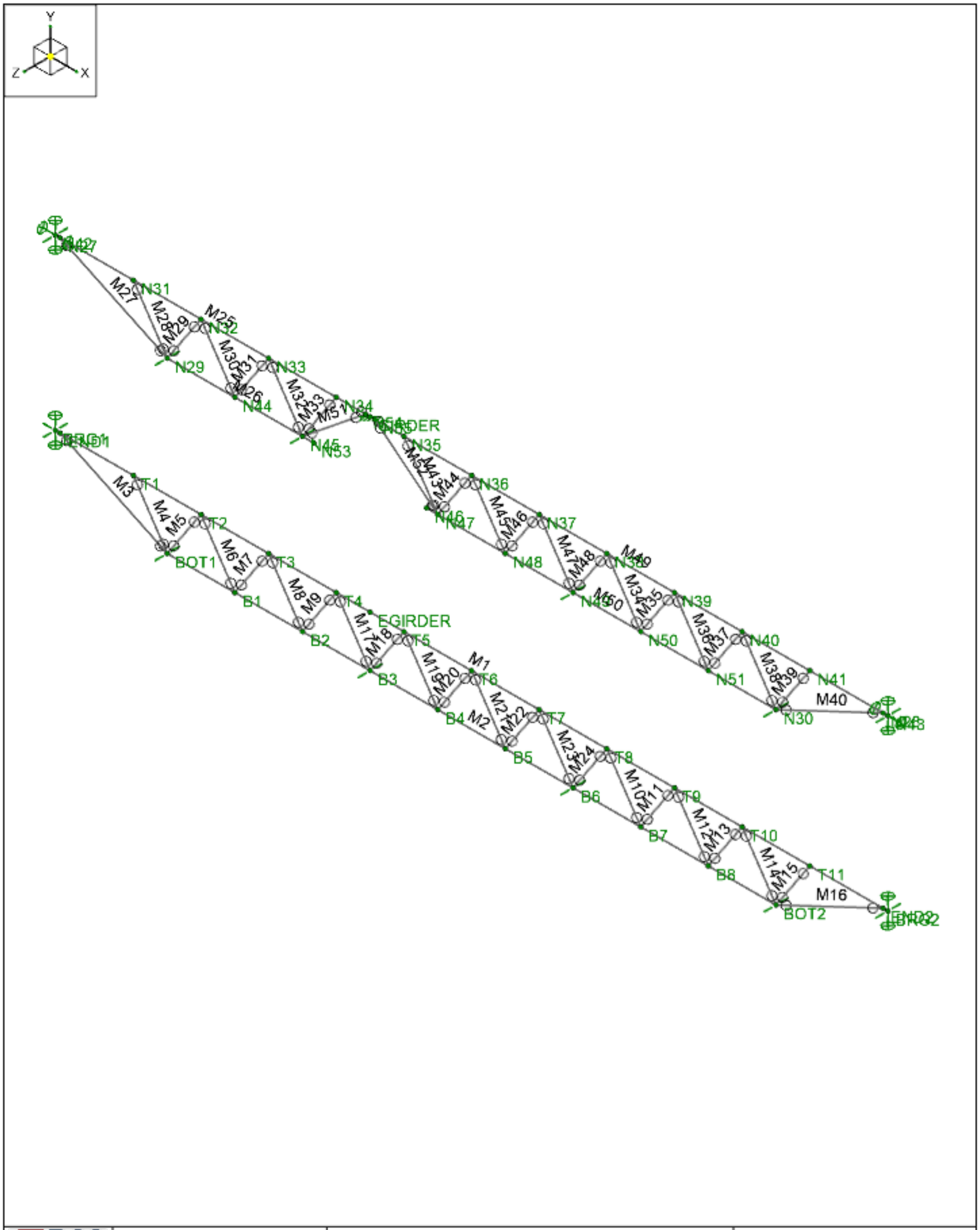
PRCTI20221788 - REVISON #6 4/5/2024

STANDARD LOAD TABLE/OPEN WEB STEEL JOISTS, K-SERIES
Based on a Maximum Allowable Tensile Stress of 30 ksi

Joist Designation	18K3	18K4	18K5	18K6	18K7	18K9	18K10	20K3	20K4	20K5	20K6	20K7	20K9	20K10	22K4	22K5	22K6	22K7	22K9	22K10	22K11
Depth (In.)	18	18	18	18	18	18	18	20	20	20	20	20	20	20	22	22	22	22	22	22	22
Approx. Wt. (lbs./ft.)	6.6	7.2	7.7	8.5	9.0	10.2	11.7	6.7	7.6	8.2	8.9	9.3	10.8	12.2	8.0	8.8	9.2	9.7	11.3	12.6	13.8
Span (ft.) ↓																					
18	550 550	550 550	550 550	550 550	550 550	550 550	550 550														
19	514 494	550 523	550 523	550 523	550 523	550 523	550 523														
20	463 423	550 490	550 490	550 490	550 490	550 490	550 490	517 517	550 550	550 550	550 550	550 550	550 550	550 550							
21	420 364	506 426	550 460	550 460	550 460	550 460	550 460	468 453	550 520	550 520	550 520	550 520	550 520	550 520							
22	382 316	460 370	518 414	550 438	550 438	550 438	550 438	426 393	514 461	550 490	550 490	550 490	550 490	550 490	550 548	550 548	550 548	550 548	550 548	550 548	550 548
23	349 276	420 323	473 362	516 393	550 418	550 418	550 418	389 344	469 402	529 451	550 468	550 468	550 468	550 468	518 491	550 518	550 518	550 518	550 518	550 518	550 518
24	320 242	385 284	434 318	473 345	526 382	550 396	550 396	357 302	430 353	485 396	528 430	550 448	550 448	550 448	475 431	536 483	550 495	550 495	550 495	550 495	550 495
25	294 214	355 250	400 281	435 305	485 337	550 377	550 377	329 266	396 312	446 350	486 380	541 421	550 426	550 426	438 381	493 427	537 464	550 474	550 474	550 474	550 474
26	272 190	328 222	369 249	402 271	448 299	538 354	550 361	304 236	366 277	412 310	449 337	500 373	550 405	550 405	404 338	455 379	496 411	550 454	550 454	550 454	550 454
27	252 169	303 198	342 222	372 241	415 267	498 315	550 347	281 211	339 247	382 277	416 301	463 333	550 389	550 389	374 301	422 337	459 367	512 406	550 432	550 432	550 432
28	234 151	282 177	318 199	346 216	385 239	463 282	548 331	261 189	315 221	355 248	386 269	430 298	517 353	550 375	348 270	392 302	427 328	475 364	550 413	550 413	550 413
29	218 136	263 159	296 179	322 194	359 215	431 254	511 298	243 170	293 199	330 223	360 242	401 268	482 317	550 359	324 242	365 272	398 295	443 327	532 387	550 399	550 399
30	203 123	245 144	276 161	301 175	335 194	402 229	477 269	227 153	274 179	308 201	336 218	374 242	450 286	533 336	302 219	341 245	371 266	413 295	497 349	550 385	550 385
31	190 111	229 130	258 146	281 158	313 175	376 207	446 243	212 138	256 162	289 182	314 198	350 219	421 259	499 304	283 198	319 222	347 241	387 267	465 316	550 369	550 369
32	178 101	215 118	242 132	264 144	294 159	353 188	418 221	199 126	240 147	271 165	295 179	328 199	395 235	468 276	265 180	299 201	326 219	363 242	436 287	517 337	549 355
33	168 92	202 108	228 121	248 131	276 145	332 171	393 201	187 114	226 134	254 150	277 163	309 181	371 214	440 251	249 164	281 183	306 199	341 221	410 261	486 307	532 334
34	158 84	190 98	214 110	233 120	260 132	312 156	370 184	176 105	212 122	239 137	261 149	290 165	349 195	414 229	235 149	265 167	288 182	321 202	386 239	458 280	516 314
35	149 77	179 90	202 101	220 110	245 121	294 143	349 168	166 96	200 112	226 126	246 137	274 151	329 179	390 210	221 137	249 153	272 167	303 185	364 219	432 257	494 292
36	141 70	169 82	191 92	208 101	232 111	278 132	330 154	157 88	189 103	213 115	232 125	259 139	311 164	369 193	209 126	236 141	257 153	286 169	344 201	408 236	467 269
37								148 81	179 95	202 106	220 115	245 128	294 151	349 178	198 116	223 130	243 141	271 156	325 185	386 217	442 247
38								141 74	170 87	191 98	208 106	232 118	279 139	331 164	187 107	211 119	230 130	256 144	308 170	366 200	419 228
39								133 69	161 81	181 90	198 98	220 109	265 129	314 151	178 98	200 110	218 120	243 133	292 157	347 185	397 211
40								127 64	153 75	172 84	188 91	209 101	251 119	298 140	169 91	190 102	207 111	231 123	278 146	330 171	377 195
41															161 85	181 95	197 103	220 114	264 135	314 159	359 181
42															153 79	173 88	188 96	209 106	252 126	299 148	342 168
43															146 73	165 82	179 89	200 99	240 117	285 138	326 157
44															139 68	157 76	171 83	191 92	229 109	272 128	311 146



PCS Structural Solutions	Joist	SK-1
ESO		23225 Joist v1.0 2024-03-0...
23225		



PCS Structural Solutions	PCS Structural Solutions	Joist	SK-1
	ESO		23225 Joist v1.0 2024-03-07...
	23225		

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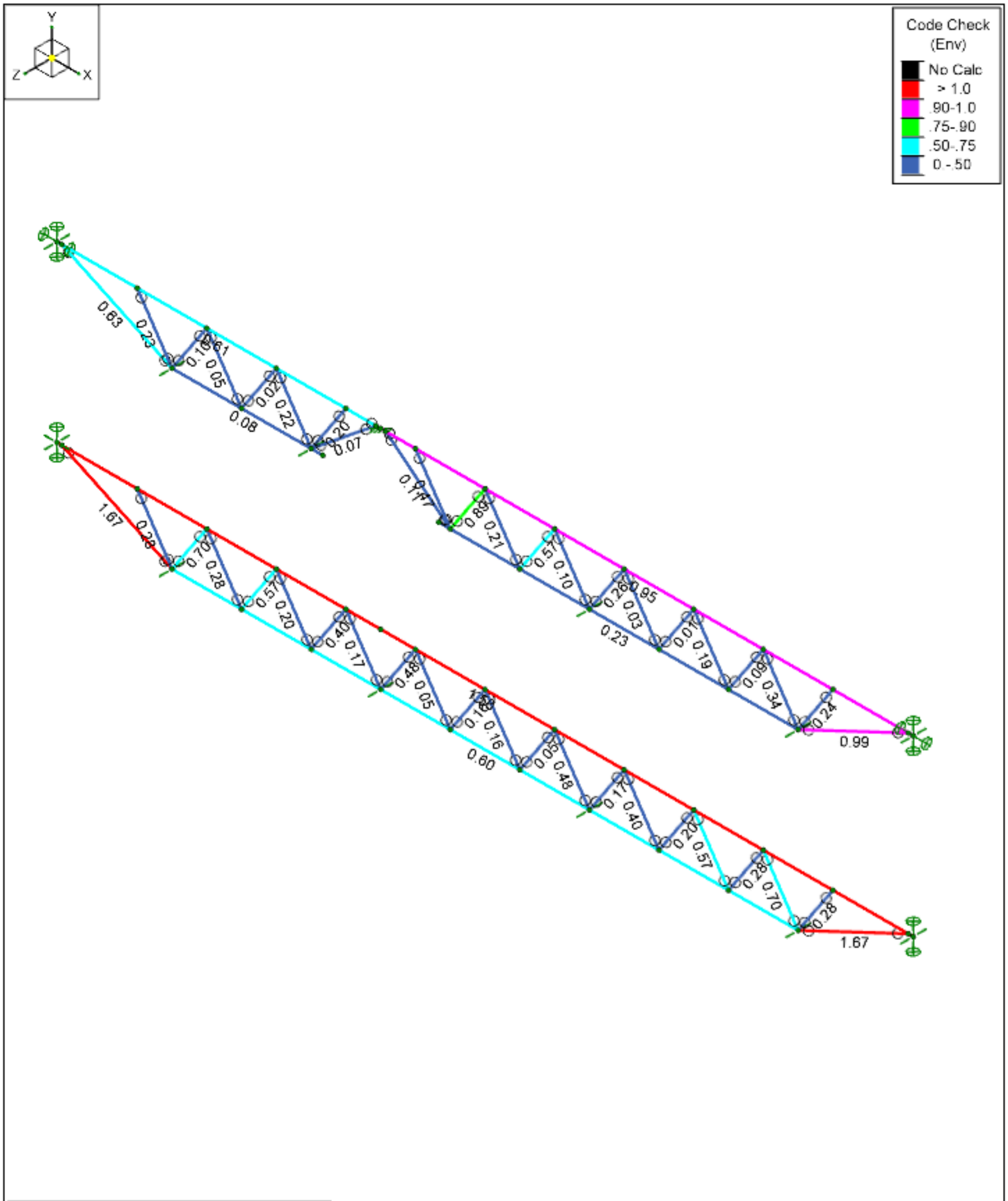

Member Code Checks Displayed (Enveloped)
Envelope Only Solution

	PCS Structural Solutions	Joist	SK-2
	ESO		23225 Joist v1.0 2024-03-07…
	23225		

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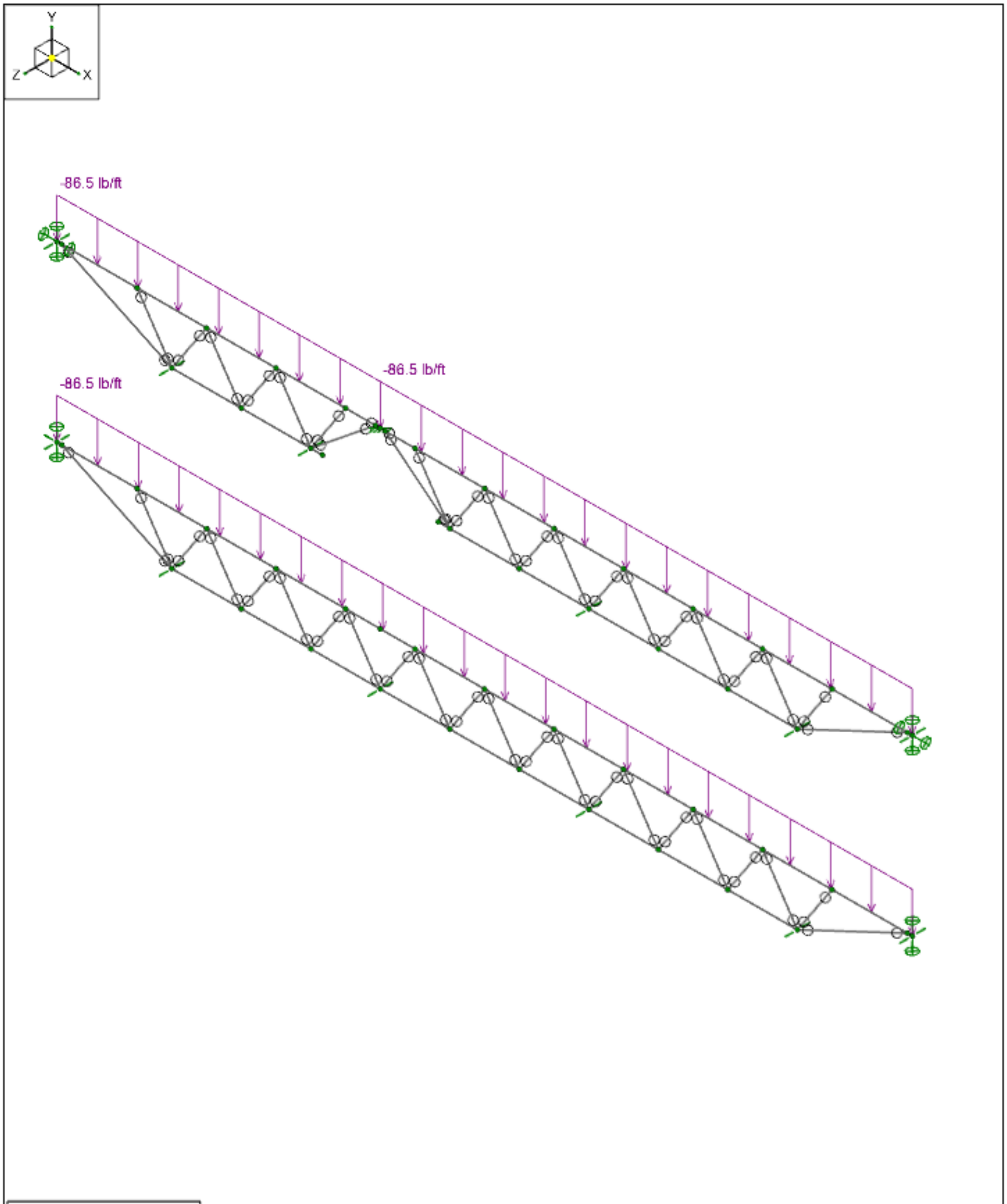
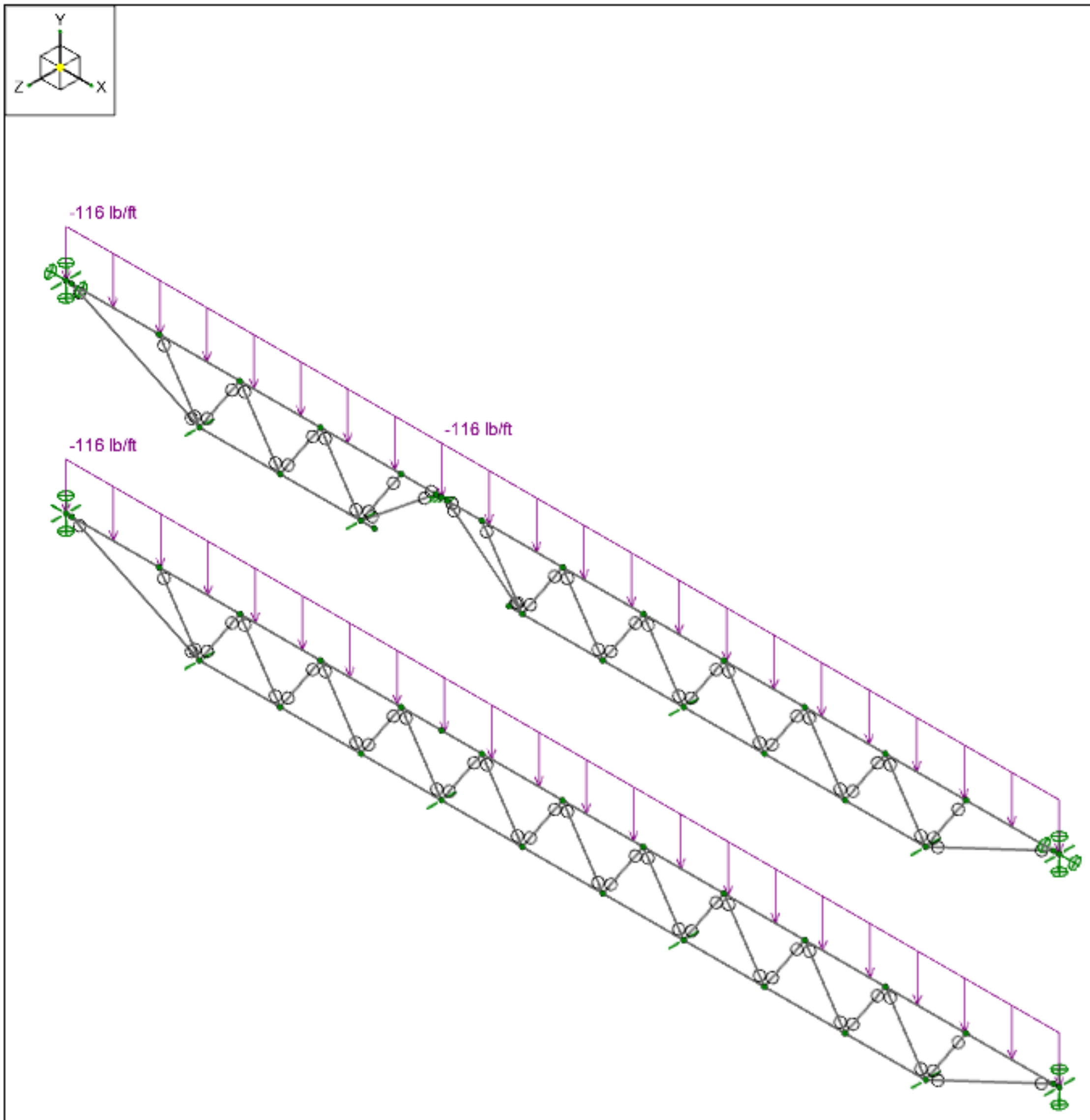


Loads: BLC 2, Dead Load
Envelope Only Solution

	PCS Structural Solutions	Joist	SK-3
	ESO		23225 Joist v1.0 2024-03-07...
	23225		

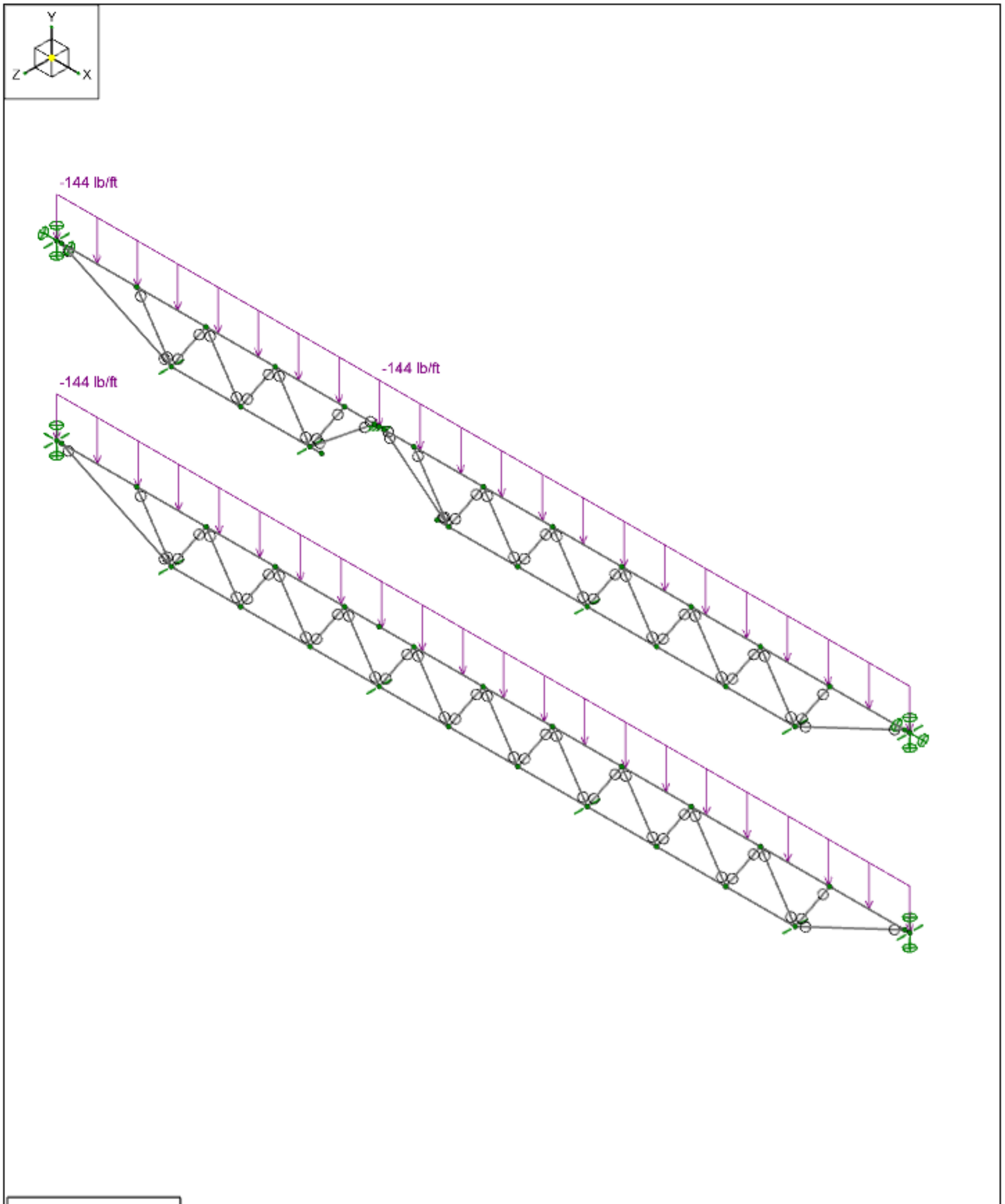


Loads: BLC 3, Live Roof
Envelope Only Solution

PCS Structural Solutions
ESO
23225

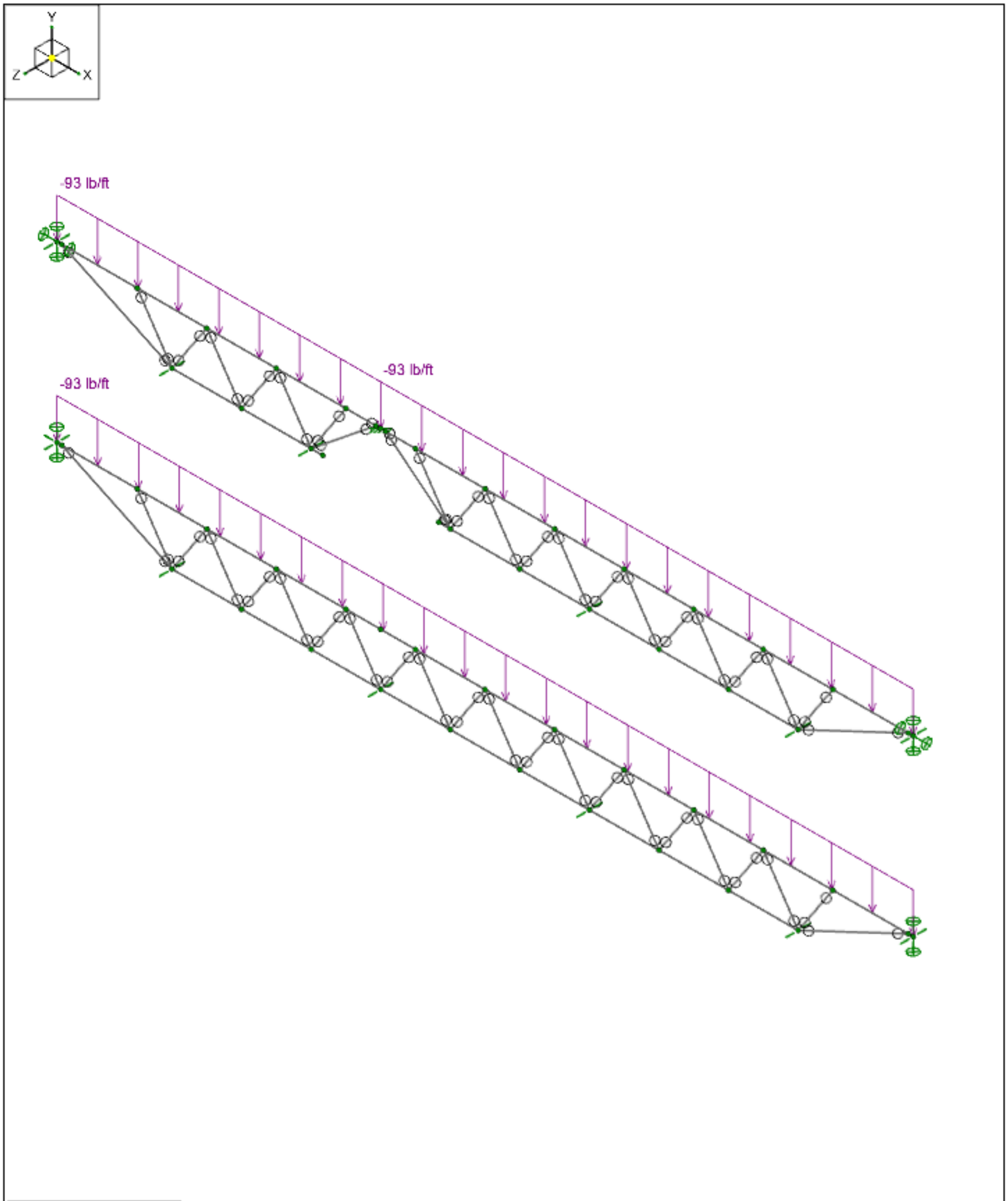
Joist

SK-4
23225 Joist v1.0 2024-03-07...



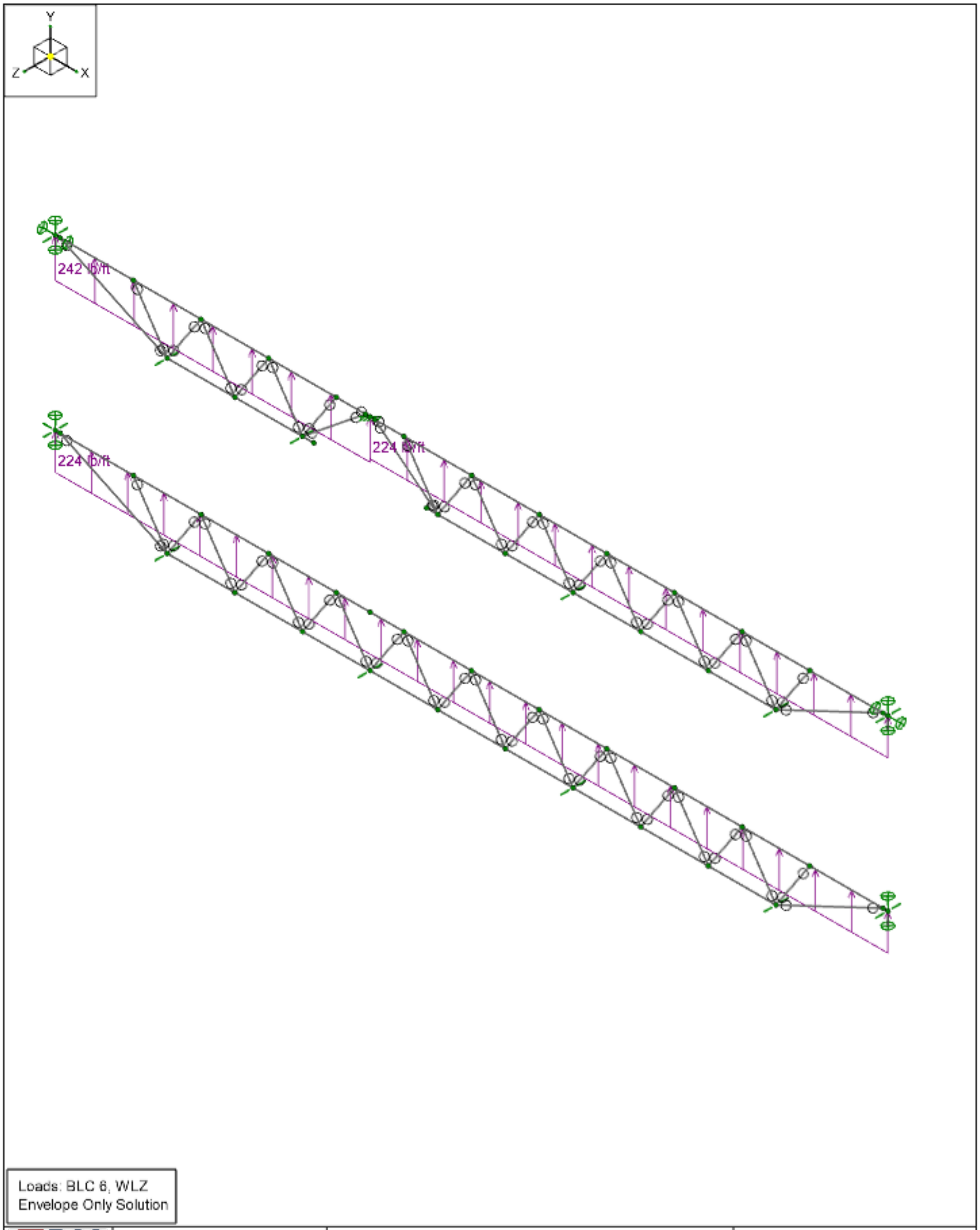
Loads: BLC 4, Snow
Envelope Only Solution

PCS Structural Solutions	Joist	SK-5
ESO		23225 Joist v1.0 2024-03-07...
23225		



Loads: BLC 5, WLX
Envelope Only Solution

PCS Structural Solutions	Joist	SK-6
ESO		23225 Joist v1.0 2024-03-07...
23225		



PCS Structural Solutions	Joist	SK-7
ESO		23225 Joist v1.0 2024-03-07…
23225		

Node Coordinates

	Label	X [in]	Y [in]	Z [in]	Detach From Diaphragm
1	END1	0	0	0	
2	END2	292	0	0	
3	BOT1	38	-18	0	
4	BOT2	254	-18	0	
5	T1	26	0	0	
6	T2	50	0	0	
7	T3	74	0	0	
8	T4	98	0	0	
9	T5	122	0	0	
10	T6	146	0	0	
11	T7	170	0	0	
12	T8	194	0	0	
13	T9	218	0	0	
14	T10	242	0	0	
15	T11	266	0	0	
16	BRG1	-1.688	0	0	
17	BRG2	293.688	0	0	
18	B1	62	-18	0	
19	B2	86	-18	0	
20	B3	110	-18	0	
21	B4	134	-18	0	
22	B5	158	-18	0	
23	B6	182	-18	0	
24	B7	206	-18	0	
25	B8	230	-18	0	
26	EGIRDER	110	0	0	
27	N27	0	60	0	
28	N28	292	60	0	
29	N29	38	42	0	
30	N30	254	42	0	
31	N31	26	60	0	
32	N32	50	60	0	
33	N33	74	60	0	
34	N34	98	60	0	
35	N35	122	60	0	
36	N36	146	60	0	
37	N37	170	60	0	
38	N38	194	60	0	
39	N39	218	60	0	
40	N40	242	60	0	
41	N41	266	60	0	
42	N42	-1.688	60	0	
43	N43	293.688	60	0	
44	N44	62	42	0	
45	N45	86	42	0	
46	N46	130	42	0	
47	N47	134	42	0	
48	N48	158	42	0	
49	N49	182	42	0	
50	N50	206	42	0	
51	N51	230	42	0	
52	GIRDER	110	60	0	
53	N53	90	42	0	
54	N54	105.75	60	0	
55	N55	114.25	60	0	

Node Boundary Conditions

	Node Label	X [k/in]	Y [k/in]	Z [k/in]	X Rot [k-ft/rad]	Y Rot [k-ft/rad]	Z Rot [k-ft/rad]
1	BOT1			Reaction			
2	BOT2			Reaction			
3	N29			Reaction			
4	N30			Reaction			
5	N45			Reaction			
6	GIRDER	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction
7	B3			Reaction			
8	B6			Reaction			
9	BRG2		Reaction	Reaction		Reaction	
10	BRG1	Reaction	Reaction	Reaction		Reaction	
11	N42		Reaction	Reaction	Reaction	Reaction	
12	N43		Reaction	Reaction	Reaction	Reaction	
13	N49			Reaction			

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm. Coeff. [1e^5°F^{-1}]	Density [k/ft^3]	Yield [ksi]	Ry	Fu [ksi]	Rt
1	A992	29000	11154	0.3	0.65	0.49	50	1.1	65	1.1
2	A36 Gr.36	29000	11154	0.3	0.65	0.49	36	1.5	58	1.2
3	A572 Gr.50	29000	11154	0.3	0.65	0.49	50	1.1	65	1.1
4	A500 Gr.B RND	29000	11154	0.3	0.65	0.527	42	1.4	58	1.3
5	A500 Gr.B RECT	29000	11154	0.3	0.65	0.527	46	1.4	58	1.3
6	A500 Gr.C RND	29000	11154	0.3	0.65	0.527	46	1.4	62	1.3
7	A500 Gr.C RECT	29000	11154	0.3	0.65	0.527	50	1.4	62	1.3
8	A53 Gr.B	29000	11154	0.3	0.65	0.49	35	1.6	60	1.2
9	A1085	29000	11154	0.3	0.65	0.49	50	1.4	65	1.3
10	A913 Gr.65	29000	11154	0.3	0.65	0.49	65	1.1	80	1.1

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design Rule	Area [in^2]	Iyy [in^4]	Izz [in^4]	J [in^4]
1	Joist Top Chord	LL1.5X1.5X0.15625X0_ASD7TH	Beam	Double Angle (No Gap)	A36 Gr.36	Typical	0.888	0.354	0.189	0.007
2	Joist Bot Chord	LL1.5X2.5X0.18X0.75	Beam	Double Angle (No Gap)	A36 Gr.36	Typical	1.375	2.949	0.246	0.014
3	Joist Web 1	.75DIA	Column	BAR	A36 Gr.36	Typical	0.442	0.016	0.016	0.031
4	Joist Web 2	.625-DIA	Column	BAR	A36 Gr.36	Typical	0.307	0.007	0.007	0.015
5	New Web End	LL1.5X2.5X4X0	Column	Double Angle (No Gap)	A36 Gr.36	Typical	1.89	2.59	0.316	0.042

Member Primary Data

	Label	I Node	J Node	Rotate(deg)	Section/Shape	Type	Design List	Material	Design Rule
1	M1	BRG1	BRG2		Joist Top Chord	Beam	Double Angle (No Gap)	A36 Gr.36	Typical
2	M2	BOT1	BOT2	180	Joist Bot Chord	Beam	Double Angle (No Gap)	A36 Gr.36	Typical
3	M3	END1	BOT1		Joist Web 1	Column	BAR	A36 Gr.36	Typical
4	M4	T1	BOT1		Joist Web 1	Column	BAR	A36 Gr.36	Typical
5	M5	BOT1	T2		Joist Web 1	Column	BAR	A36 Gr.36	Typical
6	M6	T2	B1		Joist Web 1	Column	BAR	A36 Gr.36	Typical
7	M7	B1	T3		Joist Web 1	Column	BAR	A36 Gr.36	Typical
8	M8	T3	B2		Joist Web 1	Column	BAR	A36 Gr.36	Typical
9	M9	B2	T4		Joist Web 1	Column	BAR	A36 Gr.36	Typical
10	M10	T8	B7		Joist Web 1	Column	BAR	A36 Gr.36	Typical
11	M11	B7	T9		Joist Web 1	Column	BAR	A36 Gr.36	Typical
12	M12	T9	B8		Joist Web 1	Column	BAR	A36 Gr.36	Typical
13	M13	B8	T10		Joist Web 1	Column	BAR	A36 Gr.36	Typical
14	M14	T10	BOT2		Joist Web 1	Column	BAR	A36 Gr.36	Typical

Member Primary Data (Continued)

	Label	I Node	J Node	Rotate(deg)	Section/Shape	Type	Design List	Material	Design Rule
15	M15	BOT2	T11		Joist Web 1	Column	BAR	A36 Gr.36	Typical
16	M16	BOT2	END2		Joist Web 1	Column	BAR	A36 Gr.36	Typical
17	M17	T4	B3		Joist Web 2	Column	BAR	A36 Gr.36	Typical
18	M18	B3	T5		Joist Web 2	Column	BAR	A36 Gr.36	Typical
19	M19	T5	B4		Joist Web 2	Column	BAR	A36 Gr.36	Typical
20	M20	B4	T6		Joist Web 2	Column	BAR	A36 Gr.36	Typical
21	M21	T6	B5		Joist Web 2	Column	BAR	A36 Gr.36	Typical
22	M22	B5	T7		Joist Web 2	Column	BAR	A36 Gr.36	Typical
23	M23	T7	B6		Joist Web 2	Column	BAR	A36 Gr.36	Typical
24	M24	B6	T8		Joist Web 2	Column	BAR	A36 Gr.36	Typical
25	M25	N42	GIRDER		Joist Top Chord	Beam	Double Angle (No Gap)	A36 Gr.36	Typical
26	M26	N29	N53	180	Joist Bot Chord	Beam	Double Angle (No Gap)	A36 Gr.36	Typical
27	M27	N27	N29		Joist Web 1	Column	BAR	A36 Gr.36	Typical
28	M28	N31	N29		Joist Web 1	Column	BAR	A36 Gr.36	Typical
29	M29	N29	N32		Joist Web 1	Column	BAR	A36 Gr.36	Typical
30	M30	N32	N44		Joist Web 1	Column	BAR	A36 Gr.36	Typical
31	M31	N44	N33		Joist Web 1	Column	BAR	A36 Gr.36	Typical
32	M32	N33	N45		Joist Web 1	Column	BAR	A36 Gr.36	Typical
33	M33	N45	N34		Joist Web 1	Column	BAR	A36 Gr.36	Typical
34	M34	N38	N50		Joist Web 1	Column	BAR	A36 Gr.36	Typical
35	M35	N50	N39		Joist Web 1	Column	BAR	A36 Gr.36	Typical
36	M36	N39	N51		Joist Web 1	Column	BAR	A36 Gr.36	Typical
37	M37	N51	N40		Joist Web 1	Column	BAR	A36 Gr.36	Typical
38	M38	N40	N30		Joist Web 1	Column	BAR	A36 Gr.36	Typical
39	M39	N30	N41		Joist Web 1	Column	BAR	A36 Gr.36	Typical
40	M40	N30	N28		Joist Web 1	Column	BAR	A36 Gr.36	Typical
41	M43	N35	N47		Joist Web 2	Column	BAR	A36 Gr.36	Typical
42	M44	N47	N36		Joist Web 2	Column	BAR	A36 Gr.36	Typical
43	M45	N36	N48		Joist Web 2	Column	BAR	A36 Gr.36	Typical
44	M46	N48	N37		Joist Web 2	Column	BAR	A36 Gr.36	Typical
45	M47	N37	N49		Joist Web 2	Column	BAR	A36 Gr.36	Typical
46	M48	N49	N38		Joist Web 2	Column	BAR	A36 Gr.36	Typical
47	M49	GIRDER	N43		Joist Top Chord	Beam	Double Angle (No Gap)	A36 Gr.36	Typical
48	M50	N46	N30	180	Joist Bot Chord	Beam	Double Angle (No Gap)	A36 Gr.36	Typical
49	M51	N45	N54		New Web End	Column	Double Angle (No Gap)	A36 Gr.36	Typical
50	M52	N47	N55		New Web End	Column	Double Angle (No Gap)	A36 Gr.36	Typical

Member Distributed Loads (BLC 2 : Dead Load)

	Member Label	Direction	Start Magnitude [lb/ft, F, psf, k-ft/in]	End Magnitude [lb/ft, F, psf, k-ft/in]	Start Location [(in, %)]	End Location [(in, %)]
1	M1	Y	-86.5	-86.5	0	%100
2	M25	Y	-86.5	-86.5	0	%100
3	M49	Y	-86.5	-86.5	0	%100

Member Distributed Loads (BLC 3 : Live Roof)

	Member Label	Direction	Start Magnitude [lb/ft, F, psf, k-ft/in]	End Magnitude [lb/ft, F, psf, k-ft/in]	Start Location [(in, %)]	End Location [(in, %)]
1	M1	Y	-116	-116	0	%100
2	M25	Y	-116	-116	0	%100
3	M49	Y	-116	-116	0	%100

Member Distributed Loads (BLC 4 : Snow)

	Member Label	Direction	Start Magnitude [lb/ft, F, psf, k-ft/in]	End Magnitude [lb/ft, F, psf, k-ft/in]	Start Location [(in, %)]	End Location [(in, %)]
1	M1	Y	-144	-144	0	%100
2	M25	Y	-144	-144	0	%100
3	M49	Y	-144	-144	0	%100

Member Distributed Loads (BLC 5 : WLX)

	Member Label	Direction	Start Magnitude [lb/ft, F, psf, k-ft/in]	End Magnitude [lb/ft, F, psf, k-ft/in]	Start Location [(in, %)]	End Location [(in, %)]
1	M1	Y	-93	-93	0	%100
2	M25	Y	-93	-93	0	%100
3	M49	Y	-93	-93	0	%100

Member Distributed Loads (BLC 6 : WLZ)

	Member Label	Direction	Start Magnitude [lb/ft, F, psf, k-ft/in]	End Magnitude [lb/ft, F, psf, k-ft/in]	Start Location [(in, %)]	End Location [(in, %)]
1	M1	Y	224	224	0	%100
2	M25	Y	242	242	0	%100
3	M49	Y	224	224	0	%100

Basic Load Cases

	BLC Description	Category	Y Gravity	Distributed
1	Self Wt	DL	-1	
2	Dead Load	DL		3
3	Live Roof	RLL		3
4	Snow	SL		3
5	WLX	WLX		3
6	WLZ	WLZ		3
7	ELX	ELX		
8	ELZ	ELZ		

Load Combinations

	Description	Solve	P-Delta	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
1	Deflection 1	Yes	Y	DL	1.1														
2	Deflection 2	Yes	Y	SL	1														
3	Deflection 3	Yes	Y	DL	1.1	SL	1												
4	IBC 21/ASCE ASD 1	Yes	Y	DL	1.1														
5	IBC 21/ASCE ASD 2	Yes	Y	DL	1.1	LL	1	LLS	1										
6	IBC 21/ASCE ASD 3 (b)	Yes	Y	DL	1.1	SL	1	SLN	1										
7	IBC 21/ASCE ASD 4 (b)	Yes	Y	DL	1.1	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75						
8	IBC 21/ASCE ASD 5 (a) (a)	Yes	Y	DL	1.1	WLX	0.6												
9	IBC 21/ASCE ASD 5 (a) (b)	Yes	Y	DL	1.1	WLZ	0.6												
10	IBC 21/ASCE ASD 5 (a) (c)	Yes	Y	DL	1.1	WLX	-0.6												
11	IBC 21/ASCE ASD 5 (a) (d)	Yes	Y	DL	1.1	WLZ	-0.6												
12	IBC 21/ASCE ASD 6 (a) (a)	Yes	Y	DL	1.1	WLX	0.45	LL	0.75	LLS	0.75								
13	IBC 21/ASCE ASD 6 (a) (b)	Yes	Y	DL	1.1	WLZ	0.45	LL	0.75	LLS	0.75								
14	IBC 21/ASCE ASD 6 (a) (c)	Yes	Y	DL	1.1	WLX	-0.45	LL	0.75	LLS	0.75								
15	IBC 21/ASCE ASD 6 (a) (d)	Yes	Y	DL	1.1	WLZ	-0.45	LL	0.75	LLS	0.75								
16	IBC 21/ASCE ASD 6 (b) (a)	Yes	Y	DL	1.1	WLX	0.45	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75				
17	IBC 21/ASCE ASD 6 (b) (b)	Yes	Y	DL	1.1	WLZ	0.45	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75				
18	IBC 21/ASCE ASD 6 (b) (c)	Yes	Y	DL	1.1	WLX	-0.45	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75				
19	IBC 21/ASCE ASD 6 (b) (d)	Yes	Y	DL	1.1	WLZ	-0.45	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75				
20	IBC 21/ASCE ASD 7 (a)	Yes	Y	DL	0.6	WLX	0.6												

Load Combinations (Continued)

	Description	Solve	P-Delta	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
21	IBC 21/ASCE ASD 7 (b)	Yes	Y	DL	0.6	WLZ	0.6												
22	IBC 21/ASCE ASD 7 (c)	Yes	Y	DL	0.6	WLX	-0.6												
23	IBC 21/ASCE ASD 7 (d)	Yes	Y	DL	0.6	WLZ	-0.6												
24	IBC 21/ASCE ASD 8 (a)	Yes	Y	DL	1.1	Sds*DL	0.14	ELX	0.7	ELZ	0.21								
25	IBC 21/ASCE ASD 8 (b)	Yes	Y	DL	1.1	Sds*DL	0.14	ELZ	0.7	ELX	0.21								
26	IBC 21/ASCE ASD 8 (c)	Yes	Y	DL	1.1	Sds*DL	0.14	ELX	0.7	ELZ	-0.21								
27	IBC 21/ASCE ASD 8 (d)	Yes	Y	DL	1.1	Sds*DL	0.14	ELZ	0.7	ELX	-0.21								
28	IBC 21/ASCE ASD 8 (e)	Yes	Y	DL	1.1	Sds*DL	0.14	ELX	-0.7	ELZ	-0.21								
29	IBC 21/ASCE ASD 8 (f)	Yes	Y	DL	1.1	Sds*DL	0.14	ELZ	-0.7	ELX	-0.21								
30	IBC 21/ASCE ASD 8 (g)	Yes	Y	DL	1.1	Sds*DL	0.14	ELX	-0.7	ELZ	0.21								
31	IBC 21/ASCE ASD 8 (h)	Yes	Y	DL	1.1	Sds*DL	0.14	ELZ	-0.7	ELX	0.21								
32	IBC 21/ASCE ASD 9 (a)	Yes	Y	DL	1.1	Sds*DL	0.105	ELX	0.525	ELZ	0.158	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75
33	IBC 21/ASCE ASD 9 (b)	Yes	Y	DL	1.1	Sds*DL	0.105	ELZ	0.525	ELX	0.158	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75
34	IBC 21/ASCE ASD 9 (c)	Yes	Y	DL	1.1	Sds*DL	0.105	ELX	0.525	ELZ	-0.158	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75
35	IBC 21/ASCE ASD 9 (d)	Yes	Y	DL	1.1	Sds*DL	0.105	ELZ	0.525	ELX	-0.158	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75
36	IBC 21/ASCE ASD 9 (e)	Yes	Y	DL	1.1	Sds*DL	0.105	ELX	-0.525	ELZ	-0.158	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75
37	IBC 21/ASCE ASD 9 (f)	Yes	Y	DL	1.1	Sds*DL	0.105	ELZ	-0.525	ELX	-0.158	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75
38	IBC 21/ASCE ASD 9 (g)	Yes	Y	DL	1.1	Sds*DL	0.105	ELX	-0.525	ELZ	0.158	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75
39	IBC 21/ASCE ASD 9 (h)	Yes	Y	DL	1.1	Sds*DL	0.105	ELZ	-0.525	ELX	0.158	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75
40	IBC 21/ASCE ASD 10 (a)	Yes	Y	DL	0.6	Sds*DL	-0.14	ELX	0.7	ELZ	0.21								
41	IBC 21/ASCE ASD 10 (b)	Yes	Y	DL	0.6	Sds*DL	-0.14	ELZ	0.7	ELX	0.21								
42	IBC 21/ASCE ASD 10 (c)	Yes	Y	DL	0.6	Sds*DL	-0.14	ELX	0.7	ELZ	-0.21								
43	IBC 21/ASCE ASD 10 (d)	Yes	Y	DL	0.6	Sds*DL	-0.14	ELZ	0.7	ELX	-0.21								
44	IBC 21/ASCE ASD 10 (e)	Yes	Y	DL	0.6	Sds*DL	-0.14	ELX	-0.7	ELZ	-0.21								
45	IBC 21/ASCE ASD 10 (f)	Yes	Y	DL	0.6	Sds*DL	-0.14	ELZ	-0.7	ELX	-0.21								
46	IBC 21/ASCE ASD 10 (g)	Yes	Y	DL	0.6	Sds*DL	-0.14	ELX	-0.7	ELZ	0.21								
47	IBC 21/ASCE ASD 10 (h)	Yes	Y	DL	0.6	Sds*DL	-0.14	ELZ	-0.7	ELX	0.21								

Envelope Node Reactions

No Data to Print...

Envelope Member End Reactions

	Member	Member End		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Moment[k-ft]	LC	z-z Moment[k-ft]	LC
1	M25	I	max	0	47	1491.244	19	0	47	0	47	0	47	0	47
2			min	0	1	-412.883	21	0	1	0	1	0	1	0	1
3		J	max	0	47	404.941	21	0	47	0	47	0	47	0	47
4			min	0	1	-1505.785	19	0	1	0	1	0	1	0	1
5	M49	I	max	0	47	2411.76	19	0	47	0	47	0	47	0	47
6			min	0	1	-584.817	21	0	1	0	1	0	1	0	1
7		J	max	0	47	592.988	21	0	47	0	47	0	47	0	47
8			min	0	1	-2396.829	19	0	1	0	1	0	1	0	1

Envelope AISC 15TH (360-16): ASD Member Steel Code Checks

	Member	Shape	Code Check	Loc[in]	LC	Shear Check	Loc[in]	Dir	LC	Pnc/om [lb]	Pnt/om [lb]	Mnyy/om [k-ft]	Mnzz/om [k-ft]	Cb	Eqn
1	M25	LL1.5X1.5X0.15625X0_ASD7TH	**1.102**	107.034	19	0.249	111.688	y	19	16410.571	19142.515	0.679	0.472	1	H1-1b
2	M49	LL1.5X1.5X0.15625X0_ASD7TH	**1.595**	**3.827**	19	0.398	0	y	19	16410.571	19142.515	0.679	0.472	1	H1-1b

Warning Log

No Data to Print...

EQUIPMENT EASE CALCS

PHILIPS HEALTHCARE

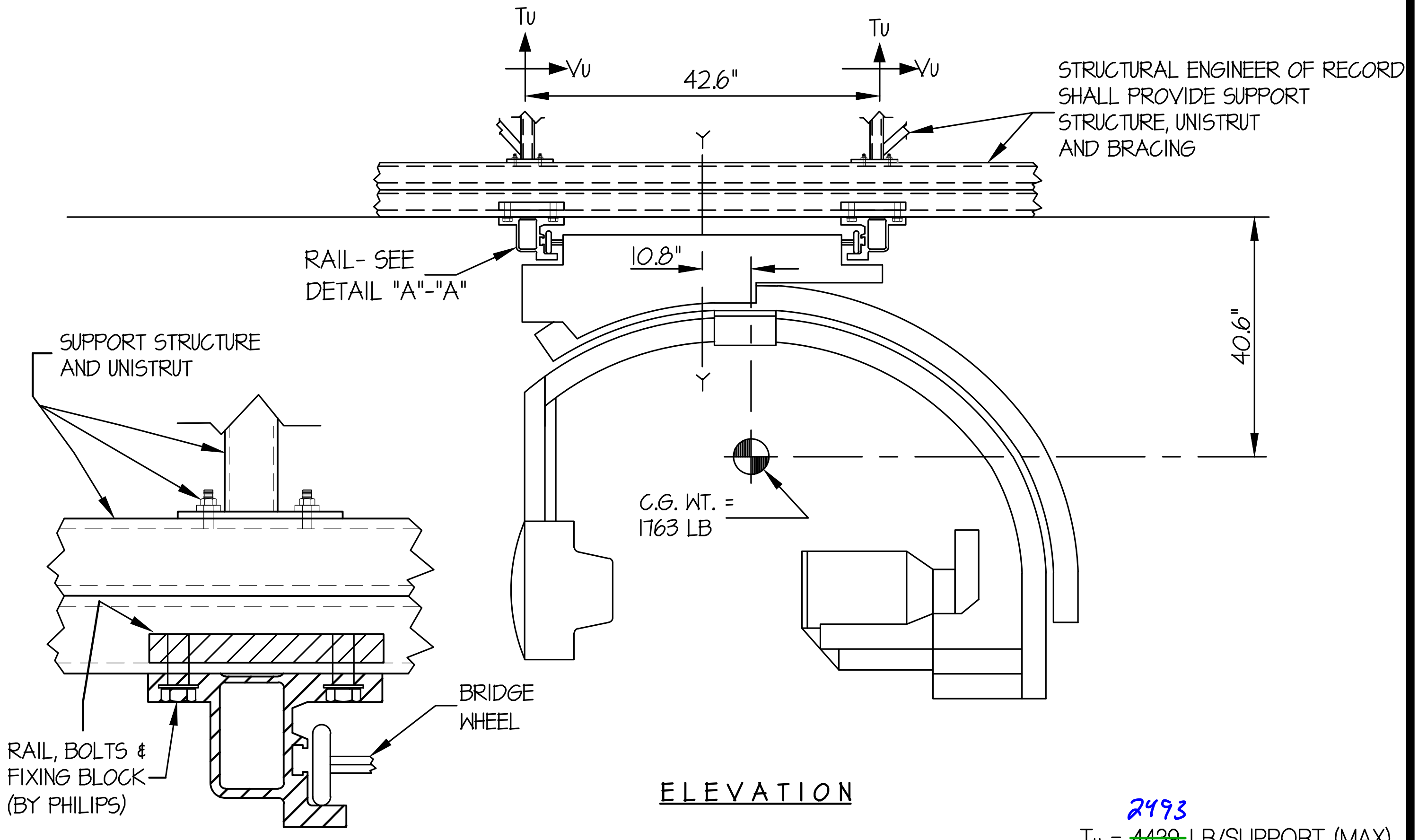
LARC N

DES. J. ROBERSON
JOB NO. 13-1656
DATE 10/26/16

SHEET 1 OF 2 SHEETS

SEISMIC ANCHORAGE

CEILING MOUNTED



ELEVATION

DETAIL "A"-"A"

T_u = ~~4439~~ 2493 LB/SUPPORT (MAX)

V_u = ~~3543~~ 1640 LB/SUPPORT (MAX)

NOTES:

1. FORCES ARE DETERMINED PER ~~2016 CALIFORNIA BUILDING CODE~~ 2018 IBC AND ASCE ~~7-10~~ 7-16
   STRENGTH DESIGN IS USED. (S_{DS} = ~~2.20~~ 1.013, a_p = 2.5, I_p = 1.5, R_p = 2.5, $z/h \leq 1$)

   HORIZONTAL FORCE (E_h) = ~~3.96 Wp~~ → $1.83W_p$

   VERTICAL FORCE (E_v) = ~~0.44 Wp~~ → $0.21W_p$

2. CENTER OF GRAVITY (C.G.) AND WEIGHT ARE THE GOVERNING PARAMETERS FOR DESIGN. THESE CALCULATION ENCOMPASSES ALL WEIGHTS UP TO THE MAXIMUM WEIGHT SHOWN.

3. STRUCTURAL ENGINEER OF RECORD FOR THE BUILDING SHALL PROVIDE SUPPORT STRUCTURE DESIGNED TO SUPPORT WEIGHTS AND FORCES SHOWN IN COMBINATION WITH ALL OTHER LOADS THAT MAY BE PRESENT.

Jonathan Roberson

JONATHAN ROBERSON
No. 4197
EXP. 6-30-2018
10/26/16

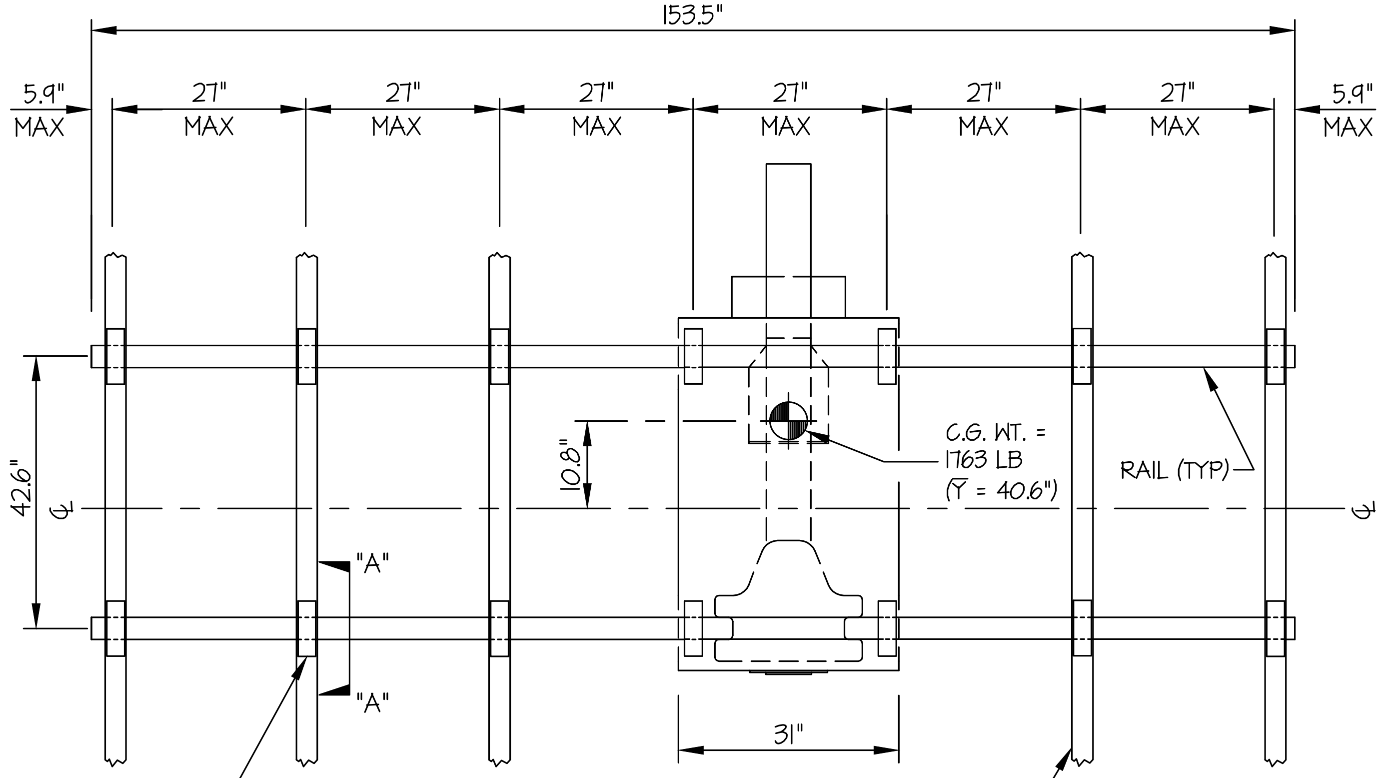
PRCTI20221788 - REVISON #6 4/5/2024

EASE
EQUIPMENT ANCHORAGE & SEISMIC ENGINEERING
www.EquipmentAnchorage.com

PHILIPS HEALTHCARE	DES. **J. ROBERSON**	SHEET **2**
LARC N	JOB NO. **13-1656**	OF **2** SHEETS
	DATE **10/26/16**	

SEISMIC ANCHORAGE

CEILING MOUNTED



RAIL, BOLTS & FIXING BLOCK (BY PHILIPS)

PLAN AT CEILING

STRUCTURAL ENGINEER OF RECORD SHALL PROVIDE SUPPORT STRUCTURE, UNISTRUT AND BRACING

① LOADS:
WEIGHT = 1763 LB
HORIZONTAL FORCE (E_h) = ~~3.96Wp = 6982 LB~~ $1.83W_p = 3227\#$
VERTICAL FORCE (E_v) = ~~0.44Wp = 776 LB~~ $0.21W_p = 371\#$
SUPPORTS FORCES:

② LOADS FROM RAILS:
WEIGHT = 183 LB
HORIZONTAL FORCE (E_h) = ~~3.96Wp = 725 LB~~ $1.83W_p = 335\#$
VERTICAL FORCE (E_v) = ~~0.44Wp = 81 LB~~ $0.21W_p = 39\#$

TENSION (T)

$$T_{U1} = \frac{(1763\#(1.2) + \overset{371\#}{\cancel{776\#}})32.1'' + \overset{3227\#}{\cancel{6982\#}}(40.6'')}{2 \text{ SUPPORTS } (42.6'')} = \overset{2474}{\cancel{4417}} \text{ LB/SUPPORT}$$

$$T_{U2} = \frac{183\#(1.2) + \overset{39\#}{\cancel{81\#}}}{14 \text{ SUPPORTS}} = \overset{19}{\cancel{22}} \text{ LB/SUPPORT}$$

$$T_U = \overset{2474\#}{\cancel{4417\#}} + \overset{19\#}{\cancel{22\#}} = \overset{2493}{\cancel{4439}} \text{ LB/SUPPORT (MAX)}$$

SHEAR (V)

$$V_{U\,\text{MAXIMUM}} = \frac{\overset{371\#}{\cancel{725\#}}}{14 \text{ SUPPORTS}} + \frac{\overset{3227\#}{\cancel{6982\#}}}{2 \text{ SUPPORTS}} = \overset{1640}{\cancel{3543}} \text{ LB/SUPPORT (MAX)}$$

PRCTI20221788 - REVISON #6 4/5/2024

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PHILIPS HEALTHCARE

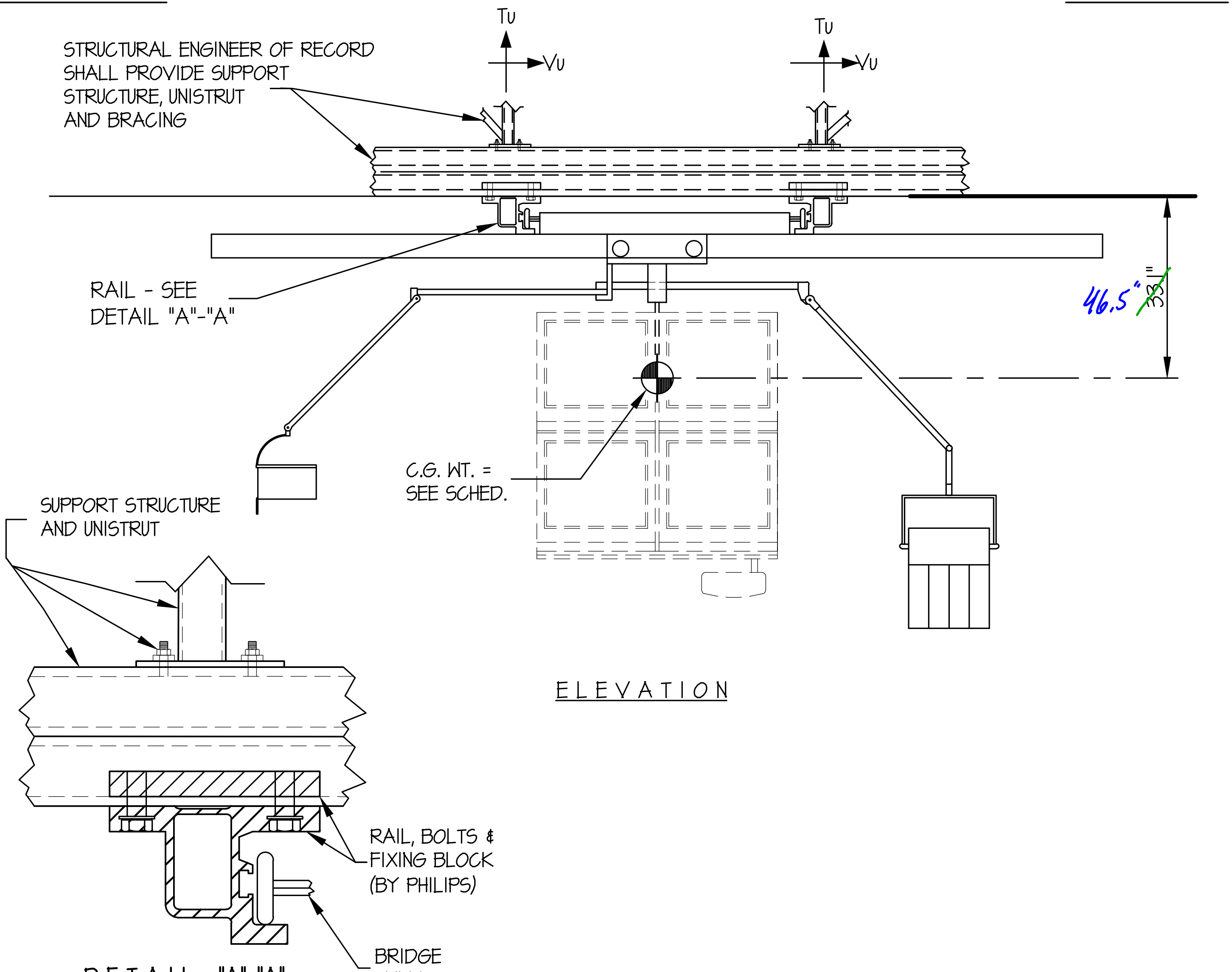
LCD MONITOR SUSPENSIONS (BEST)

DES. J. ROBERSON
JOB NO. 13-1656
DATE 10/26/16

SHEET 1 OF 2 SHEETS

SEISMIC ANCHORAGE

TRACK MOUNTED



ELEVATION

DETAIL "A"-"A"

NOTES:

1. FORCES ARE DETERMINED PER ~~2016 CALIFORNIA BUILDING CODE~~ 2018 IBC AND ASCE ~~7-10~~ 7-16
STRENGTH DESIGN IS USED. (S_{DS} = ~~2.20~~ 1.013 a_p = 2.5, I_p = 1.5, R_p = 2.5, $z/h \le 1$)

   HORIZONTAL FORCE (E_h) = ~~3.96 Wp~~ 1.83Wp
   VERTICAL FORCE (E_v) = ~~0.44 Wp~~ 0.21 Wp

2. CENTER OF GRAVITY (C.G.) AND WEIGHT ARE THE GOVERNING PARAMETERS FOR DESIGN. THESE CALCULATION ENCOMPASSES ALL WEIGHTS UP TO THE MAXIMUM WEIGHT SHOWN.

3. STRUCTURAL ENGINEER OF RECORD FOR THE BUILDING SHALL PROVIDE SUPPORT STRUCTURE DESIGNED TO SUPPORT WEIGHTS AND FORCES SHOWN IN COMBINATION WITH ALL OTHER LOADS THAT MAY BE PRESENT.

Jonathan Roberson

REGISTERED PROFESSIONAL ENGINEER
JONATHAN ROBERSON
No. 4197
EXP. 6-30-2018
10/26/16
STRUCTURAL
STATE OF CALIFORNIA

NOT STRUCTURAL ENGINEER OF RECORD

PRCTI20221788 - REVISON #6 4/5/2024

EASE EQUIPMENT ANCHORAGE & SEISMIC ENGINEERING
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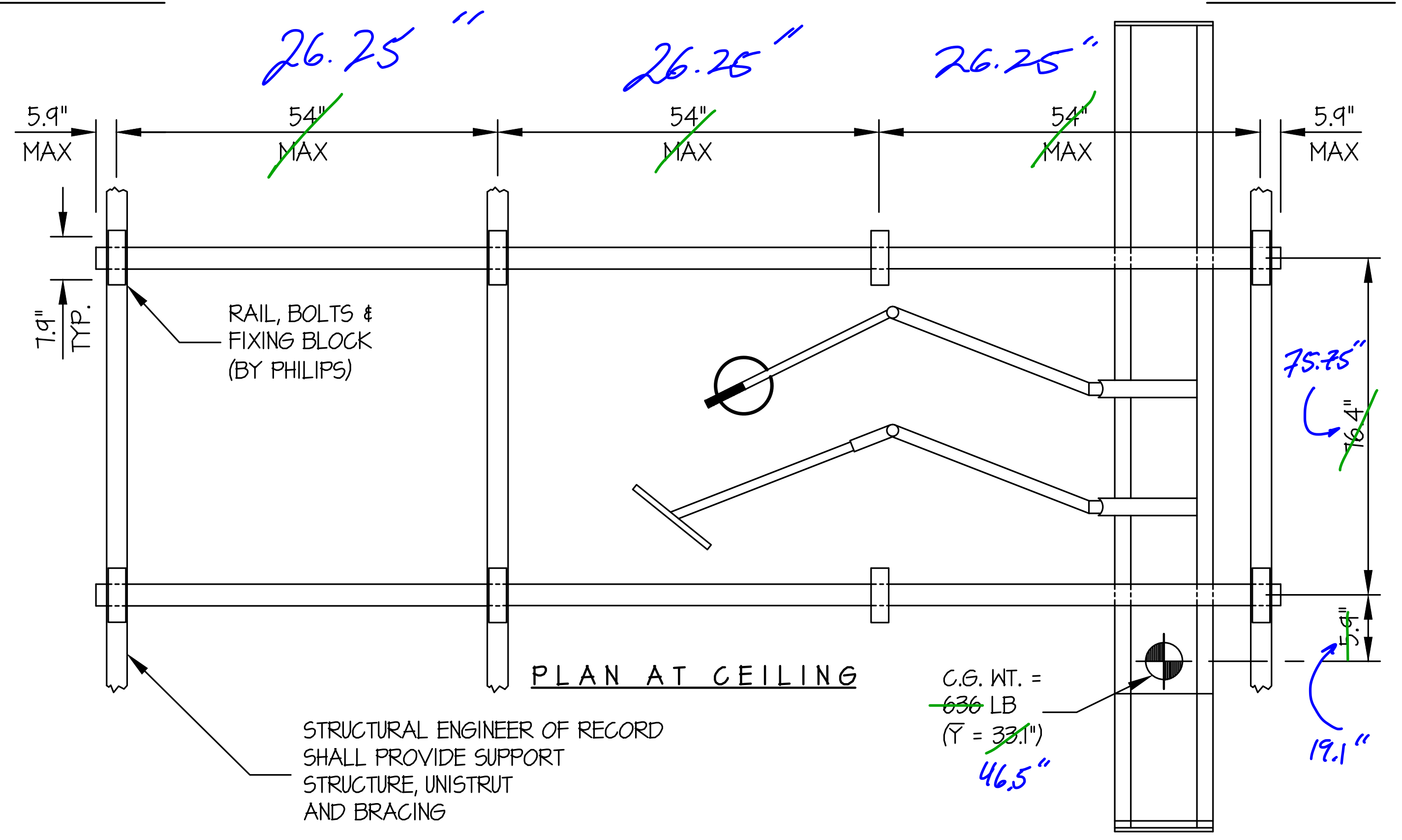
PHILIPS HEALTHCARE

LCD MONITOR SUSPENSIONS (BEST)

DES. J. ROBERSON
JOB NO. 13-1656
DATE 10/26/16
SHEET 2 OF 2 SHEETS

SEISMIC ANCHORAGE

TRACK MOUNTED



RAIL, BOLTS & FIXING BLOCK (BY PHILIPS)

PLAN AT CEILING

C.G. WT. = ~~636~~ LB
(Ȳ = ~~33.1"~~) 46.5"

STRUCTURAL ENGINEER OF RECORD SHALL PROVIDE SUPPORT STRUCTURE, UNISTRUT AND BRACING

① LOADS: 563

WEIGHT = ~~636~~ LB

HORIZONTAL FORCE (E_h) = ~~3.96~~ 1.83 W_p = ~~2519~~ 1031 LB

VERTICAL FORCE (E_v) = ~~0.44~~ 0.21 W_p = ~~280~~ 119 LB

SUPPORT FORCES:

TENSION (T)

$$T_{u1} = \frac{(\overset{563}{\cancel{636}}\#(1.2) + \overset{119}{\cancel{280}}\#)\overset{94.9''}{\cancel{82.3''}} + \overset{1031}{\cancel{2519}}\#(\overset{46.5''}{\cancel{33.1''}})}{1\ \text{SUPPORT}\ (\underset{75.75''}{\cancel{76.4''}})} = \overset{1629}{\cancel{2215}}\ \text{LB/SUPPORT}$$

$$T_{u2} = \frac{183\#(1.2) + \overset{39}{\cancel{81}}\#}{8\ \text{SUPPORTS}} = \underset{33}{\cancel{38}}\ \text{LB/SUPPORT}$$

$$T_{u\,\text{MAXIMUM}} = \overset{1629}{\cancel{2215}}\# + \overset{33}{\cancel{38}}\# = \overset{1662}{\cancel{2253}}\ \text{LB/SUPPORT (MAX)}$$

SHEAR (V)

$$V_{u\,\text{MAXIMUM}} = \frac{\overset{335}{\cancel{725}}\#}{8\ \text{SUPPORTS}} + \frac{\overset{1031}{\cancel{2519}}\#}{2\ \text{SUPPORTS}} = \overset{558}{\cancel{1350}}\ \text{LB/SUPPORT (MAX)}$$

② LOADS FROM RAILS:

WEIGHT = 183 LB

HORIZONTAL FORCE (E_h) = ~~3.96~~ 1.83 W_p = ~~725~~ 335 LB

VERTICAL FORCE (E_v) = ~~0.44~~ 0.21 W_p = ~~81~~ 39 LB

SUPPORT FORCES			
MODEL	WEIGHT (LB)	T_u MAX (lb)	V_u MAX (lb)
2 MONITORS	543	1928	1166
3 MONITORS	585	2075	1249
4 MONITORS	597	2116	1273
* 6 MONITORS	636	2253	1350
56" MONITOR	603	2137	1285
56" + 2-21" MONITORS	636	2253	1350
* 58" MONITOR	~~636~~ 563	~~2253~~ 1662	~~1350~~ 558
58" + 2-21" MONITORS	636	2253	1350

* THIS MODEL USED IN CALCULATION

PRCTI20221788 - REVISON #6 4/5/2024

EASE EQUIPMENT ANCHORAGE & SEISMIC ENGINEERING
www.EquipmentAnchorage.com

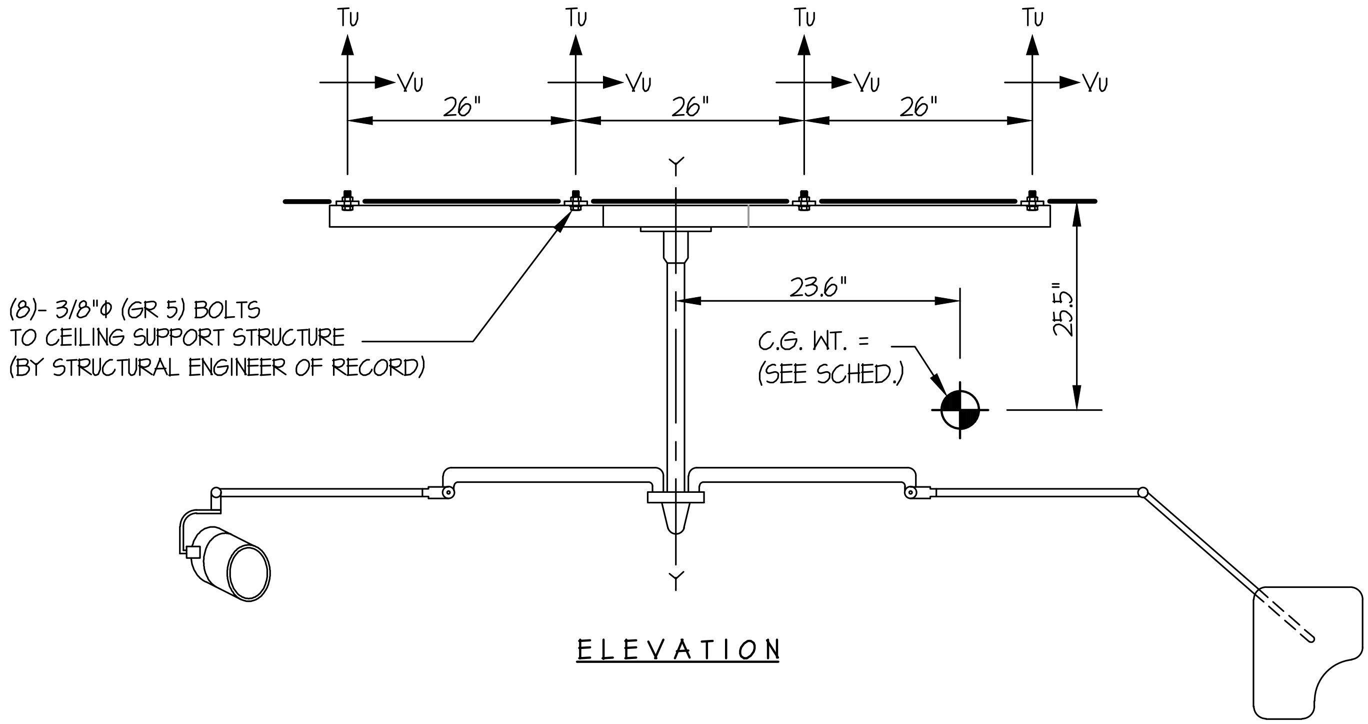
PHILIPS HEALTHCARE

MAVIG LEAD SHIELD w/ O.R. LIGHT

DES. J. ROBERSON
JOB NO. 13-1656
DATE 10/13/16
SHEET 1 **OF** 2 **SHEETS**

SEISMIC ANCHORAGE

CEILING MOUNTED



ELEVATION

	MODEL NO.	WEIGHT (LB)	Tu (LB/BOLT)	Vu (LB/BOLT)
	SHIELD W/ SMALL LIGHT	143	2931	283
*	* SHIELD W/ LARGE LIGHT	167	~~3428~~ 1999	~~331~~ 153

* THIS MODEL USED IN CALCULATION ON PAGE 2

NOTES:

1. FORCES ARE DETERMINED PER ~~2016 CALIFORNIA BUILDING CODE~~ 2018 IBC AND ASCE ~~7-10~~ 7-16
STRENGTH DESIGN IS USED. (S_{DS} = ~~2.20,~~ 1.013 a_p = 2.5, I_p = 1.5, R_p = 2.5, $z/h \leq 1$)

HORIZONTAL FORCE (E_h) = ~~3.96 W_p~~ → 1.83W_p

VERTICAL FORCE (E_v) = ~~0.44 W_p~~ → 0.21 W_p

2. CENTER OF GRAVITY (C.G.) AND WEIGHT ARE THE GOVERNING PARAMETERS FOR DESIGN. THESE CALCULATION ENCOMPASSES ALL WEIGHTS UP TO THE MAXIMUM WEIGHT SHOWN.
3. STRUCTURAL ENGINEER OF RECORD FOR THE BUILDING SHALL PROVIDE SUPPORT STRUCTURE DESIGNED TO SUPPORT WEIGHTS AND FORCES SHOWN IN COMBINATION WITH ALL OTHER LOADS THAT MAY BE PRESENT.

Jonathan Roberson

JONATHAN ROBERSON
No. 4197
EXP. 6-30-2018
10/13/16

NOT STRUCTURAL ENGINEER OF RECORD

PRCTI20221788 - REVISON #6 4/5/2024

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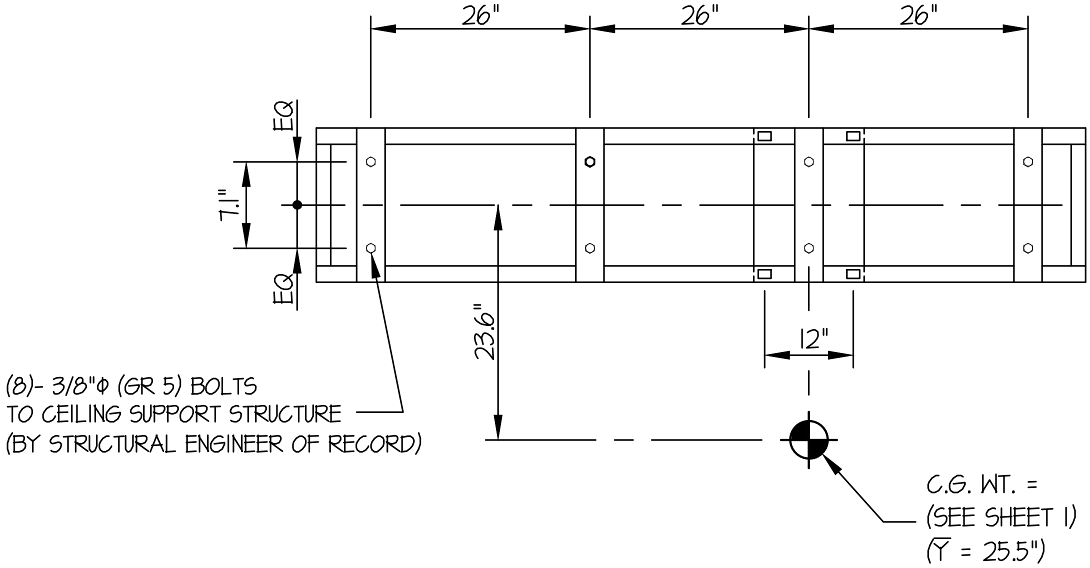
PHILIPS HEALTHCARE	DES. J. ROBERSON	SHEET 2
MAVIG LEAD SHIELD w/ O.R. LIGHT	JOB NO. 13-1656	
	DATE 10/13/16	OF 2 SHEETS

SEISMIC ANCHORAGE

CEILING MOUNTED



PLAN AT CEILING

LOADS: PER ~~2016 CALIFORNIA BUILDING CODE~~ 2018 IBC AND ASCE ~~7-10.~~ 7-16

STRENGTH DESIGN IS USED (S_{DS} = ~~2.20~~ 1.013, a_p = 2.5, I_p = 1.5, R_p = 2.5, z/h ≤ 1)

WEIGHT = 167 LB

HORIZONTAL FORCE (E_h) = ~~3.96~~ 1.83 W_p = ~~662~~ 306 LB

VERTICAL FORCE (E_v) = ~~0.44~~ 0.21 W_p = ~~74~~ 35 LB

BOLT FORCES:

BOLT SPEC: 3/8"Ø (GR 5) BOLT
φT = 7455 LB/BOLT
φV = 3877 LB/BOLT

TENSION (T)

$$T_{U\,1} = \frac{(167\#(1.2) + \overset{35}{\cancel{74}}\#)27.15''}{1\text{ BOLT }(7.1'')} = \overset{900}{\cancel{1050}}\text{ LB/BOLT}$$

$$T_{U\,2} = \frac{\overset{306}{\cancel{662}}\#(25.5'')}{1\text{ BOLT }(7.1'')} = \overset{1099}{\cancel{2378}}\text{ LB/BOLT}$$

$$T_U = \overset{1099}{\cancel{2378}}\# + \overset{900}{\cancel{1050}}\# = \overset{1999}{\cancel{3428}}\text{ LB/BOLT (MAX)}$$

SHEAR (V)

$$V_{U\,MAXIMUM} = \frac{\overset{306}{\cancel{662}}\#}{2\text{ BOLTS}} = \overset{153}{\cancel{331}}\text{ LB/BOLT (MAX)}$$

PRCTI20221788 - REVISON #6 4/5/2024

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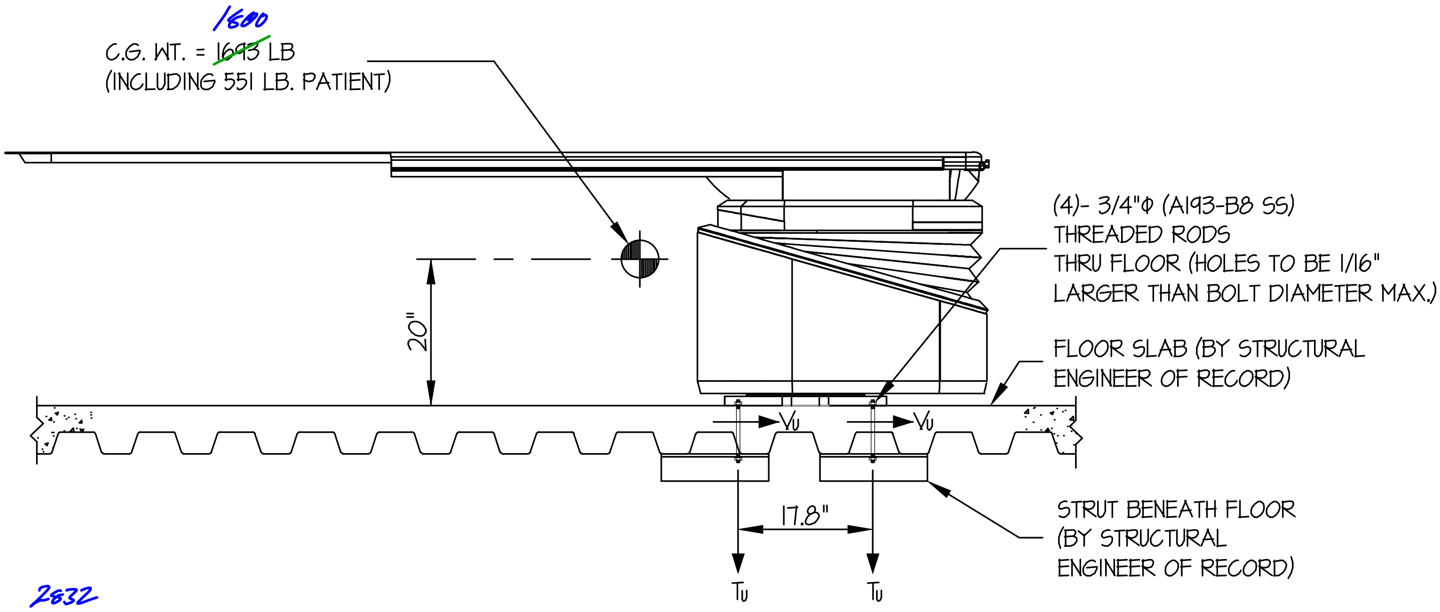
PHILIPS HEALTHCARE
AD7 WITH UNIVERSAL FLOOR PLATE

DES.	J. ROBERSON	SHEET 1 OF 2 SHEETS
JOB NO.	13-1656	
DATE	10/26/16	

SEISMIC ANCHORAGE

UPPER FLOOR



T_U = ~~4042~~ 2832 LB/BOLT (MAX)
V_U = ~~2850~~ 2185 LB/BOLT (MAX)

ELEVATION

NOTES:

1. **FORCES ARE DETERMINED PER ~~2016 CALIFORNIA BUILDING CODE~~ 2018 IBC AND ASCE ~~7-10.~~ 7-16**
   STRENGTH DESIGN IS USED. (S_{DS} = ~~2.20,~~ 1.013 a_p = 1.0, I_p = 1.5, R_p = 1.5, z/h ≤ 1)
   HORIZONTAL FORCE (E_h) = ~~2.64 Wp~~ → 1.83Wp
   VERTICAL FORCE (E_v) = ~~0.44 Wp~~ → 0.21 Wp
2. CENTER OF GRAVITY (C.G.) AND WEIGHT ARE THE GOVERNING PARAMETERS FOR DESIGN. THESE CALCULATIONS ENCOMPASSES ALL WEIGHTS UP TO THE MAXIMUM WEIGHT SHOWN.
3. STRUCTURAL ENGINEER OF RECORD FOR THE BUILDING SHALL PROVIDE SUPPORT STRUCTURE DESIGNED TO SUPPORT WEIGHTS AND FORCES SHOWN IN COMBINATION WITH ALL OTHER LOADS THAT MAY BE PRESENT.

Jonathan Roberson

REGISTERED PROFESSIONAL ENGINEER
JONATHAN ROBERSON
No. 4197
EXP. 6-30-2018
10/26/16
STRUCTURAL
STATE OF CALIFORNIA

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www.EquipmentAnchorage.com

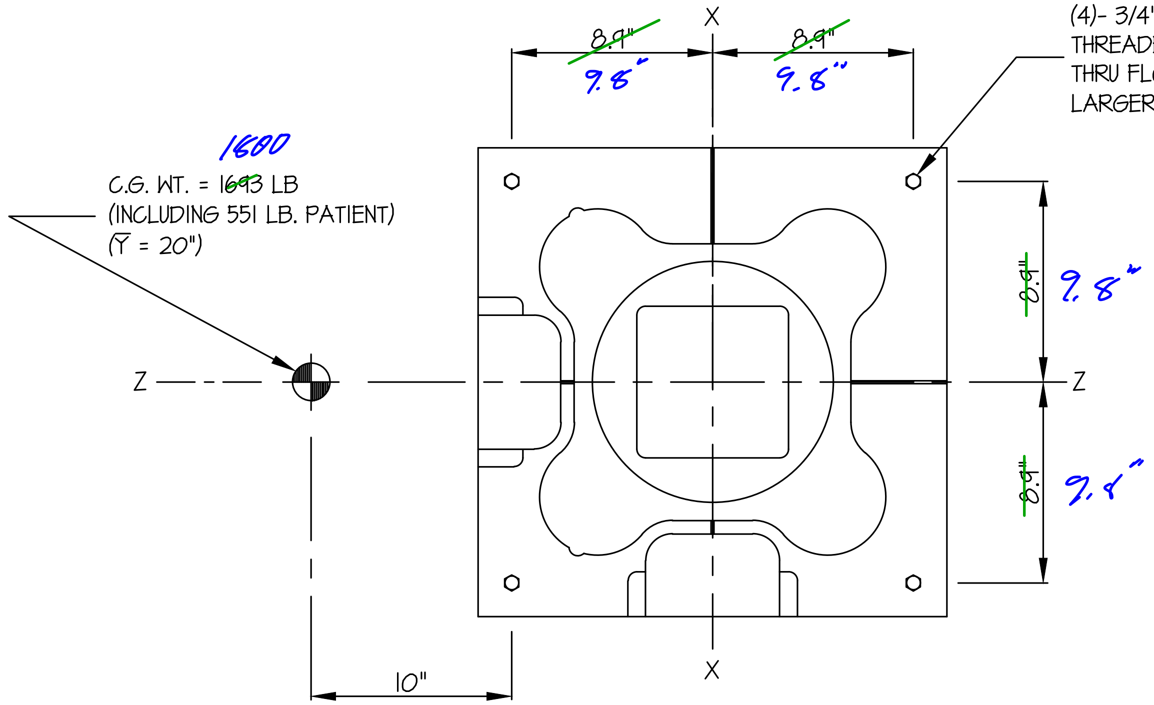
PHILIPS HEALTHCARE

AD7 WITH UNIVERSAL FLOOR PLATE

DES. J. ROBERSON
JOB NO. 13-1656
DATE 10/26/16
SHEET 2 OF 2 SHEETS

SEISMIC ANCHORAGE

UPPER FLOOR



(4)- 3/4"ϕ (A193-B8 SS) THREADED RODS THRU FLOOR (HOLES TO BE 1/16" LARGER THAN BOLT DIAMETER MAX.)

C.G. WT. = ~~1693~~ 1800 LB
(INCLUDING 551 LB. PATIENT)
($\bar{Y}$ = 20")

PLAN AT BASE

LOADS: PER ~~2016 CALIFORNIA BUILDING CODE~~ 2018 IBC AND ASCE ~~7-10.~~ 7-16

STRENGTH DESIGN IS USED (S_{DS} = ~~2.20,~~ 1.013 a_p = 1.0, I_p = 1.5, R_p = 1.5, $z/h \le 1$)

WEIGHT = ~~1693 LB~~ 1800#

HORIZONTAL FORCE (E_h) = ~~2.64 Wp~~ 1.83Wp = ~~4470 LB~~ 3294 #

VERTICAL FORCE (E_v) = ~~0.44 Wp~~ 0.21 Wp = ~~745 LB~~ 378 #

BOLT GROUP PROPERTIES:

$I_{X\text{-}X}$ = 317 in.^{4}
$I_{Z\text{-}Z}$ = 317 in.^{4}
$I_{Y\text{-}Y}$ = 634 in.^{4}
Cons. USE

MOMENTS:

$M_{XX(+)}$ = 3294#(20") + (1.2(1800#) + 378#)~~18.9~~ 19.8" = ~~141,876~~ 116,133"#
$M_{XX(-)}$ = 3294#(20") + (0.9(1800#) - 378#)~~18.9~~" = ~~104,119~~ 90,472"#
M_{ZZ} = 3294#(20") = ~~89,400~~"# 65860 19.8
M_{YY} = 3294#(18.9") = ~~84,483~~"# 62257

BOLT SPEC: 3/4"ϕ (A193-B8 SS) THREADED ROD
ϕT = 18,650 LB/BOLT (TENSION)
ϕV = 8620 LB/BOLT (SHEAR)

BOLT FORCES:

TENSION (T)

~~$T_u(+) = \left(\frac{89400''\#(8.9'')}{317\ in^4} \times 0.3\right) + \frac{141876''\#(8.9'')}{317\ in^4} - \frac{1693\#(1.2) + 745\#}{4\ \text{BOLTS}} = 4042$ LB/BOLT (MAX)~~

$T_u^{(+)}{}_{100\%/30\%} = (0.3)\,65860\,\#\cdot IN / (2\cdot[9.8+9.8]) + 116{,}133/(2\cdot[9.8+9.8]) - \frac{1800\cdot 1.2+378}{4}$
$= 2832\ \#/\text{BOLT}$

~~$T_u(-) = \left(\frac{89400''\#(8.9'')}{317\ in^4} \times 0.3\right) + \frac{104119''\#(8.9'')}{317\ in^4} - \frac{1693\#(0.9) - 745\#}{4\ \text{BOLTS}} = 3482$ LB/BOLT (MAX)~~

$T_u^{(-)}{}_{100\%/30\%} = (0.3)\,65860\,\#\cdot IN / (2\cdot[9.8+9.8]) + 90472/(2\cdot[9.8+9.8]) - \frac{1800\cdot 0.9-378}{4}$
$= 2502\ \#/\text{BOLT}$

SHEAR (V)

$V_u = \frac{\cancel{4470\#}\ 3294}{4\ \text{BOLTS}} + \frac{\cancel{84483}\ 62257''\#\sqrt{\cancel{8.9}^2 + \cancel{8.9}^2}}{634} = \cancel{2850}\ 2185$ LB/BOLT (MAX)

9.8 9.8

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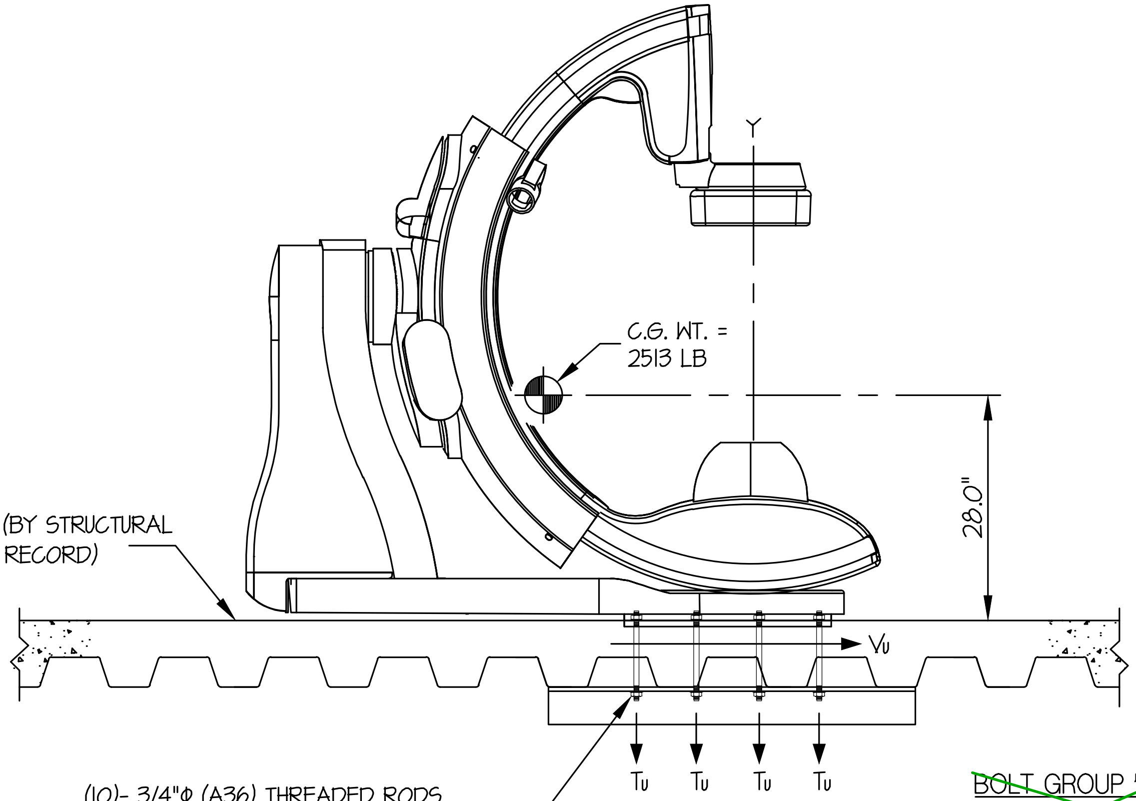
PHILIPS HEALTHCARE

CLEA - FLOOR STAND

DES. J. ROBERSON
JOB NO. 13-1656
DATE 10/26/16
SHEET 1 OF 3 SHEETS

SEISMIC ANCHORAGE

UPPER FLOOR



ELEVATION

~~BOLT GROUP "A"~~
~~T_u = 8909 LB/BOLT (MAX)~~
~~V_u = 3759 LB/BOLT (MAX)~~

BOLT GROUP "B"
T_u = 4235 LB/BOLT (MAX)
V_u = 3429 LB/BOLT (MAX)

NOTES:

1. **FORCES ARE DETERMINED PER** 2018 IBC ~~**2016 CALIFORNIA BUILDING**~~ **CODE AND ASCE** ~~**7-10.**~~ 7-16
   STRENGTH DESIGN IS USED. (S_{DS} = ~~2.20~~ 1.013 a_p = 1.0, I_p = 1.5, R_p = 1.5, z/h ≤ 1)
   HORIZONTAL FORCE (E_h) = ~~2.64Wp~~ 1.83W_p
   VERTICAL FORCE (E_v) = ~~0.44Wp~~ 0.21 W_p
2. CENTER OF GRAVITY (C.G.) AND WEIGHT ARE THE GOVERNING PARAMETERS FOR DESIGN. THESE CALCULATIONS ENCOMPASS ALL WEIGHTS UP TO THE MAXIMUM WEIGHT SHOWN.
3. STRUCTURAL ENGINEER OF RECORD FOR THE BUILDING SHALL PROVIDE SUPPORT STRUCTURE DESIGNED TO SUPPORT WEIGHTS AND FORCES SHOWN IN COMBINATION WITH ALL OTHER LOADS THAT MAY BE PRESENT.

