C. Christian Fynboe P.E.
CONSULTING ENGINEER
12181 C Street S. • TACOMA, WA 98444 • (253) 537-8128 • FAX 531-1285

PROJECT: PUYALLUP			SHEET NO. 1/14
BY: CCF	DATE: 11/14/23	JOB NO. 23111	

STRUCTURAL CALCULATIONS
FOR THE
PUYALLUP GOLDGATE
COLUMN & FOOTINGS
(WASHINGTON STATE FAIRGROUNDS)

— JEFF BROWN ARCHITECT

DESIGN PARAMETERS: 2018 IBC
SEE NOTES ON "S1.1"

C. CHRISTIAN FYNBOE
STATE OF WASHINGTON
22148
REGISTERED
PROFESSIONAL ENGINEER

christian fynboe p.e.
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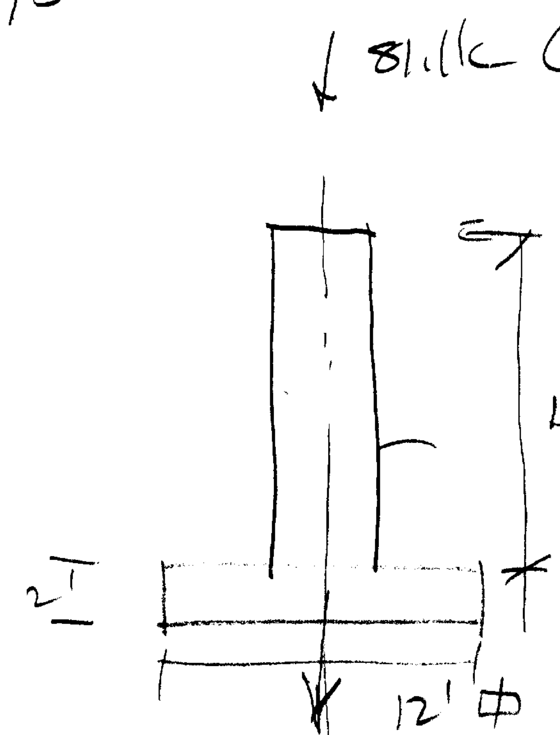
PROJECT:			SHEET NO.
BY:	DATE:	JOB NO. 2311	2/14

$V = 1.06/1.5(1.4)\ W = .50W$ (ASD)

$V = 0.5(19.1+10.8)$
$= 14.9^k$
USE BIRDAIR



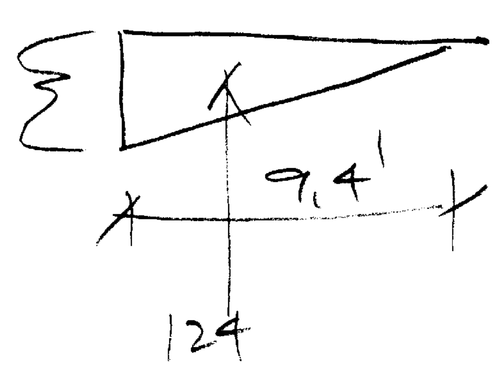
$M = 20.9(17) = 355\,k'$

$WT_{FTG} = 12(12)2(.15) = 43.2^k$

$FS_{OT} = \frac{(81.1+43.2)6}{355} = 2.1 > 1.5$ OK

$FS_{SLIDING} = \frac{(81.1+43.2).35}{20.9} = 2.1 > 1.5$ OK

$e = M/P = 355/(43.2+81.1) =$
124



$124 = \sigma(12)\,9.4/2$
$= 2.2\,KSF < 2.5\,ksf$

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PROJECT:			SHEET NO.
BY:	DATE:	JOB NO. 23111	3/14

$A_g = \pi(21)^2 = 1385 in^2$

$A_s = .01(1385) = 13.8 in^2$

USE (16) #10

$\% = \frac{1.27(16)}{1385} = 1.5\%$

ROUND TIED COLUMNS 36″ DIA.