Jonathan Roberson

JONATHAN ROBERSON
No. 4197
EXP. 6-30-2018
10/26/16

EASE

EQUIPMENT ANCHORAGE & SEISMIC ENGINEERING
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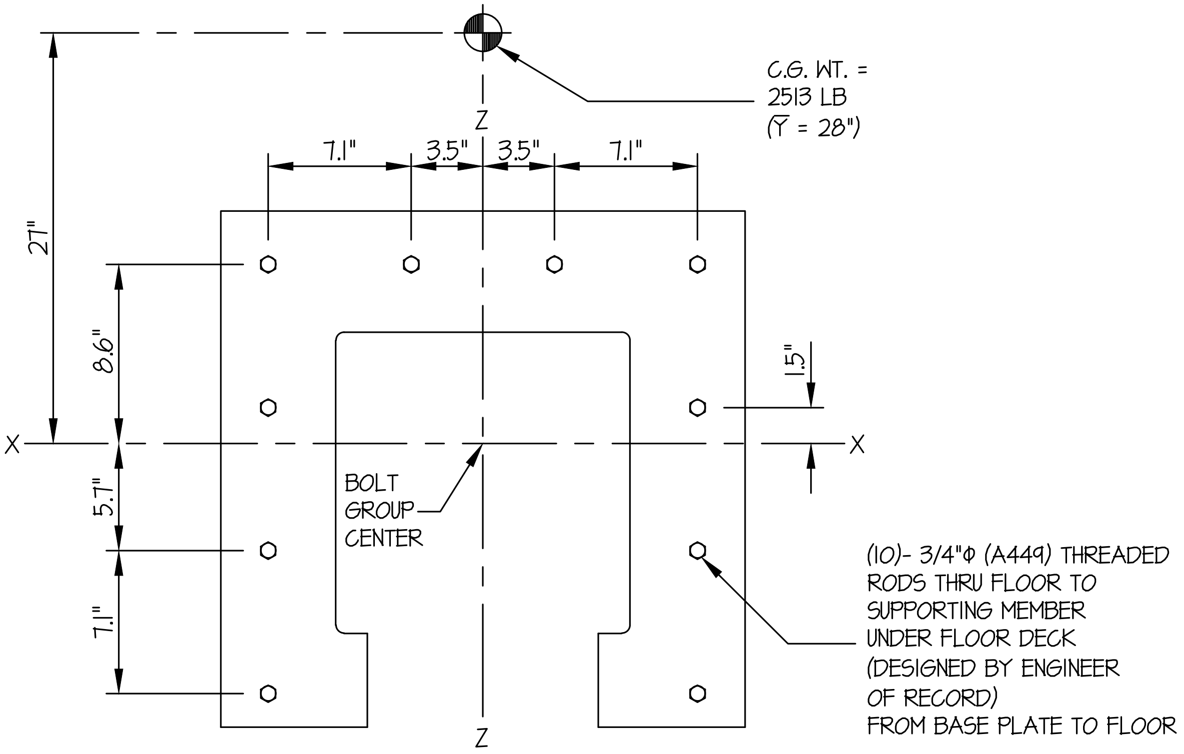
PHILIPS HEALTHCARE	DES. **J. ROBERSON**	SHEET **3**
CLEA - FLOOR STAND	JOB NO. **13-1656**	
	DATE **10/26/16**	OF **3** SHEETS

SEISMIC ANCHORAGE

UPPER FLOOR



PLAN AT BASE

GROUP B

LOADS: PER ~~2016 CALIFORNIA BUILDING CODE~~ 2018 IBC AND ASCE ~~7-10.~~ 7-16

STRENGTH DESIGN IS USED (S_{DS} = ~~2.20,~~ 1.013 a_p = 1.0, I_p = 1.5, R_p = 1.5, z/h ≤ 1)

WEIGHT = 2513 LB

HORIZONTAL FORCE (E_h) = ~~2.64Wp~~ 1.83Wp = ~~6634 LB~~ 4599#

VERTICAL FORCE (E_v) = ~~0.44Wp~~ 0.21 Wp = ~~1106 LB~~ 528#

BOLT GROUP PROPERTIES:

$I_{X\text{-}X}$ = 693 in.^{4}
$I_{Z\text{-}Z}$ = 923 in.^{4}
$I_{Y\text{-}Y}$ = 1616 in.^{4}

MOMENTS:

$M_{XX(+)}$ = 4599#(28") + (1.2(2513#) + 528#)27" = ~~297,035"#~~ 224,450"#
$M_{XX(-)}$ = 4599#(28") + (0.9(2513#) - 528#)27" = ~~216,956"#~~ 170,983"#
M_{ZZ} = 4599#(28") = ~~185,752"#~~ 128,772"#
M_{YY} = 4599#(27") = ~~179,118"#~~ 124,173"#

BOLT SPEC: 3/4"ø (A449) THREADED ROD

ΦT= 26,839 LB/BOLT (TENSION)
ΦV= 13,497 LB/BOLT (SHEAR)

BOLT FORCES:

$$T_u(+) = \left(\frac{\overset{128,772}{\cancel{185752}}\text{"\#}(10.6")}{923\ \text{in}^4} \times 0.3\right) + \frac{\overset{224,450}{\cancel{297035}}\text{"\#}(12.8")}{693\ \text{in}^4} - \frac{2513\#(1.2) + \overset{528}{\cancel{1106}}\#}{10\ \text{BOLTS}} = \overset{4235}{\cancel{5714}}\ \text{LB/BOLT (MAX)}$$

$$T_u(-) = \left(\frac{\overset{128,772}{\cancel{185752}}\text{"\#}(10.6")}{923\ \text{in}^4} \times 0.3\right) + \frac{\overset{170,983}{\cancel{216956}}\text{"\#}(12.8")}{693\ \text{in}^4} - \frac{2513\#(0.9) - \overset{528}{\cancel{1106}}\#}{10\ \text{BOLTS}} = \overset{3429}{\cancel{4532}}\ \text{LB/BOLT (MAX)}$$

SHEAR (V)

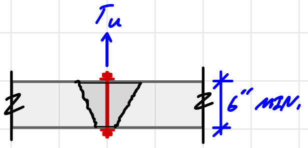
$$V_u = \frac{\overset{4599}{\cancel{6634}}\#}{10\ \text{BOLTS}} + \frac{\overset{124,173}{\cancel{179118}}\text{"\#}\sqrt{12.8"^2 + 10.6"^2}}{1616\ \text{IN}^4} = \overset{1737}{\cancel{2505}}\ \text{LB/BOLT (MAX)}$$

CHECK EQUIP. THRU-BOLTING:

MAX TENS:

$T_u = 4235^{\#}$

BOLT $\phi = 3/4"$ → STD NUT $= 1\ 9/16$ O.D. $\}$ $A_{BRG} = 1.4\ IN^2$
$13/16$ I.D.



$\sigma_{BRG} = 4235^{\#} / 1.4\ IN^2 = 3025\ PSI$

BRG ON CONC: $\phi P_{nb} = \phi(0.85 f'_c A_1)$

$= 0.65 [0.85 \cdot 5000 PSI \cdot 1.4 IN^2] = 3867^{\#} < T_u = 4235^{\#}$ ✗

∴ CONSIDER INCREASED BRG AREA SINCE NO EDGES ARE NEAR

↳ USE $A_2 = 4A_1 = 4(1.4 IN^2) = 5.6 IN^2$

$\phi P_{nb\text{-}max} = \phi 1.7 f'_c A_1 = (0.65)(1.7)(5000 PSI)(1.4 IN^2) = 7735^{\#} \geq T_u = 4235^{\#}$ ✓

$\phi P_{nb} = \phi(0.85 f'_c A_1 \sqrt{A_2/A_1}) = 0.65(0.85 \cdot 5000 PSI \cdot 1.4 IN^2 \sqrt{5.6/1.4}) = 7725^{\#}$

∴ BOLT OK w/ NUT ONLY

↳ CONS. PROV. PL 1/4"x3"x3" WASHERS

UNISTRUT FRAMING

UNISTRUT:

BRACES:

WORST CASE:

LARC W/ SUSPENDED MONITORS + (SHIELD + LIGHT)

$\Sigma V_u = (2)(1640^{\#}) + (2)(558^{\#}) + (2)(153^{\#}) = 4702^{\#}$

* ASSUME LOAD SHARED BY MIN. (2) UNISTRUT

$V_{\overrightarrow{BRACE}} = 2351^{\#} \rightarrow V_a = 0.7V = 1646^{\#} \leq (2)$ CHANNEL NUTS $= (2)(1500^{\#}) = 3000^{\#}$ ✓ OK

∴ (1) CHANNEL NUT EA. END OK

WORST CASE BRACE FORCE $= 1646^{\#} \cdot \frac{\sqrt{1^2 + 1\frac{1}{2}^2}}{1\frac{1}{2}} = 1979^{\#}$

P_{1000} BRACE: CONS. CHECK ASSUMING LOAD APPLIED AT SLOT FACE
$P_n/\Omega = 2080^{\#} \geq V_a = 1979^{\#}$ ✓ OK

∴ P1000 BRACE OK UP TO 72" = 6'-0"

CHECK UNISTRUT SPANNING HORIZONTALLY AS COLUMN:

P1001-HS: CONS. CHECK ASSUMING LOAD APPLIED AT SLOT FACE

MAX SPAN → TRAY 3'-8" = 44"
$\hookrightarrow P_{a-LIM} = 3500^{\#} < P_n/\Omega = 6225^{\#}$ ✓ OK

∴ P1001-HS OK FOR LAT LOADS

PRCTI20221788 - REVISON #6 4/5/2024

P1000 - BEAM LOADING

Span In	Max. Allowable Uniform Load Lbs	Defl. at Uniform Load In	Uniform Loading at Deflection Span/180 Lbs	Span/240 Lbs	Span/360 Lbs
24	1,690	0.06	1,690	1,690	1,690
36	1,130	0.13	1,130	1,130	900
48	850	0.22	850	760	500
60	680	0.35	650	480	320
72	560	0.50	450	340	220
84	480	0.68	330	250	160
96	420	0.89	250	190	130
108	380	1.14	200	150	100
120	340	1.40	160	120	80
144	280	2.00	110	80	60
168	240	2.72	80	60	40
192	210	3.55	60	50	NR
216	190	4.58	50	40	NR
240	170	5.62	40	NR	NR

P1001 - BEAM LOADING

Span In	Max. Allowable Uniform Load Lbs	Defl. at Uniform Load In	Uniform Loading at Deflection Span/180 Lbs	Span/240 Lbs	Span/360 Lbs
24	3,500*	0.02	3,500*	3,500*	3,500*
36	3,190	0.07	3,190	3,190	3,190
48	2,390	0.13	2,390	2,390	2,390
60	1,910	0.20	1,910	1,910	1,620
72	1,600	0.28	1,600	1,600	1,130
84	1,370	0.39	1,370	1,240	830
96	1,200	0.51	1,200	950	630
108	1,060	0.64	1,000	750	500
120	960	0.79	810	610	410
144	800	1.14	560	420	280
168	680	1.53	410	310	210
192	600	2.02	320	240	160
216	530	2.54	250	190	130
240	480	3.16	200	150	100

P1000 - COLUMN LOADING

Unbraced Height In	Max. Allowable Load at Slot Face Lbs	Maximum Column Load Applied at C.G. K = 0.65 Lbs	K = 0.80 Lbs	K =1.0 Lbs	K = 1.2 Lbs
24	3,550	10,740	9,890	8,770	7,740
36	3,190	8,910	7,740	6,390	5,310
48	2,770	7,260	6,010	4,690	3,800
60	2,380	5,910	4,690	3,630	2,960
72	2,080	4,840	3,800	2,960	2,400
84	1,860	4,040	3,200	2,480	1,980
96	1,670	3,480	2,750	2,110	1,660
108	1,510	3,050	2,400	1,810	**
120	1,380	2,700	2,110	**	**
144	1,150	2,180	1,660	**	**

P1001 - COLUMN LOADING

Unbraced Height In	Max. Allowable Load at Slot Face Lbs	Maximum Column Load Applied at C.G. K = 0.65 Lbs	K = 0.80 Lbs	K =1.0 Lbs	K = 1.2 Lbs
24	6,430	24,280	23,610	22,700	21,820
36	6,290	22,810	21,820	20,650	19,670
48	6,160	21,410	20,300	18,670	16,160
60	6,000	20,210	18,670	15,520	12,390
72	5,620	18,970	16,160	12,390	8,950
84	5,170	16,950	13,630	9,470	6,580
96	4,690	14,890	11,190	7,250	5,040
108	4,170	12,850	8,950	5,730	3,980
120	3,690	10,900	7,250	4,640	**
144	2,930	7,630	5,040	**	**

P1000/P1001 - ELEMENTS OF SECTION

Parameter	P1000		P1001	
Area of Section	0.555	In^2	1.111	In^2
Axis 1-1				
Moment of Inertia (I)	0.185	In^4	0.928	In^4
Section Modulus (S)	0.202	In^3	0.571	In^3
Radius of Gyration (r)	0.577	In	0.914	In
Axis 2-2				
Moment of Inertia (I)	0.236	In^4	0.471	In^4
Section Modulus (S)	0.290	In^3	0.580	In^3
Radius of Gyration (r)	0.651	In	0.651	In

Notes:

* Load limited by spot weld shear.

** KL/r > 200

NR = Not Recommended.

1. Beam loads are given in *total* uniform load (W Lbs) not uniform load (w lbs/ft or w lbs/in).
2. Beam loads are based on a simple span and assumed to be adequately laterally braced. Unbraced spans can reduce beam load carrying capacity. Refer to Page 62 for reduction factors for unbraced lengths.
3. For pierced channel, multiply beam loads by the following factor:

"KO" Series.......95% **"T" Series 85%**
"HS" Series ....90% **"SL" Series........85%**
"H3" Series........90% **"DS" Series........70%**

4. Deduct channel weight from the beam loads.
5. For concentrated midspan point loads, multiply beam loads by 50% and the corresponding deflection by 80%. For other load conditions refer to page 18.
6. All beam loads are for bending about Axis 1-1.

PCS Structural *Solutions*

Project: ~~MHS HYBRID OR~~ Job No: 23-225
Subject: Calcs Sheet ______ Name: ESO
Originating Office: ☐ Seattle ☒ Tacoma ☐ Portland Date: 2023-04-06

UNISTRUT: CONT'D

P1001 HS AS BM:

CHECK @ MOVING LEAD SHIELD w/ O.R. LIGHT:

SPAN = 2'-2"

PT LOADS @ 6" + 20" ~ SIM TO PT LOADS @ 1/4 PTS

$M_a = 0.7(306^{\#})(25.5") + 0.3(167^{\#} + [0.7]35^{\#})(27.15") = 7021^{\#\cdot IN}$

$M_n/\Omega = wl^2/8 = wl(l/8) = (3190^{\#})(3'/8) = 1197^{\#\cdot FT} < 14355^{\#\cdot IN}$ ✓M

PT LOADS = $167^{\#}/2 = 84^{\#}$ → OK BY INSP.

CHECK MAX TENS. LOAD COMPARED TO PT LOAD CAPACITY MID-SPAN

$$T_a = \frac{(167^{\#}\{1.0\} + \{0.7\}35^{\#})27.15"}{1\ \text{BOLT}\ (7.1")} = 733^{\#}$$

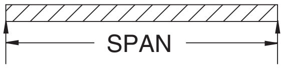
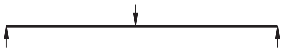
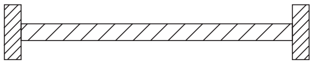
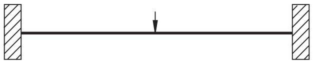
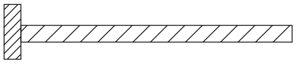
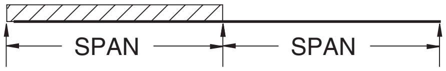
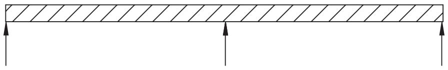
$P_n/\Omega = 3190^{\#}$ (HS FACTOR = 0.9)(LOADING FACTOR = 0.5) = $1436^{\#}$ ✓ OK

∴ UNISTRUT P1001-HS OK FOR SHIELD + LIGHT

ADD UNISTRUT ABOVE FOR LATERAL BRACING

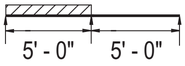
CONVERSION FACTORS FOR BEAMS WITH VARIOUS STATIC LOADING CONDITIONS

All Beam Load tables are for single-span (simple) beams supported at the ends. These can be used in the majority of the cases. However, there are times when it is necessary to know what happens with other loading and support conditions. Some common arrangements are shown below. Simply multiply the values from the Beam Load tables by factors given below

Load and Support Condition		Load Factor	Deflection Factor
1. Simple Beam, Uniform Load		**1.00**	**1.00**
2. Simple Beam, Concentrated Load at Center		**.50**	**.80**
3. Simple Beam, Two Equal Concentrated Loadcs at 1/4 pts		**1.00**	**1.10**
4. Beam Fixed at Both Ends, Uniform Load		**1.50**	**.30**
5. Beam Fixed at Both Ends, Concentrated Load at Center		**1.00**	**.40**
6. Cantilever Beam, Uniform Load		**.25**	**2.40**
7. Cantilever Beam, Concentrated Load at End		**.12**	**3.20**
8. Continuous Beam, Two Equal Spans, Uniform Load on One Span		**1.30**	**.92**
9. Continuous Beam, Two Equal Spans, Uniform Load on Both Ends		**1.00**	**.42**
10. Continuous Beam, Two Equal Spans, Concentrated Load at Center of One Span		**.62**	**.71**
11. Continuous Beam, Two Equal Spans, Concentrated Load at Center of Each Span		**.67**	**.48**

EXAMPLE I:

Determine load and deflection of a P 1000 beam continuous over one support and loaded uniformly on one span.

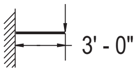


SOLUTION:

A. From load table for P1000 on page 25 load for a 5'-0" span is 680# and deflection is .35".
B. Multiply by factors from Table above.
Load = 680# x 1.30 = 884#
Deflection = .35" x .92 = .32"

EXAMPLE II

Determine load and deflection of a P 5500 cantilever beam with a concentrated load on the end.



SOLUTION:

A. From load table P5500 on page 58 load for a 3'-0" span is 2180# and deflection is .09".
B. Multiply by factors from Table above.
Load = 2180# x .12 = 262#
Deflection = .09" x 3.20 = .29"

PRCTI20221788 - REVISON #6 4/5/2024

P1000 - BEAM LOADING

Span In	Max. Allowable Uniform Load Lbs	Defl. at Uniform Load In	Uniform Loading at Deflection Span/180 Lbs	Span/240 Lbs	Span/360 Lbs
24	1,690	0.06	1,690	1,690	1,690
36	1,130	0.13	1,130	1,130	900
48	850	0.22	850	760	500
60	680	0.35	650	480	320
72	560	0.50	450	340	220
84	480	0.68	330	250	160
96	420	0.89	250	190	130
108	380	1.14	200	150	100
120	340	1.40	160	120	80
144	280	2.00	110	80	60
168	240	2.72	80	60	40
192	210	3.55	60	50	NR
216	190	4.58	50	40	NR
240	170	5.62	40	NR	NR

P1001 - BEAM LOADING

Span In	Max. Allowable Uniform Load Lbs	Defl. at Uniform Load In	Uniform Loading at Deflection Span/180 Lbs	Span/240 Lbs	Span/360 Lbs
24	3,500*	0.02	3,500*	3,500*	3,500*
36	3,190	0.07	3,190	3,190	3,190
48	2,390	0.13	2,390	2,390	2,390
60	1,910	0.20	1,910	1,910	1,620
72	1,600	0.28	1,600	1,600	1,130
84	1,370	0.39	1,370	1,240	830
96	1,200	0.51	1,200	950	630
108	1,060	0.64	1,000	750	500
120	960	0.79	810	610	410
144	800	1.14	560	420	280
168	680	1.53	410	310	210
192	600	2.02	320	240	160
216	530	2.54	250	190	130
240	480	3.16	200	150	100

P1000 - COLUMN LOADING

Unbraced Height In	Max. Allowable Load at Slot Face Lbs	Maximum Column Load Applied at C.G. K = 0.65 Lbs	K = 0.80 Lbs	K =1.0 Lbs	K = 1.2 Lbs
24	3,550	10,740	9,890	8,770	7,740
36	3,190	8,910	7,740	6,390	5,310
48	2,770	7,260	6,010	4,690	3,800
60	2,380	5,910	4,690	3,630	2,960
72	2,080	4,840	3,800	2,960	2,400
84	1,860	4,040	3,200	2,480	1,980
96	1,670	3,480	2,750	2,110	1,660
108	1,510	3,050	2,400	1,810	**
120	1,380	2,700	2,110	**	**
144	1,150	2,180	1,660	**	**

P1001 - COLUMN LOADING

Unbraced Height In	Max. Allowable Load at Slot Face Lbs	Maximum Column Load Applied at C.G. K = 0.65 Lbs	K = 0.80 Lbs	K =1.0 Lbs	K = 1.2 Lbs
24	6,430	24,280	23,610	22,700	21,820
36	6,290	22,810	21,820	20,650	19,670
48	6,160	21,410	20,300	18,670	16,160
60	6,000	20,210	18,670	15,520	12,390
72	5,620	18,970	16,160	12,390	8,950
84	5,170	16,950	13,630	9,470	6,580
96	4,690	14,890	11,190	7,250	5,040
108	4,170	12,850	8,950	5,730	3,980
120	3,690	10,900	7,250	4,640	**
144	2,930	7,630	5,040	**	**

P1000/P1001 - ELEMENTS OF SECTION

Parameter	P1000		P1001	
Area of Section	0.555	In²	1.111	In²
Axis 1-1				
Moment of Inertia (I)	0.185	In⁴	0.928	In⁴
Section Modulus (S)	0.202	In³	0.571	In³
Radius of Gyration (r)	0.577	In	0.914	In
Axis 2-2				
Moment of Inertia (I)	0.236	In⁴	0.471	In⁴
Section Modulus (S)	0.290	In³	0.580	In³
Radius of Gyration (r)	0.651	In	0.651	In

Notes:

* Load limited by spot weld shear.

** KL/r > 200

NR = Not Recommended.

1. Beam loads are given in *total* uniform load (W Lbs) not uniform load (w lbs/ft or w lbs/in).
2. Beam loads are based on a simple span and assumed to be adequately laterally braced. Unbraced spans can reduce beam load carrying capacity. Refer to Page 62 for reduction factors for unbraced lengths.
3. For pierced channel, multiply beam loads by the following factor:

"KO" Series.......95%
"HS" Series.......90%
"H3" Series........90%
"WT" Series.......85%
"T" Series 85%
"SL" Series........85%
"DS" Series........70%

4. Deduct channel weight from the beam loads.
5. For concentrated midspan point loads, multiply beam loads by 50% and the corresponding deflection by 80%. For other load conditions refer to page 18.
6. All beam loads are for bending about Axis 1-1.

UNISTRUT: CONT'D

THR'D ROD: CHECK TENS.

TRY ½" Ø A36 THR'D ROD → $F_y = 36$ KSI, $F_u = 58$ KSI

MAX LOAD IS FROM LARC-N

FROM PREV CALCS, $T_u = 2493^{\#}$

BRACE LOAD WHERE APPLICABLE:

$V_u = 2351^{\#} \rightarrow T_{u\text{-max}} = 2351^{\#} \cdot \frac{1}{1.5} = 1568^{\#}$

$\Sigma T_u = 2493^{\#} + 1568^{\#} = 4061^{\#}$

FROM AISC SCM TBL 7-17

GSY: $\phi T_n = 0.9 F_y A_g = 0.9(36\text{KSI})(0.81 \cdot A_b) = 0.9(36\text{KSI})(0.81 \cdot 0.196\text{ IN}^2)$
$= 5.14^K$

FROM TBL, CONS. USE NET TENS. AREA = 0.142 IN^2

NSR: $\phi T_n = 0.75 F_u A_e = 0.75(58\text{KSI})(0.75 A_b) = 6.17^K$

$(\phi T_n = 5.14^K \geq T_u = 2.50^K)$ ✓ OK

∴ ½" Ø THR'D ROD OK FOR TENS.

Project: ~~MHS HYBRID OR~~ Job No: 23-225

Subject: Calcs Sheet Name: ESO

Originating Office: ☐ Seattle ☒ Tacoma ☐ Portland Date: 2023-04-06

UNISTRUT: CONT'D

P1001.HS TO P1001-HS: TRY P1737

MAX LOAD IS FROM LARC-N → NEED ASD LOAD

$$T_a = \frac{(\{1.0\}1763^\# + \{0.7\}371^\#)32.1'' + \{0.7\}3227^\#(40.6'')}{2\ (42.6'')}$$

$$= 1839^\#$$

NOTE: BRACE LOAD DOES NOT OCCUR AT SAME LOCATION IN DIRECTION OF MAX TENS. LOADING

CHECK ALT CASE OF LCD MONITOR SUPPORT

$$\hookrightarrow T_a = \frac{(\{1.0\}563^\# + \{0.7\}119^\#)94.9'' + \{0.7\}1031^\#(46.5'')}{(1\ \text{SUPP})(75.75'')} + \frac{\{1.0\}183^\# + \{0.7\}39^\#}{8\ \text{SUPP}}$$

$$= 1253^\# + 26^\# = 1279^\#$$

BRACE LOAD WHERE APPLICABLE:

$V_u = 2351^\# \rightarrow T_{a\text{-max}} = \{0.7\}2351^\# \cdot 1/1.5 = 1097^\#$

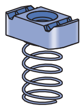
$\Sigma T_a = 1279^\# + 1097^\# = 2376^\# > 1/2''\varnothing$ CHANNEL NUT $= 2000^\#$ x

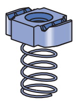
∴ PROV. MIN. 5/8" Ø THR'D ROD + CHANNEL NUTS

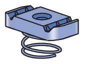
$T_n/\Omega = 2500^\# \geq T_a = 2376^\#$

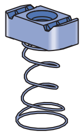
∴ P1737 w/ 5/8" Ø FASTENERS OK

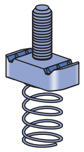
Channel Nuts With Spring


P1006 - P1010
Pg 73

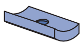

P1012S - P1024S
Pg 73

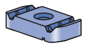

P4006 - P4010
Pg 73

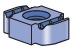

P5506 - P5510
Pg 73

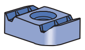

P2378 - P2382
Pg 74

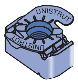
Channel Nuts Without Spring

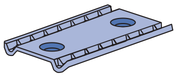

P3016
Pg 73

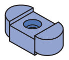

P3006 - P3013
Pg 73


P1012 - P1024
Pg 73

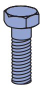

P4012 - P4023
Pg 73

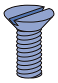

P1006T - P1010T, P4010T
Pg 73

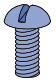

P4908
Pg 73

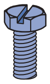

P1016
Pg 73

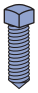
Hardware


HHCS
Pg 74


HFMS
Pg 74

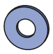

HRMS
Pg 74


HSHS
Pg 74

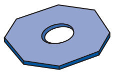

HCSS
Pg 74

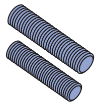

HSQN
Pg 75

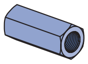

HHXN
Pg 75

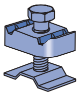

HFLW
Pg 75

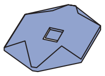

HLKW
Pg 75

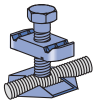

HOCW
Pg 76

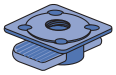

HTHR
Pg 75


HRCN
Pg 75


P2486
Pg 76


P2485
Pg 76


P2485K
Pg 76


K1062 - K1064
Pg 76

Maximum Allowable Pull-out And Slip Loads

Channel	Channel Nut Size-Thread	Gauge	Allowable Pull-Out Strength Lbs *(kN)*	Resistance to Slip Lbs *(kN)*	Torque Ft-Lbs *(N•m)*
P1000 P3000 P4400 P4526 P5000 P5500	⅞" - 9	12	2,500 *11.12*	1,700 *7.56*	*125 *170*
	¾" - 10	12	2,500 *11.12*	1,700 *7.56*	*125 *170*
	⅝" - 11	12	2,500 *11.12*	1,500 *6.67*	*100 *135*
	½" - 13	12	2,000 *8.90*	1,500 *6.67*	50 *70*
	7⁄16" - 14	12	1,400 *6.23*	1,000 *4.45*	35 *50*
	⅜" - 16	12	1,000 *4.45*	800 *3.56*	19 *25*
	5⁄16" - 18	12	800 *3.56*	500 *2.22*	11 *15*
	¼" - 20	12	600 *2.67*	300 *1.33*	6 *8*
P3300	½" - 13	12	1,500 *6.67*	1,500 *6.67*	50 *70*
	⅜" - 16	12	1,000 *4.45*	800 *3.56*	19 *25*
	5⁄16" - 18	12	800 *3.56*	500 *2.22*	11 *15*
	¼" - 20	12	600 *2.67*	300 *1.33*	6 *8*

Channel	Channel Nut Size-Thread	Gauge	Allowable Pull-Out Strength Lbs *(kN)*	Resistance to Slip Lbs *(kN)*	Torque Ft-Lbs *(N•m)*
P1100 & P4100	½" - 13	14	1,400 *6.23*	1,000 *4.45*	50 *70*
	⅜" - 16	14	1,000 *4.45*	750 *3.34*	19 *25*
	5⁄16" - 18	14	800 *3.56*	400 *1.78*	11 *15*
	¼" - 20	14	600 *2.67*	300 *1.33*	6 *8*
P2000 & P4000	½" - 13	16	1,000 *4.45*	1,000 *4.54*	50 *70*
	⅜" - 16	16	1,000 *4.45*	750 *3.34*	19 *25*
	5⁄16" - 18	16	800 *3.56*	400 *1.78*	11 *15*
	¼" - 20	16	600 *2.67*	300 *1.33*	6 *8*

* May require ⅜" or ½" thick fitting.

Nut design loads include a minimum safety factor of 3.

Note: Refer to the Channel Nut Selection Chart on the following two pages for the part number.

UNISTRUT: CON'T'D

THR'D ROD: CHECK COMP.

MAX VERT DIST. ≈ 3' = 36"

5/8" Ø THR'D ROD → $r = \frac{R}{2} = 0.75(5/8''/2)/2 = 0.1172''$

$KL/r = (1.0)(36'')/0.1172'' = 307$

$4.71\sqrt{E/F_y} = 4.71\sqrt{29{,}000\,KSI/36\,KSI} = 133.7 \leq \left(\frac{KL}{r} = \frac{L_c}{r}\right)$

$\therefore F_{cr} = 0.877F_e = 0.877\,\pi^2 E/\left(\frac{L_c}{r}\right)^2$

$= 0.877\pi^2(29000\,KSI)/(0.1172'')^2 = 3.03\,KSI$

$\hookrightarrow P_n/\Omega = F_{cr}A_g/1.67 = (3.03\,KSI)(0.307\,IN^2)/1.67 = 0.558^K = 558^\#$

BRACE LOAD WHERE APPLICABLE:

$V_u = 2351^\# \rightarrow C_{a\text{-}max} = \{0.7\}\,2351^\# \cdot 1/1.5 = 1098^\#$

$P_n/\Omega = 558^\# \not\geq C_a = 1098^\# \rightsquigarrow$ ∴ NEED STIFFENER

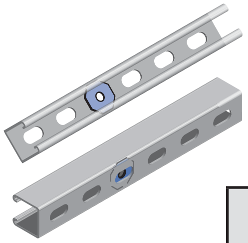
REQ'D STRESS = $P_a/A_{ROOT} = 1098^\#/0.202\,IN^2 = 5436\,PSI$

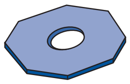
∴ USE STIFFENER CLIP SPACING OF 18" O.C. = 8025 PSI

∴ 5/8" Ø THR'D ROD w/ P1000T w/ P2845K @ 18" O.C. OK

SLOT ADAPTER™

EG

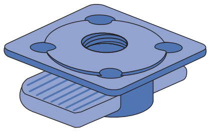




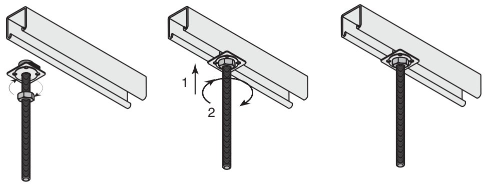
Part No.	Bolt Size	Wt/100 pcs Lbs (kg)
HOCW025	¼" *(6.4)*	1 *(0.5)*
HOCW037	⅜" *(9.5)*	1.5 *(0.7)*

KWIK WASHER™

EG



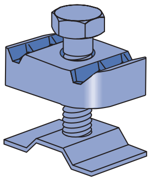
Overhead installation with one hand.
Available in zinc plated and hot dip galvanized

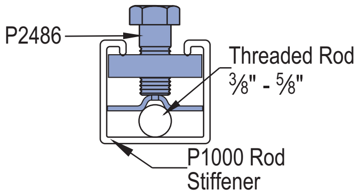


Part No.	Size In *(mm)*	Load Lbs *(kN)*	Wt/100 pcs Lbs *(kg)*
K1062	¼" *(6.4)*	250 *(1.11)*	1.2 *(0.5)*
K1063	⅜" *(9.5)*	610 *(2.71)*	2.6 *(1.2)*
K1064	½" *(12.7)*	1,130 *(5.03)*	9.3 *(4.2)*

P2486 SEISMIC ROD STIFFENER

EG

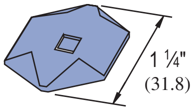




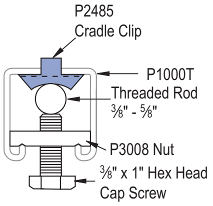
Wt/100 pcs: 16 Lbs (7.3 kg)

P2485 CRADLE CLIP

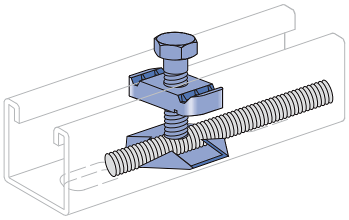
EG

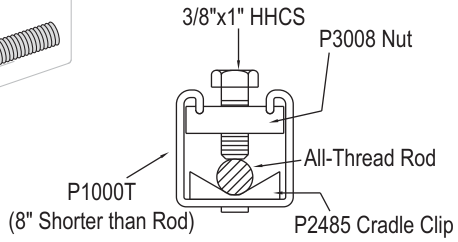


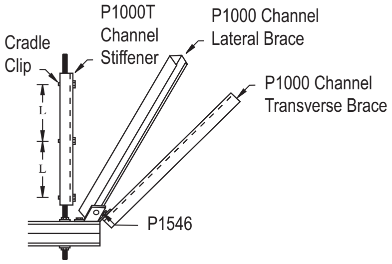
Cradle clip only, order other items seperately.



P2485K SEISMIC CRADLE CLIP ASSEMBLY







Wt/100 pcs: 3.0 Lbs (1.4 kg)

P2485 & P2486 – SPACING CHART

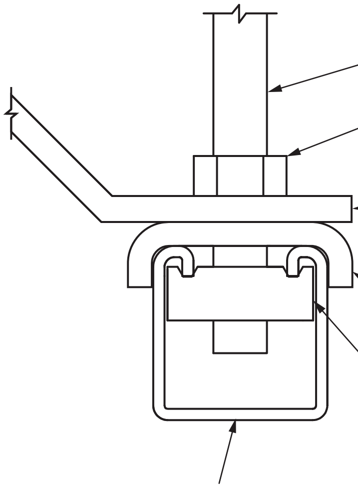
				............Rod Stiffener Clip Spacing (L)............			
Rod Size In *(mm)*	Root Area In2 *(mm2)*	Radius of Gyration In *(mm)*	Design Load Lbs *(kN)*	Rod Stress @100% 10,700 PSI In *(mm)*	Rod Stress @75% 8,025 PSI In *(mm)*	Rod Stress @50% 5,350 PSI In *(mm)*	Rod Stress @35% 3,745 PSI In *(mm)*
⅜	0.068	0.074	730	9	11	13	15
9.5	*49.5*	*1.99*	*3.25*	*228.6*	*279.4*	*330.2*	*381.0*
½	0.126	0.100	1,350	12	14	17	21
12.7	*72.4*	*2.40*	*6.01*	*304.8*	*355.6*	*431.8*	*533.4*
⅝	0.202	0.127	2,160	15	18	22	26
15.9	*138.3*	*3.32*	*9.61*	*381.0*	*457.2*	*558.8*	*660.4*

Notes:

1. Minimum Tensile Stress is 50,000 psi (345MPa)
2. Working Stress is 10,700 psi (73.9 MPa) – Same as for Tension
3. Compression Will Only Occur During a Seismic Event
4. Compression Requires the Use of Rod Stiffeners
5. KL/r = 200 When Rod Stress is at 35%

Refer to seismic bracing systems catalog for more detailed information.

DETAIL 5A.4-1: TYPICAL THREADED ROD CONNECTION TO STRUT WITH WOLF WASHER AND BRACE



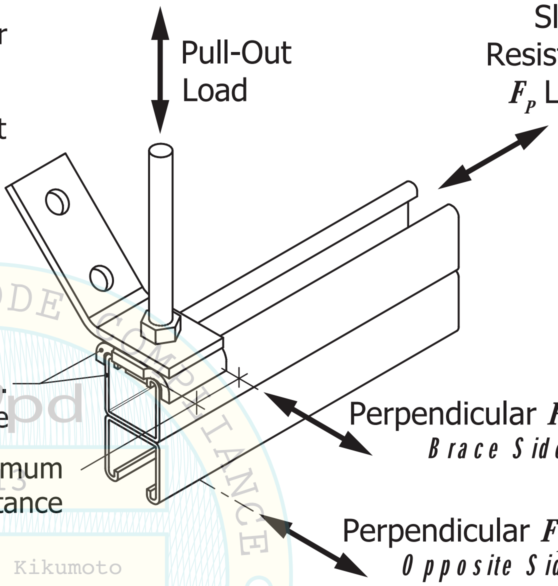


Table 5a.4-1

Rod Size	Installation Torque (ft-lbs)	Max. Capacity (lbs) [ASD]	Maximum Horizontal F_P Force (lbs) [ASD]		
		Pull-Out	Slip Resistance	Perpendicular Brace Side	Perpendicular [4] Opposite Brace
½"	60 - 65	2,605	2,375	935	640
⅝"	100 - 110	2,605	2,375	935	640

Notes:

1) Capacities listed in Table 5a.4-1 are for this connection only when attached to the open side of the Channel. Fittings, Channel and other component capacities must also be considered.
2) The fitting may be oriented in a transverse or longitudinal (as shown) orientation. A typical transverse connection is shown on Detail 5b.2-3. A max of two fittings may also be stacked at this connection to accomodate braces in both directions.
3) When used with P1001, P5501 or P5001 channel and a perpendicular load is applied on the opposite side of the channel from the brace. The total of the perpendicular loads at the Brace Side and Opposite Side must not exceed 935 lbs.

DETAIL 5A.2-1: TYPICAL FITTING CONNECTION TO STRUT WITH WOLF WASHER

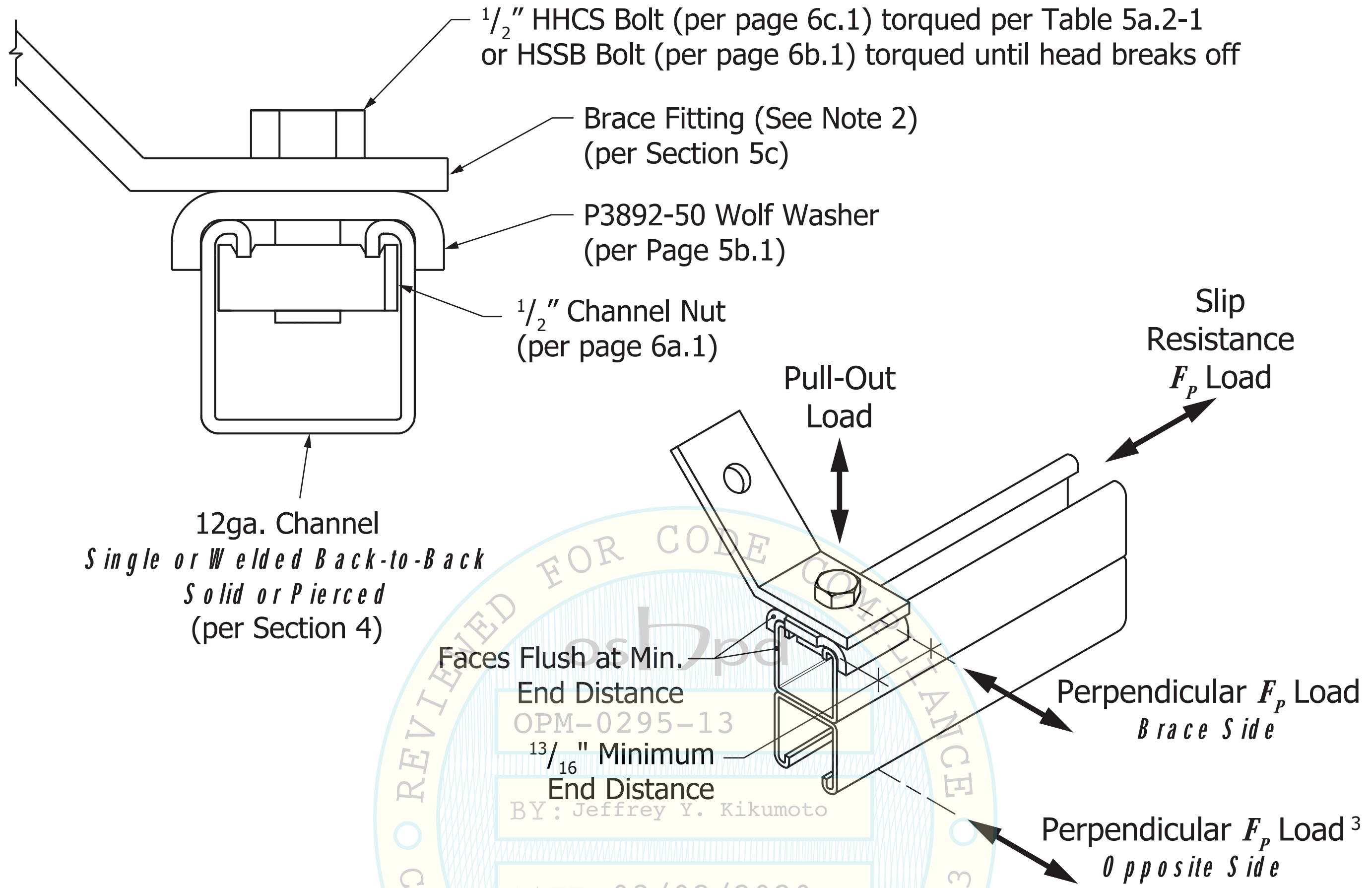


Table 5a.2-1

Bolt Size	Installation Torque (ft-lbs)	Max. Capacity (lbs) [ASD]	Maximum Horizontal F_P Force (lbs) [ASD]		
		Pull-Out	Slip Resistance	Perpendicular Brace Side	Perpendicular [3] Opposite Brace
½"	60 - 65	2,605	2,375	935	640

Notes:

1) Capacities listed in Table 5a.2-1 are for this connection only when attached to the open side of the Channel. Fittings, Channel and other component capacities must also be considered.
2) The fitting may be oriented in a transverse or longitudinal (as shown) orientation. A typical transverse connection is shown on Detail 5b.2-3. A max of two fittings may also be stacked at this connection to accomodate braces in both directions.
3) When used with P1001, P5501 or P5001 channel and a perpendicular load is applied on the opposite side of the channel from the brace. The total of the perpendicular loads at the Brace Side and Opposite Side must not exceed 935 lbs.

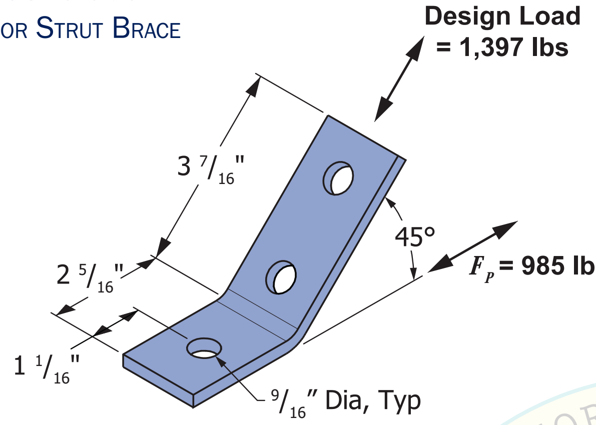
BRACE FITTINGS – NEW INSTALLATIONS

Material / Finish Specifications All Fittings on this Page
Material: ASTM A1011 SS GR 33 min. or ASTM A1011 HSLAS GR 45 min.
Finish: ASTM B633 Type III SC1 (EG)

45° FIXED ANGLE FITTINGS

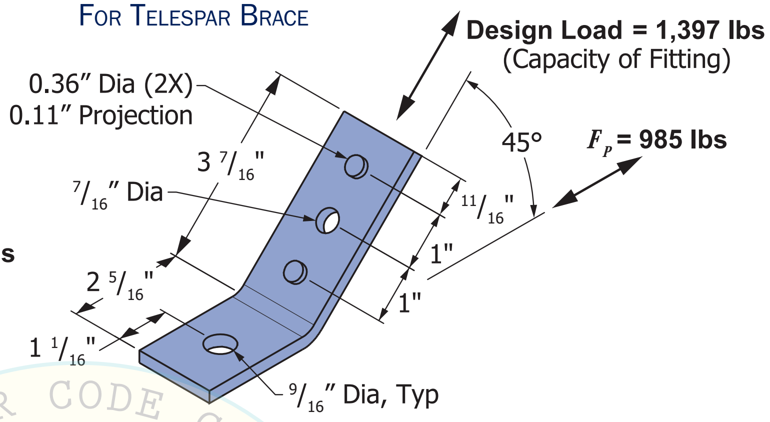
P3810-050

For Strut Brace



P3815-050

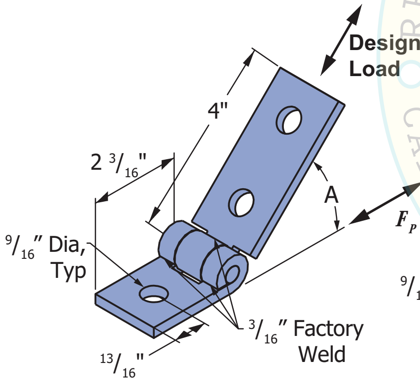
For Telespar Brace



HINGED FITTINGS

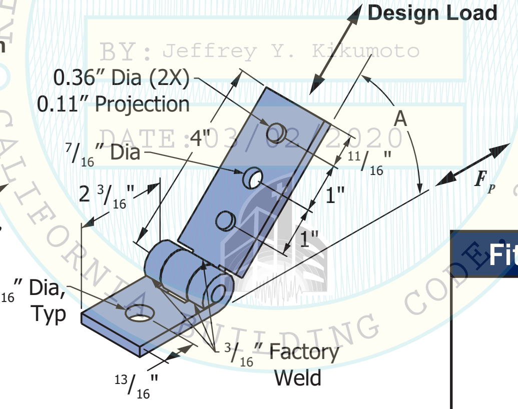
P1354AW

For Strut Brace



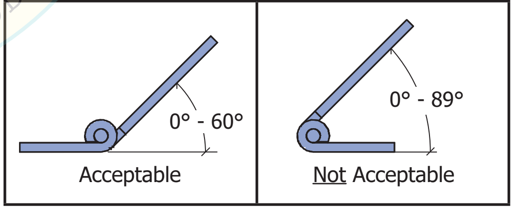
P3835-050

For Telespar Brace



Fittings: P1354AW, P3835-050		
Angle "A" from Horizontal	Design Load (lbs)	F_P (lbs)
30° $^{+5°}$/ $_{-25°}$	2,136	1,850
45° $^{+5°}$/ $_{-10°}$	1,397	985
60° $^{+0°}$/ $_{-10°}$	1,462	730

Fittings: P1354AW, P3835-050

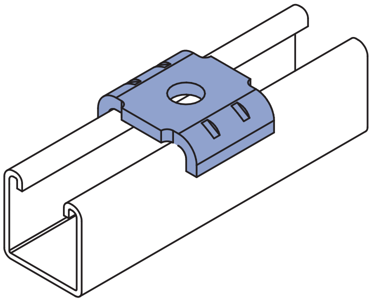


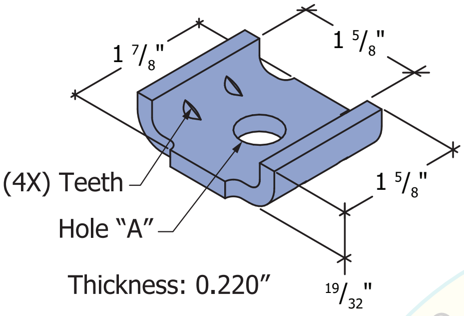
Note:

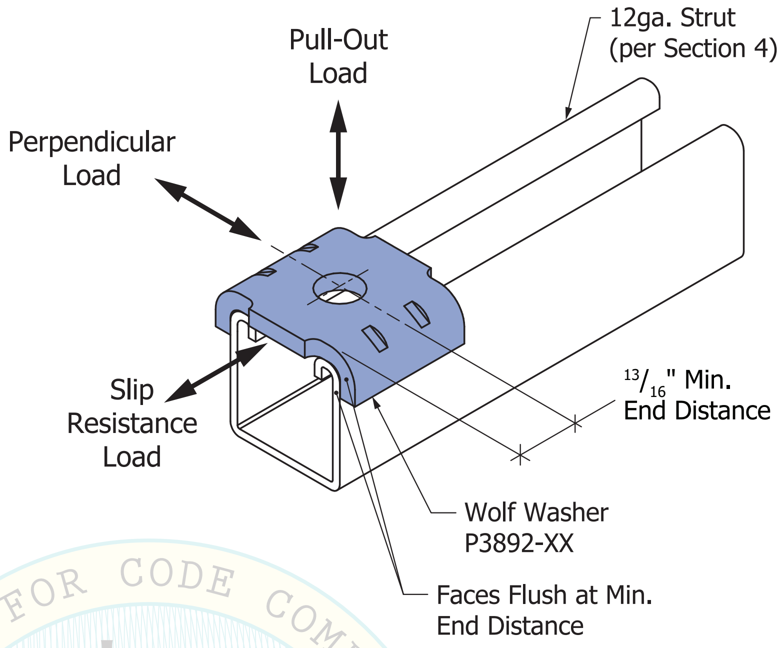
1) Loads based on ½" HHCS or HSSB Bolt, and ½" Channel Nut.
2) All fitting connections to strut must conform to one of the details in Section 5a. All holes in each fitting must have one of these connections unless otherwise noted in the above details. Other components are hidden on this page for clarity.
3) Fitting dimensions (all this page) unless otherwise noted: Hole Diameter: ⁹⁄₁₆"; Hole Spacing - From End: ¹³⁄₁₆"; Hole Spacing - On Center: 1 ⁷/₈"; Width: 1 ⁵/₈"; Thickness: ¹/₄" or 0.22".
4) P3815-050 and P3835-050 are to be connected to Telespar per Page 5a.8 and capacities on that page may govern.

Wolf Washer & Square Washer

P3892-XX - WOLF WASHER



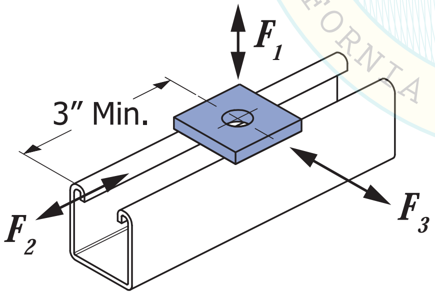




Part No.	Rod Size	Hole Size "A" (Dia.)
P3892-50	½"	9/16"
P3892-63	⅝"	11/16"

Material / Finish Specifications
Material: ASTM A1011 SS Grade 45
Finish: ASTM B633 Type III SC1 (EG)
Case Hardened

P1063, P1064, P1964, P2471 - SQUARE WASHERS



Part No.	Bolt Size	Hole Size
P1063	⅜"	7/16"
P1064	½"	9/16"
P1964	⅝"	11/16"
P2471	¾"	13/16"

Notes:

1) Channel Nut, Fitting and Cap Screw not shown for clarity. See Section 5a and Page 5b.2 for full installation requirements and load capacities.

Atkore™
Unistrut

16100 S. Lathrop Ave
Harvey, IL 60426
Toll-Free: (800) 882-5543

www.unistrutseismic.com

Structural Engineer: Rami Elhassan
California SE No. 3930

HSS SUPPORTS

PRCTI20221788 - REVISON #6 4/5/2024

Project: ~~MHS HYBRID OR~~ Job No: 23-225
Subject: Calcs Sheet ______ Name: ESO
Originating Office: ☐ Seattle ☒ Tacoma ☐ Portland Date: 2023-04-06

HSS SUPPORTS:

FROM RISA, HSS 3x3x1/4 OK FOR STR.

USE PL FOR VERT SUPP.

HSS $R_{a\,MAX} = 15.623^K$ (MAX AT STRYKER BOOMS = 7^K)

ℓ 3/16" WELD REQ'D = $15.623^K / (0.392 \cdot 3) = 13.3"$

FOR ⊥ WELD, NEED $13.3" / 1.5 = 8.86"$

$(8.86" \cdot 7^K / 15.6^K = 3.97"$ @ BOOMS)

ℓ 1/4" WELD REQ'D = $15.623^K / (0.392 \cdot 4) = 9.67"$

∴ HSS STL CONNECTIONS OK

CHECK CONN. TO CONC:

TYPICAL HSS → VERT PT LOAD OCCURS @ 1'-5½" ON 5.25' SPAN

MAX LOADS: 4.05^K → LC 177 (ASD)

OR MAX BRACE VERT LOAD = 1.59^K

OR MAX BOOM SUPPORT RXN = 5.05^K → LC 47 (ASD) DL+LL

∴ DESIGN CONC ATT. FOR $4.05^K (\Omega_0 = 2.0)\left(\frac{1.5'}{5.25'}\right)/0.7 = 3.31^K$ EL

ALSO CHECK FOR $5.05^K \cdot 1.4 = 7.07^K$ DL+LL

↳ CONS. CHECK AS CONTROLLING SEIS. LOAD (REDUCED ANCHOR CAPACITY)

∴ (4) ½" Ø x 4½" HILTI KB-TZ2 OK

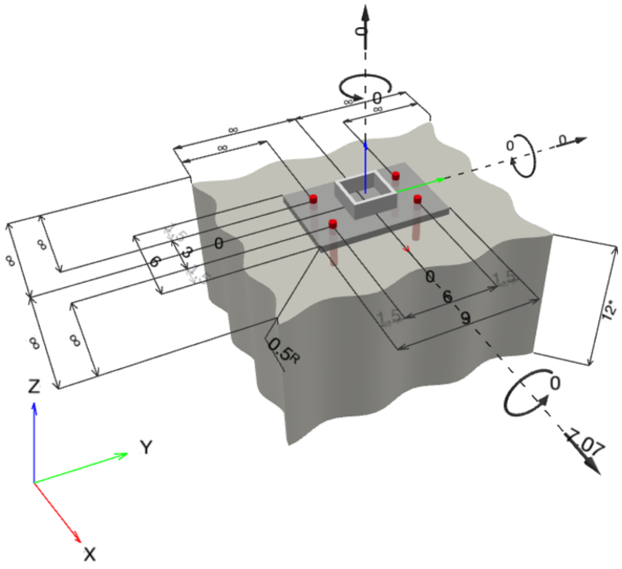
Specifier's comments:

1 Input data

Anchor type and diameter:	**Kwik Bolt TZ2 - CS 1/2 (2 1/2) hnom3**
Item number:	2210255 KB-TZ2 1/2x4 1/2
Effective embedment depth:	$h_{ef,act}$ = 2.500 in., h_{nom} = 3.000 in.
Material:	Carbon Steel
Evaluation Service Report:	ESR-4266
Issued I Valid:	12/17/2021 | 12/1/2023
Proof:	Design Method ACI 318-14 / Mech
Stand-off installation:	e_b = 0.000 in. (no stand-off); t = 0.500 in.
Anchor plate^R :	l_x x l_y x t = 6.000 in. x 9.000 in. x 0.500 in.; (Recommended plate thickness: not calculated)
Profile:	Square HSS (AISC), HSS3X3X.250; (L x W x T) = 3.000 in. x 3.000 in. x 0.250 in.
Base material:	cracked concrete, 2500, f_c' = 2,500 psi; h = 12.000 in.
Installation:	**hammer drilled hole, Installation condition: Dry**
Reinforcement:	tension: condition B, shear: condition B; no supplemental splitting reinforcement present edge reinforcement: none or < No. 4 bar
Seismic loads (cat. C, D, E, or F)	Tension load: yes (17.2.3.4.3 (d)) Shear load: yes (17.2.3.5.3 (c))

^{R} - The anchor calculation is based on a rigid anchor plate assumption.

Geometry [in.] & Loading [kip, ft.kip]



Company:	PCS Structural Solutions	Page:	2
Address:	1250 Pacific Avenue, STE 701	Specifier:	ESO
Phone I Fax:	2533832797 |	E-Mail:	info@pcs-structural.com
Design:	HSS Attachment to Conc. - DL+LL	Date:	4/11/2023
Fastening point:			

1.1 Design results

Case	Description	Forces [kip] / Moments [ft.kip]	Seismic	Max. Util. Anchor [%]
1	Combination 1	N = 0.000; V_x = 7.070; V_y = 0.000; M_x = 0.00000; M_y = 0.00000; M_z = 0.00000;	yes	49

PRCTI20221788 - REVISON #6 4/5/2024

Company:	PCS Structural Solutions	Page:	3
Address:	1250 Pacific Avenue, STE 701	Specifier:	ESO
Phone I Fax:	2533832797 |	E-Mail:	info@pcs-structural.com
Design:	HSS Attachment to Conc. - DL+LL	Date:	4/11/2023
Fastening point:			

2 Proof I Utilization (Governing Cases)

Loading	Proof	Design values [kip] Load	Capacity	Utilization β_N / β_V [%]	Status
Tension	-	-	-	- / -	N/A
Shear	Pryout Strength	7.070	14.643	- / 49	OK

Loading	β_N	β_V	ζ	Utilization $\beta_{N,V}$ [%]	Status
Combined tension and shear loads	-	-	-	-	N/A

3 Warnings

- Please consider all details and hints/warnings given in the detailed report!

Fastening meets the design criteria!

Company:	PCS Structural Solutions	Page:	4
Address:	1250 Pacific Avenue, STE 701	Specifier:	ESO
Phone I Fax:	2533832797 |	E-Mail:	info@pcs-structural.com
Design:	HSS Attachment to Conc. - DL+LL	Date:	4/11/2023
Fastening point:			

4 Remarks; Your Cooperation Duties

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ROOFTOP EQUIPMENT

PRCTI20221788 - REVISON #6 4/5/2024

PCS Structural *Solutions*

Project: ~~MHS HYBRID OR~~ Job No: 23-225
Subject: Calcs Sheet:
Originating Office: ☐ Seattle ☒ Tacoma ☐ Portland
Name: ESO
Date: 2023-04-07

AHU REPLACEMENT: BASIS OF DESIGN – CARRIER SUBM. DATED 2023-03-01 REV 0

(E) UNIT : 6000#

* ASSUME 400# CURB

NEW UNIT : 6524#, TO RE-USE (E) CURB

(E) W14x22 → SPAN = 24'-7"

CENTER OF UNIT @ 11'-6"

RTU LOADS @ $24'\text{-}7'' - (11'\text{-}6'') + \frac{5'\text{-}7''}{2} = 15.875'$

& $24'\text{-}7'' - (11'\text{-}6'') - \frac{5'\text{-}7''}{2} = 10.292'$

LOADS TO BM:

ROOF: 15 PSF + 25 PSF; TRIB = 2.88';

CONS. SAY 5.75' = FULL ROOF SUPPORT

* ASSUME AHU LOADS RESISTED BY W14x22 ONLY

MAX VERT LOAD $= [(6524\# + 402\#\text{ CURB})/24.5']\,5.75'/2\text{ SIDES} = 813\#\text{ DL}$

$+\text{ ADD'L SL} = (25\text{ PSF})(5'\text{-}7'')(5.75')/2\text{ SIDES} = 402\#\text{ SL}$

$EL = (4.4'\cdot(5720\# = F_p)/5.5' + 1525\#/2)(5.75'/24.5') = 1253\#\text{ T/C}$

$WL = (6858\#\cdot 2.8'/5.5' + 5432\#/2)(5.75'/24.5') = 1457\#\text{ T}$

(– " + ")(") = 182# COMP.

∴ (E) W14x22 OK FOR NEW UNIT

(DCR = 0.325)

ADDED LAT LOAD: 6524#/6000# = ↑8.8% ≤ 10%

∴ LAT OK

PCS Structural Solutions

Job Number = 23-225
Date = 2023-04-07
Name = ESO

Project: MHS GS Hybrid OR

Unit = AHU-OR1

Unit Information

Weight, W_p = 6513 lb
Height to Unit = 35.3 ft
Unit Width(w) = 5.6 ft
Unit Height (h) = 3.6 ft
Unit Length (ℓ) = 24.6 ft
Center of Gravity (Vertical) = 2.4 ft 2/3(Unit Height Assumed)

Curb Information

Is there a curb? YES
Weight, $W_{p\text{-}2}$ = 402 lb
Curb Width at Base (w) = 5.5 ft
Curb Height (h) = 2.0 ft
Curb Length at Base (ℓ) = 24.3 ft

Total Weight, W_{tot} 6915 lb
h_{wind} 2.8 ft 1/2(Unit height + Curb Height)
$h_{seismic}$ 4.4 ft Center of Gravity + Curb Height
Design Width, w_{des} 5.5 ft
Design Length, $ℓ_{des}$ 24.3 ft

Building Information

Are building dimensions known? YES
Building Width (B) = 66.5 ft
Building Length (L) = 207.0 ft

Design Criteria = ASCE 7-16, IBC 2018

Gravity

Roof Dead = 15 psf
Roof Snow = 25 psf
$P_{Roof\ DL}$ 2058 lb
$P_{Roof\ SL}$ 3430 lb

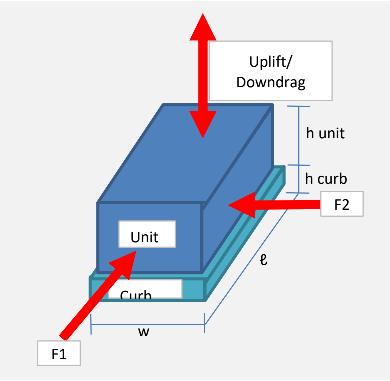
Lateral

The new unit does not have a significant impact to the building's capacity to resist wind or seismic forces

Seismic - ASCE 7-16 Chapter 13

S_{DS} = 1.103
a_p = 2.5 Tbl. 13.6-1
I_p = 1.5 § 13.1.3
R_p = 6 Tbl. 13.6-1
Height of Attachment or Bot of Curb (z) = 35.3 ft
Total Building Height (H) = 35.3 ft
$F_p = 0.4*S_{DS}*(I_p/R_p)*a_p*W_p*[1+2*z/H]$ = 5720 lb Eqn. 13.3-1
$F_{p\ max} = 1.6*S_{DS}*I_p*W_p$ = 18305 lb Eqn. 13.3-2
$F_{p\ min} = 0.3*S_{DS}*I_p*W_p$ = 3432 lb Eqn. 13.3-3

Controlling F_p = **5720 lb**
Vertical F_p = **1525 lb**



Wind - ASCE 7-16 Chapter 29

Wind Lateral:

Wind Speed 108 mph
Risk Category IV
Wind Exposure C
K_{zt}, Topographical Effect 1.00
K_e, Ground Elevation Factor 1.00

K_h (Table 29.3-1) 1.04

	F_1	F_2
A_f =	31.0 sq ft	136.7 sq ft
A_r =	137.2 sq ft	

q_h= .00256*K_d*K_h*K_{zt}*K_e*V^2 = 26.4 psf Eqn. 26.10-1

Building B*h = 7313 sq ft
Building B*L = 13766 sq ft

$(G*C_r)_1$	$(G*C_r)_2$	
1.90	1.90	for horizontal force - See § 29.4.1 - Worst case used for B*h or L*h
1.50		for vertical force - See § 29.4.1 - Maximum dimensions used for A_r

F_1 F_2

PCS Structural Solutions

Project: MHS GS Hybrid OR

Job Number = 23-225
Date = 2023-04-07
Name = ESO

Unit = AHU-OR1

$F_h = q_h*(G*C_r)*A_f$ = **1557 lb** **6858 lb** Eqn. 29.4-2
$F_v = q_h*(G*C_r)*A_r$ = **5432 lb** Eqn. 29.4-3

Moments (Unfactored)

	F_1	F_2
$M_{OT\ Seismic}$ =	25106 lb-ft	25106 lb-ft
$M_{OT\ Wind}$ =	4347 lb-ft	19145 lb-ft
$M_{R\ SL}$ =	41749 lb-ft	9468 lb-ft
$M_{R\ DL\ Unit}$ =	79275 lb-ft	17979 lb-ft
$M_{R\ DL\ Curb}$ =	4893 lb-ft	1110 lb-ft

Combinations (ASD):

	Overturning		Vertical Force		Tension		Compression		Shear	
Combination	OT_1	OT_2	Uplift	Downdrag	T_1	T_2	C_1	C_2	V_1	V_2
0.6DL-0.6WL	-47893 lb-ft	34 lb-ft	3259 lb	0 lb	0 lb	1636 lb	1967 lb	0 lb	-934 lb	-4115 lb
0.6DL-0.7EQ	-32927 lb-ft	6121 lb-ft	1068 lb	1068 lb	0 lb	1643 lb	1886 lb	0 lb	-4004 lb	-4004 lb
DL+SL	-125918 lb-ft	-28556 lb-ft	0 lb	0 lb	0 lb	0 lb	5172 lb	5172 lb	0 lb	0 lb
DL+0.6WL	-86777 lb-ft	-30575 lb-ft	3259 lb	0 lb	0 lb	0 lb	3565 lb	5538 lb	934 lb	4115 lb
DL+0.45WL+0.75SL	-117437 lb-ft	-34805 lb-ft	2445 lb	0 lb	0 lb	0 lb	4824 lb	6304 lb	701 lb	3086 lb
DL+0.7EQ	-101743 lb-ft	-36663 lb-ft	1068 lb	1068 lb	0 lb	0 lb	4713 lb	7175 lb	4004 lb	4004 lb
DL+0.525EQ+0.75SL	-128661 lb-ft	-39370 lb-ft	801 lb	801 lb	0 lb	0 lb	5686 lb	7532 lb	3003 lb	3003 lb

Design (ASD):

Tension		Compression		Shear	
T_1	T_2	C_1	C_2	V_1	V_2
0 lb	1643 lb	5686 lb	7532 lb	4004 lb	4115 lb

Steel Beam

Project File: 23225 Calcs 2023-01-31eso.ec6

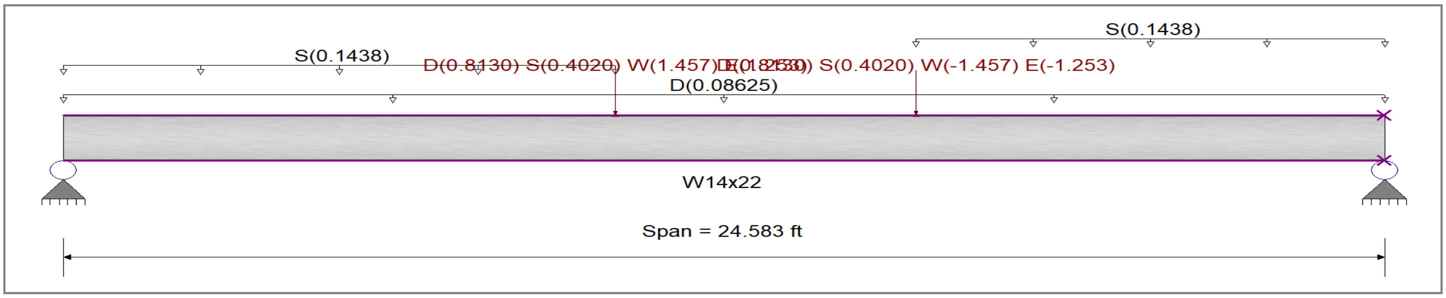
DESCRIPTION: AHU-OR1 Support Beam

CODE REFERENCES

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : IBC 2018

Material Properties

Analysis Method	Allowable Strength Design	Fy : Steel Yield :	50.0 ksi
Beam Bracing :	Beam is Fully Braced against lateral-torsional buckling	E: Modulus :	29,000.0 ksi
Bending Axis :	Major Axis Bending		



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self w eight calculated and added to loading

Uniform Load : D = 0.0150 ksf, Tributary Width = 5.750 ft, (Roof Dead)

Uniform Load : S = 0.0250 ksf, Extent = 0.0 -->> 10.292 ft, Tributary Width = 5.750 ft, (Roof Snow)

Uniform Load : S = 0.0250 ksf, Extent = 15.875 -->> 24.583 ft, Tributary Width = 5.750 ft, (Roof Snow)

Point Load : D = 0.8130, S = 0.4020, W = 1.457, E = 1.253 k @ 10.292 ft, (AHU-OR1)

Point Load : D = 0.8130, S = 0.4020, W = -1.457, E = -1.253 k @ 15.875 ft, (AHU-OR1)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	**0.325** : 1	Maximum Shear Stress Ratio =	**0.063** : 1
Section used for this span	**W14x22**	Section used for this span	**W14x22**
Ma : Applied	26.927 k-ft	Va : Applied	3.964 k
Mn / Omega : Allowable	82.834 k-ft	Vn/Omega : Allowable	63.020 k
Load Combination	+1.106D+0.750S+0.5250E	Load Combination	+D+S
		Location of maximum on span	24.583 ft
Span # where maximum occurs	Span # 1	Span # where maximum occurs	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.202 in	Ratio =	1,458	>=360	Span: 1 : -W
Max Upward Transient Deflection	-0.018 in	Ratio =	16,327	>=360	Span: 1 : S Only
Max Downward Total Deflection	0.497 in	Ratio =	594	>=180	Span: 1 : +D+S
Max Upward Total Deflection	0.000 in	Ratio =	0	<180	

Maximum Forces & Stresses for Load Combinations

Load Combination			Max Stress Ratios		Summary of Moment Values							Summary of Shear Values		
Segment Length		Span #	M	V	Mmax +	Mmax -	Ma Max	Mnx	/nx/Omega	Cb	Rm	Va Max	Vnx	/nx/Omega
D Only														
Dsgn. L =	24.58 ft	1	0.192	0.035	15.91		15.91	138.33	82.83	1.00	1.00	2.20	94.53	63.02
+D+S														
Dsgn. L =	24.58 ft	1	0.318	0.063	26.38		26.38	138.33	82.83	1.00	1.00	3.96	94.53	63.02
+D+0.750S														
Dsgn. L =	24.58 ft	1	0.287	0.056	23.75		23.75	138.33	82.83	1.00	1.00	3.52	94.53	63.02
+D+0.60W														
Dsgn. L =	24.58 ft	1	0.215	0.036	17.82		17.82	138.33	82.83	1.00	1.00	2.29	94.53	63.02
+D-0.60W														
Dsgn. L =	24.58 ft	1	0.202	0.038	16.75		16.75	138.33	82.83	1.00	1.00	2.39	94.53	63.02
+1.142D+0.70E														
Dsgn. L =	24.58 ft	1	0.242	0.041	20.06		20.06	138.33	82.83	1.00	1.00	2.59	94.53	63.02

PRCTI20221788 - REVISON #6 4/5/2024

Steel Beam

Project File: 23225 Calcs 2023-01-31eso.ec6

DESCRIPTION: AHU-OR1 Support Beam

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios		Summary of Moment Values							Summary of Shear Values		
Segment Length	Span #	M	V	Mmax +	Mmax -	Ma Max	Mnx	/Inx/Omega	Cb	Rm	Va Max	Vnx/nx/Omega	
+1.142D-0.70E													
Dsgn. L = 24.58 ft	1	0.228	0.043	18.88		18.88	138.33	82.83	1.00	1.00	2.71	94.53	63.02
+D+0.450W													
Dsgn. L = 24.58 ft	1	0.209	0.036	17.31		17.31	138.33	82.83	1.00	1.00	2.24	94.53	63.02
+D-0.450W													
Dsgn. L = 24.58 ft	1	0.197	0.037	16.32		16.32	138.33	82.83	1.00	1.00	2.34	94.53	63.02
+D+0.750S+0.450W													
Dsgn. L = 24.58 ft	1	0.305	0.057	25.24		25.24	138.33	82.83	1.00	1.00	3.57	94.53	63.02
+D+0.750S-0.450W													
Dsgn. L = 24.58 ft	1	0.287	0.058	23.77		23.77	138.33	82.83	1.00	1.00	3.67	94.53	63.02
+1.106D+0.750S+0.5250E													
Dsgn. L = 24.58 ft	1	0.325	0.060	26.93		26.93	138.33	82.83	1.00	1.00	3.79	94.53	63.02
+1.106D+0.750S-0.5250E													
Dsgn. L = 24.58 ft	1	0.307	0.062	25.39		25.39	138.33	82.83	1.00	1.00	3.90	94.53	63.02
+0.60D+0.60W													
Dsgn. L = 24.58 ft	1	0.139	0.023	11.50		11.50	138.33	82.83	1.00	1.00	1.45	94.53	63.02
+0.60D-0.60W													
Dsgn. L = 24.58 ft	1	0.130	0.024	10.74		10.74	138.33	82.83	1.00	1.00	1.52	94.53	63.02
+0.4582D+0.70E													
Dsgn. L = 24.58 ft	1	0.112	0.018	9.26		9.26	138.33	82.83	1.00	1.00	1.16	94.53	63.02
+0.4582D-0.70E													
Dsgn. L = 24.58 ft	1	0.104	0.019	8.62		8.62	138.33	82.83	1.00	1.00	1.21	94.53	63.02

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S	1	0.4969	12.362		0.0000	0.000

Vertical Reactions

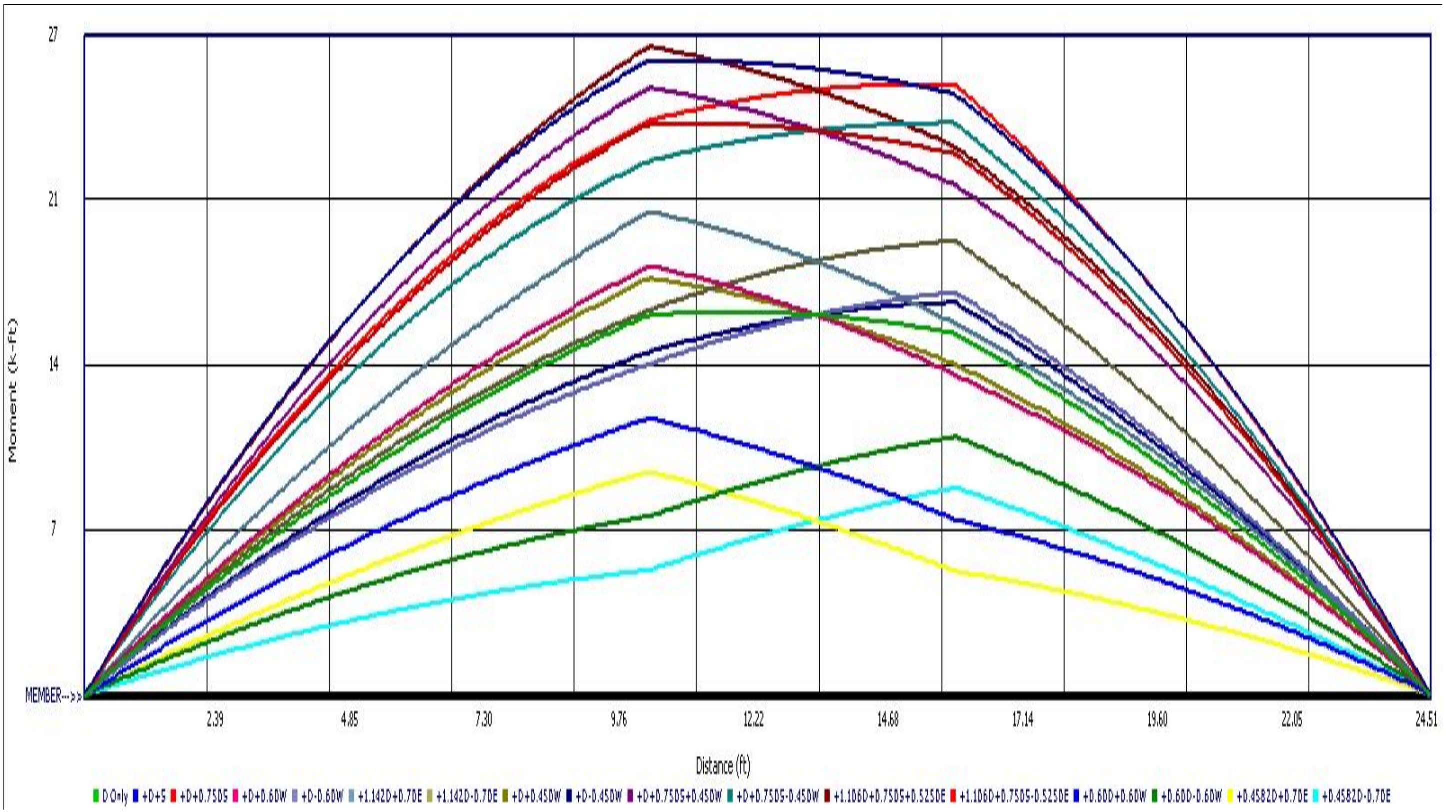
Support notation : Far left is

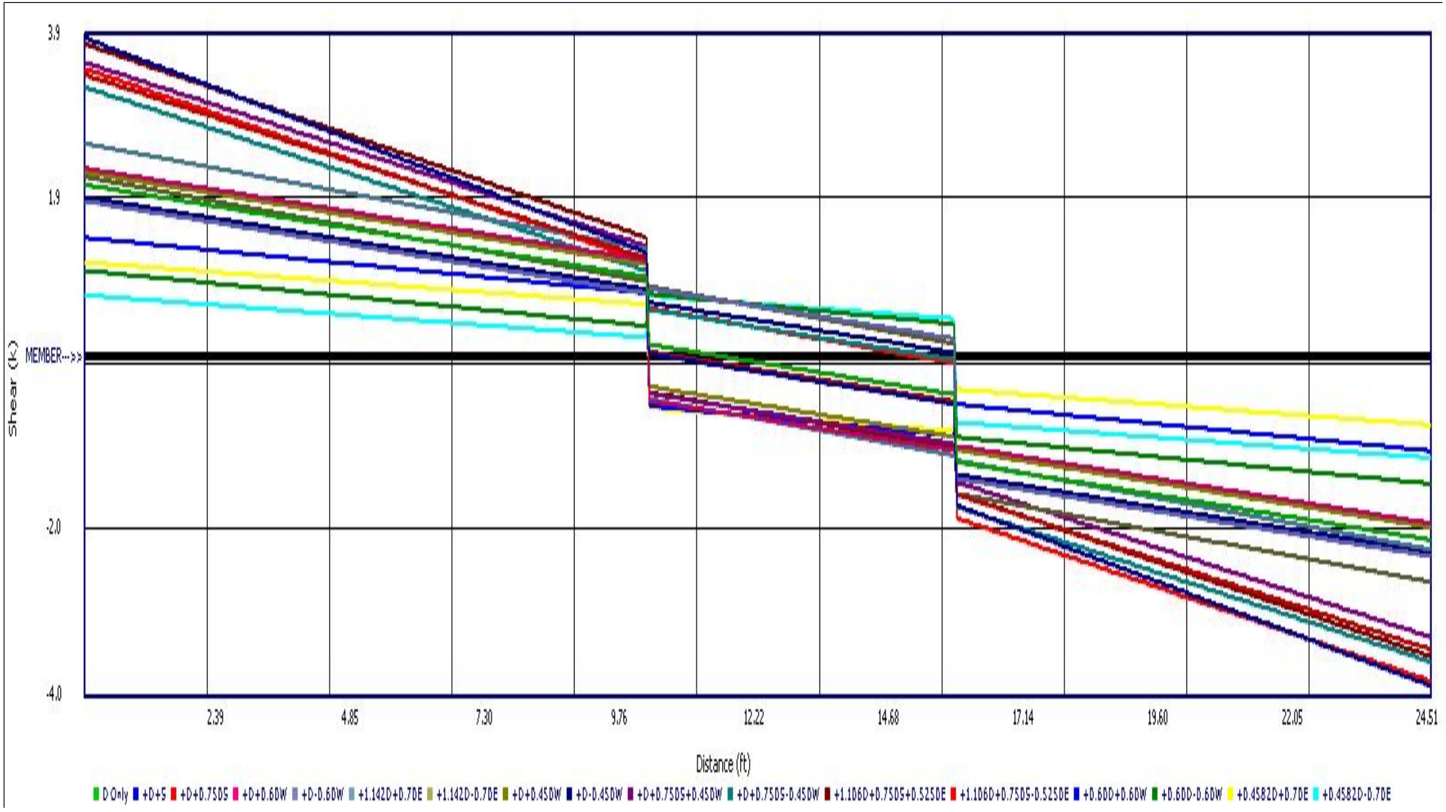
Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	3.859	3.964
Max Upward from Load Combinations	3.859	3.964
Max Upward from Load Cases	2.091	2.196
Max Downward from all Load Conditions (Re	-0.331	-0.331
Max Downward from Load Combinations (Re	-0.331	
Max Downward from Load Cases (Resisting U	-0.285	-0.331
D Only	2.091	2.196
+D+S	3.859	3.964
+D+0.750S	3.417	3.522
+D+0.60W	2.290	1.997
+D-0.60W	1.893	2.394
+D+0.70E	2.290	1.997
+D-0.70E	1.892	2.395
+D+0.450W	2.240	2.047
+D-0.450W	1.942	2.345
+D+0.750S+0.450W	3.566	3.373
+D+0.750S-0.450W	3.268	3.671
+D+0.750S+0.5250E	3.566	3.372
+D+0.750S-0.5250E	3.268	3.671
+0.60D+0.60W	1.453	1.119
+0.60D-0.60W	1.056	1.516
+0.60D+0.70E	1.454	1.118
+0.60D-0.70E	1.056	1.517
S Only	1.768	1.768
W Only	0.331	-0.331
-W	-0.331	0.331
E Only	0.285	-0.285
E Only * -1.0	-0.285	0.285

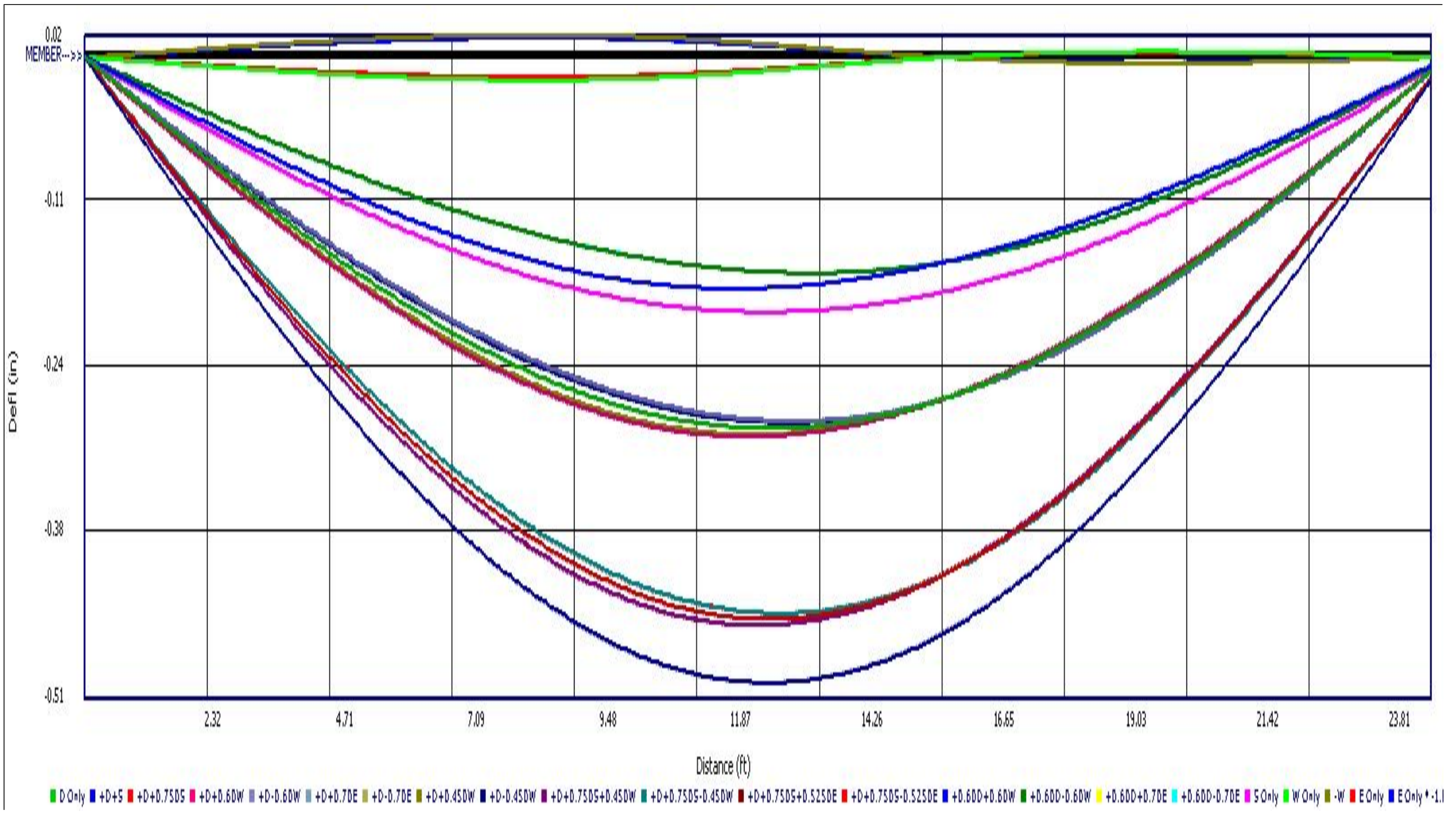
PRCTI20221788 - REVISON #6 4/5/2024

DESCRIPTION: AHU-OR1 Support Beam





DESCRIPTION: AHU-OR1 Support Beam



PRCTI20221788 - REVISON #6 4/5/2024

PCS Structural Solutions

Project: ~~MHS HYBRID OR~~ Job No: 23-225

Subject: Calcs Sheet

Name: ESO

Originating Office: ☐ Seattle ☒ Tacoma ☐ Portland

Date: 2023-04-07

<u>CHILLER :</u> BASIS OF DESIGN – CARRIER SUBM. DATED 2023-03-01 REV 0

WT = 2716# CHILLER DIMS: $h = 1'\text{-}10\tfrac{7}{8}" + 66.5" = 89.375" = 7.45'$

$w = 3'\text{-}11"$; $l = 5'\text{-}7"$

CHILLER SUPPORTED ON 8" ROOF SLAB

$\rho_s = 0.31\,\text{IN}^2 / (12" \cdot 8") = 0.003 \leq 1\%$

$$a = \frac{A_s F_y}{0.85 f'_c\, b} = \frac{(0.31\,\text{IN}^2)(60\,\text{KSI})}{0.85\,(4\,\text{KSI})\,(12")} = 0.456"$$

$$M_n = A_s f_y (d - a/2) = (0.31\,\text{IN}^2)(60\,\text{KSI})\left(\overbrace{[8" - 1"\,\text{COVER} - \tfrac{5}{16}"\ \text{TO}\ \text{℄}\ \text{BAR}]}^{d = 6.68"} - \frac{0.456"}{2}\right)$$

$$= 120\ \text{K}\cdot\text{IN}/\text{FT}$$

$$\varepsilon_t = 0.003\left(\frac{0.85\,\beta_1 f'_c\, b d}{A_s f_y} - 1\right) = 0.003\left(\frac{0.85 \cdot 0.85 \cdot 4\,\text{KSI} \cdot 12" \cdot 6.68"}{(0.31\,\text{IN}^2)(60\,\text{KSI})} - 1\right)$$

$$= 0.0344 \geq 0.005 \rightarrow \phi = 0.9 \rightarrow \underline{\underline{\phi M_n = 108\ \text{K}\cdot\text{IN}/\text{FT}}}$$

MAX VERT LOAD = 2800 / 2 SIDES = 1400# DL @ 2.79' & 6.71'

$EL = (2.73' \cdot (2247\# = F_p) / 3.92' + 599\ \#/2) = 1398\#$ T/C

$WL = (2084\# \cdot 3.7' / 3.92' + 865\ \#/2) = 2410\#$ T

$(-\ \text{''}\ + \ \text{''}\ ) = 1544\#$ COMP.

<u>∴ (E) 8" SLAB OK FOR NEW UNIT</u> → SEE S/C ATT

(ALSO OK FOR 115# HUMIDIFIER BY INSP.)

SLAB + WALL TRIB = $(150\,\text{PCF})\left[\tfrac{8"}{12} \cdot 270\,\text{FT}^2 + (57')(14'/2)\left(\tfrac{8"}{12}\right)\right] = 66900\#$

$$\text{ADDED LAT LOAD} = \frac{2716\#\ \text{CHILLER} + 115\#\ \text{HUMIDIFIER}}{66900\#} = +4.2\% \leq 10\%$$

<u>∴ LAT OK</u>

PRCTI20221788 - REVISON #6 4/5/2024

PCS Structural Solutions

Project: MHS GS Hybrid OR

Job Number = 23-225
Date = 2023-04-07
Name = ESO

Unit = CH-1

Unit Information

Weight, W_p = 1125 lb
Height to Unit = 36.2 ft
Unit Width(w) = 3.9 ft
Unit Height (h) = 5.5 ft
Unit Length (ℓ) = 5.6 ft
Center of Gravity (Vertical) = 2.3 ft 2/3(Unit Height Assumed)

Curb Information

Is there a curb? YES
Weight, $W_{p\text{-}2}$ = 1591 lb
Curb Width at Base (w) = 3.9 ft
Curb Height (h) = 1.9 ft
Curb Length at Base (ℓ) = 5.6 ft

Total Weight, W_{tot} 2716 lb
h_{wind} 3.7 ft 1/2(Unit height + Curb Height)
$h_{seismic}$ 2.3 ft Center of Gravity of Combined Unit and Curb
Design Width, w_{des} 3.9 ft
Design Length, $ℓ_{des}$ 5.6 ft

Building Information

Are building dimensions known? YES
Building Width (B) = 66.5 ft
Building Length (L) = 207.0 ft

Design Criteria = ASCE 7-16, IBC 2018

Gravity

Roof Dead = 15 psf
Roof Snow = 25 psf
$P_{Roof\ DL}$ 328 lb
$P_{Roof\ SL}$ 546 lb

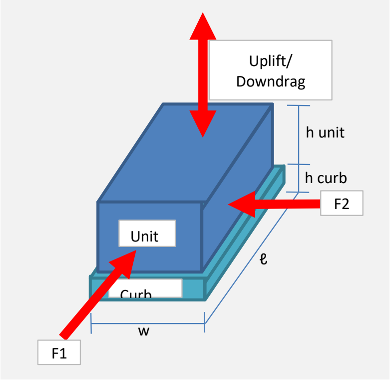
Lateral

The new unit does not have a significant impact to the building's capacity to resist wind or seismic forces

Seismic - ASCE 7-16 Chapter 13

S_{DS} = 1.103
a_p = 2.5 Tbl. 13.6-1
I_p = 1.5 § 13.1.3
R_p = 6 Tbl. 13.6-1
Height of Attachment or Bot of Curb (z) = 36.2 ft
Total Building Height (H) = 36.2 ft
$F_p = 0.4*S_{DS}*(I_p/R_p)*a_p*W_p*[1+2*z/H]$ = 2247 lb Eqn. 13.3-1
$F_{p\ max} = 1.6*S_{DS}*I_p*W_p$ = 7190 lb Eqn. 13.3-2
$F_{p\ min} = 0.3*S_{DS}*I_p*W_p$ = 1348 lb Eqn. 13.3-3

Controlling F_p = **2247 lb**
Vertical F_p = **599 lb**



Wind - ASCE 7-16 Chapter 29

Wind Lateral:

Wind Speed	108 mph
Risk Category	IV
Wind Exposure	C
K_{zt}, Topographical Effect	1.00
K_e, Ground Elevation Factor	1.00

K_h (Table 29.3-1) 1.04

	F_1	F_2	
A_f =	29.2 sq ft	41.5 sq ft	
A_r =	21.8 sq ft		
q_h= $.00256*K_d*K_h*K_{zt}*K_e*V^2$ =	26.4 psf		Eqn. 26.10-1

Building B*h = 7483 sq ft
Building B*L = 13766 sq ft

$(G*C_r)_1$	$(G*C_r)_2$	
1.90	1.90	for horizontal force - See § 29.4.1 - Worst case used for B*h or L*h
1.50		for vertical force - See § 29.4.1 - Maximum dimensions used for A_r

F_1 F_2

PCS Structural Solutions

Job Number = 23-225
Date = 2023-04-07
Name = ESO

Project: MHS GS Hybrid OR

Unit = CH-1

$F_h = q_h*(G*C_r)*A_f$ = **1463 lb** **2084 lb** Eqn. 29.4-2
$F_v = q_h*(G*C_r)*A_r$ = **865 lb** Eqn. 29.4-3

Moments (Unfactored)

	F_1	F_2
$M_{OT\ Seismic}$ =	5111 lb-ft	5111 lb-ft
$M_{OT\ Wind}$ =	5446 lb-ft	7759 lb-ft
$M_{R\ SL}$ =	1523 lb-ft	1069 lb-ft
$M_{R\ DL\ Unit}$ =	3138 lb-ft	2202 lb-ft
$M_{R\ DL\ Curb}$ =	4437 lb-ft	3115 lb-ft

Combinations (ASD):

	Overturning		Vertical Force		Tension		Compression		Shear	
Combination	OT_1	OT_2	Uplift	Downdrag	T_1	T_2	C_1	C_2	V_1	V_2
0.6DL-0.6WL	-1277 lb-ft	1465 lb-ft	519 lb	0 lb	30 lb	634 lb	229 lb	0 lb	-878 lb	-1250 lb
0.6DL-0.7EQ	-967 lb-ft	387 lb-ft	419 lb	419 lb	36 lb	309 lb	383 lb	111 lb	-1573 lb	-1573 lb
DL+SL	-9098 lb-ft	-6386 lb-ft	0 lb	0 lb	0 lb	0 lb	1631 lb	1631 lb	0 lb	0 lb
DL+0.6WL	-10843 lb-ft	-9973 lb-ft	519 lb	0 lb	0 lb	0 lb	1944 lb	2547 lb	878 lb	1250 lb
DL+0.45WL+0.75SL	-11168 lb-ft	-9610 lb-ft	389 lb	0 lb	0 lb	0 lb	2002 lb	2455 lb	658 lb	938 lb
DL+0.7EQ	-11153 lb-ft	-8895 lb-ft	419 lb	419 lb	0 lb	0 lb	2209 lb	2481 lb	1573 lb	1573 lb
DL+0.525EQ+0.75SL	-11400 lb-ft	-8802 lb-ft	315 lb	315 lb	0 lb	0 lb	2201 lb	2405 lb	1180 lb	1180 lb

Design (ASD):

Tension		Compression		Shear	
T_1	T_2	C_1	C_2	V_1	V_2
36 lb	634 lb	2209 lb	2547 lb	1573 lb	1573 lb

PRCTI20221788 - REVISON #6 4/5/2024

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: 23225 calcs 2023-04-07eso.ec6

LIC# : KW-06014122, Build:20.23.2.14 PCS STRUCTURAL SOLUTIONS

DESCRIPTION: CH-1 Support Slab

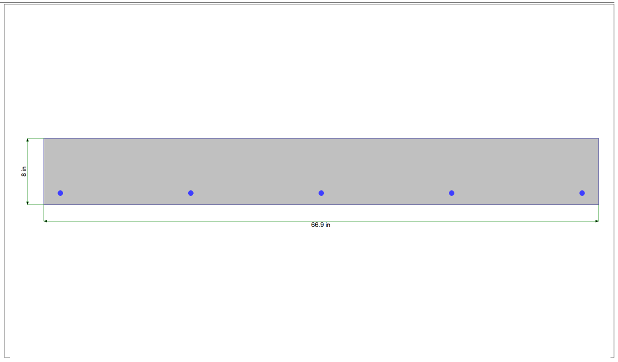
CODE REFERENCES

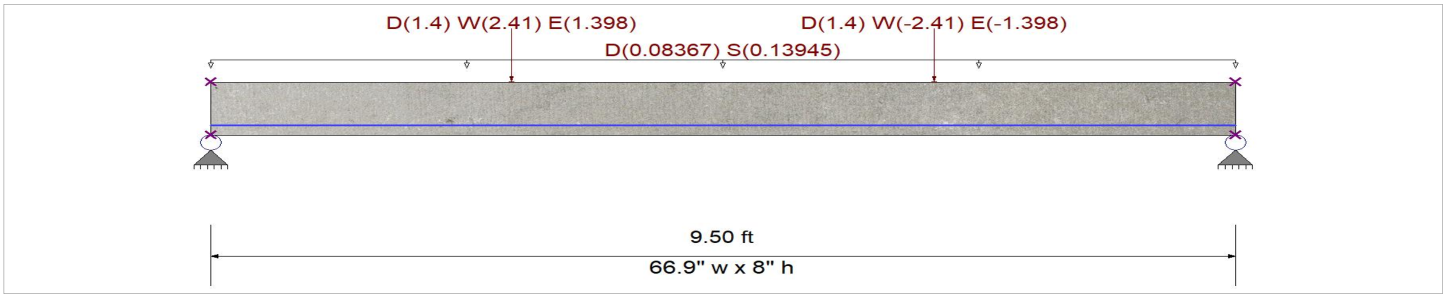
Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : IBC 2018

General Information

f'c = 4.0 ksi
fr = $f'c^{1/2} \cdot 7.50$ = 474.342 psi
ψ Density = 145.0 pcf
λ LtWt Factor = 1.0
Elastic Modulus = 3,605.0 ksi
fy - Main Rebar = 60.0 ksi
E - Main Rebar = 29,000.0 ksi

ϕ Phi Values Flexure : 0.90
Shear : 0.750
β_1 = 0.850
Fy - Stirrups 40.0 ksi
E - Stirrups = 29,000.0 ksi
Stirrup Bar Size # 3
Number of Resisting Legs Per Stirrup = 2.0





Cross Section & Reinforcing Details

Rectangular Section, Width = 66.90 in, Height = 8.0 in
Span #1 Reinforcing....
5-#5 at 1.40 in from Bottom, from 0.0 to 9.50 ft in this span

Beam self weight calculated and added to loads
Load for Span Number 1
Uniform Load : D = 0.0150, S = 0.0250 ksf, Tributary Width = 5.578 ft, (Roof Load)
Point Load : D = 1.40, W = 2.410, E = 1.398 k @ 2.790 ft, (CH-1)
Point Load : D = 1.40, W = -2.410, E = -1.398 k @ 6.710 ft, (CH-1)

DESIGN SUMMARY

Check As Min Limits!

Maximum Bending Stress Ratio = **0.376** : 1
Section used for this span **Typical Section**
Mu : Applied 16.778 k-ft
Mn * Phi : Allowable 44.609 k-ft
Location of maximum on span 5.589 ft
Span # where maximum occurs Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.002 in	Ratio =	45916	>=360.0	-W
Max Upward Transient Deflection	0.000 in	Ratio =	0	<360.0	S Only
Max Downward Total Deflection	0.020 in	Ratio =	5667	>=180.0	Span: 1 : +D+S
Max Upward Total Deflection	0.000 in	Ratio =	0	<180.0	Span: 1 : +D+0.750S-0.450W

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	5.302	5.302
Max Upward from Load Combinations	5.302	5.302
Max Upward from Load Cases	4.357	4.357
Max Downward from all Load Conditions (Resisting Uplift	-0.994	-0.994
Max Downward from Load Combinations (Resisting Uplift)	-0.994	

Concrete Beam

Project File: 23225 calcs 2023-04-07eso.ec6

DESCRIPTION: CH-1 Support Slab

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Max Downward from Load Cases (Resisting Uplift)	-0.577	-0.994
D Only	4.357	4.357
+D+S	5.020	5.020
+D+0.750S	4.854	4.854
+D+0.60W	4.954	3.761
+D-0.60W	3.761	4.954
+D+0.70E	4.761	3.953
+D-0.70E	3.953	4.761
+D+0.450W	4.805	3.910
+D-0.450W	3.910	4.805
+D+0.750S+0.450W	5.302	4.407
+D+0.750S-0.450W	4.407	5.302
+D+0.750S+0.5250E	5.157	4.551
+D+0.750S-0.5250E	4.551	5.157
+0.60D+0.60W	3.211	2.018
+0.60D-0.60W	2.018	3.211
+0.60D+0.70E	3.018	2.211
+0.60D-0.70E	2.211	3.018
S Only	0.662	0.662
W Only	0.994	-0.994
-W	-0.994	0.994
E Only	0.577	-0.577
E Only * -1.0	-0.577	0.577

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd
+1.403D+0.70S+E	1	0.00	6.60	7.15	7.15	0.00	1.00	42.70	Vu < Phi*Vc / 2	ot Reqd pe	42.7	0.0
+1.403D+0.70S+E	1	0.10	6.60	7.05	7.05	0.74	1.00	42.70	Vu < Phi*Vc / 2	ot Reqd pe	42.7	0.0
+1.403D+0.70S+E	1	0.21	6.60	6.95	6.95	1.46	1.00	42.70	Vu < Phi*Vc / 2	ot Reqd pe	42.7	0.0
+1.403D+0.70S+E	1	0.31	6.60	6.85	6.85	2.18	1.00	42.70	Vu < Phi*Vc / 2	ot Reqd pe	42.7	0.0
+1.403D+0.70S+E	1	0.42	6.60	6.75	6.75	2.89	1.00	42.70	Vu < Phi*Vc / 2	ot Reqd pe	42.7	0.0
+1.403D+0.70S+E	1	0.52	6.60	6.65	6.65	3.58	1.00	42.70	Vu < Phi*Vc / 2	ot Reqd pe	42.7	0.0
+1.403D+0.70S+E	1	0.62	6.60	6.55	6.55	4.27	0.84	42.25	Vu < Phi*Vc / 2	ot Reqd pe	42.2	0.0
+1.403D+0.70S+E	1	0.73	6.60	6.45	6.45	4.94	0.72	41.89	Vu < Phi*Vc / 2	ot Reqd pe	41.9	0.0
+1.403D+0.70S+E	1	0.83	6.60	6.35	6.35	5.61	0.62	41.89	Vu < Phi*Vc / 2	ot Reqd pe	41.9	0.0
+1.403D+0.70S+E	1	0.93	6.60	6.24	6.24	6.26	0.55	41.89	Vu < Phi*Vc / 2	ot Reqd pe	41.9	0.0
+1.403D+0.70S+E	1	1.04	6.60	6.14	6.14	6.90	0.49	41.89	Vu < Phi*Vc / 2	ot Reqd pe	41.9	0.0
+1.403D+0.70S+E	1	1.14	6.60	6.04	6.04	7.54	0.44	41.89	Vu < Phi*Vc / 2	ot Reqd pe	41.9	0.0
+1.403D+0.70S+E	1	1.25	6.60	5.94	5.94	8.16	0.40	41.89	Vu < Phi*Vc / 2	ot Reqd pe	41.9	0.0
+1.403D+0.70S+E	1	1.35	6.60	5.84	5.84	8.77	0.37	41.89	Vu < Phi*Vc / 2	ot Reqd pe	41.9	0.0
+1.403D+0.70S+E	1	1.45	6.60	5.74	5.74	9.37	0.34	41.89	Vu < Phi*Vc / 2	ot Reqd pe	41.9	0.0
+1.403D+0.70S+E	1	1.56	6.60	5.64	5.64	9.96	0.31	41.89	Vu < Phi*Vc / 2	ot Reqd pe	41.9	0.0
+1.403D+0.70S+E	1	1.66	6.60	5.54	5.54	10.54	0.29	41.89	Vu < Phi*Vc / 2	ot Reqd pe	41.9	0.0
+1.403D+0.70S+E	1	1.77	6.60	5.44	5.44	11.11	0.27	41.89	Vu < Phi*Vc / 2	ot Reqd pe	41.9	0.0
+1.403D+0.70S+E	1	1.87	6.60	5.34	5.34	11.67	0.25	41.89	Vu < Phi*Vc / 2	ot Reqd pe	41.9	0.0
+1.403D+0.70S+E	1	1.97	6.60	5.24	5.24	12.22	0.24	41.89	Vu < Phi*Vc / 2	ot Reqd pe	41.9	0.0
+1.403D+0.70S+E	1	2.08	6.60	5.14	5.14	12.76	0.22	41.89	Vu < Phi*Vc / 2	ot Reqd pe	41.9	0.0
+1.403D+0.70S+E	1	2.18	6.60	5.04	5.04	13.29	0.21	41.89	Vu < Phi*Vc / 2	ot Reqd pe	41.9	0.0
+1.403D+0.70S+E	1	2.28	6.60	4.93	4.93	13.80	0.20	41.89	Vu < Phi*Vc / 2	ot Reqd pe	41.9	0.0
+1.403D+0.70S+E	1	2.39	6.60	4.83	4.83	14.31	0.19	41.89	Vu < Phi*Vc / 2	ot Reqd pe	41.9	0.0
+1.403D+0.70S+E	1	2.49	6.60	4.73	4.73	14.81	0.18	41.89	Vu < Phi*Vc / 2	ot Reqd pe	41.9	0.0
+1.403D+0.70S+E	1	2.60	6.60	4.63	4.63	15.29	0.17	41.89	Vu < Phi*Vc / 2	ot Reqd pe	41.9	0.0
+1.403D+0.70S+E	1	2.70	6.60	4.53	4.53	15.77	0.16	41.89	Vu < Phi*Vc / 2	ot Reqd pe	41.9	0.0
+1.20D+0.50S-W	1	2.80	6.60	3.01	3.01	9.60	0.17	41.89	Vu < Phi*Vc / 2	ot Reqd pe	41.9	0.0
+1.20D+0.50S-W	1	2.91	6.60	2.92	2.92	9.91	0.16	41.89	Vu < Phi*Vc / 2	ot Reqd pe	41.9	0.0
+1.20D+0.50S-W	1	3.01	6.60	2.84	2.84	10.21	0.15	41.89	Vu < Phi*Vc / 2	ot Reqd pe	41.9	0.0
+1.20D+0.50S-W	1	3.11	6.60	2.75	2.75	10.50	0.14	41.89	Vu < Phi*Vc / 2	ot Reqd pe	41.9	0.0
+1.20D+0.50S-W	1	3.22	6.60	2.67	2.67	10.78	0.14	41.89	Vu < Phi*Vc / 2	ot Reqd pe	41.9	0.0

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DESCRIPTION: CH-1 Support Slab

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd
+1.20D+0.50S-W	1	3.32	6.60	2.58	2.58	11.05	0.13	41.89	Vu < Phi*Vc / 2	ot Reqd per	41.9	0.0
+1.20D+0.50S-W	1	3.43	6.60	2.50	2.50	11.31	0.12	41.89	Vu < Phi*Vc / 2	ot Reqd per	41.9	0.0
+1.20D+0.50S-W	1	3.53	6.60	2.41	2.41	11.57	0.11	41.89	Vu < Phi*Vc / 2	ot Reqd per	41.9	0.0
+1.20D+0.50S-W	1	3.63	6.60	2.33	2.33	11.81	0.11	41.89	Vu < Phi*Vc / 2	ot Reqd per	41.9	0.0
+1.20D+0.50S-W	1	3.74	6.60	2.24	2.24	12.05	0.10	41.89	Vu < Phi*Vc / 2	ot Reqd per	41.9	0.0
+1.20D+0.50S-W	1	3.84	6.60	2.16	2.16	12.28	0.10	41.89	Vu < Phi*Vc / 2	ot Reqd per	41.9	0.0
+1.20D+0.50S-W	1	3.95	6.60	2.07	2.07	12.50	0.09	41.89	Vu < Phi*Vc / 2	ot Reqd per	41.9	0.0
+1.20D+0.50S-W	1	4.05	6.60	1.99	1.99	12.71	0.09	41.89	Vu < Phi*Vc / 2	ot Reqd per	41.9	0.0
+1.20D+0.50S-W	1	4.15	6.60	1.90	1.90	12.91	0.08	41.89	Vu < Phi*Vc / 2	ot Reqd per	41.9	0.0
+1.20D+0.50S-W	1	4.26	6.60	1.82	1.82	13.10	0.08	41.89	Vu < Phi*Vc / 2	ot Reqd per	41.9	0.0
+1.20D+0.50S-W	1	4.36	6.60	1.73	1.73	13.29	0.07	41.89	Vu < Phi*Vc / 2	ot Reqd per	41.9	0.0
+1.20D+0.50S-W	1	4.46	6.60	1.65	1.65	13.46	0.07	41.89	Vu < Phi*Vc / 2	ot Reqd per	41.9	0.0
+1.20D+0.50S-W	1	4.57	6.60	1.56	1.56	13.63	0.06	41.89	Vu < Phi*Vc / 2	ot Reqd per	41.9	0.0
+1.20D+0.50S-W	1	4.67	6.60	1.48	1.48	13.79	0.06	41.89	Vu < Phi*Vc / 2	ot Reqd per	41.9	0.0
+1.20D+0.50S+W	1	4.78	6.60	-1.44	1.44	13.87	0.06	41.89	Vu < Phi*Vc / 2	ot Reqd per	41.9	0.0
+1.20D+0.50S+W	1	4.88	6.60	-1.52	1.52	13.71	0.06	41.89	Vu < Phi*Vc / 2	ot Reqd per	41.9	0.0
+1.20D+0.50S+W	1	4.98	6.60	-1.61	1.61	13.55	0.07	41.89	Vu < Phi*Vc / 2	ot Reqd per	41.9	0.0
+1.20D+0.50S+W	1	5.09	6.60	-1.69	1.69	13.38	0.07	41.89	Vu < Phi*Vc / 2	ot Reqd per	41.9	0.0
+1.20D+0.50S+W	1	5.19	6.60	-1.78	1.78	13.20	0.07	41.89	Vu < Phi*Vc / 2	ot Reqd per	41.9	0.0
+1.20D+0.50S+W	1	5.30	6.60	-1.86	1.86	13.01	0.08	41.89	Vu < Phi*Vc / 2	ot Reqd per	41.9	0.0
+1.20D+0.50S+W	1	5.40	6.60	-1.95	1.95	12.81	0.08	41.89	Vu < Phi*Vc / 2	ot Reqd per	41.9	0.0
+1.20D+0.50S+W	1	5.50	6.60	-2.03	2.03	12.61	0.09	41.89	Vu < Phi*Vc / 2	ot Reqd per	41.9	0.0
+1.20D+0.50S+W	1	5.61	6.60	-2.12	2.12	12.39	0.09	41.89	Vu < Phi*Vc / 2	ot Reqd per	41.9	0.0
+1.20D+0.50S+W	1	5.71	6.60	-2.20	2.20	12.17	0.10	41.89	Vu < Phi*Vc / 2	ot Reqd per	41.9	0.0
+1.20D+0.50S+W	1	5.81	6.60	-2.28	2.28	11.93	0.11	41.89	Vu < Phi*Vc / 2	ot Reqd per	41.9	0.0
+1.20D+0.50S+W	1	5.92	6.60	-2.37	2.37	11.69	0.11	41.89	Vu < Phi*Vc / 2	ot Reqd per	41.9	0.0
+1.20D+0.50S+W	1	6.02	6.60	-2.45	2.45	11.44	0.12	41.89	Vu < Phi*Vc / 2	ot Reqd per	41.9	0.0
+1.20D+0.50S+W	1	6.13	6.60	-2.54	2.54	11.18	0.12	41.89	Vu < Phi*Vc / 2	ot Reqd per	41.9	0.0
+1.20D+0.50S+W	1	6.23	6.60	-2.62	2.62	10.91	0.13	41.89	Vu < Phi*Vc / 2	ot Reqd per	41.9	0.0
+1.20D+0.50S+W	1	6.33	6.60	-2.71	2.71	10.64	0.14	41.89	Vu < Phi*Vc / 2	ot Reqd per	41.9	0.0
+1.20D+0.50S+W	1	6.44	6.60	-2.79	2.79	10.35	0.15	41.89	Vu < Phi*Vc / 2	ot Reqd per	41.9	0.0
+1.20D+0.50S+W	1	6.54	6.60	-2.88	2.88	10.06	0.16	41.89	Vu < Phi*Vc / 2	ot Reqd per	41.9	0.0
+1.20D+0.50S+W	1	6.64	6.60	-2.96	2.96	9.75	0.17	41.89	Vu < Phi*Vc / 2	ot Reqd per	41.9	0.0
+1.403D+0.70S-E	1	6.75	6.60	-4.48	4.48	16.00	0.15	41.89	Vu < Phi*Vc / 2	ot Reqd per	41.9	0.0
+1.403D+0.70S-E	1	6.85	6.60	-4.58	4.58	15.53	0.16	41.89	Vu < Phi*Vc / 2	ot Reqd per	41.9	0.0
+1.403D+0.70S-E	1	6.96	6.60	-4.68	4.68	15.05	0.17	41.89	Vu < Phi*Vc / 2	ot Reqd per	41.9	0.0
+1.403D+0.70S-E	1	7.06	6.60	-4.78	4.78	14.56	0.18	41.89	Vu < Phi*Vc / 2	ot Reqd per	41.9	0.0
+1.403D+0.70S-E	1	7.16	6.60	-4.88	4.88	14.06	0.19	41.89	Vu < Phi*Vc / 2	ot Reqd per	41.9	0.0
+1.403D+0.70S-E	1	7.27	6.60	-4.98	4.98	13.55	0.20	41.89	Vu < Phi*Vc / 2	ot Reqd per	41.9	0.0
+1.403D+0.70S-E	1	7.37	6.60	-5.09	5.09	13.02	0.21	41.89	Vu < Phi*Vc / 2	ot Reqd per	41.9	0.0
+1.403D+0.70S-E	1	7.48	6.60	-5.19	5.19	12.49	0.23	41.89	Vu < Phi*Vc / 2	ot Reqd per	41.9	0.0
+1.403D+0.70S-E	1	7.58	6.60	-5.29	5.29	11.95	0.24	41.89	Vu < Phi*Vc / 2	ot Reqd per	41.9	0.0
+1.403D+0.70S-E	1	7.68	6.60	-5.39	5.39	11.39	0.26	41.89	Vu < Phi*Vc / 2	ot Reqd per	41.9	0.0
+1.403D+0.70S-E	1	7.79	6.60	-5.49	5.49	10.83	0.28	41.89	Vu < Phi*Vc / 2	ot Reqd per	41.9	0.0
+1.403D+0.70S-E	1	7.89	6.60	-5.59	5.59	10.25	0.30	41.89	Vu < Phi*Vc / 2	ot Reqd per	41.9	0.0
+1.403D+0.70S-E	1	7.99	6.60	-5.69	5.69	9.67	0.32	41.89	Vu < Phi*Vc / 2	ot Reqd per	41.9	0.0
+1.403D+0.70S-E	1	8.10	6.60	-5.79	5.79	9.07	0.35	41.89	Vu < Phi*Vc / 2	ot Reqd per	41.9	0.0
+1.403D+0.70S-E	1	8.20	6.60	-5.89	5.89	8.46	0.38	41.89	Vu < Phi*Vc / 2	ot Reqd per	41.9	0.0
+1.403D+0.70S-E	1	8.31	6.60	-5.99	5.99	7.85	0.42	41.89	Vu < Phi*Vc / 2	ot Reqd per	41.9	0.0
+1.403D+0.70S-E	1	8.41	6.60	-6.09	6.09	7.22	0.46	41.89	Vu < Phi*Vc / 2	ot Reqd per	41.9	0.0
+1.403D+0.70S-E	1	8.51	6.60	-6.19	6.19	6.58	0.52	41.89	Vu < Phi*Vc / 2	ot Reqd per	41.9	0.0
+1.403D+0.70S-E	1	8.62	6.60	-6.30	6.30	5.93	0.58	41.89	Vu < Phi*Vc / 2	ot Reqd per	41.9	0.0
+1.403D+0.70S-E	1	8.72	6.60	-6.40	6.40	5.27	0.67	41.89	Vu < Phi*Vc / 2	ot Reqd per	41.9	0.0
+1.403D+0.70S-E	1	8.83	6.60	-6.50	6.50	4.61	0.78	42.05	Vu < Phi*Vc / 2	ot Reqd per	42.0	0.0
+1.403D+0.70S-E	1	8.93	6.60	-6.60	6.60	3.93	0.92	42.48	Vu < Phi*Vc / 2	ot Reqd per	42.5	0.0
+1.403D+0.70S-E	1	9.03	6.60	-6.70	6.70	3.24	1.00	42.70	Vu < Phi*Vc / 2	ot Reqd per	42.7	0.0
+1.403D+0.70S-E	1	9.14	6.60	-6.80	6.80	2.53	1.00	42.70	Vu < Phi*Vc / 2	ot Reqd per	42.7	0.0

DESCRIPTION: CH-1 Support Slab

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd
+1.403D+0.70S-E	1	9.24	6.60	-6.90	6.90	1.82	1.00	42.70	Vu < Phi*Vc / 2 ot Reqd pe		42.7	0.0
+1.403D+0.70S-E	1	9.34	6.60	-7.00	7.00	1.10	1.00	42.70	Vu < Phi*Vc / 2 ot Reqd pe		42.7	0.0
+1.403D+0.70S-E	1	9.45	6.60	-7.10	7.10	0.37	1.00	42.70	Vu < Phi*Vc / 2 ot Reqd pe		42.7	0.0

Maximum Forces & Stresses for Load Combinations

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	9.500	16.78	44.61	0.38
+1.40D					
Span # 1	1	9.500	15.30	44.61	0.34
+1.20D					
Span # 1	1	9.500	13.12	44.61	0.29
+1.20D+0.50S					
Span # 1	1	9.500	13.90	44.61	0.31
+1.20D+0.50W					
Span # 1	1	9.500	13.45	44.61	0.30
+1.20D-0.50W					
Span # 1	1	9.500	13.45	44.61	0.30
+1.20D+1.60S					
Span # 1	1	9.500	15.63	44.61	0.35
+1.20D+1.60S+0.50W					
Span # 1	1	9.500	15.89	44.61	0.36
+1.20D+1.60S-0.50W					
Span # 1	1	9.500	15.89	44.61	0.36
+1.20D+W					
Span # 1	1	9.500	14.46	44.61	0.32
+1.20D-W					
Span # 1	1	9.500	14.46	44.61	0.32
+1.20D+0.50S+W					
Span # 1	1	9.500	15.13	44.61	0.34
+1.20D+0.50S-W					
Span # 1	1	9.500	15.13	44.61	0.34
+1.403D+0.70S+E					
Span # 1	1	9.500	16.78	44.61	0.38
+1.403D+0.70S-E					
Span # 1	1	9.500	16.78	44.61	0.38
+0.90D+W					
Span # 1	1	9.500	11.53	44.61	0.26
+0.90D-W					
Span # 1	1	9.500	11.53	44.61	0.26
+0.6974D+E					
Span # 1	1	9.500	8.40	44.61	0.19
+0.6974D-E					
Span # 1	1	9.500	8.40	44.61	0.19

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl (in)	ocation in Span (ft	Load Combination	ax. "+" Defl (in	ocation in Span (ft
+D+S	1	0.0201	4.750		0.0000	0.000

Maximum Deflections for Load Combinations

Load Combination	Span	Max. Downward Defl	Location in Span	Max. Upward Defl	Location in Span
D Only	1	0.0176	4.750	0.0000	0.000
+D+S	1	0.0201	4.750	0.0000	0.000
+D+0.750S	1	0.0195	4.750	0.0000	0.000
+D+0.60W	1	0.0177	4.594	0.0000	0.000
+D-0.60W	1	0.0177	4.906	0.0000	0.000
+D+0.70E	1	0.0176	4.594	0.0000	0.000
+D-0.70E	1	0.0176	4.906	0.0000	0.000
+D+0.450W	1	0.0176	4.594	0.0000	0.000
+D-0.450W	1	0.0176	4.906	0.0000	0.000
+D+0.750S+0.450W	1	0.0195	4.594	0.0000	0.000
+D+0.750S-0.450W	1	0.0195	4.906	0.0000	0.000
+D+0.750S+0.5250E	1	0.0195	4.594	0.0000	0.000
+D+0.750S-0.5250E	1	0.0195	4.906	0.0000	0.000
+0.60D+0.60W	1	0.0106	4.439	0.0000	0.000

DESCRIPTION: CH-1 Support Slab

Maximum Deflections for Load Combinations

Load Combination	Span	Max. Downward Defl	Location in Span	Max. Upward Defl	Location in Span
+0.60D-0.60W	1	0.0106	5.061	0.0000	0.000
+0.60D+0.70E	1	0.0106	4.594	0.0000	0.000
+0.60D-0.70E	1	0.0106	4.906	0.0000	0.000
S Only	1	0.0025	4.750	0.0000	0.000
W Only	1	0.0009	2.570	-0.0009	6.930
-W	1	0.0009	6.930	-0.0009	2.570
E Only	1	0.0005	2.570	-0.0005	6.930
E Only * -1.0	1	0.0005	6.930	-0.0005	2.570

UPS & ELEC CABINETS

PRCTI20221788 - REVISON #6 4/5/2024

PCS Structural Solutions

Project: ~~MHS HYBRID OR~~ Job No: 23-225
Subject: Calcs Sheet
Name: ESO
Originating Office: ☐ Seattle ☒ Tacoma ☐ Portland Date: 2023-04-07

UPS: (14) 1/2" ∅ ADHESIVE ANCHORS w/ 4" EMBED OK → SEE ATT.

PHILLIPS CABINETS:

WORST CASE: MAINS 40E CABINET

$826^{\#}$

$w = 1'\text{-}9\tfrac{5}{8}"$; $l = 1'\text{-}8\tfrac{1}{2}"$; $h = 6'\text{-}4\tfrac{15}{16}"$

$$F_p = \frac{0.4 a_p S_{DS} W_p}{R_p/I_p}\left(1+2\tfrac{z}{h}\right) = \frac{0.4(1.0)(1.103)W_p}{2.5/1.5}\left(1+2\left[\tfrac{22.1'}{35.2'}\right]\right) = 0.597\,W_p$$

$$F_p\text{ MIN} = 0.3 S_{DS} I_e W_p = 0.3(1.103)(1.5)W_p = 0.496 \le F_p \checkmark$$

$$F_p = 0.597(826^{\#}) = 0.494^{k}$$

$$\Omega_0 F_p = (2.0)(0.494^{k}) = 0.987^{k}$$

∴ (2) 3/8" EXP. ANCHORS OK → SEE ATT

BACK UP STUD FRM'G: * ASSUME 6" STUDS, 10 PSF WALL

$P = 0.494^{k}/2 = 247^{\#}$ @ $6'\text{-}4\tfrac{15}{16}" = 6.41'$

WIDTH = 21.625" → * ASSUME MIN (2) STUDS ENGAGED

$P_{STUD} = 247^{\#}/2 = 124^{\#}$ @ $6.41'$ → APPLY w/ 5PSF INT. PRESSURE

OVERALL STUD HT ≈ 13'

∴ VFY MIN. (E) STUD = 600S200-45

PCS Structural Solutions

Job Number = 23-225
Date = 26-Feb-24
Name = HL

Project: MHS GS Hybrid OR

Unit = UPS

Unit Information

Weight, W_p = 2000 lb
Height to Unit = 22.1 ft
Unit Width(w) = 1.8 ft
Unit Height (h) = 6.6 ft
Unit Length (ℓ) = 2.8 ft
Center of Gravity (Vertical) = 4.4 ft 2/3(Unit Height Assumed)

Curb Information

Is there a curb? NO
Weight, W_{p-2} = 0 lb
Curb Width at Base (w) = 1.8 ft
Curb Height (h) = 6.6 ft
Curb Length at Base (ℓ) = 2.8 ft

Total Weight, W_{tot}	2000 lb	
h_{wind}	3.3 ft	1/2(Unit height + Curb Height)
$h_{seismic}$	4.4 ft	Center of Gravity + Curb Height
Design Width, w_{des}	1.8 ft	
Design Length, $ℓ_{des}$	2.8 ft	

Building Information

Are building dimensions known? YES
Building Width (B) = 66.5 ft
Building Length (L) = 207.0 ft

Design Criteria = ASCE 7-16, IBC 2018

Gravity

Dead = 15 psf
Live= 0 psf
$P_{Roof\ DL}$ 74 lb
$P_{Roof\ SL}$ 0 lb

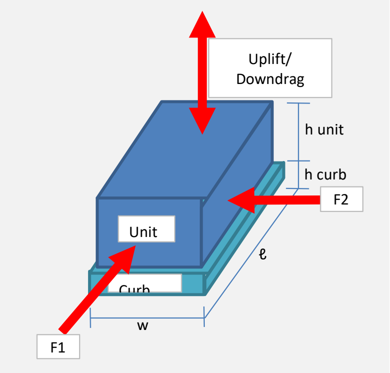
Lateral

The new unit does not have a significant impact to the building's capacity to resist wind or seismic forces

Seismic - ASCE 7-16 Chapter 13

S_{DS} =	1.103	
a_p =	1	Tbl. 13.6-1
I_p =	1.5	§ 13.1.3
R_p =	2.5	Tbl. 13.6-1
Ω_0 =	2	Tbl. 13.6-1
Height of Attachment or Bot of Curb (z) =	22.1 ft	
Total Building Height (H) =	35.2 ft	
$F_p = 0.4*S_{DS}*(I_p/R_p)*a_p*W_p*[1+2*z/H]$ =	1194 lb	Eqn. 13.3-1
$F_{p\ max} = 1.6*S_{DS}*I_p*W_p$ =	5294 lb	Eqn. 13.3-2
$F_{p\ min} = 0.3*S_{DS}*I_p*W_p$ =	993 lb	Eqn. 13.3-3

Controlling F_p = **1194 lb**
Vertical F_p = **441 lb**



Wind - ASCE 7-16 Chapter 29

Wind Lateral: Internal

Wind Speed	108 mph
Risk Category	IV
Wind Exposure	C
K_{zt}, Topographical Effect	1.00
K_e, Ground Elevation Factor	1.00

K_h (Table 29.3-1) 0.94

	F_1	F_2
A_f =	11.8 sq ft	18.0 sq ft
A_r =	5.0 sq ft	
$q_h = .00256*K_d*K_h*K_{zt}*K_e*V^2$ =	0.0 psf	Eqn. 26.10-1

Building B*h = 7293 sq ft
Building B*L = 13766 sq ft

$(G*C_r)_1$	$(G*C_r)_2$	
1.90	1.90	for horizontal force - See § 29.4.1 - Worst case used for B*h or L*h
1.50		for vertical force - See § 29.4.1 - Maximum dimensions used for A_r

PRCTI20221788 - REVISON #6 4/5/2024

PCS Structural Solutions

Job Number = 23-225
Date = 26-Feb-24
Name = HL

Project: MHS GS Hybrid OR

Unit = UPS

	F_1	F_2	
$F_h = q_h*(G*C_r)*A_f$ =	**0 lb**	**0 lb**	Eqn. 29.4-2
$F_v = q_h*(G*C_r)*A_r$ =	**0 lb**		Eqn. 29.4-3

Moments (Unfactored)

	F_1	F_2
$M_{OT\ Seismic}$ =	5212 lb-ft	5212 lb-ft
$M_{OT\ Wind}$ =	0 lb-ft	0 lb-ft
$M_{R\ SL}$ =	0 lb-ft	0 lb-ft
$M_{R\ DL\ Unit}$ =	2750 lb-ft	1800 lb-ft
$M_{R\ DL\ Curb}$ =	0 lb-ft	0 lb-ft

Combinations (ASD):

	Overturning		Vertical Force		Tension		Compression		Shear	
Combination	OT_1	OT_2	Uplift	Downdrag	T_1	T_2	C_1	C_2	V_1	V_2
0.6DL-0.6WL	-1650 lb-ft	-1080 lb-ft	0 lb	0 lb	0 lb	0 lb	600 lb	600 lb	0 lb	0 lb
0.6DL-0.7EQ	1999 lb-ft	2569 lb-ft	309 lb	309 lb	881 lb	1581 lb	0 lb	0 lb	-836 lb	-836 lb
DL+SL	-2750 lb-ft	-1800 lb-ft	0 lb	0 lb	0 lb	0 lb	1000 lb	1000 lb	0 lb	0 lb
DL+0.6WL	-2750 lb-ft	-1800 lb-ft	0 lb	0 lb	0 lb	0 lb	1000 lb	1000 lb	0 lb	0 lb
DL+0.45WL+0.75SL	-2750 lb-ft	-1800 lb-ft	0 lb	0 lb	0 lb	0 lb	1000 lb	1000 lb	0 lb	0 lb
DL+0.7EQ	-6399 lb-ft	-5449 lb-ft	309 lb	309 lb	0 lb	0 lb	2481 lb	3181 lb	836 lb	836 lb
DL+0.525EQ+0.75SL	-5487 lb-ft	-4537 lb-ft	232 lb	232 lb	0 lb	0 lb	2111 lb	2636 lb	627 lb	627 lb

Design (ASD):

Tension		Compression		Shear	
T_1	T_2	C_1	C_2	V_1	V_2
881 lb	1581 lb	2481 lb	3181 lb	836 lb	836 lb

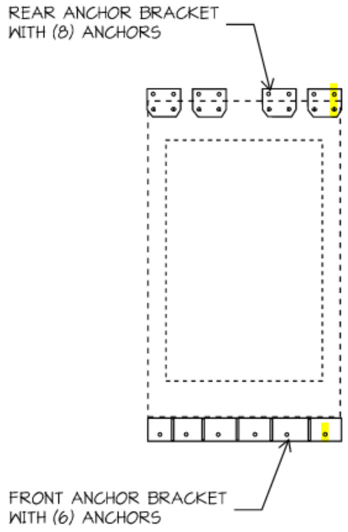
	Overturning		Vertical Force		Tension		Compression		Shear	
Combination	OT1	OT2	Uplift	Downdrag	T1	T2	C1	C2	V1	V2
1.4DL	-3850 lb-ft	-2520 lb-ft	0 lb	0 lb	0 lb	0 lb	1400 lb	1400 lb	0 lb	0 lb
0.9DL-1.0WL	-2475 lb-ft	-1620 lb-ft	0 lb	0 lb	0 lb	0 lb	900 lb	900 lb	0 lb	0 lb
0.9DL-1.0EQ	2737 lb-ft	3592 lb-ft	441 lb	441 lb	1437 lb	2437 lb	0 lb	0 lb	-1194 lb	-1194 lb
1.2DL+1.6SL+0.5SL	-3300 lb-ft	-2160 lb-ft	0 lb	0 lb	0 lb	0 lb	1200 lb	1200 lb	0 lb	0 lb
1.2DL+1.0WL+1.0LL+0.5SL	-3300 lb-ft	-2160 lb-ft	0 lb	0 lb	0 lb	0 lb	1200 lb	1200 lb	0 lb	0 lb
1.2DL+1.0EQ+1.0LL+0.2SL	-8512 lb-ft	-7372 lb-ft	441 lb	441 lb	0 lb	0 lb	3537 lb	4537 lb	1194 lb	1194 lb
0.9DL-(Ω_0)EQ	7950 lb-ft	8805 lb-ft	882 lb	882 lb	3332 lb	5333 lb	0 lb	0 lb	-2387 lb	-2387 lb
1.2DL+(Ω_0)EQ	-13725 lb-ft	-12585 lb-ft	882 lb	882 lb	0 lb	0 lb	5432 lb	7433 lb	2387 lb	2387 lb

Design (LRFD):

Tension		Compression		Shear	
T_1	T_2	C_1	C_2	V_1	V_2
1437 lb	2437 lb	3537 lb	4537 lb	1194 lb	1194 lb

Design (Ω_0 LRFD):

	Moment		Tension		Compression		Shear	
$M_{100\%/30\%}$	M_1	M_2	T_1	T_2	C_1	C_2	V_1	V_2
9122 lb	7950 lb-ft	8805 lb-ft	3332 lb	5333 lb	5432 lb	7433 lb	2387 lb	2387 lb



ASSUME:
ONLY THE FRONT ANCHOR BOLTS WILL RESIST SHEAR,

FOR EACH BOLT:
v=2387/6=400 lbf

ONLY (2) BOLTS WILL RESIST TENSION(CONSERVATIVE)

FOR EACH BOLT:
T:5333/2=2667 lbf

SEE HILTI PROFIS FOR ANCHOR CHECK

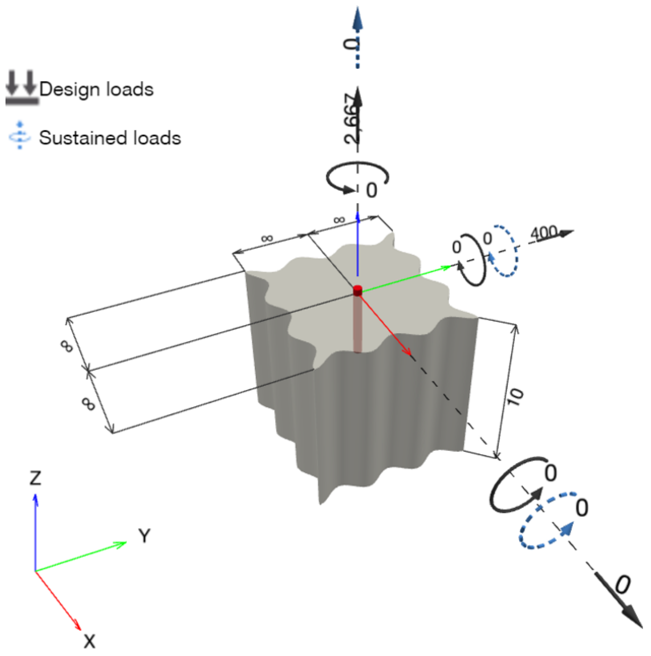
Company:		Page:	1
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Jan 3, 2024	Date:	2/26/2024
Fastening point:			

Specifier's comments:

1 Input data

Anchor type and diameter:	**HIT-HY 200 V3 + HAS-V-36 (ASTM F1554 Gr.36) 1/2**
Item number:	2198022 HAS-V-36 1/2"x6-1/2" (element) / 2334276 HIT-HY 200-R V3 (adhesive)
Effective embedment depth:	$h_{ef,act}$ = 4.000 in. ($h_{ef,limit}$ = - in.)
Material:	ASTM F1554 Grade 36
Evaluation Service Report:	ESR-4868
Issued I Valid:	11/1/2022 | 11/1/2024
Proof:	Design Method ACI 318-14 / Chem
Stand-off installation:	
Profile:	
Base material:	cracked concrete, 2500, f_c' = 2,500 psi; h = 10.000 in., Temp. short/long: 32/32 °F
Installation:	**hammer drilled hole, Installation condition: Dry**
Reinforcement:	tension: condition B, shear: condition B; no supplemental splitting reinforcement present edge reinforcement: none or < No. 4 bar
Seismic loads (cat. C, D, E, or F)	Tension load: yes (17.2.3.4.3 (d)) Shear load: yes (17.2.3.5.3 (a))

Geometry [in.] & Loading [lb, in.lb]



PRCTI20221788 - REVISON #6 4/5/2024

Company:		Page:	2
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Jan 3, 2024	Date:	2/26/2024
Fastening point:			

1.1 Design results

Case	Description	Forces [lb] / Moments [in.lb]	Seismic	Max. Util. Anchor [%]
1	Combination 1	$N = 2{,}667; V_x = 0; V_y = 400;$ $M_x = 0; M_y = 0; M_z = 0;$ $N_{sus} = 0; M_{x,sus} = 0; M_{y,sus} = 0;$	yes	81

PRCTI20221788 - REVISON #6 4/5/2024

Company:		Page:	3
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Jan 3, 2024	Date:	2/26/2024
Fastening point:			

2 Proof I Utilization (Governing Cases)

		Design values [lb]		Utilization	
Loading	**Proof**	**Load**	**Capacity**	**β_N / β_V [%]**	**Status**
Tension	Concrete Breakout Failure	2,667	3,315	81 / -	OK
Shear	Steel Strength	400	1,927	- / 21	OK

Loading	β_N	β_V	ζ	Utilization $\beta_{N,V}$ [%]	Status
Combined tension and shear loads	0.805	0.208	5/3	77	OK

3 Warnings

- Please consider all details and hints/warnings given in the detailed report!

Fastening meets the design criteria!

Company:		Page:	4
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Jan 3, 2024	Date:	2/26/2024
Fastening point:			

4 Remarks; Your Cooperation Duties

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PRCTI20221788 - REVISON #6 4/5/2024

Company:	PCS Structural Solutions	Page:	1
Address:	1250 Pacific Avenue, STE 701	Specifier:	ESO
Phone I Fax:	2533832797 |	E-Mail:	info@pcs-structural.com
Design:	40E Cabinet	Date:	4/8/2023
Fastening point:			

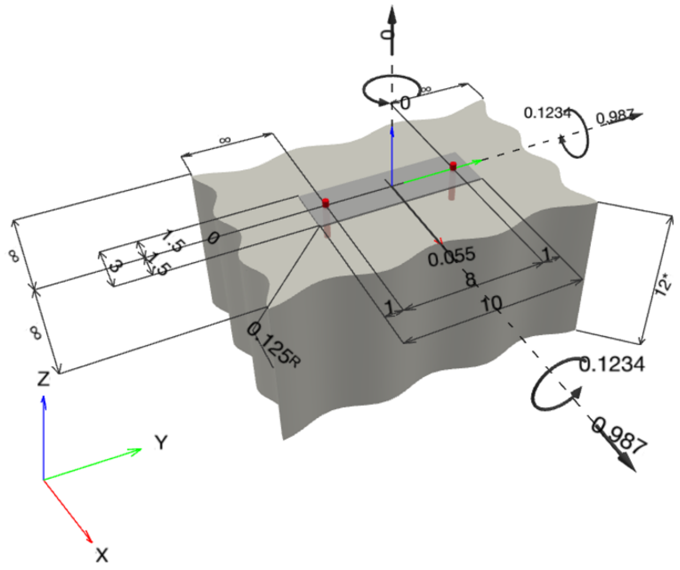
Specifier's comments:

1 Input data

Anchor type and diameter:	**Kwik Bolt TZ2 - CS 3/8 (2) hnom2**
Item number:	2210237 KB-TZ2 3/8x3 1/2
Effective embedment depth:	$h_{ef,act}$ = 2.000 in., h_{nom} = 2.500 in.
Material:	Carbon Steel
Evaluation Service Report:	ESR-4266
Issued I Valid:	12/17/2021 | 12/1/2023
Proof:	Design Method ACI 318-14 / Mech
Stand-off installation:	e_b = 0.000 in. (no stand-off); t = 0.125 in.
Anchor plate^R :	l_x x l_y x t = 3.000 in. x 10.000 in. x 0.125 in.; (Recommended plate thickness: not calculated)
Profile:	no profile
Base material:	cracked concrete, 2500, f_c' = 2,500 psi; h = 12.000 in.
Installation:	**hammer drilled hole, Installation condition: Dry**
Reinforcement:	tension: condition B, shear: condition B; no supplemental splitting reinforcement present edge reinforcement: none or < No. 4 bar
Seismic loads (cat. C, D, E, or F)	Tension load: yes (17.2.3.4.3 (d)) Shear load: yes (17.2.3.5.3 (c))

^{R} - The anchor calculation is based on a rigid anchor plate assumption.

Geometry [in.] & Loading [kip, ft.kip]



PRCTI20221788 - REVISON #6 4/5/2024

Company:	PCS Structural Solutions	Page:	2
Address:	1250 Pacific Avenue, STE 701	Specifier:	ESO
Phone I Fax:	2533832797 |	E-Mail:	info@pcs-structural.com
Design:	40E Cabinet	Date:	4/8/2023
Fastening point:			

1.1 Design results

Case	Description	Forces [kip] / Moments [ft.kip]	Seismic	Max. Util. Anchor [%]
1	Combination 1	N = 0.000; V_x = 0.987; V_y = 0.987; M_x = 0.12340; M_y = 0.12340; M_z = 0.00000;	yes	42

Company:	PCS Structural Solutions	Page:	3
Address:	1250 Pacific Avenue, STE 701	Specifier:	ESO
Phone I Fax:	2533832797 |	E-Mail:	info@pcs-structural.com
Design:	40E Cabinet	Date:	4/8/2023
Fastening point:			

2 Proof I Utilization (Governing Cases)

		Design values [kip]		Utilization	
Loading	**Proof**	**Load**	**Capacity**	**β_N / β_V [%]**	**Status**
Tension	Concrete Breakout Failure	1.086	2.596	42 / -	OK
Shear	Steel Strength	0.703	2.201	- / 32	OK

Loading	**β_N**	**β_V**	**ζ**	**Utilization $\beta_{N,V}$ [%]**	**Status**
Combined tension and shear loads	0.418	0.338	5/3	40	OK

3 Warnings

- Please consider all details and hints/warnings given in the detailed report!

Fastening meets the design criteria!

Company:	PCS Structural Solutions	Page:	4
Address:	1250 Pacific Avenue, STE 701	Specifier:	ESO
Phone I Fax:	2533832797 |	E-Mail:	info@pcs-structural.com
Design:	40E Cabinet	Date:	4/8/2023
Fastening point:			

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PRCTI20221788 - REVISON #6 4/5/2024

Project Name: 23225 Philips Cab Backup Studs 2023-04-10eso

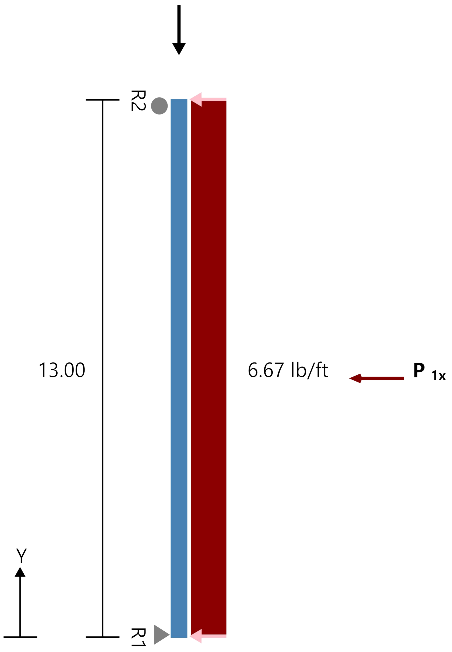
Model: Wall Stud –1

Code: 2012 NASPEC [AISI S100-2012]

Page 1 of 1

Date: 04/10/2023

Simpson Strong-Tie® CFS Designer™ 4.0.0.6



Section : 600S200-43 (33 ksi) @ 16" o.c. Single C Stud (punched)

Maxo = 1436.9 ft-lb **Va =** 1415.7 lb **I =** 2.68 in^4

Loads have not been modified for strength checks
Loads have been multiplied by 0.70 for deflection calculations

Bridging Connectors - Design Method =AISI S100

Span	Axial KyLy, KtLt	Flexual, Distortional	Connector	Stress Ratio
Span	None, None	None, 156.0"	N/A	-

Web Crippling

Support	Load (lb)	Bearing (in)	Pa (lb)	M (ft-lbs)	Max Int.	Stiffener?
P1x	124.0	3.50	661.2	543.7	0.33	NO
R2	104.5	--Shear Connection w/ clip--				NO
R1	106.2	--Stud/Track Design, Ref Connectors--				NO

Gravity Load

Type	Load (lb)
Uniform	13.33plf

Point Loads	**P1**
Load(lb)	124
X-Dist.(ft)	6.41

	Code Check	Required	Allowed	Interaction	Notes
Span	Max. Axial, lbs	173.3(c)	1195.7(c)	14%	KΦ=0.00 lb-in/in
	Max. Shear, lbs	106.2	1240.3	9%	Shear (Punched)
	Max. Moment (MaFy, Ma-dist), ft-lbs	543.7	1282.4	42%	Ma-dist (control),KΦ=0.00 lb-in/in
	Moment Stability, ft-lbs	543.7	601.5	90%	
	Shear/Moment	0.38	1.00	38%	Shear 63.5, Moment 543.7
	Axial/Moment	0.98	1.00	98%	Axial 87.9(c), Moment 543.7
	Deflection Span, in	0.125	--meets L/1252--		

Support	Rx(lb)	Ry(lb)	Simpson Strong-Tie Connector	Connector Interaction	Anchor Interaction
R2	104.5	0.0	SCB45.5(2) & (2) #12-24 SST X or XL to A36 Steel	17.13 %	9.37 %
R1	106.2	173.3	600T125-33 (33) & (1) .157" SST PDPA/PDPAT-62KP to steel (3/16" to 1/2" thickness)	25.90 %	48.23 %

* Reference catalog for connector and anchor requirement notes as well as screw placement requirements

MISCELLANEOUS

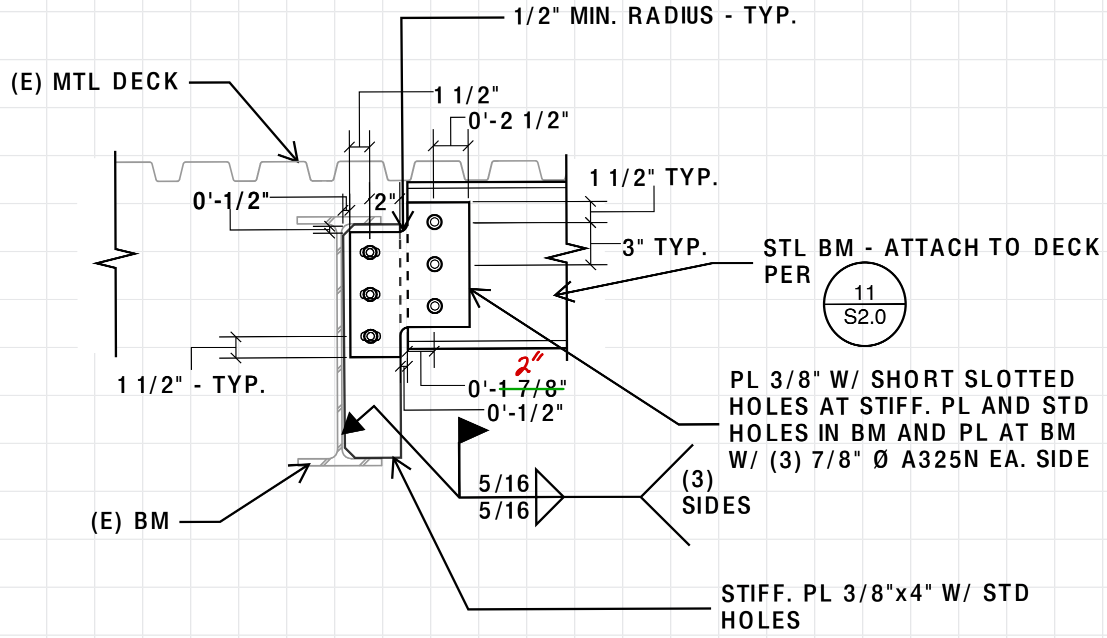
PRCTI20221788 - REVISON #6 4/5/2024

PCS Structural Solutions

Project: ~~MHS HYBRID OR~~ Job No: 23-225
Subject: Calcs Sheet
Name: ESO
Originating Office: ☐ Seattle ☒ Tacoma ☐ Portland Date: 2023-04-08

CHECK CONN. (N) W12x53 TO (E) W18x40:

V_a - MAX (FROM RISA) = ~~23.062^k~~ → 16.2^k → PREV CALCS CONS. 2024-03-04



$\ell_{eh} = 2\frac{1}{2}" \geq 2d_b = 2(0.875") = 1.75"$ ✓ ℓ_{eh}

$\ell_{ev} = 1\frac{1}{2}" \geq 1\frac{1}{8}" + [C_2 = \frac{1}{8}"] = 1\frac{1}{4}"$ ✓ MIN EDGE DIST.

MAX $t_p = \frac{d}{2} + \frac{1}{16} = 0.875"/2 + \frac{1}{16} = 0.5" \geq t = \frac{3}{8}$ ✓ t_p

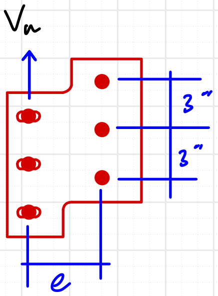
CONN. ECC. $= 2" + \frac{1}{2}" + 2" = 4\frac{1}{2}"$

TYP. SHEAR TAB CONN. CONN. CAPACITY $= 39.2^k$ ✓ OK

∴ (3) 7/8" Ø BOLTS IN SHORT SLOTTED HOLES + PL 3/8"x4" OK

CHECK CONN. (N) W12x53 TO (E) W18x40: CONT'D

CHECK BOLTS + PLATE OPP SIDE



$M_a = V_a \cdot e = 23.1^K \cdot 4.5" = 104^{K \cdot IN}$

$V_{ADD'L} = 104^{K \cdot IN} / 6" = 34.7^K$

MAX BOLT SHEAR $= \sqrt{(23.1^K)^2 + (34.7^K)^2} = 41.7^K$

$F_{nv} = 54$ KSI

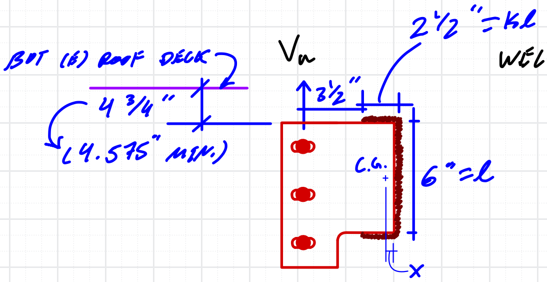
[AISC SCM 15TH]

$R_n/\Omega = F_n A_b / 2.00 = 54KSI \cdot 0.601IN^2 / 2.00 = 16.3^K < V_a = 41.7^K$ ✗ [EQN J3-1]

$F_n = F_{nv} = 54$ KSI [TBL J3.2]

$A_b = 0.601\ IN^2$ [TBL 7-17]

∴ TRY WELDING w/ SHORTER PL



WELD C.G. ⇒ $(6" \cdot x) + 2[x(x/2)] = 2[(2½" - x)(2½" - x)/2]$

$x = 0.568$

$e = 5.432" = al$

$l = 6" \rightarrow a = 0.905 \rightarrow$ USE 0.9

$kl = 2½" \rightarrow k = 0.417 \rightarrow$ USE 0.4

$\rightarrow c = 1.58$ [TBL 8-8]

$$D_{MIN} = \frac{\Omega P_a}{C C_1 l} = \frac{(2.0)(23.1^K)}{1.58 \cdot (1.0)(6")} = 4.87 \rightarrow \text{USE } D = 5$$ [TBL 8-8]

∴ 5/16" FILLET OK

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Subject: Calcs Sheet Name: ESO
Originating Office: ☐ Seattle ☒ Tacoma ☐ Portland Date: 2023-04-08

CHECK DECK SHEAR CONN. TO (E) W18x40 @ WT REINF.:

(E) DECK = 1½" 20 GA. B-DECK $I = 0.22\ IN^4$, $S^+ = 0.235\ IN^3$, $S^- = 0.246\ IN^3$

SIDE LAPS: 1½" T.S.W @ 12" O.C.

INTERMEDIATE SUPPORTS: (5) ½ Ø PUDDLE WELDS

} $V_a \approx 3615$ W/ SPANS OF 5'-9"

∴ USE (E) $V_n = 1197$ PLF

↳ #10 SCREWS REQ'D EA. SIDE OF WT $= \frac{1197}{2\text{ SIDES}} / 177^{\#}/\text{SCR}$
= 3.38 SCREWS/FT ⇝ ∴ USE #10 SCREWS @ 3" O.C.

CHECK BEAM REINF. WELDS:

(E) W18x40 + WT 6x36 → CONS. USE WT 4x33.5

DESIGN SHEAR TRANSFER ACROSS MEMBERS:

$$\text{CHECK } \frac{VQ}{Ib} = \frac{(20.8^{k})(66.9\ in^3)}{(1445.36\ in^4)(b = t_{w_{WT}} = 0.48'')} = 2.24\ KSI$$

use t_w WT6x36

$V_{u\text{-}max} = 20.8^{k}$ [RISA]

$Q = y'A' = 66.9\ in^3$

$y' = 6.799''$

$A' = 9.84\ in^2$ [ENERCALC]

$I = 1445.36\ in^4$ [ENERCALC]

$v = 2.24\ KSI\ (t_w = 0.48'') = 0.96\ ^{k}/_{in} = 11.6\ ^{k}/_{ft}$

TRY 2-12 WELD PATTERN

[AISC SCM 15TH]

NEED $11.6^{k} \leq 0.928\,(D)(2'')(2\ \text{SIDES})$ [EQN 8-2b]

↳ $D_{REQ'D} \geq 3.125$ → USE 4

∴ 1/4" FILLET 2-12 EA. SIDE O/S

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CHECK BEAM REINF. WELDS:

(E) W18x40 + WT 6x36 → CONS. USE WT 4x33.5

CHECK INTERCONNECTION SPACING:

SINCE THE WT IS ON TOP OF THE WIDE-FLANGE, CHECK COMP. REQ'S

CHECK $\frac{a}{r_i} \leq 0.75 \, {L_b}/{r_{MIN-B.U.}}$ [AISC SCM 15TH] [§ E6.2a]

$$r_i = r_{y\,MIN} = MIN \begin{cases} r_y \; WT6x36 = 3.04'' \\ r_y \; WT4x33.5 = 2.12'' \\ r_y \; W18x40 = 1.27'' \end{cases}$$ CONTROLS

$$\frac{a}{r_i} = \frac{12''}{1.27''} = 9.45 \leq 0.75 \frac{L_b}{r_{MIN-B.U.}} = 0.75 \frac{(5.76'' \cdot 12)}{1.721''} = 30.1 \checkmark$$

$r_{MIN-B.U.} = 1.721''$ [ENBR CALC]

AT MEMBER ENDS, PROVIDE $l_{WELD} \geq b_{f\,MAX} = b_{f\,W6x36} = 12''$

FOR MEMBERS NOT SUBJECT TO CORROSION [§ J3.5]

$$\text{WELD } S_{MAX} = 24 \times t_{MIN} \leq 12''$$
$$= 24 \times t_{w-W6x36} = 0.43'' = 10.3'' \leq 12''$$

∴ PROV. 1/4" 2-10 FILLET WELDS EA. SIDE w/ 12" AT ENDS

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CHECK BEAM REINF. WELDS: CONT'D

(E) W18x40 + WT 6x36 CONT'D

CHECK BASE METAL:

$$t_{MIN} = \frac{6.19D}{F_u} = \frac{6.19(4)}{65\,KSI} = 0.38''$$ [EQN 9-3]

$$F_{u-A992} = 65\,KSI$$ [TBL 2-4]

$$t_{MIN} = 0.38'' \leq t_{PROV.} = 0.48''$$ ✓ OK

∴ WT TO WIDEFLANGE CONN. OK

CHECK END WELDS:

$$M_{a-MAX} = 121.067^{K\cdot FT} = 1453^{K\cdot IN}$$ [RISA]

$$M_y/\Omega = F_y S_x/\Omega$$
$$= (50KSI)(187\,IN^3)/1.67 = 5599^{K\cdot IN}$$
[AISC SCM 15TH]
[COMM. § F13.3]

$$S_x = S_{x+y} \text{ TO TOP FLANGE} = 187\,IN^3$$ [ENERCALC]

SINCE $M_y/\Omega > M_{a-MAX}$, DESIGN END WELD FOR
$$T_a = M_a Q/I = 1453^{K\cdot IN} \cdot 66.9\,IN^3/1445\,IN^4 = 67.3^K$$
[AISC SCM 15TH]
[COMM. § F13.3]

TRY 1/4" FILLET EA. SIDE

$$l_{WELD\ REQ'D} = \frac{67.3^K}{(2\ SIDES)\cdot 0.928(D=4)} = 9.1'' \rightarrow \therefore 12''\ OK$$
[BASED ON
EQN 9-3]

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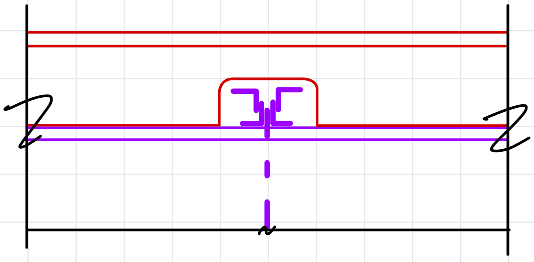
CHECK BEAM REINF. WELDS: CONT'D

(E) W18x40 + WT 6x36 CONT'D

CONDITION AT (E) JST SEAT:

COPE WT @ (E) JST SEAT 1/2" CLR



(E) 18K3 SEAT HT = 2 1/2"
MAX SEAT WIDTH = 6"

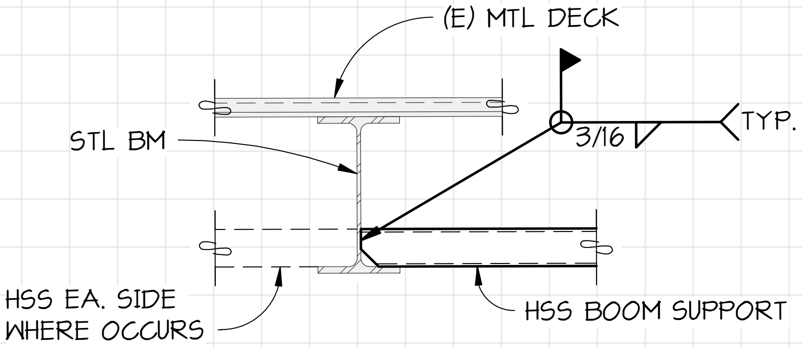
[VULCRAFT JOIST MANUAL V2020J]
[TBL 2.2-1]

w/ 1/2", COPE = 7" WIDE

w/ WELDS @ 2-10, CLEAR DIST = 8" ≥ 7" ✓ OK

∴ COPE @ (E) STL JST OK

CHECK ATT. AT BOOM SUPPORTS:



MAX REACTION = 7.0^k [R25A]

3/16" WELD REQ'D: $\ell \geq \dfrac{7.0^k}{0.928(3)} = 2.51''$ [BASED ON EQN 9-3]

∴ 3/16" FILLET ALL AROUND AT MEMBER ENDS O/S ✓

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Project: ~~MHS HYBRID OR~~ Job No: 23-225

Subject: Calcs Sheet

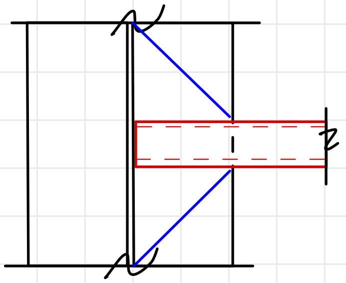
Originating Office: ☐ Seattle ☒ Tacoma ☐ Portland

Name: ESO

Date: 2023-04-08

CHECK ATT. AT BOOM SUPPORTS: CONT'D

CHECK FLANGE FOR P_a: W12x16 ~~W12x26~~ WORST CASE



CHECK ℘ BENDING ASSUMING YIELD LINE OF 45° [§J10]

$$\ell_{\wp} = 3''_{HSS} + 2\left(\frac{bf - tw}{2}\right) = 3'' + 2\left(\frac{\overset{3.99''}{\cancel{6.49''}} - \overset{0.22''}{\cancel{0.23''}}}{2}\right) = \overset{6.77''}{\cancel{9.26''}}$$

$$M_a = \overset{5.2^K}{\cancel{7}}{}^{K} \cdot \left[\tfrac{1}{2}\left(\frac{bf - tw}{2}\right) = \tfrac{1}{2}\left(\frac{\overset{3.99}{\cancel{6.49''}} - \overset{0.22}{\cancel{0.23''}}}{2}\right) = \underset{0.94''}{\cancel{1.57''}}\right]$$

$$= \cancel{10.99}^{K \cdot IN} \quad 4.90^{K \cdot IN}$$

W12x16 ~~W12x26~~: $b_f = \cancel{6.49''}$ 3.99"

$t_f = \cancel{0.38}''$ 0.265"

$t_w = \cancel{0.23}''$ 0.22"

$$M_n/\Omega = [F_y Z \leq 1.6 F_y S_x]/\Omega = [50KSI \cdot \overset{0.119}{\cancel{0.334}} IN^3 \leq 1.6 \cdot 50KSI \cdot \overset{0.074}{\cancel{0.223}} IN^3]/1.67 \quad [EQN\ F11\text{-}1]$$

$$= [16.7^{K \cdot IN} \leq 17.84^{K \cdot IN}]/1.67 = 10^{K \cdot IN} = M_n/\Omega$$

$$F_y = 50KSI;\ Z = bh^2/4 = (\underset{6.77''}{\cancel{9.26''}})(\underset{0.265}{\cancel{0.38''}})^2/4 = \underset{0.119}{\cancel{0.334}} IN^3;\ S = bh^2/6 = \underset{0.074}{\cancel{0.223}} IN^3;\ \Omega = 1.67$$

$$M_a = \overset{4.90}{\cancel{10.99}}{}^{K \cdot IN} > M_n/\Omega = \underset{3.55}{\cancel{10}}{}^{K \cdot IN};$$

HOWEVER WELD TO WEB CAN TRANSFER UP TO

$$0.928\,DL = 0.928(3)(3'') = 6.35^K > P_a = \overset{5.2^K}{\cancel{7}^K}$$

$\therefore$ BOOM ATT. OK

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CHECK ATT. AT EQUIP. SUPPORTS:

5.4^K MAX PER SIDE → 2 x 5.4^K = = 10.8^K ⇒ PREV. CALCS CONSERV.

MAX REACTION = ~~15.82^K~~

LOAD @ 90° TO ℓ WELD [RESA]

1/4" WELD REQ'D: $\ell \geq 1.5 \left(\frac{15.82^K}{0.928(5)} \right) = 5.11"$ [BASED ON EQN 9-3]

∴ 5/16" FILLET O/S ✓

CHECK UPWARD RXN AS BM BRG: TRY $\ell_b = 3/8"$

CONC. LOAD @ > d FROM MEMBER END

WEB LOCAL YIELDING: $\Omega = 1.5$; $\ell_b = 3/8"$

$R_n/\Omega = 2(R_1/\Omega) + \ell_b (R_2/\Omega)$ [EQN 9-47b]

$= 23.6^K$ @ W12x16 CONTROLS > 15.82^K ✓

$R_1 = 10.4^K$ @ W12x16 ; 20.5^K @ W12x35 [JBL 9-4]

$R_2 = 7.33^K/\text{IN}$ @ W12x16 ; 10.0^K @ W12x35 [JBL 9-4]

WEB LOCAL CRIPPLING: $\Omega = 2.0$; $\ell_b = 3/8"$

$R_n/\Omega = 2[R_3/\Omega + \ell_b (R_4/\Omega)]$ [EQN 9-50b]

$= 27.4^K$ @ W12x16 CONTROLS > 15.82^K ✓

$R_3 = 12.8^K$ @ W12x16 ; 28.5^K @ W12x35 [JBL 9-4]

$R_4 = 2.92^K/\text{IN}$ @ W12x16 ; 3.00^K @ W12x35 [JBL 9-4]

∴ CONN OK FOR BRG

∴ CONN OK!

6.56" → CONS. USE W12x35

CHECK FLANGE FOR DOWNWARD REACTION:

$R_a = 15.82^K/2 = \cancel{7.92}^K$ → 5.4 K (2024-03-05) → $M_a = \cancel{7.92}^K \cdot (b_f = \cancel{6\tfrac{1}{2}}"/2) = \cancel{25.74}^{K \cdot IN}$ 5.4 17.8

$M_n/\Omega = [F_y Z \leq 1.6 F_y S]/\Omega$

$= (50\text{KSI})(bh^2/4)/\Omega = (50\text{KSI})[\cancel{7} \cdot (\cancel{0.36}")^2/4]/1.67 = \cancel{11.08}^{K \cdot IN}$ 10.3" 0.265" 5.42 $< M_a = \cancel{25.74}^{K \cdot IN}$ 17.8 ✗ N.G.

$b = (3"\text{ HSS} + 3/8"\ \text{PL} + 3/8"\ \text{PL} + b_f = \cancel{6.5"}) = \cancel{10.25}$ 6.56 10.3

$h = t_f = \cancel{0.36"}$ → 0.265"

∴ PROV. STIFF PL

($M_n/\Omega = 20.8^K$ @ W12x35 ✓ OK)

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CHECK EXTENTS OF FRP:

(E) CONC. SLAB f'c = 5000 PSI [(E DWGS)]

DESIGN IS INTENDED TO REPLACE (10) #4 BARS

$$\ell_d = \left(\frac{3}{40} \frac{\overset{60000\text{ PSI}}{f_y}}{\underset{1.0}{\lambda}\sqrt{\underset{5000\text{ PSI}}{f'_c}}} \frac{\cancel{\psi_t \psi_e \psi_s}\ 1.0}{\left(\frac{\underset{(4/8)/2+1''=1.25''}{c_b}+\overset{0}{K_{tr}}}{\underset{0.5''}{d_b}}\right)} \right) \overset{0.5''}{d_b} \geq 12'' \Rightarrow 12.73'' \Rightarrow \text{USE } 13''$$

$$\left.\begin{matrix} 0.5'' \\ (4/8)/2+1'' = 1.25'' \end{matrix}\right\} \frac{c_b+K_{tr}}{d_b} = 2.5$$

WEST OF GRID 1.4

COL STRIP EXTENDS WEST 7'-0" => EXTEND FRP 8'-1"

EAST OF GRID 1.4

COL STRIP EXTENDS EAST 3'-3" => EXTEND FRP 4'-4"

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PCS Structural Solutions

Project: ~~MHS HYBRID OR~~ Job No: 23-225
Subject: Calcs Sheet
Name: ESO
Originating Office: ☐ Seattle ☒ Tacoma ☐ Portland
Date: 2024-03-18

HANGING COL CONNECTIONS: $P_{a\text{-max}} = 13.0^k$ [(RISA)]

TRY (4) $7/8"$ Ø A325 N ⇒ $r_n/\Omega = 27.1^k$/BOLT ✓✓ OK!

BMS ON CONC WALLS:

TENSION END ⇒ ASSUME SUPPORTED 12" FROM TENS END OF WALL
3" FROM COMP. END

TRY THROUGH BOLTS TO SIDE OF CONC. WALL

TENS: $T_{a\text{-max}} = 8.81^k$ (LC 207)

STRYKER MX EQUIP DL1 EQUIP EL1

↳ LC = $(1.0 + 0.105 S_{DS})$ DL + 0.75 SL + 1.0 OL5 + 1.106 OL8 − 0.525 OL16

↳ MAX LRFD TENS = $(1.2 + 0.2 S_{DS})$(DL + OL8) + 1.2 OL5 − 1.0 OL16

w/ Ω_0 → $(1.2 + 0.2 S_{DS})$(DL + OL8) + 1.2 OL5 − 2.5 OL16

= (1.4028)(DL + OL8) + 1.2 OL5 − 2.5 OL16

↳ $T_{u\text{-max}} = 10.23^k = 5.12^k$/SIDE

CHECK ANCHOR IN TOP OF WALL ⇒ N.G.
BACK OF WALL ⇒ N.G.
TRY THRU-BOLTING ⇒ CHECK PROFIS w/ $\frac{1}{2} t_{WALL}$
↳ ∴ (2) $5/8"$ Ø ADHESIVE ANCHORS OK
6" O.C., FIRST ANCHOR 8" FROM EDGE ✓OK

CHECK STIFF. PL TO THRU-BOLT PL CONN.: TRY $1/2"$ SIDE PLATES
TRY $l_{WELD} = 3"$
TRY $5/16"$ WELD

$T_u = 5.12^k$

SHEAR LAG $U = 1 - \frac{\bar{x}}{l} = 1 - \frac{1/2"}{3"} = 0.83$

$\phi R_n = 1.392 Dl = 1.392 (5)(3")(2 \text{ SIDES}) = 41.7^k$

$A_e = A_n U = (1/2")(6")(0.83) = 2.49 \text{ in}^2 \Rightarrow \phi_t P_n = 0.75 F_u A_e = 0.75(65 \text{ ksi})(2.49 \text{ in}^2) = 121^k$ ✓OK

CHECK CONN. ECC.:

$T_u = 5.12^k$ @ ECC = 6" ⇒ $M_u = 30.72^k$ ⇒ $T/C = M_u/d = 30.72^{k}/(21.1" - 0.685" \cdot 2) = 1.56^k$

$1.56^k \le$ WELD = (2 SIDES)(1.392)(D=5)($l \approx 3"$) = 41.7^k ✓ ECC. OK

∴ CONN. OK (NOTE: USE l_{WELD} = 6" @ 12" O.C. FOR BETTER PL ENGAGEMENT)

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Company:	PCS Structural Solutions	Page:	1
Address:	1250 Pacific Avenue, STE 701	Specifier:	ESO
Phone I Fax:	2533832797 |	E-Mail:	info@pcs-structural.com
Design:	Cant. Bm Att. to Conc. Wall	Date:	3/9/2024
Fastening point:			

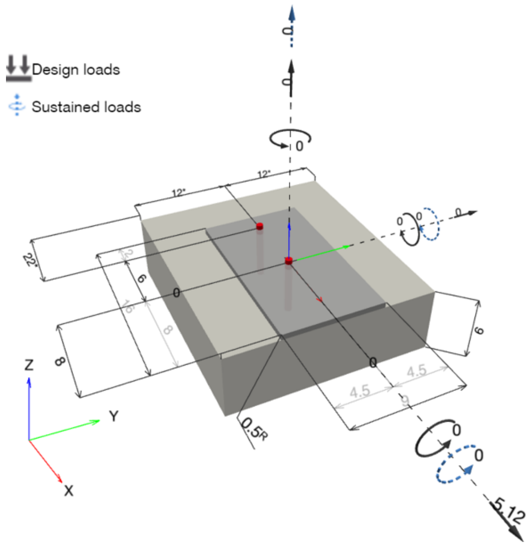
Specifier's comments:

1 Input data

Anchor type and diameter:	**HIT-RE 500 V3 + HAS-E-55 (ASTM F1554 Gr.55) 5/8**
Item number:	2198015 HAS-E-55 5/8"x6" (element) / 2123401 HIT-RE 500 V3 (adhesive)
Effective embedment depth:	$h_{ef,act}$ = 4.500 in. ($h_{ef,limit}$ = - in.)
Material:	ASTM F1554 Grade 55
Evaluation Service Report:	ESR-3814
Issued I Valid:	1/1/2023 | 1/1/2025
Proof:	Design Method ACI 318-14 / Chem
Stand-off installation:	e_b = 0.000 in. (no stand-off); t = 0.500 in.
Anchor plate^R :	l_x x l_y x t = 16.000 in. x 9.000 in. x 0.500 in.; (Recommended plate thickness: not calculated)
Profile:	no profile
Base material:	cracked concrete, 4000, f_c' = 4,000 psi; h = 6.000 in., Temp. short/long: 32/32 °F
Installation:	**hammer drilled hole, Installation condition: Dry**
Reinforcement:	tension: condition B, shear: condition B; no supplemental splitting reinforcement present edge reinforcement: none or < No. 4 bar
Seismic loads (cat. C, D, E, or F)	Tension load: yes (17.2.3.4.3 (d)) Shear load: yes (17.2.3.5.3 (c))

^{R} - The anchor calculation is based on a rigid anchor plate assumption.

Geometry [in.] & Loading [kip, ft.kip]



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Address:	1250 Pacific Avenue, STE 701	Specifier:	ESO
Phone I Fax:	2533832797 |	E-Mail:	info@pcs-structural.com
Design:	Cant. Bm Att. to Conc. Wall	Date:	3/9/2024
Fastening point:			

1.1 Design results

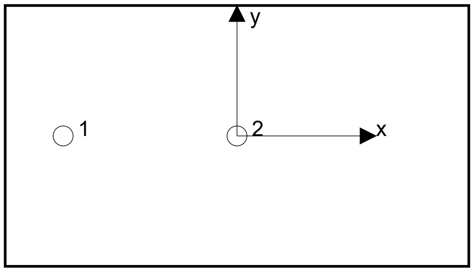
Case	Description	Forces [kip] / Moments [ft.kip]	Seismic	Max. Util. Anchor [%]
1	Combination 1	$N = 0.000; V_x = 5.120; V_y = 0.000;$ $M_x = 0.00000; M_y = 0.00000; M_z = 0.00000;$ $N_{sus} = 0.000; M_{x,sus} = 0.00000; M_{y,sus} = 0.00000;$	yes	89

2 Load case/Resulting anchor forces

Anchor reactions [kip]

Tension force: (+Tension, -Compression)

Anchor	Tension force	Shear force	Shear force x	Shear force y
1	0.000	2.560	2.560	0.000
2	0.000	2.560	2.560	0.000



max. concrete compressive strain: - [‰]
max. concrete compressive stress: - [psi]
resulting tension force in (x/y)=(0.000/0.000): 0.000 [kip]
resulting compression force in (x/y)=(0.000/0.000): 0.000 [kip]

Anchor forces are calculated based on the assumption of a rigid anchor plate.

3 Tension load

	Load N_{ua} [kip]	Capacity ϕ N_n [kip]	Utilization $\beta_N = N_{ua}/\phi$ N_n	Status
Steel Strength*	N/A	N/A	N/A	N/A
Bond Strength**	N/A	N/A	N/A	N/A
Sustained Tension Load Bond Strength*	N/A	N/A	N/A	N/A
Concrete Breakout Failure**	N/A	N/A	N/A	N/A

* highest loaded anchor **anchor group (anchors in tension)

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Phone I Fax:	2533832797 |	E-Mail:	info@pcs-structural.com
Design:	Cant. Bm Att. to Conc. Wall	Date:	3/9/2024
Fastening point:			

4 Shear load

	Load V_{ua} [kip]	Capacity ϕ V_n [kip]	Utilization $\beta_V = V_{ua}/\phi$ V_n	Status
Steel Strength*	2.560	6.611	39	OK
Steel failure (with lever arm)*	N/A	N/A	N/A	N/A
Pryout Strength (Bond Strength controls)**	5.120	18.976	27	OK
Concrete edge failure in direction x+**	5.120	5.818	89	OK

* highest loaded anchor **anchor group (relevant anchors)

4.1 Steel Strength

$V_{sa,eq}$ = ESR value refer to ICC-ES ESR-3814

ϕ $V_{steel} \geq V_{ua}$ ACI 318-14 Table 17.3.1.1

Variables

$A_{se,V}$ [in.^{2}]	f_{uta} [psi]	$\alpha_{V,seis}$
0.23	75,000	1.000

Calculations

$V_{sa,eq}$ [kip]
10.170

Results

$V_{sa,eq}$ [kip]	ϕ steel	ϕ $V_{sa,eq}$ [kip]	V_{ua} [kip]
10.170	0.650	6.611	2.560

Company:	PCS Structural Solutions	Page:	4
Address:	1250 Pacific Avenue, STE 701	Specifier:	ESO
Phone I Fax:	2533832797 |	E-Mail:	info@pcs-structural.com
Design:	Cant. Bm Att. to Conc. Wall	Date:	3/9/2024
Fastening point:			

4.2 Pryout Strength (Bond Strength controls)

$V_{cpg} = k_{cp}\left[\left(\frac{A_{Na}}{A_{Na0}}\right) \psi_{ec1,Na}\ \psi_{ec2,Na}\ \psi_{ed,Na}\ \psi_{cp,Na}\ N_{ba}\right]$ ACI 318-14 Eq. (17.5.3.1b)

$\phi\ V_{cpg} \geq V_{ua}$ ACI 318-14 Table 17.3.1.1

A_{Na} see ACI 318-14, Section 17.4.5.1, Fig. R 17.4.5.1(b)

$A_{Na0} = (2\ c_{Na})^2$ ACI 318-14 Eq. (17.4.5.1c)

$c_{Na} = 10\ d_a \sqrt{\frac{\tau_{uncr}}{1100}}$ ACI 318-14 Eq. (17.4.5.1d)

$\psi_{ec,Na} = \left(\frac{1}{1 + \frac{e_N'}{c_{Na}}}\right) \leq 1.0$ ACI 318-14 Eq. (17.4.5.3)

$\psi_{ed,Na} = 0.7 + 0.3\left(\frac{c_{a,min}}{c_{Na}}\right) \leq 1.0$ ACI 318-14 Eq. (17.4.5.4b)

$\psi_{cp,Na} = \text{MAX}\left(\frac{c_{a,min}}{c_{ac}}, \frac{c_{Na}}{c_{ac}}\right) \leq 1.0$ ACI 318-14 Eq. (17.4.5.5b)

$N_{ba} = \lambda_a \cdot \tau_{k,c} \cdot \alpha_{N,seis} \cdot \pi \cdot d_a \cdot h_{ef}$ ACI 318-14 Eq. (17.4.5.2)

Variables

k_{cp}	$\alpha_{overhead}$	$\tau_{k,c,uncr}$ [psi]	d_a [in.]	h_{ef} [in.]	$c_{a,min}$ [in.]	$\tau_{k,c}$ [psi]
2	1.000	2,486	0.625	4.500	8.000	1,352

$e_{c1,N}$ [in.]	$e_{c2,N}$ [in.]	c_{ac} [in.]	λ_a	$\alpha_{N,seis}$
0.000	0.000	11.198	1.000	0.950

Calculations

c_{Na} [in.]	A_{Na} [in.^{2}]	A_{Na0} [in.^{2}]	$\psi_{ed,Na}$
9.353	436.81	349.88	0.957

$\psi_{ec1,Na}$	$\psi_{ec2,Na}$	$\psi_{cp,Na}$	N_{ba} [kip]
1.000	1.000	1.000	11.349

Results

V_{cpg} [kip]	$\phi_{concrete}$	$\phi_{seismic}$	$\phi_{nonductile}$	$\phi\ V_{cpg}$ [kip]	V_{ua} [kip]
27.108	0.700	1.000	1.000	18.976	5.120

4.3 Concrete edge failure in direction x+

$V_{cb} = \left(\frac{A_{Vc}}{A_{Vc0}}\right) \psi_{ed,V}\ \psi_{c,V}\ \psi_{h,V}\ \psi_{parallel,V}\ V_b$	ACI 318-14 Eq. (17.5.2.1a)
$\phi\ V_{cb} \geq V_{ua}$	ACI 318-14 Table 17.3.1.1
A_{Vc} see ACI 318-14, Section 17.5.2.1, Fig. R 17.5.2.1(b)	
$A_{Vc0} = 4.5\ c_{a1}^2$	ACI 318-14 Eq. (17.5.2.1c)
$\psi_{ed,V} = 0.7 + 0.3\left(\frac{c_{a2}}{1.5c_{a1}}\right) \leq 1.0$	ACI 318-14 Eq. (17.5.2.6b)
$\psi_{h,V} = \sqrt{\frac{1.5c_{a1}}{h_a}} \geq 1.0$	ACI 318-14 Eq. (17.5.2.8)
$V_b = \left(7\left(\frac{l_e}{d_a}\right)^{0.2}\sqrt{d_a}\right) \lambda_a \sqrt{f'_c}\ c_{a1}^{1.5}$	ACI 318-14 Eq. (17.5.2.2a)

Variables

c_{a1} [in.]	c_{a2} [in.]	$\psi_{c,V}$	h_a [in.]	l_e [in.]
8.000	12.000	1.000	6.000	4.500

λ_a	d_a [in.]	f'_c [psi]	$\psi_{parallel,V}$
1.000	0.625	4,000	1.000

Calculations

A_{Vc} [in.^{2}]	A_{Vc0} [in.^{2}]	$\psi_{ed,V}$	$\psi_{h,V}$	V_b [kip]
144.00	288.00	1.000	1.414	11.754

Results

V_{cb} [kip]	$\phi_{concrete}$	$\phi_{seismic}$	$\phi_{nonductile}$	$\phi\ V_{cb}$ [kip]	V_{ua} [kip]
8.311	0.700	1.000	1.000	5.818	5.120

5 Warnings

- The anchor design methods in PROFIS Engineering require rigid anchor plates per current regulations (AS 5216:2021, ETAG 001/Annex C, EOTA TR029 etc.). This means load re-distribution on the anchors due to elastic deformations of the anchor plate are not considered - the anchor plate is assumed to be sufficiently stiff, in order not to be deformed when subjected to the design loading. PROFIS Engineering calculates the minimum required anchor plate thickness with CBFEM to limit the stress of the anchor plate based on the assumptions explained above. The proof if the rigid anchor plate assumption is valid is not carried out by PROFIS Engineering. Input data and results must be checked for agreement with the existing conditions and for plausibility!
- Condition A applies where the potential concrete failure surfaces are crossed by supplementary reinforcement proportioned to tie the potential concrete failure prism into the structural member. Condition B applies where such supplementary reinforcement is not provided, or where pullout or pryout strength governs.
- Design Strengths of adhesive anchor systems are influenced by the cleaning method. Refer to the INSTRUCTIONS FOR USE given in the Evaluation Service Report for cleaning and installation instructions.
- For additional information about ACI 318 strength design provisions, please go to https://submittals.us.hilti.com/PROFISAnchorDesignGuide/
- An anchor design approach for structures assigned to Seismic Design Category C, D, E or F is given in ACI 318-14, Chapter 17, Section 17.2.3.4.3 (a) that requires the governing design strength of an anchor or group of anchors be limited by ductile steel failure. If this is NOT the case, the connection design (tension) shall satisfy the provisions of Section 17.2.3.4.3 (b), Section 17.2.3.4.3 (c), or Section 17.2.3.4.3 (d). The connection design (shear) shall satisfy the provisions of Section 17.2.3.5.3 (a), Section 17.2.3.5.3 (b), or Section 17.2.3.5.3 (c).
- Section 17.2.3.4.3 (b) / Section 17.2.3.5.3 (a) require the attachment the anchors are connecting to the structure be designed to undergo ductile yielding at a load level corresponding to anchor forces no greater than the controlling design strength. Section 17.2.3.4.3 (c) / Section 17.2.3.5.3 (b) waive the ductility requirements and require the anchors to be designed for the maximum tension / shear that can be transmitted to the anchors by a non-yielding attachment. Section 17.2.3.4.3 (d) / Section 17.2.3.5.3 (c) waive the ductility requirements and require the design strength of the anchors to equal or exceed the maximum tension / shear obtained from design load combinations that include E, with E increased by ω_0.
- Installation of Hilti adhesive anchor systems shall be performed by personnel trained to install Hilti adhesive anchors. Reference ACI 318-14, Section 17.8.1.

Fastening meets the design criteria!

6 Installation data

Anchor type and diameter: HIT-RE 500 V3 + HAS-E-55 (ASTM F1554 Gr.55) 5/8

Profile: no profile

Item number: 2198015 HAS-E-55 5/8"x6" (element) / 2123401 HIT-RE 500 V3 (adhesive)

Hole diameter in the fixture: d_f = 0.687 in.

Maximum installation torque: 0.01800 ft.kip

Plate thickness (input): 0.500 in.

Hole diameter in the base material: 0.750 in.

Recommended plate thickness: not calculated

Hole depth in the base material: 4.500 in.

Drilling method: Hammer drilled

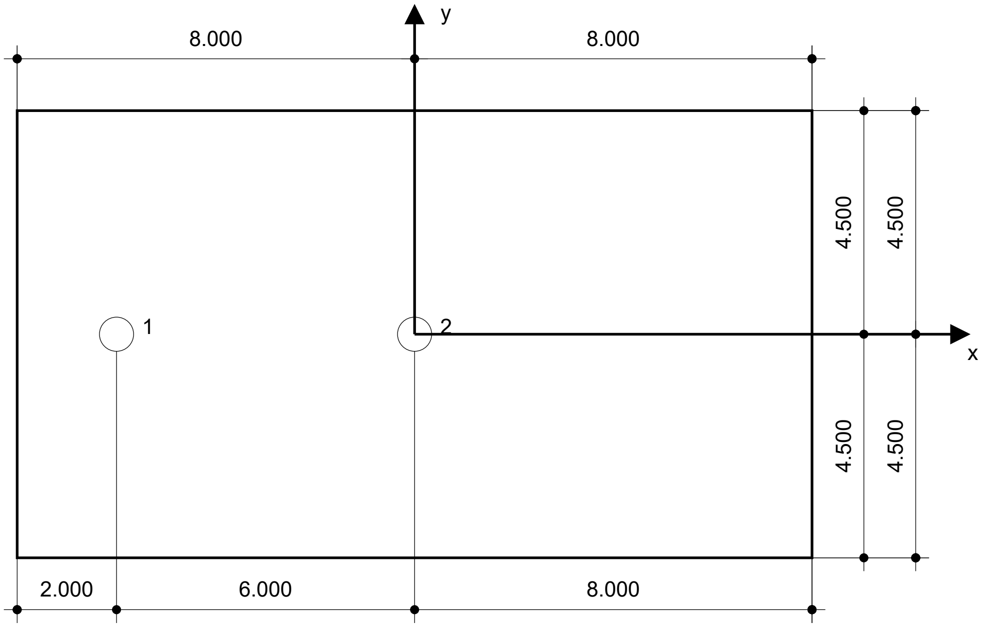
Minimum thickness of the base material: 6.000 in.

Cleaning: Compressed air cleaning of the drilled hole according to instructions for use is required

5/8 Hilti HAS Carbon steel threaded rod with Hilti HIT-RE 500 V3

6.1 Recommended accessories

Drilling	Cleaning	Setting
• Suitable Rotary Hammer • Properly sized drill bit	• Compressed air with required accessories to blow from the bottom of the hole • Proper diameter wire brush	• Dispenser including cassette and mixer • Torque wrench



Coordinates Anchor [in.]

Anchor	x	y	c_{-x}	c_{+x}	c_{-y}	c_{+y}
1	-6.000	0.000	22.000	14.000	12.000	12.000
2	0.000	0.000	28.000	8.000	12.000	12.000

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Phone I Fax:	2533832797 |	E-Mail:	info@pcs-structural.com
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Fastening point:			

7 Remarks; Your Cooperation Duties

- Any and all information and data contained in the Software concern solely the use of Hilti products and are based on the principles, formulas and security regulations in accordance with Hilti's technical directions and operating, mounting and assembly instructions, etc., that must be strictly complied with by the user. All figures contained therein are average figures, and therefore use-specific tests are to be conducted prior to using the relevant Hilti product. The results of the calculations carried out by means of the Software are based essentially on the data you put in. Therefore, you bear the sole responsibility for the absence of errors, the completeness and the relevance of the data to be put in by you. Moreover, you bear sole responsibility for having the results of the calculation checked and cleared by an expert, particularly with regard to compliance with applicable norms and permits, prior to using them for your specific facility. The Software serves only as an aid to interpret norms and permits without any guarantee as to the absence of errors, the correctness and the relevance of the results or suitability for a specific application.
- You must take all necessary and reasonable steps to prevent or limit damage caused by the Software. In particular, you must arrange for the regular backup of programs and data and, if applicable, carry out the updates of the Software offered by Hilti on a regular basis. If you do not use the AutoUpdate function of the Software, you must ensure that you are using the current and thus up-to-date version of the Software in each case by carrying out manual updates via the Hilti Website. Hilti will not be liable for consequences, such as the recovery of lost or damaged data or programs, arising from a culpable breach of duty by you.

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PCS Structural *Solutions*

Project: ~~MHS HYBRID OR~~ Job No: 23-225

Subject: Calcs Sheet Name: ESO

Originating Office: ☐ Seattle ☒ Tacoma ☐ Portland Date: 2024-03-09

BMS ON CONC WALLS:

COMPRESSION END:

STRYKER MX EQUIP DL1 EQUIP EL1

COMP: $C_{a\text{-}MAX} = 21.9^{k}$ (LC 207)

$\hookrightarrow LC = (1.0 + 0.105 S_{DS})\ DL + 0.75 SL + 1.0\ OL5 + 1.106\ OL8 - 0.525\ OL16$

$\hookrightarrow$ MAX LRFD JENS $= (1.2 + 0.2 S_{DS})(DL + OL8) + 1.2\ OL5 - 1.0\ OL16$

W/ Ω_0 $= (1.2 + 0.2 S_{DS})(DL + OL8) + 1.2\ OL5 - 2.5\ OL16$

$= (1.4028)(DL + OL8) + 1.2\ OL5 - 2.5\ OL16$

$\hookrightarrow C_{u\text{-}MAX} = 25.52^{k}$

CHECK BEARING:

TRY JUST LOADED AREA

$A_1 = 6'' \times 10'' = 60\ IN^2$

$\phi P_{nb} = \phi\, 0.85 f'c A_1$

$= 0.65 \cdot 0.85 \cdot 4000\,PSI\,(60\,IN^2) = 132.6^{k} >> C_u = 25.52^{k}$ ✓ BRG

$\therefore$ BM OK FOR BRG

GIRDER BM WEB PENETRATION

LOCATION AT (ℓ = 346"/2) − (1' + 2 3/4") − (1' + 1")/2 = 171" @ CL

= 161 @ SOUTH SIDE

= 182 @ NORTH SIDE

V_{u-max} @ OPN'G = 3.56^{K} (LC-211) [DL, EL, LL, SL]

M_{u-max} @ OPN'G = 89.5^{K-FT} (LC-210) [" "]

$I_{LOSS\,@\,OPN'G} = bh^3/12 = (0.395")(8.29")^3/12 = 18.8\ IN^3$ ⇒ GO FROM W24x55 I = 1350

$h = (d = 23.6") - [10.47" - (6" + 5/8")/2]\,2 = 8.29"$

NEW DEPTH = 23.7"

TRY $V_u = 1.6\,V_u = 5.696^{K}$
$M_u = 1.6\,M_u = 143.2^{K\cdot FT}$ } OK ✓OK

IMPACT ON DEFLECTIONS (STIFFNESS) IS MINIMAL ✓OK [(MATHCAD)]

$\therefore$ W24x55 OK

GIRDER BM ENDS

$P_{u-max} = 10.7^{K}$ (LC 207) @ SOUTH
$= 9.31^{K}$ (LC 214) @ NORTH

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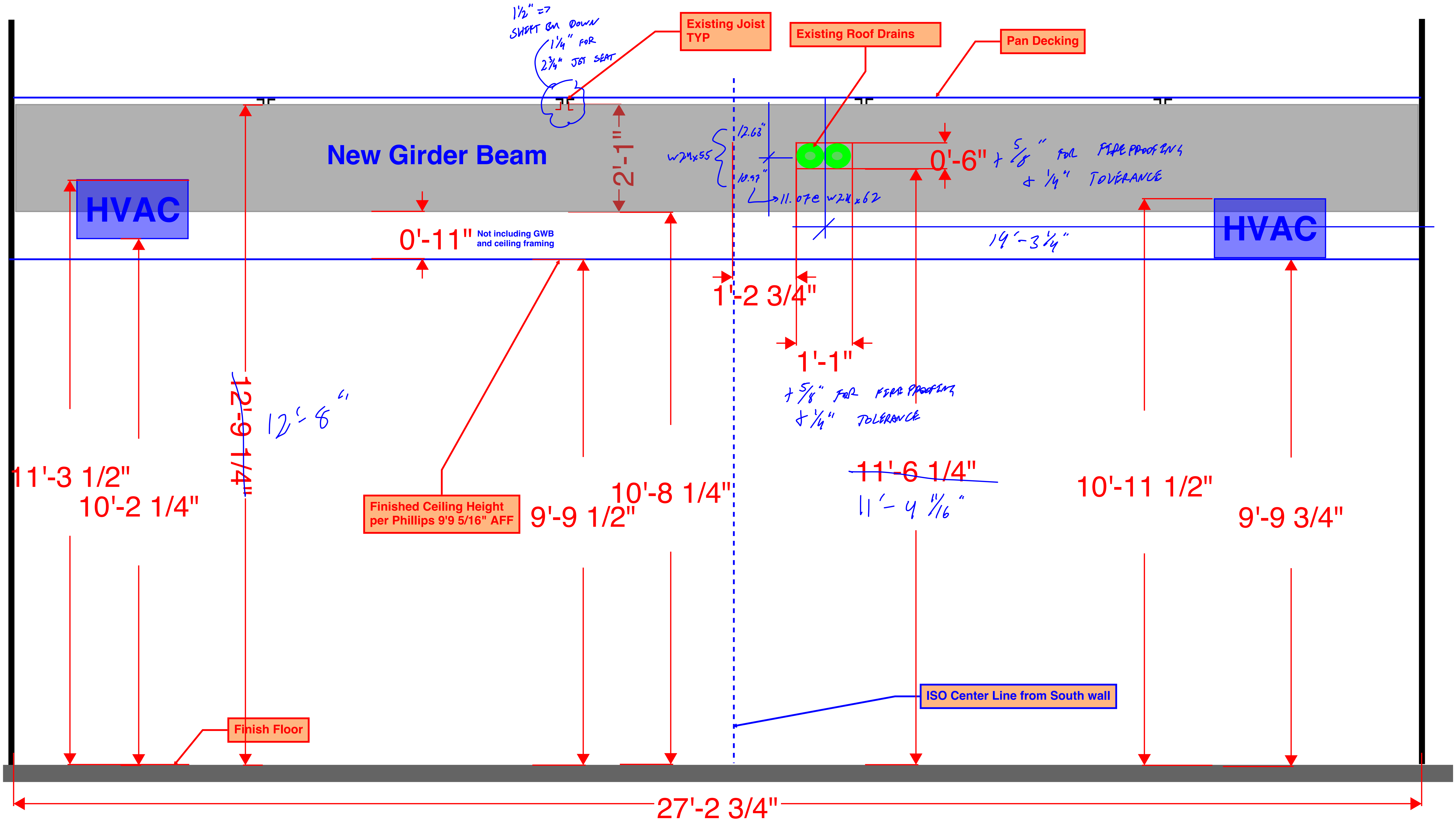
East Elevation at 6' 1 1/2" off 1.4



Steel Beam Web Opening Design

Description: This spreadsheet is used to check the capacity of a WF steel beam with an opening in the web. The design procedure is based on AISC Design Guide 2 - Steel and Composite Beams with Web Openings (Revision October 2003). Equations from this design guide are referenced as (x-x), referring to the section and equation number.

Demand at Opening

Shear Demand: $V_u := 5.696 \cdot kip$

Moment Demand: $M_u := 143.2 \cdot kip \cdot ft$

--> Use demands from the maximum shear and moment along the length of the opening. Moment should be entered as positive for when compression is in top flange.

Member Properties

Beam Size: $Shape := $ “W24X55” (Enter as beam size all CAPS)

Yield Stress: $F_y := 50\ ksi$

Modulus of Elasticity: $E_s := 29000\ ksi$

Area: $A_s = 16.2\ in^2$

Beam Depth: $d = 23.6\ in$

Web Thickness: $t_w = 0.395\ in$

Flange Width: $b_f = 7.01\ in$

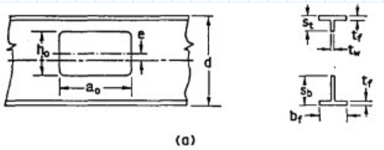
Flange Thickness: $t_f = 0.505\ in$

Plastic Section Modulus: $Z_x = 134\ in^3$

Opening Properties

Depth of Opening: $h_o := 6.625 \cdot in$

Length of Opening: $a_o := 13.625 \cdot in$



(a)

For circular openings assume the diameter, Do = ho = ao. For more information on circular openings see Section 2. Other Considerations part b.

Eccentricity of Opening: $e := 0.83 \cdot in$ (always positive for steel sections. CL opening to CL BM)

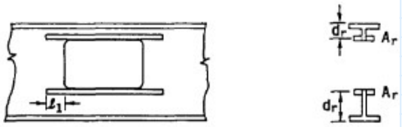
Eccentricity Up or Down?: $updown :=$ Ecc Location: Down

Reinforced Opening?: $reinf :=$ Reinforced?: No

Area of Reinforcing: $A_r := 0.65 \cdot in^2$

Reinf Thickness: $t_r := 0.5 \cdot in$

(Area of reinf is for top or bottom)
(enter 0 if no reinf used)



Bottom Tee Depth $s_b := 0.5 \cdot (d - h_o) + x \cdot e = 7.658\ in$

Top Tee Depth $s_t := 0.5 \cdot (d - h_o) - x \cdot e = 9.318\ in$

Change in Steel Area: $\Delta A_s := h_o \cdot t_w - 2 \cdot A_r = 2.617\ in^2$

Net Steel Area: $A_{sn} := A_s - \Delta A_s = 13.583\ in^2$

Bottom Opening Ratio: $v_b = 1.779$

Top Opening Ratio: $v_t = 1.462$

$\bar{s} = s - \frac{A_r}{2b_f}$, used to calculate ν when reinforcement is used

ν = aspect ratio of tee $= \frac{a_o}{s}$, use $\nu = \frac{a_o}{\bar{s}}$ when reinforcement is used

1. Proportioning Guideline Checks

a. Check: Compression Flange

$$CHECK := \left\| \begin{array}{l} \text{if } \dfrac{b_f}{2\cdot t_f} \le \dfrac{65}{\sqrt{\dfrac{F_y}{ksi}}} \\ \quad \left\| \text{“OK”} \right. \\ \text{else} \\ \quad \left\| \text{“NO GOOD”} \right. \end{array} \right. = \text{“OK”} \qquad (3\text{-}23)$$

b. Check: Web buckling and limit on Vm

i. Web Opening Parameter Limit: $P_{omax} := 5.6$ (Steel Sections)

Web Opening Parameter Limit: $P_o := \dfrac{a_o}{h_o} + \dfrac{6\cdot h_o}{d} = 3.741$ (3-24)

$$CHECK := \left\| \begin{array}{l} \text{if } P_o \le P_{omax} \\ \quad \left\| \text{“OK”} \right. \\ \text{else} \\ \quad \left\| \text{“NO GOOD”} \right. \end{array} \right. = \text{“OK”}$$

ii. Web-thickness ratio Limit: (Section 3.7a2b)

Opening Ratio Limit:

$$OL := \left\| \begin{array}{l} \text{if } \dfrac{d-2\cdot t_f}{t_w} \le \dfrac{420}{\sqrt{\dfrac{F_y}{ksi}}} \\ \quad \left\| 3 \right. \\ \text{else if } \dfrac{d-2\cdot t_f}{t_w} \le \dfrac{520}{\sqrt{\dfrac{F_y}{ksi}}} \\ \quad \left\| 2.2 \right. \\ \text{else} \\ \quad \left\| 0 \right. \end{array} \right. = 3$$

$$CHECK := \left\| \begin{array}{l} \text{if } \dfrac{a_o}{h_o} \le OL \\ \quad \left\| \text{“OK”} \right. \\ \text{else} \\ \quad \left\| \text{“NO GOOD”} \right. \end{array} \right. = \text{“OK”} \qquad (3\text{-}25)$$

If value for OL is 0, section is inadequate and does not meet web width-thickness ratio required

iii. Maximum Nominal Shear Capacity Limit: $V_p := \dfrac{F_y \cdot t_w \cdot d}{\sqrt{3}} = 269.1\ kip$ (Section 3.7a2b)

$$V_{pmax} := \left\| \begin{array}{l} \text{if } OL = 3 \\ \quad \left\| \dfrac{2}{3}\cdot V_p \right. \\ \text{else if } OL = 2.2 \\ \quad \left\| 0.45 \cdot V_p \right. \\ \text{else} \\ \quad \left\| 0 \cdot kip \right. \end{array} \right. = 179.4\ kip$$

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c. Check: Opening and Tee Dimensions (Section 3.7b1)

```
CHECK := | if  $\frac{h_o}{d} \le 0.7$
         |     "OK"
         | else
         |     "NO GOOD - Decrease hole depth or increase beam depth."        = "OK"
```

```
CHECK := | if  $0.15 \cdot d \le s_t$
         |     | if  $0.15 \cdot d \le s_b$
         |     |     "OK"
         |     | else
         |     |     "NO GOOD - Decrease hole depth or downward eccentricity."
         | else
         |     "NO GOOD - Decrease hole depth or upward eccentricity."        = "OK"
```

```
CHECK := | if  $v_t \le 12$
         |     | if  $v_b \le 12$
         |     |     "OK"
         |     | else
         |     |     "NO GOOD - Decrease hole size or upward eccentricity."
         | else
         |     "NO GOOD - Decrease hole size or upward eccentricity."        = "OK"
```

d. Check: Buckling of Tee-Shaped Compression Zone (Section 3.7a3)

```
CHECK := | if  $0 \cdot kip \cdot ft \le M_u$
         |     | if  $v_t \le 4$
         |     |     "OK"
         |     | else
         |     |     "Compression Zone Needs Check"
         | else
         |     | if  $v_b \le 4$
         |     |     "OK"
         |     | else
         |     |     "Compression Zone Needs Check"        = "OK"
```

If "Compression Zone Needs Check", the compression tee needs to be analyzed as an axially loaded column. See next two pages for analysis. Omit if check above is OK.

i. Compression Tee Demand

Axial Force: $P_u := \frac{|M_u|}{d - 2 \cdot y_c} = 93.01\ kip$

i. Compression Tee Section Properties

Web Area: $A_w = 3.481\ in^2$
Tee Area: $A_T = 7.021\ in^2$
Centriod: $y_c = 2.562\ in$
MOI (x): $I_{Tx} = 60.696\ in^4$
MOI (y): $I_{Ty} = 14.542\ in^4$
Gyration (x): $r_{Tx} = 2.94\ in$
Gyration (y): $r_{Ty} = 1.439\ in$
Torsional Constant: $J = 0.482\ in^4$
Tee Depth: $s = 9.318\ in$
Tee Length: $L_T := a_o = 13.625\ in$ (Column length = length of opening)
Effective Length Factor $K := 1.0$ (Assumed pin-pin)

ii. Stem Slenderness Check

$\lambda_s := \frac{s}{t_w} = 23.589$ $\lambda_{rs} := 0.75 \cdot \sqrt{\frac{E_s}{F_y}} = 18.062$

$stem = $ "Slender" $Q_{s1} = 0.713$

iii. Flange Slenderness Check

$\lambda_f := \frac{b_f}{2 \cdot t_f} = 6.941$ $\lambda_{rf} := 0.56 \cdot \sqrt{\frac{E_s}{F_y}} = 13.487$

$flange = $ "Slender" $Q_{s2} = 1$

Slender Unstiffened Element Reduction Factor: $Q_s := min(Q_{s1}, Q_{s2}) = 0.713$ (AISC E7-1)

iv. x-x Axis Critical Elastic Flexural Buckling

$\frac{K \cdot L_T}{r_{Tx}} = 4.634$ $F_{ex} := \frac{\pi^2 \cdot E_s}{\left(\frac{K \cdot L_T}{r_{Tx}}\right)^2} = 13328.628\ ksi$ (AISC Spec. EQ. E3-4)

v. Critical Elastic Torsional and Flexural-Torsional Buckling Stress

$\frac{K \cdot L_T}{r_{Ty}} = 9.467$ $F_{ey} := \frac{\pi^2 \cdot E_s}{\left(\frac{K \cdot L_T}{r_{Ty}}\right)^2} = 3193.335\ ksi$ (AISC Spec. EQ. E4-8)

vi. Torsional Parameters

For WT Section:

$$G := 11200 \cdot \mathbf{ksi}$$

$$x_o := 0 \cdot \mathbf{in}$$

$$y_o := y_c - 0.5 \cdot t_f = 2.31\ \mathbf{in}$$

$$r_o := \sqrt{{x_o}^2 + {y_o}^2 + \frac{I_{Tx} + I_{Ty}}{A_T}} = 4.006\ \mathbf{in}$$ (AISC Spec. EQ. E4-11)

$$H := 1 - \frac{{x_o}^2 + {y_o}^2}{{r_o}^2} = 0.668$$ (AISC Spec. EQ. E4-10)

$$F_{ez} := \frac{G \cdot J}{A_T \cdot {r_o}^2} = 47.9\ \mathbf{ksi}$$ (AISC Spec. EQ. E4-9)

$$F_{et} := \left(\frac{F_{ey} + F_{ez}}{2 \cdot H}\right) \cdot \left(1 - \sqrt{1 - \frac{4 \cdot F_{ey} \cdot F_{ez} \cdot H}{\left(F_{ey} + F_{ez}\right)^2}}\right) = 47.66\ \mathbf{ksi}$$ (AISC Spec. EQ. E4-5)

$$F_e := min\left(F_{ex}, F_{et}\right) = 47.66\ \mathbf{ksi}$$

$$F_{cr} := \begin{array}{|l} \text{if } \dfrac{Q_s \cdot F_y}{F_e} < 2.25 \\ \quad \left\| Q_s \cdot \left(0.658^{\frac{Q_s \cdot F_y}{F_e}}\right) \cdot F_y \right. \\ \text{else} \\ \quad \left\| 0.877 \cdot F_e \right. \end{array} = 26.068\ \mathbf{ksi}$$ (AISC Spec. EQ. E7-1)

$$\phi P_n := 0.9 \cdot F_{cr} \cdot A_T = 164.723\ \mathbf{kip}$$

$$Check := \begin{array}{|l} \text{if } \phi P_n \ge P_u \\ \quad \| \text{“Compression Section Zone is GOOD”} \\ \text{else} \\ \quad \| \text{“Compression Section Zone is NOT GOOD”} \end{array} = \text{“Compression Section Zone is GOOD”}$$

e. Check: Lateral Torsional Buckling (Section 3.7a4)

In members with unreinforced opening or reinforced openings with the reinforcement placed on both sides of the web, the torsional constant, J, should be multiplied by the modification factor below when checking LTB (Assumes compact section is used). If member is reinforced on only one side of the web, Ar = 0 for the calc of ΔA_s.

Reinforcement Area: $A_r = 0\ in^2$

Unbraced length of compression flange: $L_b := 5.77 \cdot ft$

Modification to Torsional Constant: $C_J := \left(1 - \left(\frac{a_o}{L_b}\right) \cdot \frac{h_o \cdot t_w - 2 \cdot A_r}{t_w \cdot (d + 2 \cdot b_f)}\right) = 0.965$

Modified Torsional Constant: $J' := C_J \cdot J = 0.465\ in^4$

Limiting Lengths

$L_p := 1.76 \cdot r_y \cdot \sqrt{\frac{E_s}{F_y}} = 4.733\ ft$ (AISC Spec. EQ. F2-5)

Distance Between Flange Centroids: $h := d - 2 \cdot t_f = 22.59\ in$

$r_{ts} := \sqrt{\frac{I_y \cdot h}{2 \cdot S_x}} = 1.698\ in$ (AISC Spec. EQ. F2-7 User Note)

$c := 1$ (AISC Spec. EQ. F2-8a)

$L_r := 1.95 \cdot r_{ts} \cdot \frac{E_s}{0.7\ F_y} \cdot \sqrt{\frac{J' \cdot c}{S_x \cdot h} + \sqrt{\left(\frac{J' \cdot c}{S_x \cdot h}\right)^2 + 6.76 \cdot \left(\frac{0.7 \cdot F_y}{E_s}\right)^2}} = 13.181\ ft$ (AISC Spec. EQ. F2-6)

$C_b := 1.0$ (assumed - conservative)

(a) When Lb <= Lp LTB does not apply

$M_p := F_y \cdot Z_x = 558.333\ kip \cdot ft$

$M_{na} := M_p = 558.333\ kip \cdot ft$

(b) When Lp < Lb <= Lr:

Plastic Moment Capacity:

$M_{nb} := C_b \cdot \left(M_p - \left(M_p - 0.7 \cdot F_y \cdot S_x\right) \cdot \left(\frac{L_b - L_p}{L_r - L_p}\right)\right) = 530.615\ kip \cdot ft$ (AISC Spec. EQ. F2-1)

(c) When Lb > Lr:

$F_{cr} := \frac{C_b \cdot \pi^2 \cdot E_s}{\left(\frac{L_b}{r_{ts}}\right)^2} \cdot \sqrt{1 + 0.078 \cdot \frac{J' \cdot c}{S_x \cdot h} \cdot \left(\frac{L_b}{r_{ts}}\right)^2}$ (AISC Spec. EQ. F2-4)

$M_{nc} := F_{cr} \cdot S_x = \left(1.654 \cdot 10^3\right)\ kip \cdot ft$ (AISC Spec. EQ. F2-3)

Flexural Moment Capacity

LRFD Redcuction Factor: $\phi := 0.9$

$$\phi M_n := \left\| \begin{array}{l} \text{if } L_b \le L_p \\ \quad \left\| \phi \cdot M_{na} \right. \\ \text{else if } L_p < L_b \le L_r \\ \quad \left\| \phi \cdot M_{nb} \right. \\ \text{else} \\ \quad \left\| \phi \cdot M_{nc} \right. \end{array} \right\| = 477.553\ kip \cdot ft$$

Check Against Max Moment in Unbraced length of compression flange

2. Other Design Considerations

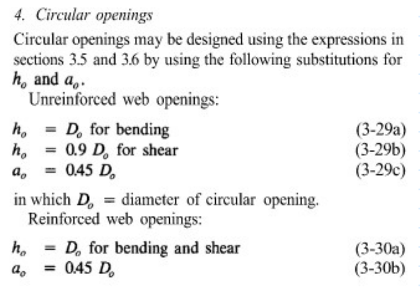
a. Corner Radii: (Section 3.7b2)

The corners of opening should have minimum radii at least 2 times the thickness of the web or 5/8", whichever is greater.

Min Corner Radii: $r_{min} := \max\left(2 \cdot t_w, 0.625 \cdot in\right) = 0.79\ in$

b. Circular Openings (Section 3.7b4)

It is conservative to use the diameter of the opening, Do = ho = ao when checking web openings. However, circular openings may be designed using the following substitutions for ho and ao if additional capacity is required.



4. *Circular openings*

Circular openings may be designed using the expressions in sections 3.5 and 3.6 by using the following substitutions for h_o and a_o.

Unreinforced web openings:

$h_o = D_o$ for bending (3-29a)

$h_o = 0.9\ D_o$ for shear (3-29b)

$a_o = 0.45\ D_o$ (3-29c)

in which D_o = diameter of circular opening.

Reinforced web openings:

$h_o = D_o$ for bending and shear (3-30a)

$a_o = 0.45\ D_o$ (3-30b)

c. Concentrated Loads (Section 3.7b3)

No concentrated loads should be placed above the opening. or a distance d from the support to opening edge.

Are Stiffeners Required:

```
CHECK := if $\frac{d - 2 \cdot t_f}{t_w} \le \frac{520}{\sqrt{\frac{F_y}{ksi}}}$
             if $\frac{b_f}{2\ t_f} \le \frac{65}{\sqrt{\frac{F_y}{ksi}}}$
                 “Stiffeners Not Required”
             else
                 “Stiffeners Required”
         else
             “Stiffeners are Required”
= “Stiffeners Not Required”
```

Minimum distance from concentrated load to CL of opening: $d_{conc} = 1.551\ ft$

d. Spacing of Openings (Section 3.7b6)

$\phi := 0.9$

Openings should be spaced in accordance with the following criteria to avoid interaction between openings. S = clear space between openings. More advanced analysis using 'first principles' is required to analyze beams with multiple web openings spaced closer than what is listed below.

Rectangular Openings:

Minimum Spacing: $S_r := \max\left(h_o, a_o \cdot \left(\frac{\frac{V_u}{\phi \cdot V_p}}{1 - \frac{V_u}{\phi \cdot V_p}}\right)\right) = 6.625\ in$

Composite Beams:

If beam is actually composite and analyzing as non-composite:

$S_{comp} := \max\left(2 \cdot d, a_o\right) = 47.2\ in$

Circular Openings:

Opening Diameter: $D_o := a_o$ (Input diameter here)

Minimum Spacing: $S_o := \max\left(1.5\ D_o, D_o \cdot \left(\frac{\frac{V_u}{\phi \cdot V_p}}{1 - \frac{V_u}{\phi \cdot V_p}}\right)\right) = 20.438\ in$

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e. Reinforcement (Section 3.7b5)

Reinforcement should be placed as close to an opening as possible, leaving adequate room for fillet welds, if required on both sides of reinforcement. Continuous welds should be used to attach the reinforcement bars. A fillet weld may be used on one or both sides of the bar within the length of the opening. However, fillet welds should be used on both sides of the reinforcement on extensions past the opening. The required strength of the weld within the length of the opening is,

Does this Section Apply?: $REINF = \text{"THIS SECTION DOES NOT APPLY"}$

Force in Reinforcing:
(Assuming Fy of RI is EQ to Steel Beam)

$$P_r := \begin{array}{l} \text{if } F_y \cdot A_r \le \dfrac{F_y \cdot t_w \cdot a_o}{2 \cdot \sqrt{3}} \\ \quad F_y \cdot A_r \\ \text{else} \\ \quad \dfrac{F_y \cdot t_w \cdot a_o}{2 \cdot \sqrt{3}} \end{array} = 0\ \mathbf{kip}$$

Required Weld Strength within Opening Length: $R_{wrOP} := \phi \cdot 2 \cdot P_r = 0\ \mathbf{lbf}$ (3-31)

Required Length of Weld Beyond Opening: $l_1 := \max\left(\dfrac{a_o}{4}, \dfrac{A_r \cdot \sqrt{3}}{2 \cdot t_w}\right) = 3.406\ \mathbf{in}$

Required Weld Strength within Each Extension: $R_{wrEXT} := \phi \cdot F_y \cdot A_r = 0\ \mathbf{kip}$ (3-32)

If reinforcing bars are used on only one side of the web, the section should meet the following additional requirements:

Flange Area: $A_f := b_f \cdot t_f = 3.54\ \mathbf{in}^2$

CHECK:(3-33)

$$CHECK := \begin{array}{l} \text{if } A_r \le \dfrac{A_f}{3} \\ \quad \text{"OK"} \\ \text{else} \\ \quad \text{"NO GOOD"} \end{array} = \text{"OK"}$$

CHECK:(3-34)

$$CHECK := \begin{array}{l} \text{if } \dfrac{a_o}{h_o} \le 2.5 \\ \quad \text{"OK"} \\ \text{else} \\ \quad \text{"NO GOOD"} \end{array} = \text{"OK"}$$

NOTE: OK

CHECK:(3-35)

$$CHECK := \begin{array}{l} \text{if } \max\left(\dfrac{s_t}{t_w}, \dfrac{s_b}{t_w}\right) \le \dfrac{140}{\sqrt{\dfrac{F_y}{\mathbf{ksi}}}} \\ \quad \text{"OK"} \\ \text{else} \\ \quad \text{"NO GOOD"} \end{array} = \text{"NO GOOD"}$$

CHECK:(3-36)

$$CHECK := \begin{array}{l} \text{if } \dfrac{M_u}{V_u \cdot d} \le 20 \\ \quad \text{"OK"} \\ \text{else} \\ \quad \text{"NO GOOD"} \end{array} = \text{"OK"}$$

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3. Maximum Moment Capacity

Plastic Moment of Gross Section: $M_p := F_y \cdot Z_x = 558.3\ \mathbf{kip \cdot ft}$

Resistance Factors: $\phi := 0.9$ (Steel Beams)

Reinforced Opening: $reinf = \text{"NO"}$

a) Unreinforced Maximum Moment Capacity:

$$\phi M_m := \phi \cdot M_p \cdot \left(1 - \frac{\Delta A_s \cdot \left(\frac{h_o}{4} + e\right)}{Z_x}\right) = 478.1\ \mathbf{kip \cdot ft} \qquad (3\text{-}6)$$

b) Reinforced Maximum Moment Capacity:

$$\phi M_m := \left\| \begin{array}{l} \text{if } reinf = \text{"NO"} \\ \quad \left\| \ \phi M_m \right. \\ \text{else if } t_w \cdot e < A_r \\ \quad \left\| \ \phi \cdot M_p \cdot \left(1 - \frac{t_w \cdot \left(\frac{h_o^{\ 2}}{4} + h_o \cdot e - e^2\right) - A_r \cdot h_o}{Z_x}\right) \right. \\ \text{else} \\ \quad \left\| \ \phi \cdot M_p \cdot \left(1 - \frac{\left(h_o \cdot t_w - 2 \cdot A_r\right) \cdot \left(\frac{h_o}{4} + e - \frac{A_r}{2 \cdot t_w}\right)}{Z_x}\right) \right. \end{array} \right. = 478.1\ \mathbf{ft \cdot kip} \qquad (3\text{-}7)$$

4. Maximum Shear Capacity

(Section 3.6a)

a) Bottom Tee

Plastic Shear Capacity (Bottom): $V_{pb} := \frac{F_y \cdot t_w \cdot s_b}{\sqrt{3}} = 87.3\ \mathbf{kip}$

Aspect Ratio: $v_b = 1.78$

Force in Reinforcing: $P_r = 0\ \mathbf{kip}$

$$\mu := \frac{2 \cdot P_r \cdot d_{rb}}{V_{pb} \cdot s_b} = 0 \qquad \text{(Note: } \mu = 0 \text{ if Unreinforced)} \qquad (3\text{-}14)$$

Shear Ratio: $\alpha_{vb} := min\left(\frac{\sqrt{6} + \mu}{v_b + \sqrt{3}}, 1\right) = 0.698$ (3-13)

Max Shear Capacity (Bottom): $V_{mb} := \alpha_{vb} \cdot V_{pb} = 60.9\ \mathbf{kip}$ (3-13)

b) Top Tee

Plastic Shear Capacity (Top): $V_{pt} := \frac{F_y \cdot t_w \cdot s_t}{\sqrt{3}} = 106.2\ \mathbf{kip}$

Aspect Ratio: $v_t = 1.46$

Force in Reinforcing: $P_r = 0\ \mathbf{kip}$

$$\mu := \frac{2 \cdot P_r \cdot d_{rt}}{V_{pb} \cdot s_t} = 0$$ (3-14)

(Note: μ=0 if Unreinforced)

Shear Ratio: $\alpha_{vt} := min\left(\frac{\sqrt{6} + \mu}{v_t + \sqrt{3}}, 1\right) = 0.767$ (3-13)

Max Shear Capacity (Top): $V_{mt} := \alpha_{vt} \cdot V_{pt} = 81.5\ kip$ (3-13)

b) Total Shear Capacity

Max Shear Capacity: $\phi V_m := \phi \cdot min\left(V_{mb} + V_{mt}, V_{pmax}\right) = 128.1\ kip$ (3-12)

5. Nominal Bending and Shear Capacities

Nominal Moment Capacity:

$$\phi M_n := \phi M_m \cdot \left(\frac{\left(\frac{V_u}{\phi V_m}\right)^3}{\left(\frac{|M_u|}{\phi M_m}\right)^3} + 1\right)^{\frac{-1}{3}} = 477.582\ kip \cdot ft$$ (3-5b)

Nominal Shear Capacity:

$$\phi V_n := \phi M_n \cdot \left(\frac{V_u}{|M_u|}\right) = 18.997\ kip$$ (3-5a)

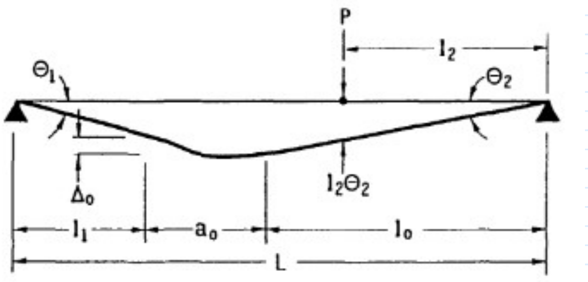
5. Web Opening Check

```
CHECK := if |M_u| ≤ ϕM_n                    = "Web Opening OK"
             if V_u ≤ ϕV_n
                 "Web Opening OK"
             else
                 "NO GOOD"
         else
             "NO GOOD"
```

*If NO GOOD, either increase beam size, decrease opening size, or add reinforcing

6. Deflection Check

This deflection procedure is from AISC Design Guide 2 Section 6.4 Approximate Procedure. This is a conservative procedure, see AISC Design Guide 2 Section 6 for more advanced procedures to determine deflection. This method assumes the opening is concentric. **This procedure assumes their is no eccentricity in the opening and opening reinforcing is ignored. Also, this method assumes there is only one opening in the beam. Multiple openings can produce a pronounced increase in deflection, therefore further analysis is required if multiple openings occur along a beam span.**



Length of Beam: $L := 28.83 \cdot ft$

Distance to CL of Opening: $X_o := 14.25 \cdot ft$ (from closer support)

Distance from support to point at which deflection is calculated: $L_2 := 14.417 \cdot ft$

Distance from high moment end of opening to adjacent support: $L_o := L - \left(X_o + 0.5 \cdot a_o\right) = 14.012\ ft$

Moment of Inertia of the Tee: $I_T = 46.852\ in^4$

Modulus of Elasticity: $E_s = 29000\ ksi$

Length of Opening: $a_o = 13.625\ in$

Shear Demand at Opening: $V_u = 5.696\ kip$

Deflection Through Opening:

$$\Delta_o := \frac{V_u \cdot a_o^{\ 3}}{6 \cdot E_s \cdot I_T} = 0.002\ in \qquad (6\text{-}2)$$

Additional deflection between high moment end and support caused by opening:

$$\Delta_{p1} := \Delta_o \cdot \frac{L_2}{L_o} = 0.002\ in$$

$$\theta_H := \frac{\Delta_o}{L_o} = 1.051 \cdot 10^{-5}$$

$$\theta_T := \frac{V_u \cdot a_o^{\ 2}}{4 \cdot E_s \cdot I_T} = 1.946 \cdot 10^{-4}$$

$$L_3 := L_o - L_2 = -0.405\ ft$$

Additional deflection to enforce slope continuity:

$$\Delta_{p2} := \frac{2 \cdot \left(\theta_H + \theta_T\right) \cdot L_2 \cdot L_3}{L_o + L_2} = -0.001\ in$$

Total additional deflection due to opening:

$$\Delta_{add} := \Delta_{p1} + \Delta_{p2} = \left(8.082 \cdot 10^{-4}\right)\ in \qquad (6\text{-}3)$$

0.0008082" → MINIMAL IMPACT

(Added to the deflection of the beam without an opening at the L2 point)

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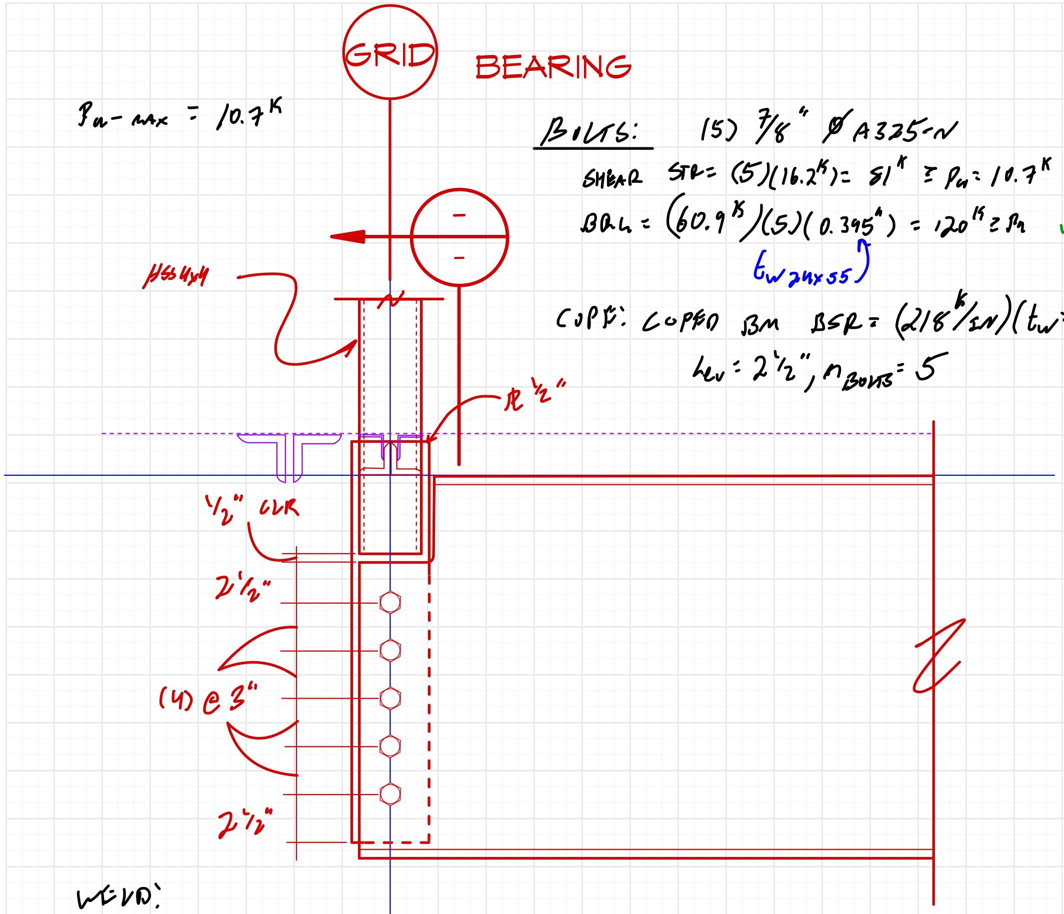
PCS Structural *Solutions*

Project: ~~MHS HYBRID OR~~ Job No: 23-225
Subject: Details Sheet
Name: ESO
Originating Office: ☐ Seattle ☒ Tacoma ☐ Portland
Date: 2024-03-09

$P_{u-max} = 10.7^K$



BOLTS: (5) 7/8" Ø A325-N

SHEAR STR = $(5)(16.2^K) = 81^K \geq P_u = 10.7^K$ ✓OK

BRG = $(60.9^K)(5)(0.395") = 120^K \geq P_u$ ✓OK

(t_w 24x55)

COPE: COPED BM BSR = $(218^K/IN)(t_w = 0.395") = 86.11^K \geq P_u$ ✓OK

$l_{ev} = 2\frac{1}{2}"$, $n_{BOLTS} = 5$

WELD:

TRY 1/4" WELD → $l_{REQ'D} = 10.7^K/(0.928 \cdot 4\ SIDES \cdot [D=4] \cdot l) \Rightarrow l_{REQ'D} \geq 0.72$

∴ 4" MIN OK

SRY 1/2" PL · 5" → $0.9(F_y A_g)/1.67 = 0.9(36KSI)(1/2")(5") = 81^K$ ✓OK

$0.75\ F_u A_e / 2.00 = 0.75(58KSI)(5/6 \cdot 1/2" \cdot 5")/2 = 33.9^K$ ✓OK

$l = 4" \geq H$ ✓ $\Rightarrow U = 1 - \bar{x}/l$ $\bar{x} = \dfrac{B^2 + 2BH}{4(B+H)} = 3/2 \Rightarrow U = 5/6"$

PL: GSY: $F_y A_g/1.67 = (36KSI)(1/2" \cdot 5")/1.67 = 53^K > P_u$ ✓OK

NSR: $F_u A_e/2.00 = (58KSI) \cdot 1/2" \cdot [5" - (15/16" + 1/16")]/2 = 58^K > P_u$ ✓OK

BSR: $\Omega = 2.00$; $R_n = 0.6F_u A_{nv} + U_{bs} F_u A_{nt} \leq 0.6 F_y A_{gv} + U_{bs} F_u A_{nt} = (203^K \leq 185.6^K)/2.00 = 92.8^K \geq P_u$ ✓

$A_{gv} = (1/2")(2\frac{1}{2}" + 4 \cdot 3") = 7.25\ IN^2$; $A_{nt} = (1/2")(5" - 15/16" - 1/16")/2 = 1.00\ IN^2$

$A_{nv} = \frac{1}{2}"(2\frac{1}{2}" + 4 \cdot 3" - 4.5(15/16" + 1/16")) = 5\ IN^2$

$F_u = 58KSI$; $F_y = 36KSI$; CONS. USE $U_{BS} = 0.5$

∴ CONN OK

RISA RESULTS

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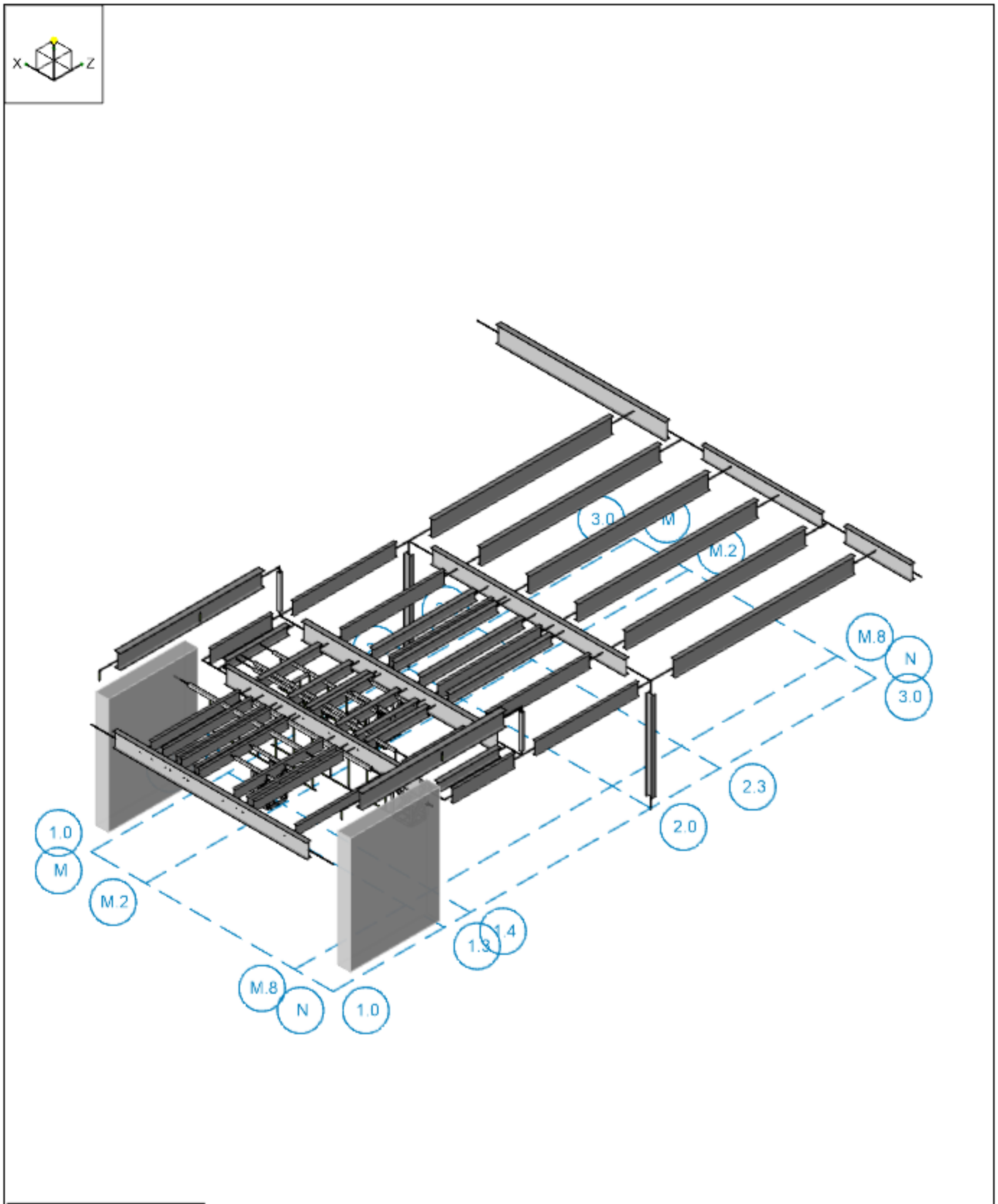
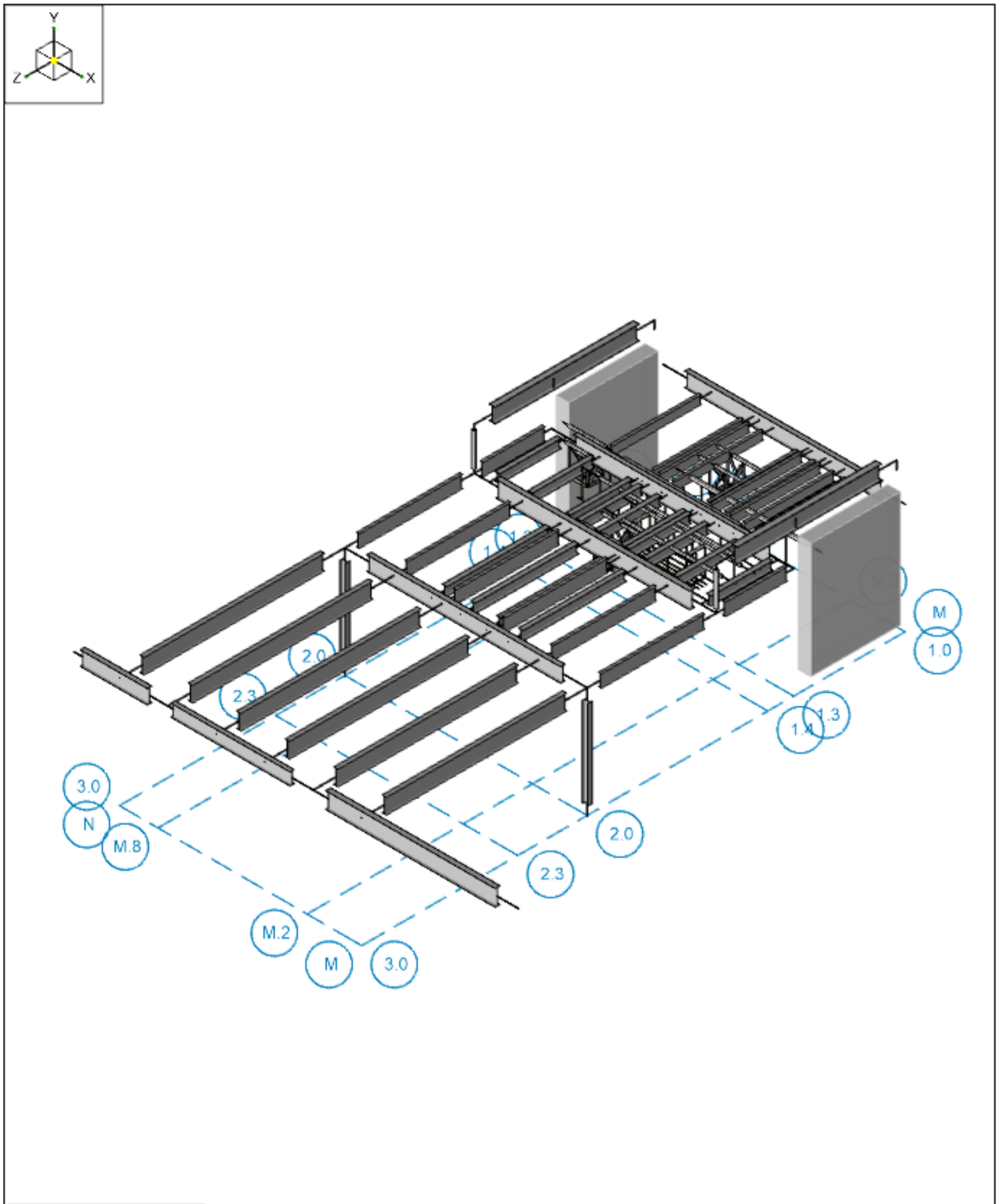


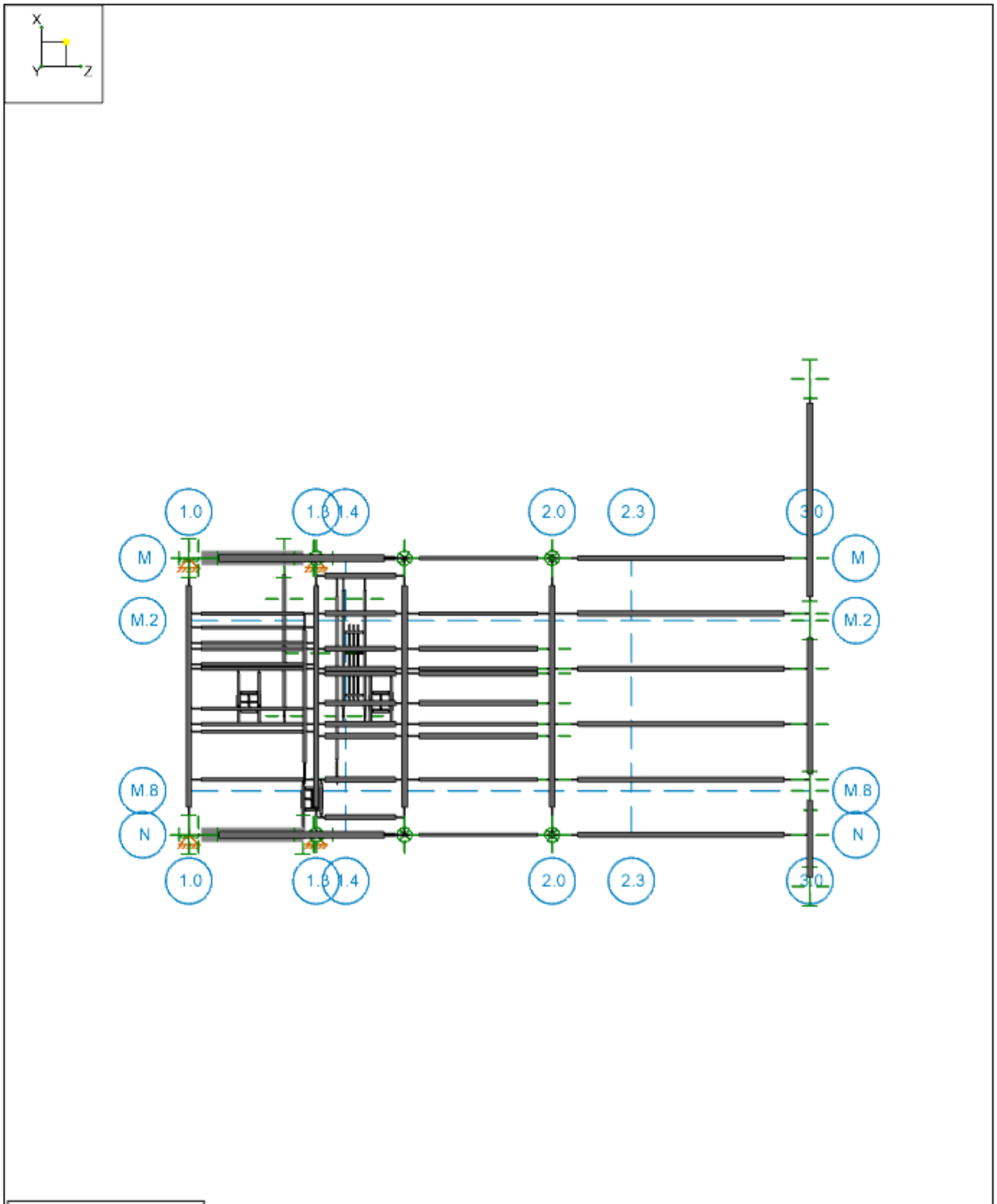
Envelope Only Solution

	PCS Structural Solutions	OR	SK-1
	ESO		23225 OR Model Roof Rev ...
	23225		



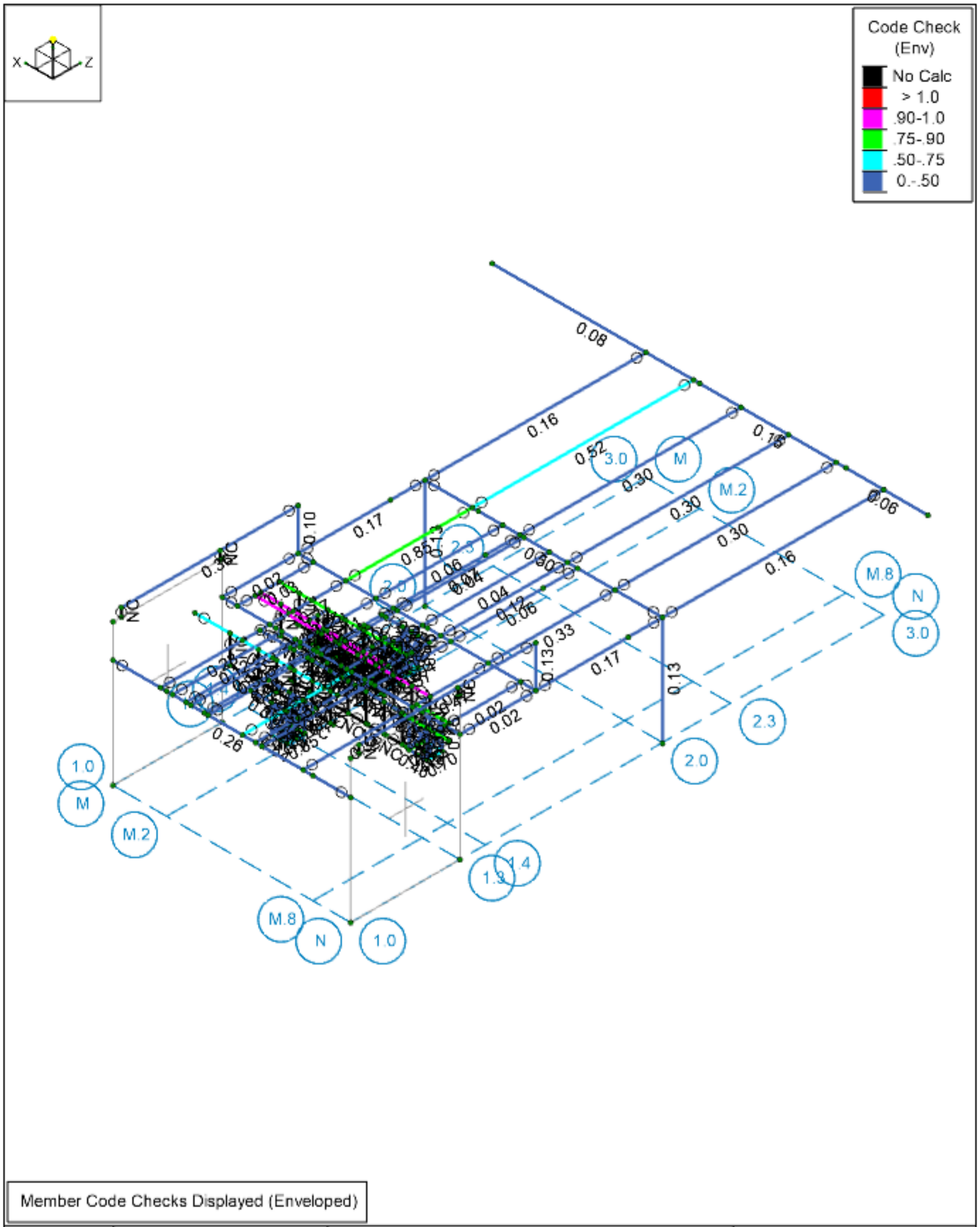
Envelope Only Solution

PCS Structural Solutions	PCS Structural Solutions	OR	SK-2
	ESO		23225 OR Model Roof Rev ...
	23225		



Envelope Only Solution

	PCS Structural Solutions	OR	SK-4
	ESO		23225 OR Model Roof Rev ...
	23225		



PCS Structural Solutions	PCS Structural Solutions	OR	SK-35
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	23225		

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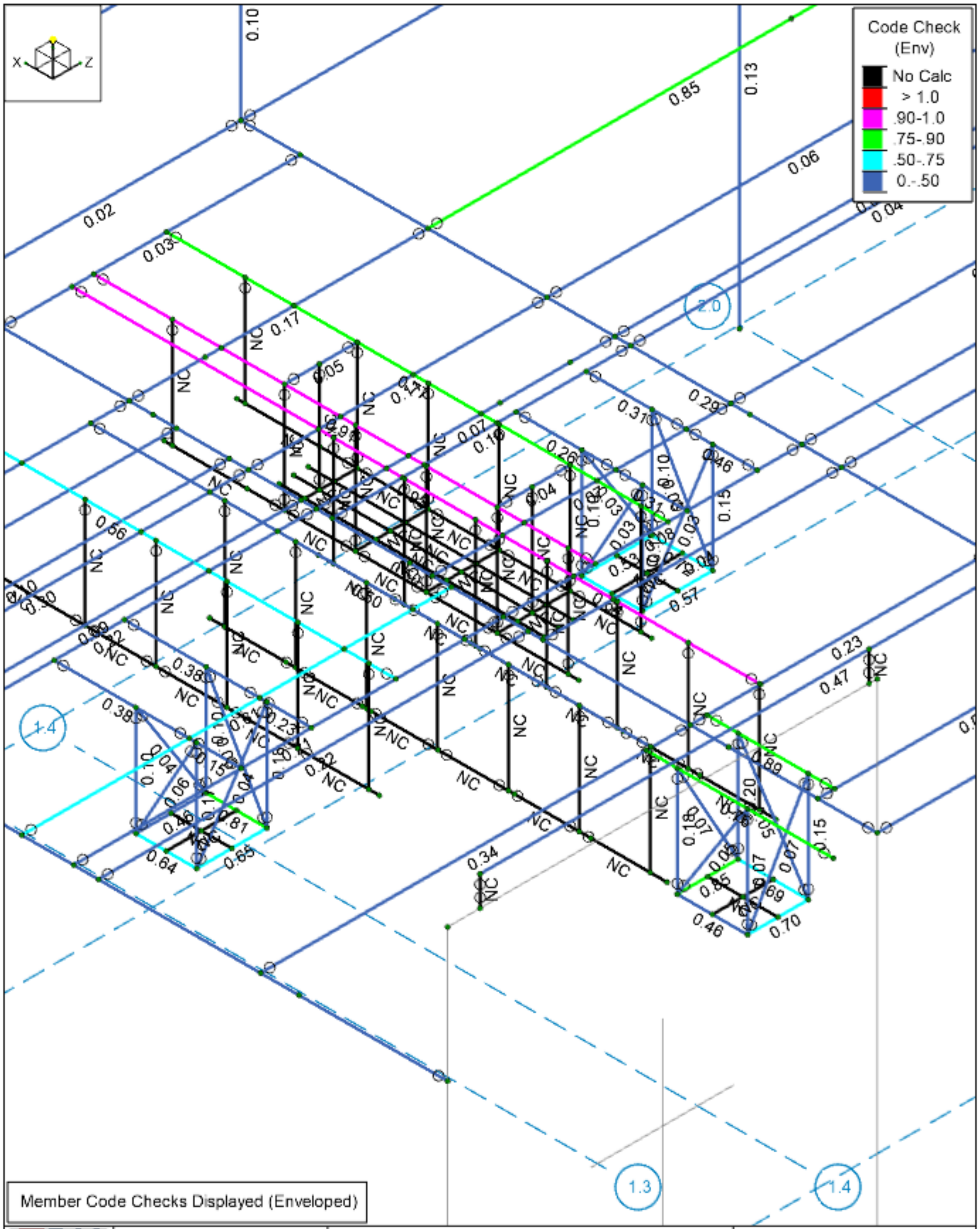

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	23225		

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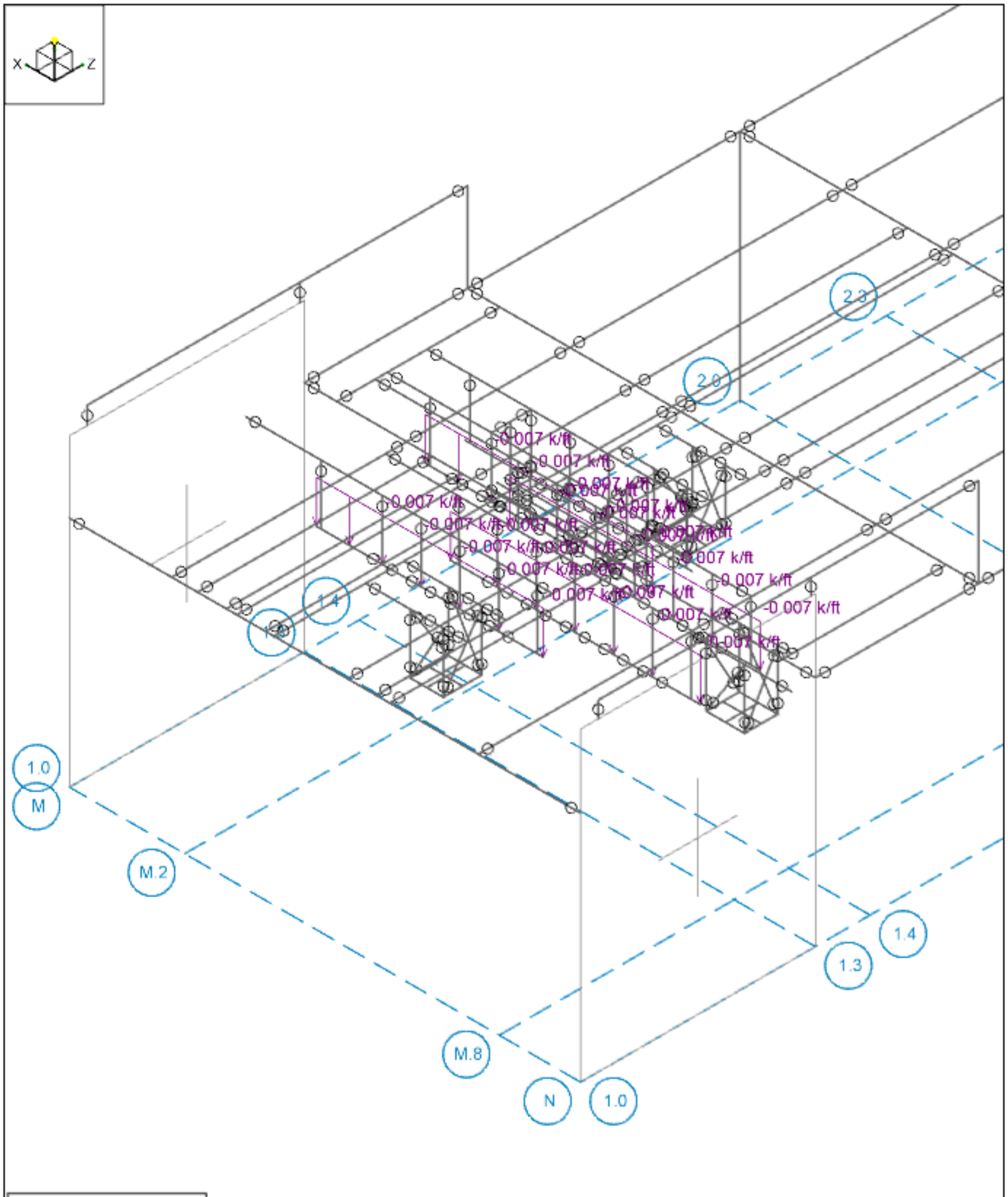
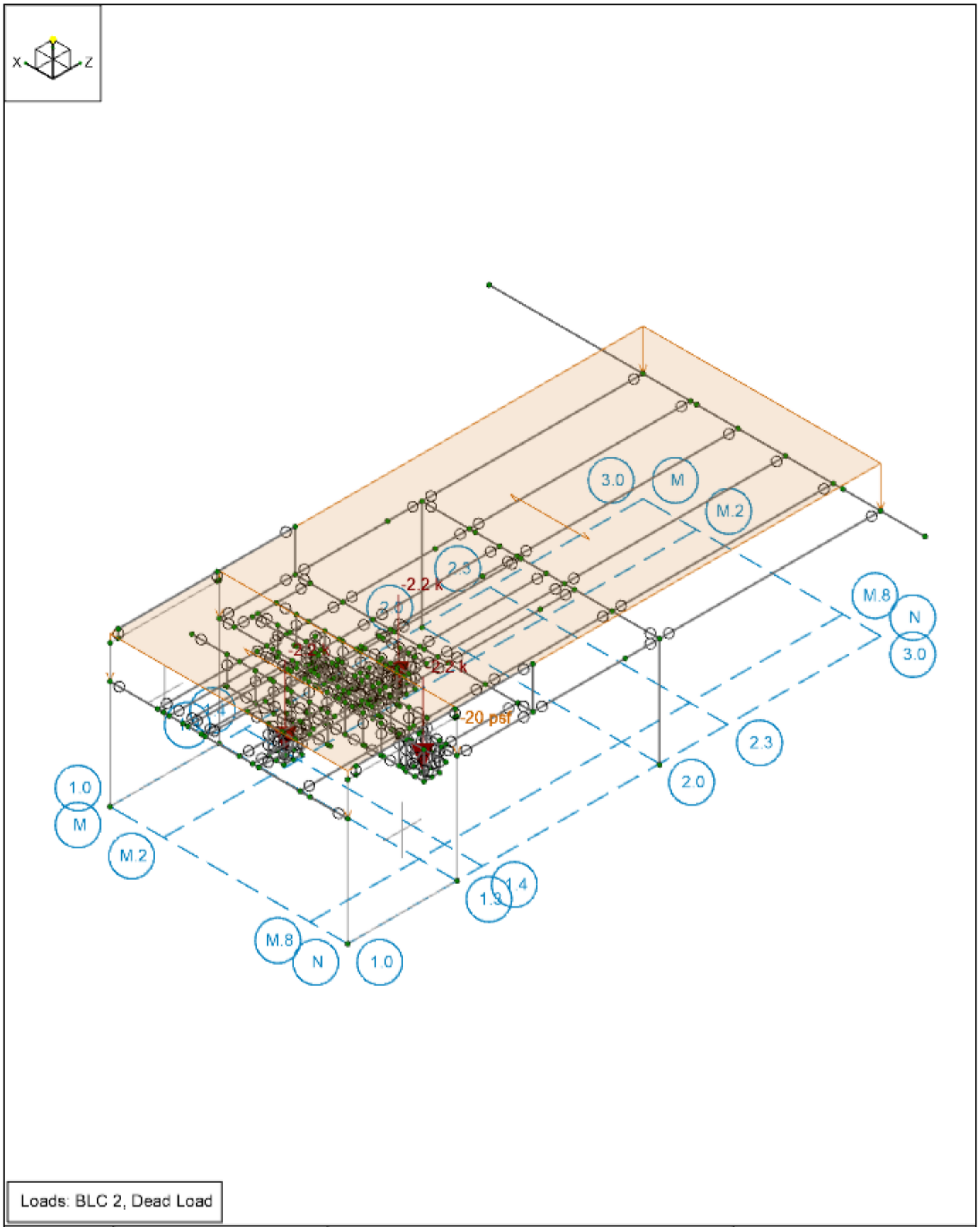


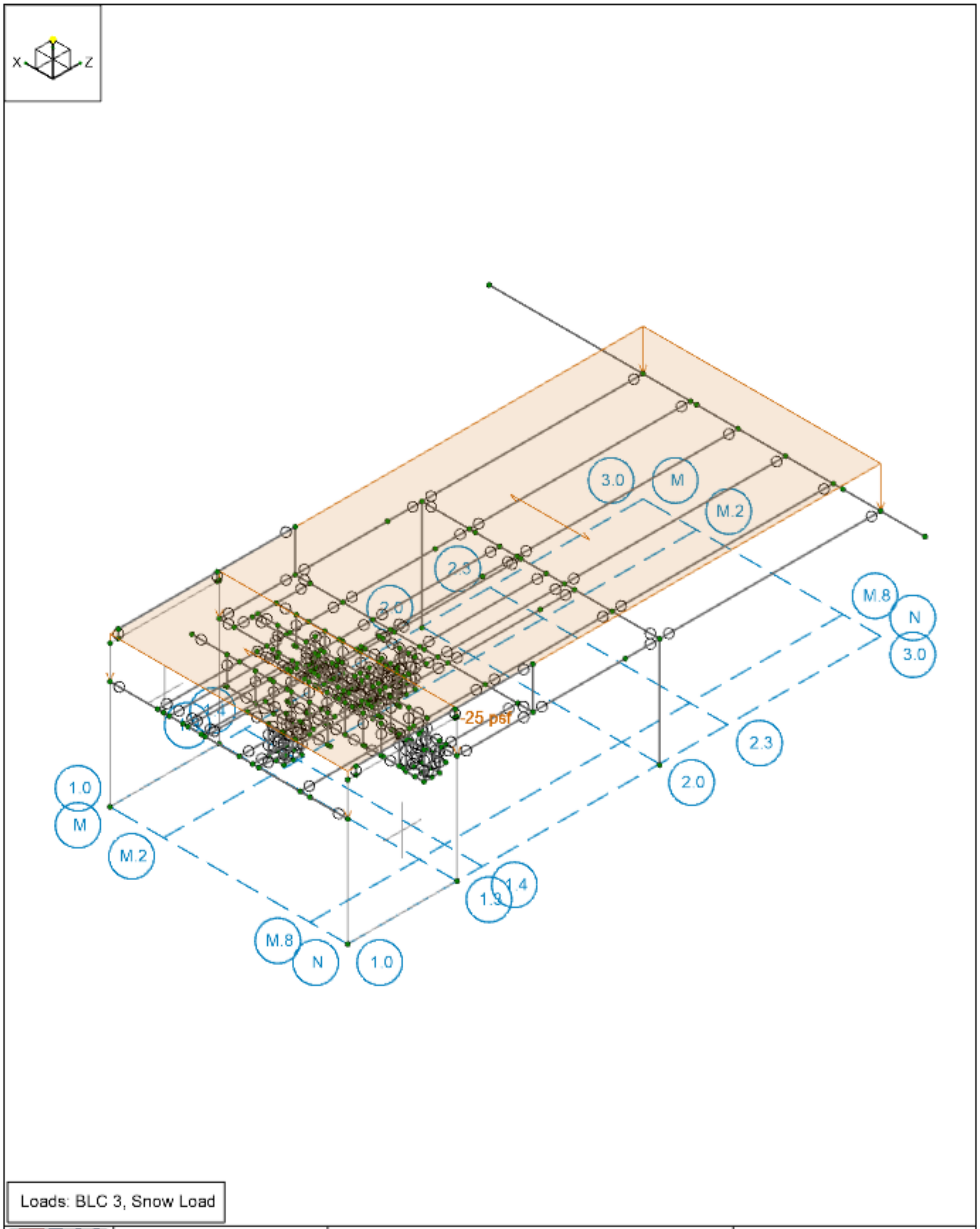
Loads: BLC 1, Self Wt
Envelope Only Solution

PCS Structural Solutions	OR	SK-5
ESO		23225 OR Model Roof Rev ...
23225		



Loads: BLC 2, Dead Load

	PCS Structural Solutions	OR	SK-6
	ESO		23225 OR Model Roof Rev ...
	23225		



PCS Structural Solutions	PCS Structural Solutions	OR	SK-7
	ESO		23225 OR Model Roof Rev ...
	23225		

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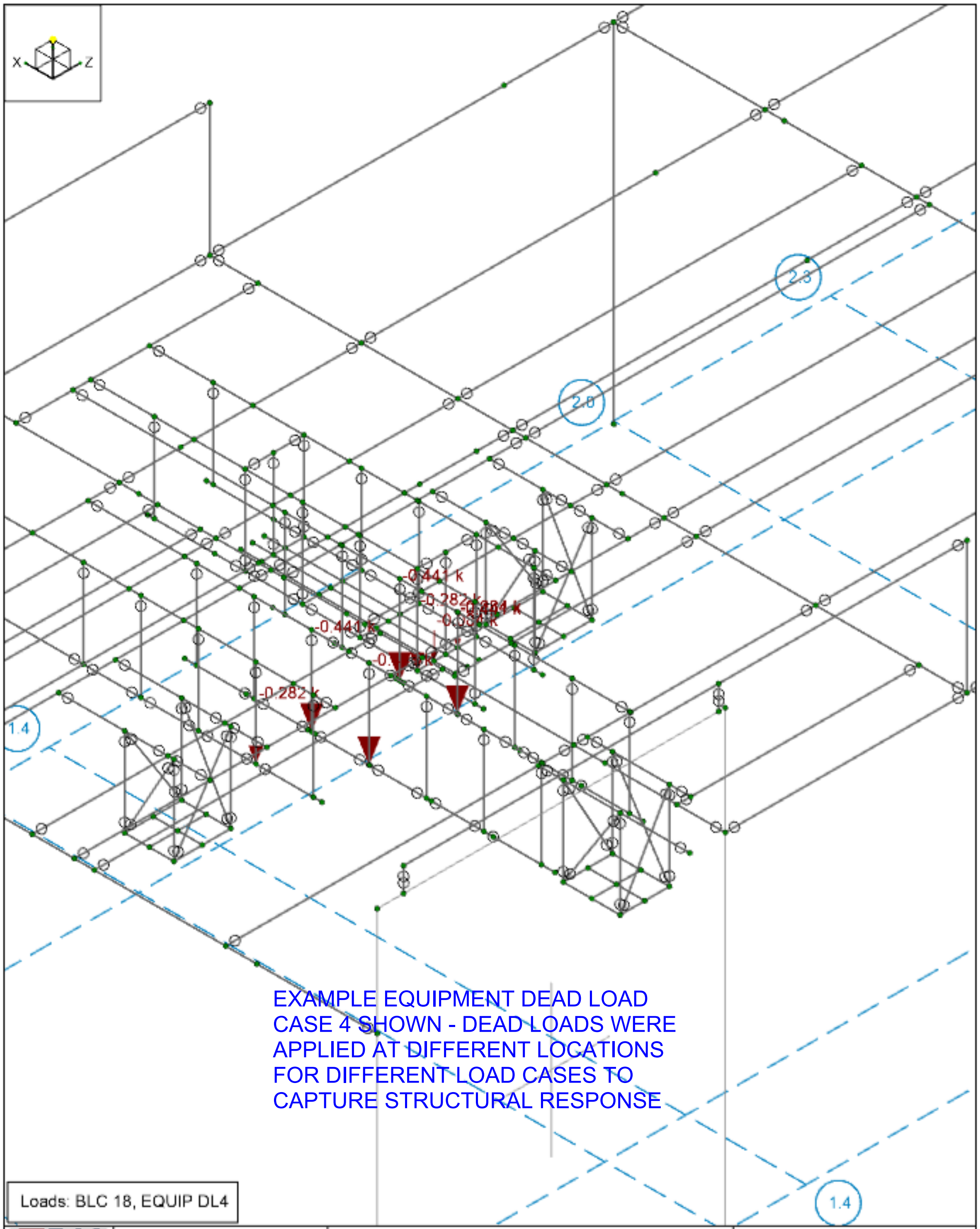
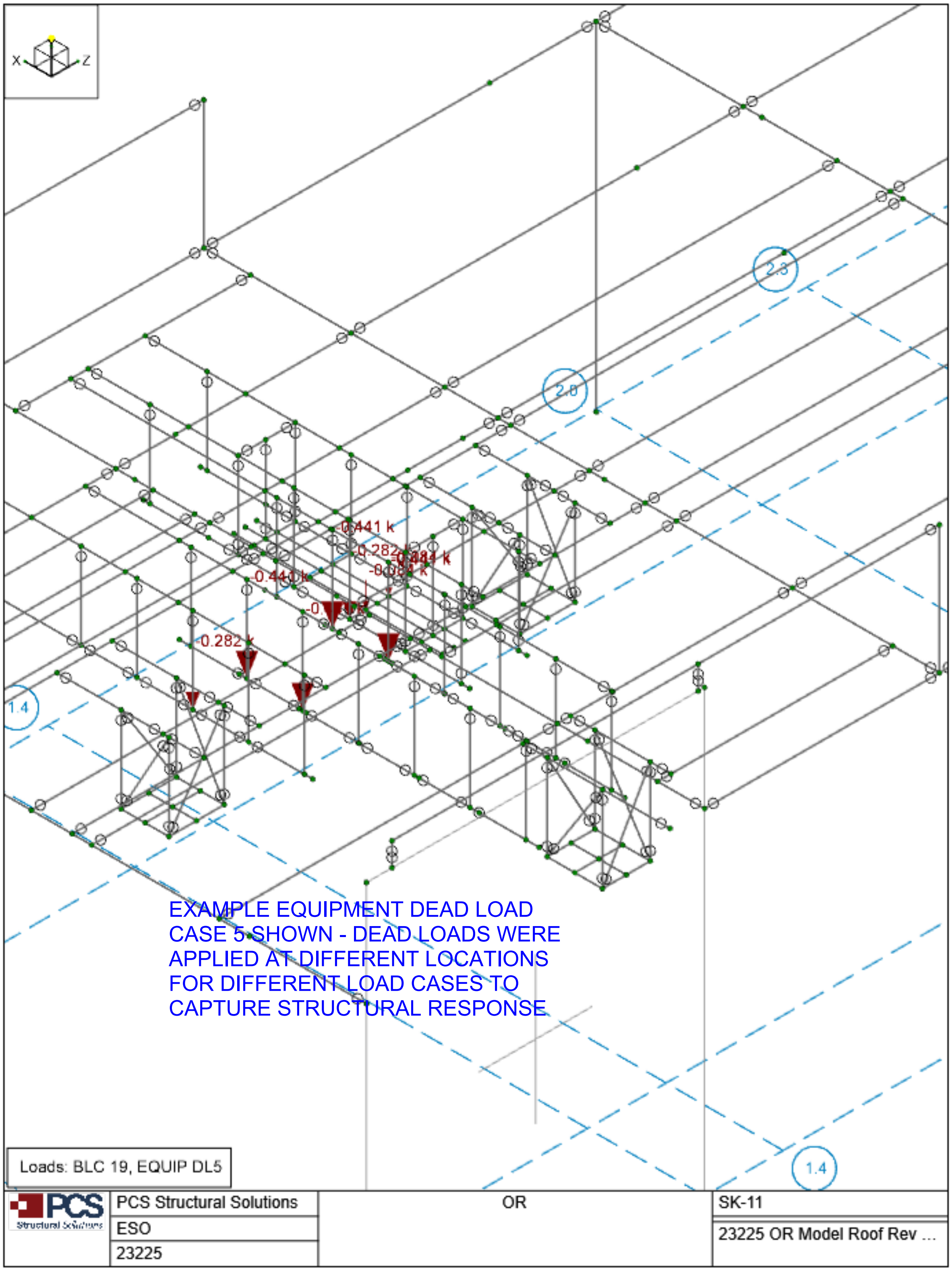


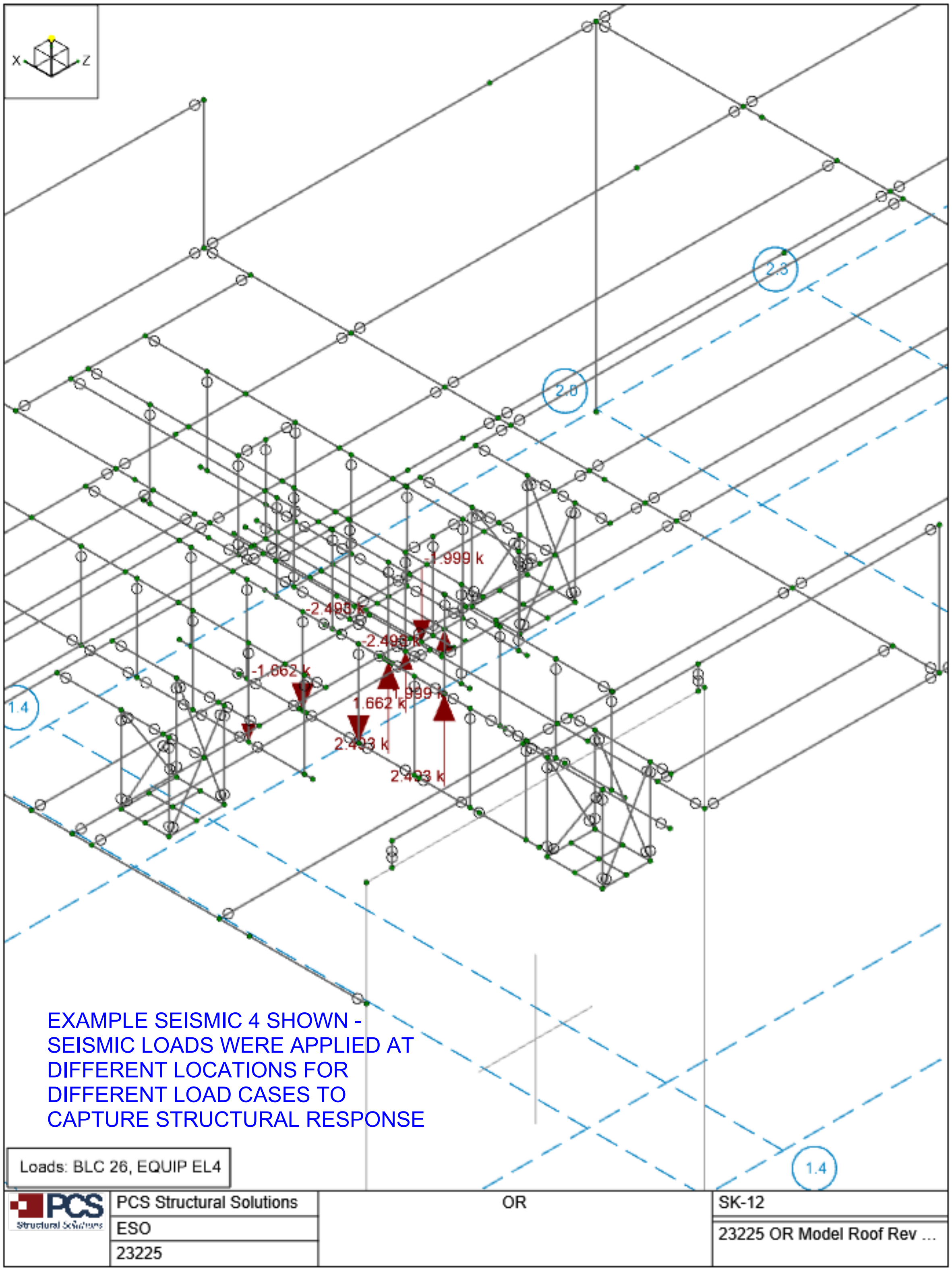
EXAMPLE EQUIPMENT DEAD LOAD
CASE 4 SHOWN - DEAD LOADS WERE
APPLIED AT DIFFERENT LOCATIONS
FOR DIFFERENT LOAD CASES TO
CAPTURE STRUCTURAL RESPONSE

PCS Structural Solutions	PCS Structural Solutions	OR	SK-10
	ESO		23225 OR Model Roof Rev ...
	23225		

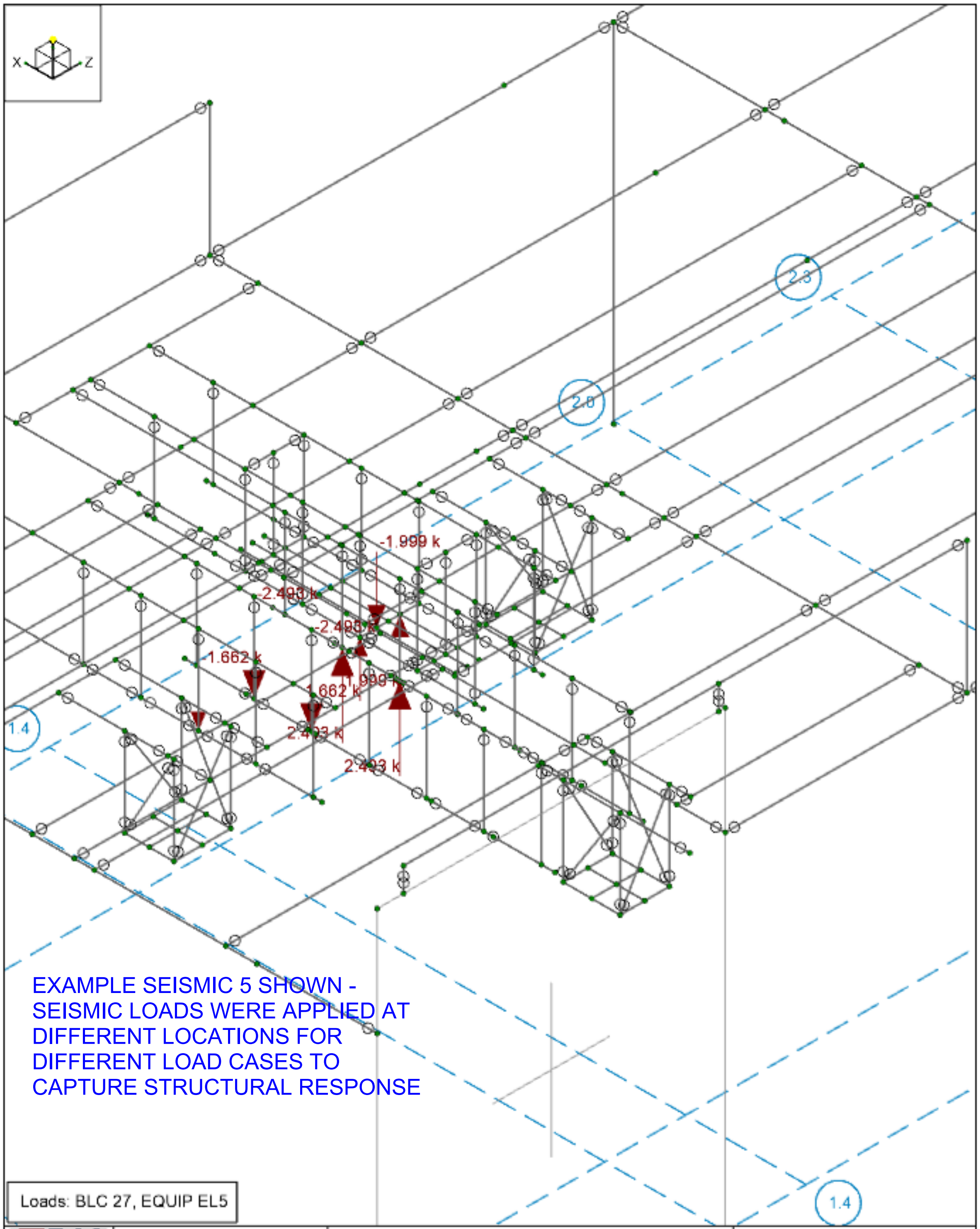


EXAMPLE EQUIPMENT DEAD LOAD CASE 5 SHOWN - DEAD LOADS WERE APPLIED AT DIFFERENT LOCATIONS FOR DIFFERENT LOAD CASES TO CAPTURE STRUCTURAL RESPONSE

PRCTI20221788 - REVISON #6 4/5/2024



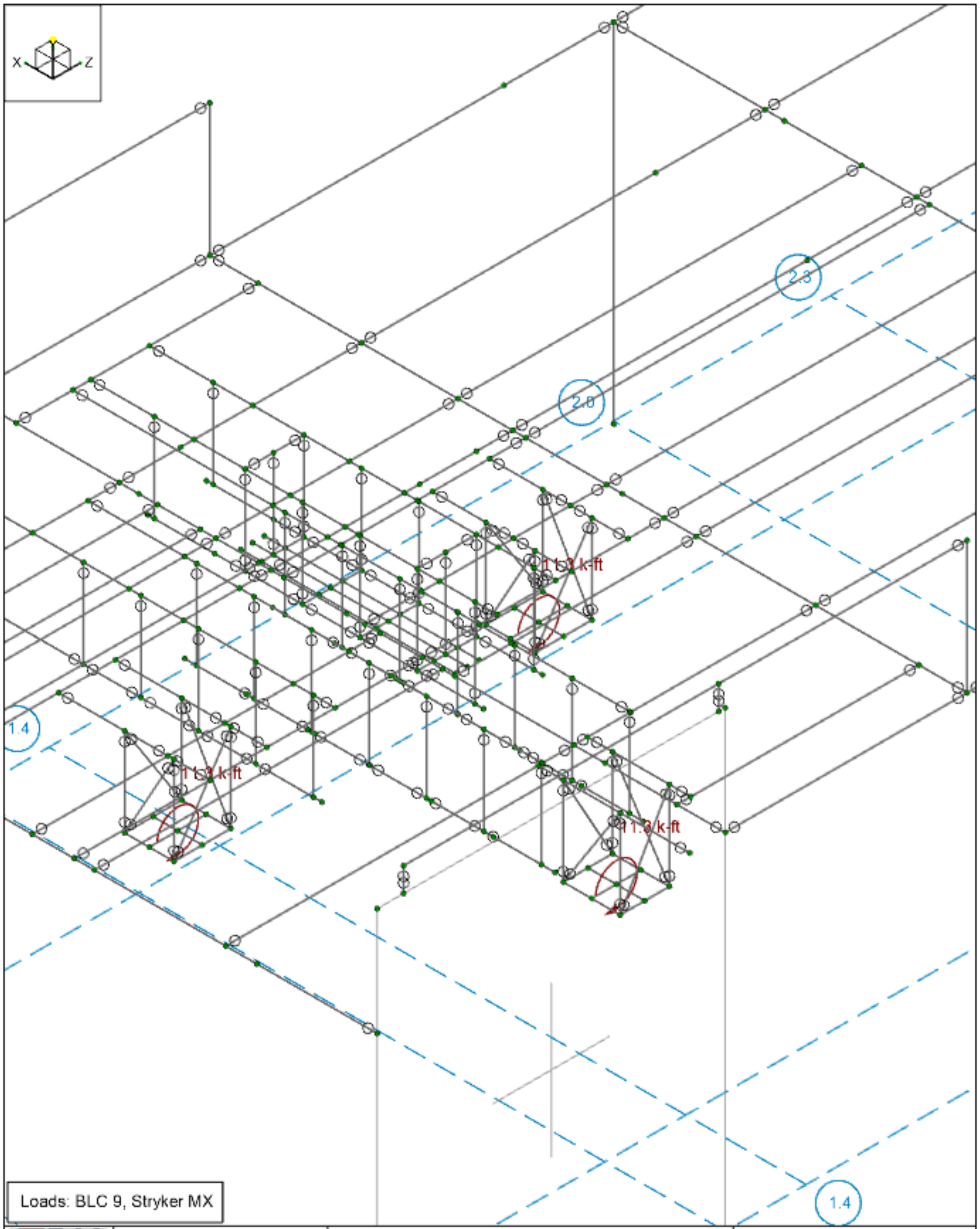
EXAMPLE SEISMIC 4 SHOWN -
SEISMIC LOADS WERE APPLIED AT
DIFFERENT LOCATIONS FOR
DIFFERENT LOAD CASES TO
CAPTURE STRUCTURAL RESPONSE



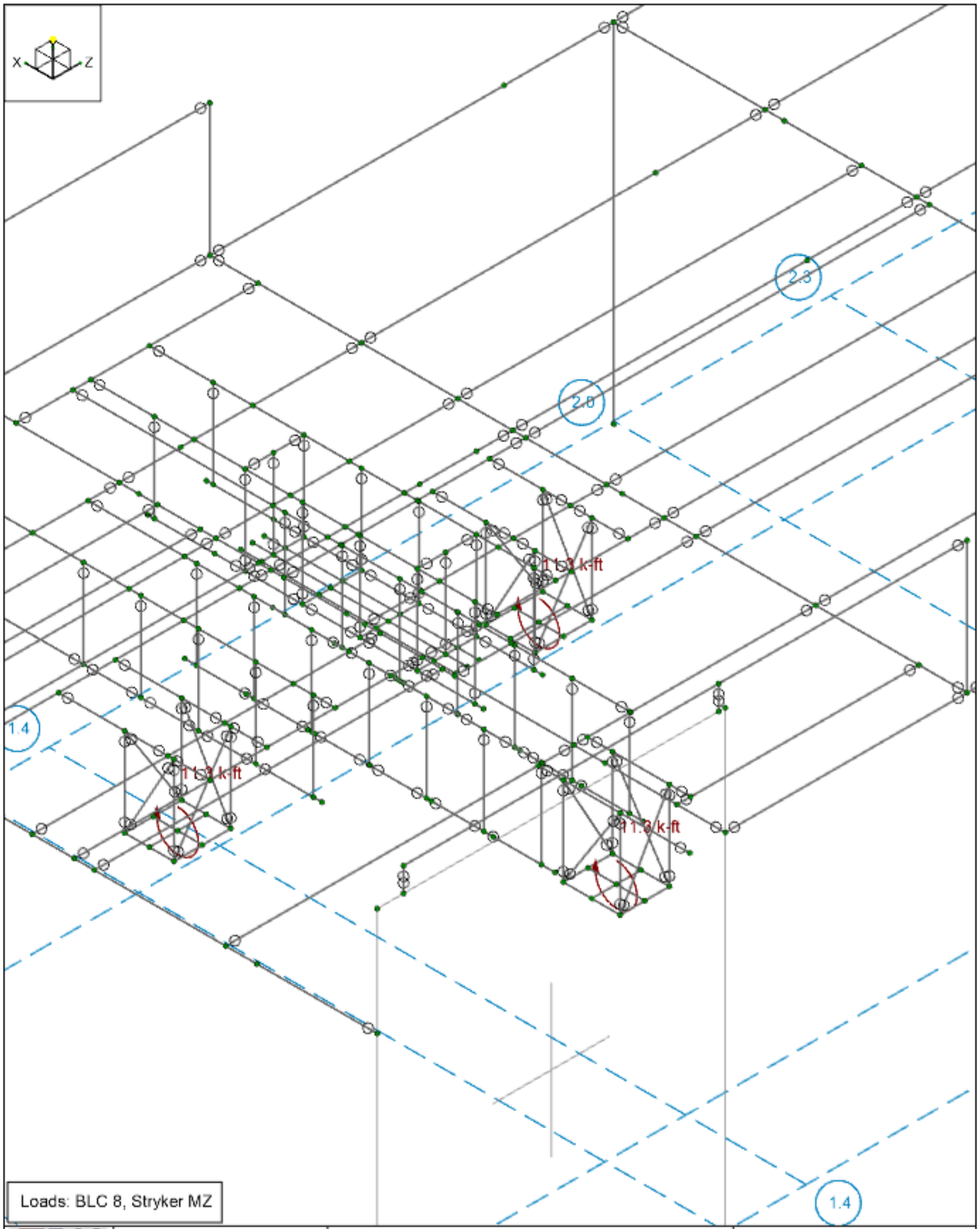
EXAMPLE SEISMIC 5 SHOWN - SEISMIC LOADS WERE APPLIED AT DIFFERENT LOCATIONS FOR DIFFERENT LOAD CASES TO CAPTURE STRUCTURAL RESPONSE

Loads: BLC 27, EQUIP EL5

PCS Structural Solutions	OR	SK-13
ESO		23225 OR Model Roof Rev ...
23225		

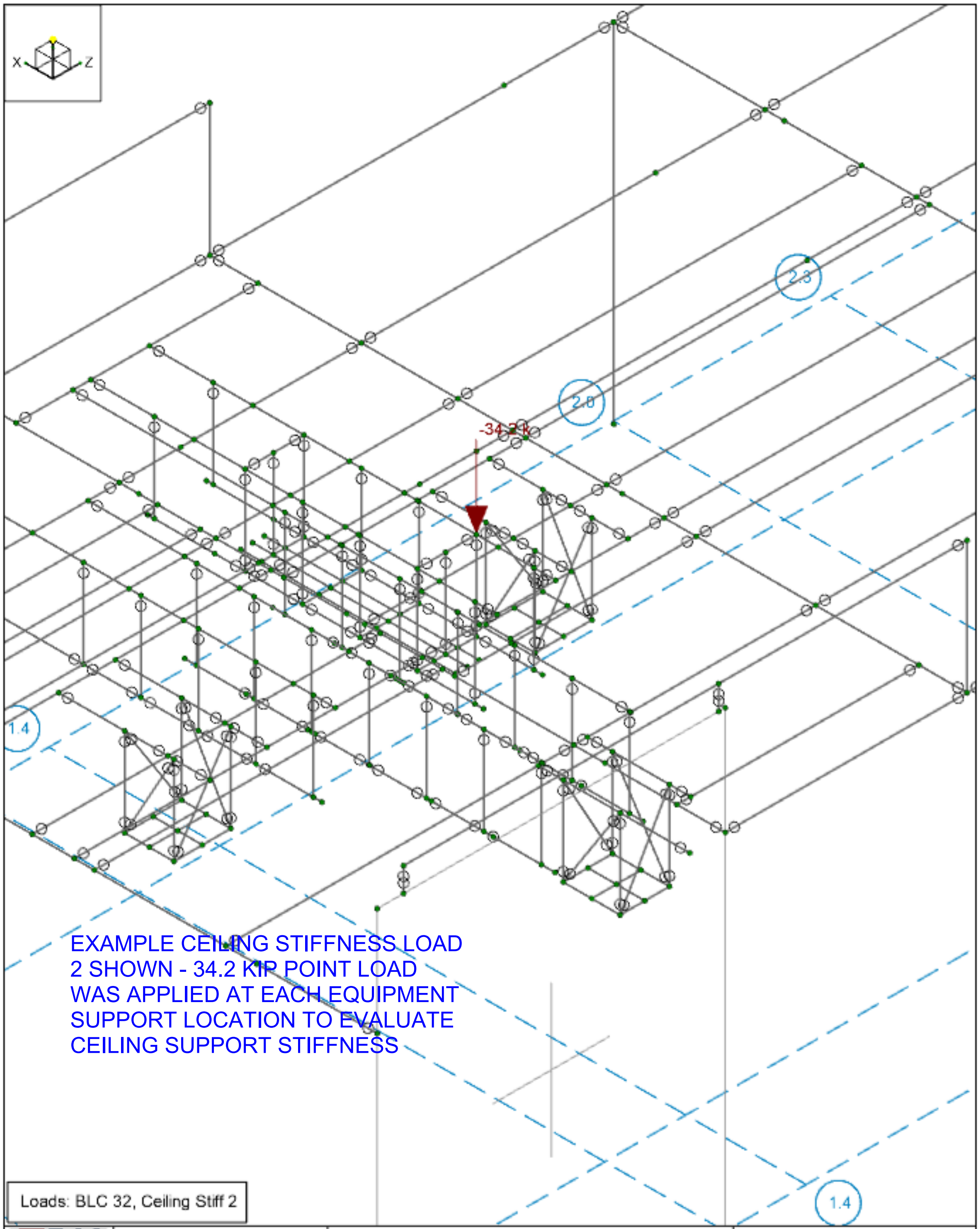


PCS Structural Solutions	OR	SK-9
ESO		23225 OR Model Roof Rev ...
23225		



Loads: BLC 8, Stryker MZ

PCS Structural Solutions	OR	SK-8
ESO		23225 OR Model Roof Rev ...
23225		



EXAMPLE CEILING STIFFNESS LOAD 2 SHOWN - 34.2 KIP POINT LOAD WAS APPLIED AT EACH EQUIPMENT SUPPORT LOCATION TO EVALUATE CEILING SUPPORT STIFFNESS

Loads: BLC 32, Ceiling Stiff 2

PCS Structural Solutions	ESO	OR	SK-14
23225			23225 OR Model Roof Rev ...

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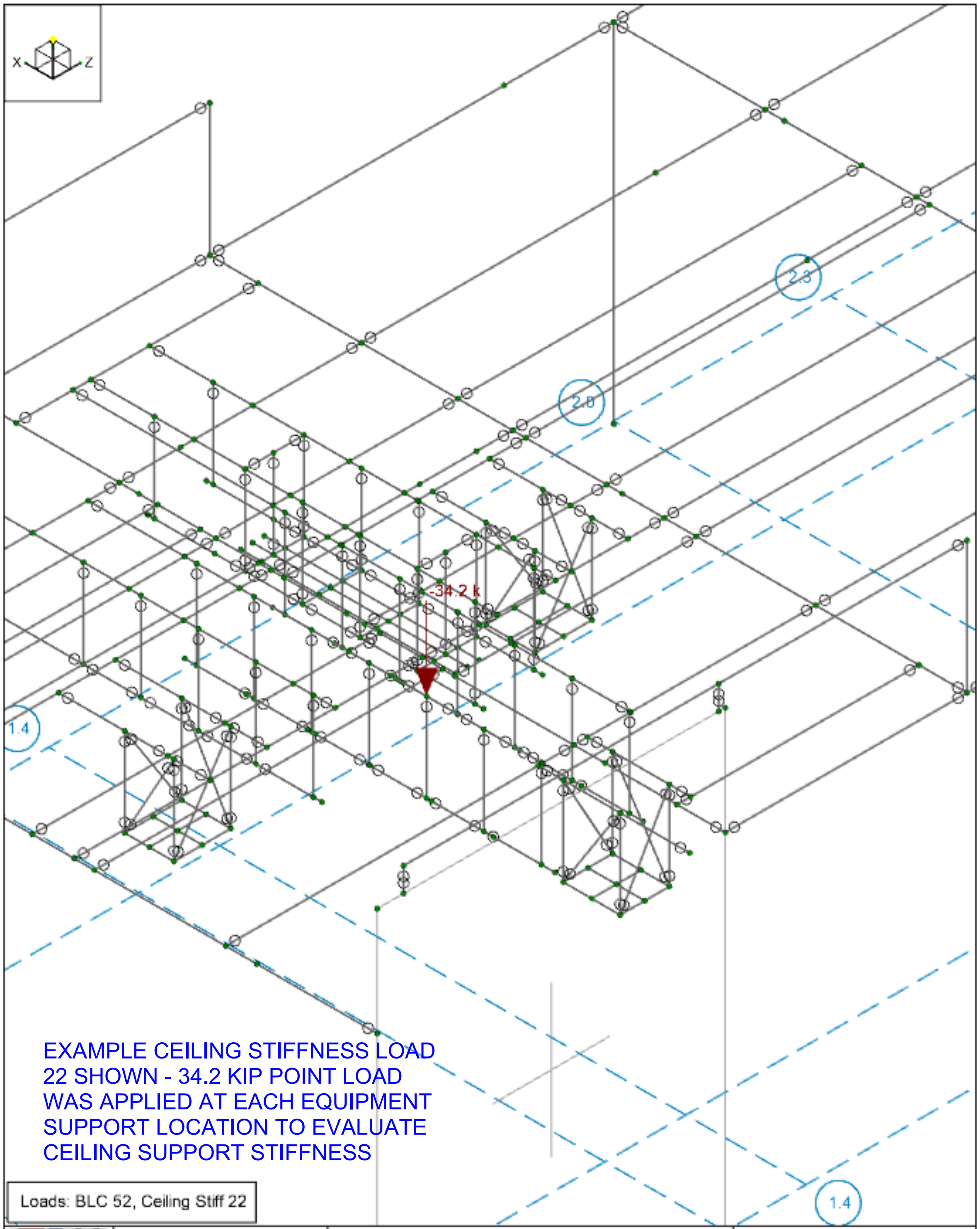
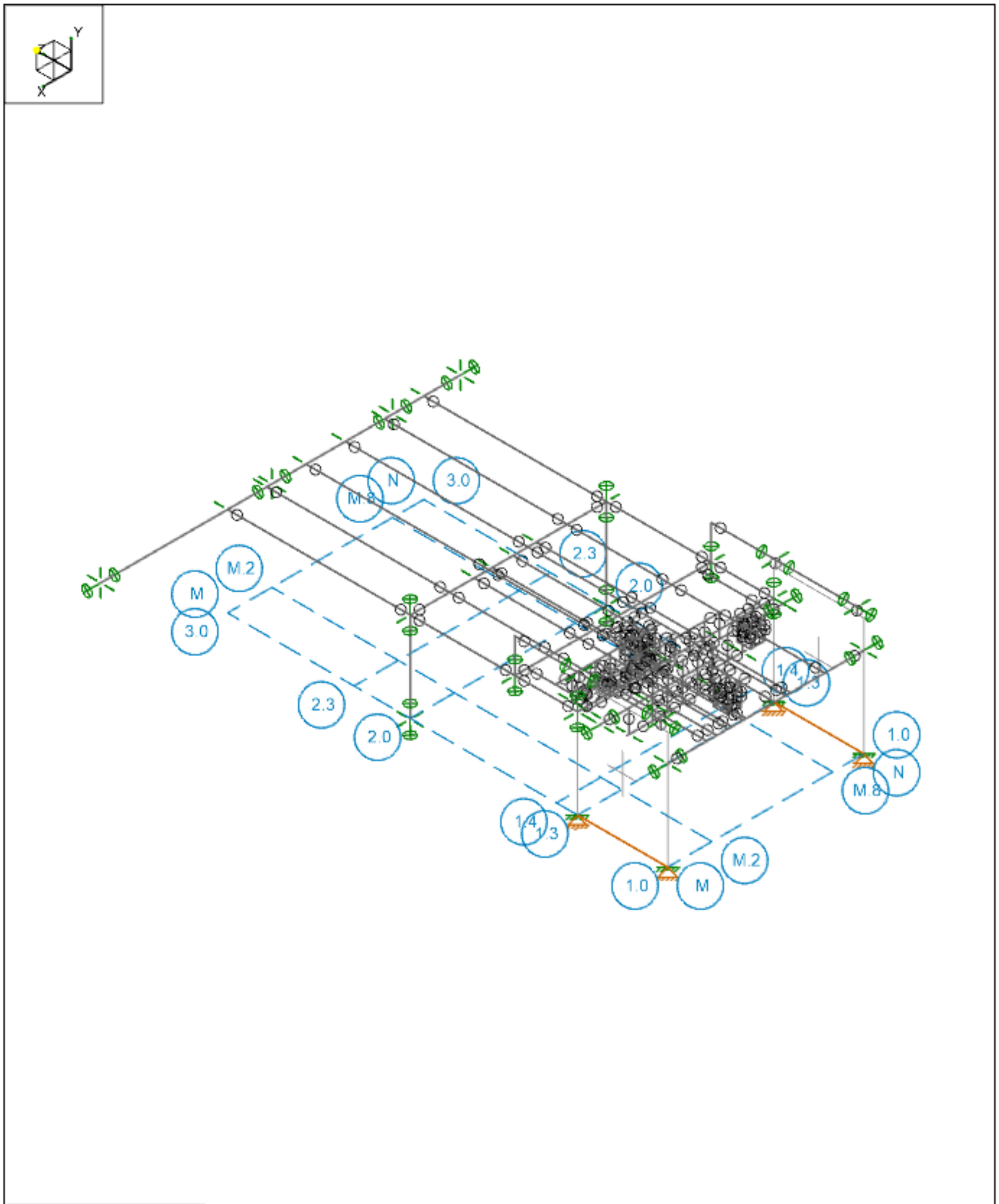


EXAMPLE CEILING STIFFNESS LOAD 22 SHOWN - 34.2 KIP POINT LOAD WAS APPLIED AT EACH EQUIPMENT SUPPORT LOCATION TO EVALUATE CEILING SUPPORT STIFFNESS

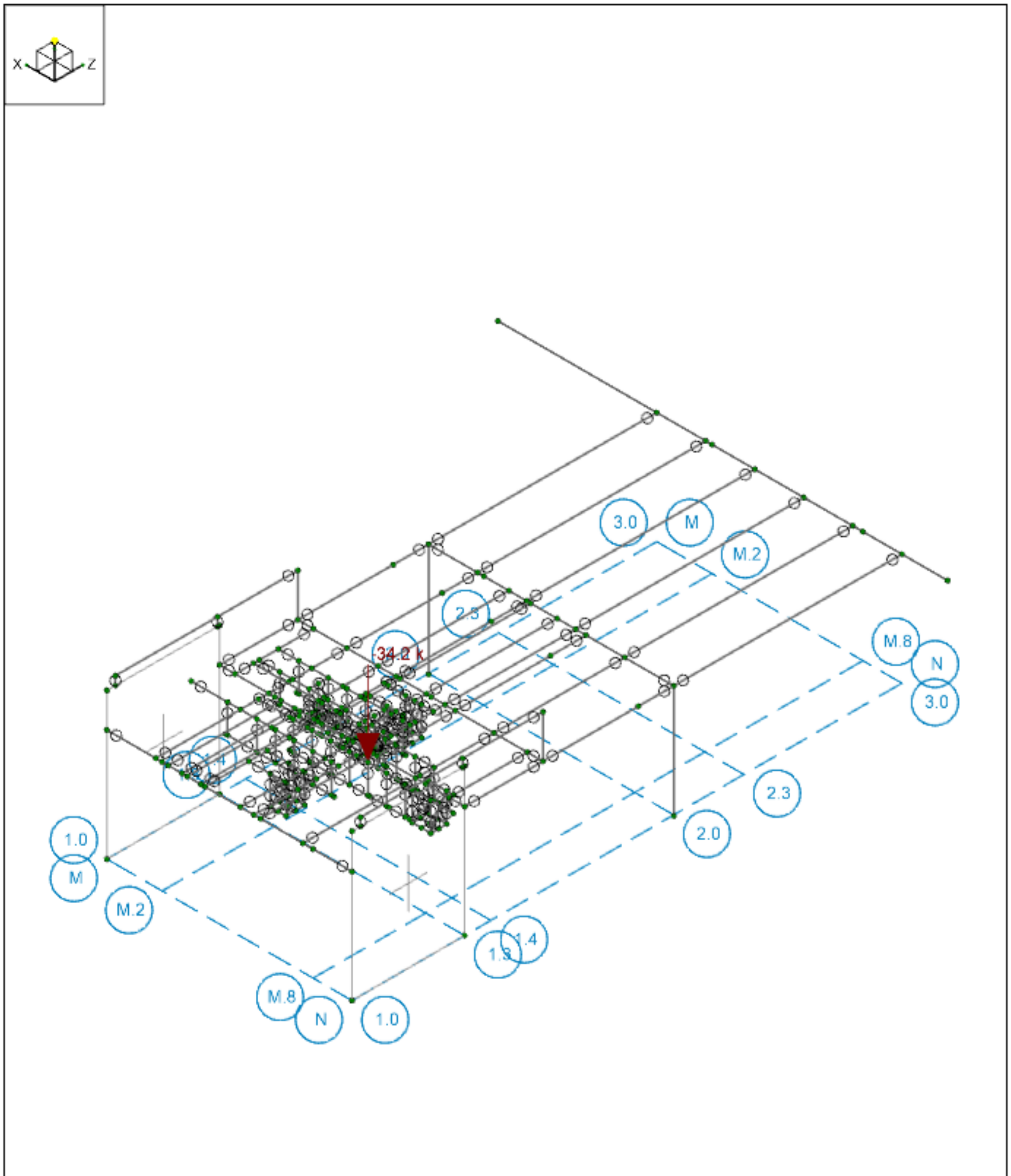
Loads: BLC 52, Ceiling Stiff 22

PCS Structural Solutions	OR	SK-15
ESO		23225 OR Model Roof Rev ...
23225		



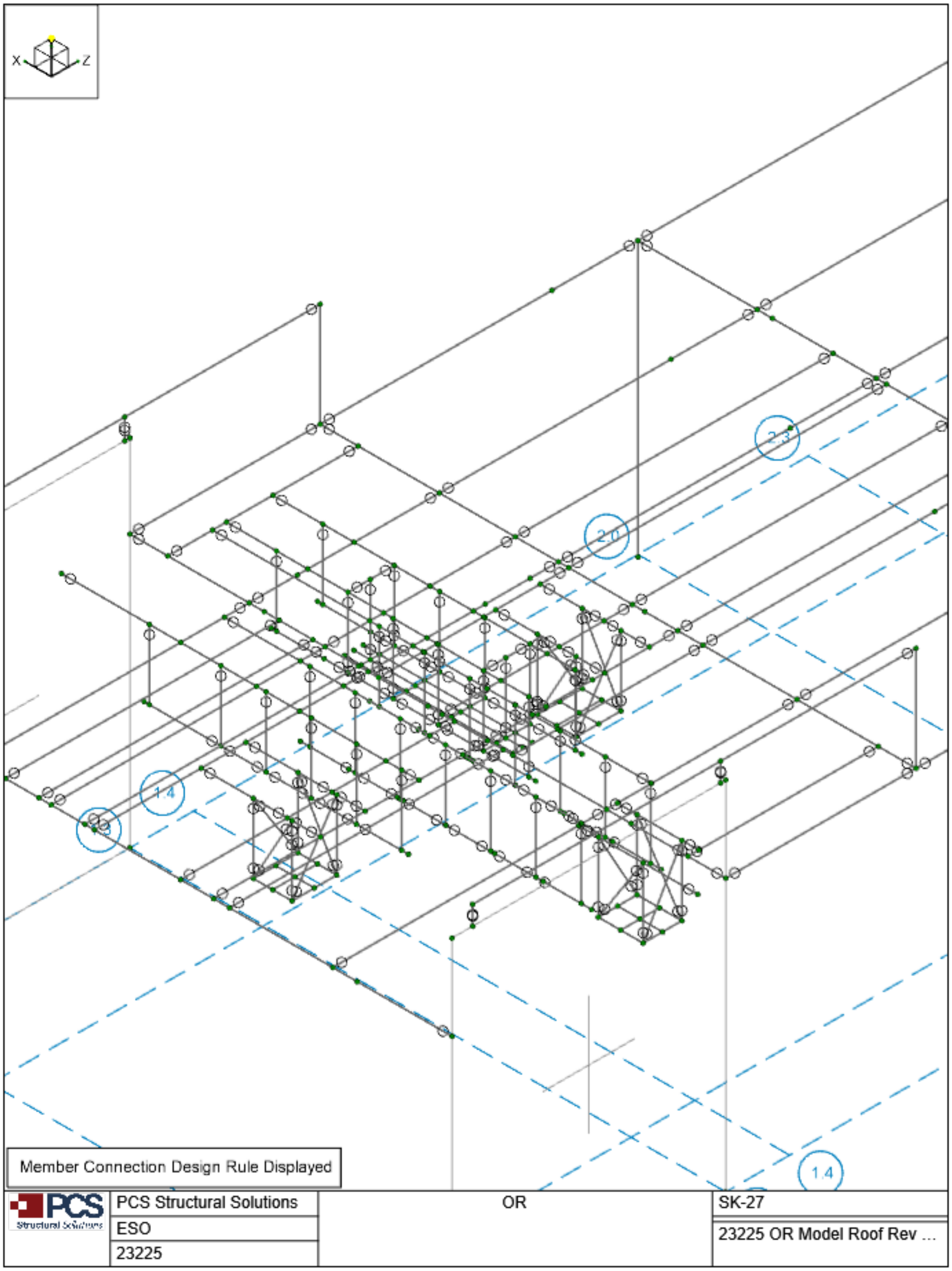
Envelope Only Solution

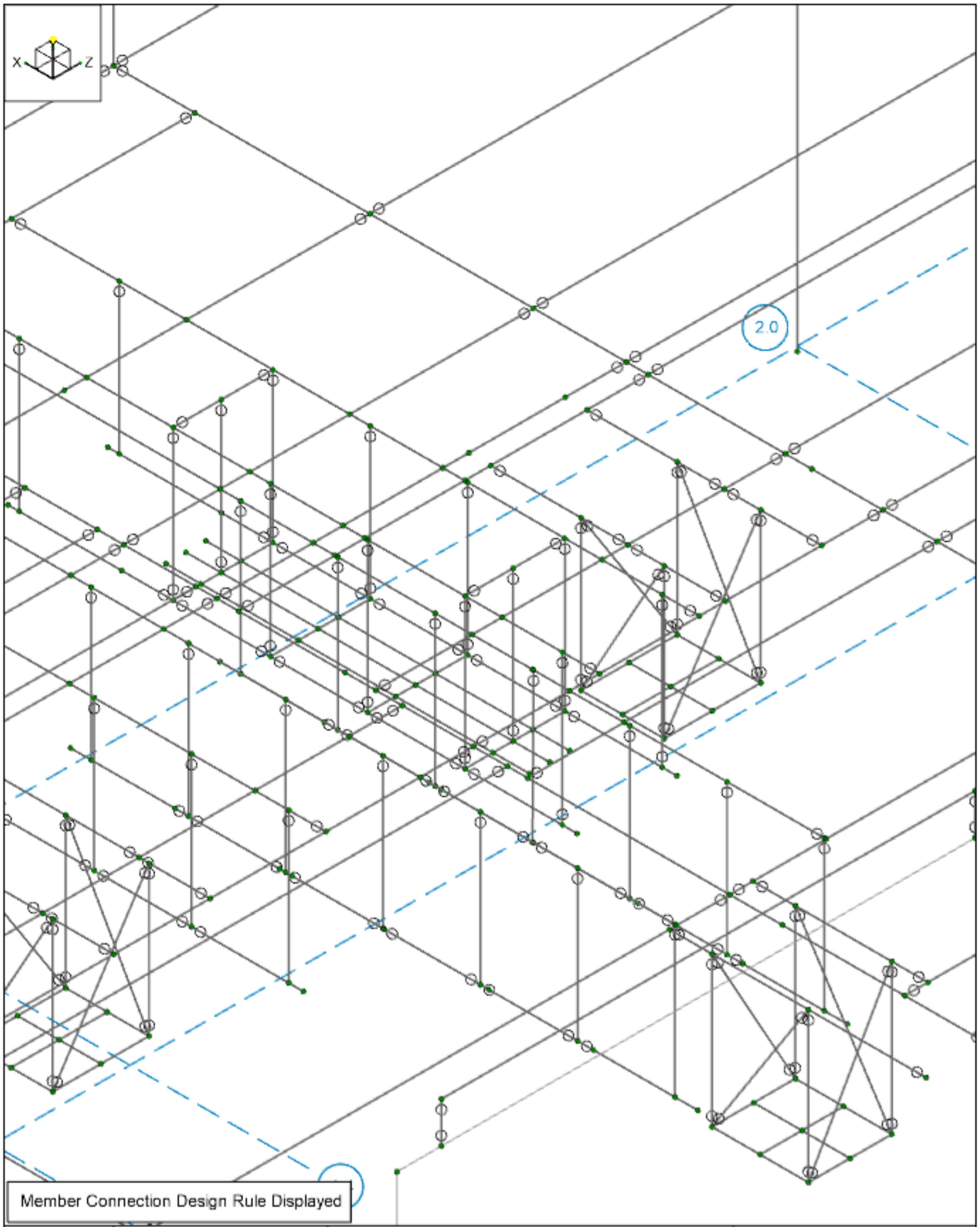
	PCS Structural Solutions	OR	SK-3
	ESO		23225 OR Model Roof Rev ...
	23225		



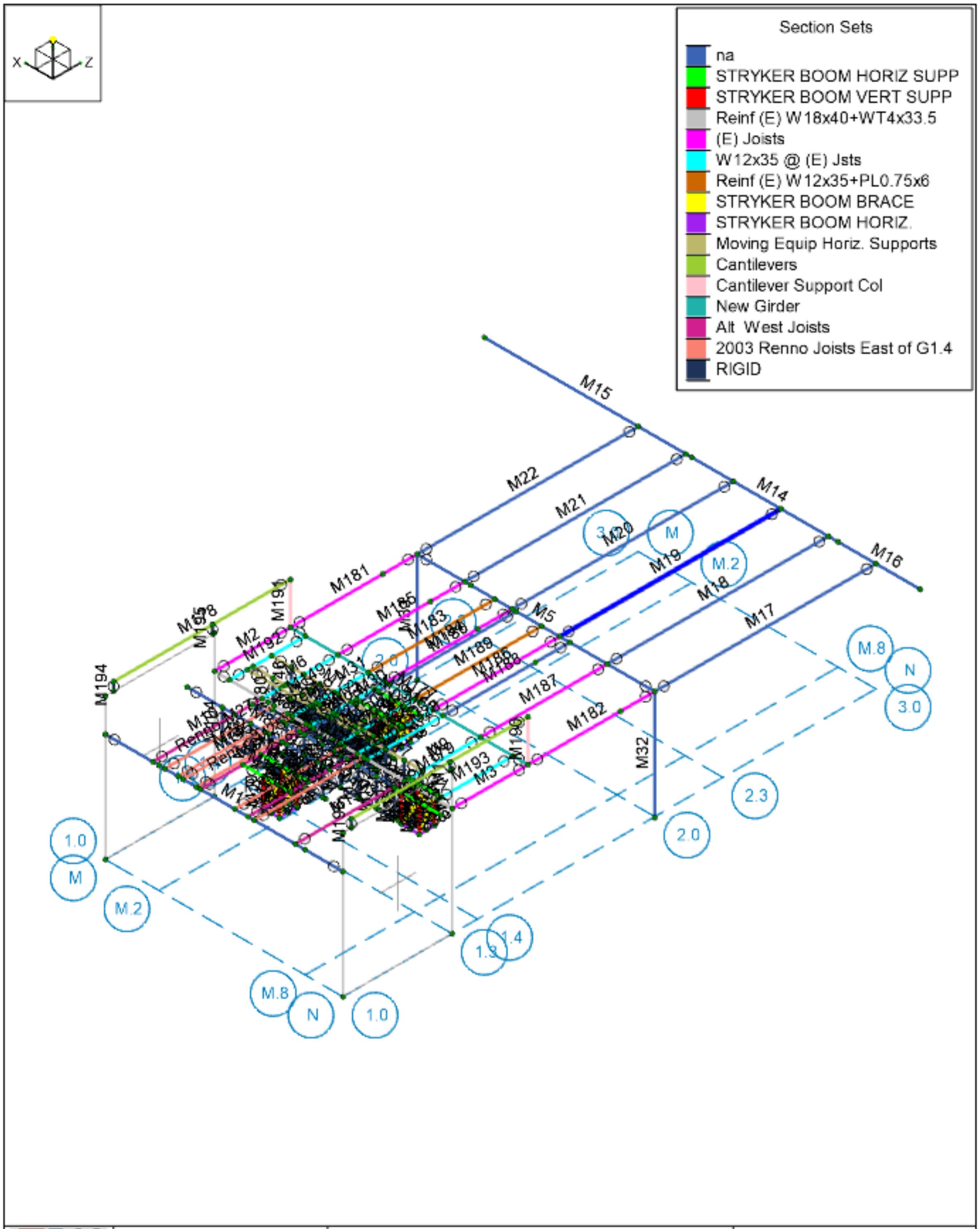
Member Connection Design Rule Displayed
Loads: BLC 52, Ceiling Stiff 22

	PCS Structural Solutions	OR	SK-26
	ESO		23225 OR Model Roof Rev ...
	23225		


X
Z
2.3
2.0
1.4
1.3
1.4
Member Connection Design Rule Displayed
PCS Structural Solutions
ESO
23225
OR
SK-27
23225 OR Model Roof Rev ...



PCS Structural Solutions	PCS Structural Solutions	OR	SK-28
	ESO		23225 OR Model Roof Rev ...
	23225		

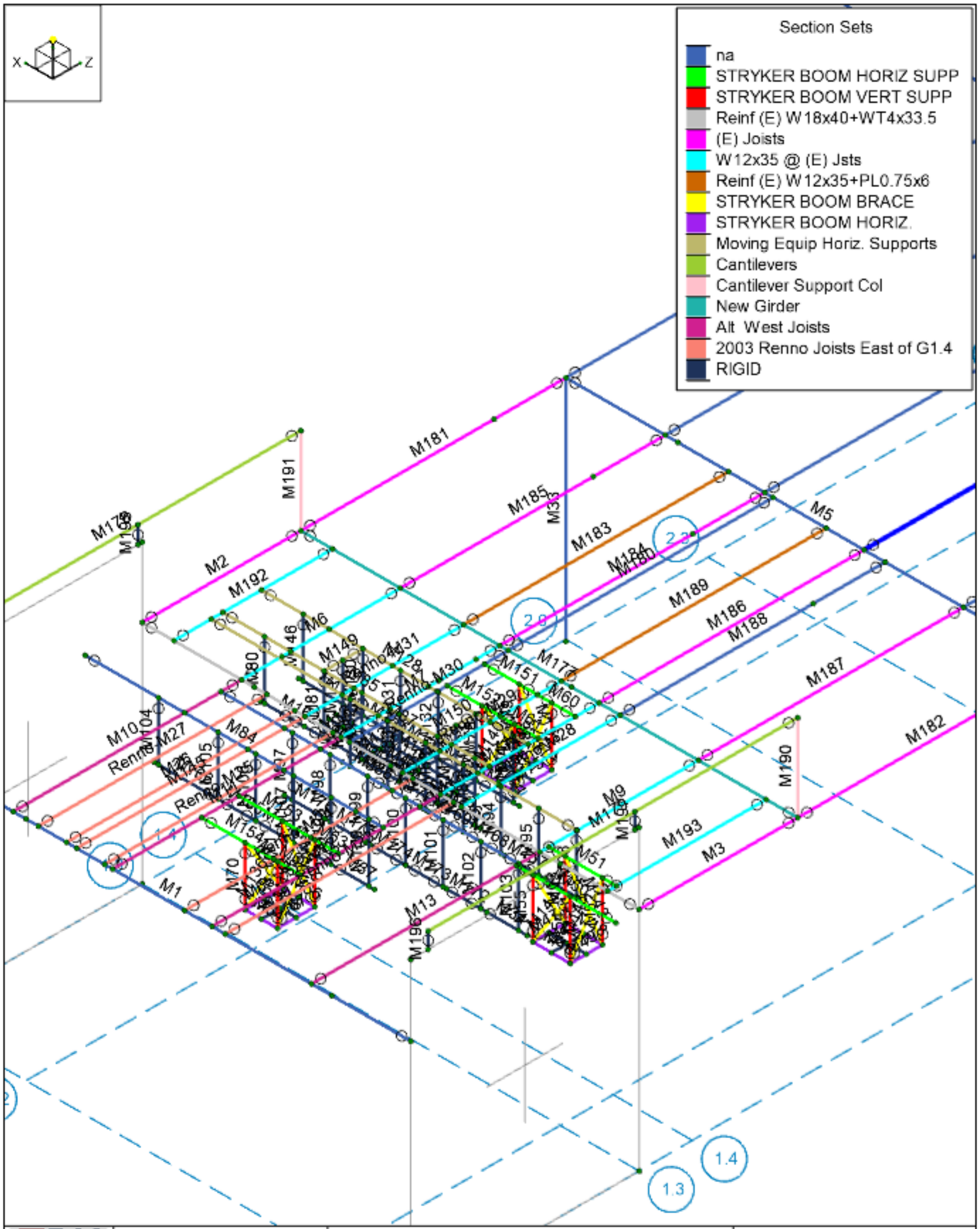


PCS Structural Solutions
ESO
23225

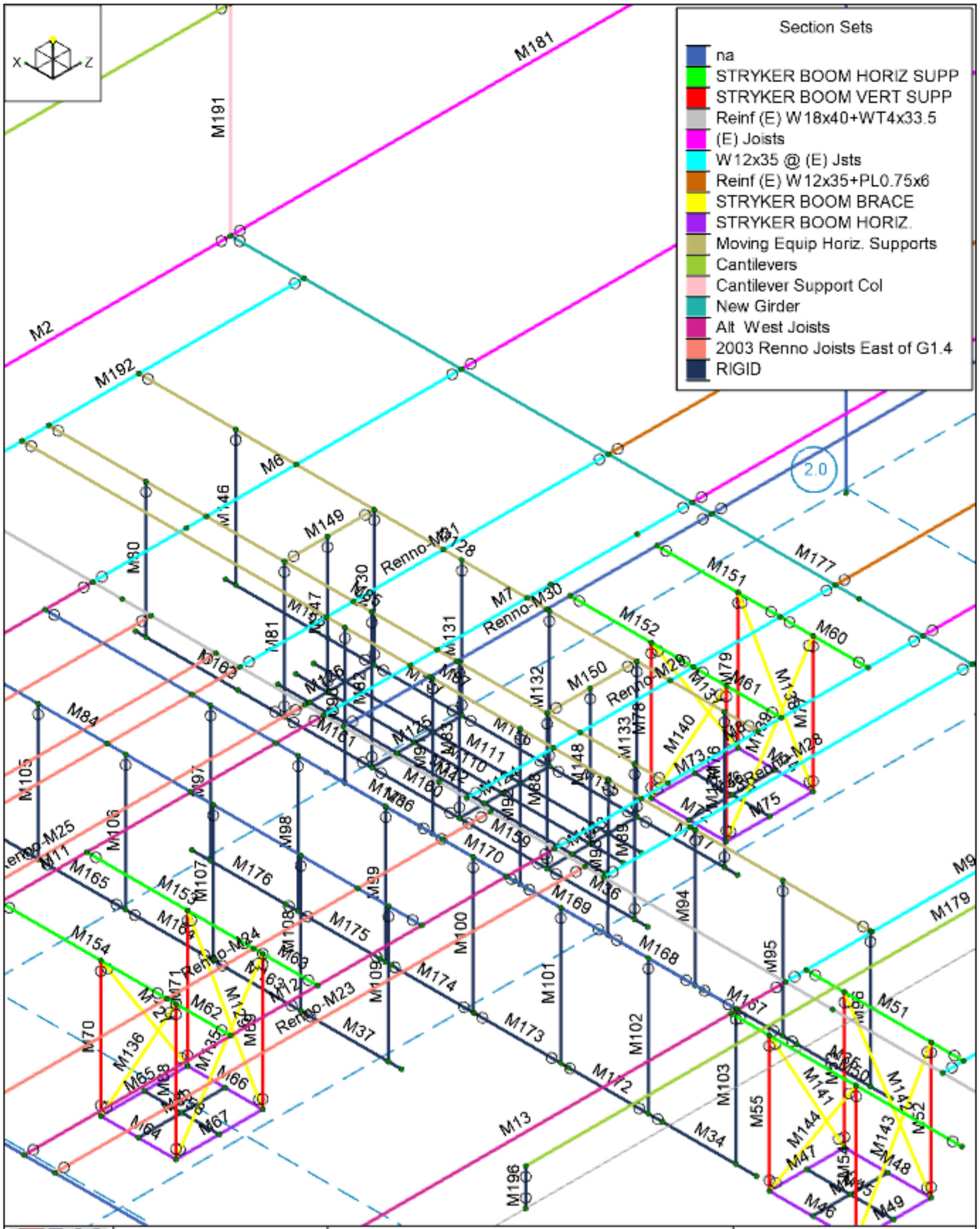
OR

SK-29

23225 OR Model Roof Rev ...



PCS Structural Solutions
ESO
23225
OR
SK-30
23225 OR Model Roof Rev ...



PCS Structural Solutions
ESO
23225
OR
SK-31
23225 OR Model Roof Rev ...

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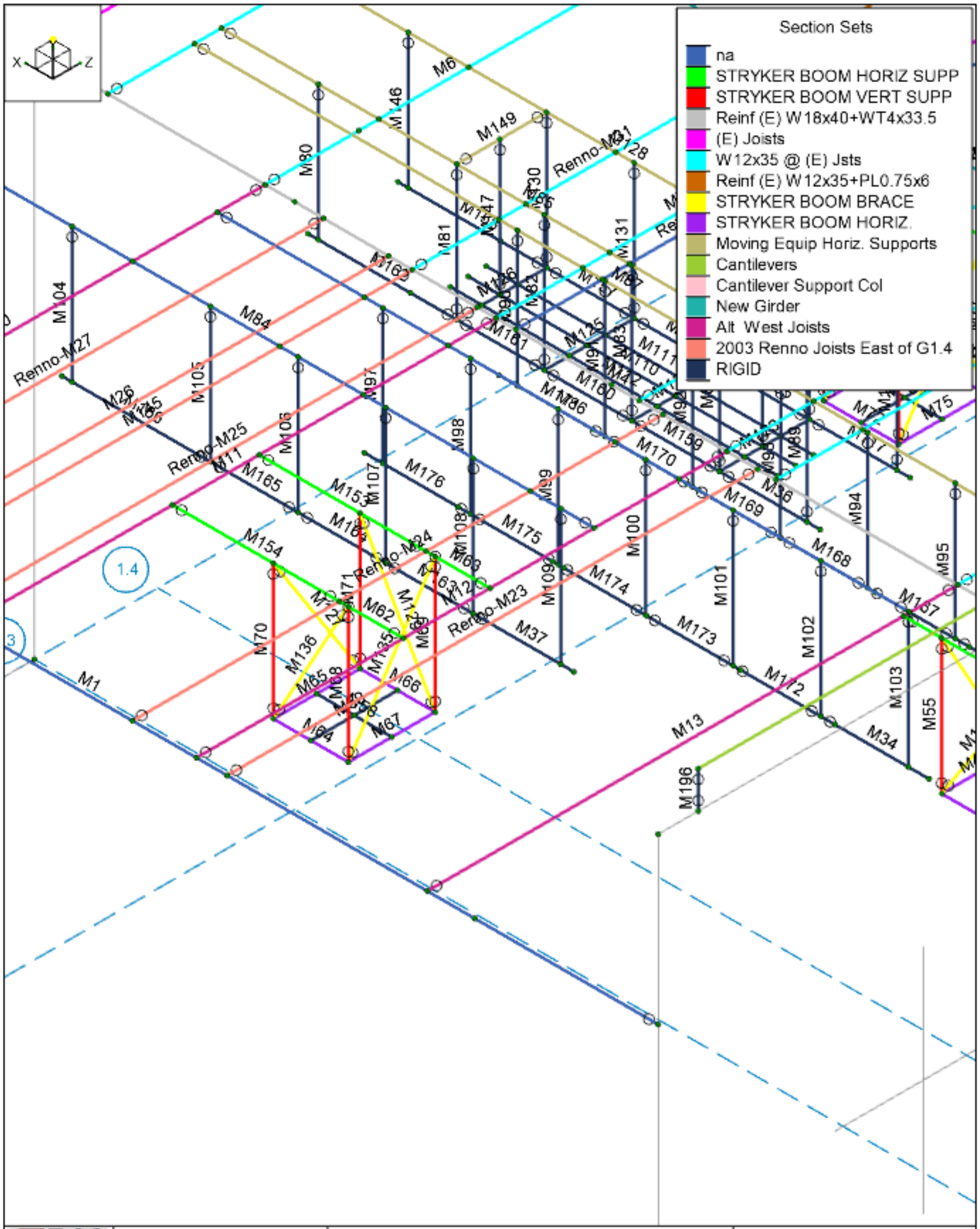
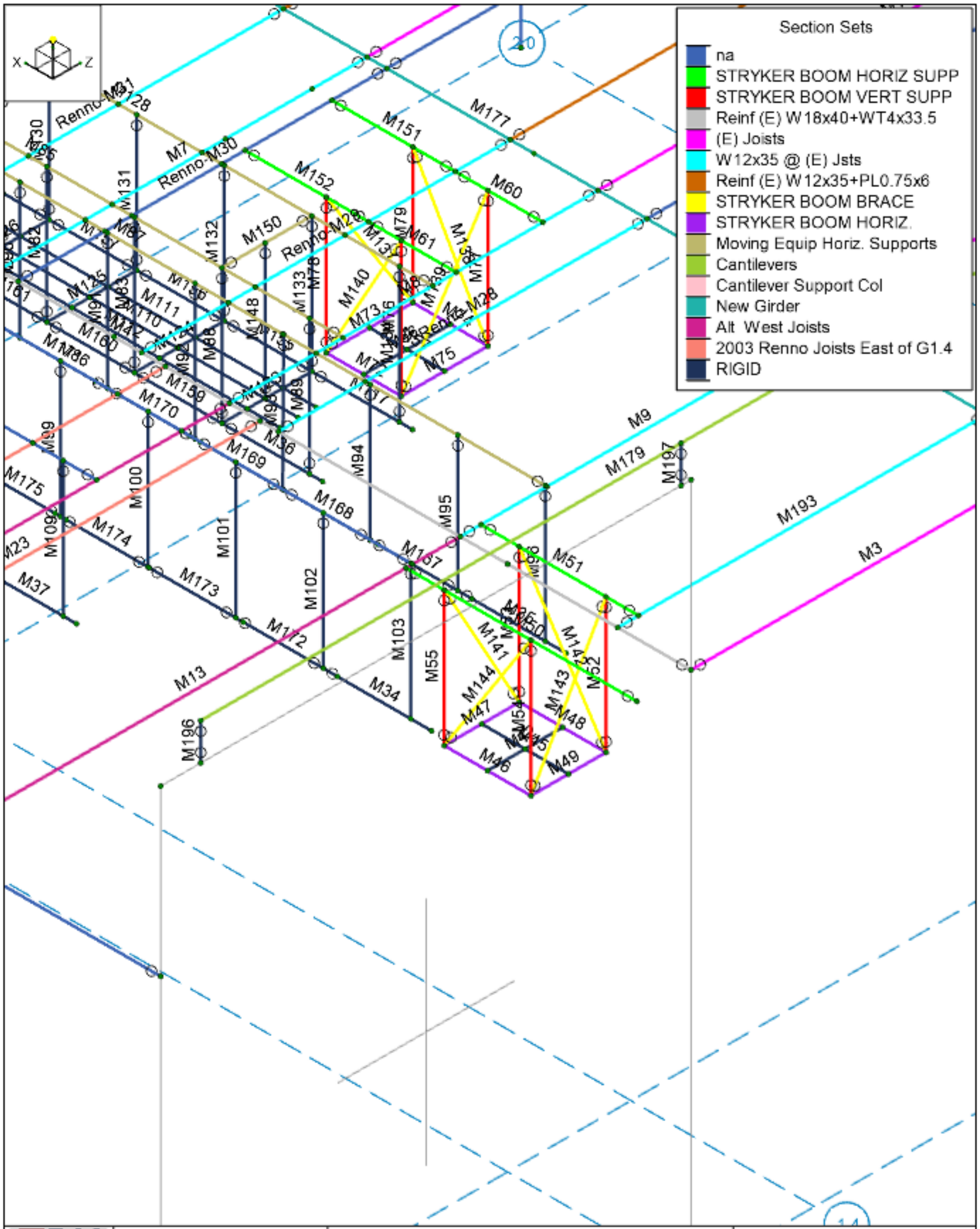


PCS Structural Solutions	PCS Structural Solutions	OR	SK-32
	ESO		23225 OR Model Roof Rev ...
	23225		



PCS Structural Solutions	PCS Structural Solutions	OR	SK-33
	ESO		23225 OR Model Roof Rev ...
	23225		

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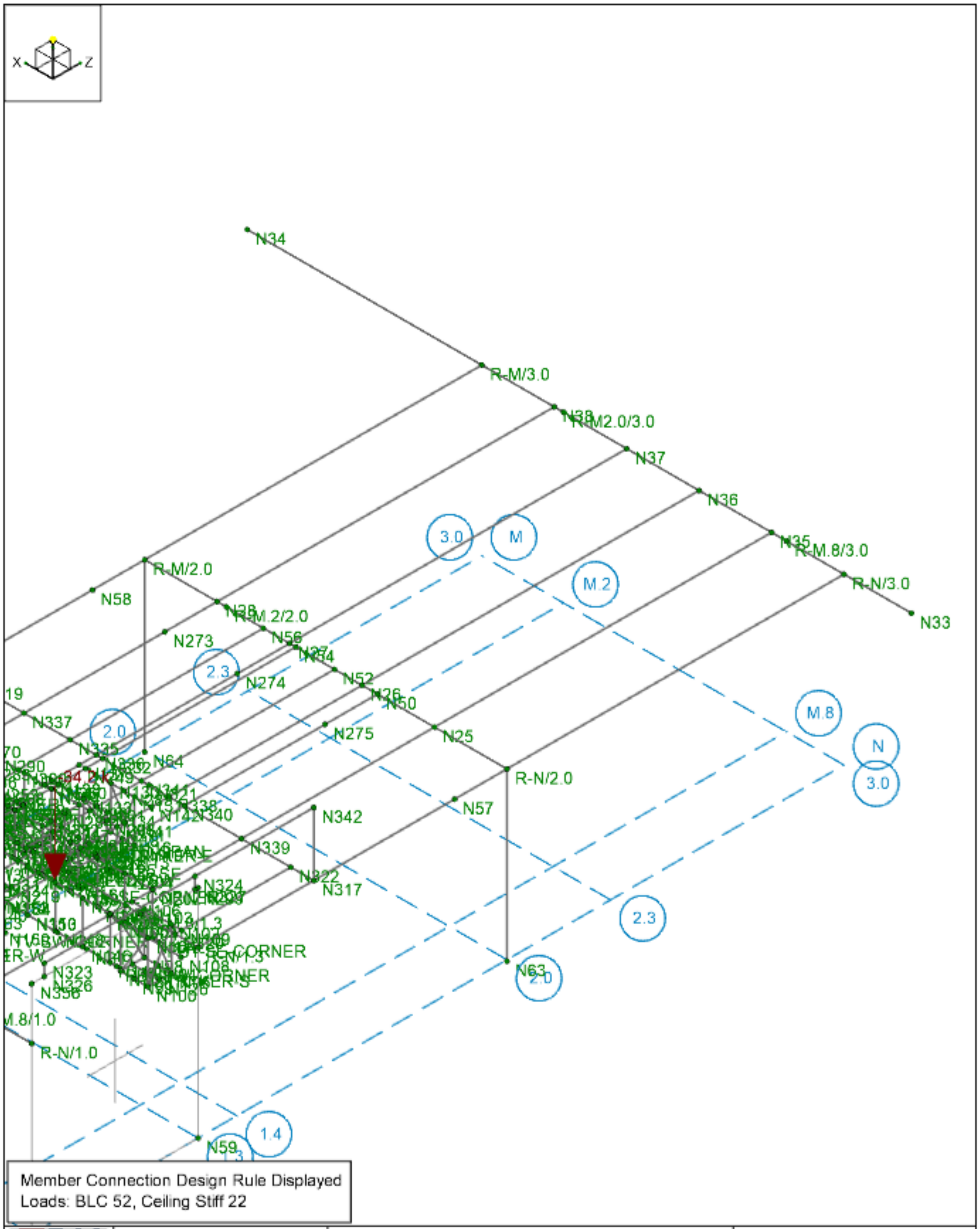


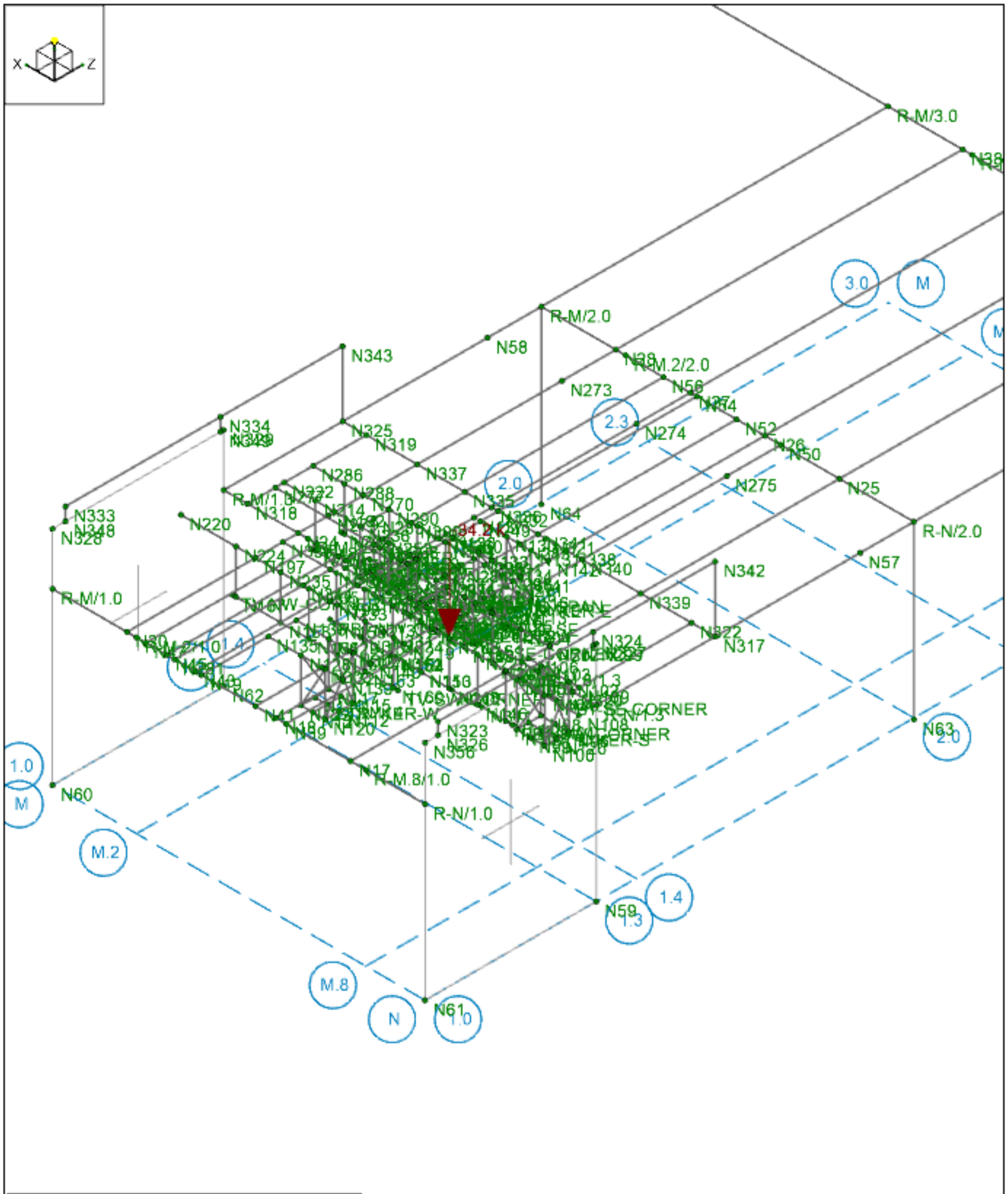
Member Connection Design Rule Displayed
Loads: BLC 52, Ceiling Stiff 22

PCS Structural Solutions
ESO
23225

OR

SK-17

23225 OR Model Roof Rev ...



Member Connection Design Rule Displayed
Loads: BLC 52, Ceiling Stiff 22

PCS Structural Solutions	OR	SK-18
ESO		23225 OR Model Roof Rev ...
23225		

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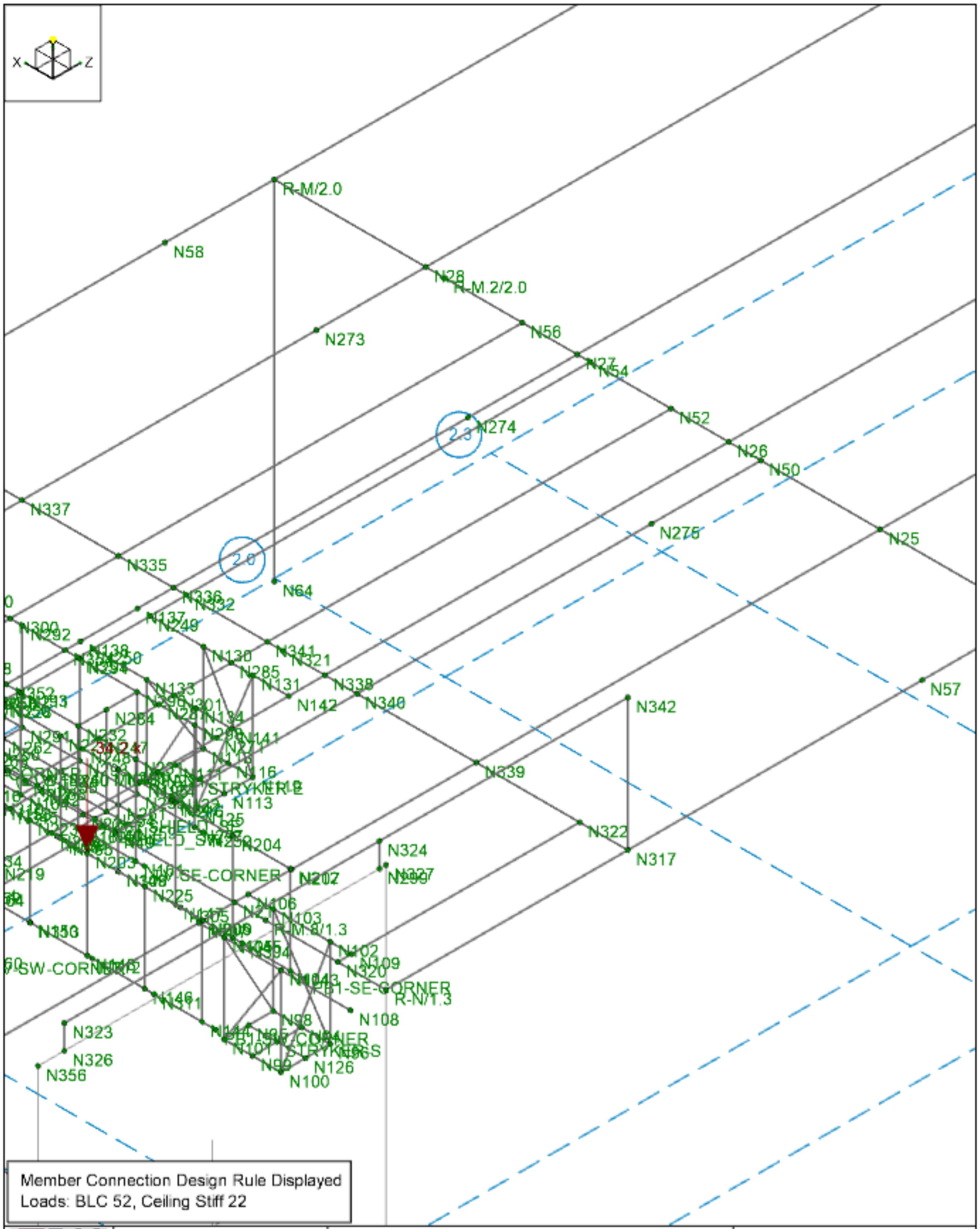
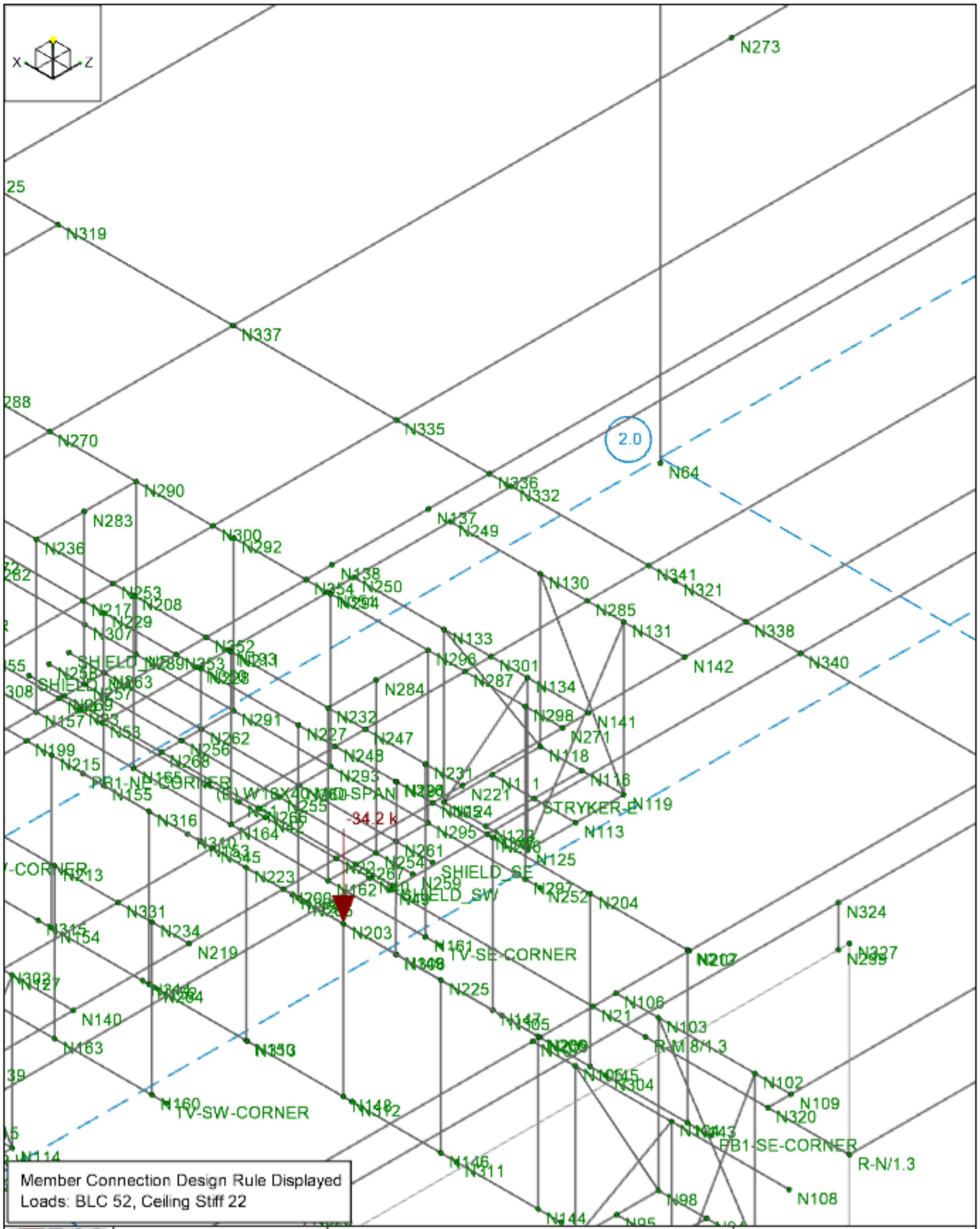
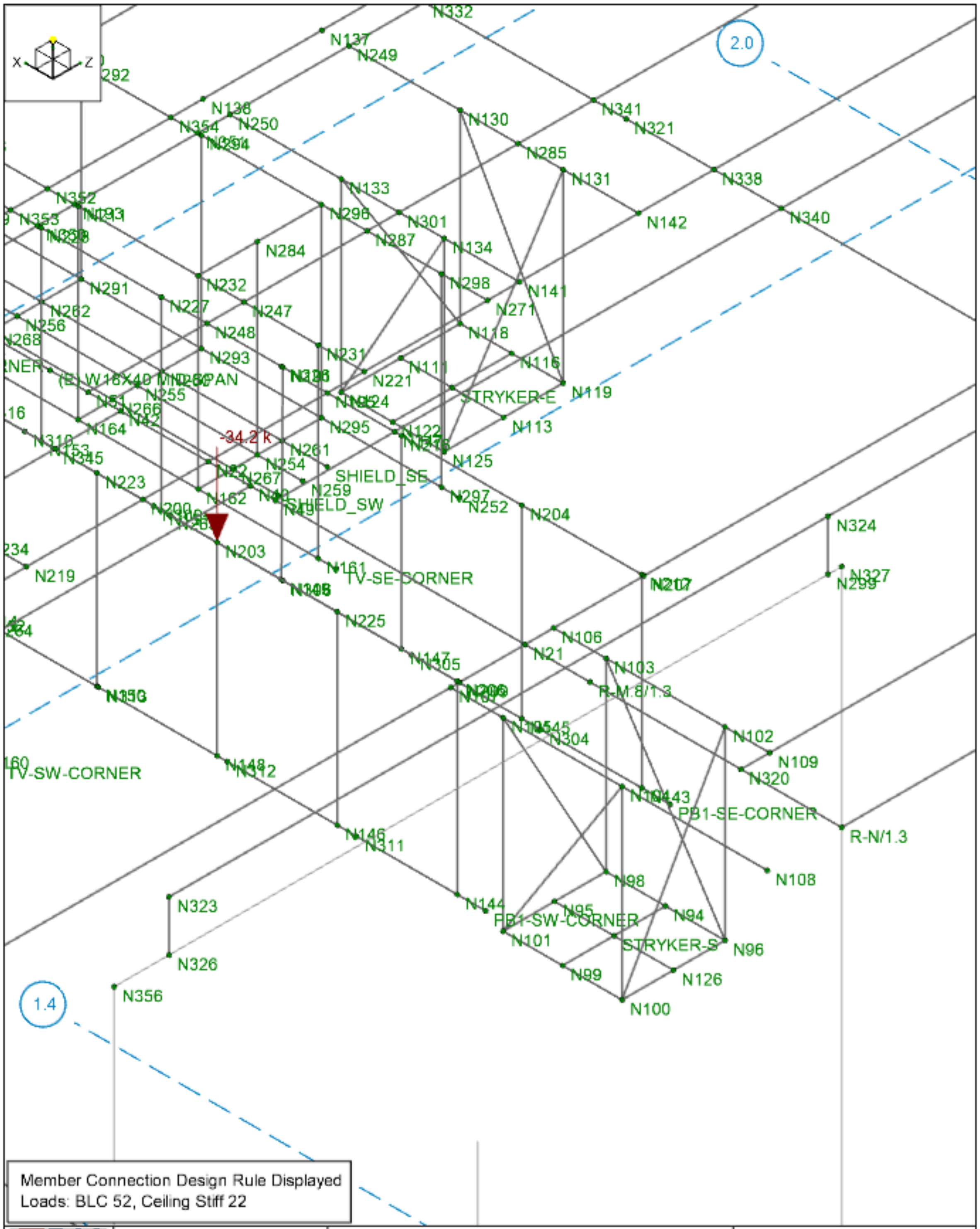


PCS Structural Solutions	ESO	OR	SK-19
ESO			23225 OR Model Roof Rev ...
23225			

PRCTI20221788 - REVISON #6 4/5/2024



PCS Structural Solutions	OR	SK-20
ESO		23225 OR Model Roof Rev ...
23225		

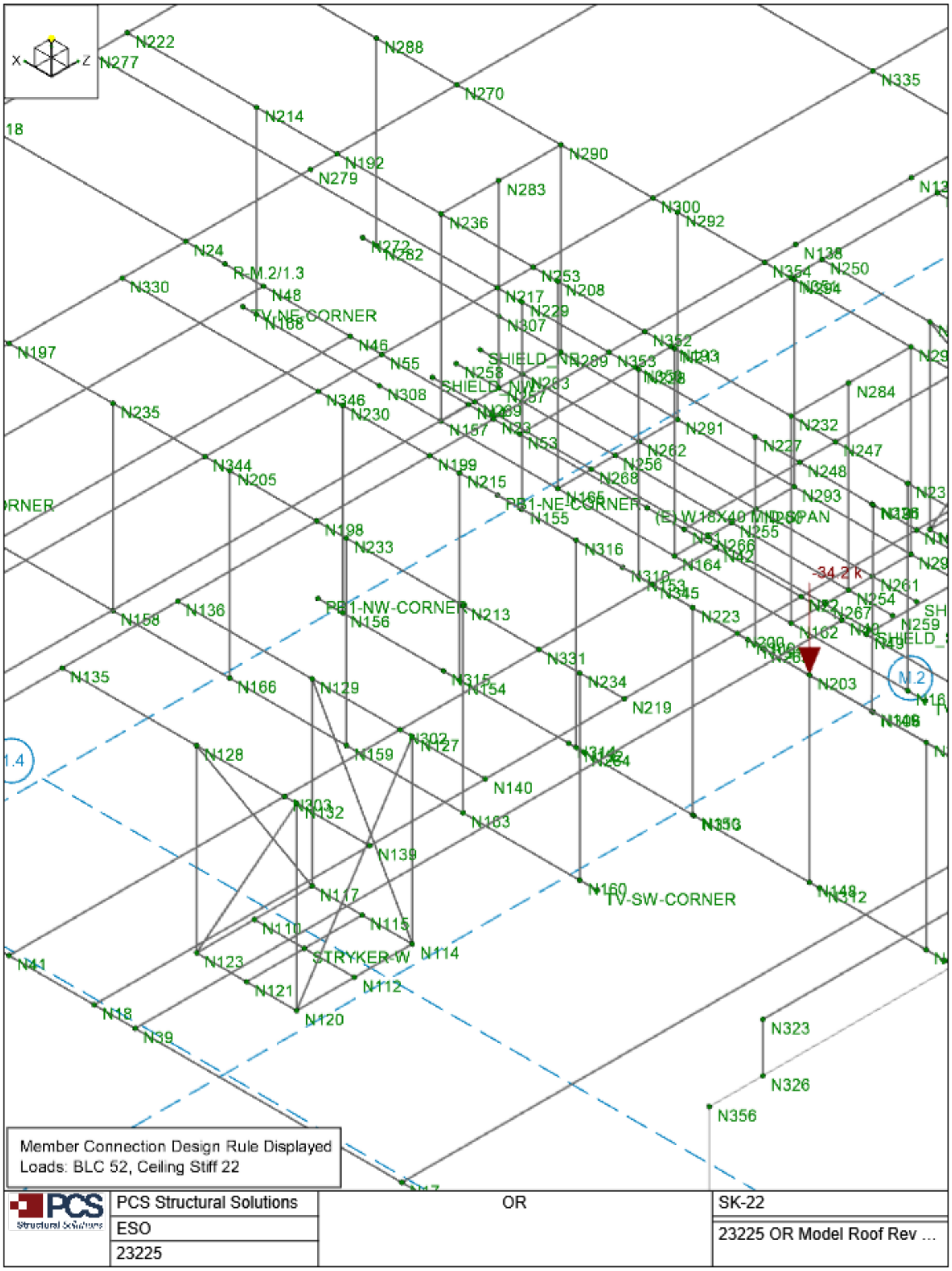


Member Connection Design Rule Displayed
Loads: BLC 52, Ceiling Stiff 22

PCS Structural Solutions
ESO
23225

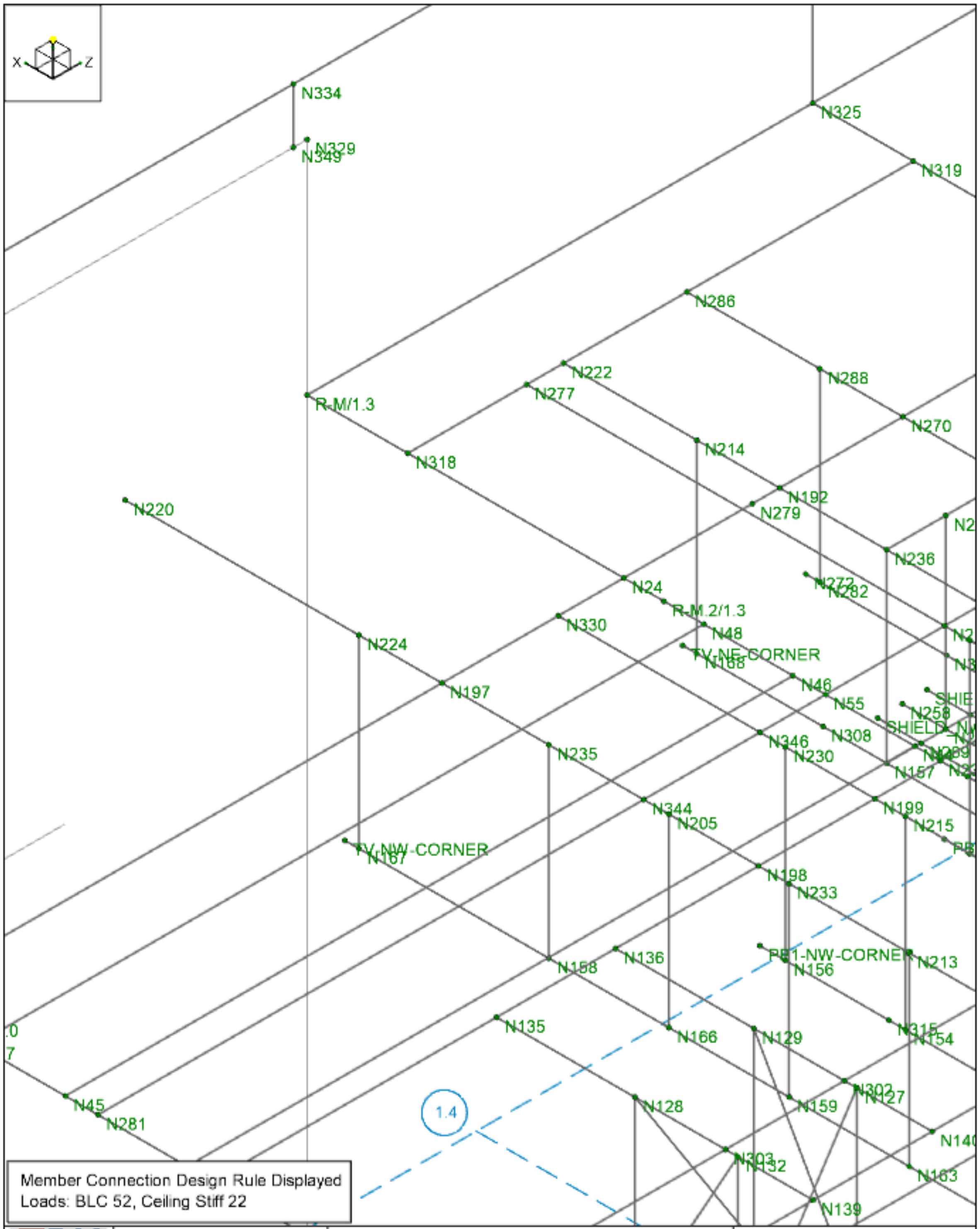
OR

SK-21
23225 OR Model Roof Rev ...



Member Connection Design Rule Displayed
Loads: BLC 52, Ceiling Stiff 22

PCS Structural Solutions	OR	SK-22
ESO		23225 OR Model Roof Rev ...
23225		



Member Connection Design Rule Displayed
Loads: BLC 52, Ceiling Stiff 22

	PCS Structural Solutions	OR	SK-25
	ESO		23225 OR Model Roof Rev ...
	23225		

Project Grid Lines

	Label	Start [in]	End [in]	Start [in]	End [in]	Start Bubble	End Bubble
1	1.0	0	0	0	346	Yes	Yes
2	1.3	159	159	0	346	Yes	Yes
3	1.4	196	196	0	346	Yes	Yes
4	2.0	454	454	0	346	Yes	Yes
5	M	0	776	346	346	Yes	Yes
6	M.2	0	776	268	268	Yes	Yes
7	M.8	0	776	55	55	Yes	Yes
8	N	0	776	0	0	Yes	Yes
9	2.3	553	553	0	346	Yes	Yes
10	3.0	776	776	0	346	Yes	Yes

Node Coordinates

	Label	X [in]	Y [in]	Z [in]	Detach From Diaphragm
1	R-N/1.0	0	157.75	0	
2	R-N/1.3	0	157.75	159	
3	R-N/2.0	0	157.75	454	
4	R-N/3.0	0	157.75	776	
5	R-M.8/1.0	55	157.75	0	
6	R-M.8/1.3	55	157.75	159	
7	R-M.8/3.0	55	157.75	776	
8	R-M.2/1.0	268	157.75	0	
9	R-M.2/1.3	268	157.75	159	
10	R-M.2/2.0	268	157.75	454	
11	R-M2.0/3.0	268	157.75	776	
12	R-M/1.0	346	157.75	0	
13	R-M/1.3	346	157.75	159	
14	R-M/2.0	346	157.75	454	
15	R-M/3.0	346	157.75	776	
16	N17	69.2	157.75	0	
17	N18	138.4	157.75	0	
18	N19	207.6	157.75	0	
19	N20	276.8	157.75	0	
20	N21	69.2	157.75	159	
21	N22	138.4	157.75	159	
22	N23	207.6	157.75	159	
23	N24	276.8	157.75	159	
24	N25	69.2	157.75	454	
25	N26	138.4	157.75	454	
26	N27	207.6	157.75	454	
27	N28	276.8	157.75	454	
28	N33	-64.5	157.75	776	
29	N34	570	157.75	776	
30	N35	69.2	157.75	776	
31	N36	138.4	157.75	776	
32	N37	207.6	157.75	776	
33	N38	276.8	157.75	776	
34	N39	129.2	157.75	0	
35	N40	129.2	157.75	159	
36	N41	157.575	157.75	0	
37	N42	157.575	157.75	159	
38	N43	213.2	157.75	0	
39	N44	213.2	157.75	159	
40	N45	239.825	157.75	0	
41	N46	239.825	157.75	159	

Node Coordinates (Continued)

	Label	X [in]	Y [in]	Z [in]	Detach From Diaphragm
42	N47	259.325	157.75	0	
43	N48	259.325	157.75	159	
44	N49	123.7	157.75	159	
45	N50	123.7	157.75	454	
46	N51	164.7	157.75	159	
47	N52	164.7	157.75	454	
48	N53	201.7	157.75	159	
49	N54	201.7	157.75	454	
50	N55	232.7	157.75	159	
51	N56	232.7	157.75	454	
52	N57	0	157.75	404	
53	N58	346	157.75	404	
54	N59	0	0	159	
55	N60	346	0	0	
56	N61	0	0	0	
57	N62	346	0	159	
58	N63	0	-1.25	454	
59	N64	346	-1.25	454	
60	PB1-SE-CORNER	63.5	117.375	185	
61	PB1-SW-CORNER	63.5	117.375	144.6875	
62	PB1-NE-CORNER	232.75	117.375	185	
63	PB1-NW-CORNER	232.75	117.375	144.6875	
64	TV-SW-CORNER	144.5	117.375	119.25	
65	TV-NW-CORNER	298	117.375	119.25	
66	TV-SE-CORNER	144.5	117.375	193.0625	
67	TV-NE-CORNER	298	117.375	193.0625	
68	STRYKER-S	44.75	117.375	154	
69	STRYKER-W	166.125	117.375	75	
70	STRYKER-E	166.125	117.375	240	
71	(E) W18X40 MID-SPAN	173	157.75	159	
72	N95	57.75	117.375	154	
73	N94	44.75	117.375	165.25	
74	N96	31.75	117.375	165.25	
75	N98	57.75	117.375	165.25	
76	N99	44.75	117.375	142.75	
77	N100	31.75	117.375	142.75	
78	N101	57.75	117.375	142.75	
79	N102	31.75	157.75	165.25	
80	N103	57.75	157.75	165.25	
81	N104	31.75	157.75	142.75	
82	N105	57.75	157.75	142.75	
83	N106	69.2	157.75	165.25	
84	N107	69.2	157.75	142.75	
85	N108	0	157.75	142.75	
86	N109	22	157.75	165.25	
87	N110	177.375	117.375	75	
88	N111	177.375	117.375	240	
89	N112	154.875	117.375	75	
90	N113	154.875	117.375	240	
91	N114	154.875	117.375	88	
92	N115	166.125	117.375	88	
93	N116	166.125	117.375	253	
94	N117	177.375	117.375	88	
95	N118	177.375	117.375	253	
96	N119	154.875	117.375	253	

Node Coordinates (Continued)

	Label	X [in]	Y [in]	Z [in]	Detach From Diaphragm
97	N120	154.875	117.375	62	
98	N121	166.125	117.375	62	
99	N122	166.125	117.375	227	
100	N123	177.375	117.375	62	
101	N124	177.375	117.375	227	
102	N125	154.875	117.375	227	
103	N126	31.75	117.375	154	
104	N127	154.875	157.75	88	
105	N128	177.375	157.75	62	
106	N129	177.375	157.75	88	
107	N130	177.375	157.75	253	
108	N131	154.875	157.75	253	
109	N132	154.875	157.75	62	
110	N133	177.375	157.75	227	
111	N134	154.875	157.75	227	
112	N135	207.6	157.75	62	
113	N136	207.6	157.75	88	
114	N137	207.6	157.75	253	
115	N138	207.6	157.75	227	
116	N139	138.4	157.75	62	
117	N140	138.4	157.75	88	
118	N141	138.4	157.75	227	
119	N142	138.4	157.75	253	
120	N143	69.6875	117.375	185	
121	N144	69.6875	117.375	144.6875	
122	N145	95.9375	117.375	185	
123	N146	95.9375	117.375	144.6875	
124	N147	122.1875	117.375	185	
125	N148	122.1875	117.375	144.6875	
126	N149	148.4375	117.375	185	
127	N150	148.4375	117.375	144.6875	
128	N151	174.6875	117.375	185	
129	N152	174.6875	117.375	144.6875	
130	N153	200.9375	117.375	185	
131	N154	200.9375	117.375	144.6875	
132	N155	227.1875	117.375	185	
133	N156	227.1875	117.375	144.6875	
134	N157	253.4375	117.375	193.0625	
135	N158	253.4375	117.375	119.25	
136	N159	200.9375	117.375	119.25	
137	N160	148.4375	117.375	119.25	
138	N161	148.4375	117.375	193.0625	
139	N162	174.6875	117.375	193.0625	
140	N163	174.6875	117.375	119.25	
141	N164	200.9375	117.375	193.0625	
142	N165	227.1875	117.375	193.0625	
143	N166	227.1875	117.375	119.25	
144	N167	294.9375	117.375	119.25	
145	N168	294.9375	117.375	193.0625	
146	N203	122.1875	157.75	144.6875	
147	N204	95.9375	157.75	185	
148	N205	227.1875	157.75	119.25	
149	N206	69.6875	157.75	144.6875	
150	N207	69.2	157.75	185	
151	N208	227.1875	157.75	193.0625	

Node Coordinates (Continued)

	Label	X [in]	Y [in]	Z [in]	Detach From Diaphragm
152	N209	69.2	157.75	144.6875	
153	N211	200.9375	157.75	193.0625	
154	N212	69.6875	157.75	185	
155	N213	174.6875	157.75	119.25	
156	N214	294.9375	157.75	193.0625	
157	N215	200.9375	157.75	144.6875	
158	N216	122.1875	157.75	185	
159	N219	138.4	157.75	119.25	
160	N217	232.75	157.75	185	
161	N220	346	157.75	119.25	
162	N221	138.4	157.75	193.0625	
163	N222	324	157.75	193.0625	
164	N223	148.4375	157.75	144.6875	
165	N224	294.9375	157.75	119.25	
166	N225	95.9375	157.75	144.6875	
167	N226	148.4375	157.75	185	
168	N227	174.6875	157.75	185	
169	N228	200.9375	157.75	185	
170	N229	227.1875	157.75	185	
171	N230	227.1875	157.75	144.6875	
172	N231	148.4375	157.75	193.0625	
173	N232	174.6875	157.75	193.0625	
174	N233	200.9375	157.75	119.25	
175	N234	148.4375	157.75	119.25	
176	N235	253.4375	157.75	119.25	
177	N236	253.4375	157.75	193.0625	
178	N191	148.125	157.75	185	
179	N192	276.8	157.75	193.0625	
180	N193	201.7	157.75	193.0625	
181	N195	138.4	157.75	185	
182	N197	276.8	157.75	119.25	
183	N198	207.6	157.75	119.25	
184	N199	207.6	157.75	144.6875	
185	N200	138.4	157.75	144.6875	
186	N249	201.7	157.75	253	
187	N250	201.7	157.75	227	
188	N247	164.7	157.75	193.0625	
189	N254	174.6875	117.375	206	
190	N255	200.9375	117.375	206	
191	N256	227.1875	117.375	206	
192	N257	253.4375	117.375	206	
193	N253	232.7	157.75	193.0625	
194	N258	262.9375	117.375	206	
195	N259	164.8125	117.375	206	
196	N260	200.9375	117.375	211.375	
197	N261	174.6875	117.375	211.375	
198	N262	227.1875	117.375	211.375	
199	N263	253.4375	117.375	211.375	
200	SHIELD_NE	262.9375	117.375	211.375	
201	SHIELD_SE	164.8125	117.375	211.375	
202	N266	200.9375	117.375	200.625	
203	N267	174.6875	117.375	200.625	
204	N268	227.1875	117.375	200.625	
205	N269	253.4375	117.375	200.625	
206	SHIELD_NW	262.9375	117.375	200.625	

Node Coordinates (Continued)

	Label	X [in]	Y [in]	Z [in]	Detach From Diaphragm
207	SHIELD_SW	164.8125	117.375	200.625	
208	N264	173	117.375	144.6875	
209	N265	173	117.375	185	
210	N252	144.5	117.375	220	
211	N271	138.4	157.75	220	
212	N286	324	157.75	220	
213	N288	294.9375	157.75	220	
214	N248	164.7	157.75	185	
215	N289	253.4375	117.375	220	
216	N290	253.4375	157.75	220	
217	N291	227.1875	117.375	220	
218	N292	227.1875	157.75	220	
219	N293	200.9375	117.375	220	
220	N294	200.9375	157.75	220	
221	N295	174.6875	117.375	220	
222	N296	174.6875	157.75	220	
223	N297	148.4375	117.375	220	
224	N298	148.4375	157.75	220	
225	N270	276.8	157.75	220	
226	N272	298	117.375	220	
227	N273	276.8	157.75	404	
228	N274	207.6	157.75	404	
229	N275	123.7	157.75	404	
230	N287	164.7	157.75	220	
231	N277	324	157.75	185	
232	N279	276.8	157.75	187.0625	
233	N300	232.7	157.75	220	
234	N281	232.7	157.75	0	
235	N282	294.9375	117.375	220	
236	N283	253.4375	157.75	206	
237	N284	174.6875	157.75	206	
238	N285	164.7	157.75	253	
239	N301	164.7	157.75	227	
240	N302	157.575	157.75	88	
241	N303	157.575	157.75	62	
242	N307	267.3	117.375	220	
243	N308	267.3	117.375	193.0625	
244	N304	91.708333	117.375	185	
245	N305	119.916667	117.375	185	
246	N306	148.125	117.375	185	
247	N309	176.333333	117.375	185	
248	N310	204.541667	117.375	185	
249	N311	91.708333	117.375	144.6875	
250	N312	119.916667	117.375	144.6875	
251	N313	148.125	117.375	144.6875	
252	N314	176.333333	117.375	144.6875	
253	N315	204.541667	117.375	144.6875	
254	N316	174.6875	157.75	144.6875	
255	N317	0	157.75	269.5	
256	N321	157.575	157.75	269.5	
257	N325	346	157.75	269.5	
258	N327	0	207.11	159	
259	N328	346	206.11	0	
260	N329	346	206.11	159	
261	N332	201.7	157.75	269.5	

Node Coordinates (Continued)

	Label	X [in]	Y [in]	Z [in]	Detach From Diaphragm
262	N335	232.7	157.75	269.5	
263	N336	207.6	157.75	269.5	
264	N337	276.8	157.75	269.5	
265	N338	138.4	157.75	269.5	
266	N339	69.2	157.75	269.5	
267	N340	123.7	157.75	269.5	
268	N341	164.7	157.75	269.5	
269	N318	324	157.75	159	
270	N319	324	157.75	269.5	
271	N320	22	157.75	159	
272	N322	22	157.75	269.5	
273	N323	0	218.11	12	
274	N324	0	218.11	156	
275	N333	346	218.11	12	
276	N334	346	218.11	156	
277	N342	0	218.11	269.5	
278	N343	346	218.11	269.5	
279	N330	276.8	157.75	144.6875	
280	N331	157.575	157.75	119.25	
281	N344	232.7	157.75	119.25	
282	N345	157.575	157.75	144.6875	
283	N346	232.7	157.75	144.6875	
284	N347	123.7	157.75	185	
285	N356	0	207.11	0	
286	N299	0	207.11	156	
287	N326	0	207.11	12	
288	N348	346	206.11	12	
289	N349	346	206.11	156	
290	N350	201.7	157.75	185	
291	N351	201.7	157.75	220	
292	N352	207.6	157.75	193.0625	
293	N353	207.6	157.75	185	
294	N354	207.6	157.75	220	

Node Boundary Conditions

	Node Label	X [k/in]	Y [k/in]	Z [k/in]	X Rot [k-ft/rad]	Y Rot [k-ft/rad]	Z Rot [k-ft/rad]
1	N334	Reaction					Reaction
2	N324	Reaction					Reaction
3	N333	Reaction		Reaction			Reaction
4	N323	Reaction		Reaction			Reaction
5	N155			Reaction			
6	N156			Reaction			
7	N161			Reaction			
8	N297			Reaction			
9	N160			Reaction			
10	N108			Reaction	Reaction		
11	N220			Reaction	Reaction		
12	N52			Reaction			
13	N54			Reaction			
14	N50			Reaction			
15	N56			Reaction			
16	N27			Reaction			
17	N25			Reaction			
18	N35			Reaction			
19	R-N/3.0			Reaction			

Node Boundary Conditions (Continued)

	Node Label	X [k/in]	Y [k/in]	Z [k/in]	X Rot [k-ft/rad]	Y Rot [k-ft/rad]	Z Rot [k-ft/rad]
20	R-M/3.0			Reaction			
21	N38			Reaction			
22	N37			Reaction			
23	N36			Reaction			
24	N26			Reaction			
25	N144			Reaction			
26	N143			Reaction			
27	N325	Reaction		Reaction		Reaction	
28	N167			Reaction			
29	N168			Reaction			
30	N282			Reaction			
31	R-N/1.0	Reaction		Reaction	Reaction		
32	R-M/1.0	Reaction		Reaction	Reaction		
33	R-M/1.3	Reaction		Reaction		Reaction	
34	R-N/1.3	Reaction		Reaction		Reaction	
35	R-M/2.0	Reaction		Reaction		Reaction	
36	R-N/2.0	Reaction		Reaction		Reaction	
37	R-M2.0/3.0	Reaction	Reaction	Reaction	Reaction		
38	R-M.8/3.0	Reaction	Reaction	Reaction	Reaction		
39	N33	Reaction	Reaction	Reaction	Reaction		
40	N34	Reaction	Reaction	Reaction	Reaction		
41	N59	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction
42	N60	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction
43	N61	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction
44	N62	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction
45	N63	Reaction	Reaction	Reaction		Reaction	
46	N64	Reaction	Reaction	Reaction		Reaction	
47	N317	Reaction		Reaction		Reaction	

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design Rule	Area [in^2]	Iyy [in^4]	Izz [in^4]	J [in^4]
1	STRYKER BOOM HORIZ SUPP	HSS3X3X4	Beam	Tube	A500 Gr. C - 50ksi	Typical	2.44	3.02	3.02	5.08
2	STRYKER BOOM VERT SUPP	L3X3X4	VBrace	Single Angle	A36 Gr.36	Typical	1.44	1.23	1.23	0.031
3	Reinf (E) W18x40+WT4x33.5	W18X40+WT4X33.5_HRA	Beam	Wide Flange	A36 Gr.36	Typical	21.403	26.246	1445.36	0.81
4	Reinf (E) W12x26+PL1x8	W12X26+PL1X8	Beam	Wide Flange	A36 Gr.36	Typical	12.638	45.48	225.19	0.3
5	(E) Joists	VJ18-3	Beam	Wide Flange	A992	Typical	1.323	1.332	81.015	0.015
6	W12x35 @ (E) Jsts	W12X35	Beam	Wide Flange	A992	Typical	10.3	24.5	285	0.741
7	Reinf (E) W12x35+PL0.75x6	W12X35+PL0.75X6	Beam	Wide Flange	A992	Typical	14.76	37.99	420.071	0.741
8	STRYKER BOOM BRACE	L3X3X4	HBrace	Single Angle	A36 Gr.36	Typical	1.44	1.23	1.23	0.031
9	STRYKER BOOM HORIZ.	L4X3X6	Beam	Single Angle	A36 Gr.36	Typical	2.49	1.89	3.94	0.123
10	Moving Equip Horiz. Supports	HSS3X3X4	Beam	Tube	A500 Gr. C - 50ksi	Typical	2.44	3.02	3.02	5.08
11	Cantilevers	W21X68	Beam	Wide Flange	A992	Typical	20	64.7	1480	2.45
12	Cantilever Support Col	HSS4X4X4	Column	Tube	A500 Gr. C - 50ksi	Typical	3.37	7.8	7.8	12.8
13	New Girder	W24X55	Beam	Wide Flange	A992	Typical	16.2	29.1	1350	1.18
14	Alt West Joists	W12X16	Beam	Wide Flange	A992	Typical	4.71	2.82	103	0.103
15	2003 Renno Joists East of G1.4	W12X16	Beam	Wide Flange	A992	Typical	4.71	2.82	103	0.103

General Section Sets

	Label	Shape	Type	Material	Area [in^2]	Iyy [in^4]	Izz [in^4]	J [in^4]
1	GEN1	RE4X4	Beam	gen_Conc3NW	16	21.333	21.333	31.573
2	RIGID		None	RIGID	1e+6	1e+6	1e+6	1e+6

Wall Panel Data

	Label	A Node	B Node	C Node	D Node	Material Type	Material Set	Thickness [in]	Design Rule	Panel/Spacing
1	WP1	N62	N329	N328	N60	Concrete	Conc4000NW	18	(E) OR Wall	N/A
2	WP2	N61	N356	N327	N59	Concrete	Conc3000NW	18	(E) OR Wall	N/A

Member Primary Data

	Label	I Node	J Node	Rotate(deg)	Section/Shape	Type	Design List	Material	Design Rule
1	M1	R-N/1.0	R-M/1.0		W21X44	Beam	Wide Flange	A992	Typical
2	M2	R-M/1.3	N325		(E) Joists	Beam	Wide Flange	A992	Typical
3	M3	R-N/1.3	N317		(E) Joists	Beam	Wide Flange	A992	Typical
4	M4	R-N/1.3	R-M/1.3		Reinf (E) W18x40+WT4x33.5	Beam	Wide Flange	A36 Gr.36	Typical
5	M5	R-N/2.0	R-M/2.0		W21X44	Beam	Wide Flange	A992	Typical
6	M6	N24	N337		W12x35 @ (E) Jsts	Beam	Wide Flange	A992	Typical
7	M7	N23	N336		W12x35 @ (E) Jsts	Beam	Wide Flange	A992	Typical
8	M8	N22	N338		W12x35 @ (E) Jsts	Beam	Wide Flange	A992	Typical
9	M9	N21	N339		W12x35 @ (E) Jsts	Beam	Wide Flange	A992	Typical
10	M10	N20	N24		Alt West Joists	Beam	Wide Flange	A992	Typical
11	M11	N19	N23		Alt West Joists	Beam	Wide Flange	A992	Typical
12	M12	N18	N22		Alt West Joists	Beam	Wide Flange	A992	Typical
13	M13	N17	N21		Alt West Joists	Beam	Wide Flange	A992	Typical
14	M14	R-M.8/3.0	R-M2.0/3.0		W18X35	Beam	Wide Flange	A992	Typical
15	M15	R-M2.0/3.0	N34		W24X55	Beam	Wide Flange	A992	Typical
16	M16	N33	R-M.8/3.0		W21X44	Beam	Wide Flange	A992	Typical
17	M17	R-N/2.0	R-N/3.0		VJ22-42	Beam	Wide Flange	A992	Typical
18	M18	N25	N35		VJ22-42	Beam	Wide Flange	A992	Typical
19	M19	N26	N36		VJ22-42	Beam	Wide Flange	A992	Typical
20	M20	N27	N37		VJ22-42	Beam	Wide Flange	A992	Typical
21	M21	N28	N38		VJ22-42	Beam	Wide Flange	A992	Typical
22	M22	R-M/2.0	R-M/3.0		VJ22-42	Beam	Wide Flange	A992	Typical
23	Renno-M23	N39	N40		2003 Renno Joists East of G1.4	Beam	Wide Flange	A992	Typical
24	Renno-M24	N41	N42		2003 Renno Joists East of G1.4	Beam	Wide Flange	A992	Typical
25	Renno-M25	N43	N44		2003 Renno Joists East of G1.4	Beam	Wide Flange	A992	Typical
26	M26	N45	N46		2003 Renno Joists East of G1.4	Beam	Wide Flange	A992	Typical
27	Renno-M27	N47	N48		2003 Renno Joists East of G1.4	Beam	Wide Flange	A992	Typical
28	Renno-M28	N49	N340		W12x35 @ (E) Jsts	Beam	Wide Flange	A992	Typical
29	Renno-M29	N51	N341		W12x35 @ (E) Jsts	Beam	Wide Flange	A992	Typical
30	Renno-M30	N53	N332		W12X35	Beam	Wide Flange	A992	Typical
31	Renno-M31	N55	N335		W12x35 @ (E) Jsts	Beam	Wide Flange	A992	Typical
32	M32	N63	R-N/2.0		W8X28	Column	Wide Flange	A992	Typical
33	M33	N64	R-M/2.0		W8X28	Column	Wide Flange	A992	Typical
34	M34	PB1-SW-CORNER	N146		RIGID	None	None	RIGID	Typical
35	M35	PB1-SE-CORNER	N145		RIGID	None	None	RIGID	Typical
36	M36	TV-SE-CORNER	N162		RIGID	None	None	RIGID	Typical
37	M37	TV-SW-CORNER	N163		RIGID	None	None	RIGID	Typical
38	M42	N94	N99		RIGID	None	None	RIGID	Typical
39	M45	N126	N95		RIGID	None	None	RIGID	Typical
40	M46	N100	N101		STRYKER BOOM HORIZ.	Beam	Single Angle	A36 Gr.36	Typical
41	M47	N101	N98		STRYKER BOOM HORIZ.	Beam	Single Angle	A36 Gr.36	Typical
42	M48	N98	N96		STRYKER BOOM HORIZ.	Beam	Single Angle	A36 Gr.36	Typical
43	M49	N96	N100		STRYKER BOOM HORIZ.	Beam	Single Angle	A36 Gr.36	Typical
44	M50	N108	N107		STRYKER BOOM HORIZ SUPP	Beam	Tube	A500 Gr. C - 50ksi	Typical
45	M51	N109	N106		STRYKER BOOM HORIZ SUPP	Beam	Tube	A500 Gr. C - 50ksi	Typical
46	M52	N96	N102		STRYKER BOOM VERT SUPP	VBrace	Single Angle	A36 Gr.36	Typical
47	M53	N98	N103		STRYKER BOOM VERT SUPP	VBrace	Single Angle	A36 Gr.36	Typical
48	M54	N100	N104		STRYKER BOOM VERT SUPP	VBrace	Single Angle	A36 Gr.36	Typical
49	M55	N101	N105		STRYKER BOOM VERT SUPP	VBrace	Single Angle	A36 Gr.36	Typical

Member Primary Data (Continued)

	Label	I Node	J Node	Rotate(deg)	Section/Shape	Type	Design List	Material	Design Rule
50	M56	N116	N122		RIGID	None	None	RIGID	Typical
51	M57	N113	N111		RIGID	None	None	RIGID	Typical
52	M58	N112	N110		RIGID	None	None	RIGID	Typical
53	M59	N121	N115		RIGID	None	None	RIGID	Typical
54	M60	N142	N285		STRYKER BOOM HORIZ SUPP	Beam	Tube	A500 Gr. C - 50ksi	Typical
55	M61	N141	N301		STRYKER BOOM HORIZ SUPP	Beam	Tube	A500 Gr. C - 50ksi	Typical
56	M62	N139	N303		STRYKER BOOM HORIZ SUPP	Beam	Tube	A500 Gr. C - 50ksi	Typical
57	M63	N140	N302		STRYKER BOOM HORIZ SUPP	Beam	Tube	A500 Gr. C - 50ksi	Typical
58	M64	N120	N123		STRYKER BOOM HORIZ.	Beam	Single Angle	A36 Gr.36	Typical
59	M65	N123	N117		STRYKER BOOM HORIZ.	Beam	Single Angle	A36 Gr.36	Typical
60	M66	N117	N114		STRYKER BOOM HORIZ.	Beam	Single Angle	A36 Gr.36	Typical
61	M67	N114	N120		STRYKER BOOM HORIZ.	Beam	Single Angle	A36 Gr.36	Typical
62	M68	N120	N132		STRYKER BOOM VERT SUPP	VBrace	Single Angle	A36 Gr.36	Typical
63	M69	N114	N127		STRYKER BOOM VERT SUPP	VBrace	Single Angle	A36 Gr.36	Typical
64	M70	N123	N128		STRYKER BOOM VERT SUPP	VBrace	Single Angle	A36 Gr.36	Typical
65	M71	N117	N129		STRYKER BOOM VERT SUPP	VBrace	Single Angle	A36 Gr.36	Typical
66	M72	N125	N124		STRYKER BOOM HORIZ.	Beam	Single Angle	A36 Gr.36	Typical
67	M73	N124	N118		STRYKER BOOM HORIZ.	Beam	Single Angle	A36 Gr.36	Typical
68	M74	N118	N119		STRYKER BOOM HORIZ.	Beam	Single Angle	A36 Gr.36	Typical
69	M75	N119	N125		STRYKER BOOM HORIZ.	Beam	Single Angle	A36 Gr.36	Typical
70	M76	N125	N134		STRYKER BOOM VERT SUPP	VBrace	Single Angle	A36 Gr.36	Typical
71	M77	N119	N131		STRYKER BOOM VERT SUPP	VBrace	Single Angle	A36 Gr.36	Typical
72	M78	N124	N133		STRYKER BOOM VERT SUPP	VBrace	Single Angle	A36 Gr.36	Typical
73	M79	N118	N130		STRYKER BOOM VERT SUPP	VBrace	Single Angle	A36 Gr.36	Typical
74	M84	N219	N220		HSS4X4X4	Beam	Tube	A500 Gr. C - 50ksi	Typical
75	M85	N221	N222		Moving Equip Horiz. Supports	Beam	Tube	A500 Gr. C - 50ksi	Typical
76	M86	N209	N330	90	HSS4X4X4	Beam	Tube	A500 Gr. C - 50ksi	Typical
77	M87	N207	N277		Moving Equip Horiz. Supports	Beam	Tube	A500 Gr. C - 50ksi	Typical
78	M80	N168	N214		RIGID	None	None	RIGID	Typical
79	M81	N157	N236		RIGID	None	None	RIGID	Typical
80	M82	N165	N208		RIGID	None	None	RIGID	Typical
81	M83	N164	N211		RIGID	None	None	RIGID	Typical
82	M88	N162	N232		RIGID	None	None	RIGID	Typical
83	M89	N161	N231		RIGID	None	None	RIGID	Typical
84	M90	N155	N229		RIGID	None	None	RIGID	Typical
85	M91	N153	N228		RIGID	None	None	RIGID	Typical
86	M92	N151	N227		RIGID	None	None	RIGID	Typical
87	M93	N149	N191		RIGID	None	None	RIGID	Typical
88	M94	N147	N216		RIGID	None	None	RIGID	Typical
89	M95	N145	N204		RIGID	None	None	RIGID	Typical
90	M96	N143	N212		RIGID	None	None	RIGID	Typical
91	M97	N156	N230		RIGID	None	None	RIGID	Typical
92	M98	N154	N215		RIGID	None	None	RIGID	Typical
93	M99	N152	N316		RIGID	None	None	RIGID	Typical
94	M100	N150	N223		RIGID	None	None	RIGID	Typical
95	M101	N148	N203		RIGID	None	None	RIGID	Typical
96	M102	N146	N225		RIGID	None	None	RIGID	Typical
97	M103	N144	N206		RIGID	None	None	RIGID	Typical
98	M104	N167	N224		RIGID	None	None	RIGID	Typical
99	M105	N158	N235		RIGID	None	None	RIGID	Typical
100	M106	N166	N205		RIGID	None	None	RIGID	Typical
101	M107	N159	N233		RIGID	None	None	RIGID	Typical
102	M108	N163	N213		RIGID	None	None	RIGID	Typical
103	M109	N160	N234		RIGID	None	None	RIGID	Typical
104	M110	N259	N258		RIGID	None	None	RIGID	Typical

Member Primary Data (Continued)

	Label	I Node	J Node	Rotate(deg)	Section/Shape	Type	Design List	Material	Design Rule
105	M111	SHIELD_SE	SHIELD_NE		RIGID	None	None	RIGID	Typical
106	M112	SHIELD_SW	SHIELD_NW		RIGID	None	None	RIGID	Typical
107	M123	N162	N295		RIGID	None	None	RIGID	Typical
108	M124	N164	N293		RIGID	None	None	RIGID	Typical
109	M125	N165	N291		RIGID	None	None	RIGID	Typical
110	M126	N157	N289		RIGID	None	None	RIGID	Typical
111	M128	N271	N286		Moving Equip Horiz. Supports	Beam	Tube	A500 Gr. C - 50ksi	Typical
112	M130	N289	N290		RIGID	None	None	RIGID	Typical
113	M131	N291	N292		RIGID	None	None	RIGID	Typical
114	M132	N293	N294		RIGID	None	None	RIGID	Typical
115	M133	N295	N296		RIGID	None	None	RIGID	Typical
116	M134	N297	N298		RIGID	None	None	RIGID	Typical
117	M117	N252	N295		RIGID	None	None	RIGID	Typical
118	M127	N117	N128		STRYKER BOOM BRACE	HBrace	Single Angle	A36 Gr.36	Typical
119	M129	N114	N129		STRYKER BOOM BRACE	HBrace	Single Angle	A36 Gr.36	Typical
120	M135	N120	N127		STRYKER BOOM BRACE	HBrace	Single Angle	A36 Gr.36	Typical
121	M136	N123	N132		STRYKER BOOM BRACE	HBrace	Single Angle	A36 Gr.36	Typical
122	M137	N118	N133		STRYKER BOOM BRACE	HBrace	Single Angle	A36 Gr.36	Typical
123	M138	N119	N130		STRYKER BOOM BRACE	HBrace	Single Angle	A36 Gr.36	Typical
124	M139	N125	N131		STRYKER BOOM BRACE	HBrace	Single Angle	A36 Gr.36	Typical
125	M140	N124	N134		STRYKER BOOM BRACE	HBrace	Single Angle	A36 Gr.36	Typical
126	M141	N98	N105		STRYKER BOOM BRACE	HBrace	Single Angle	A36 Gr.36	Typical
127	M142	N96	N103		STRYKER BOOM BRACE	HBrace	Single Angle	A36 Gr.36	Typical
128	M143	N100	N102		STRYKER BOOM BRACE	HBrace	Single Angle	A36 Gr.36	Typical
129	M144	N101	N104		STRYKER BOOM BRACE	HBrace	Single Angle	A36 Gr.36	Typical
130	M145	N281	N55		2003 Renno Joists East of G1.4	Beam	Wide Flange	A992	Typical
131	M146	N282	N288		RIGID	None	None	RIGID	Typical
132	M147	N257	N283		RIGID	None	None	RIGID	Typical
133	M148	N254	N284		RIGID	None	None	RIGID	Typical
134	M149	N236	N290		Moving Equip Horiz. Supports	Beam	Tube	A500 Gr. C - 50ksi	Typical
135	M150	N232	N296		Moving Equip Horiz. Supports	Beam	Tube	A500 Gr. C - 50ksi	Typical
136	M151	N285	N249		STRYKER BOOM HORIZ SUPP	Beam	Tube	A500 Gr. C - 50ksi	Typical
137	M152	N301	N250		STRYKER BOOM HORIZ SUPP	Beam	Tube	A500 Gr. C - 50ksi	Typical
138	M153	N302	N136		STRYKER BOOM HORIZ SUPP	Beam	Tube	A500 Gr. C - 50ksi	Typical
139	M154	N303	N135		STRYKER BOOM HORIZ SUPP	Beam	Tube	A500 Gr. C - 50ksi	Typical
140	M155	N295	N293		RIGID	None	None	RIGID	Typical
141	M156	N293	N291		RIGID	None	None	RIGID	Typical
142	M157	N291	N289		RIGID	None	None	RIGID	Typical
143	M158	N289	N272		RIGID	None	None	RIGID	Typical
144	M159	N162	N164		RIGID	None	None	RIGID	Typical
145	M160	N164	N165		RIGID	None	None	RIGID	Typical
146	M161	N165	N157		RIGID	None	None	RIGID	Typical
147	M162	N157	TV-NE-CORNER		RIGID	None	None	RIGID	Typical
148	M163	N163	N159		RIGID	None	None	RIGID	Typical
149	M164	N159	N166		RIGID	None	None	RIGID	Typical
150	M165	N166	N158		RIGID	None	None	RIGID	Typical
151	M166	N158	TV-NW-CORNER		RIGID	None	None	RIGID	Typical
152	M167	N145	N147		RIGID	None	None	RIGID	Typical
153	M168	N147	N149		RIGID	None	None	RIGID	Typical
154	M169	N149	N151		RIGID	None	None	RIGID	Typical
155	M170	N151	N153		RIGID	None	None	RIGID	Typical
156	M171	N153	PB1-NE-CORNER		RIGID	None	None	RIGID	Typical
157	M172	N146	N148		RIGID	None	None	RIGID	Typical
158	M173	N148	N150		RIGID	None	None	RIGID	Typical
159	M174	N150	N152		RIGID	None	None	RIGID	Typical

Member Primary Data (Continued)

	Label	I Node	J Node	Rotate(deg)	Section/Shape	Type	Design List	Material	Design Rule
160	M175	N152	N154		RIGID	None	None	RIGID	Typical
161	M176	N154	PB1-NW-CORNER		RIGID	None	None	RIGID	Typical
162	M177	N317	N325		New Girder	Beam	Wide Flange	A992	Typical
163	M178	N333	N343		Cantilevers	Beam	Wide Flange	A992	Typical
164	M179	N323	N342		Cantilevers	Beam	Wide Flange	A992	Typical
165	M180	N332	N54		W12X35	Beam	Wide Flange	A992	Typical
166	M181	N325	R-M/2.0		(E) Joists	Beam	Wide Flange	A992	Typical
167	M182	N317	R-N/2.0		(E) Joists	Beam	Wide Flange	A992	Typical
168	M183	N335	N56		Reinf (E) W12x35+PL0.75x6	Beam	Wide Flange	A992	Typical
169	M184	N336	N27		(E) Joists	Beam	Wide Flange	A992	Typical
170	M185	N337	N28		(E) Joists	Beam	Wide Flange	A992	Typical
171	M186	N338	N26		(E) Joists	Beam	Wide Flange	A992	Typical
172	M187	N339	N25		(E) Joists	Beam	Wide Flange	A992	Typical
173	M188	N340	N50		W12X35	Beam	Wide Flange	A992	Typical
174	M189	N341	N52		Reinf (E) W12x35+PL0.75x6	Beam	Wide Flange	A992	Typical
175	M190	N317	N342		Cantilever Support Col	Column	Tube	A500 Gr. C - 50ksi	Typical
176	M192	N318	N319		W12x35 @ (E) Jsts	Beam	Wide Flange	A992	Typical
177	M193	N320	N322		W12x35 @ (E) Jsts	Beam	Wide Flange	A992	Typical
178	M191	N325	N343		Cantilever Support Col	Column	Tube	A500 Gr. C - 50ksi	Typical
179	M194	N348	N333		RIGID	None	None	RIGID	Typical
180	M195	N349	N334		RIGID	None	None	RIGID	Typical
181	M196	N326	N323		RIGID	None	None	RIGID	Typical
182	M197	N299	N324		RIGID	None	None	RIGID	Typical

Node Loads and Enforced Displacements (BLC 2 : Dead Load)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	STRYKER-W	L	Y	-2.2
2	STRYKER-S	L	Y	-2.2
3	STRYKER-E	L	Y	-2.2

Node Loads and Enforced Displacements (BLC 5 : Stiffness Load 1)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	(E) W18X40 MID-SPAN	L	Y	-34.2

Node Loads and Enforced Displacements (BLC 6 : Stiffness Load 2)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	N235	L	Y	-34.2

Node Loads and Enforced Displacements (BLC 8 : Stryker MZ)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	STRYKER-W	L	MZ	11.3
2	STRYKER-E	L	MZ	11.3
3	STRYKER-S	L	MZ	11.3

Node Loads and Enforced Displacements (BLC 9 : Stryker MX)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	STRYKER-W	L	MX	11.3
2	STRYKER-E	L	MX	11.3
3	STRYKER-S	L	MX	11.3

Node Loads and Enforced Displacements (BLC 13 : Larc-N Rot Stiff 1)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	N146	L	Y	-10

Node Loads and Enforced Displacements (BLC 14 : Larc-N Rot Stiff 2)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	N145	L	Y	-10

Node Loads and Enforced Displacements (BLC 15 : EQUIP DL1)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	N143	L	Y	-0.441
2	N144	L	Y	-0.441
3	N146	L	Y	-0.441
4	N145	L	Y	-0.441
5	N160	L	Y	-0.282
6	N161	L	Y	-0.282
7	N267	L	Y	-0.084
8	N261	L	Y	-0.084

Node Loads and Enforced Displacements (BLC 16 : EQUIP DL2)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	N267	L	Y	-0.084
2	N261	L	Y	-0.084
3	N161	L	Y	-0.282
4	N160	L	Y	-0.282
5	N145	L	Y	-0.441
6	N146	L	Y	-0.441
7	N148	L	Y	-0.441
8	N147	L	Y	-0.441

Node Loads and Enforced Displacements (BLC 17 : EQUIP DL3)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	N147	L	Y	-0.441
2	N148	L	Y	-0.441
3	N150	L	Y	-0.441
4	N149	L	Y	-0.441
5	N160	L	Y	-0.282
6	N161	L	Y	-0.282
7	N267	L	Y	-0.084
8	N261	L	Y	-0.084

Node Loads and Enforced Displacements (BLC 18 : EQUIP DL4)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	N261	L	Y	-0.084
2	N267	L	Y	-0.084
3	N149	L	Y	-0.441
4	N150	L	Y	-0.441
5	N152	L	Y	-0.441
6	N151	L	Y	-0.441
7	N163	L	Y	-0.282

Node Loads and Enforced Displacements (BLC 18 : EQUIP DL4) (Continued)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s^2/in, k*s^2*in)]
8	N162	L	Y	-0.282

Node Loads and Enforced Displacements (BLC 19 : EQUIP DL5)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s^2/in, k*s^2*in)]
1	N159	L	Y	-0.282
2	N164	L	Y	-0.282
3	N154	L	Y	-0.441
4	N153	L	Y	-0.441
5	N151	L	Y	-0.441
6	N152	L	Y	-0.441
7	N266	L	Y	-0.084
8	N260	L	Y	-0.084

Node Loads and Enforced Displacements (BLC 20 : EQUIP DL6)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s^2/in, k*s^2*in)]
1	N156	L	Y	-0.441
2	N155	L	Y	-0.441
3	N154	L	Y	-0.441
4	N153	L	Y	-0.441
5	N268	L	Y	-0.084
6	N262	L	Y	-0.084
7	N165	L	Y	-0.282
8	N166	L	Y	-0.282

Node Loads and Enforced Displacements (BLC 21 : EQUIP DL7)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s^2/in, k*s^2*in)]
1	N156	L	Y	-0.441
2	N154	L	Y	-0.441
3	N155	L	Y	-0.441
4	N153	L	Y	-0.441
5	N269	L	Y	-0.084
6	N263	L	Y	-0.084
7	N157	L	Y	-0.282
8	N158	L	Y	-0.282

Node Loads and Enforced Displacements (BLC 22 : EQUIP DL8)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s^2/in, k*s^2*in)]
1	N167	L	Y	-0.282
2	N168	L	Y	-0.282
3	N155	L	Y	-0.441
4	N156	L	Y	-0.441
5	N153	L	Y	-0.441
6	N154	L	Y	-0.441
7	N269	L	Y	-0.084
8	N263	L	Y	-0.084

Node Loads and Enforced Displacements (BLC 23 : EQUIP EL1)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	N144	L	Y	-2.493
2	N146	L	Y	-2.493
3	N143	L	Y	2.493
4	N145	L	Y	2.493
5	N160	L	Y	-1.662
6	N161	L	Y	1.662
7	N261	L	Y	1.999
8	N267	L	Y	-1.999

Node Loads and Enforced Displacements (BLC 24 : EQUIP EL2)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	N147	L	Y	2.493
2	N145	L	Y	2.493
3	N146	L	Y	-2.493
4	N148	L	Y	-2.493
5	N160	L	Y	-1.662
6	N161	L	Y	1.662
7	N261	L	Y	1.999
8	N267	L	Y	-1.999

Node Loads and Enforced Displacements (BLC 25 : EQUIP EL3)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	N148	L	Y	-2.493
2	N150	L	Y	-2.493
3	N149	L	Y	2.493
4	N147	L	Y	2.493
5	N160	L	Y	-1.662
6	N161	L	Y	1.662
7	N261	L	Y	1.999
8	N267	L	Y	-1.999

Node Loads and Enforced Displacements (BLC 26 : EQUIP EL4)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	N151	L	Y	2.493
2	N149	L	Y	2.493
3	N150	L	Y	-2.493
4	N152	L	Y	-2.493
5	N163	L	Y	-1.662
6	N162	L	Y	1.662
7	N261	L	Y	1.999
8	N267	L	Y	-1.999

Node Loads and Enforced Displacements (BLC 27 : EQUIP EL5)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	N152	L	Y	-2.493
2	N154	L	Y	-2.493
3	N151	L	Y	2.493
4	N153	L	Y	2.493
5	N266	L	Y	-1.999

Node Loads and Enforced Displacements (BLC 27 : EQUIP EL5) (Continued)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
6	N260	L	Y	1.999
7	N159	L	Y	-1.662
8	N164	L	Y	1.662

Node Loads and Enforced Displacements (BLC 28 : EQUIP EL6)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	N155	L	Y	2.493
2	N153	L	Y	2.493
3	N154	L	Y	-2.493
4	N156	L	Y	-2.493
5	N268	L	Y	-1.999
6	N262	L	Y	1.999
7	N165	L	Y	1.662
8	N166	L	Y	-1.662

Node Loads and Enforced Displacements (BLC 29 : EQUIP EL7)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	N154	L	Y	-2.493
2	N156	L	Y	-2.493
3	N155	L	Y	2.493
4	N153	L	Y	2.493
5	N269	L	Y	-1.999
6	N263	L	Y	1.999
7	N158	L	Y	-1.662
8	N157	L	Y	1.662

Node Loads and Enforced Displacements (BLC 30 : EQUIP EL8)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	N155	L	Y	2.493
2	N153	L	Y	2.493
3	N154	L	Y	-2.493
4	N156	L	Y	-2.493
5	N269	L	Y	-1.999
6	N263	L	Y	1.999
7	N168	L	Y	1.662
8	N167	L	Y	-1.662

Node Loads and Enforced Displacements (BLC 31 : Ceiling Stiff 1)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	N298	L	Y	-34.2

Node Loads and Enforced Displacements (BLC 32 : Ceiling Stiff 2)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	N296	L	Y	-34.2

Node Loads and Enforced Displacements (BLC 33 : Ceiling Stiff 3)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	N294	L	Y	-34.2

Node Loads and Enforced Displacements (BLC 34 : Ceiling Stiff 4)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	N292	L	Y	-34.2

Node Loads and Enforced Displacements (BLC 35 : Ceiling Stiff 5)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	N290	L	Y	-34.2

Node Loads and Enforced Displacements (BLC 36 : Ceiling Stiff 6)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	N288	L	Y	-34.2

Node Loads and Enforced Displacements (BLC 37 : Ceiling Stiff 7)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	N231	L	Y	-34.2

Node Loads and Enforced Displacements (BLC 38 : Ceiling Stiff 8)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	N232	L	Y	-34.2

Node Loads and Enforced Displacements (BLC 39 : Ceiling Stiff 9)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	N211	L	Y	-34.2

Node Loads and Enforced Displacements (BLC 40 : Ceiling Stiff 10)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	N208	L	Y	-34.2

Node Loads and Enforced Displacements (BLC 41 : Ceiling Stiff 11)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	N236	L	Y	-34.2

Node Loads and Enforced Displacements (BLC 42 : Ceiling Stiff 12)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	N214	L	Y	-34.2

Node Loads and Enforced Displacements (BLC 43 : Ceiling Stiff 13)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	N212	L	Y	-34.2

Node Loads and Enforced Displacements (BLC 44 : Ceiling Stiff 14)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	N204	L	Y	-34.2

Node Loads and Enforced Displacements (BLC 45 : Ceiling Stiff 15)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	N216	L	Y	-34.2

Node Loads and Enforced Displacements (BLC 46 : Ceiling Stiff 16)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	N191	L	Y	-34.2

Node Loads and Enforced Displacements (BLC 47 : Ceiling Stiff 17)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	N227	L	Y	-34.2

Node Loads and Enforced Displacements (BLC 48 : Ceiling Stiff 18)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	N228	L	Y	-34.2

Node Loads and Enforced Displacements (BLC 49 : Ceiling Stiff 19)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	N229	L	Y	-34.2

Node Loads and Enforced Displacements (BLC 50 : Ceiling Stiff 20)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	N206	L	Y	-34.2

Node Loads and Enforced Displacements (BLC 51 : Ceiling Stiff 21)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	N225	L	Y	-34.2

Node Loads and Enforced Displacements (BLC 52 : Ceiling Stiff 22)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	N203	L	Y	-34.2

Node Loads and Enforced Displacements (BLC 53 : Ceiling Stiff 23)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	N223	L	Y	-34.2

Node Loads and Enforced Displacements (BLC 54 : Ceiling Stiff 24)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	N316	L	Y	-34.2

Node Loads and Enforced Displacements (BLC 55 : Ceiling Stiff 25)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	N215	L	Y	-34.2

Node Loads and Enforced Displacements (BLC 56 : Ceiling Stiff 26)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	N230	L	Y	-34.2

Node Loads and Enforced Displacements (BLC 57 : Ceiling Stiff 27)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	N234	L	Y	-34.2

Node Loads and Enforced Displacements (BLC 58 : Ceiling Stiff 28)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	N213	L	Y	-34.2

Node Loads and Enforced Displacements (BLC 59 : Ceiling Stiff 29)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	N233	L	Y	-34.2

Node Loads and Enforced Displacements (BLC 60 : Ceiling Stiff 30)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	N205	L	Y	-34.2

Node Loads and Enforced Displacements (BLC 61 : Ceiling Stiff 31)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	N235	L	Y	-34.2

Node Loads and Enforced Displacements (BLC 62 : Ceiling Stiff 32)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)]
1	N224	L	Y	-34.2

Member Point Loads

No Data to Print...

Member Distributed Loads (BLC 1 : Self Wt)

	Member Label	Direction	Start Magnitude [k/ft, F, psf, k-ft/in]	End Magnitude [k/ft, F, psf, k-ft/in]	Start Location [(in, %)]	End Location [(in, %)]
1	M36	Y	-0.007	-0.007	0	%100
2	M159	Y	-0.007	-0.007	0	%100
3	M160	Y	-0.007	-0.007	0	%100
4	M161	Y	-0.007	-0.007	0	%100
5	M162	Y	-0.007	-0.007	0	%100
6	M37	Y	-0.007	-0.007	0	%100
7	M163	Y	-0.007	-0.007	0	%100
8	M164	Y	-0.007	-0.007	0	%100
9	M165	Y	-0.007	-0.007	0	%100
10	M166	Y	-0.007	-0.007	0	%100
11	M35	Y	-0.007	-0.007	0	%100
12	M167	Y	-0.007	-0.007	0	%100
13	M168	Y	-0.007	-0.007	0	%100
14	M169	Y	-0.007	-0.007	0	%100
15	M170	Y	-0.007	-0.007	0	%100
16	M171	Y	-0.007	-0.007	0	%100
17	M34	Y	-0.007	-0.007	0	%100
18	M172	Y	-0.007	-0.007	0	%100
19	M173	Y	-0.007	-0.007	0	%100
20	M174	Y	-0.007	-0.007	0	%100
21	M175	Y	-0.007	-0.007	0	%100
22	M176	Y	-0.007	-0.007	0	%100

Member Distributed Loads (BLC 63 : BLC 2 Transient Area Loads)

	Member Label	Direction	Start Magnitude [k/ft, F, psf, k-ft/in]	End Magnitude [k/ft, F, psf, k-ft/in]	Start Location [(in, %)]	End Location [(in, %)]
1	M2	Y	-0.015	-0.02	0	22.1
2	M2	Y	-0.02	-0.019	22.1	44.2
3	M2	Y	-0.019	-0.018	44.2	66.3
4	M2	Y	-0.018	-0.021	66.3	88.4
5	M2	Y	-0.021	-0.021	88.4	110.5
6	M3	Y	-0.02	-0.024	0	22.1
7	M3	Y	-0.024	-0.018	22.1	44.2
8	M3	Y	-0.018	-0.016	44.2	66.3
9	M3	Y	-0.016	-0.021	66.3	88.4
10	M3	Y	-0.021	-0.021	88.4	110.5
11	M6	Y	-0.071	-0.073	0	22.1
12	M6	Y	-0.073	-0.059	22.1	44.2
13	M6	Y	-0.059	-0.063	44.2	66.3
14	M6	Y	-0.063	-0.09	66.3	88.4
15	M6	Y	-0.09	-0.106	88.4	110.5
16	M7	Y	-0.028	-0.024	0	22.1
17	M7	Y	-0.024	-0.027	22.1	44.2
18	M7	Y	-0.027	-0.027	44.2	66.3
19	M7	Y	-0.027	-0.025	66.3	88.4
20	M7	Y	-0.025	-0.03	88.4	110.5
21	M8	Y	-0.033	-0.03	0	22.1
22	M8	Y	-0.03	-0.033	22.1	44.2
23	M8	Y	-0.033	-0.033	44.2	66.3
24	M8	Y	-0.033	-0.034	66.3	88.4
25	M8	Y	-0.034	-0.044	88.4	110.5

Member Distributed Loads (BLC 63 : BLC 2 Transient Area Loads) (Continued)

	Member Label	Direction	Start Magnitude [k/ft, F, psf, k-ft/in]	End Magnitude [k/ft, F, psf, k-ft/in]	Start Location [(in, %)]	End Location [(in, %)]
26	M9	Y	-0.073	-0.081	0	22.1
27	M9	Y	-0.081	-0.084	22.1	44.2
28	M9	Y	-0.084	-0.089	44.2	66.3
29	M9	Y	-0.089	-0.095	66.3	88.4
30	M9	Y	-0.095	-0.097	88.4	110.5
31	M17	Y	-0.057	-0.057	0	24.769
32	M17	Y	-0.057	-0.057	24.769	49.538
33	M17	Y	-0.057	-0.057	49.538	74.308
34	M17	Y	-0.057	-0.057	74.308	99.077
35	M17	Y	-0.057	-0.057	99.077	123.846
36	M17	Y	-0.057	-0.059	123.846	148.615
37	M17	Y	-0.059	-0.065	148.615	173.385
38	M17	Y	-0.065	-0.059	173.385	198.154
39	M17	Y	-0.059	-0.052	198.154	222.923
40	M17	Y	-0.052	-0.062	222.923	247.692
41	M17	Y	-0.062	-0.063	247.692	272.462
42	M17	Y	-0.063	-0.054	272.462	297.231
43	M17	Y	-0.054	-0.047	297.231	322
44	M18	Y	-0.102	-0.106	0	24.769
45	M18	Y	-0.106	-0.114	24.769	49.538
46	M18	Y	-0.114	-0.118	49.538	74.308
47	M18	Y	-0.118	-0.114	74.308	99.077
48	M18	Y	-0.114	-0.125	99.077	123.846
49	M18	Y	-0.125	-0.129	123.846	148.615
50	M18	Y	-0.129	-0.112	148.615	173.385
51	M18	Y	-0.112	-0.11	173.385	198.154
52	M18	Y	-0.11	-0.111	198.154	222.923
53	M18	Y	-0.111	-0.105	222.923	247.692
54	M18	Y	-0.105	-0.115	247.692	272.462
55	M18	Y	-0.115	-0.121	272.462	297.231
56	M18	Y	-0.121	-0.108	297.231	322
57	M19	Y	-0.138	-0.123	0	24.769
58	M19	Y	-0.123	-0.112	24.769	49.538
59	M19	Y	-0.112	-0.111	49.538	74.308
60	M19	Y	-0.111	-0.113	74.308	99.077
61	M19	Y	-0.113	-0.105	99.077	123.846
62	M19	Y	-0.105	-0.111	123.846	148.615
63	M19	Y	-0.111	-0.132	148.615	173.385
64	M19	Y	-0.132	-0.124	173.385	198.154
65	M19	Y	-0.124	-0.113	198.154	222.923
66	M19	Y	-0.113	-0.117	222.923	247.692
67	M19	Y	-0.117	-0.115	247.692	272.462
68	M19	Y	-0.115	-0.111	272.462	297.231
69	M19	Y	-0.111	-0.112	297.231	322
70	M20	Y	-0.118	-0.112	0	24.769
71	M20	Y	-0.112	-0.112	24.769	49.538
72	M20	Y	-0.112	-0.112	49.538	74.308
73	M20	Y	-0.112	-0.11	74.308	99.077
74	M20	Y	-0.11	-0.118	99.077	123.846
75	M20	Y	-0.118	-0.123	123.846	148.615
76	M20	Y	-0.123	-0.124	148.615	173.385
77	M20	Y	-0.124	-0.122	173.385	198.154
78	M20	Y	-0.122	-0.115	198.154	222.923
79	M20	Y	-0.115	-0.114	222.923	247.692
80	M20	Y	-0.114	-0.117	247.692	272.462

Member Distributed Loads (BLC 63 : BLC 2 Transient Area Loads) (Continued)

	Member Label	Direction	Start Magnitude [k/ft, F, psf, k-ft/in]	End Magnitude [k/ft, F, psf, k-ft/in]	Start Location [(in, %)]	End Location [(in, %)]
81	M20	Y	-0.117	-0.113	272.462	297.231
82	M20	Y	-0.113	-0.1	297.231	322
83	M21	Y	-0.104	-0.113	0	24.769
84	M21	Y	-0.113	-0.115	24.769	49.538
85	M21	Y	-0.115	-0.11	49.538	74.308
86	M21	Y	-0.11	-0.119	74.308	99.077
87	M21	Y	-0.119	-0.127	99.077	123.846
88	M21	Y	-0.127	-0.121	123.846	148.615
89	M21	Y	-0.121	-0.103	148.615	173.385
90	M21	Y	-0.103	-0.103	173.385	198.154
91	M21	Y	-0.103	-0.112	198.154	222.923
92	M21	Y	-0.112	-0.124	222.923	247.692
93	M21	Y	-0.124	-0.118	247.692	272.462
94	M21	Y	-0.118	-0.105	272.462	297.231
95	M21	Y	-0.105	-0.125	297.231	322
96	M22	Y	-0.057	-0.057	0	24.769
97	M22	Y	-0.057	-0.057	24.769	49.538
98	M22	Y	-0.057	-0.057	49.538	74.308
99	M22	Y	-0.057	-0.057	74.308	99.077
100	M22	Y	-0.057	-0.057	99.077	123.846
101	M22	Y	-0.057	-0.059	123.846	148.615
102	M22	Y	-0.059	-0.066	148.615	173.385
103	M22	Y	-0.066	-0.066	173.385	198.154
104	M22	Y	-0.066	-0.059	198.154	222.923
105	M22	Y	-0.059	-0.057	222.923	247.692
106	M22	Y	-0.057	-0.058	247.692	272.462
107	M22	Y	-0.058	-0.057	272.462	297.231
108	M22	Y	-0.057	-0.055	297.231	322
109	Renno-M28	Y	-0.066	-0.06	0	22.1
110	Renno-M28	Y	-0.06	-0.054	22.1	44.2
111	Renno-M28	Y	-0.054	-0.052	44.2	66.3
112	Renno-M28	Y	-0.052	-0.052	66.3	88.4
113	Renno-M28	Y	-0.052	-0.053	88.4	110.5
114	Renno-M29	Y	-0.052	-0.048	0	22.1
115	Renno-M29	Y	-0.048	-0.044	22.1	44.2
116	Renno-M29	Y	-0.044	-0.042	44.2	66.3
117	Renno-M29	Y	-0.042	-0.048	66.3	88.4
118	Renno-M29	Y	-0.048	-0.057	88.4	110.5
119	Renno-M30	Y	-0.036	-0.031	0	22.1
120	Renno-M30	Y	-0.031	-0.03	22.1	44.2
121	Renno-M30	Y	-0.03	-0.032	44.2	66.3
122	Renno-M30	Y	-0.032	-0.035	66.3	88.4
123	Renno-M30	Y	-0.035	-0.038	88.4	110.5
124	Renno-M31	Y	-0.051	-0.055	0	22.1
125	Renno-M31	Y	-0.055	-0.052	22.1	44.2
126	Renno-M31	Y	-0.052	-0.049	44.2	66.3
127	Renno-M31	Y	-0.049	-0.049	66.3	88.4
128	Renno-M31	Y	-0.049	-0.045	88.4	110.5
129	M149	Y	-0.054	-0.033	0	8.979
130	M149	Y	-0.033	-0.026	8.979	17.958
131	M149	Y	-0.026	-0.032	17.958	26.938
132	M150	Y	-0.038	-0.03	0	5.388
133	M150	Y	-0.03	-0.03	5.388	10.775
134	M150	Y	-0.03	-0.036	10.775	16.163
135	M150	Y	-0.036	-0.034	16.163	21.55

Member Distributed Loads (BLC 63 : BLC 2 Transient Area Loads) (Continued)

	Member Label	Direction	Start Magnitude [k/ft, F, psf, k-ft/in]	End Magnitude [k/ft, F, psf, k-ft/in]	Start Location [(in, %)]	End Location [(in, %)]
136	M150	Y	-0.034	-0.028	21.55	26.938
137	M180	Y	-0.025	-0.037	0	26.357
138	M180	Y	-0.037	-0.036	26.357	52.714
139	M180	Y	-0.036	-0.034	52.714	79.071
140	M180	Y	-0.034	-0.034	79.071	105.429
141	M180	Y	-0.034	-0.036	105.429	131.786
142	M180	Y	-0.036	-0.04	131.786	158.143
143	M180	Y	-0.04	-0.033	158.143	184.5
144	M181	Y	-0.058	-0.058	0.025	184.422
145	M182	Y	-0.057	-0.057	0.013	184.447
146	M183	Y	-0.049	-0.062	0	26.357
147	M183	Y	-0.062	-0.061	26.357	52.714
148	M183	Y	-0.061	-0.058	52.714	79.071
149	M183	Y	-0.058	-0.058	79.071	105.429
150	M183	Y	-0.058	-0.061	105.429	131.786
151	M183	Y	-0.061	-0.062	131.786	158.143
152	M183	Y	-0.062	-0.049	158.143	184.5
153	M184	Y	-0.023	-0.026	0	26.357
154	M184	Y	-0.026	-0.024	26.357	52.714
155	M184	Y	-0.024	-0.023	52.714	79.071
156	M184	Y	-0.023	-0.022	79.071	105.429
157	M184	Y	-0.022	-0.023	105.429	131.786
158	M184	Y	-0.023	-0.026	131.786	158.143
159	M184	Y	-0.026	-0.023	158.143	184.5
160	M185	Y	-0.068	-0.108	0	26.357
161	M185	Y	-0.108	-0.107	26.357	52.714
162	M185	Y	-0.107	-0.086	52.714	79.071
163	M185	Y	-0.086	-0.086	79.071	105.429
164	M185	Y	-0.086	-0.107	105.429	131.786
165	M185	Y	-0.107	-0.107	131.786	158.143
166	M185	Y	-0.107	-0.067	158.143	184.5
167	M186	Y	-0.042	-0.035	0	26.357
168	M186	Y	-0.035	-0.031	26.357	52.714
169	M186	Y	-0.031	-0.032	52.714	79.071
170	M186	Y	-0.032	-0.032	79.071	105.429
171	M186	Y	-0.032	-0.031	105.429	131.786
172	M186	Y	-0.031	-0.036	131.786	158.143
173	M186	Y	-0.036	-0.045	158.143	184.5
174	M187	Y	-0.069	-0.115	0	26.357
175	M187	Y	-0.115	-0.116	26.357	52.714
176	M187	Y	-0.116	-0.094	52.714	79.071
177	M187	Y	-0.094	-0.094	79.071	105.429
178	M187	Y	-0.094	-0.116	105.429	131.786
179	M187	Y	-0.116	-0.114	131.786	158.143
180	M187	Y	-0.114	-0.068	158.143	184.5
181	M188	Y	-0.075	-0.061	0	26.357
182	M188	Y	-0.061	-0.053	26.357	52.714
183	M188	Y	-0.053	-0.053	52.714	79.071
184	M188	Y	-0.053	-0.053	79.071	105.429
185	M188	Y	-0.053	-0.053	105.429	131.786
186	M188	Y	-0.053	-0.061	131.786	158.143
187	M188	Y	-0.061	-0.075	158.143	184.5
188	M189	Y	-0.062	-0.058	0	26.357
189	M189	Y	-0.058	-0.052	26.357	52.714
190	M189	Y	-0.052	-0.048	52.714	79.071

Member Distributed Loads (BLC 63 : BLC 2 Transient Area Loads) (Continued)

	Member Label	Direction	Start Magnitude [k/ft, F, psf, k-ft/in]	End Magnitude [k/ft, F, psf, k-ft/in]	Start Location [(in, %)]	End Location [(in, %)]
191	M189	Y	-0.048	-0.049	79.071	105.429
192	M189	Y	-0.049	-0.054	105.429	131.786
193	M189	Y	-0.054	-0.056	131.786	158.143
194	M189	Y	-0.056	-0.049	158.143	184.5
195	M192	Y	-0.057	-0.058	0	22.1
196	M192	Y	-0.058	-0.049	22.1	44.2
197	M192	Y	-0.049	-0.05	44.2	66.3
198	M192	Y	-0.05	-0.064	66.3	88.4
199	M192	Y	-0.064	-0.07	88.4	110.5
200	M193	Y	-0.06	-0.048	0	22.1
201	M193	Y	-0.048	-0.051	22.1	44.2
202	M193	Y	-0.051	-0.061	44.2	66.3
203	M193	Y	-0.061	-0.063	66.3	88.4
204	M193	Y	-0.063	-0.063	88.4	110.5
205	M10	Y	-0.119	-0.118	0	26.5
206	M10	Y	-0.118	-0.144	26.5	53
207	M10	Y	-0.144	-0.146	53	79.5
208	M10	Y	-0.146	-0.117	79.5	106
209	M10	Y	-0.117	-0.124	106	132.5
210	M10	Y	-0.124	-0.151	132.5	159
211	M11	Y	-0.034	-0.044	0	26.5
212	M11	Y	-0.044	-0.047	26.5	53
213	M11	Y	-0.047	-0.042	53	79.5
214	M11	Y	-0.042	-0.044	79.5	106
215	M11	Y	-0.044	-0.047	106	132.5
216	M11	Y	-0.047	-0.045	132.5	159
217	M12	Y	-0.015	-0.022	0	26.5
218	M12	Y	-0.022	-0.024	26.5	53
219	M12	Y	-0.024	-0.021	53	79.5
220	M12	Y	-0.021	-0.021	79.5	106
221	M12	Y	-0.021	-0.024	106	132.5
222	M12	Y	-0.024	-0.024	132.5	159
223	M13	Y	-0.135	-0.166	0	26.5
224	M13	Y	-0.166	-0.185	26.5	53
225	M13	Y	-0.185	-0.177	53	79.5
226	M13	Y	-0.177	-0.16	79.5	106
227	M13	Y	-0.16	-0.16	106	132.5
228	M13	Y	-0.16	-0.172	132.5	159
229	Renno-M23	Y	-0.036	-0.058	0	26.5
230	Renno-M23	Y	-0.058	-0.063	26.5	53
231	Renno-M23	Y	-0.063	-0.054	53	79.5
232	Renno-M23	Y	-0.054	-0.054	79.5	106
233	Renno-M23	Y	-0.054	-0.059	106	132.5
234	Renno-M23	Y	-0.059	-0.062	132.5	159
235	Renno-M24	Y	-0.084	-0.063	0	26.5
236	Renno-M24	Y	-0.063	-0.053	26.5	53
237	Renno-M24	Y	-0.053	-0.058	53	79.5
238	Renno-M24	Y	-0.058	-0.066	79.5	106
239	Renno-M24	Y	-0.066	-0.063	106	132.5
240	Renno-M24	Y	-0.063	-0.05	132.5	159
241	Renno-M25	Y	-0.017	-0.02	0	26.5
242	Renno-M25	Y	-0.02	-0.02	26.5	53
243	Renno-M25	Y	-0.02	-0.019	53	79.5
244	Renno-M25	Y	-0.019	-0.02	79.5	106
245	Renno-M25	Y	-0.02	-0.021	106	132.5

Member Distributed Loads (BLC 63 : BLC 2 Transient Area Loads) (Continued)

	Member Label	Direction	Start Magnitude [k/ft, F, psf, k-ft/in]	End Magnitude [k/ft, F, psf, k-ft/in]	Start Location [(in, %)]	End Location [(in, %)]
246	Renno-M25	Y	-0.021	-0.023	132.5	159
247	M26	Y	-0.025	-0.019	0	26.5
248	M26	Y	-0.019	-0.022	26.5	53
249	M26	Y	-0.022	-0.023	53	79.5
250	M26	Y	-0.023	-0.02	79.5	106
251	M26	Y	-0.02	-0.02	106	132.5
252	M26	Y	-0.02	-0.018	132.5	159
253	Renno-M27	Y	-0.038	-0.03	0	26.5
254	Renno-M27	Y	-0.03	-0.029	26.5	53
255	Renno-M27	Y	-0.029	-0.03	53	79.5
256	Renno-M27	Y	-0.03	-0.031	79.5	106
257	Renno-M27	Y	-0.031	-0.034	106	132.5
258	Renno-M27	Y	-0.034	-0.034	132.5	159
259	M145	Y	-0.022	-0.024	0	26.5
260	M145	Y	-0.024	-0.023	26.5	53
261	M145	Y	-0.023	-0.023	53	79.5
262	M145	Y	-0.023	-0.023	79.5	106
263	M145	Y	-0.023	-0.022	106	132.5
264	M145	Y	-0.022	-0.022	132.5	159

Member Distributed Loads (BLC 64 : BLC 3 Transient Area Loads)

	Member Label	Direction	Start Magnitude [k/ft, F, psf, k-ft/in]	End Magnitude [k/ft, F, psf, k-ft/in]	Start Location [(in, %)]	End Location [(in, %)]
1	M2	Y	-0.019	-0.025	0	22.1
2	M2	Y	-0.025	-0.024	22.1	44.2
3	M2	Y	-0.024	-0.023	44.2	66.3
4	M2	Y	-0.023	-0.026	66.3	88.4
5	M2	Y	-0.026	-0.026	88.4	110.5
6	M3	Y	-0.025	-0.029	0	22.1
7	M3	Y	-0.029	-0.022	22.1	44.2
8	M3	Y	-0.022	-0.019	44.2	66.3
9	M3	Y	-0.019	-0.026	66.3	88.4
10	M3	Y	-0.026	-0.026	88.4	110.5
11	M6	Y	-0.088	-0.091	0	22.1
12	M6	Y	-0.091	-0.074	22.1	44.2
13	M6	Y	-0.074	-0.078	44.2	66.3
14	M6	Y	-0.078	-0.112	66.3	88.4
15	M6	Y	-0.112	-0.133	88.4	110.5
16	M7	Y	-0.034	-0.03	0	22.1
17	M7	Y	-0.03	-0.033	22.1	44.2
18	M7	Y	-0.033	-0.033	44.2	66.3
19	M7	Y	-0.033	-0.031	66.3	88.4
20	M7	Y	-0.031	-0.038	88.4	110.5
21	M8	Y	-0.041	-0.038	0	22.1
22	M8	Y	-0.038	-0.041	22.1	44.2
23	M8	Y	-0.041	-0.041	44.2	66.3
24	M8	Y	-0.041	-0.043	66.3	88.4
25	M8	Y	-0.043	-0.055	88.4	110.5
26	M9	Y	-0.091	-0.101	0	22.1
27	M9	Y	-0.101	-0.105	22.1	44.2
28	M9	Y	-0.105	-0.111	44.2	66.3
29	M9	Y	-0.111	-0.119	66.3	88.4
30	M9	Y	-0.119	-0.121	88.4	110.5
31	M17	Y	-0.071	-0.071	0	24.769
32	M17	Y	-0.071	-0.071	24.769	49.538
33	M17	Y	-0.071	-0.071	49.538	74.308

Member Distributed Loads (BLC 64 : BLC 3 Transient Area Loads) (Continued)

	Member Label	Direction	Start Magnitude [k/ft, F, psf, k-ft/in]	End Magnitude [k/ft, F, psf, k-ft/in]	Start Location [(in, %)]	End Location [(in, %)]
34	M17	Y	-0.071	-0.071	74.308	99.077
35	M17	Y	-0.071	-0.072	99.077	123.846
36	M17	Y	-0.072	-0.074	123.846	148.615
37	M17	Y	-0.074	-0.081	148.615	173.385
38	M17	Y	-0.081	-0.074	173.385	198.154
39	M17	Y	-0.074	-0.065	198.154	222.923
40	M17	Y	-0.065	-0.077	222.923	247.692
41	M17	Y	-0.077	-0.079	247.692	272.462
42	M17	Y	-0.079	-0.067	272.462	297.231
43	M17	Y	-0.067	-0.059	297.231	322
44	M18	Y	-0.127	-0.132	0	24.769
45	M18	Y	-0.132	-0.142	24.769	49.538
46	M18	Y	-0.142	-0.147	49.538	74.308
47	M18	Y	-0.147	-0.142	74.308	99.077
48	M18	Y	-0.142	-0.157	99.077	123.846
49	M18	Y	-0.157	-0.161	123.846	148.615
50	M18	Y	-0.161	-0.14	148.615	173.385
51	M18	Y	-0.14	-0.137	173.385	198.154
52	M18	Y	-0.137	-0.139	198.154	222.923
53	M18	Y	-0.139	-0.131	222.923	247.692
54	M18	Y	-0.131	-0.143	247.692	272.462
55	M18	Y	-0.143	-0.152	272.462	297.231
56	M18	Y	-0.152	-0.135	297.231	322
57	M19	Y	-0.172	-0.154	0	24.769
58	M19	Y	-0.154	-0.141	24.769	49.538
59	M19	Y	-0.141	-0.139	49.538	74.308
60	M19	Y	-0.139	-0.142	74.308	99.077
61	M19	Y	-0.142	-0.131	99.077	123.846
62	M19	Y	-0.131	-0.139	123.846	148.615
63	M19	Y	-0.139	-0.165	148.615	173.385
64	M19	Y	-0.165	-0.156	173.385	198.154
65	M19	Y	-0.156	-0.141	198.154	222.923
66	M19	Y	-0.141	-0.146	222.923	247.692
67	M19	Y	-0.146	-0.143	247.692	272.462
68	M19	Y	-0.143	-0.138	272.462	297.231
69	M19	Y	-0.138	-0.14	297.231	322
70	M20	Y	-0.147	-0.14	0	24.769
71	M20	Y	-0.14	-0.14	24.769	49.538
72	M20	Y	-0.14	-0.14	49.538	74.308
73	M20	Y	-0.14	-0.137	74.308	99.077
74	M20	Y	-0.137	-0.148	99.077	123.846
75	M20	Y	-0.148	-0.154	123.846	148.615
76	M20	Y	-0.154	-0.155	148.615	173.385
77	M20	Y	-0.155	-0.153	173.385	198.154
78	M20	Y	-0.153	-0.144	198.154	222.923
79	M20	Y	-0.144	-0.142	222.923	247.692
80	M20	Y	-0.142	-0.146	247.692	272.462
81	M20	Y	-0.146	-0.141	272.462	297.231
82	M20	Y	-0.141	-0.125	297.231	322
83	M21	Y	-0.13	-0.142	0	24.769
84	M21	Y	-0.142	-0.143	24.769	49.538
85	M21	Y	-0.143	-0.138	49.538	74.308
86	M21	Y	-0.138	-0.149	74.308	99.077
87	M21	Y	-0.149	-0.159	99.077	123.846
88	M21	Y	-0.159	-0.152	123.846	148.615

Member Distributed Loads (BLC 64 : BLC 3 Transient Area Loads) (Continued)

	Member Label	Direction	Start Magnitude [k/ft, F, psf, k-ft/in]	End Magnitude [k/ft, F, psf, k-ft/in]	Start Location [(in, %)]	End Location [(in, %)]
89	M21	Y	-0.152	-0.129	148.615	173.385
90	M21	Y	-0.129	-0.129	173.385	198.154
91	M21	Y	-0.129	-0.14	198.154	222.923
92	M21	Y	-0.14	-0.155	222.923	247.692
93	M21	Y	-0.155	-0.147	247.692	272.462
94	M21	Y	-0.147	-0.131	272.462	297.231
95	M21	Y	-0.131	-0.156	297.231	322
96	M22	Y	-0.071	-0.071	0	24.769
97	M22	Y	-0.071	-0.071	24.769	49.538
98	M22	Y	-0.071	-0.071	49.538	74.308
99	M22	Y	-0.071	-0.071	74.308	99.077
100	M22	Y	-0.071	-0.071	99.077	123.846
101	M22	Y	-0.071	-0.073	123.846	148.615
102	M22	Y	-0.073	-0.082	148.615	173.385
103	M22	Y	-0.082	-0.082	173.385	198.154
104	M22	Y	-0.082	-0.074	198.154	222.923
105	M22	Y	-0.074	-0.072	222.923	247.692
106	M22	Y	-0.072	-0.072	247.692	272.462
107	M22	Y	-0.072	-0.071	272.462	297.231
108	M22	Y	-0.071	-0.069	297.231	322
109	Renno-M28	Y	-0.083	-0.075	0	22.1
110	Renno-M28	Y	-0.075	-0.068	22.1	44.2
111	Renno-M28	Y	-0.068	-0.065	44.2	66.3
112	Renno-M28	Y	-0.065	-0.066	66.3	88.4
113	Renno-M28	Y	-0.066	-0.066	88.4	110.5
114	Renno-M29	Y	-0.065	-0.06	0	22.1
115	Renno-M29	Y	-0.06	-0.055	22.1	44.2
116	Renno-M29	Y	-0.055	-0.053	44.2	66.3
117	Renno-M29	Y	-0.053	-0.059	66.3	88.4
118	Renno-M29	Y	-0.059	-0.071	88.4	110.5
119	Renno-M30	Y	-0.045	-0.039	0	22.1
120	Renno-M30	Y	-0.039	-0.038	22.1	44.2
121	Renno-M30	Y	-0.038	-0.04	44.2	66.3
122	Renno-M30	Y	-0.04	-0.044	66.3	88.4
123	Renno-M30	Y	-0.044	-0.048	88.4	110.5
124	Renno-M31	Y	-0.063	-0.069	0	22.1
125	Renno-M31	Y	-0.069	-0.064	22.1	44.2
126	Renno-M31	Y	-0.064	-0.061	44.2	66.3
127	Renno-M31	Y	-0.061	-0.062	66.3	88.4
128	Renno-M31	Y	-0.062	-0.056	88.4	110.5
129	M149	Y	-0.067	-0.042	0	8.979
130	M149	Y	-0.042	-0.032	8.979	17.958
131	M149	Y	-0.032	-0.039	17.958	26.938
132	M150	Y	-0.048	-0.038	0	5.388
133	M150	Y	-0.038	-0.038	5.388	10.775
134	M150	Y	-0.038	-0.045	10.775	16.163
135	M150	Y	-0.045	-0.043	16.163	21.55
136	M150	Y	-0.043	-0.035	21.55	26.938
137	M180	Y	-0.032	-0.046	0	26.357
138	M180	Y	-0.046	-0.045	26.357	52.714
139	M180	Y	-0.045	-0.043	52.714	79.071
140	M180	Y	-0.043	-0.043	79.071	105.429
141	M180	Y	-0.043	-0.045	105.429	131.786
142	M180	Y	-0.045	-0.05	131.786	158.143
143	M180	Y	-0.05	-0.041	158.143	184.5

Member Distributed Loads (BLC 64 : BLC 3 Transient Area Loads) (Continued)

	Member Label	Direction	Start Magnitude [k/ft, F, psf, k-ft/in]	End Magnitude [k/ft, F, psf, k-ft/in]	Start Location [(in, %)]	End Location [(in, %)]
144	M181	Y	-0.072	-0.072	0.025	184.422
145	M182	Y	-0.072	-0.072	0.013	184.447
146	M183	Y	-0.061	-0.077	0	26.357
147	M183	Y	-0.077	-0.076	26.357	52.714
148	M183	Y	-0.076	-0.072	52.714	79.071
149	M183	Y	-0.072	-0.073	79.071	105.429
150	M183	Y	-0.073	-0.077	105.429	131.786
151	M183	Y	-0.077	-0.077	131.786	158.143
152	M183	Y	-0.077	-0.061	158.143	184.5
153	M184	Y	-0.029	-0.033	0	26.357
154	M184	Y	-0.033	-0.03	26.357	52.714
155	M184	Y	-0.03	-0.029	52.714	79.071
156	M184	Y	-0.029	-0.028	79.071	105.429
157	M184	Y	-0.028	-0.029	105.429	131.786
158	M184	Y	-0.029	-0.033	131.786	158.143
159	M184	Y	-0.033	-0.029	158.143	184.5
160	M185	Y	-0.084	-0.135	0	26.357
161	M185	Y	-0.135	-0.134	26.357	52.714
162	M185	Y	-0.134	-0.108	52.714	79.071
163	M185	Y	-0.108	-0.108	79.071	105.429
164	M185	Y	-0.108	-0.133	105.429	131.786
165	M185	Y	-0.133	-0.134	131.786	158.143
166	M185	Y	-0.134	-0.083	158.143	184.5
167	M186	Y	-0.053	-0.044	0	26.357
168	M186	Y	-0.044	-0.039	26.357	52.714
169	M186	Y	-0.039	-0.039	52.714	79.071
170	M186	Y	-0.039	-0.039	79.071	105.429
171	M186	Y	-0.039	-0.039	105.429	131.786
172	M186	Y	-0.039	-0.045	131.786	158.143
173	M186	Y	-0.045	-0.056	158.143	184.5
174	M187	Y	-0.086	-0.144	0	26.357
175	M187	Y	-0.144	-0.145	26.357	52.714
176	M187	Y	-0.145	-0.118	52.714	79.071
177	M187	Y	-0.118	-0.118	79.071	105.429
178	M187	Y	-0.118	-0.145	105.429	131.786
179	M187	Y	-0.145	-0.143	131.786	158.143
180	M187	Y	-0.143	-0.085	158.143	184.5
181	M188	Y	-0.093	-0.076	0	26.357
182	M188	Y	-0.076	-0.066	26.357	52.714
183	M188	Y	-0.066	-0.066	52.714	79.071
184	M188	Y	-0.066	-0.066	79.071	105.429
185	M188	Y	-0.066	-0.067	105.429	131.786
186	M188	Y	-0.067	-0.076	131.786	158.143
187	M188	Y	-0.076	-0.093	158.143	184.5
188	M189	Y	-0.077	-0.073	0	26.357
189	M189	Y	-0.073	-0.065	26.357	52.714
190	M189	Y	-0.065	-0.059	52.714	79.071
191	M189	Y	-0.059	-0.061	79.071	105.429
192	M189	Y	-0.061	-0.068	105.429	131.786
193	M189	Y	-0.068	-0.07	131.786	158.143
194	M189	Y	-0.07	-0.061	158.143	184.5
195	M192	Y	-0.071	-0.072	0	22.1
196	M192	Y	-0.072	-0.061	22.1	44.2
197	M192	Y	-0.061	-0.062	44.2	66.3
198	M192	Y	-0.062	-0.079	66.3	88.4

Member Distributed Loads (BLC 64 : BLC 3 Transient Area Loads) (Continued)

	Member Label	Direction	Start Magnitude [k/ft, F, psf, k-ft/in]	End Magnitude [k/ft, F, psf, k-ft/in]	Start Location [(in, %)]	End Location [(in, %)]
199	M192	Y	-0.079	-0.087	88.4	110.5
200	M193	Y	-0.075	-0.06	0	22.1
201	M193	Y	-0.06	-0.064	22.1	44.2
202	M193	Y	-0.064	-0.077	44.2	66.3
203	M193	Y	-0.077	-0.079	66.3	88.4
204	M193	Y	-0.079	-0.078	88.4	110.5
205	M10	Y	-0.149	-0.147	0	26.5
206	M10	Y	-0.147	-0.18	26.5	53
207	M10	Y	-0.18	-0.183	53	79.5
208	M10	Y	-0.183	-0.146	79.5	106
209	M10	Y	-0.146	-0.155	106	132.5
210	M10	Y	-0.155	-0.188	132.5	159
211	M11	Y	-0.042	-0.055	0	26.5
212	M11	Y	-0.055	-0.058	26.5	53
213	M11	Y	-0.058	-0.053	53	79.5
214	M11	Y	-0.053	-0.055	79.5	106
215	M11	Y	-0.055	-0.058	106	132.5
216	M11	Y	-0.058	-0.056	132.5	159
217	M12	Y	-0.019	-0.027	0	26.5
218	M12	Y	-0.027	-0.03	26.5	53
219	M12	Y	-0.03	-0.027	53	79.5
220	M12	Y	-0.027	-0.027	79.5	106
221	M12	Y	-0.027	-0.03	106	132.5
222	M12	Y	-0.03	-0.03	132.5	159
223	M13	Y	-0.168	-0.208	0	26.5
224	M13	Y	-0.208	-0.231	26.5	53
225	M13	Y	-0.231	-0.221	53	79.5
226	M13	Y	-0.221	-0.2	79.5	106
227	M13	Y	-0.2	-0.2	106	132.5
228	M13	Y	-0.2	-0.215	132.5	159
229	Renno-M23	Y	-0.045	-0.073	0	26.5
230	Renno-M23	Y	-0.073	-0.079	26.5	53
231	Renno-M23	Y	-0.079	-0.067	53	79.5
232	Renno-M23	Y	-0.067	-0.067	79.5	106
233	Renno-M23	Y	-0.067	-0.074	106	132.5
234	Renno-M23	Y	-0.074	-0.078	132.5	159
235	Renno-M24	Y	-0.105	-0.079	0	26.5
236	Renno-M24	Y	-0.079	-0.066	26.5	53
237	Renno-M24	Y	-0.066	-0.073	53	79.5
238	Renno-M24	Y	-0.073	-0.083	79.5	106
239	Renno-M24	Y	-0.083	-0.079	106	132.5
240	Renno-M24	Y	-0.079	-0.063	132.5	159
241	Renno-M25	Y	-0.021	-0.025	0	26.5
242	Renno-M25	Y	-0.025	-0.025	26.5	53
243	Renno-M25	Y	-0.025	-0.024	53	79.5
244	Renno-M25	Y	-0.024	-0.025	79.5	106
245	Renno-M25	Y	-0.025	-0.027	106	132.5
246	Renno-M25	Y	-0.027	-0.029	132.5	159
247	M26	Y	-0.031	-0.024	0	26.5
248	M26	Y	-0.024	-0.027	26.5	53
249	M26	Y	-0.027	-0.029	53	79.5
250	M26	Y	-0.029	-0.025	79.5	106
251	M26	Y	-0.025	-0.025	106	132.5
252	M26	Y	-0.025	-0.022	132.5	159
253	Renno-M27	Y	-0.047	-0.037	0	26.5

Member Distributed Loads (BLC 64 : BLC 3 Transient Area Loads) (Continued)

	Member Label	Direction	Start Magnitude [k/ft, F, psf, k-ft/in]	End Magnitude [k/ft, F, psf, k-ft/in]	Start Location [(in, %)]	End Location [(in, %)]
254	Renno-M27	Y	-0.037	-0.037	26.5	53
255	Renno-M27	Y	-0.037	-0.038	53	79.5
256	Renno-M27	Y	-0.038	-0.038	79.5	106
257	Renno-M27	Y	-0.038	-0.042	106	132.5
258	Renno-M27	Y	-0.042	-0.043	132.5	159
259	M145	Y	-0.028	-0.03	0	26.5
260	M145	Y	-0.03	-0.029	26.5	53
261	M145	Y	-0.029	-0.028	53	79.5
262	M145	Y	-0.028	-0.029	79.5	106
263	M145	Y	-0.029	-0.027	106	132.5
264	M145	Y	-0.027	-0.028	132.5	159

Member Area Loads (BLC 2 : Dead Load)

	Node A	Node B	Node C	Node D	Direction	Load Direction	A Magnitude [psf]	B Magnitude [psf]	C Magnitude [psf]	D Magnitude [psf]	Exclude Braces
1	R-N/1.3	R-M/1.3	R-M/3.0	R-N/3.0	Y	A-B	-20	-20	-20	-20	Yes
2	R-N/1.3	R-M/1.3	R-M/1.0	R-N/1.0	Y	A-B	-20	-20	-20	-20	Yes

Member Area Loads (BLC 3 : Snow Load)

	Node A	Node B	Node C	Node D	Direction	Load Direction	A Magnitude [psf]	B Magnitude [psf]	C Magnitude [psf]	D Magnitude [psf]	Exclude Braces
1	R-N/1.3	R-M/1.3	R-M/3.0	R-N/3.0	Y	A-B	-25	-25	-25	-25	Yes
2	R-N/1.3	R-M/1.3	R-M/1.0	R-N/1.0	Y	A-B	-25	-25	-25	-25	Yes

Basic Load Cases

	BLC Description	Category	Y Gravity	Nodal	Distributed	Area(Member)	Surface(Plate/Wall)
1	Self Wt	DL	-1		22		
2	Dead Load	DL		3		2	
3	Snow Load	SL				2	
4	Live Load	LL					
5	Stiffness Load 1	OL1		1			
6	Stiffness Load 2	OL2		1			
7	Stiffness Load 3	OL3					
8	Stryker MZ	OL4		3			
9	Stryker MX	OL5		3			
10	ELX	ELX					2
11	ELY	ELY					
12	ELZ	ELZ					2
13	Larc-N Rot Stiff 1	OL6		1			
14	Larc-N Rot Stiff 2	OL7		1			
15	EQUIP DL1	OL8		8			
16	EQUIP DL2	OL9		8			
17	EQUIP DL3	OL10		8			
18	EQUIP DL4	OL11		8			
19	EQUIP DL5	OL12		8			
20	EQUIP DL6	OL13		8			
21	EQUIP DL7	OL14		8			
22	EQUIP DL8	OL15		8			
23	EQUIP EL1	OL16		8			
24	EQUIP EL2	OL17		8			
25	EQUIP EL3	OL18		8			
26	EQUIP EL4	OL19		8			
27	EQUIP EL5	OL20		8			
28	EQUIP EL6	OL21		8			

Basic Load Cases (Continued)

	BLC Description	Category	Y Gravity	Nodal	Distributed	Area(Member)	Surface(Plate/Wall)
29	EQUIP EL7	OL22		8			
30	EQUIP EL8	OL23		8			
31	Ceiling Stiff 1	OL24		1			
32	Ceiling Stiff 2	OL25		1			
33	Ceiling Stiff 3	OL26		1			
34	Ceiling Stiff 4	OL27		1			
35	Ceiling Stiff 5	OL28		1			
36	Ceiling Stiff 6	OL29		1			
37	Ceiling Stiff 7	OL30		1			
38	Ceiling Stiff 8	OL31		1			
39	Ceiling Stiff 9	OL32		1			
40	Ceiling Stiff 10	OL33		1			
41	Ceiling Stiff 11	OL34		1			
42	Ceiling Stiff 12	OL35		1			
43	Ceiling Stiff 13	OL36		1			
44	Ceiling Stiff 14	OL37		1			
45	Ceiling Stiff 15	OL38		1			
46	Ceiling Stiff 16	OL39		1			
47	Ceiling Stiff 17	OL40		1			
48	Ceiling Stiff 18	OL41		1			
49	Ceiling Stiff 19	OL42		1			
50	Ceiling Stiff 20	OL43		1			
51	Ceiling Stiff 21	OL44		1			
52	Ceiling Stiff 22	OL45		1			
53	Ceiling Stiff 23	OL46		1			
54	Ceiling Stiff 24	OL47		1			
55	Ceiling Stiff 25	OL48		1			
56	Ceiling Stiff 26	OL49		1			
57	Ceiling Stiff 27	OL50		1			
58	Ceiling Stiff 28	OL51		1			
59	Ceiling Stiff 29	OL52		1			
60	Ceiling Stiff 30	OL53		1			
61	Ceiling Stiff 31	None		1			
62	Ceiling Stiff 32	OL55		1			
63	BLC 2 Transient Area Loads	None			264		
64	BLC 3 Transient Area Loads	None			264		

Load Combinations

	Description	Solve	P-Delta	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
1	Deflection 1	Yes	Y	DL	1																		
2	Deflection 2	Yes	Y	SL	1																		
3	Deflection 3	Yes	Y	DL	1	SL	1																
4	STIFFNESS1		Y	OL1	1																		
5	STIFFNESS2		Y	OL2	1																		
6	STIFFNESS3		Y	OL3	1																		
7	LARCN-Rot-Stiff-1		Y	OL6	1																		
8	LARCN-Rot-Stiff-2		Y	OL7	1																		
9	Deflection 1		Y	DL	1																		
10	Deflection 2		Y	LL	1																		
11	Deflection 3		Y	DL	1	LL	1																
12	Deflection 1		Y	DL	1																		
13	Deflection 2		Y	SL	1																		
14	Deflection 3		Y	DL	1	SL	1																
15	STIFFNESS1		Y	OL1	1																		
16	STIFFNESS2		Y	OL2	1																		

Load Combinations (Continued)

	Description	Solve	P-Delta	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
17	STIFFNESS3		Y	OL3	1																		
18	LARCN-Rot-Stiff-1		Y	OL6	1																		
19	LARCN-Rot-Stiff-2		Y	OL7	1																		
20	Deflection 1		Y	DL	1																		
21	Deflection 2		Y	LL	1																		
22	Deflection 3		Y	DL	1	LL	1																
23	IBC 16-8a-1	Yes	Y	DL	1	OL4	1	OL8	1														
24	IBC 16-8a-2	Yes	Y	DL	1	OL4	1	OL9	1														
25	IBC 16-8a-3	Yes	Y	DL	1	OL4	1	OL10	1														
26	IBC 16-8a-4	Yes	Y	DL	1	OL4	1	OL11	1														
27	IBC 16-8a-5	Yes	Y	DL	1	OL4	1	OL12	1														
28	IBC 16-8a-6	Yes	Y	DL	1	OL4	1	OL13	1														
29	IBC 16-8a-7	Yes	Y	DL	1	OL4	1	OL14	1														
30	IBC 16-8a-8	Yes	Y	DL	1	OL4	1	OL15	1														
31	IBC 16-8b-1	Yes	Y	DL	1	OL5	1	OL8	1														
32	IBC 16-8b-2	Yes	Y	DL	1	OL5	1	OL9	1														
33	IBC 16-8b-3	Yes	Y	DL	1	OL5	1	OL10	1														
34	IBC 16-8b-4	Yes	Y	DL	1	OL5	1	OL11	1														
35	IBC 16-8b-5	Yes	Y	DL	1	OL5	1	OL12	1														
36	IBC 16-8b-6	Yes	Y	DL	1	OL5	1	OL13	1														
37	IBC 16-8b-7	Yes	Y	DL	1	OL5	1	OL14	1														
38	IBC 16-8b-8	Yes	Y	DL	1	OL5	1	OL15	1														
39	IBC 16-9a-1	Yes	Y	DL	1	LL	1	LLS	1	OL4	1	OL8	1										
40	IBC 16-9a-2	Yes	Y	DL	1	LL	1	LLS	1	OL4	1	OL9	1										
41	IBC 16-9a-3	Yes	Y	DL	1	LL	1	LLS	1	OL4	1	OL10	1										
42	IBC 16-9a-4	Yes	Y	DL	1	LL	1	LLS	1	OL4	1	OL11	1										
43	IBC 16-9a-5	Yes	Y	DL	1	LL	1	LLS	1	OL4	1	OL12	1										
44	IBC 16-9a-6	Yes	Y	DL	1	LL	1	LLS	1	OL4	1	OL13	1										
45	IBC 16-9a-7	Yes	Y	DL	1	LL	1	LLS	1	OL4	1	OL14	1										
46	IBC 16-9a-8	Yes	Y	DL	1	LL	1	LLS	1	OL4	1	OL15	1										
47	IBC 16-9b-1	Yes	Y	DL	1	LL	1	LLS	1	OL5	1	OL8	1										
48	IBC 16-9b-2	Yes	Y	DL	1	LL	1	LLS	1	OL5	1	OL9	1										
49	IBC 16-9b-3	Yes	Y	DL	1	LL	1	LLS	1	OL5	1	OL10	1										
50	IBC 16-9b-4	Yes	Y	DL	1	LL	1	LLS	1	OL5	1	OL11	1										
51	IBC 16-9b-5	Yes	Y	DL	1	LL	1	LLS	1	OL5	1	OL12	1										
52	IBC 16-9b-6	Yes	Y	DL	1	LL	1	LLS	1	OL5	1	OL13	1										
53	IBC 16-9b-7	Yes	Y	DL	1	LL	1	LLS	1	OL5	1	OL14	1										
54	IBC 16-9b-8	Yes	Y	DL	1	LL	1	LLS	1	OL5	1	OL15	1										
55	IBC 16-10 (b)a-1	Yes	Y	DL	1	SL	1	SLN	1	OL4	1	OL8	1										
56	IBC 16-10 (b)a-2	Yes	Y	DL	1	SL	1	SLN	1	OL4	1	OL9	1										
57	IBC 16-10 (b)a-3	Yes	Y	DL	1	SL	1	SLN	1	OL4	1	OL10	1										
58	IBC 16-10 (b)a-4	Yes	Y	DL	1	SL	1	SLN	1	OL4	1	OL11	1										
59	IBC 16-10 (b)a-5	Yes	Y	DL	1	SL	1	SLN	1	OL4	1	OL12	1										
60	IBC 16-10 (b)a-6	Yes	Y	DL	1	SL	1	SLN	1	OL4	1	OL13	1										
61	IBC 16-10 (b)a-7	Yes	Y	DL	1	SL	1	SLN	1	OL4	1	OL14	1										
62	IBC 16-10 (b)a-8	Yes	Y	DL	1	SL	1	SLN	1	OL4	1	OL15	1										
63	IBC 16-10 (b)b-1	Yes	Y	DL	1	SL	1	SLN	1	OL5	1	OL8	1										
64	IBC 16-10 (b)b-2	Yes	Y	DL	1	SL	1	SLN	1	OL5	1	OL9	1										
65	IBC 16-10 (b)b-3	Yes	Y	DL	1	SL	1	SLN	1	OL5	1	OL10	1										
66	IBC 16-10 (b)b-4	Yes	Y	DL	1	SL	1	SLN	1	OL5	1	OL11	1										
67	IBC 16-10 (b)b-5	Yes	Y	DL	1	SL	1	SLN	1	OL5	1	OL12	1										
68	IBC 16-10 (b)b-6	Yes	Y	DL	1	SL	1	SLN	1	OL5	1	OL13	1										
69	IBC 16-10 (b)b-7	Yes	Y	DL	1	SL	1	SLN	1	OL5	1	OL14	1										
70	IBC 16-10 (b)b-8	Yes	Y	DL	1	SL	1	SLN	1	OL5	1	OL15	1										
71	IBC 16-11 (b)a-1	Yes	Y	DL	1	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL4	1	OL8	1						

Load Combinations (Continued)

	Description	Solve	P-Delta	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
72	IBC 16-11 (b)a-2	Yes	Y	DL	1	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL4	1	OL9	1						
73	IBC 16-11 (b)a-3	Yes	Y	DL	1	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL4	1	OL10	1						
74	IBC 16-11 (b)a-4	Yes	Y	DL	1	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL4	1	OL11	1						
75	IBC 16-11 (b)a-5	Yes	Y	DL	1	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL4	1	OL12	1						
76	IBC 16-11 (b)a-6	Yes	Y	DL	1	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL4	1	OL13	1						
77	IBC 16-11 (b)a-7	Yes	Y	DL	1	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL4	1	OL14	1						
78	IBC 16-11 (b)a-8	Yes	Y	DL	1	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL4	1	OL15	1						
79	IBC 16-11 (b)b-1	Yes	Y	DL	1	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL5	1	OL8	1						
80	IBC 16-11 (b)b-2	Yes	Y	DL	1	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL5	1	OL9	1						
81	IBC 16-11 (b)b-3	Yes	Y	DL	1	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL5	1	OL10	1						
82	IBC 16-11 (b)b-4	Yes	Y	DL	1	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL5	1	OL11	1						
83	IBC 16-11 (b)b-5	Yes	Y	DL	1	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL5	1	OL12	1						
84	IBC 16-11 (b)b-6	Yes	Y	DL	1	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL5	1	OL13	1						
85	IBC 16-11 (b)b-7	Yes	Y	DL	1	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL5	1	OL14	1						
86	IBC 16-11 (b)b-8	Yes	Y	DL	1	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL5	1	OL15	1						
87	IBC 16-12 (b) (a)a-1	Yes	Y	DL	1	Sds*DL	0.14	ELX	0.7	OL4	1	OL8	1.142										
88	IBC 16-12 (b) (a)a-2	Yes	Y	DL	1	Sds*DL	0.14	ELX	0.7	OL4	1	OL9	1.142										
89	IBC 16-12 (b) (a)a-3	Yes	Y	DL	1	Sds*DL	0.14	ELX	0.7	OL4	1	OL10	1.142										
90	IBC 16-12 (b) (a)a-4	Yes	Y	DL	1	Sds*DL	0.14	ELX	0.7	OL4	1	OL11	1.142										
91	IBC 16-12 (b) (a)a-5	Yes	Y	DL	1	Sds*DL	0.14	ELX	0.7	OL4	1	OL12	1.142										
92	IBC 16-12 (b) (a)a-6	Yes	Y	DL	1	Sds*DL	0.14	ELX	0.7	OL4	1	OL13	1.142										
93	IBC 16-12 (b) (a)a-7	Yes	Y	DL	1	Sds*DL	0.14	ELX	0.7	OL4	1	OL14	1.142										
94	IBC 16-12 (b) (a)a-8	Yes	Y	DL	1	Sds*DL	0.14	ELX	0.7	OL4	1	OL15	1.142										
95	IBC 16-12 (b) (a)b-1	Yes	Y	DL	1	Sds*DL	0.14	ELX	0.7	OL5	1	OL8	1.142										
96	IBC 16-12 (b) (a)b-2	Yes	Y	DL	1	Sds*DL	0.14	ELX	0.7	OL5	1	OL9	1.142										
97	IBC 16-12 (b) (a)b-3	Yes	Y	DL	1	Sds*DL	0.14	ELX	0.7	OL5	1	OL10	1.142										
98	IBC 16-12 (b) (a)b-4	Yes	Y	DL	1	Sds*DL	0.14	ELX	0.7	OL5	1	OL11	1.142										
99	IBC 16-12 (b) (a)b-5	Yes	Y	DL	1	Sds*DL	0.14	ELX	0.7	OL5	1	OL12	1.142										
100	IBC 16-12 (b) (a)b-6	Yes	Y	DL	1	Sds*DL	0.14	ELX	0.7	OL5	1	OL13	1.142										
101	IBC 16-12 (b) (a)b-7	Yes	Y	DL	1	Sds*DL	0.14	ELX	0.7	OL5	1	OL14	1.142										
102	IBC 16-12 (b) (a)b-8	Yes	Y	DL	1	Sds*DL	0.14	ELX	0.7	OL5	1	OL15	1.142										
103	IBC 16-12 (b) (b)a-1	Yes	Y	DL	1	Sds*DL	0.14	ELZ	0.7	OL4	1	OL8	1.142										
104	IBC 16-12 (b) (b)a-2	Yes	Y	DL	1	Sds*DL	0.14	ELZ	0.7	OL4	1	OL9	1.142										
105	IBC 16-12 (b) (b)a-3	Yes	Y	DL	1	Sds*DL	0.14	ELZ	0.7	OL4	1	OL10	1.142										
106	IBC 16-12 (b) (b)a-4	Yes	Y	DL	1	Sds*DL	0.14	ELZ	0.7	OL4	1	OL11	1.142										
107	IBC 16-12 (b) (b)a-5	Yes	Y	DL	1	Sds*DL	0.14	ELZ	0.7	OL4	1	OL12	1.142										
108	IBC 16-12 (b) (b)a-6	Yes	Y	DL	1	Sds*DL	0.14	ELZ	0.7	OL4	1	OL13	1.142										
109	IBC 16-12 (b) (b)a-7	Yes	Y	DL	1	Sds*DL	0.14	ELZ	0.7	OL4	1	OL14	1.142										
110	IBC 16-12 (b) (b)a-8	Yes	Y	DL	1	Sds*DL	0.14	ELZ	0.7	OL4	1	OL15	1.142										
111	IBC 16-12 (b) (b)b-1	Yes	Y	DL	1	Sds*DL	0.14	ELZ	0.7	OL5	1	OL8	1.142										
112	IBC 16-12 (b) (b)b-2	Yes	Y	DL	1	Sds*DL	0.14	ELZ	0.7	OL5	1	OL9	1.142										
113	IBC 16-12 (b) (b)b-3	Yes	Y	DL	1	Sds*DL	0.14	ELZ	0.7	OL5	1	OL10	1.142										
114	IBC 16-12 (b) (b)b-4	Yes	Y	DL	1	Sds*DL	0.14	ELZ	0.7	OL5	1	OL11	1.142										
115	IBC 16-12 (b) (b)b-5	Yes	Y	DL	1	Sds*DL	0.14	ELZ	0.7	OL5	1	OL12	1.142										
116	IBC 16-12 (b) (b)b-6	Yes	Y	DL	1	Sds*DL	0.14	ELZ	0.7	OL5	1	OL13	1.142										
117	IBC 16-12 (b) (b)b-7	Yes	Y	DL	1	Sds*DL	0.14	ELZ	0.7	OL5	1	OL14	1.142										
118	IBC 16-12 (b) (b)b-8	Yes	Y	DL	1	Sds*DL	0.14	ELZ	0.7	OL5	1	OL15	1.142										
119	IBC 16-12 (b) (c)a-1	Yes	Y	DL	1	Sds*DL	0.14	ELX	-0.7	OL4	1	OL8	1.142										
120	IBC 16-12 (b) (c)a-2	Yes	Y	DL	1	Sds*DL	0.14	ELX	-0.7	OL4	1	OL9	1.142										
121	IBC 16-12 (b) (c)a-3	Yes	Y	DL	1	Sds*DL	0.14	ELX	-0.7	OL4	1	OL10	1.142										
122	IBC 16-12 (b) (c)a-4	Yes	Y	DL	1	Sds*DL	0.14	ELX	-0.7	OL4	1	OL11	1.142										
123	IBC 16-12 (b) (c)a-5	Yes	Y	DL	1	Sds*DL	0.14	ELX	-0.7	OL4	1	OL12	1.142										
124	IBC 16-12 (b) (c)a-6	Yes	Y	DL	1	Sds*DL	0.14	ELX	-0.7	OL4	1	OL13	1.142										
125	IBC 16-12 (b) (c)a-7	Yes	Y	DL	1	Sds*DL	0.14	ELX	-0.7	OL4	1	OL14	1.142										
126	IBC 16-12 (b) (c)a-8	Yes	Y	DL	1	Sds*DL	0.14	ELX	-0.7	OL4	1	OL15	1.142										

Load Combinations (Continued)

	Description	Solve	P-Delta	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
127	IBC 16-12 (b) (c)a-1	Yes	Y	DL	1	Sds*DL	0.14	ELX	-0.7	OL5	1	OL8	1.142										
128	IBC 16-12 (b) (c)a-2	Yes	Y	DL	1	Sds*DL	0.14	ELX	-0.7	OL5	1	OL9	1.142										
129	IBC 16-12 (b) (c)a-3	Yes	Y	DL	1	Sds*DL	0.14	ELX	-0.7	OL5	1	OL10	1.142										
130	IBC 16-12 (b) (c)a-4	Yes	Y	DL	1	Sds*DL	0.14	ELX	-0.7	OL5	1	OL11	1.142										
131	IBC 16-12 (b) (c)a-5	Yes	Y	DL	1	Sds*DL	0.14	ELX	-0.7	OL5	1	OL12	1.142										
132	IBC 16-12 (b) (c)a-6	Yes	Y	DL	1	Sds*DL	0.14	ELX	-0.7	OL5	1	OL13	1.142										
133	IBC 16-12 (b) (c)a-7	Yes	Y	DL	1	Sds*DL	0.14	ELX	-0.7	OL5	1	OL14	1.142										
134	IBC 16-12 (b) (c)a-8	Yes	Y	DL	1	Sds*DL	0.14	ELX	-0.7	OL5	1	OL15	1.142										
135	IBC 16-12 (b) (d)a-1	Yes	Y	DL	1	Sds*DL	0.14	ELZ	-0.7	OL4	1	OL8	1.142	OL16	-0.7								
136	IBC 16-12 (b) (d)a-2	Yes	Y	DL	1	Sds*DL	0.14	ELZ	-0.7	OL4	1	OL9	1.142	OL17	-0.7								
137	IBC 16-12 (b) (d)a-3	Yes	Y	DL	1	Sds*DL	0.14	ELZ	-0.7	OL4	1	OL10	1.142	OL18	-0.7								
138	IBC 16-12 (b) (d)a-4	Yes	Y	DL	1	Sds*DL	0.14	ELZ	-0.7	OL4	1	OL11	1.142	OL19	-0.7								
139	IBC 16-12 (b) (d)a-5	Yes	Y	DL	1	Sds*DL	0.14	ELZ	-0.7	OL4	1	OL12	1.142	OL20	-0.7								
140	IBC 16-12 (b) (d)a-6	Yes	Y	DL	1	Sds*DL	0.14	ELZ	-0.7	OL4	1	OL13	1.142	OL21	-0.7								
141	IBC 16-12 (b) (d)a-7	Yes	Y	DL	1	Sds*DL	0.14	ELZ	-0.7	OL4	1	OL14	1.142	OL22	-0.7								
142	IBC 16-12 (b) (d)a-8	Yes	Y	DL	1	Sds*DL	0.14	ELZ	-0.7	OL4	1	OL15	1.142	OL23	-0.7								
143	IBC 16-12 (b) (d)a-1	Yes	Y	DL	1	Sds*DL	0.14	ELZ	-0.7	OL5	1	OL8	1.142	OL16	-0.7								
144	IBC 16-12 (b) (d)a-2	Yes	Y	DL	1	Sds*DL	0.14	ELZ	-0.7	OL5	1	OL9	1.142	OL17	-0.7								
145	IBC 16-12 (b) (d)a-3	Yes	Y	DL	1	Sds*DL	0.14	ELZ	-0.7	OL5	1	OL10	1.142	OL18	-0.7								
146	IBC 16-12 (b) (d)a-4	Yes	Y	DL	1	Sds*DL	0.14	ELZ	-0.7	OL5	1	OL11	1.142	OL19	-0.7								
147	IBC 16-12 (b) (d)a-5	Yes	Y	DL	1	Sds*DL	0.14	ELZ	-0.7	OL5	1	OL12	1.142	OL20	-0.7								
148	IBC 16-12 (b) (d)a-6	Yes	Y	DL	1	Sds*DL	0.14	ELZ	-0.7	OL5	1	OL13	1.142	OL21	-0.7								
149	IBC 16-12 (b) (d)a-7	Yes	Y	DL	1	Sds*DL	0.14	ELZ	-0.7	OL5	1	OL14	1.142	OL22	-0.7								
150	IBC 16-12 (b) (d)a-8	Yes	Y	DL	1	Sds*DL	0.14	ELZ	-0.7	OL5	1	OL15	1.142	OL23	-0.7								
151	IBC 16-14 (a)a-1	Yes	Y	DL	1	Sds*DL	0.105	ELX	0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL4	1	OL8	1.106		
152	IBC 16-14 (a)a-2	Yes	Y	DL	1	Sds*DL	0.105	ELX	0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL4	1	OL9	1.106		
153	IBC 16-14 (a)a-3	Yes	Y	DL	1	Sds*DL	0.105	ELX	0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL4	1	OL10	1.106		
154	IBC 16-14 (a)a-4	Yes	Y	DL	1	Sds*DL	0.105	ELX	0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL4	1	OL11	1.106		
155	IBC 16-14 (a)a-5	Yes	Y	DL	1	Sds*DL	0.105	ELX	0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL4	1	OL12	1.106		
156	IBC 16-14 (a)a-6	Yes	Y	DL	1	Sds*DL	0.105	ELX	0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL4	1	OL13	1.106		
157	IBC 16-14 (a)a-7	Yes	Y	DL	1	Sds*DL	0.105	ELX	0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL4	1	OL14	1.106		
158	IBC 16-14 (a)a-8	Yes	Y	DL	1	Sds*DL	0.105	ELX	0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL4	1	OL15	1.106		
159	IBC 16-14 (a)b-1	Yes	Y	DL	1	Sds*DL	0.105	ELX	0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL5	1	OL8	1.106		
160	IBC 16-14 (a)b-2	Yes	Y	DL	1	Sds*DL	0.105	ELX	0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL5	1	OL9	1.106		
161	IBC 16-14 (a)b-3	Yes	Y	DL	1	Sds*DL	0.105	ELX	0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL5	1	OL10	1.106		
162	IBC 16-14 (a)b-4	Yes	Y	DL	1	Sds*DL	0.105	ELX	0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL5	1	OL11	1.106		
163	IBC 16-14 (a)b-5	Yes	Y	DL	1	Sds*DL	0.105	ELX	0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL5	1	OL12	1.106		
164	IBC 16-14 (a)b-6	Yes	Y	DL	1	Sds*DL	0.105	ELX	0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL5	1	OL13	1.106		
165	IBC 16-14 (a)b-7	Yes	Y	DL	1	Sds*DL	0.105	ELX	0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL5	1	OL14	1.106		
166	IBC 16-14 (a)b-8	Yes	Y	DL	1	Sds*DL	0.105	ELX	0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL5	1	OL15	1.106		
167	IBC 16-14 (b)a-1	Yes	Y	DL	1	Sds*DL	0.105	ELZ	0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL4	1	OL8	1.106	OL16	0.525
168	IBC 16-14 (b)a-2	Yes	Y	DL	1	Sds*DL	0.105	ELZ	0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL4	1	OL9	1.106	OL17	0.525
169	IBC 16-14 (b)a-3	Yes	Y	DL	1	Sds*DL	0.105	ELZ	0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL4	1	OL10	1.106	OL18	0.525
170	IBC 16-14 (b)a-4	Yes	Y	DL	1	Sds*DL	0.105	ELZ	0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL4	1	OL11	1.106	OL19	0.525
171	IBC 16-14 (b)a-5	Yes	Y	DL	1	Sds*DL	0.105	ELZ	0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL4	1	OL12	1.106	OL20	0.525
172	IBC 16-14 (b)a-6	Yes	Y	DL	1	Sds*DL	0.105	ELZ	0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL4	1	OL13	1.106	OL21	0.525
173	IBC 16-14 (b)a-7	Yes	Y	DL	1	Sds*DL	0.105	ELZ	0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL4	1	OL14	1.106	OL22	0.525
174	IBC 16-14 (b)a-8	Yes	Y	DL	1	Sds*DL	0.105	ELZ	0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL4	1	OL15	1.106	OL23	0.525
175	IBC 16-14 (b)b-1	Yes	Y	DL	1	Sds*DL	0.105	ELZ	0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL5	1	OL8	1.106	OL16	0.525
176	IBC 16-14 (b)b-2	Yes	Y	DL	1	Sds*DL	0.105	ELZ	0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL5	1	OL9	1.106	OL17	0.525
177	IBC 16-14 (b)b-3	Yes	Y	DL	1	Sds*DL	0.105	ELZ	0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL5	1	OL10	1.106	OL18	0.525
178	IBC 16-14 (b)b-4	Yes	Y	DL	1	Sds*DL	0.105	ELZ	0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL5	1	OL11	1.106	OL19	0.525
179	IBC 16-14 (b)b-5	Yes	Y	DL	1	Sds*DL	0.105	ELZ	0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL5	1	OL12	1.106	OL20	0.525
180	IBC 16-14 (b)b-6	Yes	Y	DL	1	Sds*DL	0.105	ELZ	0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL5	1	OL13	1.106	OL21	0.525
181	IBC 16-14 (b)b-7	Yes	Y	DL	1	Sds*DL	0.105	ELZ	0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL5	1	OL14	1.106	OL22	0.525

Load Combinations (Continued)

	Description	Solve	P-Delta	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
182	IBC 16-14 (b)b-8	Yes	Y	DL	1	Sds*DL	0.105	ELZ	0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL5	1	OL15	1.106	OL23	0.525
183	IBC 16-14 (c)a-1	Yes	Y	DL	1	Sds*DL	0.105	ELX	-0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL4	1	OL8	1.106		
184	IBC 16-14 (c)a-2	Yes	Y	DL	1	Sds*DL	0.105	ELX	-0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL4	1	OL9	1.106		
185	IBC 16-14 (c)a-3	Yes	Y	DL	1	Sds*DL	0.105	ELX	-0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL4	1	OL10	1.106		
186	IBC 16-14 (c)a-4	Yes	Y	DL	1	Sds*DL	0.105	ELX	-0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL4	1	OL11	1.106		
187	IBC 16-14 (c)a-5	Yes	Y	DL	1	Sds*DL	0.105	ELX	-0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL4	1	OL12	1.106		
188	IBC 16-14 (c)a-6	Yes	Y	DL	1	Sds*DL	0.105	ELX	-0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL4	1	OL13	1.106		
189	IBC 16-14 (c)a-7	Yes	Y	DL	1	Sds*DL	0.105	ELX	-0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL4	1	OL14	1.106		
190	IBC 16-14 (c)a-8	Yes	Y	DL	1	Sds*DL	0.105	ELX	-0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL4	1	OL15	1.106		
191	IBC 16-14 (c)b-1	Yes	Y	DL	1	Sds*DL	0.105	ELX	-0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL5	1	OL8	1.106		
192	IBC 16-14 (c)b-2	Yes	Y	DL	1	Sds*DL	0.105	ELX	-0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL5	1	OL9	1.106		
193	IBC 16-14 (c)b-3	Yes	Y	DL	1	Sds*DL	0.105	ELX	-0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL5	1	OL10	1.106		
194	IBC 16-14 (c)b-4	Yes	Y	DL	1	Sds*DL	0.105	ELX	-0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL5	1	OL11	1.106		
195	IBC 16-14 (c)b-5	Yes	Y	DL	1	Sds*DL	0.105	ELX	-0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL5	1	OL12	1.106		
196	IBC 16-14 (c)b-6	Yes	Y	DL	1	Sds*DL	0.105	ELX	-0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL5	1	OL13	1.106		
197	IBC 16-14 (c)b-7	Yes	Y	DL	1	Sds*DL	0.105	ELX	-0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL5	1	OL14	1.106		
198	IBC 16-14 (c)b-8	Yes	Y	DL	1	Sds*DL	0.105	ELX	-0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL5	1	OL15	1.106		
199	IBC 16-14 (d)a-1	Yes	Y	DL	1	Sds*DL	0.105	ELZ	-0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL4	1	OL8	1.106	OL16	-0.525
200	IBC 16-14 (d)a-2	Yes	Y	DL	1	Sds*DL	0.105	ELZ	-0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL4	1	OL9	1.106	OL17	-0.525
201	IBC 16-14 (d)a-3	Yes	Y	DL	1	Sds*DL	0.105	ELZ	-0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL4	1	OL10	1.106	OL18	-0.525
202	IBC 16-14 (d)a-4	Yes	Y	DL	1	Sds*DL	0.105	ELZ	-0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL4	1	OL11	1.106	OL19	-0.525
203	IBC 16-14 (d)a-5	Yes	Y	DL	1	Sds*DL	0.105	ELZ	-0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL4	1	OL12	1.106	OL20	-0.525
204	IBC 16-14 (d)a-6	Yes	Y	DL	1	Sds*DL	0.105	ELZ	-0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL4	1	OL13	1.106	OL21	-0.525
205	IBC 16-14 (d)a-7	Yes	Y	DL	1	Sds*DL	0.105	ELZ	-0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL4	1	OL14	1.106	OL22	-0.525
206	IBC 16-14 (d)a-8	Yes	Y	DL	1	Sds*DL	0.105	ELZ	-0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL4	1	OL15	1.106	OL23	-0.525
207	IBC 16-14 (d)b-1	Yes	Y	DL	1	Sds*DL	0.105	ELZ	-0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL5	1	OL8	1.106	OL16	-0.525
208	IBC 16-14 (d)b-2	Yes	Y	DL	1	Sds*DL	0.105	ELZ	-0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL5	1	OL9	1.106	OL17	-0.525
209	IBC 16-14 (d)b-3	Yes	Y	DL	1	Sds*DL	0.105	ELZ	-0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL5	1	OL10	1.106	OL18	-0.525
210	IBC 16-14 (d)b-4	Yes	Y	DL	1	Sds*DL	0.105	ELZ	-0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL5	1	OL11	1.106	OL19	-0.525
211	IBC 16-14 (d)b-5	Yes	Y	DL	1	Sds*DL	0.105	ELZ	-0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL5	1	OL12	1.106	OL20	-0.525
212	IBC 16-14 (d)b-6	Yes	Y	DL	1	Sds*DL	0.105	ELZ	-0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL5	1	OL13	1.106	OL21	-0.525
213	IBC 16-14 (d)b-7	Yes	Y	DL	1	Sds*DL	0.105	ELZ	-0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL5	1	OL14	1.106	OL22	-0.525
214	IBC 16-14 (d)b-8	Yes	Y	DL	1	Sds*DL	0.105	ELZ	-0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	OL5	1	OL15	1.106	OL23	-0.525
215	IBC 16-16 (a)a-1	Yes	Y	DL	0.6	Sds*DL	-0.14	ELX	0.7	OL4	0.6	OL8	0.458										
216	IBC 16-16 (a)a-2	Yes	Y	DL	0.6	Sds*DL	-0.14	ELX	0.7	OL4	0.6	OL9	0.458										
217	IBC 16-16 (a)a-3	Yes	Y	DL	0.6	Sds*DL	-0.14	ELX	0.7	OL4	0.6	OL10	0.458										
218	IBC 16-16 (a)a-4	Yes	Y	DL	0.6	Sds*DL	-0.14	ELX	0.7	OL4	0.6	OL11	0.458										
219	IBC 16-16 (a)a-5	Yes	Y	DL	0.6	Sds*DL	-0.14	ELX	0.7	OL4	0.6	OL12	0.458										
220	IBC 16-16 (a)a-6	Yes	Y	DL	0.6	Sds*DL	-0.14	ELX	0.7	OL4	0.6	OL13	0.458										
221	IBC 16-16 (a)a-7	Yes	Y	DL	0.6	Sds*DL	-0.14	ELX	0.7	OL4	0.6	OL14	0.458										
222	IBC 16-16 (a)a-8	Yes	Y	DL	0.6	Sds*DL	-0.14	ELX	0.7	OL4	0.6	OL15	0.458										
223	IBC 16-16 (a)b-1	Yes	Y	DL	0.6	Sds*DL	-0.14	ELX	0.7	OL5	0.6	OL8	0.458										
224	IBC 16-16 (a)b-2	Yes	Y	DL	0.6	Sds*DL	-0.14	ELX	0.7	OL5	0.6	OL9	0.458										
225	IBC 16-16 (a)b-3	Yes	Y	DL	0.6	Sds*DL	-0.14	ELX	0.7	OL5	0.6	OL10	0.458										
226	IBC 16-16 (a)b-4	Yes	Y	DL	0.6	Sds*DL	-0.14	ELX	0.7	OL5	0.6	OL11	0.458										
227	IBC 16-16 (a)b-5	Yes	Y	DL	0.6	Sds*DL	-0.14	ELX	0.7	OL5	0.6	OL12	0.458										
228	IBC 16-16 (a)b-6	Yes	Y	DL	0.6	Sds*DL	-0.14	ELX	0.7	OL5	0.6	OL13	0.458										
229	IBC 16-16 (a)b-7	Yes	Y	DL	0.6	Sds*DL	-0.14	ELX	0.7	OL5	0.6	OL14	0.458										
230	IBC 16-16 (a)b-8	Yes	Y	DL	0.6	Sds*DL	-0.14	ELX	0.7	OL5	0.6	OL15	0.458										
231	IBC 16-16 (b)a-1	Yes	Y	DL	0.6	Sds*DL	-0.14	ELZ	0.7	OL4	0.6	OL8	0.458	OL16	0.7								
232	IBC 16-16 (b)a-2	Yes	Y	DL	0.6	Sds*DL	-0.14	ELZ	0.7	OL4	0.6	OL9	0.458	OL17	0.7								
233	IBC 16-16 (b)a-3	Yes	Y	DL	0.6	Sds*DL	-0.14	ELZ	0.7	OL4	0.6	OL10	0.458	OL18	0.7								
234	IBC 16-16 (b)a-4	Yes	Y	DL	0.6	Sds*DL	-0.14	ELZ	0.7	OL4	0.6	OL11	0.458	OL19	0.7								
235	IBC 16-16 (b)a-5	Yes	Y	DL	0.6	Sds*DL	-0.14	ELZ	0.7	OL4	0.6	OL12	0.458	OL20	0.7								
236	IBC 16-16 (b)a-6	Yes	Y	DL	0.6	Sds*DL	-0.14	ELZ	0.7	OL4	0.6	OL13	0.458	OL21	0.7								

Load Combinations (Continued)

	Description	Solve	P-Delta	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
237	IBC 16-16 (b)a-7	Yes	Y	DL	0.6	Sds*DL	-0.14	ELZ	0.7	OL4	0.6	OL14	0.458	OL22	0.7								
238	IBC 16-16 (b)a-8	Yes	Y	DL	0.6	Sds*DL	-0.14	ELZ	0.7	OL4	0.6	OL15	0.458	OL23	0.7								
239	IBC 16-16 (b)b-1	Yes	Y	DL	0.6	Sds*DL	-0.14	ELZ	0.7	OL5	0.6	OL8	0.458	OL16	0.7								
240	IBC 16-16 (b)b-2	Yes	Y	DL	0.6	Sds*DL	-0.14	ELZ	0.7	OL5	0.6	OL9	0.458	OL17	0.7								
241	IBC 16-16 (b)b-3	Yes	Y	DL	0.6	Sds*DL	-0.14	ELZ	0.7	OL5	0.6	OL10	0.458	OL18	0.7								
242	IBC 16-16 (b)b-4	Yes	Y	DL	0.6	Sds*DL	-0.14	ELZ	0.7	OL5	0.6	OL11	0.458	OL19	0.7								
243	IBC 16-16 (b)b-5	Yes	Y	DL	0.6	Sds*DL	-0.14	ELZ	0.7	OL5	0.6	OL12	0.458	OL20	0.7								
244	IBC 16-16 (b)b-6	Yes	Y	DL	0.6	Sds*DL	-0.14	ELZ	0.7	OL5	0.6	OL13	0.458	OL21	0.7								
245	IBC 16-16 (b)b-7	Yes	Y	DL	0.6	Sds*DL	-0.14	ELZ	0.7	OL5	0.6	OL14	0.458	OL22	0.7								
246	IBC 16-16 (b)b-8	Yes	Y	DL	0.6	Sds*DL	-0.14	ELZ	0.7	OL5	0.6	OL15	0.458	OL23	0.7								
247	IBC 16-16 (c)a-1	Yes	Y	DL	0.6	Sds*DL	-0.14	ELX	-0.7	OL4	0.6	OL8	0.458										
248	IBC 16-16 (c)a-2	Yes	Y	DL	0.6	Sds*DL	-0.14	ELX	-0.7	OL4	0.6	OL9	0.458										
249	IBC 16-16 (c)a-3	Yes	Y	DL	0.6	Sds*DL	-0.14	ELX	-0.7	OL4	0.6	OL10	0.458										
250	IBC 16-16 (c)a-4	Yes	Y	DL	0.6	Sds*DL	-0.14	ELX	-0.7	OL4	0.6	OL11	0.458										
251	IBC 16-16 (c)a-5	Yes	Y	DL	0.6	Sds*DL	-0.14	ELX	-0.7	OL4	0.6	OL12	0.458										
252	IBC 16-16 (c)a-6	Yes	Y	DL	0.6	Sds*DL	-0.14	ELX	-0.7	OL4	0.6	OL13	0.458										
253	IBC 16-16 (c)a-7	Yes	Y	DL	0.6	Sds*DL	-0.14	ELX	-0.7	OL4	0.6	OL14	0.458										
254	IBC 16-16 (c)a-8	Yes	Y	DL	0.6	Sds*DL	-0.14	ELX	-0.7	OL4	0.6	OL15	0.458										
255	IBC 16-16 (c)b-1	Yes	Y	DL	0.6	Sds*DL	-0.14	ELX	-0.7	OL5	0.6	OL8	0.458										
256	IBC 16-16 (c)b-2	Yes	Y	DL	0.6	Sds*DL	-0.14	ELX	-0.7	OL5	0.6	OL9	0.458										
257	IBC 16-16 (c)b-3	Yes	Y	DL	0.6	Sds*DL	-0.14	ELX	-0.7	OL5	0.6	OL10	0.458										
258	IBC 16-16 (c)b-4	Yes	Y	DL	0.6	Sds*DL	-0.14	ELX	-0.7	OL5	0.6	OL11	0.458										
259	IBC 16-16 (c)b-5	Yes	Y	DL	0.6	Sds*DL	-0.14	ELX	-0.7	OL5	0.6	OL12	0.458										
260	IBC 16-16 (c)b-6	Yes	Y	DL	0.6	Sds*DL	-0.14	ELX	-0.7	OL5	0.6	OL13	0.458										
261	IBC 16-16 (c)b-7	Yes	Y	DL	0.6	Sds*DL	-0.14	ELX	-0.7	OL5	0.6	OL14	0.458										
262	IBC 16-16 (c)b-8	Yes	Y	DL	0.6	Sds*DL	-0.14	ELX	-0.7	OL5	0.6	OL15	0.458										
263	IBC 16-16 (d)a-1	Yes	Y	DL	0.6	Sds*DL	-0.14	ELZ	-0.7	OL4	0.6	OL8	0.458	OL16	-0.7								
264	IBC 16-16 (d)a-2	Yes	Y	DL	0.6	Sds*DL	-0.14	ELZ	-0.7	OL4	0.6	OL9	0.458	OL17	-0.7								
265	IBC 16-16 (d)a-3	Yes	Y	DL	0.6	Sds*DL	-0.14	ELZ	-0.7	OL4	0.6	OL10	0.458	OL18	-0.7								
266	IBC 16-16 (d)a-4	Yes	Y	DL	0.6	Sds*DL	-0.14	ELZ	-0.7	OL4	0.6	OL11	0.458	OL19	-0.7								
267	IBC 16-16 (d)a-5	Yes	Y	DL	0.6	Sds*DL	-0.14	ELZ	-0.7	OL4	0.6	OL12	0.458	OL20	-0.7								
268	IBC 16-16 (d)a-6	Yes	Y	DL	0.6	Sds*DL	-0.14	ELZ	-0.7	OL4	0.6	OL13	0.458	OL21	-0.7								
269	IBC 16-16 (d)a-7	Yes	Y	DL	0.6	Sds*DL	-0.14	ELZ	-0.7	OL4	0.6	OL14	0.458	OL22	-0.7								
270	IBC 16-16 (d)a-8	Yes	Y	DL	0.6	Sds*DL	-0.14	ELZ	-0.7	OL4	0.6	OL15	0.458	OL23	-0.7								
271	IBC 16-16 (d)b-1	Yes	Y	DL	0.6	Sds*DL	-0.14	ELZ	-0.7	OL5	0.6	OL8	0.458	OL16	-0.7								
272	IBC 16-16 (d)b-2	Yes	Y	DL	0.6	Sds*DL	-0.14	ELZ	-0.7	OL5	0.6	OL9	0.458	OL17	-0.7								
273	IBC 16-16 (d)b-3	Yes	Y	DL	0.6	Sds*DL	-0.14	ELZ	-0.7	OL5	0.6	OL10	0.458	OL18	-0.7								
274	IBC 16-16 (d)b-4	Yes	Y	DL	0.6	Sds*DL	-0.14	ELZ	-0.7	OL5	0.6	OL11	0.458	OL19	-0.7								
275	IBC 16-16 (d)b-5	Yes	Y	DL	0.6	Sds*DL	-0.14	ELZ	-0.7	OL5	0.6	OL12	0.458	OL20	-0.7								
276	IBC 16-16 (d)b-6	Yes	Y	DL	0.6	Sds*DL	-0.14	ELZ	-0.7	OL5	0.6	OL13	0.458	OL21	-0.7								
277	IBC 16-16 (d)b-7	Yes	Y	DL	0.6	Sds*DL	-0.14	ELZ	-0.7	OL5	0.6	OL14	0.458	OL22	-0.7								
278	IBC 16-16 (d)b-8	Yes	Y	DL	0.6	Sds*DL	-0.14	ELZ	-0.7	OL5	0.6	OL15	0.458	OL23	-0.7								
279	Ceiling Stiff1		Y	OL24	1																		
280	Ceiling Stiff 2		Y	OL25	1																		
281	Ceiling Stiff 3		Y	OL26	1																		
282	Ceiling Stiff 4		Y	OL27	1																		
283	Ceiling Stiff 5		Y	OL28	1																		
284	Ceiling Stiff 6		Y	OL29	1																		
285	Ceiling Stiff 7		Y	OL30	1																		
286	Ceiling Stiff 8		Y	OL31	1																		
287	Ceiling Stiff 9		Y	OL32	1																		
288	Ceiling Stiff 10		Y	OL33	1																		
289	Ceiling Stiff 11		Y	OL34	1																		
290	Ceiling Stiff 12		Y	OL35	1																		
291	Ceiling Stiff 13		Y	OL36	1																		

Load Combinations (Continued)

	Description	Solve	P-Delta	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
292	Ceiling Stiff 14		Y	OL37	1																		
293	Ceiling Stiff 15		Y	OL38	1																		
294	Ceiling Stiff 16		Y	OL39	1																		
295	Ceiling Stiff 17		Y	OL40	1																		
296	Ceiling Stiff 18		Y	OL41	1																		
297	Ceiling Stiff 19		Y	OL42	1																		
298	Ceiling Stiff 20		Y	OL43	1																		
299	Ceiling Stiff 21		Y	OL44	1																		
300	Ceiling Stiff 22		Y	OL45	1																		
301	Ceiling Stiff 23		Y	OL46	1																		
302	Ceiling Stiff 24		Y	OL47	1																		
303	Ceiling Stiff 25		Y	OL48	1																		
304	Ceiling Stiff 26		Y	OL49	1																		
305	Ceiling Stiff 27		Y	OL50	1																		
306	Ceiling Stiff 28		Y	OL51	1																		
307	Ceiling Stiff 29		Y	OL52	1																		
308	Ceiling Stiff 30		Y	OL53	1																		
309	Ceiling Stiff 31		Y	OL54	1																		
310	Ceiling Stiff 32		Y	OL55	1																		
311	Max Tens Cantilever	Yes	Y	DL	1.2	Sds*DL	0.2	ELZ	-2.5	LL	1	LLS	1	SL	0.2	SLN	0.2	OL5	1.2	OL8	1.403	OL16	-2.5

Envelope Node Reactions

	Node Label		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N334	max	0.005	134	0	311	0	311	0	311	0	311	0.002	120
2		min	-0.005	99	0	1	0	1	0	1	0	1	-0.001	222
3	N324	max	0.006	128	0	311	0	311	0	311	0	311	0.002	254
4		min	-0.005	94	0	1	0	1	0	1	0	1	-0.002	96
5	N333	max	0.003	88	0	311	0.005	214	0	311	0	311	0	120
6		min	-0.003	254	0	1	0	238	0	1	0	1	0	222
7	N323	max	0.003	222	0	311	0.009	311	0	311	0	311	0	254
8		min	-0.003	256	0	1	0	231	0	1	0	1	0	96
9	N155	max	0	311	0	311	-0.015	232	0	311	0	311	0	311
10		min	0	1	0	1	-0.323	311	0	1	0	1	0	1
11	N156	max	0	311	0	311	-0.003	236	0	311	0	311	0	311
12		min	0	1	0	1	-0.718	311	0	1	0	1	0	1
13	N161	max	0	311	0	311	0.789	311	0	311	0	311	0	311
14		min	0	1	0	1	0.068	236	0	1	0	1	0	1
15	N297	max	0	311	0	311	0.814	311	0	311	0	311	0	311
16		min	0	1	0	1	0.069	236	0	1	0	1	0	1
17	N160	max	0	311	0	311	3.082	311	0	311	0	311	0	311
18		min	0	1	0	1	0.261	236	0	1	0	1	0	1
19	N108	max	0	311	0	311	1.603	311	0.169	167	0	311	0	311
20		min	0	1	0	1	-7.512	175	-0.123	311	0	1	0	1
21	N220	max	0	311	0	311	2.769	311	0.174	174	0	311	0	311
22		min	0	1	0	1	-8.462	181	-0.037	278	0	1	0	1
23	N52	max	0	311	0	311	0.021	246	0	311	0	311	0	311
24		min	0	1	0	1	-0.609	311	0	1	0	1	0	1
25	N54	max	0	311	0	311	0.247	3	0	311	0	311	0	311
26		min	0	1	0	1	-0.018	244	0	1	0	1	0	1
27	N50	max	0	311	0	311	-0.144	244	0	311	0	311	0	311
28		min	0	1	0	1	-1.905	311	0	1	0	1	0	1
29	N56	max	0	311	0	311	-0.573	233	0	311	0	311	0	311
30		min	0	1	0	1	-6.721	311	0	1	0	1	0	1
31	N27	max	0	311	0	311	0.995	311	0	311	0	311	0	311
32		min	0	1	0	1	0.079	236	0	1	0	1	0	1

Envelope Node Reactions (Continued)

	Node Label		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
33	N25	max	0	311	0	311	-0.046	233	0	311	0	311	0	311
34		min	0	1	0	1	-0.548	311	0	1	0	1	0	1
35	N35	max	0	311	0	311	0	233	0	311	0	311	0	311
36		min	0	1	0	1	0	311	0	1	0	1	0	1
37	R-N/3.0	max	0	311	0	311	0	311	0	311	0	311	0	311
38		min	0	1	0	1	0	236	0	1	0	1	0	1
39	R-M/3.0	max	0	311	0	311	0	236	0	311	0	311	0	311
40		min	0	1	0	1	0	311	0	1	0	1	0	1
41	N38	max	0	311	0	311	-0.274	236	0	311	0	311	0	311
42		min	0	1	0	1	-3.412	311	0	1	0	1	0	1
43	N37	max	0	311	0	311	0	311	0	311	0	311	0	311
44		min	0	1	0	1	0	236	0	1	0	1	0	1
45	N36	max	0	311	0	311	0	236	0	311	0	311	0	311
46		min	0	1	0	1	0	311	0	1	0	1	0	1
47	N26	max	0	311	0	311	-0.036	236	0	311	0	311	0	311
48		min	0	1	0	1	-0.424	311	0	1	0	1	0	1
49	N144	max	0	311	0	311	0.719	311	0	311	0	311	0	311
50		min	0	1	0	1	0.003	236	0	1	0	1	0	1
51	N143	max	0	311	0	311	0.322	311	0	311	0	311	0	311
52		min	0	1	0	1	0.015	232	0	1	0	1	0	1
53	N325	max	0.738	311	0	311	-0.068	234	0	311	0	311	0	311
54		min	0.004	238	0	1	-0.906	311	0	1	0	1	0	1
55	N167	max	0	311	0	311	-0.261	236	0	311	0	311	0	311
56		min	0	1	0	1	-3.082	311	0	1	0	1	0	1
57	N168	max	0	311	0	311	6.521	311	0	311	0	311	0	311
58		min	0	1	0	1	0.512	234	0	1	0	1	0	1
59	N282	max	0	311	0	311	6.555	311	0	311	0	311	0	311
60		min	0	1	0	1	0.512	234	0	1	0	1	0	1
61	R-N/1.0	max	2.76	254	0	311	0.167	270	0	2	0	311	0	311
62		min	-2.814	96	0	1	-8.653	177	0	311	0	1	0	1
63	R-M/1.0	max	2.737	128	0	311	1.336	311	0	2	0	311	0	311
64		min	-2.609	222	0	1	-6.046	180	0	311	0	1	0	1
65	R-M/1.3	max	3.897	128	0	311	-0.253	263	0	311	4.301	230	0	311
66		min	-3.285	222	0	1	-4.663	181	0	1	-4.832	120	0	1
67	R-N/1.3	max	3.091	254	0	311	-0.272	270	0	311	4.398	96	0	311
68		min	-4.381	96	0	1	-3.779	175	0	1	-3.527	254	0	1
69	R-M/2.0	max	0	2	0	311	-0.009	236	0	311	0	311	0	311
70		min	0	311	0	1	-0.112	311	0	1	0	1	0	1
71	R-N/2.0	max	0	219	0	311	0	236	0	311	0	311	0	311
72		min	0	311	0	1	0	311	0	1	0	1	0	1
73	R-M2.0/3.0	max	0	311	11.109	59	0	236	0	311	0	311	0	311
74		min	0	238	2.701	273	0	311	0	1	0	1	0	1
75	R-M.8/3.0	max	0	311	9.409	63	0	236	0	311	0	311	0	311
76		min	0	238	2.145	236	0	311	0	1	0	1	0	1
77	N33	max	0	311	-0.01	236	0	236	0	311	0	311	0	311
78		min	0	219	-0.301	63	0	311	0	1	0	1	0	1
79	N34	max	0	311	0.866	311	0	311	0	311	0	311	0	311
80		min	0	238	-0.002	2	0	236	0	1	0	1	0	1
81	N59	max	0.663	128	8.984	167	0.73	311	0	311	0.412	96	1.981	96
82		min	-0.661	222	1.092	2	-0.941	110	0	1	-0.401	254	-1.948	254
83	N60	max	0.7	262	11.221	311	3.463	311	0	311	0.399	120	2.032	230
84		min	-0.71	88	0.956	2	0.313	238	0	1	-0.393	230	-2.04	120
85	N61	max	0.699	128	11.524	311	3.754	311	0	311	0.403	254	2.042	96
86		min	-0.683	222	0.879	2	0.366	231	0	1	-0.41	96	-2.035	254
87	N62	max	0.664	262	8.364	182	0.511	311	0	311	0.383	230	1.967	230

Envelope Node Reactions (Continued)

	Node Label		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
88		min	-0.672	88	0.99	2	-0.992	103	0	1	-0.39	120	-1.98	120
89	N63	max	0	254	15.918	3	0	311	0	311	0	311	0	311
90		min	0	96	3.806	276	0	236	0	1	0	1	0	1
91	N64	max	0	311	16.015	3	0	311	0	311	0	311	0	311
92		min	0	2	3.846	275	0	236	0	1	0	1	0	1
93	N317	max	0.213	311	0	311	0.095	135	0	311	0	311	0	311
94		min	-0.003	238	0	1	-0.19	63	0	1	0	1	0	1
95	WP1	max	2.312	120	82.126	311	26.537	311	-4.66	263	0	262	0	311
96		min	-2.293	230	8.91	2	-0.528	238	-28.021	180	-0.001	88	0	1
97	WP2	max	2.305	254	85.14	311	30.447	311	-6.522	270	0.017	254	0	311
98		min	-2.325	96	8.902	2	0.19	231	-34.726	175	-0.018	96	0	1
99	Totals:	max	19.419	131	248.734	311	69.352	311						
100		min	-19.419	216	46.614	2	-19.419	103						

Envelope AISC 15TH (360-16): ASD Member Steel Code Checks

	Member	Shape	Code Check	Loc[in]	LC	Shear Check	Loc[in]	Dir	LC	Pnc/om [k]	Pnt/om [k]	Mnyy/om [k-ft]	Mnzz/om [k-ft]	Cb	Eqn
1	M1	W21X44	0.26	154.979	169	0.045	0	y	167	107.761	389.222	25.426	222.616	1	H1-1b
2	M2	VJ18-3	0.022	55.25	70	0.001	110.5	y	56	16.319	39.611	2.081	23.493	1	H1-1b
3	M3	VJ18-3	0.021	54.099	70	0.001	0	y	64	16.319	39.611	2.081	23.493	1	H1-1b
4	M4	W18X40+WT4X33.5_HRA	0.496	230.667	213	0.179	0	y	175	95.3	461.382	25.062	234.114	1	H1-1b
5	M5	W21X44	0.502	165.792	3	0.088	346	y	3	107.761	389.222	25.426	222.616	1	H1-1b
6	M6	W12X35	0.169	34.531	311	0.037	0	y	213	211.878	308.383	28.693	127.745	1	H1-1b
7	M7	W12X35	0.072	61.005	311	0.075	33.38	y	311	211.878	308.383	28.693	97.571	1	H1-1b
8	M8	W12X35	0.076	61.005	201	0.054	0	y	137	211.878	308.383	28.693	127.745	1	H1-1b
9	M9	W12X35	0.234	26.474	311	0.236	0	y	311	211.878	308.383	28.693	127.745	1	H1-1b
10	M10	W12X16	0.276	119.25	182	0.071	159	y	182	16.766	141.018	5.639	50.15	1	H1-1b
11	M11	W12X16	0.218	145.75	139	0.071	145.75	y	147	16.766	141.018	5.639	16.505	1.235	H1-1b
12	M12	W12X16	0.214	119.25	169	0.077	145.75	y	311	16.766	141.018	5.639	50.15	1	H1-1b
13	M13	W12X16	0.344	144.094	311	0.187	145.75	y	311	16.766	141.018	5.639	33.901	2.537	H1-1b
14	M14	W18X35	0.151	213	63	0.064	0	y	63	130.96	308.383	20.11	113.868	2.05	H1-1b
15	M15	W24X55	0.078	0	311	0.038	0	y	59	156.112	485.03	33.143	187.59	2.473	H1-1b
16	M16	W21X44	0.059	119.5	63	0.018	119.5	y	63	251.79	389.222	25.426	238.024	2.557	H1-1b
17	M17	VJ22-42	0.158	161	70	0.006	0	y	62	10.662	108.353	2.495	82.085	1	H1-1b
18	M18	VJ22-42	0.3	157.646	70	0.013	322	y	3	10.662	108.353	2.495	82.085	1	H1-1b
19	M19	VJ22-42	0.301	164.354	70	0.012	0	y	3	10.662	108.353	2.495	82.085	1	H1-1b
20	M20	VJ22-42	0.304	161	70	0.012	0	y	3	10.662	108.353	2.495	82.085	1	H1-1b
21	M21	VJ22-42	0.521	157.646	311	0.013	322	y	3	10.662	108.353	2.495	82.085	1	H1-1a
22	M22	VJ22-42	0.161	164.354	70	0.006	322	y	59	10.662	108.353	2.495	82.085	1	H1-1b
23	Renno-M23	W12X16	0.215	77.844	63	0.019	159	y	68	16.766	141.018	5.639	15.161	1.135	H1-1b
24	Renno-M24	W12X16	0.612	62.938	170	0.082	159	y	178	16.766	141.018	5.639	17.158	1.284	H1-1b
25	Renno-M25	W12X16	0.09	79.5	63	0.008	159	y	65	16.766	141.018	5.639	15.155	1.134	H1-1b
26	M26	W12X16	0.103	79.5	63	0.009	0	y	66	16.766	141.018	5.639	15.235	1.14	H1-1b
27	Renno-M27	W12X16	0.123	79.5	63	0.012	159	y	66	16.766	141.018	5.639	15.154	1.134	H1-1b
28	Renno-M28	W12X35	0.044	26.474	176	0.056	25.323	y	176	211.878	308.383	28.693	127.745	1.57	H1-1b
29	Renno-M29	W12X35	0.071	26.474	138	0.05	0	y	138	211.878	308.383	28.693	127.745	1.198	H1-1b
30	Renno-M30	W12X35	0.105	59.854	311	0.156	26.474	y	311	211.878	308.383	28.693	127.745	1.824	H1-1b
31	Renno-M31	W12X35	0.111	26.474	311	0.115	33.38	z	311	211.878	308.383	28.693	127.745	1.894	H1-1b
32	M32	W8X28	0.13	0	3	0	159	y	96	122.321	247.006	25.2	55.353	1	H1-1b*
33	M33	W8X28	0.131	0	3	0	159	y	311	122.321	247.006	25.2	67.864	1.667	H1-1b*
34	M46	L4X3X6	0.459	13	311	0.092	13	y	311	52.983	53.677	1.787	4.699	1	H2-1
35	M47	L4X3X6	0.853	11.25	311	0.184	22.5	y	311	52.983	53.677	1.787	4.699	1	H2-1
36	M48	L4X3X6	0.689	13	311	0.136	0	y	311	52.983	53.677	1.787	4.699	1	H2-1
37	M49	L4X3X6	0.698	11.25	311	0.147	0	y	311	52.983	53.677	1.787	4.699	1	H2-1
38	M50	HSS3X3X4	0.763	57.667	311	0.258	58.388	y	311	55.054	73.054	6.188	6.188	1.519	H1-1b
39	M51	HSS3X3X4	0.89	35.4	311	0.317	47.2	y	311	64.045	73.054	6.188	6.188	1.253	H1-1b

Envelope AISC 15TH (360-16): ASD Member Steel Code Checks (Continued)

	Member	Shape	Code Check	Loc[in]	LC	Shear Check	Loc[in]	Dir	LC	Pnc/om [k]	Pnt/om [k]	Mnyy/om [k-ft]	Mnzz/om [k-ft]	Cb	Eqn
40	M52	L3X3X4	0.148	40.375	135	0.004	40.375	y	175	24.157	31.042	1.123	2.335	1	H2-1
41	M53	L3X3X4	0.196	40.375	311	0.001	40.375	y	119	24.157	31.042	1.123	2.335	1	H2-1
42	M54	L3X3X4	0.069	40.375	167	0.001	40.375	y	311	24.157	31.042	1.123	2.335	1	H2-1
43	M55	L3X3X4	0.183	0	311	0.007	40.375	y	175	24.157	31.042	1.123	2.335	1	H2-1
44	M60	HSS3X3X4	0.455	16.437	311	0.168	26.3	y	311	70.129	73.054	6.188	6.188	1.402	H1-1b
45	M61	HSS3X3X4	0.306	16.437	139	0.124	26.3	y	139	70.129	73.054	6.188	6.188	1.401	H1-1b
46	M62	HSS3X3X4	0.154	16.379	311	0.231	16.578	y	311	71.484	73.054	6.188	6.188	1.5	H1-1b
47	M63	HSS3X3X4	0.227	16.379	311	0.299	19.175	y	311	71.484	73.054	6.188	6.188	1.493	H1-1b
48	M64	L4X3X6	0.642	11.25	120	0.138	0	y	120	52.983	53.677	1.787	4.699	1	H2-1
49	M65	L4X3X6	0.458	13	311	0.089	26	y	311	52.983	53.677	1.787	4.699	1	H2-1
50	M66	L4X3X6	0.81	11.25	311	0.175	22.5	y	311	52.983	53.677	1.787	4.699	1	H2-1
51	M67	L4X3X6	0.646	13	311	0.129	0	y	311	52.983	53.677	1.787	4.699	1	H2-1
52	M68	L3X3X4	0.166	0	311	0.001	40.375	y	90	24.157	31.042	1.123	2.335	1	H2-1
53	M69	L3X3X4	0.183	40.375	311	0	40.375	y	1	24.157	31.042	1.123	2.335	1	H2-1
54	M70	L3X3X4	0.1	0	57	0.001	40.375	y	311	24.157	31.042	1.123	2.335	1	H2-1
55	M71	L3X3X4	0.101	0	44	0	40.375	y	1	24.157	31.042	1.123	2.335	1	H2-1
56	M72	L4X3X6	0.64	11.25	139	0.138	0	y	139	52.983	53.677	1.787	4.699	1	H2-1
57	M73	L4X3X6	0.525	13	311	0.103	26	y	311	52.983	53.677	1.787	4.699	1	H2-1
58	M74	L4X3X6	0.719	11.25	311	0.155	22.5	y	311	52.983	53.677	1.787	4.699	1	H2-1
59	M75	L4X3X6	0.571	13	311	0.114	0	y	311	52.983	53.677	1.787	4.699	1	H2-1
60	M76	L3X3X4	0.124	0	311	0	40.375	y	94	24.157	31.042	1.123	2.335	1	H2-1
61	M77	L3X3X4	0.15	40.375	311	0	40.375	y	1	24.157	31.042	1.123	2.335	1	H2-1
62	M78	L3X3X4	0.099	0	43	0.001	40.375	y	311	24.157	31.042	1.123	2.335	1	H2-1
63	M79	L3X3X4	0.105	40.375	311	0	40.375	y	3	24.157	31.042	1.123	2.335	1	H2-1
64	M84	HSS4X4X4	0.562	155.7	311	0.168	138.4	z	311	27.203	100.898	11.702	11.702	1.962	H1-1b
65	M85	HSS3X3X4	0.908	139.2	311	0.337	154.667	z	311	13.177	73.054	6.188	6.188	2.736	H1-1b
66	M86	HSS4X4X4	0.498	25.95	311	0.31	0	z	311	27.203	100.898	11.702	11.702	3	H1-1b
67	M87	HSS3X3X4	0.934	26.542	311	0.782	0	y	311	6.992	73.054	6.188	6.188	3	H1-1a
68	M128	HSS3X3X4	0.774	139.2	311	0.341	154.667	z	311	13.177	73.054	6.188	6.188	3	H1-1b
69	M127	L3X3X4	0.044	24.511	311	0.004	48.022	y	138	21.771	31.042	1.123	2.315	1.136	H2-1
70	M129	L3X3X4	0.056	22.148	311	0.002	46.221	y	138	22.347	31.042	1.123	2.332	1.136	H2-1
71	M135	L3X3X4	0.044	24.511	311	0.013	48.022	y	170	21.771	31.042	1.123	2.315	1.136	H2-1
72	M136	L3X3X4	0.055	22.148	311	0.003	46.221	y	170	22.347	31.042	1.123	2.332	1.136	H2-1
73	M137	L3X3X4	0.027	24.511	311	0.002	48.022	y	141	21.771	31.042	1.123	2.315	1.136	H2-1
74	M138	L3X3X4	0.031	22.148	311	0.003	46.221	y	311	22.347	31.042	1.123	2.332	1.136	H2-1
75	M139	L3X3X4	0.025	24.511	311	0.004	48.022	y	202	21.771	31.042	1.123	2.315	1.136	H2-1
76	M140	L3X3X4	0.031	22.148	311	0.004	46.221	y	311	22.347	31.042	1.123	2.332	1.136	H2-1
77	M141	L3X3X4	0.066	22.148	175	0.012	46.221	y	311	22.347	31.042	1.123	2.332	1.136	H2-1
78	M142	L3X3X4	0.052	23.011	135	0.021	48.022	y	311	21.771	31.042	1.123	2.315	1.136	H2-1
79	M143	L3X3X4	0.071	22.148	311	0.016	46.221	y	311	22.347	31.042	1.123	2.332	1.136	H2-1
80	M144	L3X3X4	0.051	23.011	135	0.027	48.022	y	311	21.771	31.042	1.123	2.315	1.136	H2-1
81	M145	W12X16	0.301	144.094	180	0.082	159	y	180	16.766	141.018	5.639	20.578	1.54	H1-1b
82	M149	HSS3X3X4	0.046	13.188	311	0.015	12.908	z	214	69.989	73.054	6.188	6.188	1.404	H1-1b
83	M150	HSS3X3X4	0.044	13.188	311	0.047	12.908	z	311	69.989	73.054	6.188	6.188	1.434	H1-1b
84	M151	HSS3X3X4	0.315	12.719	311	0.101	0	y	311	67.378	73.054	6.188	6.188	1.404	H1-1b
85	M152	HSS3X3X4	0.265	12.719	43	0.081	12.333	y	42	67.378	73.054	6.188	6.188	1.41	H1-1b
86	M153	HSS3X3X4	0.384	19.802	44	0.085	19.28	y	62	63.014	73.054	6.188	6.188	1.4	H1-1b
87	M154	HSS3X3X4	0.384	19.802	57	0.085	19.28	y	169	63.014	73.054	6.188	6.188	1.4	H1-1b
88	M177	W24X55	0.293	140.563	311	0.073	0	y	311	138.269	485.03	33.143	334.331	1	H1-1b
89	M178	W21X68	0.365	144.844	214	0.061	144.844	y	311	146.666	598.802	60.878	272.912	1.376	H1-1b
90	M179	W21X68	0.473	144.844	311	0.078	144.844	y	311	146.666	598.802	60.878	272.856	1.376	H1-1b
91	M180	W12X35	0.036	92.25	3	0.013	184.5	y	3	108.182	308.383	28.693	96.706	1.134	H1-1b
92	M181	VJ18-3	0.168	92.25	70	0.005	0	y	56	5.882	39.611	2.081	23.493	1	H1-1b
93	M182	VJ18-3	0.168	92.25	69	0.005	0	y	64	5.882	39.611	2.081	23.493	1	H1-1b
94	M183	W12X35+PL0.75X6	0.06	92.25	311	0.021	184.5	y	3	167.748	441.916	45.402	118.247	1.135	H1-1b

Envelope AISC 15TH (360-16): ASD Member Steel Code Checks (Continued)

	Member	Shape	Code Check	Loc[in]	LC	Shear Check	Loc[in]	Dir	LC	Pnc/om [k]	Pnt/om [k]	Mnyy/om [k-ft]	Mnzz/om [k-ft]	Cb	Eqn
95	M184	VJ18-3	0.074	92.25	3	0.003	0	y	3	5.882	39.611	2.081	23.493	1	H1-1b
96	M185	VJ18-3	0.848	92.25	311	0.009	184.5	y	3	5.882	39.611	2.081	23.493	1	H1-1a
97	M186	VJ18-3	0.125	92.25	63	0.004	184.5	y	55	5.882	39.611	2.081	23.493	1	H1-1b
98	M187	VJ18-3	0.335	92.25	63	0.01	0	y	55	5.882	39.611	2.081	23.493	1	H1-1b
99	M188	W12X35	0.055	92.25	55	0.02	184.5	y	55	108.182	308.383	28.693	96.531	1.132	H1-1b
100	M189	W12X35+PL0.75X6	0.043	92.25	3	0.017	0	y	55	167.748	441.916	45.402	117.884	1.132	H1-1b
101	M190	HSS4X4X4	0.132	60.36	311	0	60.36	y	96	89.929	100.898	11.702	11.702	1.68	H1-1b*
102	M192	W12X35	0.029	61.005	214	0.015	0	y	206	211.878	308.383	28.693	127.745	1	H1-1b
103	M193	W12X35	0.025	34.531	200	0.053	0	y	199	211.878	308.383	28.693	127.745	1	H1-1b
104	M191	HSS4X4X4	0.102	60.36	214	0	60.36	y	120	89.929	100.898	11.702	11.702	1.68	H1-1b*

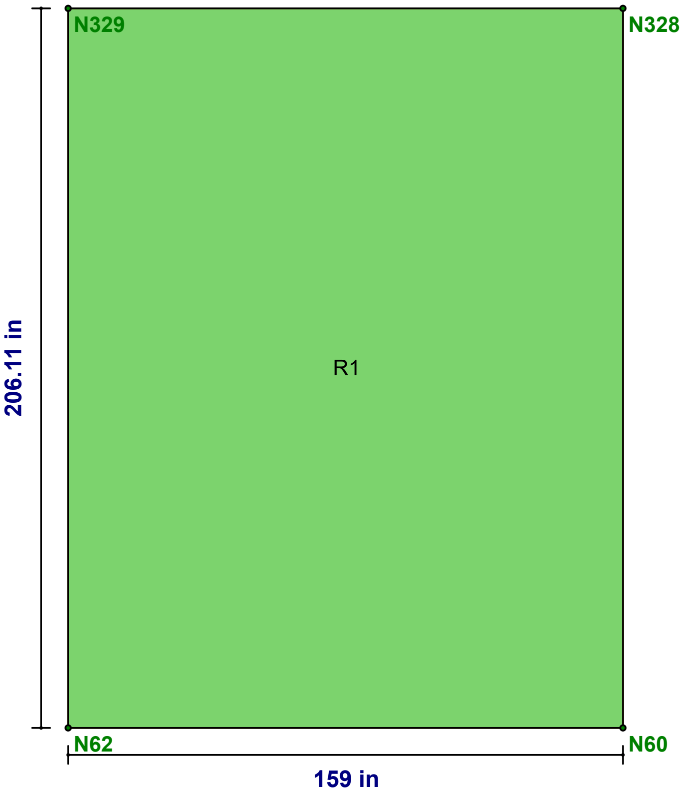
Warning Log

	Message
1	Wall Panel is failing a wall geometry or reinforcement requirement. See detail report for more information.

NOTE: WALL REINFORCEMENT IS AN EXISITING CONDITION AND CANNOT BE REASONABLY ALTERED; HOWEVER THE WALLS EASILY SATIFIED STRENGTH CHECKS FOR THIS PROJECT

Detail Report: WP1

Concrete Wall



CRITERIA		GEOMETRY		MATERIALS	
Code:	ACI 318-14	**Total Height (in):**	206.11	**Material Set:**	Conc4000NW
Design Rule:	(E) OR Wall	**Total Length (in):**	159	**Concrete f'c (ksi):**	4
Seismic Rule:	None	**Thickness (in):**	18	**Concrete E (ksi):**	3644
Loc of r/f:	Each Face	**Int Cover (-z) (in):**	1	**Concrete G (ksi):**	1584
Outer Bars:	Vertical	**Ext Cover (+z) (in):**	1	**Conc Density (k/ft^3):**	0.145
Vert Bar Size:	#5	**Cover Open/Edge (in):**	1	**Lambda:**	1
Horz Bar Size:	#4	**K:**	1	**Conc Str Blk:**	Rectangular
Transfer In?:	No	**Use Cracked?:**	Yes	**Vert Bar Fy (ksi):**	60
Transfer Out?:	No	**In Icr Factor:**	0.7	**Horz Bar Fy (ksi):**	60
Group Wall?:	No	**Out Icr Factor:**	0.35	**Steel E (ksi):**	29000

REGION RESULTS

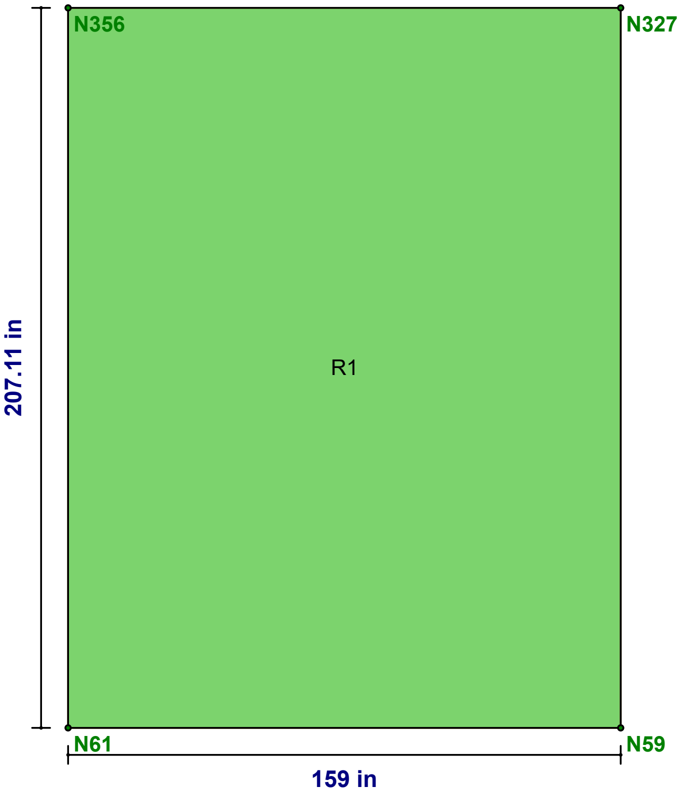
Region	UC Max In Plane	LC	UC Shear In Plane	LC	Delta Max In Plane (in)	LC	UC Max Out Plane	LC	UC Shear Out Plane	LC	Delta Max Out Plane (in)	LC
R1	0.111	214	0.056	311	0.001	70	0.044	311	0.014	247	0.002	120

REINFORCEMENT RESULTS

Region	Vertical Reinforcement	Horizontal Reinforcement	Diagonal Reinforcement
R1	#5@18in oc e.f.	#4@12in oc e.f.	N/A

Detail Report: WP2

Concrete Wall



CRITERIA		GEOMETRY		MATERIALS	
Code:	ACI 318-14	**Total Height (in):**	207.11	**Material Set:**	Conc3000NW
Design Rule:	(E) OR Wall	**Total Length (in):**	159	**Concrete f'c (ksi):**	3
Seismic Rule:	None	**Thickness (in):**	18	**Concrete E (ksi):**	3156
Loc of r/f:	Each Face	**Int Cover (-z) (in):**	1	**Concrete G (ksi):**	1372
Outer Bars:	Vertical	**Ext Cover (+z) (in):**	1	**Conc Density (k/ft^3):**	0.145
Vert Bar Size:	#5	**Cover Open/Edge (in):**	1	**Lambda:**	1
Horz Bar Size:	#4	**K:**	1	**Conc Str Blk:**	Rectangular
Transfer In?:	No	**Use Cracked?:**	Yes	**Vert Bar Fy (ksi):**	60
Transfer Out?:	No	**In Icr Factor:**	0.7	**Horz Bar Fy (ksi):**	60
Group Wall?:	No	**Out Icr Factor:**	0.35	**Steel E (ksi):**	29000

REGION RESULTS

Region	UC Max In Plane	LC	UC Shear In Plane	LC	Delta Max In Plane (in)	LC	UC Max Out Plane	LC	UC Shear Out Plane	LC	Delta Max Out Plane (in)	LC
R1	0.144	311	0.068	311	0.002	311	0.047	311	0.017	230	0.003	96

REINFORCEMENT RESULTS

Region	Vertical Reinforcement	Horizontal Reinforcement	Diagonal Reinforcement
R1	#5@18in oc e.f.	#4@12in oc e.f.	N/A

Detail Report: WP2 (In-Plane, Region R1)

CRITERIA

Code:	ACI 318-14
Design Rule:	(E) OR Wall
Seismic Rule:	None
Loc of r/f:	Each Face
Outer Bars:	Vertical
Vert Bar Size:	#5
Horz Bar Size:	#4
Group Wall?:	No

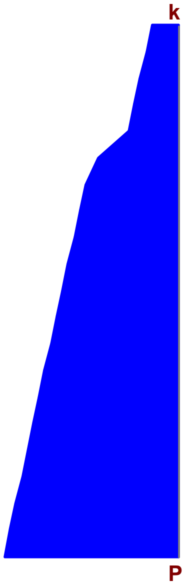
GEOMETRY

Total Height (in):	207.11
Total Length (in):	159
Thickness (in):	18
Int Cover (-z) (in):	1
Ext Cover (+z) (in):	1
Cover Open/Edge (in):	1
K:	1
Use Cracked?:	Yes
Icr Factor:	0.7

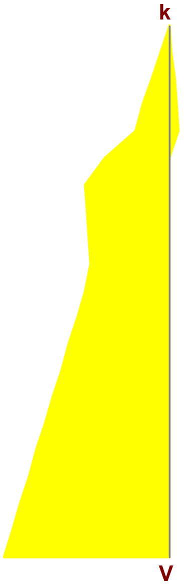
MATERIALS

Material Set:	Conc3000NW
Concrete f'c (ksi):	3
Concrete E (ksi):	3156
Concrete G (ksi):	1372
Conc Density (k/ft^3):	0.145
Lambda:	1
Conc Str Blk:	Rectangular
Vert Bar Fy (ksi):	60
Horz Bar Fy (ksi):	60
Steel E (ksi):	29000

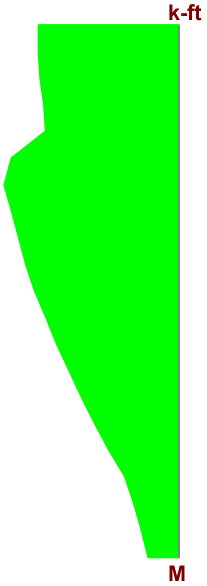
ENVELOPE DIAGRAMS



Min: 15.335 at 207.11 in
Max: 104.229 at 0 in



Min: -1.951 at 165.688 in
Max: 34.931 at 0 in



Min: -0.917 at 0 in
Max: 275.021 at 144.977 in

ACI 318-14 Code Check

AXIAL/BENDING DETAILS

UC Max:	0.144	**phi*Pn:**	NC	**phi eff.:**	0.9
Location (in):	144.977	**Gov Mu (k-ft):**	275.021	**Gov LC:**	311
Gov Pu (k):	0	**phi*Mn (k-ft):**	1908.185		

SHEAR DETAILS

UC Max:	0.068	**phi*Vn (k):**	513.333	**Vs (k):**	249.757
Location (in):	0	**Vnmax (k):**	1254.066	**Gov LC:**	311
Gov Vu (k):	34.931	**Vc (k):**	434.687		

DEFLECTION DETAILS

Delta max (in):	0.002	**Location (in):**	207.11
Deflection Ratio:	H/10000	**Gov LC:**	311

REINFORCEMENT DETAILS

As Provided (H) (in^2):	7.069	**rho min (H):**	0.002	**As min (V) (in^2):**	3.434
rho Provided (H):	0.002	**As Provided (V) (in^2):**	5.522	**rho min (V):**	0.001
As min (H) (in^2):	7.456	**rho Provided (V):**	0.002		

As provided(H) does not meet code required minimum.
Wall vertical rebar spacing violated (ACI 318-14 11.6.1).

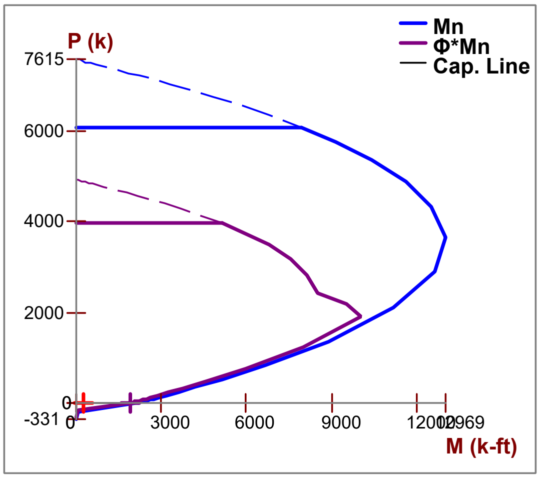
WALL SEGMENT SECTION PROPERTIES

Total Length (in):	159	**Icracked (in^4):**	4.221e+6	**KL/r:**	4.512
A (in^2):	2862	**Cracked Mom, Mcr (k-ft):**	2596.308		
Igross (in^4):	6.03e+6	**r (in):**	38.402		

SLENDER BENDING SPAN RESULTS

KL/r in	Cm in	Lu in (in)	Pc (k)	deltaNS	M act (k-ft)	M2 min (k-ft)	Mc in (k-ft)
4.512	1	207.11	0	N/A	0	0	N/A

IN-PLANE WALL INTERACTION DIAGRAM



Detail Report: WP2 (Out-of-Plane, Region R1)

CRITERIA

Code:	ACI 318-14
Design Rule:	(E) OR Wall
Seismic Rule:	None
Loc of r/f:	Each Face
Outer Bars:	Vertical
Vert Bar Size:	#5
Horz Bar Size:	#4
Group Wall?:	No

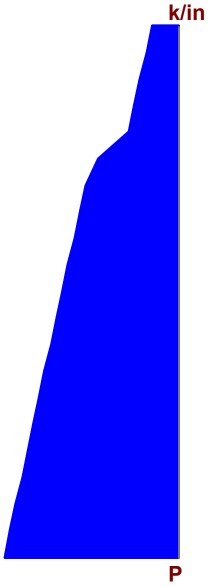
GEOMETRY

Total Height (in):	207.11
Total Length (in):	159
Thickness (in):	18
Int Cover (-z) (in):	1
Ext Cover (+z) (in):	1
Cover Open/Edge (in):	1
K:	1
Use Cracked?:	Yes
Icr Factor:	0.35

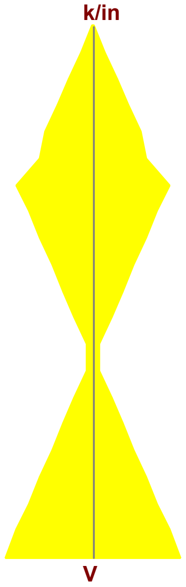
MATERIALS

Material Set:	Conc3000NW
Concrete f'c (ksi):	3
Concrete E (ksi):	3156
Concrete G (ksi):	1372
Conc Density (k/ft^3):	0.145
Lambda:	1
Conc Str Blk:	Rectangular
Vert Bar Fy (ksi):	60
Horz Bar Fy (ksi):	60
Steel E (ksi):	29000

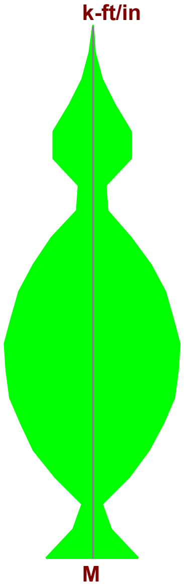
ENVELOPE DIAGRAMS



Min: 0.096 at 207.11 in
Max: 0.656 at 0 in



Min: -0.023 at 0 in
Max: 0.023 at 0 in



Min: -0.048 at 82.844 in
Max: 0.049 at 82.844 in

ACI 318-14 Code Check

AXIAL/BENDING DETAILS

UC Max Int (-z):	0.047	**phi eff. Int (-z):**	0.9	**Gov Mu Ext (+z) (k-ft/in):**	0.062
Location (in):	62.133	**Gov LC Int (-z):**	311	**phi*Mn Ext (+z) (k-ft/in):**	1.333
Gov Pu Int (-z) (k/in):	0	**UC Max Ext (+z):**	0.047	**phi eff. Ext (+z):**	0.9
phi*Pn Int (-z):	NC	**Location (in):**	62.133	**Gov LC Ext (+z):**	311
Gov Mu Int (-z) (k-ft/in):	-0.062	**Gov Pu Ext (+z) (k/in):**	0		
phi*Mn Int (-z) (k-ft/in):	1.333	**phi*Pn Ext (+z):**	NC		

SHEAR DETAILS

UC Max:	0.017	**Gov Vu (k/in):**	0.276	**phi*Vns (k/in):**	0
Location (in):	0	**phi*Vnc (k/in):**	16.547	**Gov LC:**	230

DEFLECTION DETAILS

Delta max (in):	0.003	**Location (in):**	72.489
Deflection Ratio:	H/10000	**Gov LC:**	96

REINFORCEMENT DETAILS

As Provided (V) (in^2):	5.522	**As min (V) (in^2):**	3.434
rho Provided (V):	0.002	**rho min (V):**	0.001

Wall vertical rebar spacing violated (ACI 318-14 11.6.1).

WALL SEGMENT SECTION PROPERTIES

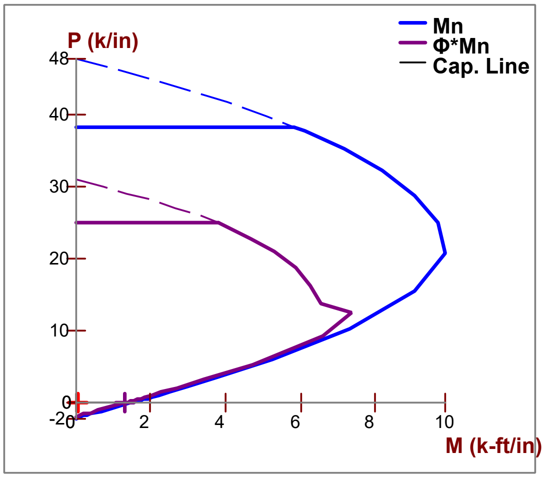
Total Width (in):	18	**Icracked (in^4):**	3061.8	**KL/r:**	39.858
A (in^2):	324	**Cracked Mom, Mcr (k-ft):**	293.922		
Igross (in^4):	8748	**r (in):**	3.074		

SLENDER BENDING SPAN RESULTS

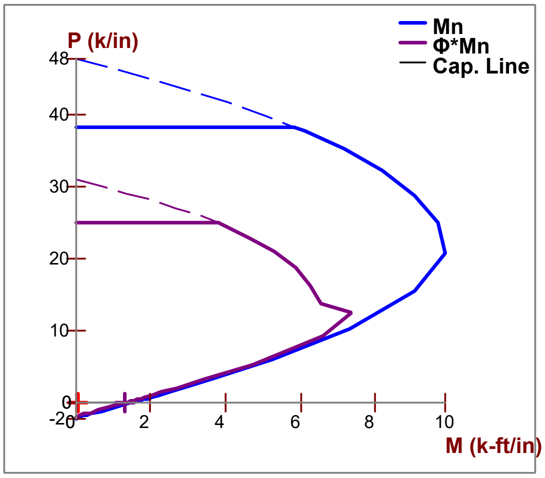
	KL/r out	Cm out	Lu out (in)	Pc (k/ft)	deltaNS	M act (k-ft/in)	M2 min (k-ft/in)	Mc out (k-ft/in)
Interior	39.858	0.6	207.11	88.229	1	0(207.11in)	0.062	0.062(62.133in)
Exterior				88.229	1	0(0in)	0.062	-0.062(62.133in)

OUT-PLANE WALL INTERACTION DIAGRAM

Interior (-z) Face Wall Interaction Diagram



Exterior (+z) Face Wall Interaction Diagram



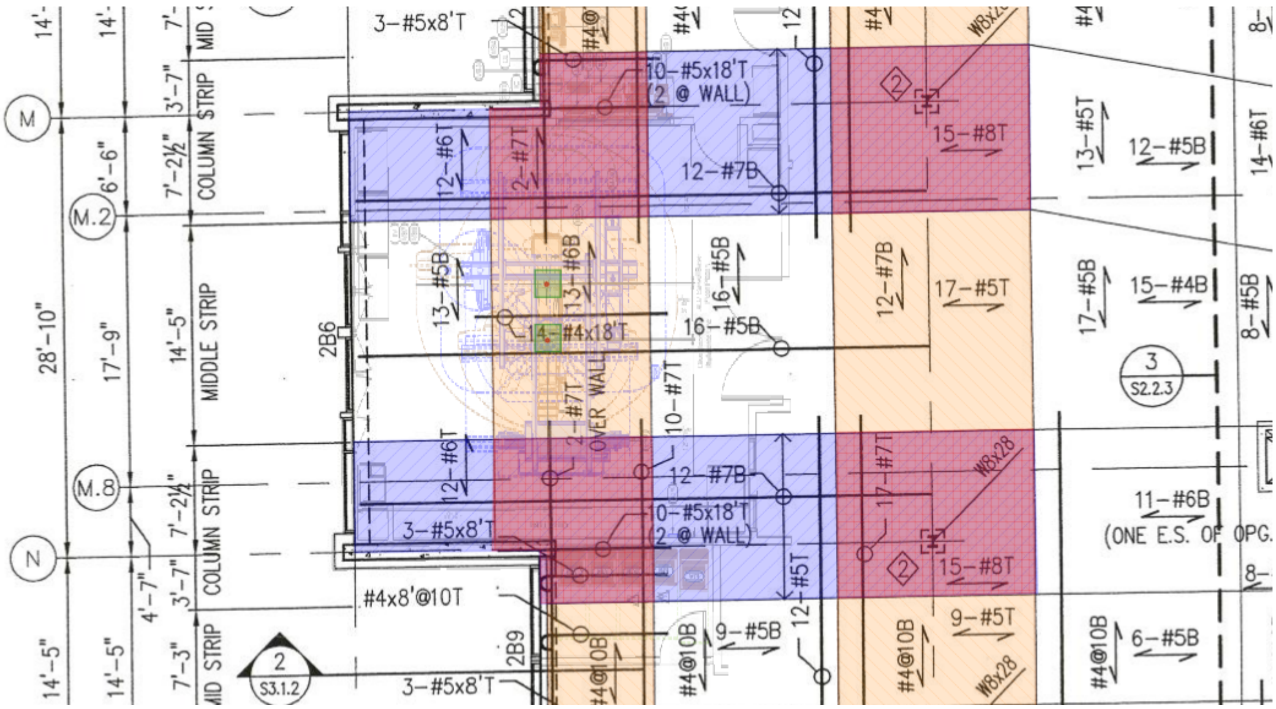
RAM CONCEPT MODEL

PRCTI20221788 - REVISON #6 4/5/2024

PCS Structural Solutions

Project: ~~MHS HYBRID OR~~ Job No: 23-225
Subject: Calcs Sheet
Name: ESO
Originating Office: ☐ Seattle ☒ Tacoma ☐ Portland
Date: 2023-04-10

EXISTING DRAWINGS - REFERENCE REINFORCEMENT PLAN AT PLANNED O.R.



KEY:

🟧 EXISTING COLUMN STRIP - NORTH-SOUTH

🟦 EXISTING COLUMN STRIP - WEST-EAST

🟥 COLUMN STRIP INTERSECTION

🟩 PLANNED ZONE OF CONCRETE CHIP-OUT AND EQUIPMENT ANCHORAGE

PRCTI20221788 - REVISON #6 4/5/2024

PCS Structural *Solutions*

Project: ~~MHS HYBRID OR~~ Job No: 23-225
Subject: Calcs Sheet
Name: ESO
Originating Office: ☐ Seattle ☒ Tacoma ☐ Portland Date: 2023-03-09

RAM CONCEPT MODELS: NOTES

EDGE BM → h = 2'-6", b = 1'-0"

TYPICAL SLAB → t = 10", 1" CONC. COVER, f'c = 5000 PSI

CRITICAL STRIP: (13) #6 BOT WEST-TO-EAST
(16) #5 BOT NORTH-TO-SOUTH
(14) #4 x 18' TOP WEST-TO-EAST

ORIGINAL DESIGN LOADS:

USE ADDT'L SDL = 10 PSF
PARTITION DL: 20 PSF
LL-OTHER: 80 PSF
LL - PUBLIC AREAS, EXIT CORRIDORS: 100 PSF
FULL LIVE LOAD REDUCTION TAKEN

NEW LOADS AT OR: AT OR, USE REFINED LOADS AS FOLLOWS

USE ADDT'L SDL = 10 PSF
USE LL = 60 PSF (NO PARTITION), LL REDUCTION ALLOWED

+ ADD EQUIPMENT LOADS → SEE FOLLOWING PAGES

SLAB: CONT'D

FLOOR LOADS @ CLEA + AD7 TABLE:

APPLY LOADS TO RAM CONCEPT AS FOLLOWS

DL → APPLY AS DL

LL → APPLY AS NON-REDUCIBLE LL

RAM CONCEPT USING 1.2DL + 1.6LL

MAX SEIS. LOAD COMBO = 1.2DL + EL + LL

↳ APPLY EL AS LL W/ FACTOR OF $\frac{1}{1.6}$ = 0.625

↳ APPLY 100%/30% MOMENT FOR M_{xx} + M_{yy}

↳ M_{zz} - IN-PLANE TORSION - HAS MINIMAL IMPACT ON SLAB FLEXURE - [illegible]

AD7: DEAD LOAD: $P = 1249^{\#}$

$M_{xx} = 1249^{\#} \cdot 19.8'' = 24730^{\#''}$

LIVE LOAD: $P = 551^{\#}$

$M_{xx} = 551^{\#} \cdot 19.8'' = 10910^{\#''}$

SEIS. LOAD: $P = 0.21 W_p = 0.21(1800^{\#}) = 378^{\#} \rightarrow \frac{1}{1.6}P = 237^{\#}$

$M_{xx} = 1.83(1800^{\#})20'' + 378^{\#} \cdot 19.8'' = 73365^{\#''}$ ↰ $\rightarrow \frac{1}{1.6}M_x = 45853^{\#''}$

$M_{zz} = 1.83(1800^{\#})20'' = 65880^{\#''}$ ↣

$M_{yy} = 1.83(1800^{\#})18.9'' = 62257^{\#''}$ ↺ $\rightarrow \frac{1}{1.6}M_y = 38910^{\#''}$

CLEA: DEAD LOAD: $P = 2513^{\#}$

$M_{xx} = 2513^{\#} \cdot 27'' = 67851^{\#''}$

LIVE LOAD: $0^{\#}$

SEIS. LOAD: $P = 0.21 W_p = 0.21(2513^{\#}) = 528^{\#} \rightarrow \frac{1}{1.6}P = 330^{\#}$

$M_{xx} = 1.83(2513^{\#})28'' + 528^{\#} \cdot 27'' = 143022^{\#''}$ ↰ $\rightarrow \frac{1}{1.6}M_x = 89389^{\#''}$

$M_{zz} = 1.83(2513^{\#})28'' = 128766^{\#''}$ ↣

$M_{yy} = 1.83(1800^{\#})27'' = 88938^{\#''}$ ↺ $\rightarrow \frac{1}{1.6}M_y = 55586^{\#''}$

SLAB: CONT'D

FLOOR LOADS @ CLEA + AD7 TABLE: CONT'D

APPLY LOADS TO RAM CONCEPT AS FOLLOWS

AD7: DEAD LOAD: $P = 1249^{\#}$

$M_{xx} = 1249^{\#} \cdot 19.8'' = 24730^{\#''}$

LIVE LOAD: $P = 551^{\#} LL + 237^{\#} EL = 788^{\#}$

$M_{xx} = 10910^{\#''} LL + 45853^{\#''} EL = 56763^{\#''}$

$M_{YY} = 38910^{\#''}$

100%/30%: $1.0M_x + 0.3M_y = 56763^{\#''} M_x + 11673^{\#''} M_y$

$0.3M_x + 1.0M_y = [10910^{\#''} + \{0.3\} 45853^{\#''} = 24666^{\#''} M_x + 38910^{\#''} M_y$

CLEA: DEAD LOAD: $P = 2513^{\#}$

$M_{xx} = 2513^{\#} \cdot 27'' = 67851^{\#''}$

LIVE LOAD: $P = 330^{\#}$

$M_x = 89389^{\#''}$

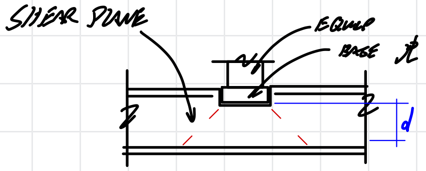
$M_y = 55586^{\#''}$

100%/30%: $1.0M_x + 0.3M_y = 89389^{\#''} M_x + 16676^{\#''} M_y$

$0.3M_x + 1.0M_y = 26819^{\#''} M_x + 55586^{\#''} M_y$

CHECK PUNCHING:

MAXIMUM PUNCHING SHEAR STRESS



$$V_{u,max} = \frac{V_u}{A_c} + \frac{\gamma_v M_u c}{J}$$

AD7	CLEA
$V_u = (1.2 + 0.2S_{DS})D + EL + LL$	
$= \{1.2\}(1294^{\#}) + \{1.0\}(378^{\#}) + \{1.0\}(551^{\#})$	$= \{1.2\}(2513^{\#}) + \{1.0\}(528^{\#}) + \{1.0\}(0^{\#})$
$= 2482^{\#}$	$= 3544^{\#}$
$A_c = b_o d$ $\quad d = 8'' - 1''\text{CLR} - \frac{5}{8}'' - \overset{\frac{1}{2}\ \#5\ \text{BAR}}{\frac{5}{16}''} = 6.06''$ ↳ USE 6″	
$b_o = 2[\underbrace{1'\text{-}11\frac{5}{8}'' + \overset{2(d/2)}{6''}}_{b_1 = 29.6''} + \underbrace{2'\text{-}3\frac{9}{16}'' + \overset{2(d/2)}{6''}}_{b_2 = 33.5''}] = 134''$	$b_o = 2[\underbrace{2'\text{-}1\frac{9}{16}'' + \overset{2(d/2)}{6''}}_{b_1 = 31.5''} + \underbrace{2'\text{-}2\frac{3}{8}'' + \overset{2(d/2)}{6''}}_{b_2 = 32.3''}] = 127.9''$
$A_c = 126'' \cdot 6'' = 756\ \text{IN}^2$	$A_c = 127.9'' \cdot 6'' = 767\ \text{IN}^2$
$V_u / A_c = 2462^{\#} / 756\ \text{IN}^2 = 3.28\ \text{PSI}$	$= 3544^{\#} / 767\ \text{IN}^2 = 4.62\ \text{PSI}$

CHECK PUNCHING: CONT'D

ADT

CASE B:

$J/c = [b_1 d(b_1+3b_2)+d^3]/3$
$=[(29.6'')(6'')(29.6''+3\cdot 33.5'')+(6'')^3]/3$
$= 7774\ IN^3$

$M_{ux} = \{1.2\}24730^{\#''} + \{1.0\}73366^{\#''} + \{1.0\}10910^{\#''}$
$= 113951^{\#''}$

$M_{uy} = \{1.0\}62257^{\#''}$

$M_{u_{SRSS}} = \sqrt{(113951^{\#''})^2 + [(0.3)62257^{\#''}]^2}$
$= 115471^{\#''}$

CONS.

$\frac{\gamma_v M_c\ c}{J} = \frac{1.0(115471^{\#\cdot IN})}{7774\ IN^3} = 14.9 PSI$

$v_{u,MAX} = \frac{V_u}{A_c} + \frac{\gamma_v M_u c}{J} = 3.28\ PSI$
$+14.9\ PSI$
$= 18.2\ PSI$

$\phi v_c = 0.75\ MIN$
$(2+\frac{4}{\beta})\lambda\sqrt{f'c} = (2+\frac{4}{1.13})(1.0)\sqrt{5000 PSI} = 391\ PSI$
$(2+\frac{\alpha_s d}{b_o})\lambda\sqrt{f'c} = (2+\frac{40\cdot 6''}{134''})(1.0)\sqrt{5000 PSI} = 268\ PSI$
$4\lambda\sqrt{f'c} = 4(1.0)\sqrt{5000 PSI} = 282\ PSI$

$f'c = 5000\ PSI;\ \alpha_s = 40\ (INT.);\ d = 6'';\ \lambda = 1.0;$
$\beta = b_2/b_1 = 33.5''/29.6'' = 1.13$

$\phi v_c = 0.75(268 PSI) = 201 PSI \geq v_u = 18.2 PSI$ ✓OK

CLEA

$=[(31.5'')(6'')(31.5''+3\cdot 32.3'')+(6'')^3]/3$
$= 8418\ IN^3$

$M_{ux} = \{1.2\}67851^{\#''} + \{1.0\}143022^{\#''}$
$= 224443^{\#''}$

$M_{uy} = \{1.0\}88938^{\#''}$

$M_{u_{SRSS}} = \sqrt{(224443^{\#''})^2 + [(0.3)88938^{\#''}]^2}$
$= 226023^{\#''}$

$= \frac{1.0(226023^{\#\cdot IN})}{8418\ IN^3} = 26.8\ PSI$

$= 4.62\ PSI + 26.8\ PSI = 31.4\ PSI$

$= (2+\frac{4}{1.03})(1.0)\sqrt{5000 PSI} = 416\ PSI$
$= (2+\frac{40\cdot 6''}{127.9''})(1.0)\sqrt{5000 PSI} = 274\ PSI$
$= 282\ PSI$

$\beta = b_2/b_1 = 32.3''/31.5'' = 1.03$

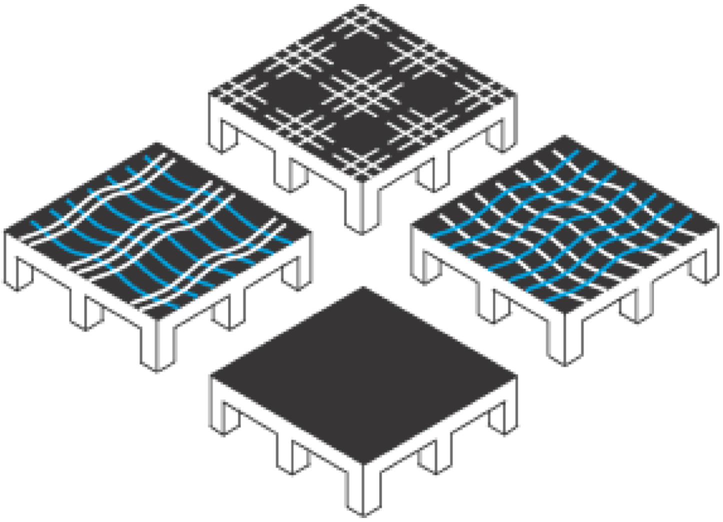
$\phi v_c = 0.75(274 PSI) = 205 PSI > v_u = 31.4 PSI$ ✓OK

∴ EQUIP OK FOR PUNCHING

RAM CONCEPT MODEL FOR

MHS GS HYBRID OR - PUYALLUP, WA

PREPARED BY PCS STRUCTURAL SOLUTIONS



NOTES:

EXISITNG DESIGN WAS BASED ON 80 PSF TYPICAL LIVE LOAD AND 20 PSF PARTITION LOAD

PLANNED O.R. IS ANALYZED WITH 60PSF LIVE LOAD AND NO ADDITIONAL PARTITION LOAD REQUIRED

INTENT OF MODEL WAS TO LOOK AT LOCALIZED EFFECT OF 2" SLAB DEPRESSION FOR EQUIPMENT BASE PLATES AT THE PLANNED O.R. AND DETERMINE ANY IMPACTS ON EXISTING REINFORCEMENT DUE TO EQUIPMENT LOADS, CHIP-OUT ACTIVIES, AND ANCHOR PLACING.

23225 Hybrid OR 2023-04-10eso.cpt
4/11/2023
23225

8.4

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Drawing Import: Standard Plan

Element: Wall Elements Above; Wall Elements Below; Wall Element Outline Only; Column Elements Above; Column Elements Below; Slab Elements; Slab Element Outline Only;
~~Scale = 1:250~~ RESIZED TO 90% TO FIT ON ONE PAGE - SCALE ≈ 1:278

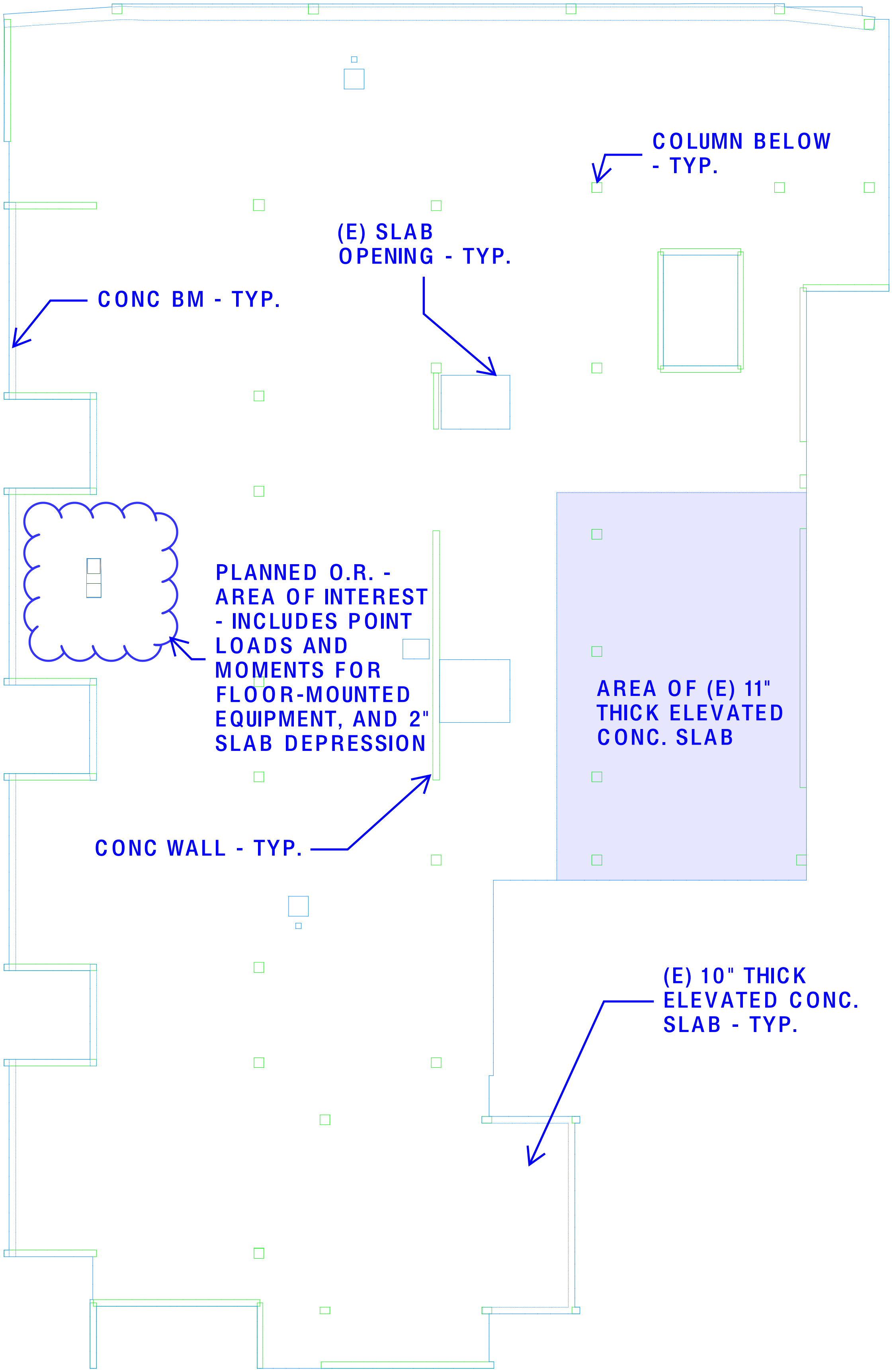

Table of Contents

Materials

Concrete Mix

Mix Name	*Density (pcf)*	*Density For Loads (pcf)*	*f'ci (psi)*	*f'c (psi)*	*fcui (psi)*	*fcu (psi)*	*Poissons Ratio*	*Thermal Exp Coeff*	*Ec Calc*	*User Eci (psi)*	*User Ec (psi)*
3000 psi	150	150	3000	3000	3725	3725	0.2	5.556e-6	Code	2500000	3000000
4000 psi	150	150	3000	4000	3725	4975	0.2	5.556e-6	Code	2500000	3000000
5000 psi	150	150	3000	5000	3725	6399	0.2	5.556e-6	Code	2500000	3000000
6000 psi	150	150	3000	6000	3725	7450	0.2	5.556e-6	Code	2500000	3000000

PT Systems

System Name	*Type*	*Aps (in²)*	*Eps (ksi)*	*fse (ksi)*	*fpy (ksi)*	*fpu (ksi)*	*Duct Width (inches)*	*Strands Per Duct*	*Min Radius (inches)*
½" Unbonded	unbonded	0.153	28000	175	243	270	0.5	1	72
½" Bonded	bonded	0.153	28000	160	243	270	3	4	72
0.6" Unbonded	unbonded	0.217	28000	175	243	270	0.6	1	96
0.6" Bonded	bonded	0.217	28000	160	243	270	4	4	96

PT Stressing Parameters

System Name	*Jacking Stress (ksi)*	*Seating Loss (inches)*	*Anchor Friction*	*Wobble Friction (1/inches)*	*Angular Friction (1/radians)*	*Long-Term Losses (ksi)*
½" Unbonded	216	0.25	0	0.0001167	0.07	22
½" Bonded	216	0.25	0.02	0.00008333	0.2	22
0.6" Unbonded	216	0.25	0	0.0001167	0.07	22
0.6" Bonded	216	0.25	0.02	0.00008333	0.2	22

Reinforcing Bars

Bar Name	*As (in²)*	*Es (ksi)*	*Fy (ksi)*	*Coating*	*Straight Ld/Db*	*90 Hook Ld/Db*	*180 Hook Ld/Db*
#3	0.11	29000	60	None	Code	Code	Code
#4	0.2	29000	60	None	Code	Code	Code
#5	0.31	29000	60	None	Code	Code	Code
#6	0.44	29000	60	None	Code	Code	Code
#7	0.6	29000	60	None	Code	Code	Code
#8	0.79	29000	60	None	Code	Code	Code
#9	1	29000	60	None	Code	Code	Code
#10	1.27	29000	60	None	Code	Code	Code
#11	1.56	29000	60	None	Code	Code	Code

Materials (2)

SSR Systems

SSR System Name	*Stud Area (in²)*	*Head Area (in²)*	*Min Clear Head Spacing (inches)*	*Specified Stud Spacing (inches)*	*Fy (ksi)*	*Stud Spacing Rounding Increment (inches)*	*Min Studs Per Rail*	*System Type*
3/8" SSR	0.11	1.11	0.5	None	50	0.25	2	Rail
1/2" SSR	0.196	1.96	0.5	None	50	0.25	2	Rail
5/8" SSR	0.307	3.07	0.5	None	50	0.25	2	Rail
3/4" SSR	0.442	4.42	0.5	None	50	0.25	2	Rail
Ancon Shearfix Auto-Size	0.1217	1.096	0.5906	None	72.52	0.03937	2	Rail
Ancon Shearfix 10 mm	0.1217	1.096	0.5906	None	72.52	0.03937	2	Rail
Ancon Shearfix 12 mm	0.1753	1.578	0.5906	None	72.52	0.03937	2	Rail
Ancon Shearfix 14 mm	0.2386	2.147	0.5906	None	72.52	0.03937	2	Rail
Ancon Shearfix 16 mm	0.3116	2.805	0.5906	None	72.52	0.03937	2	Rail
Ancon Shearfix 20 mm	0.4869	4.383	0.5906	None	72.52	0.03937	2	Rail
Ancon Shearfix 24 mm	0.7012	6.311	0.5906	None	72.52	0.03937	2	Rail

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Loadings

Loading Name	*Type*	*Analysis*	*On-Pattern Factor*	*Off-Pattern Factor*
Self-Dead Loading	Self-Weight	Normal	1	1
Balance Loading	Balance	Normal	1	1
Hyperstatic Loading	Hyperstatic	Hyperstatic	1	1
Temporary Construction (At Stressing) Loading	Stressing Dead	Normal	1	1
Other Dead Loading	Dead	Normal	1	1
Live (Reducible) Loading	Live (Reducible)	Normal	1	0
Live (Unreducible) Loading	Live (Unreducible)	Normal	1	0
Live (Storage) Loading	Live (Storage)	Normal	1	0
Live (Parking) Loading	Live (Parking)	Normal	1	0
Live (Roof) Loading	Live (Roof)	Normal	1	0
Snow Loading	Snow	Normal	1	1

Load Combinations

All Dead LC

Active Design Criteria: <none>
Analysis: Linear

Loading	*Standard Factor*	*Alt. Envelope Factor*
Self-Dead Loading	1	1
Other Dead Loading	1	1

Dead + Balance LC

Active Design Criteria: <none>
Analysis: Linear

Loading	*Standard Factor*	*Alt. Envelope Factor*
Self-Dead Loading	1	1
Balance Loading	1	1
Other Dead Loading	1	1

Initial Service LC

Active Design Criteria: Initial Service Design
Analysis: Linear

Loading	*Standard Factor*	*Alt. Envelope Factor*
Self-Dead Loading	1	1
Balance Loading	1.13	1.13
Temporary Construction (At Stressing) Loading	1	1

Service LC: D + L

Active Design Criteria: User Minimum Design, Code Minimum Design, Service Design
Analysis: Linear

Loading	*Standard Factor*	*Alt. Envelope Factor*
Self-Dead Loading	1	1
Balance Loading	1	1
Other Dead Loading	1	1
Live (Reducible) Loading	1	0
Live (Unreducible) Loading	1	0
Live (Storage) Loading	1	0
Live (Parking) Loading	1	0

Service LC: D + Lr

Active Design Criteria: User Minimum Design, Code Minimum Design, Service Design
Analysis: Linear

Loading	*Standard Factor*	*Alt. Envelope Factor*
Self-Dead Loading	1	1
Balance Loading	1	1
Other Dead Loading	1	1
Live (Roof) Loading	1	0

Load Combinations (2)

Service LC: D + S

Active Design Criteria: User Minimum Design, Code Minimum Design, Service Design
Analysis: Linear

Loading	*Standard Factor*	*Alt. Envelope Factor*
Self-Dead Loading	1	1
Balance Loading	1	1
Other Dead Loading	1	1
Snow Loading	1	0

Service LC: D + 0.75L + 0.75Lr

Active Design Criteria: User Minimum Design, Code Minimum Design, Service Design
Analysis: Linear

Loading	*Standard Factor*	*Alt. Envelope Factor*
Self-Dead Loading	1	1
Balance Loading	1	1
Other Dead Loading	1	1
Live (Reducible) Loading	0.75	0
Live (Unreducible) Loading	0.75	0
Live (Storage) Loading	0.75	0
Live (Parking) Loading	0.75	0
Live (Roof) Loading	0.75	0

Service LC: D + 0.75L + 0.75S

Active Design Criteria: User Minimum Design, Code Minimum Design, Service Design
Analysis: Linear

Loading	*Standard Factor*	*Alt. Envelope Factor*
Self-Dead Loading	1	1
Balance Loading	1	1
Other Dead Loading	1	1
Live (Reducible) Loading	0.75	0
Live (Unreducible) Loading	0.75	0
Live (Storage) Loading	0.75	0
Live (Parking) Loading	0.75	0
Snow Loading	0.75	0

Sustained Service LC

Active Design Criteria: Sustained Service Design
Analysis: Linear

Loading	*Standard Factor*	*Alt. Envelope Factor*
Self-Dead Loading	1	1
Balance Loading	1	1
Other Dead Loading	1	1
Live (Reducible) Loading	0.5	0.5
Live (Unreducible) Loading	0.5	0.5
Live (Storage) Loading	1	1
Live (Parking) Loading	0.5	0.5
Live (Roof) Loading	0.5	0.5

Load Combinations (3)

Factored LC: 1.4D

Active Design Criteria: User Minimum Design, Code Minimum Design, Strength Design, Ductility Design
Analysis: Linear

Loading	*Standard Factor*	*Alt. Envelope Factor*
Self-Dead Loading	1.4	0.9
Hyperstatic Loading	1	1
Other Dead Loading	1.4	0.9

Factored LC: 1.2D + 1.6L + 0.5Lr

Active Design Criteria: User Minimum Design, Code Minimum Design, Strength Design, Ductility Design
Analysis: Linear

Loading	*Standard Factor*	*Alt. Envelope Factor*
Self-Dead Loading	1.2	0.9
Hyperstatic Loading	1	1
Other Dead Loading	1.2	0.9
Live (Reducible) Loading	1.6	0
Live (Unreducible) Loading	1.6	0
Live (Storage) Loading	1.6	0
Live (Parking) Loading	1.6	0
Live (Roof) Loading	0.5	0

Factored LC: 1.2D + f1L + 1.6Lr

Active Design Criteria: User Minimum Design, Code Minimum Design, Strength Design, Ductility Design
Analysis: Linear

Loading	*Standard Factor*	*Alt. Envelope Factor*
Self-Dead Loading	1.2	0.9
Hyperstatic Loading	1	1
Other Dead Loading	1.2	0.9
Live (Reducible) Loading	0.5	0
Live (Unreducible) Loading	1	0
Live (Storage) Loading	1	0
Live (Parking) Loading	1	0
Live (Roof) Loading	1.6	0

Factored LC: 1.2D + 1.6L + 0.5S

Active Design Criteria: User Minimum Design, Code Minimum Design, Strength Design, Ductility Design
Analysis: Linear

Loading	*Standard Factor*	*Alt. Envelope Factor*
Self-Dead Loading	1.2	0.9
Hyperstatic Loading	1	1
Other Dead Loading	1.2	0.9
Live (Reducible) Loading	1.6	0
Live (Unreducible) Loading	1.6	0
Live (Storage) Loading	1.6	0
Live (Parking) Loading	1.6	0
Snow Loading	0.5	0

Load Combinations (4)

Factored LC: 1.2D + f1L + 1.6S

Active Design Criteria: User Minimum Design, Code Minimum Design, Strength Design, Ductility Design
Analysis: Linear

Loading	*Standard Factor*	*Alt. Envelope Factor*
Self-Dead Loading	1.2	0.9
Hyperstatic Loading	1	1
Other Dead Loading	1.2	0.9
Live (Reducible) Loading	0.5	0
Live (Unreducible) Loading	1	0
Live (Storage) Loading	1	0
Live (Parking) Loading	1	0
Snow Loading	1.6	0

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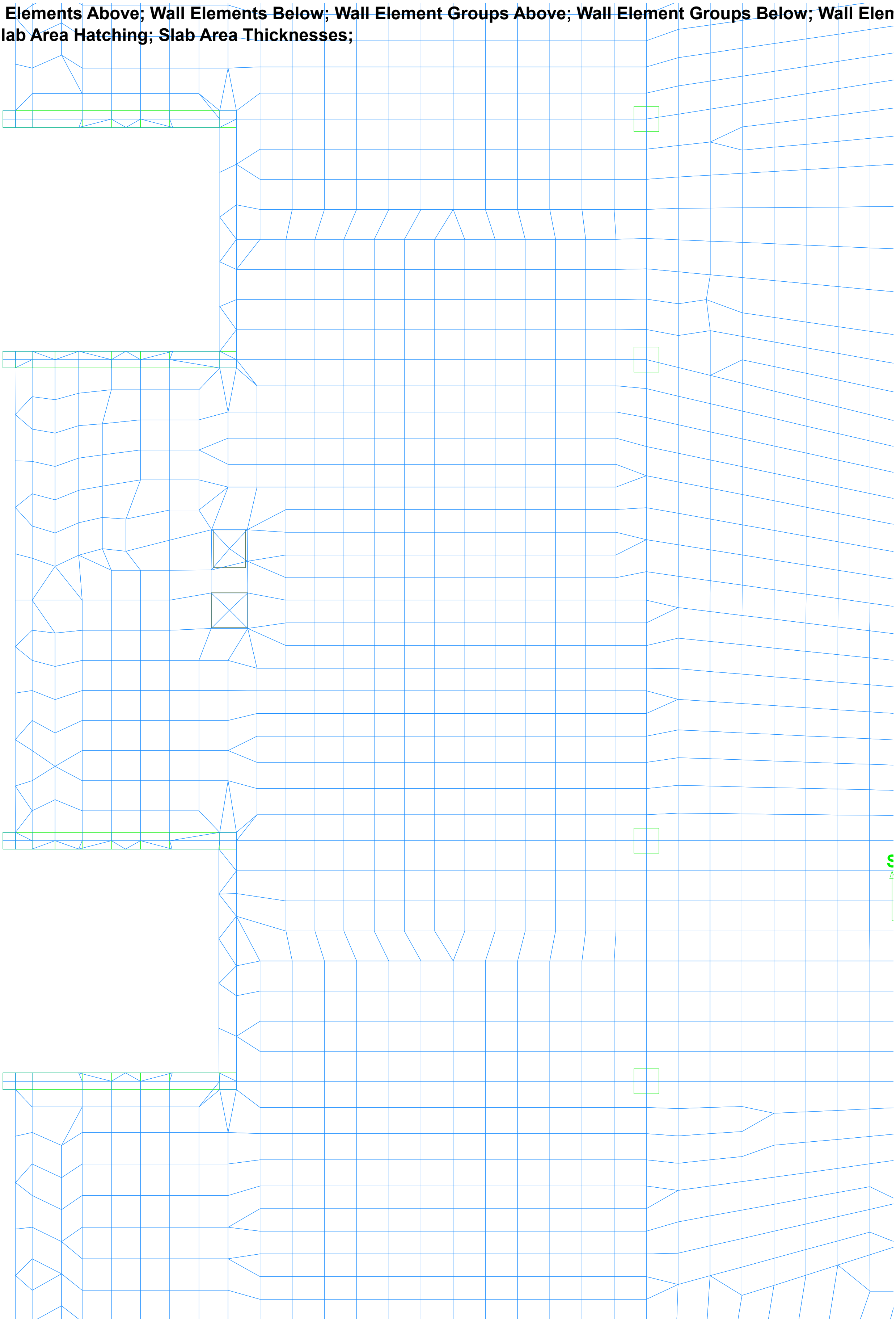
Element: Standard Plan

Element: Wall Elements Above; Wall Elements Below; Wall Element Groups Above; Wall Element Groups Below; Wall Elen

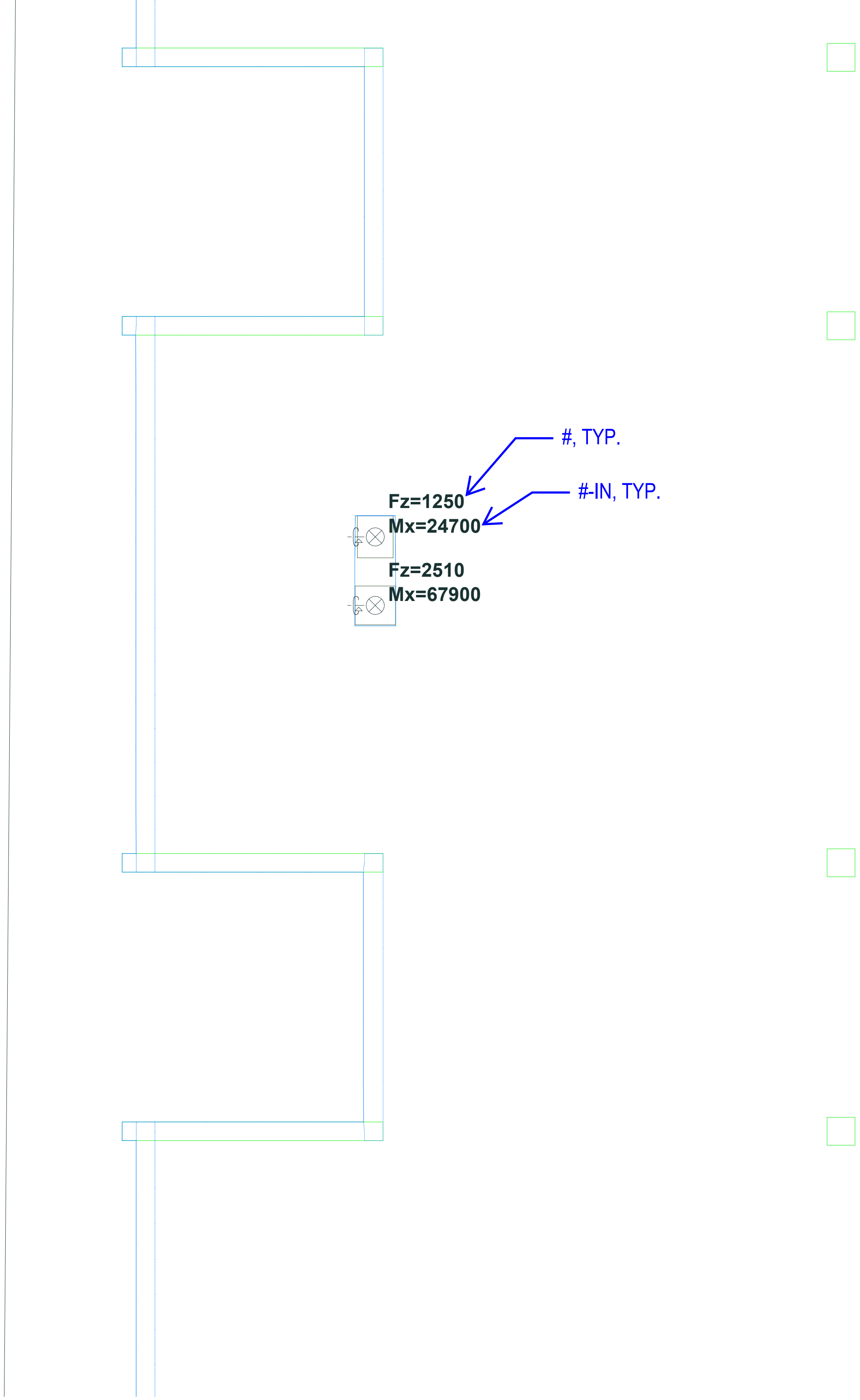
Mesh Input: Slab Area Hatching; Slab Area Thicknesses;

Scale = 1:100



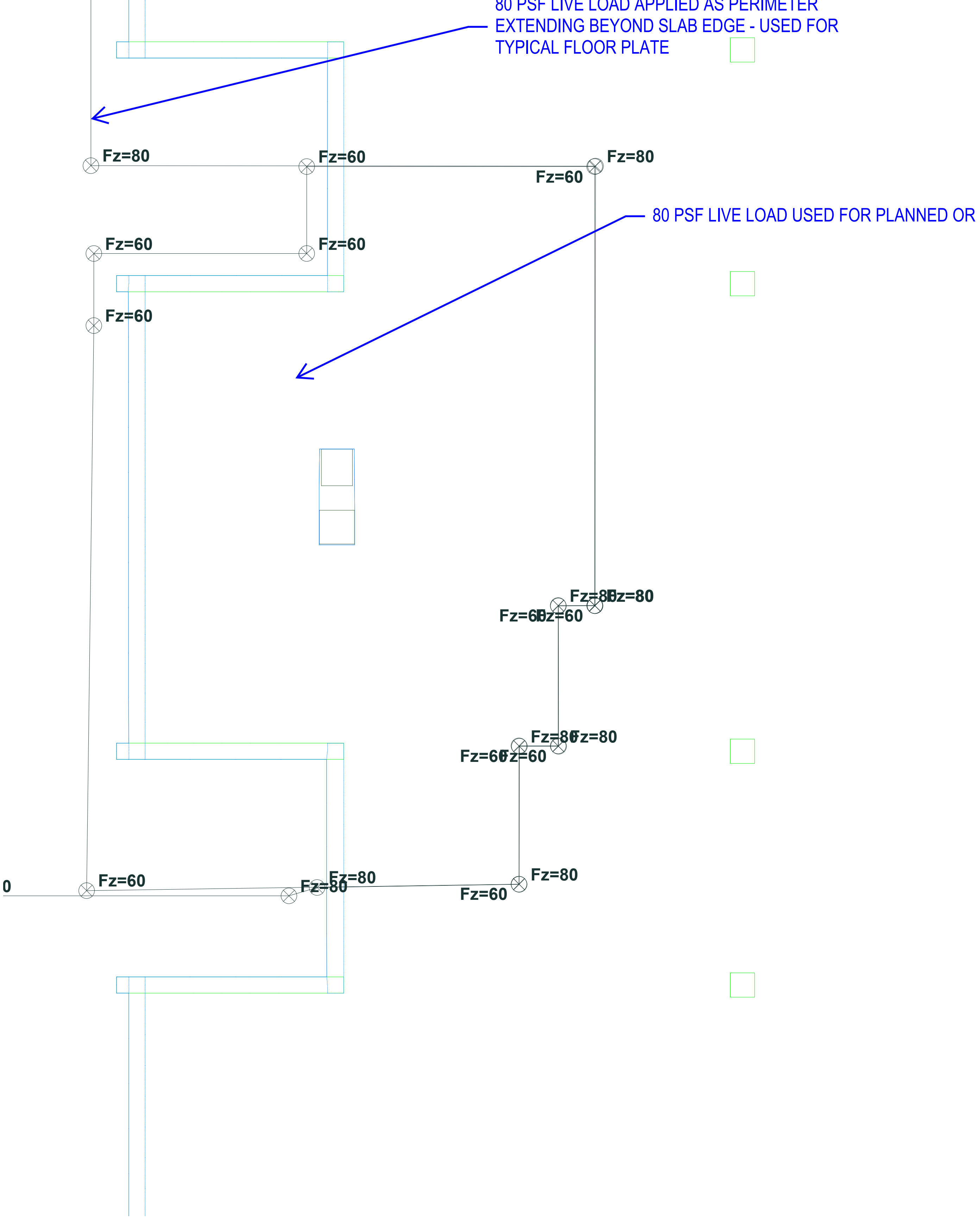
Other Dead Loading: All Loads Plan

Other Dead Loading: Point Loads; Point Load Icons; Point Load Values; Line Loads; Line Load Icons; Line Load Values; A
Element: Wall Elements Above; Wall Elements Below; Wall Element Outline Only; Column Elements Above; Column Eleme
Scale = 1:100



Live (Reducible) Loading: All Loads Plan

Live (Reducible) Loading: Point Loads; Point Load Icons; Point Load Values; Line Loads; Line Load Icons; Line Load Valu
Element: Wall Elements Above; Wall Elements Below; Wall Element Outline Only; Column Elements Above; Column Eleme
Scale = 1:100



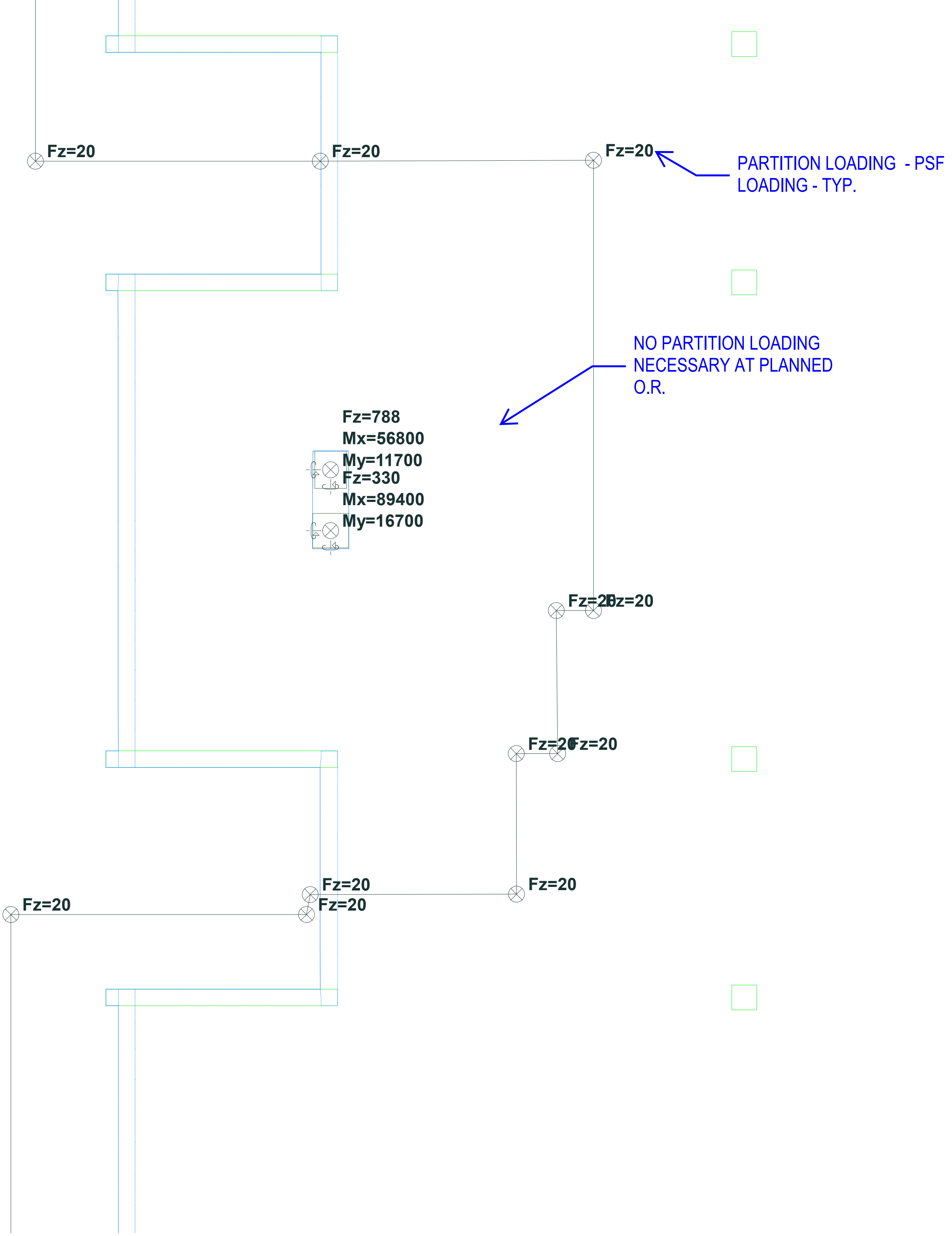
80 PSF LIVE LOAD APPLIED AS PERIMETER EXTENDING BEYOND SLAB EDGE - USED FOR TYPICAL FLOOR PLATE

80 PSF LIVE LOAD USED FOR PLANNED OR

PRCTI20221788 - REVISON #6 4/5/2024

Live (Unreducible) Loading: All Loads Plan

Live (Unreducible) Loading: Point Loads; Point Load Icons; Point Load Values; Line Loads; Line Load Icons; Line Load Va
Element: Wall Elements Above; Wall Elements Below; Wall Element Outline Only; Column Elements Above; Column Eleme
Scale = 1:100

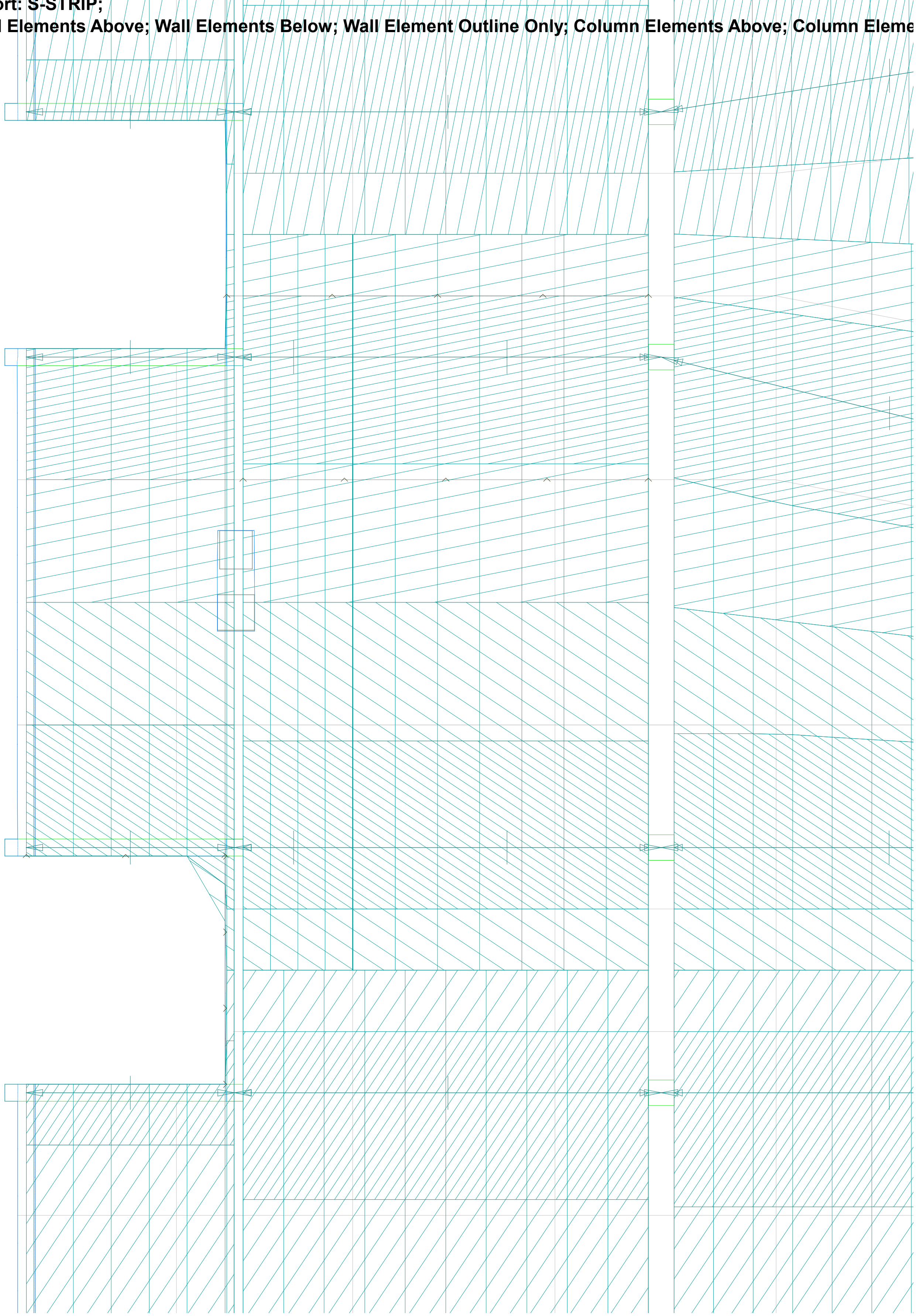


PARTITION LOADING - PSF LOADING - TYP.

NO PARTITION LOADING NECESSARY AT PLANNED O.R.

Design Strip: Latitude Design Spans Plan

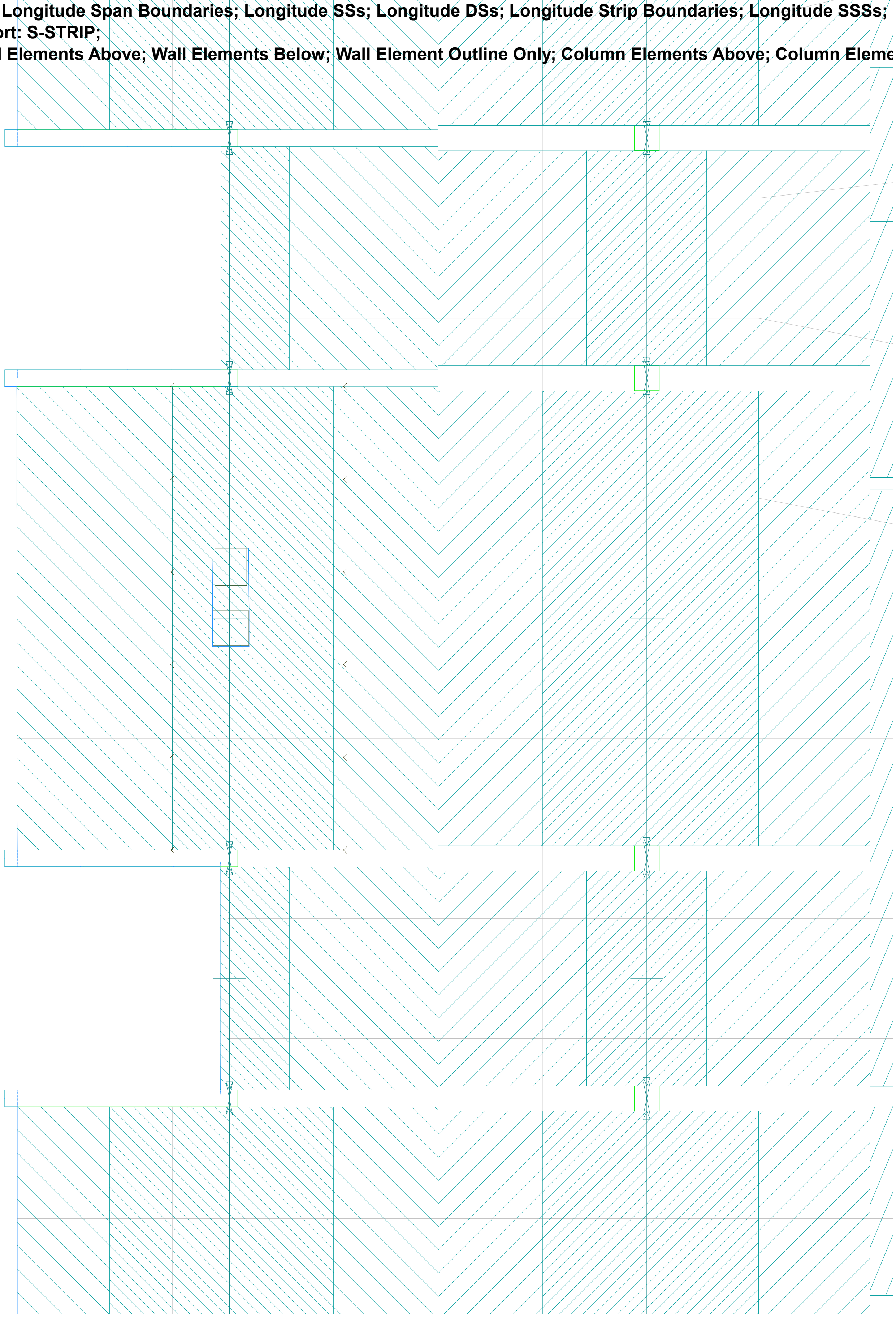
Design Strip: Latitude Span Boundaries; Latitude SSs; Latitude DSs; Latitude Strip Boundaries; Latitude SSSs; SSS Hatch
Drawing Import: S-STRIP;
Element: Wall Elements Above; Wall Elements Below; Wall Element Outline Only; Column Elements Above; Column Eleme
Scale = 1:100



PRCTI20221788 - REVISON #6 4/5/2024

Design Strip: Longitude Design Spans Plan

Design Strip: Longitude Span Boundaries; Longitude SSs; Longitude DSs; Longitude Strip Boundaries; Longitude SSSs;
Drawing Import: S-STRIP;
Element: Wall Elements Above; Wall Elements Below; Wall Element Outline Only; Column Elements Above; Column Eleme
Scale = 1:100

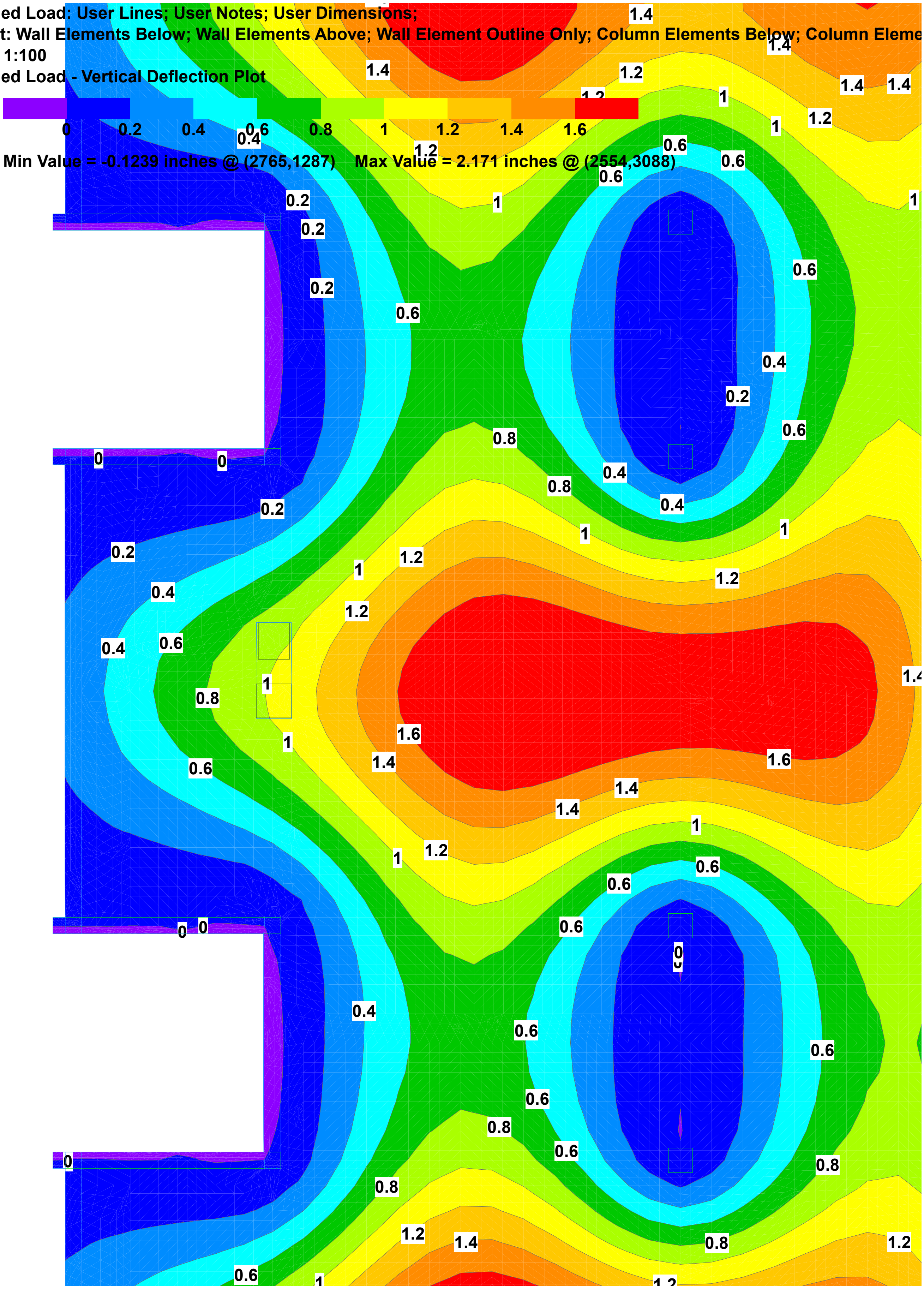


PRCTI20221788 - REVISON #6 4/5/2024

RAM CONCEPT MODEL FOR - 23225 Hybrid OR 2023-04-10eso.cpt - 4/11/2023

Sustained Load: Std Deflection Plan

Sustained Load: User Lines; User Notes; User Dimensions;
Element: Wall Elements Below; Wall Elements Above; Wall Element Outline Only; Column Elements Below; Column Eleme
Scale = 1:100
Sustained Load - Vertical Deflection Plot

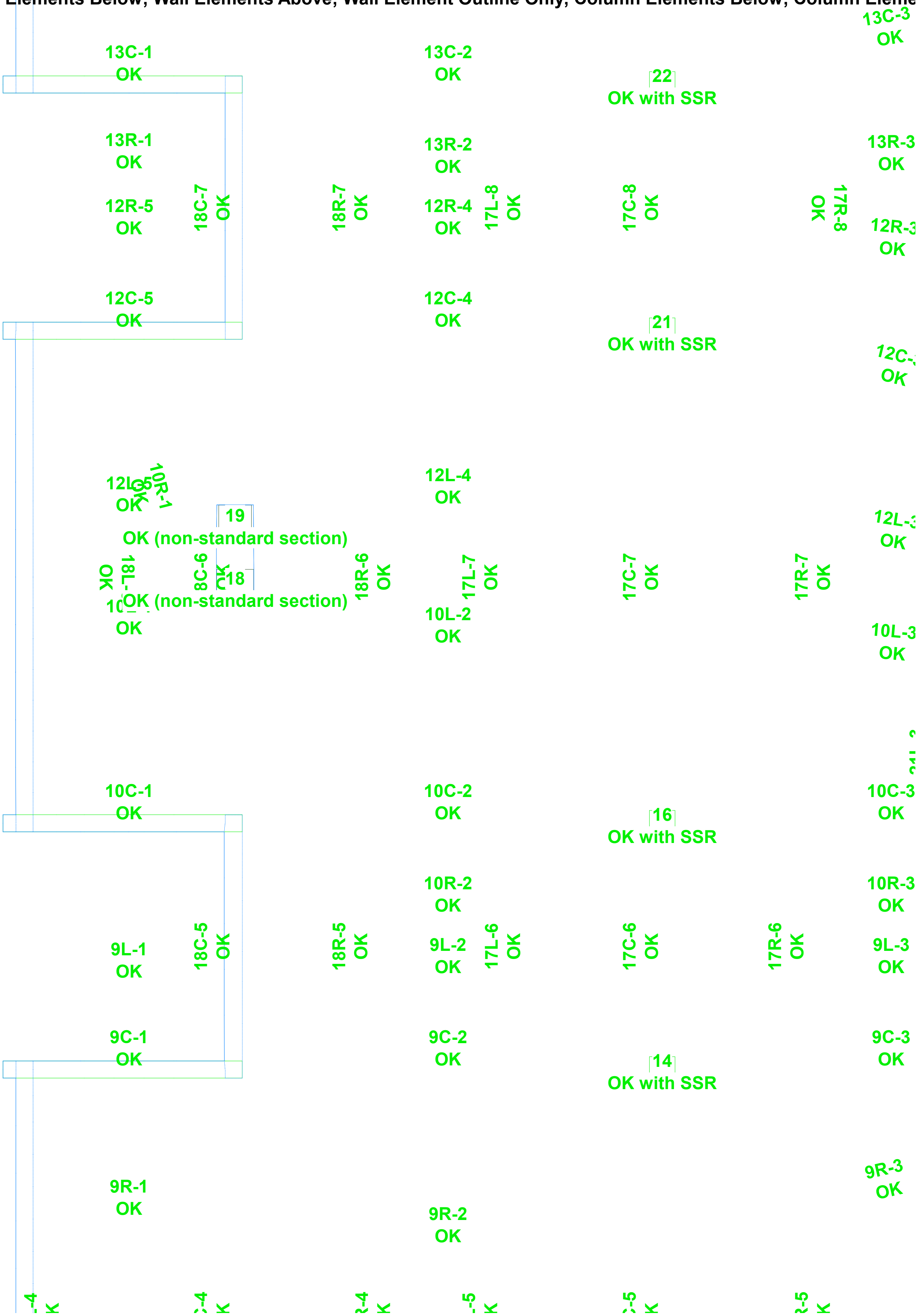


Min Value = -0.1239 inches @ (2765,1287)   Max Value = 2.171 inches @ (2554,3088)

PRCTI20221788 - REVISON #6 4/5/2024

Design Status: Status Plan

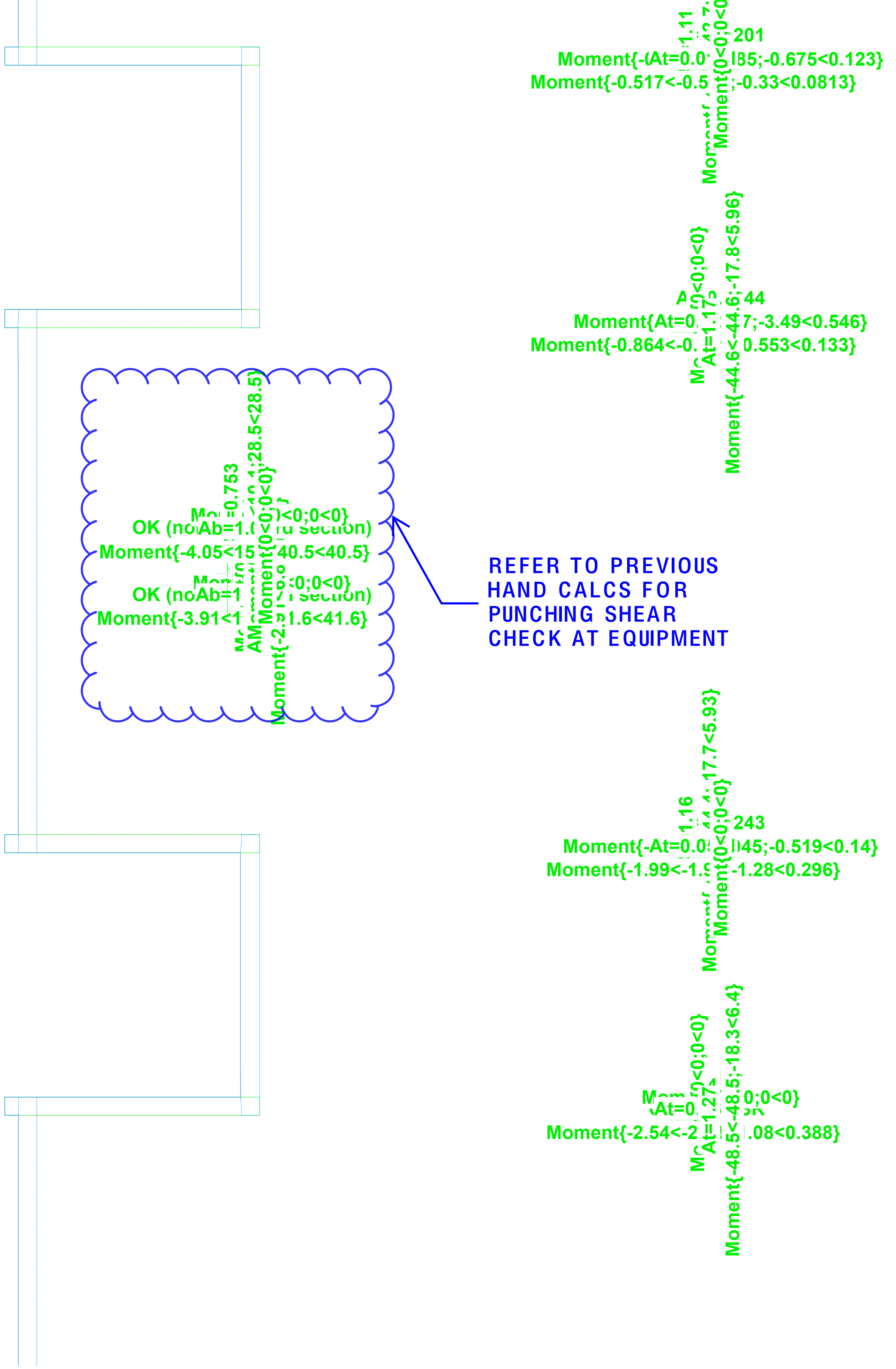
Design Status: User Lines; User Notes; User Dimensions; Latitude Span Designs; Longitude Span Designs; Span Design
Element: Wall Elements Below; Wall Elements Above; Wall Element Outline Only; Column Elements Below; Column Eleme
Scale = 1:100



PRCTI20221788 - REVISON #6 4/5/2024

Design Status: Punching Shear Status Plan

Design Status: User Lines; User Notes; User Dimensions; PC Designs; PC Design Numbers; PC Design Status; PC Design
Element: Wall Elements Below; Wall Elements Above; Wall Element Outline Only; Column Elements Below; Column Eleme
Scale = 1:100

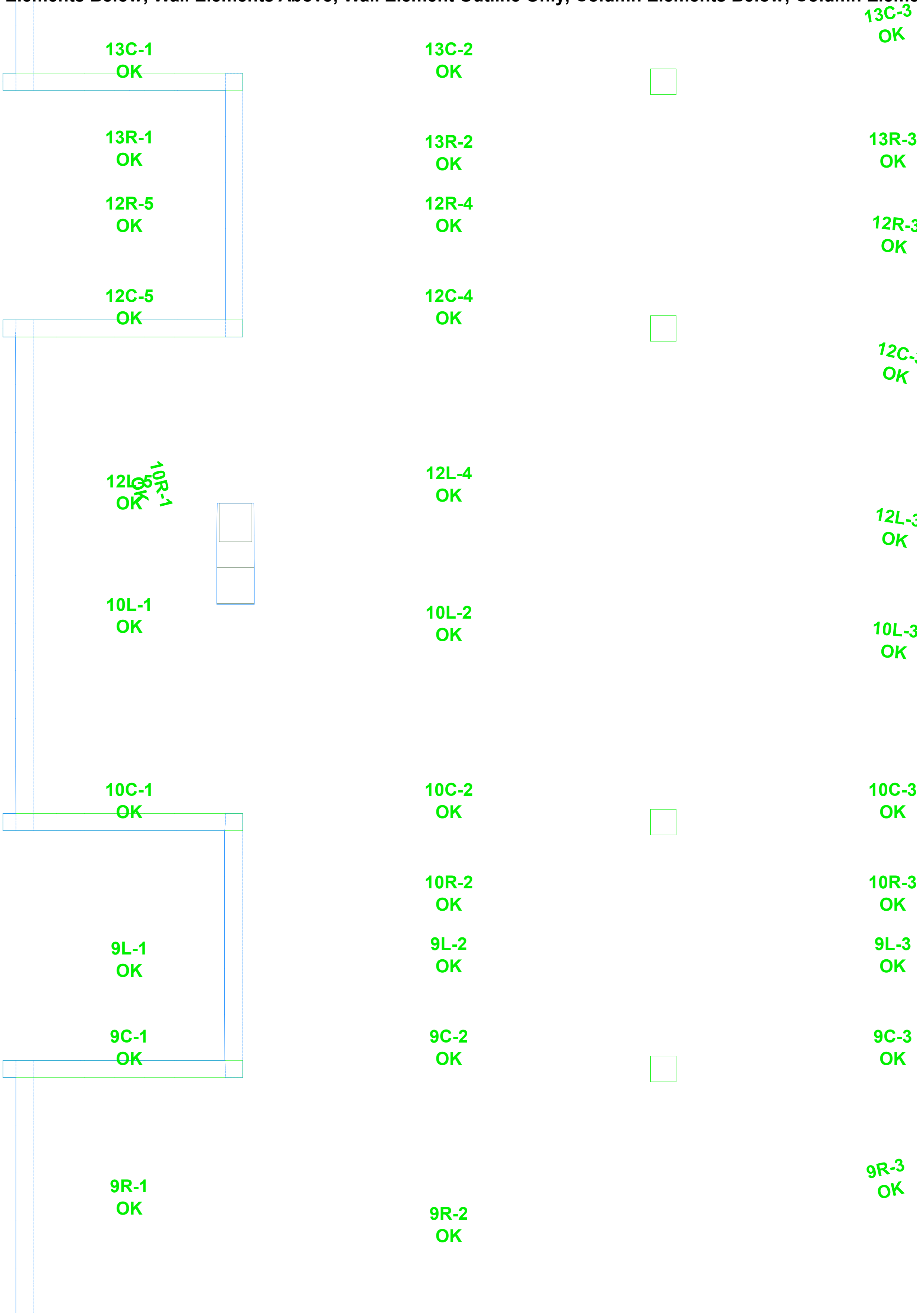


REFER TO PREVIOUS
HAND CALCS FOR
PUNCHING SHEAR
CHECK AT EQUIPMENT

PRCTI20221788 - REVISON #6 4/5/2024

Design Status: Latitude Status Plan

Design Status: User Lines; User Notes; User Dimensions; Latitude Span Designs; Span Design Numbers; Span Design Sta
Element: Wall Elements Below; Wall Elements Above; Wall Element Outline Only; Column Elements Below; Column Eleme
Scale = 1:100

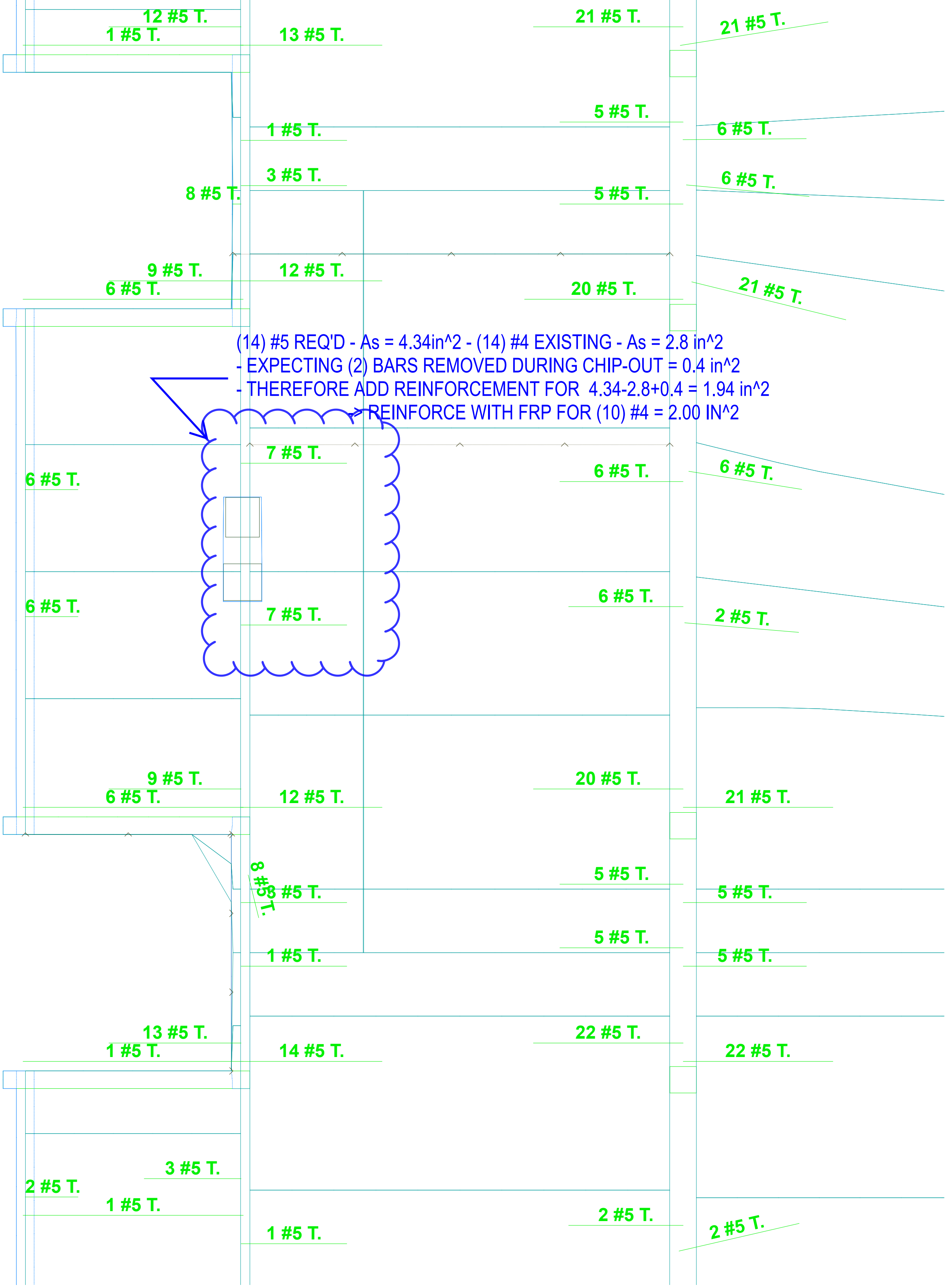


PRCTI20221788 - REVISON #6 4/5/2024

RAM CONCEPT MODEL FOR - 23225 Hybrid OR 2023-04-10eso.cpt - 4/11/2023

Design Status: Latitude Top Reinforcement Plan

Design Status: Latitude Span Designs; Span Design Top Bars; Span Design Bar Descriptions; Latitude DS Designs; DS De
Element: Wall Elements Above; Wall Elements Below; Wall Element Outline Only; Column Elements Above; Column Eleme
Design Strip: Latitude Strip Boundaries; Latitude SSSs;
Reinforcement: Latitude User Concentrated Reinf.; Top Face Concentrated Reinf.; Both Faces Concentrated Reinf.; Auto F
Scale = 1:100

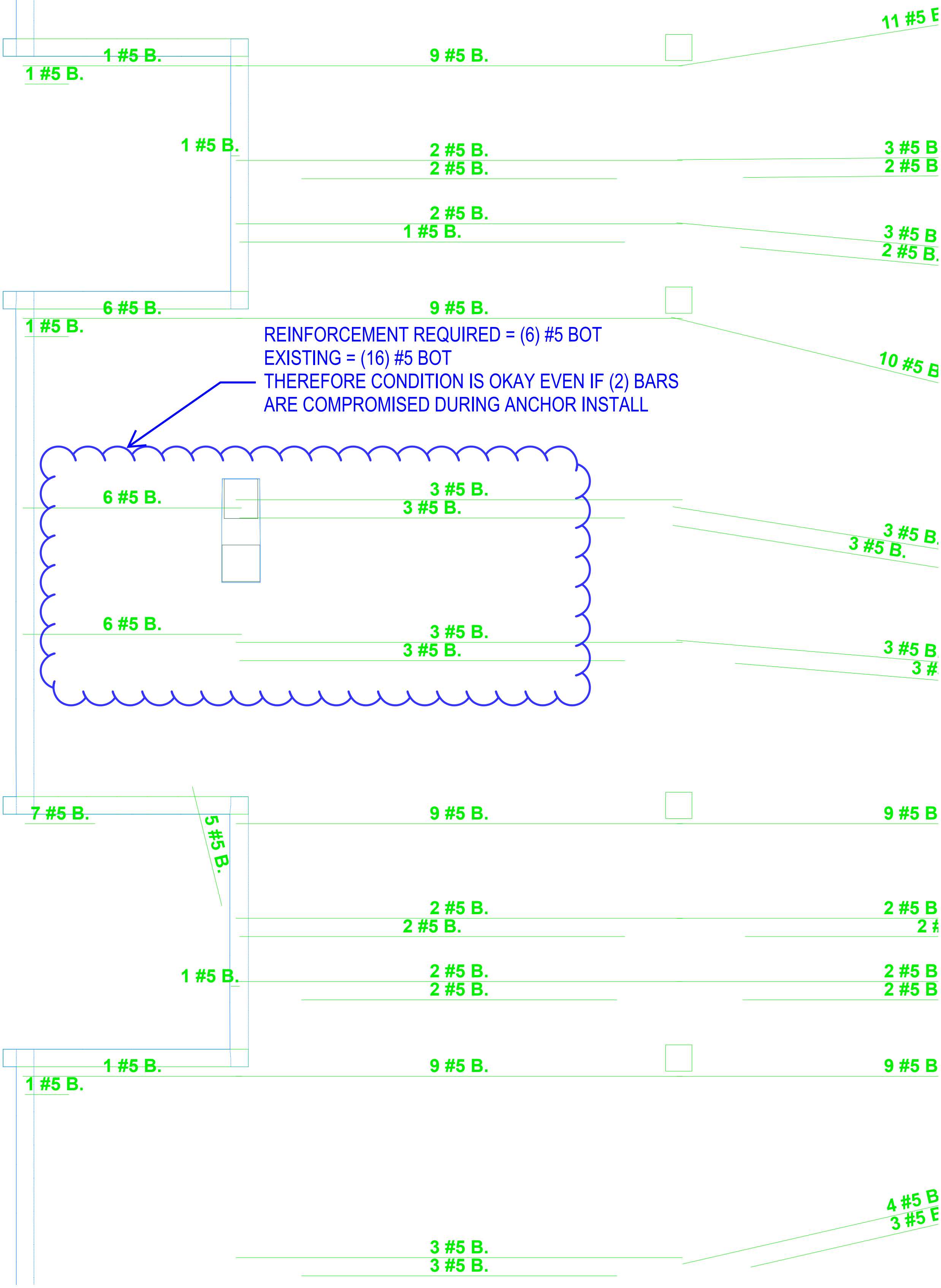


(14) #5 REQ'D - As = 4.34in^2 - (14) #4 EXISTING - As = 2.8 in^2
- EXPECTING (2) BARS REMOVED DURING CHIP-OUT = 0.4 in^2
- THEREFORE ADD REINFORCEMENT FOR 4.34-2.8+0.4 = 1.94 in^2
-> REINFORCE WITH FRP FOR (10) #4 = 2.00 IN^2

PRCTI20221788 - REVISON #6 4/5/2024

Design Status: Latitude Bottom Reinforcement Plan

Design Status: Latitude Span Designs; Span Design Bottom Bars; Span Design Bar Descriptions; Latitude DS Designs; D
Element: Wall Elements Above; Wall Elements Below; Wall Element Outline Only; Column Elements Above; Column Eleme
Reinforcement: Latitude User Concentrated Reinf.; Bottom Face Concentrated Reinf.; Both Faces Concentrated Reinf.; Au
Scale = 1:100

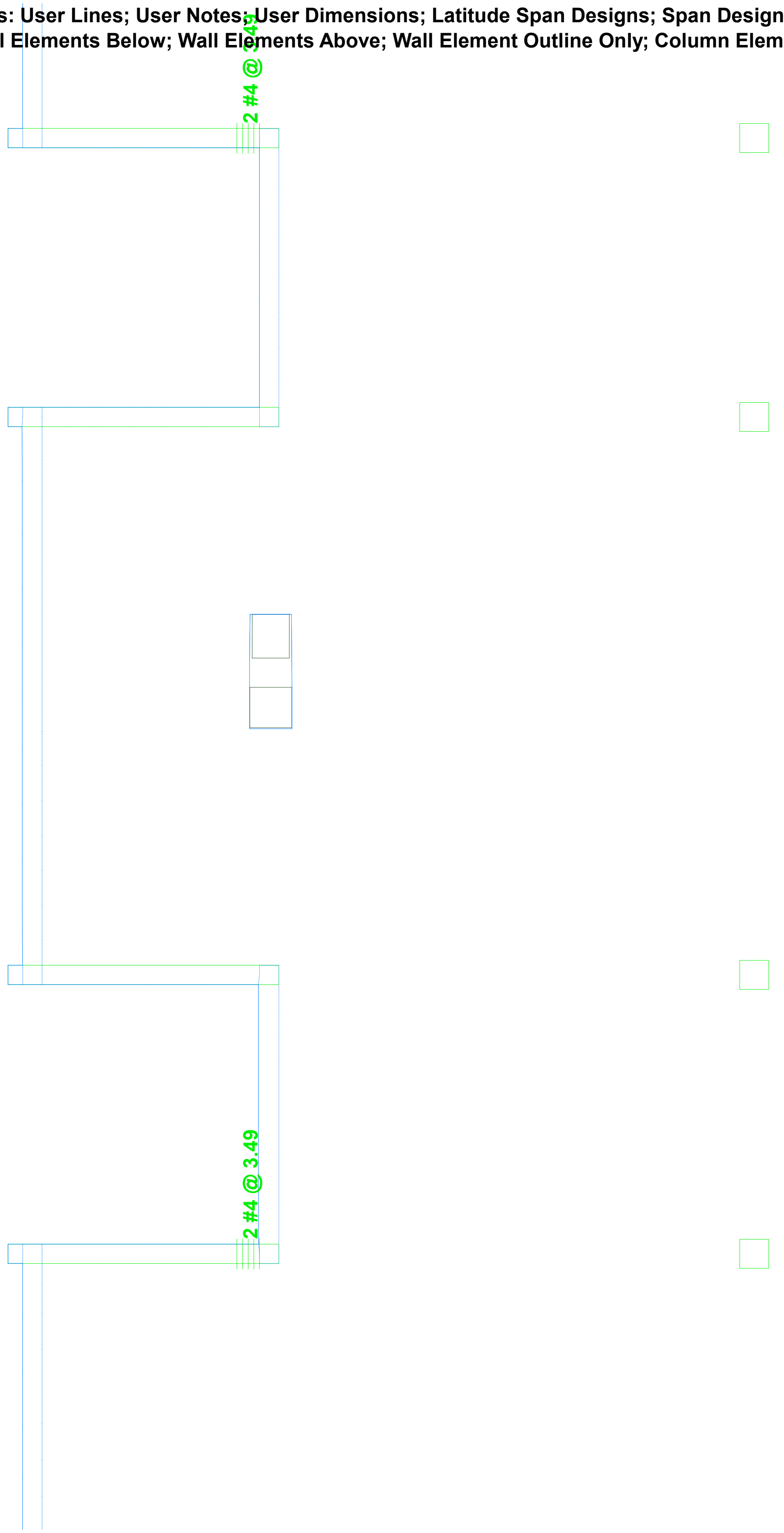


REINFORCEMENT REQUIRED = (6) #5 BOT
EXISTING = (16) #5 BOT
THEREFORE CONDITION IS OKAY EVEN IF (2) BARS
ARE COMPROMISED DURING ANCHOR INSTALL

PRCTI20221788 - REVISON #6 4/5/2024

Design Status: Latitude Shear Reinforcement Plan

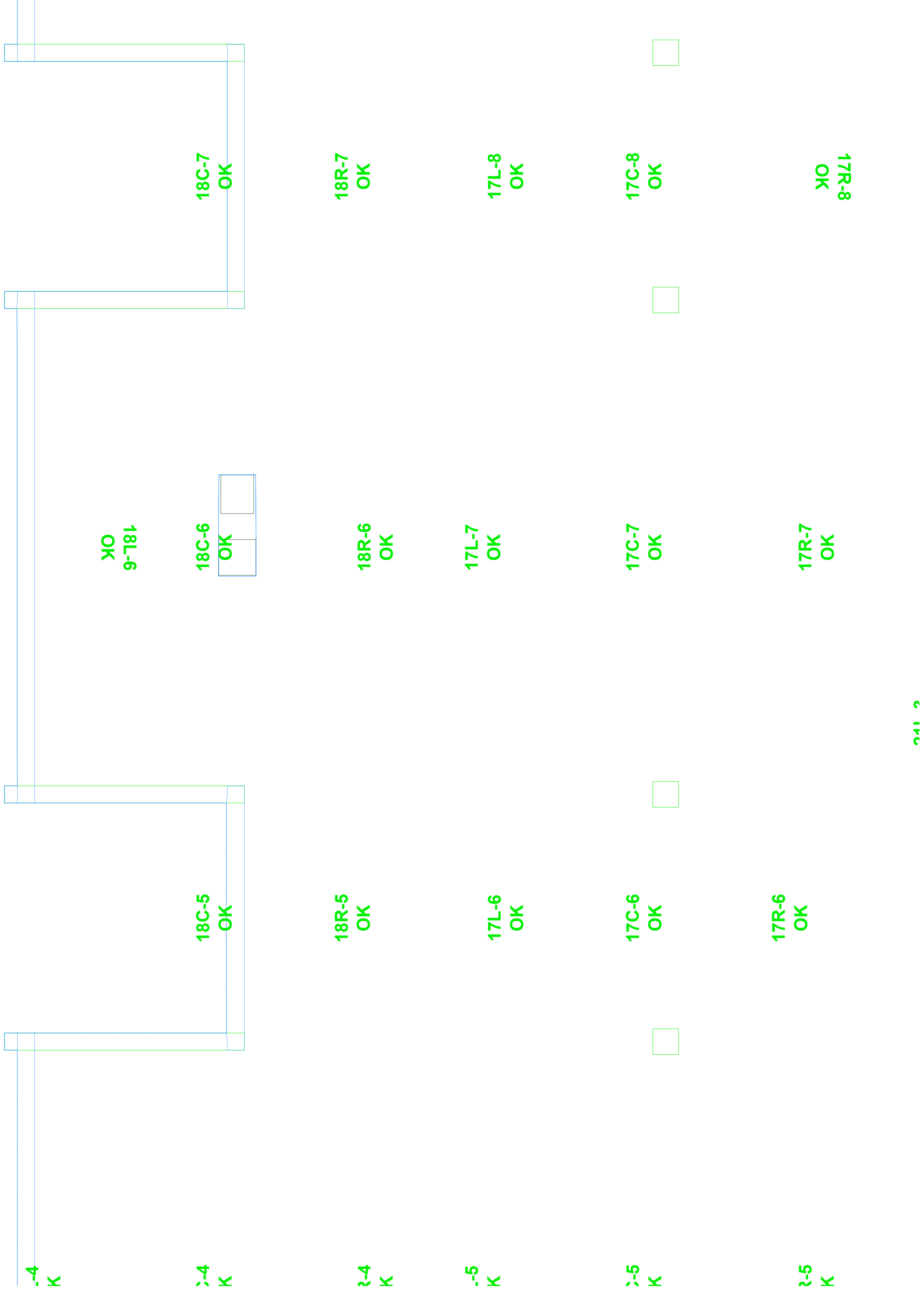
Design Status: User Lines; User Notes; User Dimensions; Latitude Span Designs; Span Design Shear Bars; Span Design I
Element: Wall Elements Below; Wall Elements Above; Wall Element Outline Only; Column Elements Below; Column Eleme
Scale = 1:100



PRCTI20221788 - REVISON #6 4/5/2024

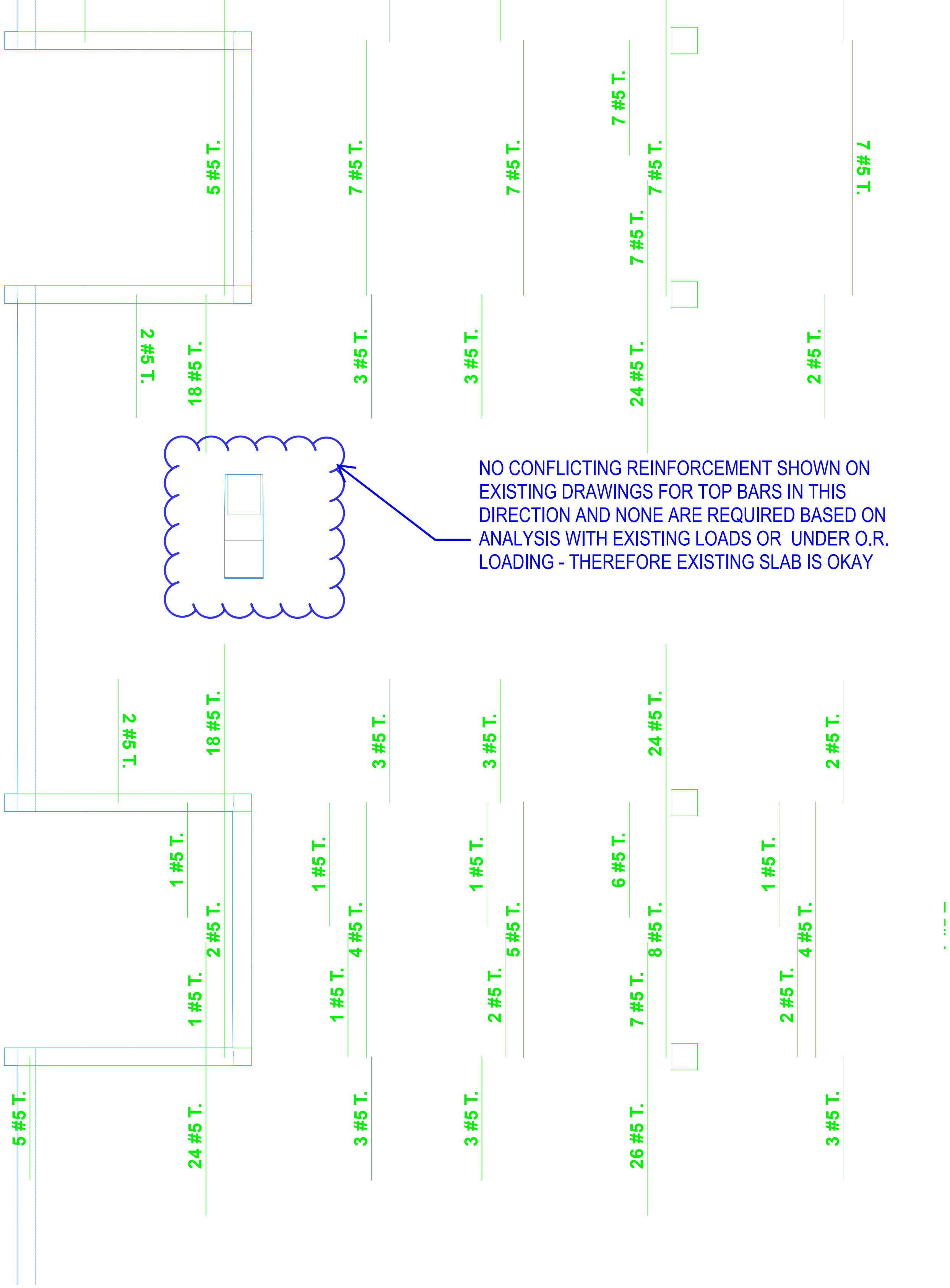
Design Status: Longitude Status Plan

Design Status: User Lines; User Notes; User Dimensions; Longitude Span Designs; Span Design Numbers; Span Design S
Element: Wall Elements Below; Wall Elements Above; Wall Element Outline Only; Column Elements Below; Column Eleme
Scale = 1:100



Design Status: Longitude Top Reinforcement Plan

Design Status: User Lines; User Notes; User Dimensions; Longitude Span Designs; Span Design Top Bars; Span Design
Element: Wall Elements Below; Wall Elements Above; Wall Element Outline Only; Column Elements Below; Column Eleme
Reinforcement: Top Face Concentrated Reinf.; Both Faces Concentrated Reinf.; Auto Face Concentrated Reinf.; Concentra
Scale = 1:100

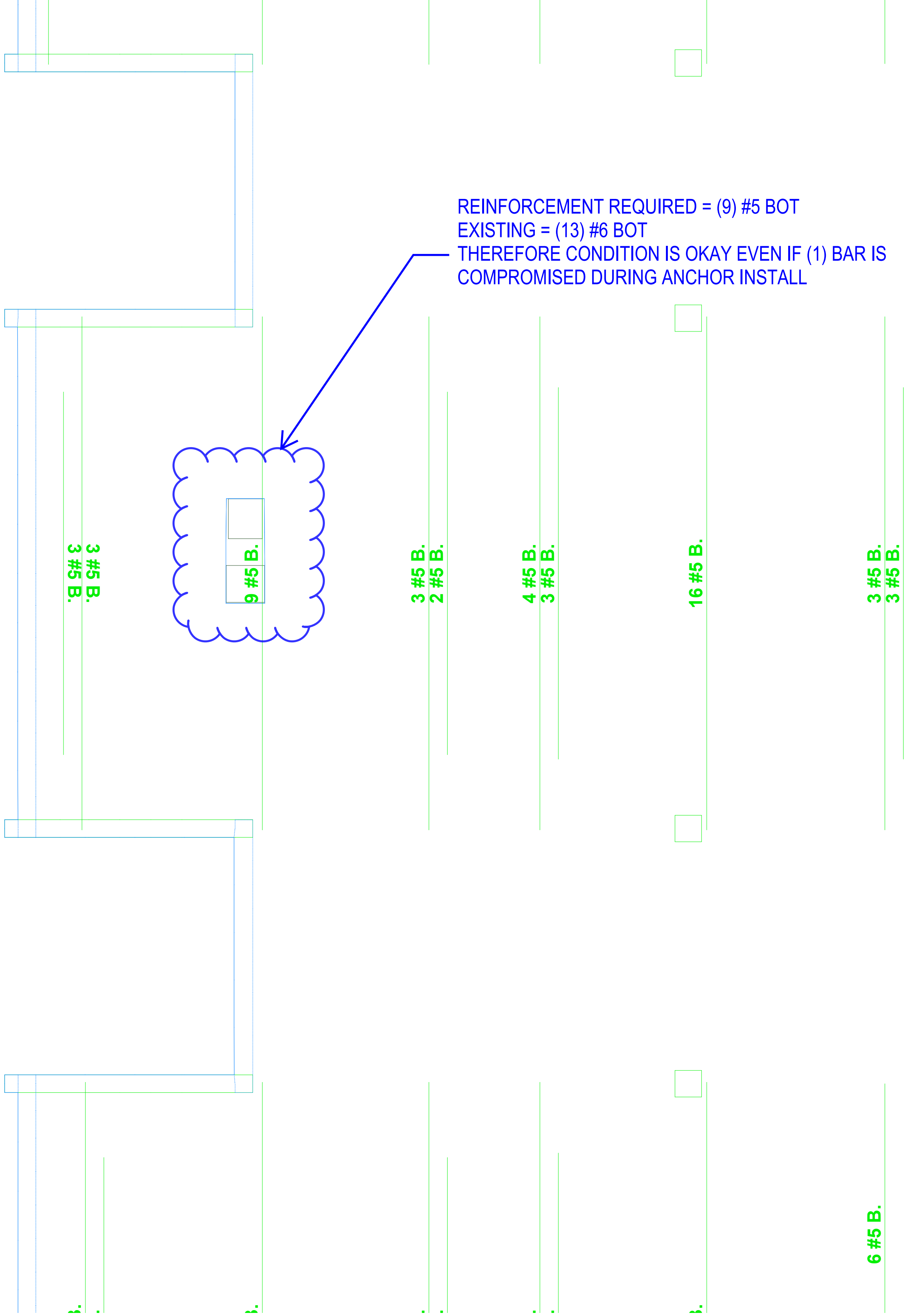


NO CONFLICTING REINFORCEMENT SHOWN ON EXISTING DRAWINGS FOR TOP BARS IN THIS DIRECTION AND NONE ARE REQUIRED BASED ON ANALYSIS WITH EXISTING LOADS OR UNDER O.R. LOADING - THEREFORE EXISTING SLAB IS OKAY

PRCTI20221788 - REVISON #6 4/5/2024

Design Status: Longitude Bottom Reinforcement Plan

Design Status: User Lines; User Notes; User Dimensions; Longitude Span Designs; Span Design Bottom Bars; Span Desi
Element: Wall Elements Below; Wall Elements Above; Wall Element Outline Only; Column Elements Below; Column Eleme
Reinforcement: Bottom Face Concentrated Reinf.; Both Faces Concentrated Reinf.; Auto Face Concentrated Reinf.; Conce
Scale = 1:100

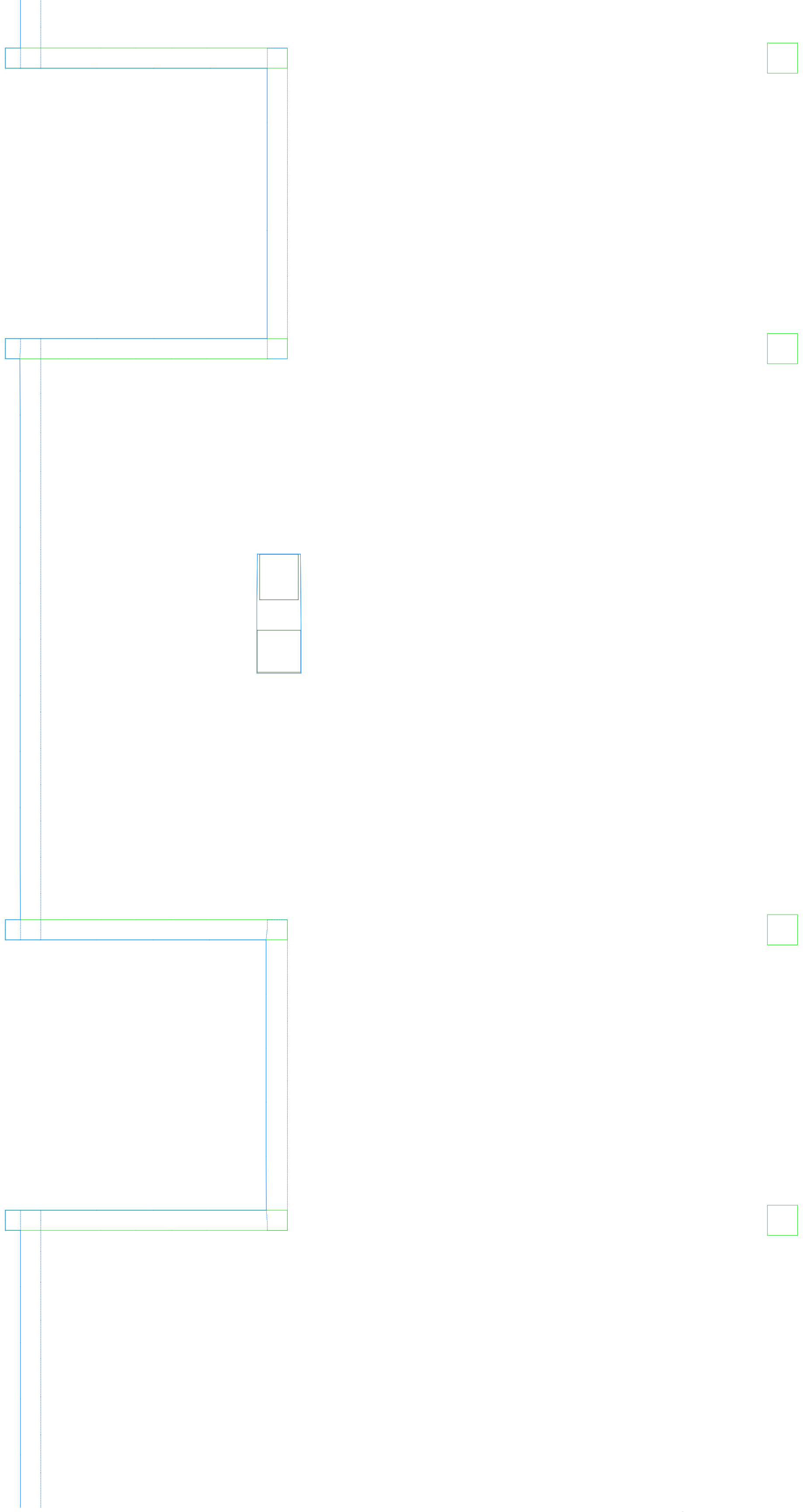


REINFORCEMENT REQUIRED = (9) #5 BOT
EXISTING = (13) #6 BOT
THEREFORE CONDITION IS OKAY EVEN IF (1) BAR IS
COMPROMISED DURING ANCHOR INSTALL

PRCTI20221788 - REVISON #6 4/5/2024

Design Status: Longitude Shear Reinforcement Plan

Design Status: User Lines; User Notes; User Dimensions; Longitude Span Designs; Span Design Shear Bars; Span Desig
Element: Wall Elements Below; Wall Elements Above; Wall Element Outline Only; Column Elements Below; Column Eleme
Scale = 1:100



Calc Log

```
Calculating Through Detailing and Load History (Everything Out-of-Date)(Considering Previous Warnings)
Active Calculation Options:
    The structure is not automatically stabilized in the X and Y directions.
    Supports above slab NOT included in self-dead loading.
    Tendon vertical component NOT considered in punch check reactions.
    Design reinforcement.
    6 zero-tension iterations are used to eliminate tension in area springs.
    Creep Factor of 3.35 used in ECR calculations.
    Shrinkage strain of 0.0004 used in ECR calculations.
    ACI 318-14 is used in design.
    Live load reduction not used
Stiffness matrix is already up to date.
Self-dead load creation is already up to date.
Generated tendons are already up to date.
Balance load creation is already up to date.
User reinforcement detailing is already up to date.
    WARNING: Span segment 22-2 has a left cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 22-2 has a left cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 22-2 has a left cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 22-2 has a left cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 22-2 has a left cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 22-2 has a left cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 22-2 has a left cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 22-2 has a left cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 22-2 has a left cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 22-2 has a left cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 22-2 has a left cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 22-2 has a left cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 22-2 has a left cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 22-2 has a left cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 22-2 has a left cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 22-2 has a left cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 22-2 has a left cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 1-1 has a right cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 1-1 has a right cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 1-1 has a right cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 1-1 has a right cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
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        User Continued After Warning
    WARNING: Span segment 1-1 has a right cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 1-1 has a right cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
```

Calc Log (2)

Calc Log (3)

```
   WARNING: Span segment 1-1 has a right cross section that is very narrow.  This will be merged with the center strip.
      User Continued After Warning
   WARNING: Span segment 1-1 has a right cross section that is very narrow.  This will be merged with the center strip.
      User Continued After Warning
   WARNING: Span segment 1-1 has a right cross section that is very narrow.  This will be merged with the center strip.
      User Continued After Warning
   WARNING: Span segment 1-1 has a right cross section that is very narrow.  This will be merged with the center strip.
      User Continued After Warning
   WARNING: Span segment 10-1 has a right cross section that is very narrow.  This will be merged with the center strip.
      User Continued After Warning
   WARNING: Span segment 10-1 has a right cross section that is very narrow.  This will be merged with the center strip.
      User Continued After Warning
   WARNING: Span segment 10-1 has a right cross section that is very narrow.  This will be merged with the center strip.
      User Continued After Warning
   WARNING: Span segment 10-1 has a right cross section that is very narrow.  This will be merged with the center strip.
      User Continued After Warning
   WARNING: Span segment 10-1 has a right cross section that is very narrow.  This will be merged with the center strip.
      User Continued After Warning
   WARNING: Span segment 10-1 has a right cross section that is very narrow.  This will be merged with the center strip.
      User Continued After Warning
   WARNING: Span segment 10-1 has a right cross section that is very narrow.  This will be merged with the center strip.
      User Continued After Warning
   WARNING: Span segment 12-5 has a right cross section that is very narrow.  This will be merged with the center strip.
      User Continued After Warning
   WARNING: Span segment 12-5 has a right cross section that is very narrow.  This will be merged with the center strip.
      User Continued After Warning
   WARNING: Span segment 12-5 has a right cross section that is very narrow.  This will be merged with the center strip.
      User Continued After Warning
   WARNING: Span segment 12-5 has a right cross section that is very narrow.  This will be merged with the center strip.
      User Continued After Warning
   WARNING: Span segment 12-5 has a right cross section that is very narrow.  This will be merged with the center strip.
      User Continued After Warning
   WARNING: Span segment 12-5 has a right cross section that is very narrow.  This will be merged with the center strip.
      User Continued After Warning
   WARNING: Span segment 12-5 has a right cross section that is very narrow.  This will be merged with the center strip.
      User Continued After Warning
   WARNING: Span segment 12-5 has a right cross section that is very narrow.  This will be merged with the center strip.
      User Continued After Warning
   WARNING: Span segment 13-5 has a right cross section that is very narrow.  This will be merged with the center strip.
      User Continued After Warning
   WARNING: Span segment 13-5 has a right cross section that is very narrow.  This will be merged with the center strip.
      User Continued After Warning
   WARNING: Span segment 13-5 has a right cross section that is very narrow.  This will be merged with the center strip.
      User Continued After Warning
   WARNING: Span segment 13-5 has a right cross section that is very narrow.  This will be merged with the center strip.
      User Continued After Warning
   WARNING: Span segment 13-5 has a right cross section that is very narrow.  This will be merged with the center strip.
      User Continued After Warning
   WARNING: Span segment 14-1 has a left cross section that is very narrow.  This will be merged with the center strip.
      User Continued After Warning
   WARNING: Span segment 14-1 has a left cross section that is very narrow.  This will be merged with the center strip.
      User Continued After Warning
   WARNING: Span segment 14-1 has a left cross section that is very narrow.  This will be merged with the center strip.
      User Continued After Warning
   WARNING: Span segment 14-1 has a left cross section that is very narrow.  This will be merged with the center strip.
      User Continued After Warning
   WARNING: Span segment 14-1 has a left cross section that is very narrow.  This will be merged with the center strip.
      User Continued After Warning
   WARNING: Span segment 14-1 has a left cross section that is very narrow.  This will be merged with the center strip.
      User Continued After Warning
   WARNING: Span segment 14-1 has a left cross section that is very narrow.  This will be merged with the center strip.
      User Continued After Warning
   WARNING: Span segment 14-1 has a left cross section that is very narrow.  This will be merged with the center strip.
      User Continued After Warning
Determining Concrete Cross Sections
Determining Tendon Cross Sections
```

Calc Log (4)

center strip.

center strip.

center strip.

center strip.

center strip.

center strip.

center strip.

center strip.

center strip.

center strip.

center strip.

center strip.

center strip.

center strip.

center strip.

center strip.

center strip.

center strip.

center strip.

center strip.

Calc Log (5)

```
Determining Reinforcing Bar Cross Sections
Solving for Self-Dead Loading.
    Solving for Self-Dead Loading - Pattern: Full Pattern.
        Total Loads: (0,0,-2760000) pounds
        Total Reactions: (7.47e-9,6.23e-8,2760000) pounds
        Load-Reaction Tolerance: (7.47e-9,6.23e-8,4.46e-7) pounds
Solving for Balance Loading.
    Balance Loading has No Loads.
Solving for Temporary Construction (At Stressing) Loading.
    Temporary Construction (At Stressing) Loading has No Loads.
Solving for Other Dead Loading.
    Solving for Other Dead Loading - Pattern: Full Pattern.
        Total Loads: (0,0,-214000) pounds
        Total Reactions: (9.05e-10,6.16e-9,214000) pounds
        Load-Reaction Tolerance: (9.05e-10,6.16e-9,3.84e-8) pounds
Solving for Live (Reducible) Loading.
    Solving for Live (Reducible) Loading - Pattern: Full Pattern.
        Total Loads: (0,0,-1660000) pounds
        Total Reactions: (4.38e-9,3.92e-8,1660000) pounds
        Load-Reaction Tolerance: (4.38e-9,3.92e-8,2.76e-7) pounds
Solving for Live (Unreducible) Loading.
    Solving for Live (Unreducible) Loading - Pattern: Full Pattern.
        Total Loads: (0,0,-400000) pounds
        Total Reactions: (8.35e-10,1.12e-8,400000) pounds
        Load-Reaction Tolerance: (8.35e-10,1.12e-8,6.41e-8) pounds
Solving for Live (Storage) Loading.
    Live (Storage) Loading has No Loads.
Solving for Live (Parking) Loading.
    Live (Parking) Loading has No Loads.
Solving for Live (Roof) Loading.
    Live (Roof) Loading has No Loads.
Solving for Snow Loading.
    Snow Loading has No Loads.
Calculating Precompression in Cross Sections
    Solving for Hyperstatic Loading.
Solving for All Dead LC.
Solving for Dead + Balance LC.
Solving for Initial Service LC.
Solving for Service LC: D + L.
Solving for Service LC: D + Lr.
Solving for Service LC: D + S.
Solving for Service LC: D + 0.75L + 0.75Lr.
Solving for Service LC: D + 0.75L + 0.75S.
Solving for Sustained Service LC.
Solving for Factored LC: 1.4D.
Solving for Factored LC: 1.2D + 1.6L + 0.5Lr.
Solving for Factored LC: 1.2D + f1L + 1.6Lr.
Solving for Factored LC: 1.2D + 1.6L + 0.5S.
Solving for Factored LC: 1.2D + f1L + 1.6S.
Calculating Code Minimum Design envelopes.
Calculating User Minimum Design envelopes.
Calculating Initial Service Design envelopes.
Calculating Service Design envelopes.
Calculating Sustained Service Design envelopes.
Calculating Strength Design envelopes.
Calculating Ductility Design envelopes.
Calculating Code Minimum Design - Pass 0
Calculating User Minimum Design - Pass 0
Calculating Initial Service Design - Pass 0
Calculating Service Design - Pass 0
Calculating Sustained Service Design - Pass 0
Calculating Strength Design - Pass 0
Calculating Ductility Design - Pass 0
Calculating Code Minimum Design - Pass 1
Calculating User Minimum Design - Pass 1
Calculating Initial Service Design - Pass 1
```

Calc Log (6)

Calc Log (7)

```
Calculating Service Design - Pass 1
Calculating Sustained Service Design - Pass 1
Calculating Strength Design - Pass 1
Calculating Ductility Design - Pass 1
Calculating Code Minimum Design - Pass 2
Calculating User Minimum Design - Pass 2
Calculating Initial Service Design - Pass 2
Calculating Service Design - Pass 2
Calculating Sustained Service Design - Pass 2
Calculating Strength Design - Pass 2
Calculating Ductility Design - Pass 2
Calculating Code Minimum Design - Final Design Check
Calculating User Minimum Design - Final Design Check
Calculating Initial Service Design - Final Design Check
Calculating Service Design - Final Design Check
Calculating Sustained Service Design - Final Design Check
Calculating Strength Design - Final Design Check
Calculating Ductility Design - Final Design Check
Laying Out Program Reinforcement
Optimizing Program Reinforcement Layout
Converting SSR Designs
Converting Program Transverse Bar Designs
Detailing User Transverse Reinforcement
Detailing Program Reinforcement
    WARNING: Latitude concentrated program reinforcement at (2371,1552) has a very small spacing (1.355 inches). You r
        User Continued After Warning
    WARNING: Latitude concentrated program reinforcement at (2691,2426) has a very small spacing (0.8024 inches). You
        User Continued After Warning
    WARNING: Latitude concentrated program reinforcement at (2689,2615) has a very small spacing (0.7143 inches). You
        User Continued After Warning
    WARNING: Latitude concentrated program reinforcement at (3110,2616) has a very small spacing (0.7143 inches). You
        User Continued After Warning
    WARNING: Latitude concentrated program reinforcement at (2323,2910) has a very small spacing (1.389 inches). You r
        User Continued After Warning
    WARNING: Latitude concentrated program reinforcement at (2672,3235) has a very small spacing (0.9937 inches). You
        User Continued After Warning
    WARNING: Longitude concentrated program reinforcement at (2904,1075) has a very small spacing (1.458 inches). You
        User Continued After Warning
    WARNING: Longitude concentrated program reinforcement at (2598,1316) has a very small spacing (1.02 inches). You
        User Continued After Warning
    WARNING: Longitude concentrated program reinforcement at (3001,2729) has a very small spacing (1.036 inches). You
        User Continued After Warning
    WARNING: Longitude concentrated program reinforcement at (2341,2779) has a very small spacing (1.143 inches). You
        User Continued After Warning
    WARNING: Longitude concentrated program reinforcement at (2947,2893) has a very small spacing (1.019 inches). You
        User Continued After Warning
Estimating Costs
Deflection Checks are already up to date.
This analysis has been completed successfully, check above for any warnings or errors.
```

Calc Log (8)

nay be able to resolve this problem by converting the bars to user reinforcement and adjusting the width and spacing.

may be able to resolve this problem by converting the bars to user reinforcement and adjusting the width and spacing.

may be able to resolve this problem by converting the bars to user reinforcement and adjusting the width and spacing.

may be able to resolve this problem by converting the bars to user reinforcement and adjusting the width and spacing.

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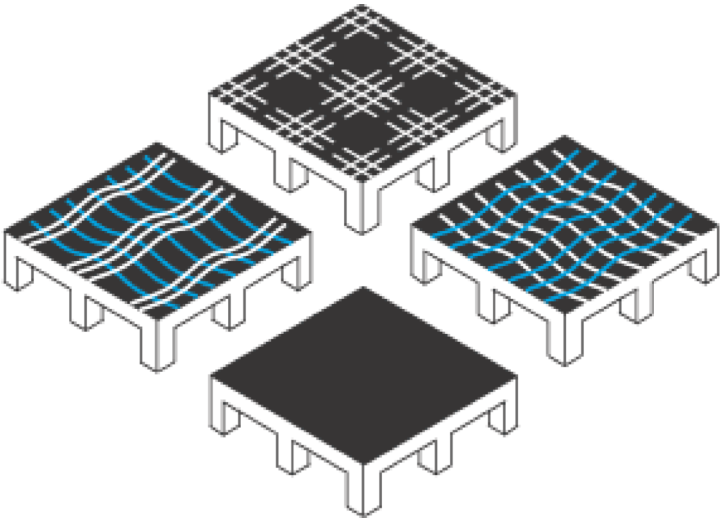
ı may be able to resolve this problem by converting the bars to user reinforcement and adjusting the width and spacing.

RAM CONCEPT MODEL FOR

(E) LOADS MHS GS HYBRID OR - PUYALLUP, WA

PREPARED BY PCS STRUCTURAL SOLUTIONS



NOTES:

EXISITNG MODEL - FOR REFERENCE - ANALYZED WITH TYPICAL DEISGN LIVE LOAD IS 80 PSF + 20PSF PARTITION

PLANNED LOCALIZED SLAB DEPRESSION AT THE ADDED EUIPMENT IS NOT INCLUDED IN THIS MODEL

23225 Hybrid OR (E) 2023-04-10eso.cpt
4/11/2023
23225

8.4

Table of Contents

Materials

Concrete Mix

Mix Name	*Density (pcf)*	*Density For Loads (pcf)*	*f'ci (psi)*	*f'c (psi)*	*fcui (psi)*	*fcu (psi)*	*Poissons Ratio*	*Thermal Exp Coeff*	*Ec Calc*	*User Eci (psi)*	*User Ec (psi)*
3000 psi	150	150	3000	3000	3725	3725	0.2	5.556e-6	Code	2500000	3000000
4000 psi	150	150	3000	4000	3725	4975	0.2	5.556e-6	Code	2500000	3000000
5000 psi	150	150	3000	5000	3725	6399	0.2	5.556e-6	Code	2500000	3000000
6000 psi	150	150	3000	6000	3725	7450	0.2	5.556e-6	Code	2500000	3000000

PT Systems

System Name	*Type*	*Aps (in²)*	*Eps (ksi)*	*fse (ksi)*	*fpy (ksi)*	*fpu (ksi)*	*Duct Width (inches)*	*Strands Per Duct*	*Min Radius (inches)*
½" Unbonded	unbonded	0.153	28000	175	243	270	0.5	1	72
½" Bonded	bonded	0.153	28000	160	243	270	3	4	72
0.6" Unbonded	unbonded	0.217	28000	175	243	270	0.6	1	96
0.6" Bonded	bonded	0.217	28000	160	243	270	4	4	96

PT Stressing Parameters

System Name	*Jacking Stress (ksi)*	*Seating Loss (inches)*	*Anchor Friction*	*Wobble Friction (1/inches)*	*Angular Friction (1/radians)*	*Long-Term Losses (ksi)*
½" Unbonded	216	0.25	0	0.0001167	0.07	22
½" Bonded	216	0.25	0.02	0.00008333	0.2	22
0.6" Unbonded	216	0.25	0	0.0001167	0.07	22
0.6" Bonded	216	0.25	0.02	0.00008333	0.2	22

Reinforcing Bars

Bar Name	*As (in²)*	*Es (ksi)*	*Fy (ksi)*	*Coating*	*Straight Ld/Db*	*90 Hook Ld/Db*	*180 Hook Ld/Db*
#3	0.11	29000	60	None	Code	Code	Code
#4	0.2	29000	60	None	Code	Code	Code
#5	0.31	29000	60	None	Code	Code	Code
#6	0.44	29000	60	None	Code	Code	Code
#7	0.6	29000	60	None	Code	Code	Code
#8	0.79	29000	60	None	Code	Code	Code
#9	1	29000	60	None	Code	Code	Code
#10	1.27	29000	60	None	Code	Code	Code
#11	1.56	29000	60	None	Code	Code	Code

Materials (2)

SSR Systems

SSR System Name	*Stud Area (in²)*	*Head Area (in²)*	*Min Clear Head Spacing (inches)*	*Specified Stud Spacing (inches)*	*Fy (ksi)*	*Stud Spacing Rounding Increment (inches)*	*Min Studs Per Rail*	*System Type*
3/8" SSR	0.11	1.11	0.5	None	50	0.25	2	Rail
1/2" SSR	0.196	1.96	0.5	None	50	0.25	2	Rail
5/8" SSR	0.307	3.07	0.5	None	50	0.25	2	Rail
3/4" SSR	0.442	4.42	0.5	None	50	0.25	2	Rail
Ancon Shearfix Auto-Size	0.1217	1.096	0.5906	None	72.52	0.03937	2	Rail
Ancon Shearfix 10 mm	0.1217	1.096	0.5906	None	72.52	0.03937	2	Rail
Ancon Shearfix 12 mm	0.1753	1.578	0.5906	None	72.52	0.03937	2	Rail
Ancon Shearfix 14 mm	0.2386	2.147	0.5906	None	72.52	0.03937	2	Rail
Ancon Shearfix 16 mm	0.3116	2.805	0.5906	None	72.52	0.03937	2	Rail
Ancon Shearfix 20 mm	0.4869	4.383	0.5906	None	72.52	0.03937	2	Rail
Ancon Shearfix 24 mm	0.7012	6.311	0.5906	None	72.52	0.03937	2	Rail

Loadings

Loading Name	*Type*	*Analysis*	*On-Pattern Factor*	*Off-Pattern Factor*
Self-Dead Loading	Self-Weight	Normal	1	1
Balance Loading	Balance	Normal	1	1
Hyperstatic Loading	Hyperstatic	Hyperstatic	1	1
Temporary Construction (At Stressing) Loading	Stressing Dead	Normal	1	1
Other Dead Loading	Dead	Normal	1	1
Live (Reducible) Loading	Live (Reducible)	Normal	1	0
Live (Unreducible) Loading	Live (Unreducible)	Normal	1	0
Live (Storage) Loading	Live (Storage)	Normal	1	0
Live (Parking) Loading	Live (Parking)	Normal	1	0
Live (Roof) Loading	Live (Roof)	Normal	1	0
Snow Loading	Snow	Normal	1	1

Load Combinations

All Dead LC

Active Design Criteria: <none>
Analysis: Linear

Loading	*Standard Factor*	*Alt. Envelope Factor*
Self-Dead Loading	1	1
Other Dead Loading	1	1

Dead + Balance LC

Active Design Criteria: <none>
Analysis: Linear

Loading	*Standard Factor*	*Alt. Envelope Factor*
Self-Dead Loading	1	1
Balance Loading	1	1
Other Dead Loading	1	1

Initial Service LC

Active Design Criteria: Initial Service Design
Analysis: Linear

Loading	*Standard Factor*	*Alt. Envelope Factor*
Self-Dead Loading	1	1
Balance Loading	1.13	1.13
Temporary Construction (At Stressing) Loading	1	1

Service LC: D + L

Active Design Criteria: User Minimum Design, Code Minimum Design, Service Design
Analysis: Linear

Loading	*Standard Factor*	*Alt. Envelope Factor*
Self-Dead Loading	1	1
Balance Loading	1	1
Other Dead Loading	1	1
Live (Reducible) Loading	1	0
Live (Unreducible) Loading	1	0
Live (Storage) Loading	1	0
Live (Parking) Loading	1	0

Service LC: D + Lr

Active Design Criteria: User Minimum Design, Code Minimum Design, Service Design
Analysis: Linear

Loading	*Standard Factor*	*Alt. Envelope Factor*
Self-Dead Loading	1	1
Balance Loading	1	1
Other Dead Loading	1	1
Live (Roof) Loading	1	0

Load Combinations (2)

Service LC: D + S

Active Design Criteria: User Minimum Design, Code Minimum Design, Service Design
Analysis: Linear

Loading	*Standard Factor*	*Alt. Envelope Factor*
Self-Dead Loading	1	1
Balance Loading	1	1
Other Dead Loading	1	1
Snow Loading	1	0

Service LC: D + 0.75L + 0.75Lr

Active Design Criteria: User Minimum Design, Code Minimum Design, Service Design
Analysis: Linear

Loading	*Standard Factor*	*Alt. Envelope Factor*
Self-Dead Loading	1	1
Balance Loading	1	1
Other Dead Loading	1	1
Live (Reducible) Loading	0.75	0
Live (Unreducible) Loading	0.75	0
Live (Storage) Loading	0.75	0
Live (Parking) Loading	0.75	0
Live (Roof) Loading	0.75	0

Service LC: D + 0.75L + 0.75S

Active Design Criteria: User Minimum Design, Code Minimum Design, Service Design
Analysis: Linear

Loading	*Standard Factor*	*Alt. Envelope Factor*
Self-Dead Loading	1	1
Balance Loading	1	1
Other Dead Loading	1	1
Live (Reducible) Loading	0.75	0
Live (Unreducible) Loading	0.75	0
Live (Storage) Loading	0.75	0
Live (Parking) Loading	0.75	0
Snow Loading	0.75	0

Sustained Service LC

Active Design Criteria: Sustained Service Design
Analysis: Linear

Loading	*Standard Factor*	*Alt. Envelope Factor*
Self-Dead Loading	1	1
Balance Loading	1	1
Other Dead Loading	1	1
Live (Reducible) Loading	0.5	0.5
Live (Unreducible) Loading	0.5	0.5
Live (Storage) Loading	1	1
Live (Parking) Loading	0.5	0.5
Live (Roof) Loading	0.5	0.5

Load Combinations (3)

Factored LC: 1.4D

Active Design Criteria: User Minimum Design, Code Minimum Design, Strength Design, Ductility Design
Analysis: Linear

Loading	*Standard Factor*	*Alt. Envelope Factor*
Self-Dead Loading	1.4	0.9
Hyperstatic Loading	1	1
Other Dead Loading	1.4	0.9

Factored LC: 1.2D + 1.6L + 0.5Lr

Active Design Criteria: User Minimum Design, Code Minimum Design, Strength Design, Ductility Design
Analysis: Linear

Loading	*Standard Factor*	*Alt. Envelope Factor*
Self-Dead Loading	1.2	0.9
Hyperstatic Loading	1	1
Other Dead Loading	1.2	0.9
Live (Reducible) Loading	1.6	0
Live (Unreducible) Loading	1.6	0
Live (Storage) Loading	1.6	0
Live (Parking) Loading	1.6	0
Live (Roof) Loading	0.5	0

Factored LC: 1.2D + f1L + 1.6Lr

Active Design Criteria: User Minimum Design, Code Minimum Design, Strength Design, Ductility Design
Analysis: Linear

Loading	*Standard Factor*	*Alt. Envelope Factor*
Self-Dead Loading	1.2	0.9
Hyperstatic Loading	1	1
Other Dead Loading	1.2	0.9
Live (Reducible) Loading	0.5	0
Live (Unreducible) Loading	1	0
Live (Storage) Loading	1	0
Live (Parking) Loading	1	0
Live (Roof) Loading	1.6	0

Factored LC: 1.2D + 1.6L + 0.5S

Active Design Criteria: User Minimum Design, Code Minimum Design, Strength Design, Ductility Design
Analysis: Linear

Loading	*Standard Factor*	*Alt. Envelope Factor*
Self-Dead Loading	1.2	0.9
Hyperstatic Loading	1	1
Other Dead Loading	1.2	0.9
Live (Reducible) Loading	1.6	0
Live (Unreducible) Loading	1.6	0
Live (Storage) Loading	1.6	0
Live (Parking) Loading	1.6	0
Snow Loading	0.5	0

Load Combinations (4)

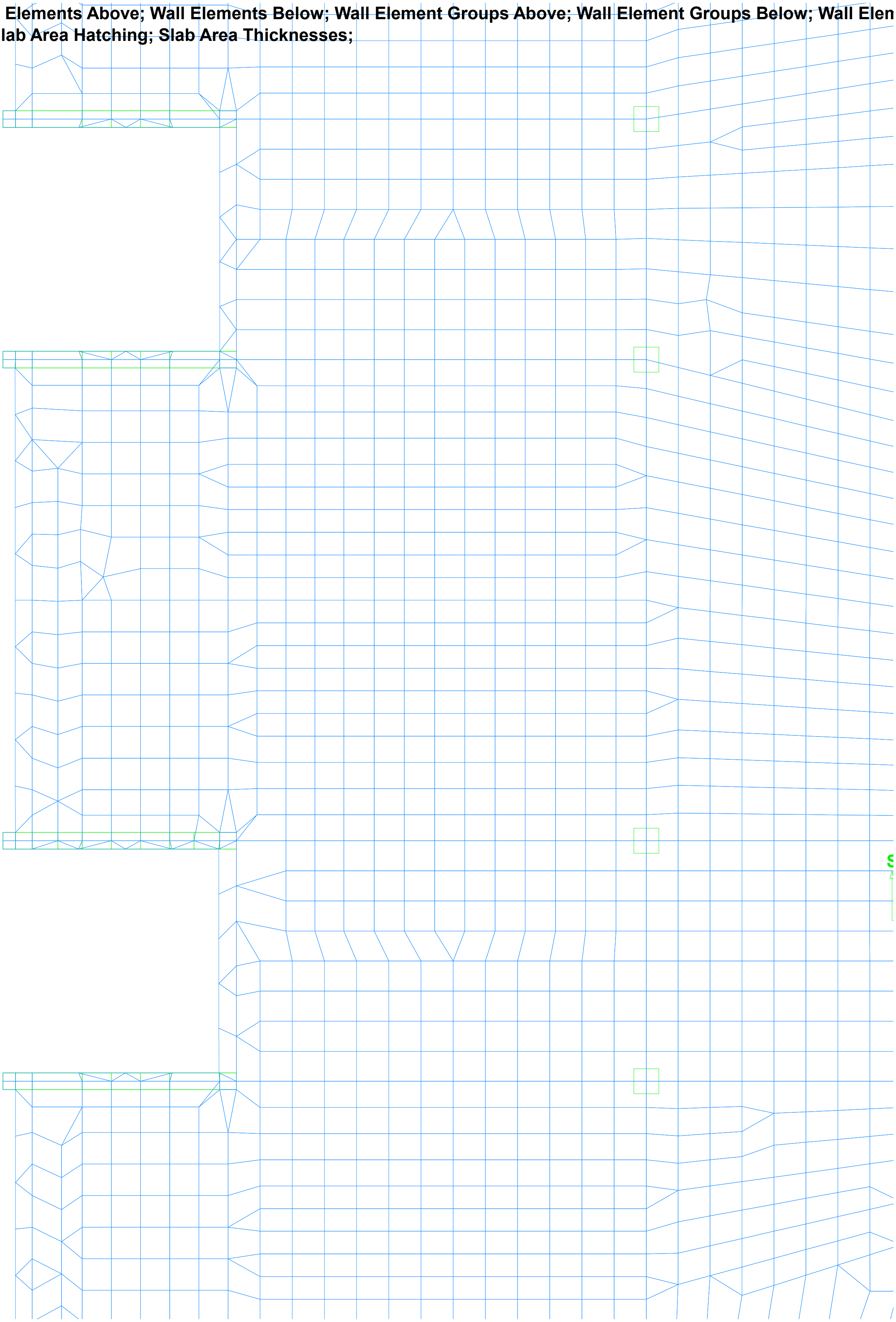
Factored LC: 1.2D + f1L + 1.6S

Active Design Criteria: User Minimum Design, Code Minimum Design, Strength Design, Ductility Design
Analysis: Linear

Loading	*Standard Factor*	*Alt. Envelope Factor*
Self-Dead Loading	1.2	0.9
Hyperstatic Loading	1	1
Other Dead Loading	1.2	0.9
Live (Reducible) Loading	0.5	0
Live (Unreducible) Loading	1	0
Live (Storage) Loading	1	0
Live (Parking) Loading	1	0
Snow Loading	1.6	0

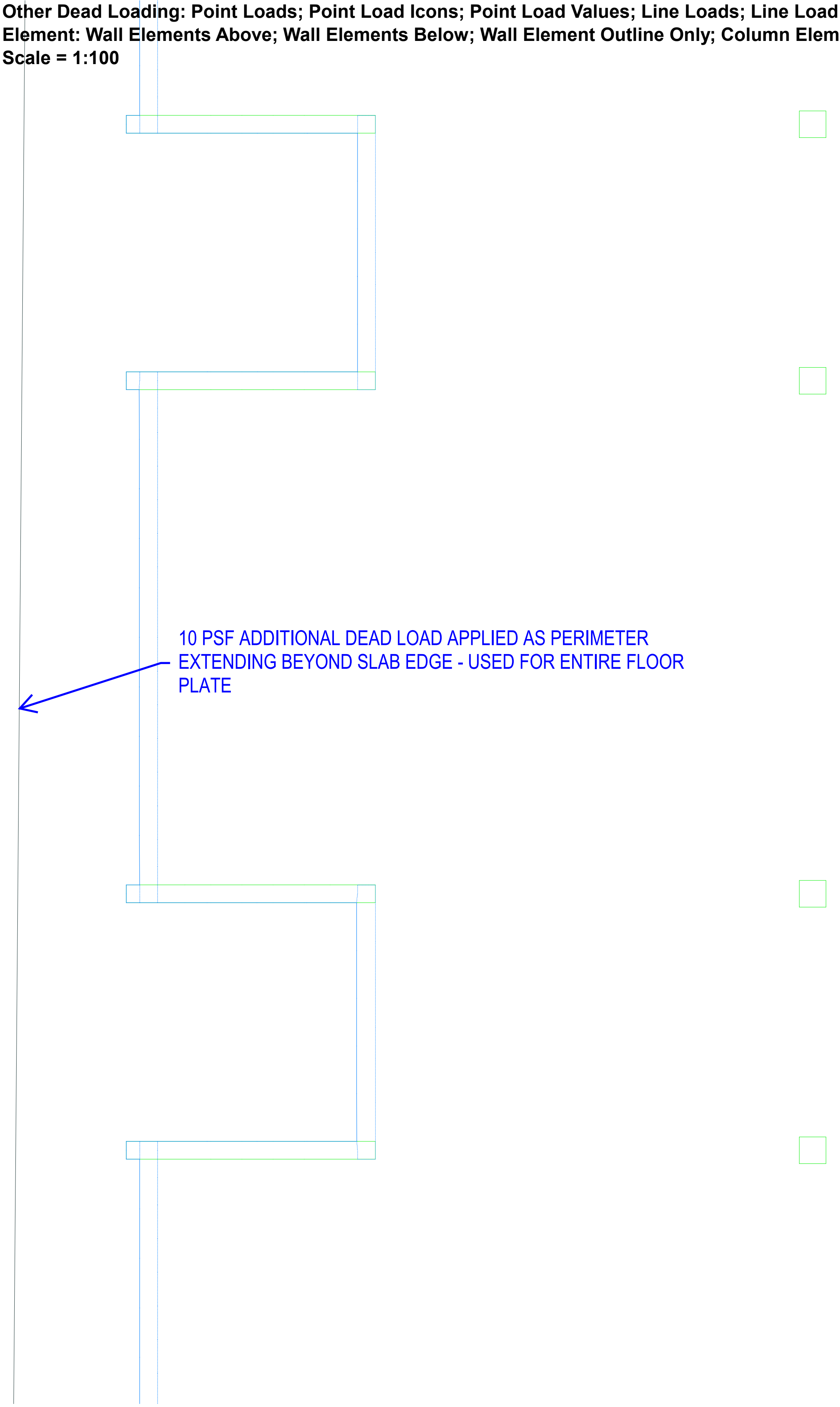
Element: Standard Plan

Element: Wall Elements Above; Wall Elements Below; Wall Element Groups Above; Wall Element Groups Below; Wall Elen
Mesh Input: Slab Area Hatching; Slab Area Thicknesses;
Scale = 1:100



Other Dead Loading: All Loads Plan

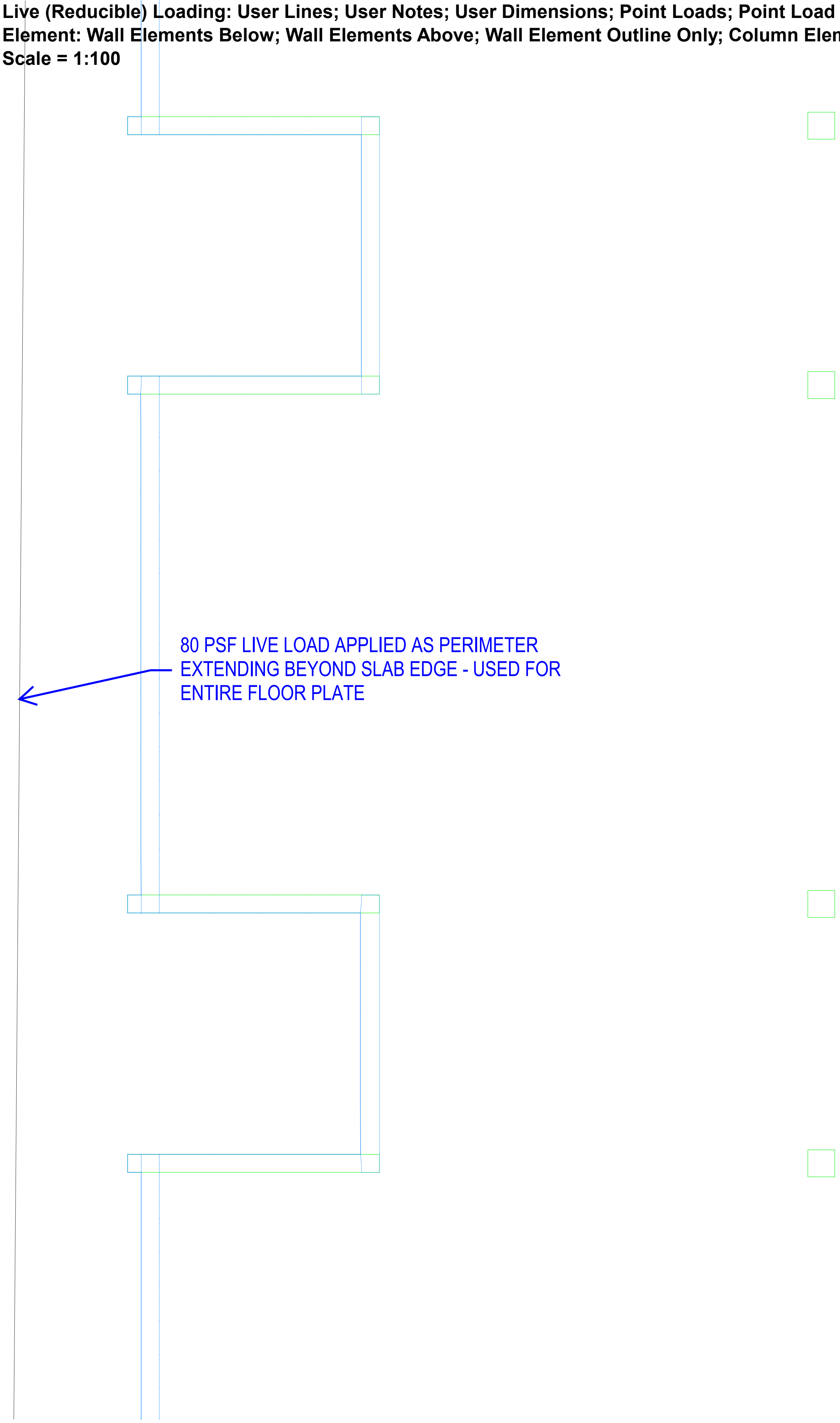
Other Dead Loading: Point Loads; Point Load Icons; Point Load Values; Line Loads; Line Load Icons; Line Load Values; A
Element: Wall Elements Above; Wall Elements Below; Wall Element Outline Only; Column Elements Above; Column Eleme
Scale = 1:100



10 PSF ADDITIONAL DEAD LOAD APPLIED AS PERIMETER EXTENDING BEYOND SLAB EDGE - USED FOR ENTIRE FLOOR PLATE

Live (Reducible) Loading: All Loads Plan

Live (Reducible) Loading: User Lines; User Notes; User Dimensions; Point Loads; Point Load Icons; Point Load Values; Li
Element: Wall Elements Below; Wall Elements Above; Wall Element Outline Only; Column Elements Below; Column Eleme
Scale = 1:100



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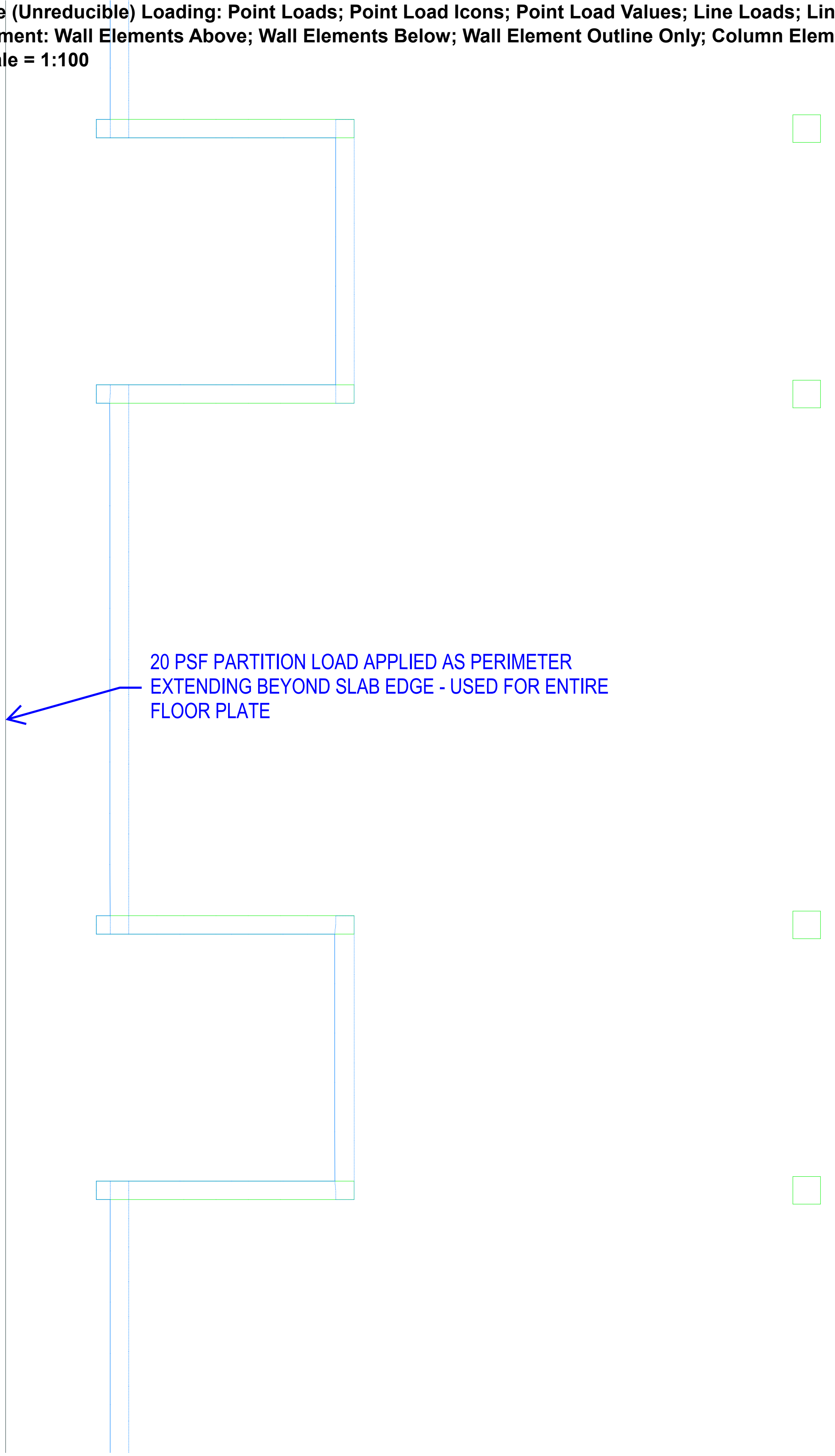
Live (Unreducible) Loading: All Loads Plan

Live (Unreducible) Loading: Point Loads; Point Load Icons; Point Load Values; Line Loads; Line Load Icons; Line Load Va
Element: Wall Elements Above; Wall Elements Below; Wall Element Outline Only; Column Elements Above; Column Eleme
Scale = 1:100



20 PSF PARTITION LOAD APPLIED AS PERIMETER EXTENDING BEYOND SLAB EDGE - USED FOR ENTIRE FLOOR PLATE

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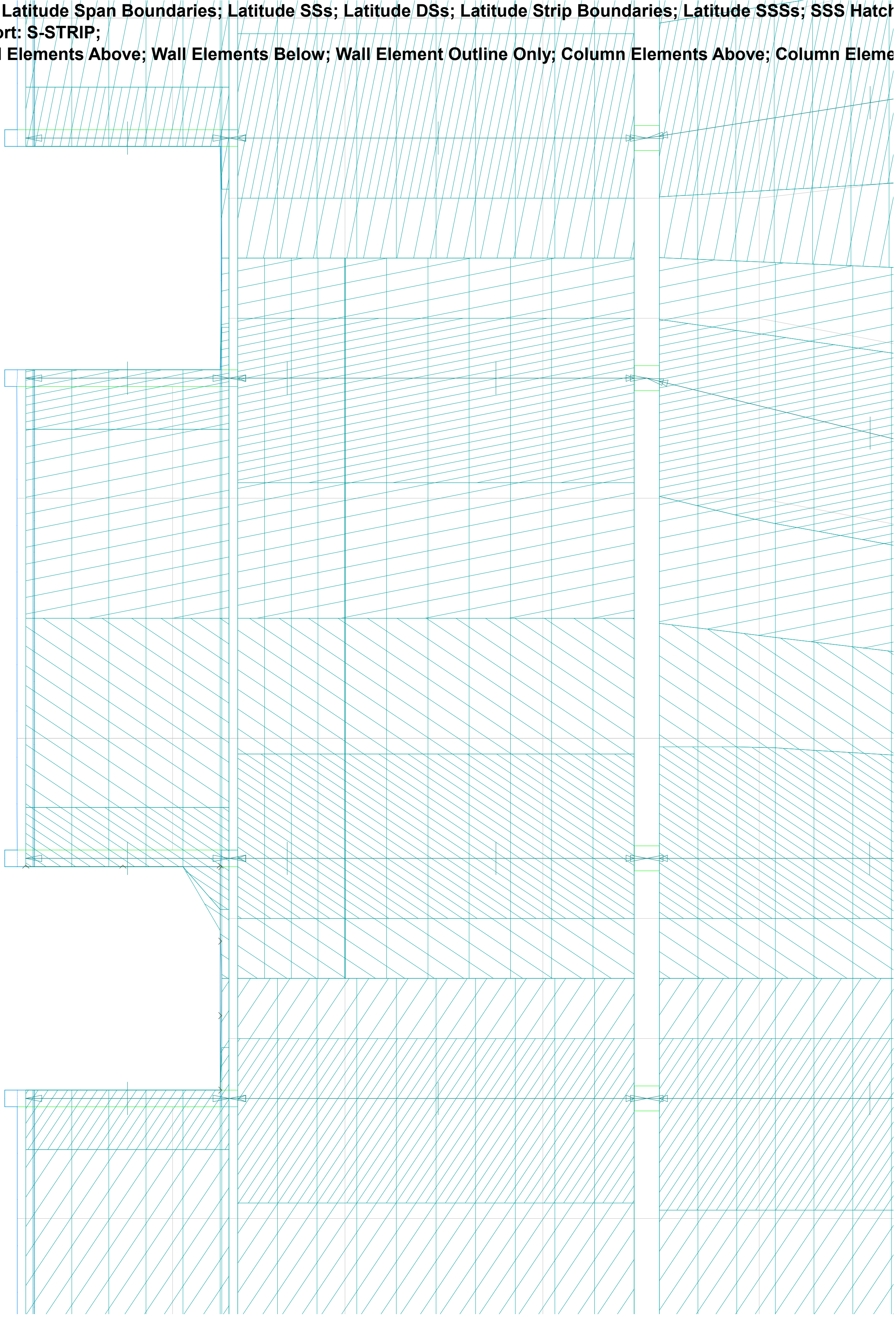
Design Strip: Latitude Design Spans Plan

Design Strip: Latitude Span Boundaries; Latitude SSs; Latitude DSs; Latitude Strip Boundaries; Latitude SSSs; SSS Hatcl
Drawing Import: S-STRIP;
Element: Wall Elements Above; Wall Elements Below; Wall Element Outline Only; Column Elements Above; Column Eleme
Scale = 1:100



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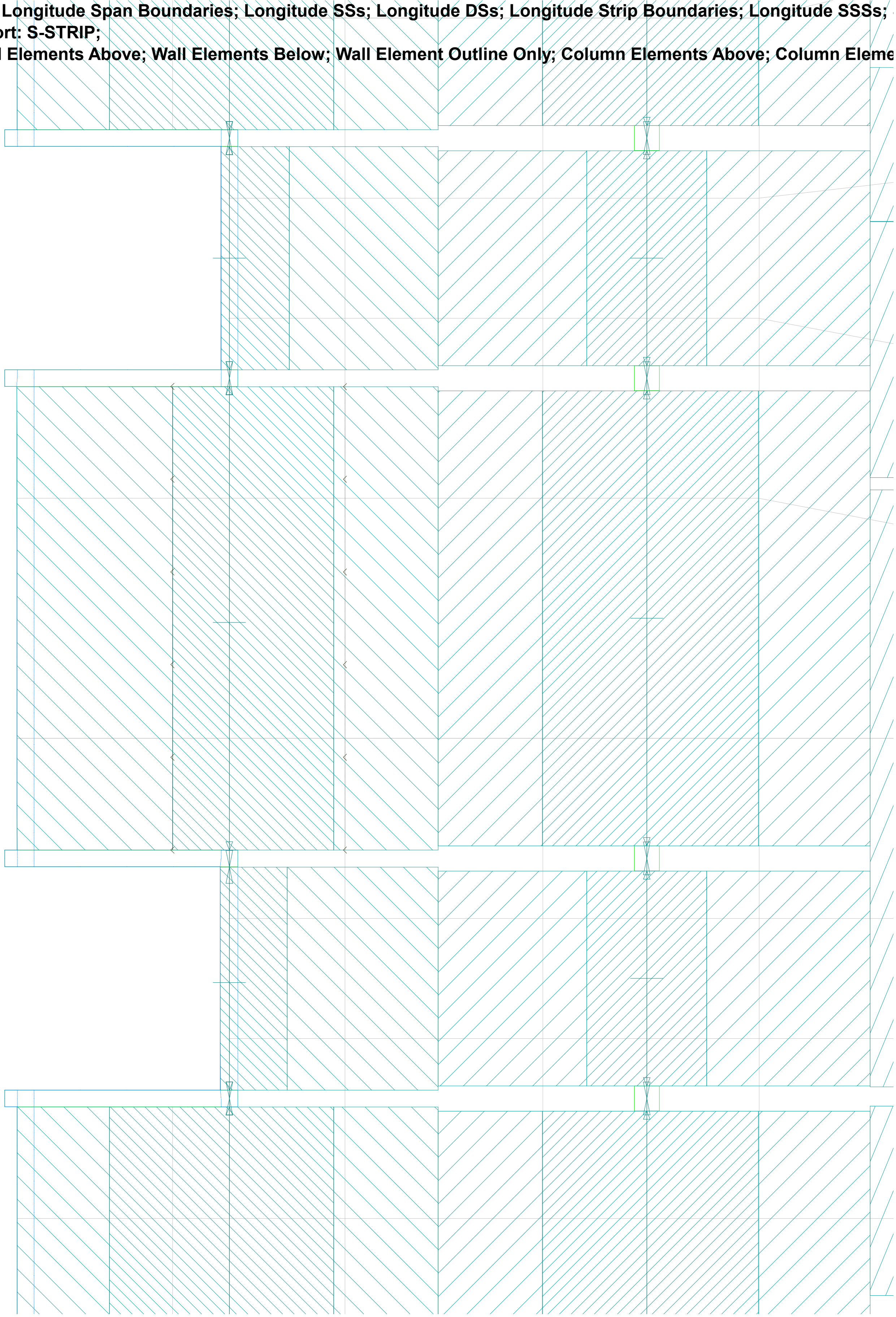
Design Strip: Longitude Design Spans Plan

Design Strip: Longitude Span Boundaries; Longitude SSs; Longitude DSs; Longitude Strip Boundaries; Longitude SSSs;
Drawing Import: S-STRIP;
Element: Wall Elements Above; Wall Elements Below; Wall Element Outline Only; Column Elements Above; Column Eleme
Scale = 1:100



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Sustained Load: Std Deflection Plan

Sustained Load: User Lines; User Notes; User Dimensions;

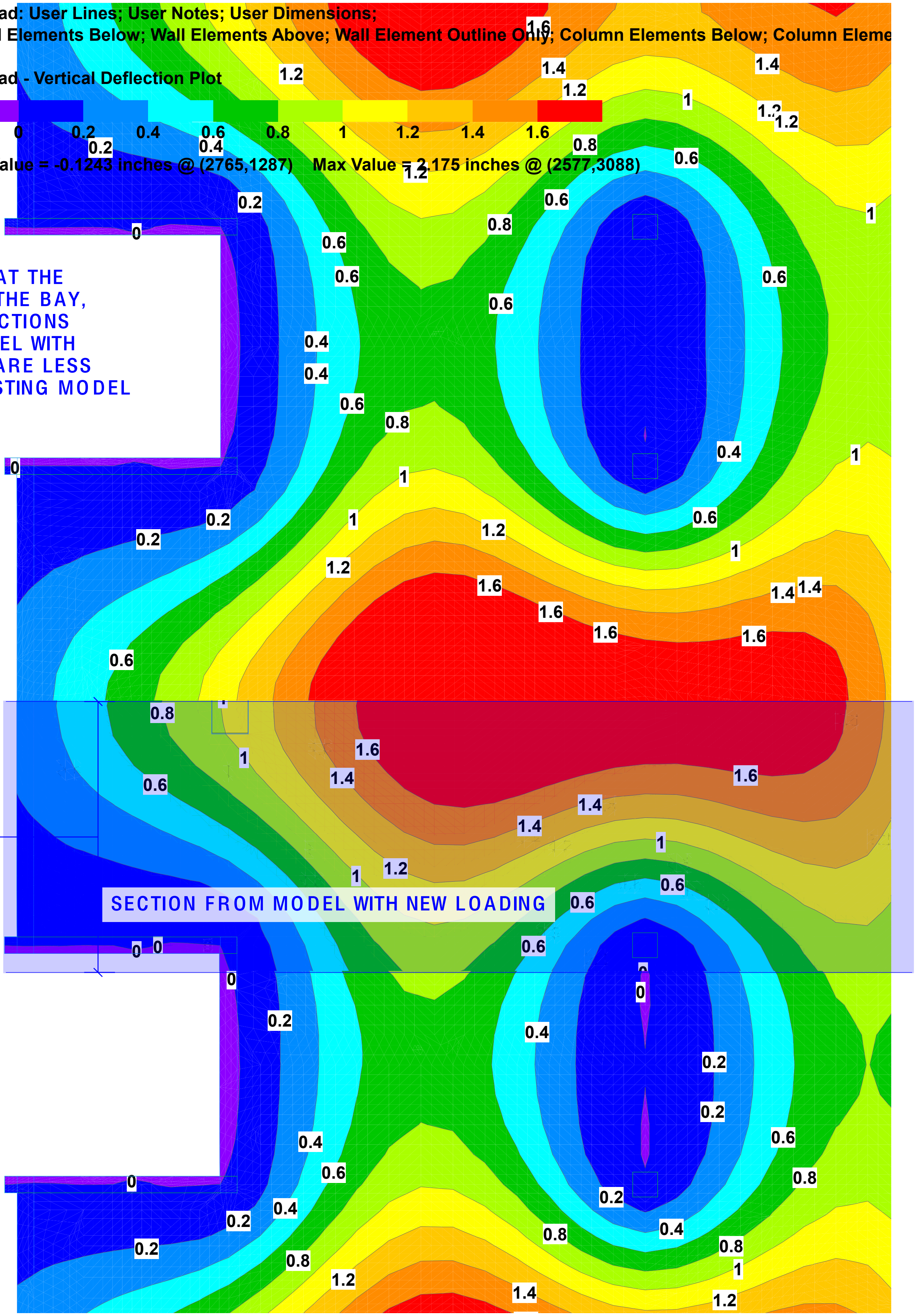
Element: Wall Elements Below; Wall Elements Above; Wall Element Outline Only; Column Elements Below; Column Eleme

Scale = 1:100

Sustained Load - Vertical Deflection Plot

0	0.2	0.4	0.6	0.8	1	1.2	1.4	1.6

Min Value = -0.1243 inches @ (2765,1287)   Max Value = 2.175 inches @ (2577,3088)

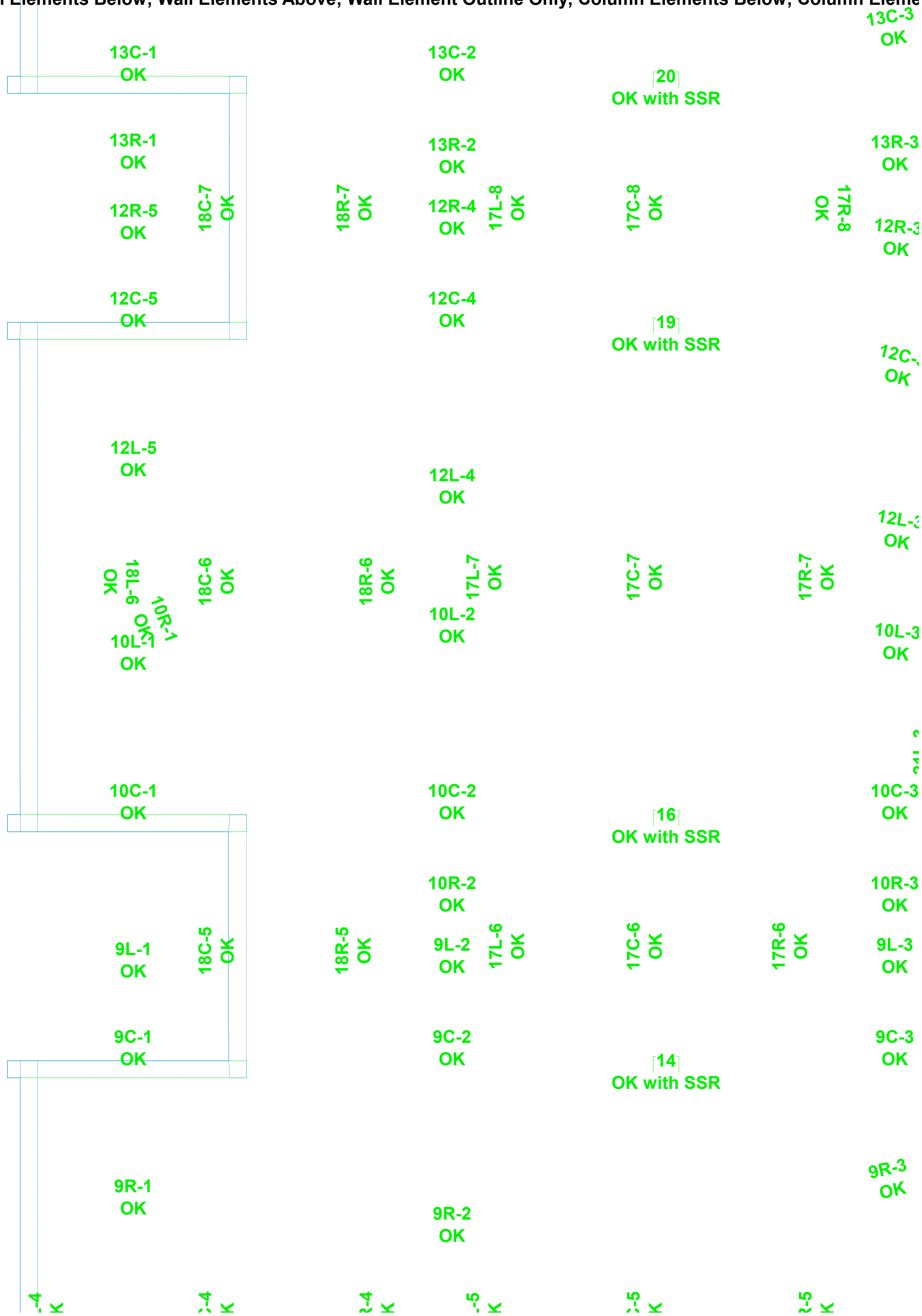


LOOKING AT THE CENTER OF THE BAY, THE DEFLECTIONS FROM MODEL WITH NEW LOADS ARE LESS THAN IN THE EXISTING MODEL

SECTION FROM MODEL WITH NEW LOADING

Design Status: Status Plan

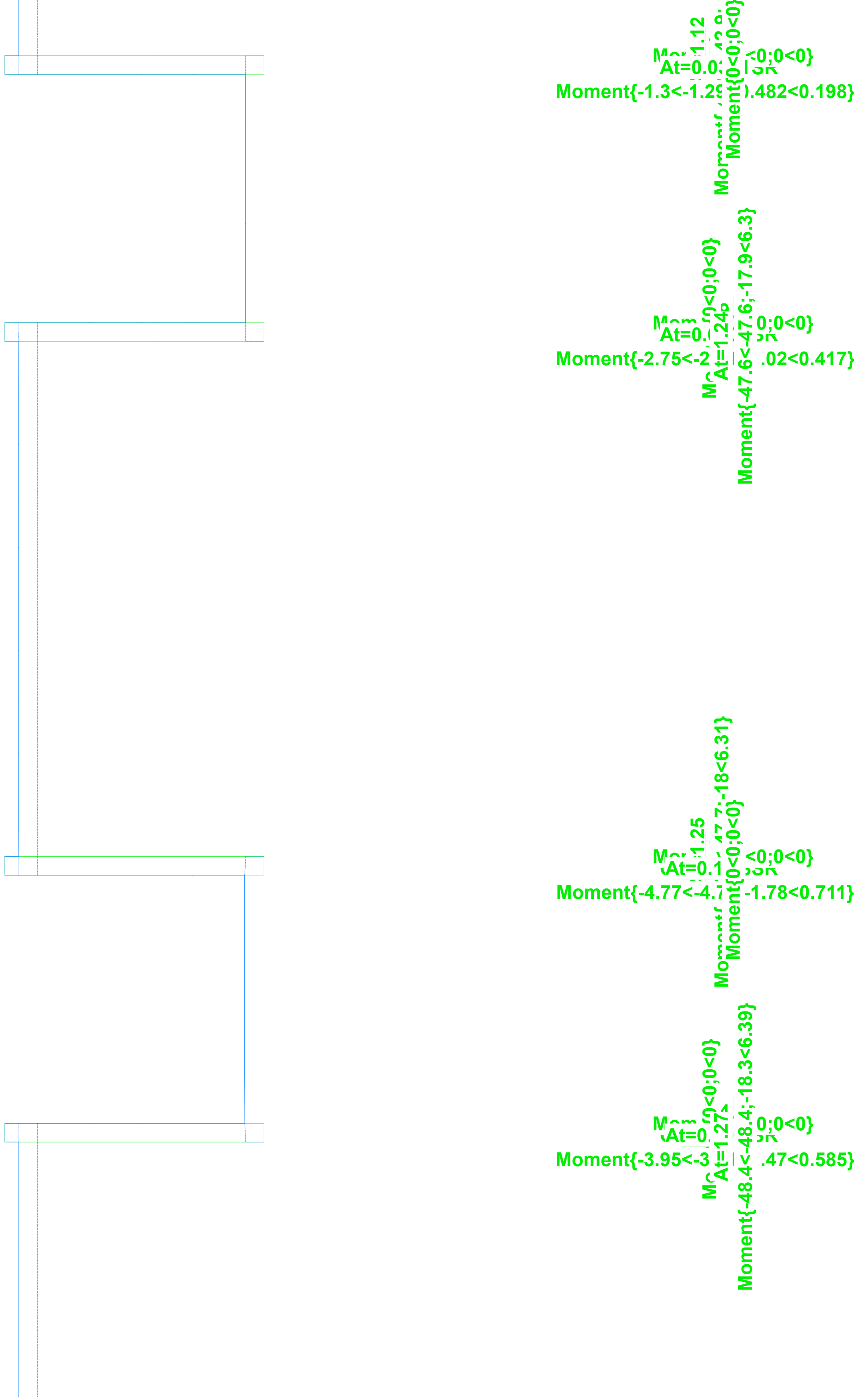
Design Status: User Lines; User Notes; User Dimensions; Latitude Span Designs; Longitude Span Designs; Span Design
Element: Wall Elements Below; Wall Elements Above; Wall Element Outline Only; Column Elements Below; Column Eleme
Scale = 1:100



PRCTI20221788 - REVISON #6 4/5/2024

Design Status: Punching Shear Status Plan

Design Status: User Lines; User Notes; User Dimensions; PC Designs; PC Design Numbers; PC Design Status; PC Design
Element: Wall Elements Below; Wall Elements Above; Wall Element Outline Only; Column Elements Below; Column Eleme
Scale = 1:100



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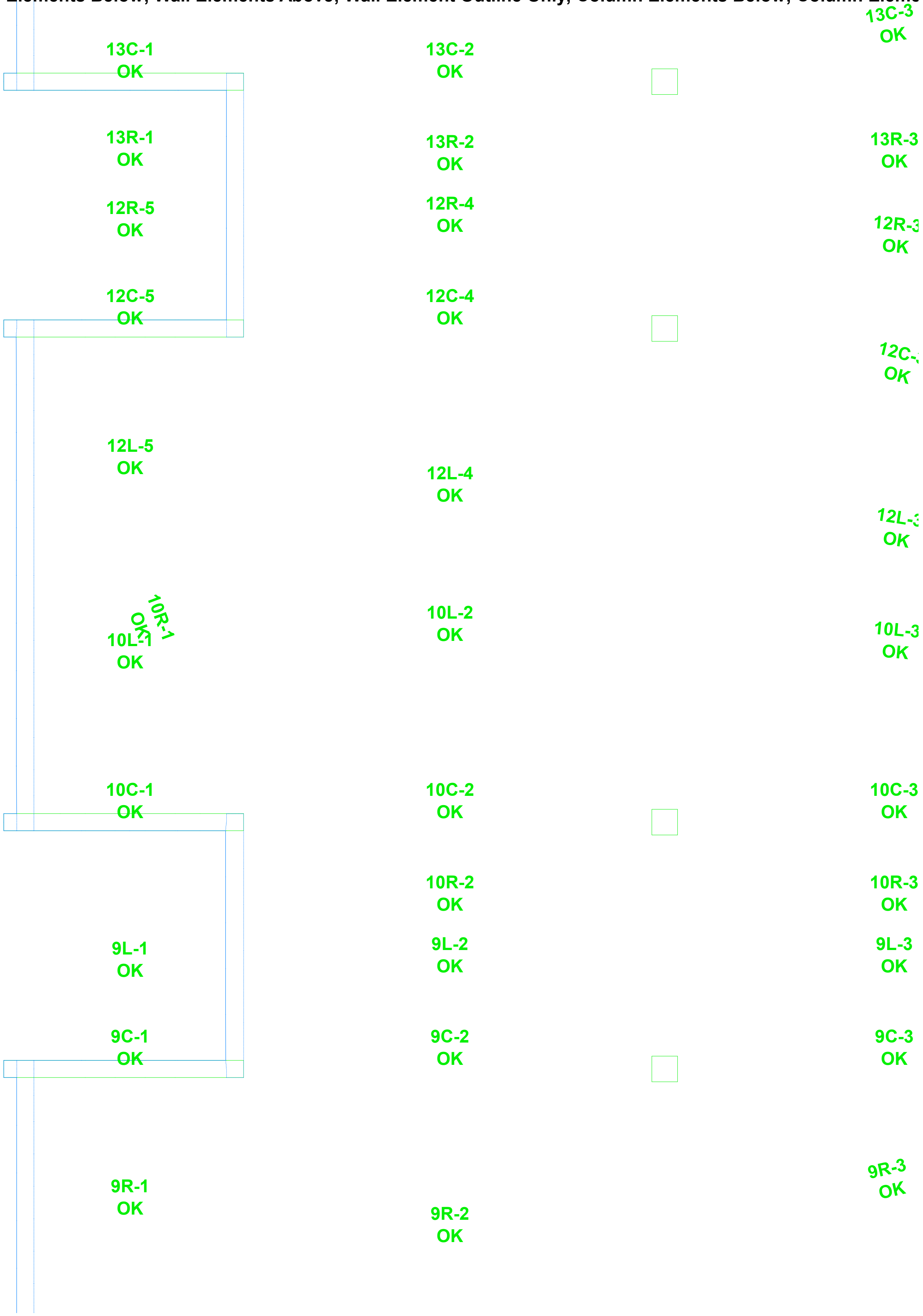
Design Status: Latitude Status Plan

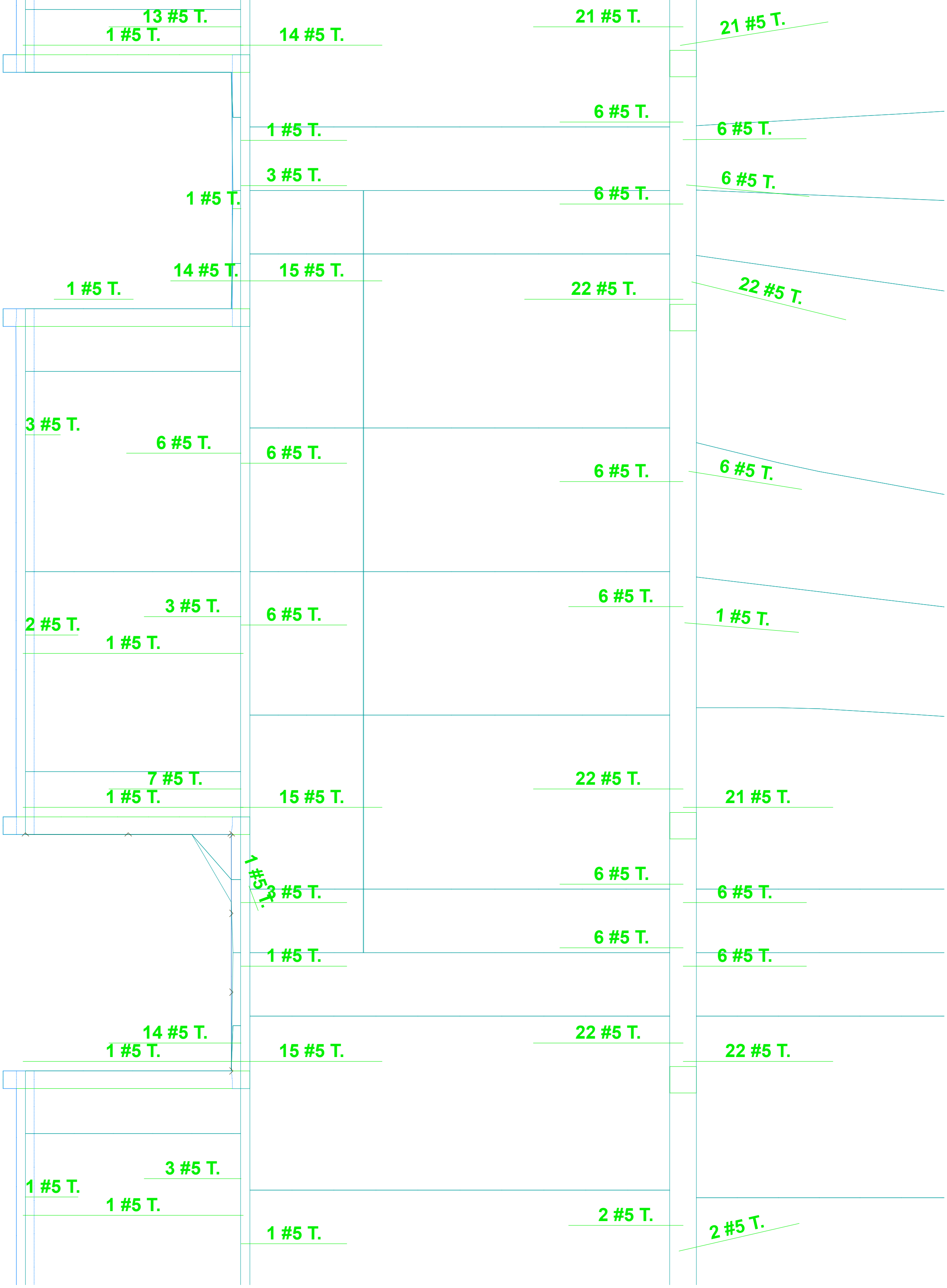
Design Status: User Lines; User Notes; User Dimensions; Latitude Span Designs; Span Design Numbers; Span Design Sta
Element: Wall Elements Below; Wall Elements Above; Wall Element Outline Only; Column Elements Below; Column Eleme
Scale = 1:100



PRCTI20221788 - REVISON #6 4/5/2024

Design Status: Latitude Top Reinforcement Plan

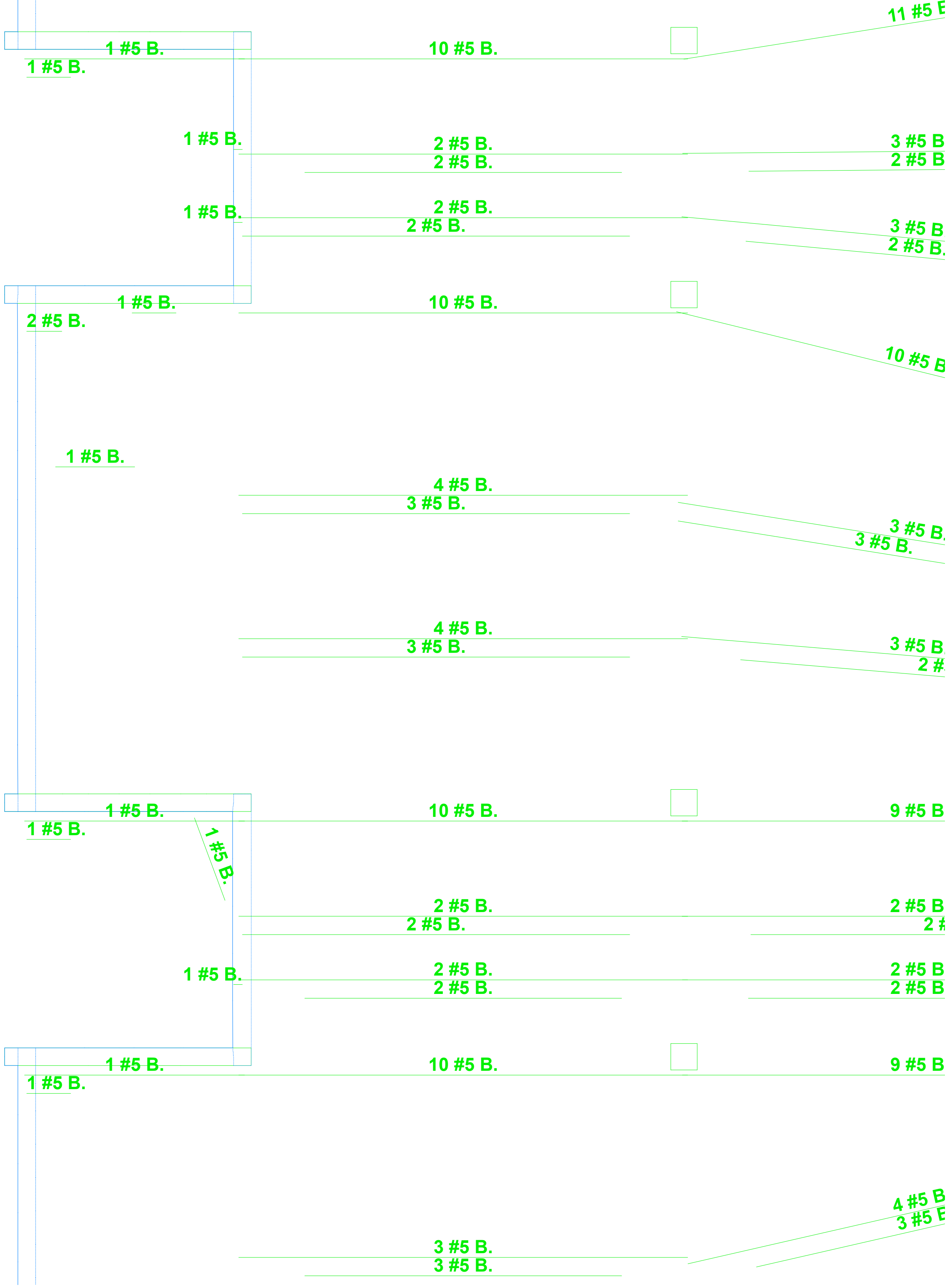
Design Status: Latitude Span Designs; Span Design Top Bars; Span Design Bar Descriptions; Latitude DS Designs; DS De
Element: Wall Elements Above; Wall Elements Below; Wall Element Outline Only; Column Elements Above; Column Eleme
Design Strip: Latitude Strip Boundaries; Latitude SSSs;
Reinforcement: Latitude User Concentrated Reinf.; Top Face Concentrated Reinf.; Both Faces Concentrated Reinf.; Auto F
Scale = 1:100



PRCTI20221788 - REVISON #6 4/5/2024

Design Status: Latitude Bottom Reinforcement Plan

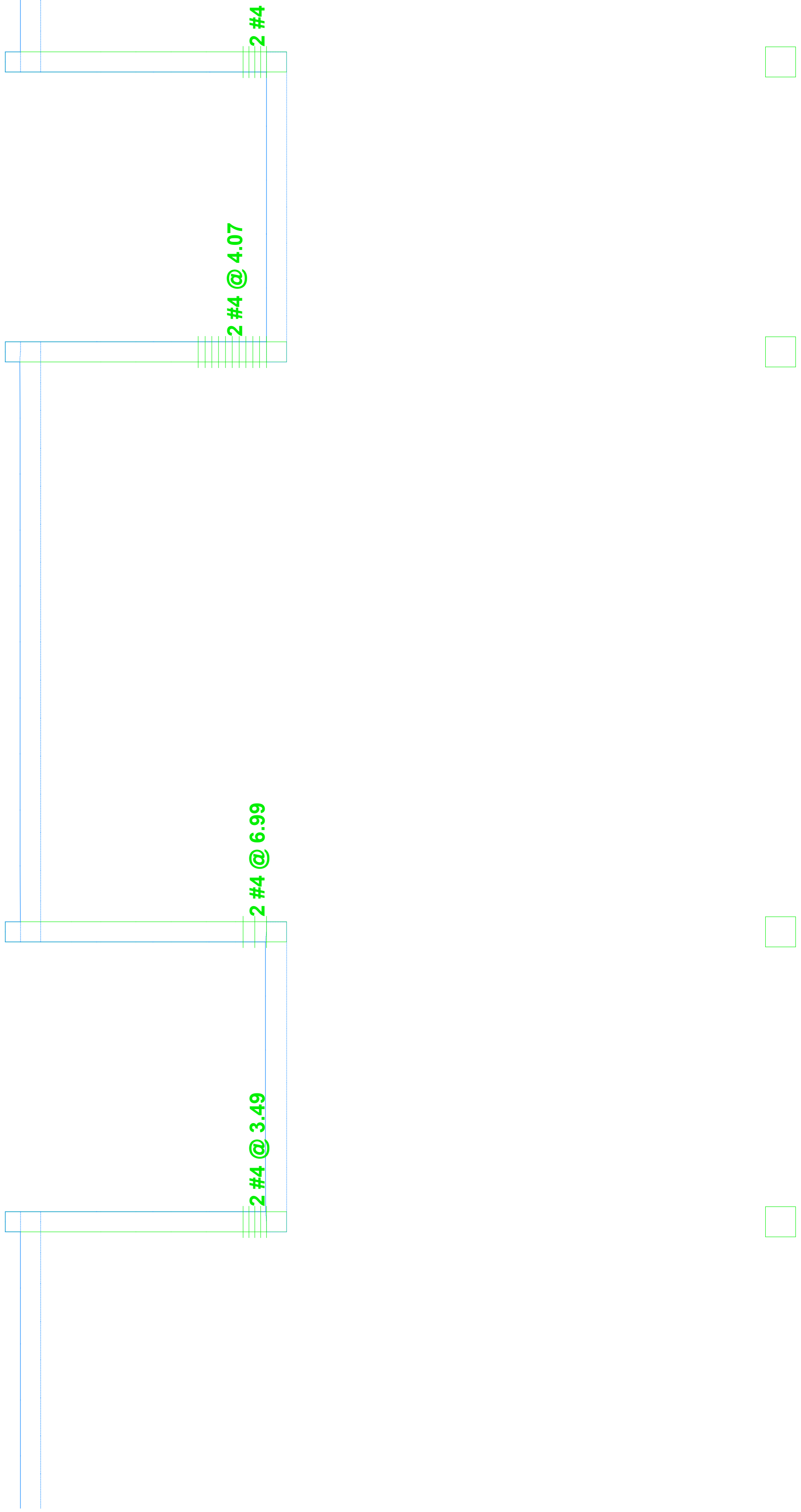
Design Status: Latitude Span Designs; Span Design Bottom Bars; Span Design Bar Descriptions; Latitude DS Designs; D
Element: Wall Elements Above; Wall Elements Below; Wall Element Outline Only; Column Elements Above; Column Eleme
Reinforcement: Latitude User Concentrated Reinf.; Bottom Face Concentrated Reinf.; Both Faces Concentrated Reinf.; Au
Scale = 1:100



PRCTI20221788 - REVISON #6 4/5/2024

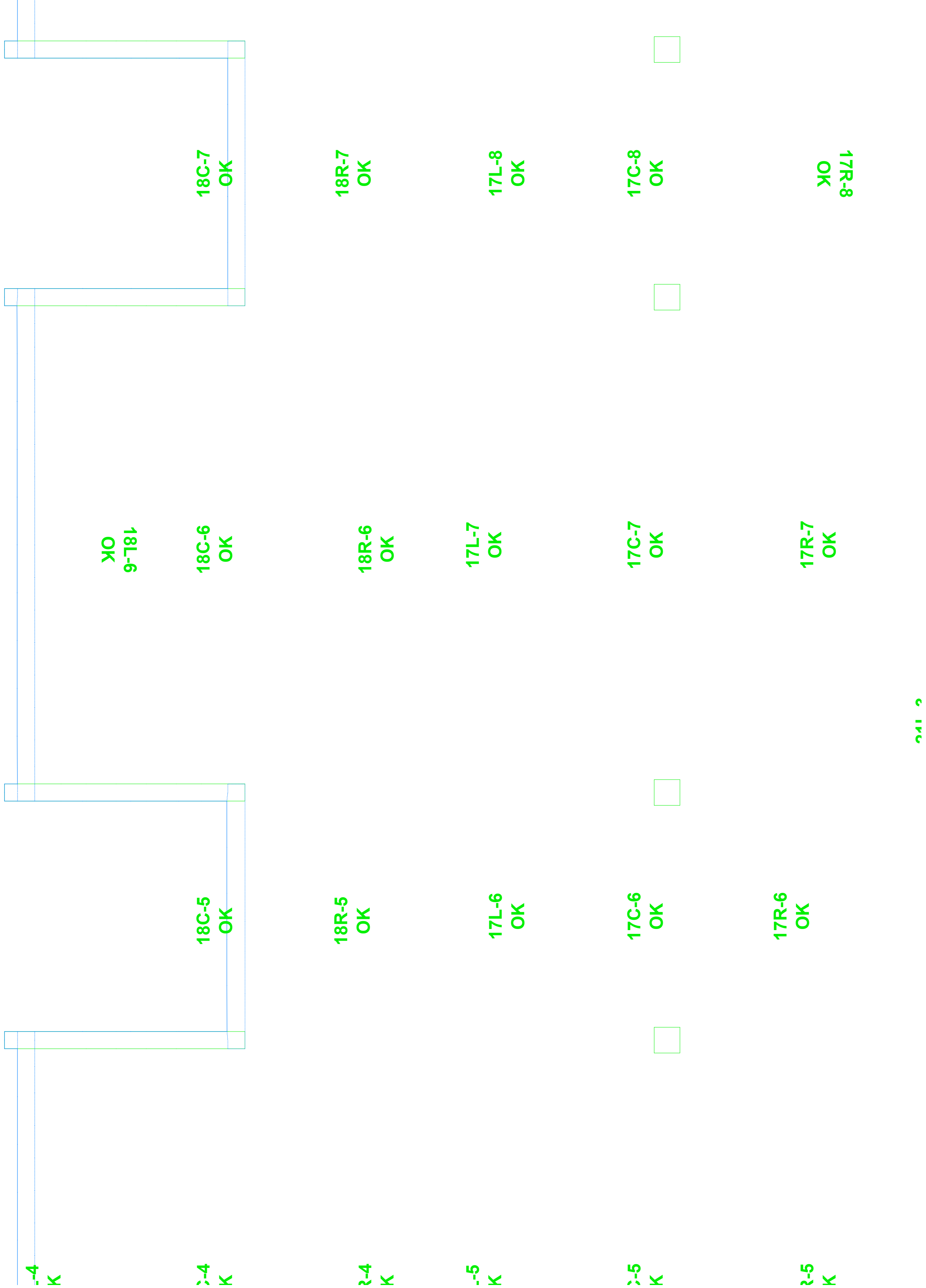
Design Status: Latitude Shear Reinforcement Plan

Design Status: User Lines; User Notes; User Dimensions; Latitude Span Designs; Span Design Shear Bars; Span Design
Element: Wall Elements Below; Wall Elements Above; Wall Element Outline Only; Column Elements Below; Column Eleme
Scale = 1:100



Design Status: Longitude Status Plan

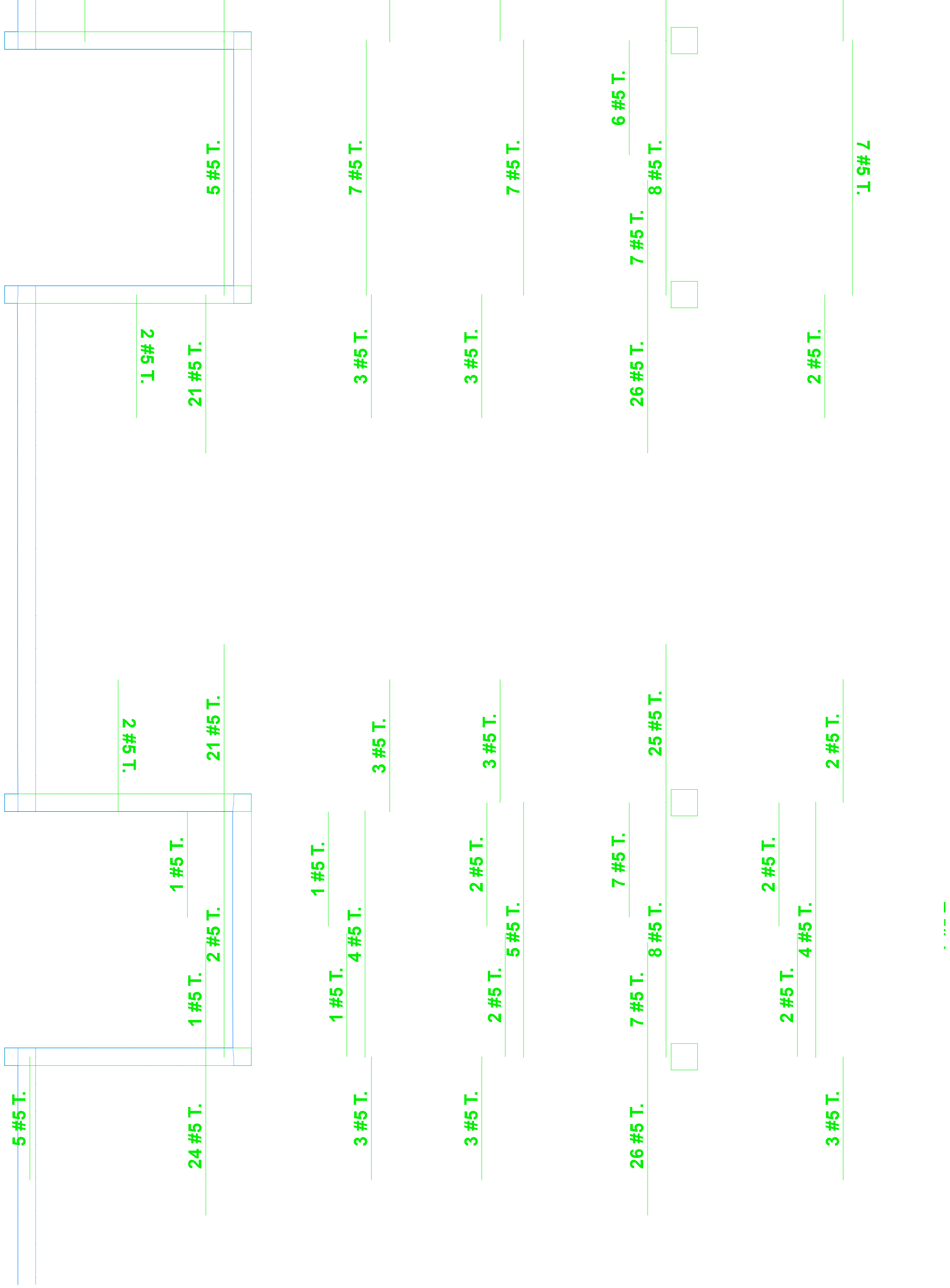
Design Status: User Lines; User Notes; User Dimensions; Longitude Span Designs; Span Design Numbers; Span Design S
Element: Wall Elements Below; Wall Elements Above; Wall Element Outline Only; Column Elements Below; Column Eleme
Scale = 1:100



PRCTI20221788 - REVISON #6 4/5/2024

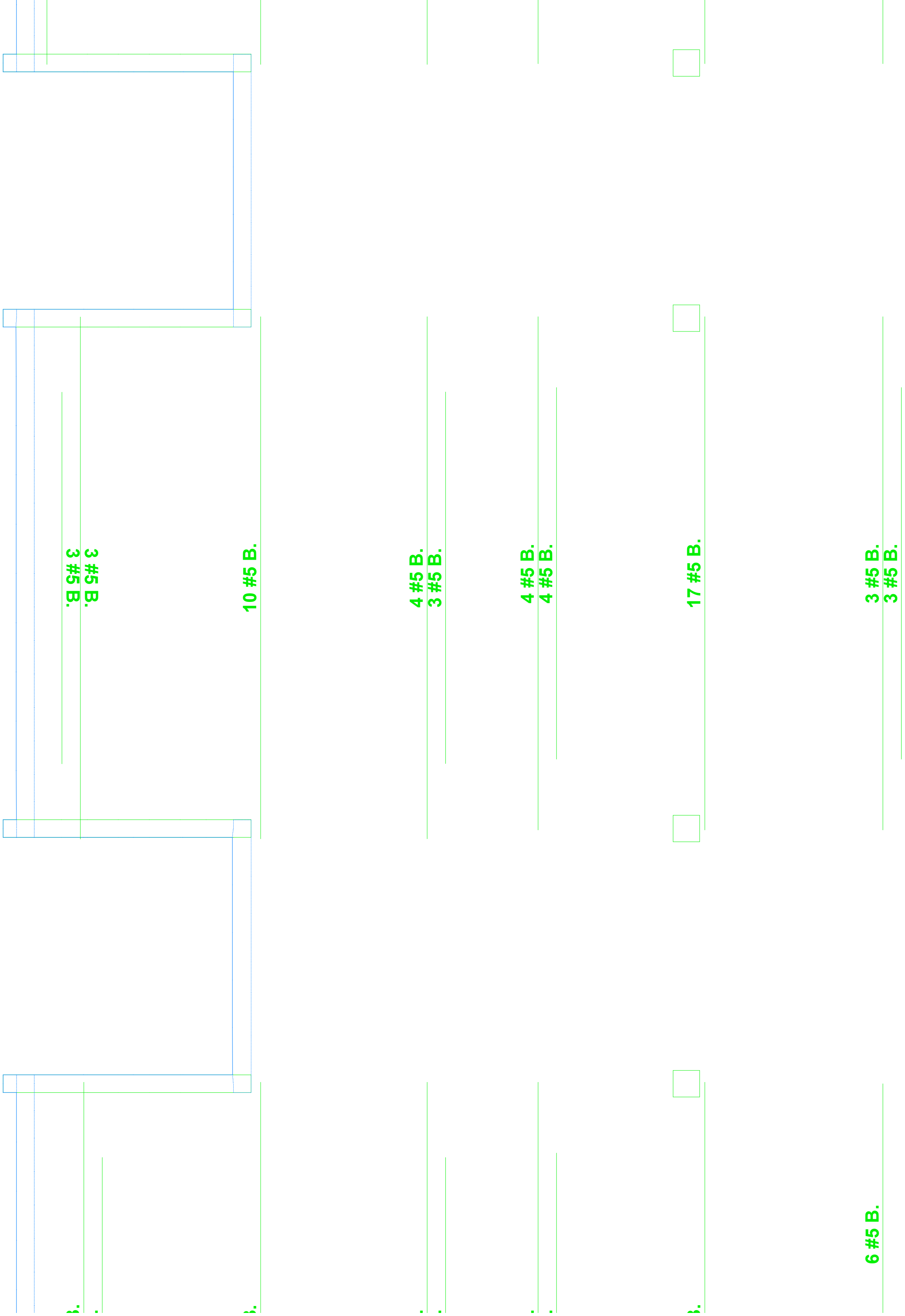
Design Status: Longitude Top Reinforcement Plan

Design Status: User Lines; User Notes; User Dimensions; Longitude Span Designs; Span Design Top Bars; Span Design
Element: Wall Elements Below; Wall Elements Above; Wall Element Outline Only; Column Elements Below; Column Eleme
Reinforcement: Top Face Concentrated Reinf.; Both Faces Concentrated Reinf.; Auto Face Concentrated Reinf.; Concentra
Scale = 1:100



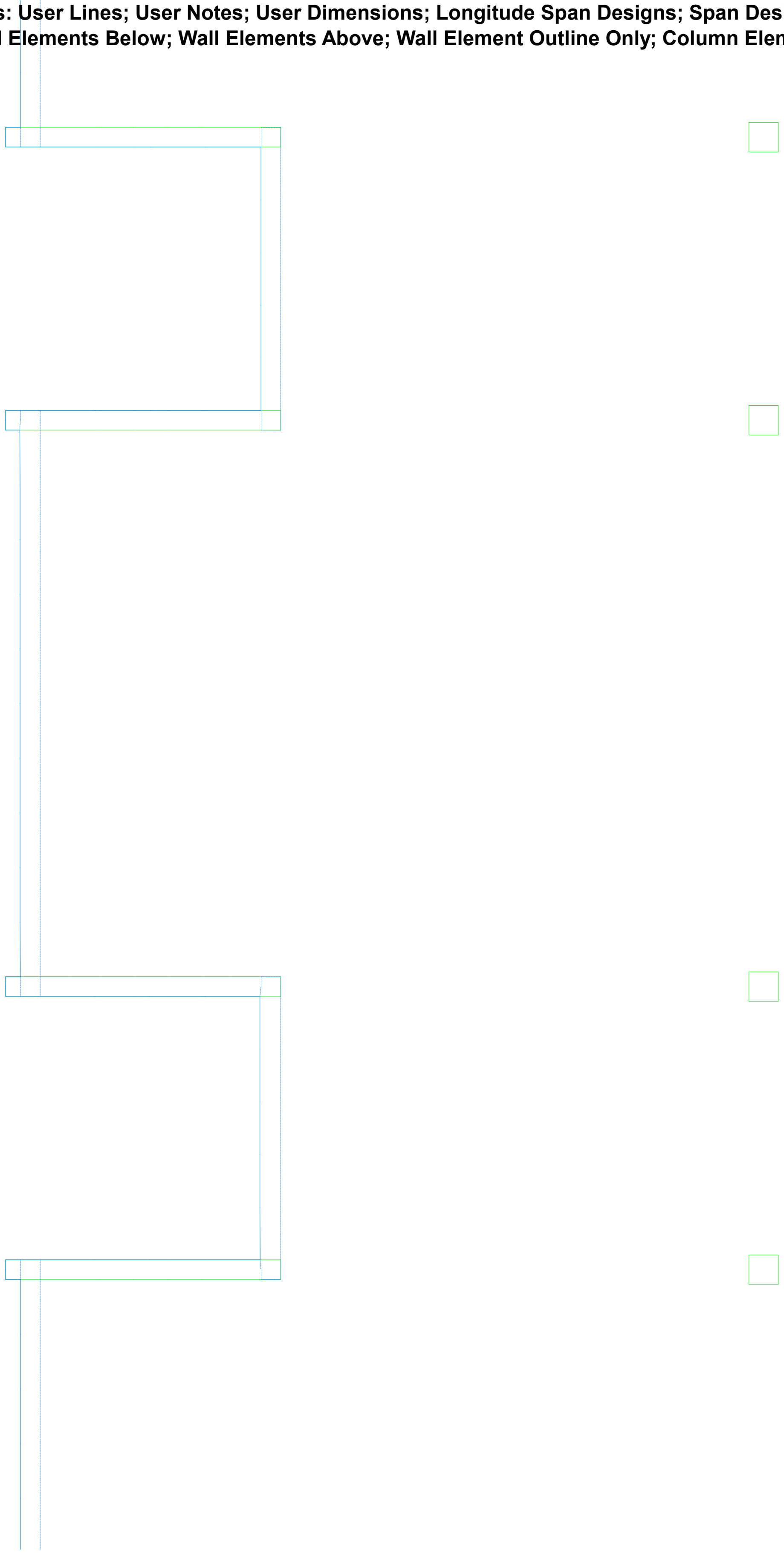
Design Status: Longitude Bottom Reinforcement Plan

Design Status: User Lines; User Notes; User Dimensions; Longitude Span Designs; Span Design Bottom Bars; Span Desi
Element: Wall Elements Below; Wall Elements Above; Wall Element Outline Only; Column Elements Below; Column Eleme
Reinforcement: Bottom Face Concentrated Reinf.; Both Faces Concentrated Reinf.; Auto Face Concentrated Reinf.; Conce
Scale = 1:100



Design Status: Longitude Shear Reinforcement Plan

Design Status: User Lines; User Notes; User Dimensions; Longitude Span Designs; Span Design Shear Bars; Span Desig
Element: Wall Elements Below; Wall Elements Above; Wall Element Outline Only; Column Elements Below; Column Eleme
Scale = 1:100



Calc Log

```
Calculating Through Detailing and Load History (Everything Out-of-Date)(Considering Previous Warnings)
Active Calculation Options:
    The structure is not automatically stabilized in the X and Y directions.
    Supports above slab NOT included in self-dead loading.
    Tendon vertical component NOT considered in punch check reactions.
    Design reinforcement.
    6 zero-tension iterations are used to eliminate tension in area springs.
    Creep Factor of 3.35 used in ECR calculations.
    Shrinkage strain of 0.0004 used in ECR calculations.
    ACI 318-14 is used in design.
    Live load reduction not used
Stiffness matrix is already up to date.
Self-dead load creation is already up to date.
Generated tendons are already up to date.
Balance load creation is already up to date.
User reinforcement detailing is already up to date.
    WARNING: Span segment 22-2 has a left cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 22-2 has a left cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 22-2 has a left cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 22-2 has a left cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 22-2 has a left cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 22-2 has a left cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 22-2 has a left cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 22-2 has a left cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 22-2 has a left cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 22-2 has a left cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 22-2 has a left cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 22-2 has a left cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 22-2 has a left cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 22-2 has a left cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 22-2 has a left cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 22-2 has a left cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 22-2 has a left cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 1-1 has a right cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 1-1 has a right cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 1-1 has a right cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 1-1 has a right cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 1-1 has a right cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 1-1 has a right cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 1-1 has a right cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 1-1 has a right cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
```

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Calc Log (2)

Calc Log (3)

```
    WARNING: Span segment 1-1 has a right cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 1-1 has a right cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 1-1 has a right cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 1-1 has a right cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 10-1 has a right cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 10-1 has a right cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 10-1 has a right cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 10-1 has a right cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 10-1 has a right cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 10-1 has a right cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 10-1 has a right cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 13-5 has a right cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 13-5 has a right cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 13-5 has a right cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 13-5 has a right cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 13-5 has a right cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 14-1 has a left cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 14-1 has a left cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 14-1 has a left cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 14-1 has a left cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 14-1 has a left cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 14-1 has a left cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 14-1 has a left cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
    WARNING: Span segment 14-1 has a left cross section that is very narrow.  This will be merged with the center strip.
        User Continued After Warning
Determining Concrete Cross Sections
Determining Tendon Cross Sections
Determining Reinforcing Bar Cross Sections
Solving for Self-Dead Loading.
    Solving for Self-Dead Loading - Pattern: Full Pattern.
        Total Loads: (0,0,-2760000) pounds
        Total Reactions: (-3.27e-9,3.31e-8,2760000) pounds
        Load-Reaction Tolerance: (-3.27e-9,3.31e-8,2.86e-7) pounds
Solving for Balance Loading.
    Balance Loading has No Loads.
Solving for Temporary Construction (At Stressing) Loading.
    Temporary Construction (At Stressing) Loading has No Loads.
Solving for Other Dead Loading.
    Solving for Other Dead Loading - Pattern: Full Pattern.
        Total Loads: (0,0,-210000) pounds
        Total Reactions: (-2.74e-10,2.73e-9,210000) pounds
        Load-Reaction Tolerance: (-2.74e-10,2.73e-9,2.28e-8) pounds
Solving for Live (Reducible) Loading.
```

Calc Log (4)

center strip.

center strip.

center strip.

center strip.

center strip.

center strip.

center strip.

center strip.

center strip.

center strip.

center strip.

center strip.

Calc Log (5)

```
    Solving for Live (Reducible) Loading - Pattern: Full Pattern.
        Total Loads: (0,0,-1680000) pounds
        Total Reactions: (-2.26e-9,2.18e-8,1680000) pounds
        Load-Reaction Tolerance: (-2.26e-9,2.18e-8,1.82e-7) pounds
Solving for Live (Unreducible) Loading.
    Solving for Live (Unreducible) Loading - Pattern: Full Pattern.
        Total Loads: (0,0,-420000) pounds
        Total Reactions: (-5.65e-10,5.44e-9,420000) pounds
        Load-Reaction Tolerance: (-5.65e-10,5.44e-9,4.54e-8) pounds
Solving for Live (Storage) Loading.
    Live (Storage) Loading has No Loads.
Solving for Live (Parking) Loading.
    Live (Parking) Loading has No Loads.
Solving for Live (Roof) Loading.
    Live (Roof) Loading has No Loads.
Solving for Snow Loading.
    Snow Loading has No Loads.
Calculating Precompression in Cross Sections
    Solving for Hyperstatic Loading.
Solving for All Dead LC.
Solving for Dead + Balance LC.
Solving for Initial Service LC.
Solving for Service LC: D + L.
Solving for Service LC: D + Lr.
Solving for Service LC: D + S.
Solving for Service LC: D + 0.75L + 0.75Lr.
Solving for Service LC: D + 0.75L + 0.75S.
Solving for Sustained Service LC.
Solving for Factored LC: 1.4D.
Solving for Factored LC: 1.2D + 1.6L + 0.5Lr.
Solving for Factored LC: 1.2D + f1L + 1.6Lr.
Solving for Factored LC: 1.2D + 1.6L + 0.5S.
Solving for Factored LC: 1.2D + f1L + 1.6S.
Calculating Code Minimum Design envelopes.
Calculating User Minimum Design envelopes.
Calculating Initial Service Design envelopes.
Calculating Service Design envelopes.
Calculating Sustained Service Design envelopes.
Calculating Strength Design envelopes.
Calculating Ductility Design envelopes.
Calculating Code Minimum Design - Pass 0
Calculating User Minimum Design - Pass 0
Calculating Initial Service Design - Pass 0
Calculating Service Design - Pass 0
Calculating Sustained Service Design - Pass 0
Calculating Strength Design - Pass 0
Calculating Ductility Design - Pass 0
Calculating Code Minimum Design - Pass 1
Calculating User Minimum Design - Pass 1
Calculating Initial Service Design - Pass 1
Calculating Service Design - Pass 1
Calculating Sustained Service Design - Pass 1
Calculating Strength Design - Pass 1
Calculating Ductility Design - Pass 1
Calculating Code Minimum Design - Pass 2
Calculating User Minimum Design - Pass 2
Calculating Initial Service Design - Pass 2
Calculating Service Design - Pass 2
Calculating Sustained Service Design - Pass 2
Calculating Strength Design - Pass 2
Calculating Ductility Design - Pass 2
Calculating Code Minimum Design - Final Design Check
Calculating User Minimum Design - Final Design Check
Calculating Initial Service Design - Final Design Check
Calculating Service Design - Final Design Check
Calculating Sustained Service Design - Final Design Check
```

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Calc Log (6)

Calc Log (7)

```
Calculating Strength Design - Final Design Check
Calculating Ductility Design - Final Design Check
Laying Out Program Reinforcement
Optimizing Program Reinforcement Layout
Converting SSR Designs
Converting Program Transverse Bar Designs
Detailing User Transverse Reinforcement
Detailing Program Reinforcement
    WARNING: Latitude concentrated program reinforcement at (2371,1552) has a very small spacing (1.288 inches). You
        User Continued After Warning
    WARNING: Latitude concentrated program reinforcement at (2691,2426) has a very small spacing (0.8024 inches). You
        User Continued After Warning
    WARNING: Latitude concentrated program reinforcement at (2689,2615) has a very small spacing (0.7143 inches). You
        User Continued After Warning
    WARNING: Latitude concentrated program reinforcement at (3092,2616) has a very small spacing (0.7143 inches). You
        User Continued After Warning
    WARNING: Latitude concentrated program reinforcement at (2323,2910) has a very small spacing (1.389 inches). You
        User Continued After Warning
    WARNING: Latitude concentrated program reinforcement at (2672,3235) has a very small spacing (0.9937 inches). You
        User Continued After Warning
    WARNING: Longitude concentrated program reinforcement at (2904,1075) has a very small spacing (1.458 inches). You
        User Continued After Warning
    WARNING: Longitude concentrated program reinforcement at (2598,1316) has a very small spacing (1.02 inches). You
        User Continued After Warning
    WARNING: Longitude concentrated program reinforcement at (3001,2729) has a very small spacing (1.036 inches). You
        User Continued After Warning
    WARNING: Longitude concentrated program reinforcement at (2341,2779) has a very small spacing (1.143 inches). You
        User Continued After Warning
    WARNING: Longitude concentrated program reinforcement at (2947,2893) has a very small spacing (1.019 inches). You
        User Continued After Warning
Estimating Costs
Deflection Checks are already up to date.
This analysis has been completed successfully, check above for any warnings or errors.
```

Calc Log (8)

nay be able to resolve this problem by converting the bars to user reinforcement and adjusting the width and spacing.

may be able to resolve this problem by converting the bars to user reinforcement and adjusting the width and spacing.

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