Short columns; no sidesway (1)

Bars Grade 60 — Concrete $f'_c = 4{,}000$ psi — $0.10 f'_c A_g = 407$ kips (2)

P_u (kips)—Ultimate Usable Capacity; $M_u/P_u = e$ (in.) ($\phi = 0.70$)

Bars	p %	0	0.1t	2″	3″	4″	6″	8″	12″	16″	20″	24″	28″	OT (3) e (in.)	Balance e (in.)	Balance P_u (k)	For P_u at (2) 407 k (2) e (in.)	O (2) M_u (k-ft.)
15-#10	1.87	3177	2434	2434	2434	2360	2011	1710	1272	978	767	619	513	3.29	13.39	1160	33.88	1134
15-#11	2.29	3349	2557	2557	2557	2480	2119	1808	1357	1063	848	693	580	3.48	14.55	1159	37.93	1341
15-#14	3.31	3760	2854	2854	2854	2770	2378	2043	1558	1244	1022	854	726	3.82	17.15	1174	47.63	1824
15-#18	5.89	4800	3602	3602	3602	3497	3017	2611	2025	1639	1374	1180	1027	4.42	23.40	1207	70.36	2918
16-#10	1.99	3227	2470	2470	2470	2395	2044	1742	1301	1006	793	642	537	3.29	13.61	1172	35.14	1194
16-#11	2.45	3411	2602	2602	2602	2523	2157	1846	1389	1095	877	718	603	3.48	14.82	1171	39.54	1418
16-#14	3.53	3849	2919	2919	2919	2832	2432	2096	1602	1282	1057	884	756	3.82	17.51	1190	49.97	1927
16-#18	6.28	4958	3717	3717	3717	3608	3110	2701	2101	1699	1427	1227	1072	4.42	23.94	1230	73.70	3089
17-#10	2.12	3278	2509	2509	2509	2434	2078	1773	1327	1035	820	667	556	3.36	14.02	1168	36.43	1263
17-#11	2.60	3473	2649	2649	2649	2570	2198	1883	1420	1125	906	745	628	3.57	15.31	1169	41.02	1494
17-#14	3.75	3938	2986	2986	2986	2899	2490	2147	1643	1319	1093	919	785	3.91	18.20	1187	51.90	2028
18-#10	2.24	3328	2545	2545	2545	2469	2112	1805	1353	1061	844	689	578	3.50	14.53	1159	37.73	1325
18-#11	2.75	3535	2693	2693	2693	2613	2240	1921	1451	1153	932	773	651	3.71	15.92	1158	42.64	1572
18-#14	3.97	4027	3049	3049	3049	2960	2548	2202	1685	1355	1125	949	814	4.07	19.06	1175	53.94	2124
19-#10	2.37	3378	2584	2584	2584	2506	2144	1834	1381	1087	869	712	597	3.45	14.65	1176	38.97	1390
19-#11	2.91	3597	2740	2740	2740	2658	2279	1956	1484	1181	961	796	674	3.66	16.06	1177	44.05	1645
19-#14	4.19	4116	3117	3117	3117	3025	2604	2249	1730	1392	1159	980	843	4.03	19.24	1198	55.99	2229
20-#10	2.49	3429	2620	2620	2620	2543	2179	1865	1406	1113	894	735	616	3.47	14.88	1185	40.31	1452
20-#11	3.06	3659	2784	2784	2784	2703	2321	1992	1514	1209	988	820	697	3.69	16.34	1188	45.52	1724
20-#14	4.42	4205	3180	3180	3180	3088	2664	2300	1770	1429	1193	1012	871	4.06	19.60	1214	57.98	2324
21-#10	2.62	3479	2658	2658	2658	2579	2210	1895	1434	1136	917	755	636	3.52	15.27	1184	41.51	1515
21-#11	3.21	3720	2830	2830	2830	2747	2359	2029	1546	1235	1014	844	717	3.74	16.81	1186	46.99	1791
21-#14	4.64	4294	3247	3247	3247	3153	2717	2350	1814	1464	1224	1040	897	4.11	20.25	1211	60.12	2426
22-#10	2.74	3529	2695	2695	2695	2617	2243	1925	1460	1161	939	775	657	3.61	15.71	1180	42.78	1577
22-#11	3.37	3782	2876	2876	2876	2793	2398	2064	1577	1263	1038	868	738	3.84	17.35	1181	48.47	1865
22-#14	4.86	4384	3312	3312	3312	3217	2774	2399	1856	1503	1256	1070	923	4.22	21.01	1205	62.16	2521
23-#10	2.86	3580	2733	2733	2733	2652	2276	1956	1486	1184	962	797	674	3.60	15.88	1191	44.03	1638
23-#11	3.52	3844	2921	2921	2921	2837	2438	2101	1608	1288	1063	891	760	3.83	17.54	1194	50.00	1935
24-#10	2.99	3630	2771	2771	2771	2690	2308	1986	1512	1206	983	817	693	3.62	16.11	1199	45.21	1702
24-#11	3.67	3906	2969	2969	2969	2882	2477	2136	1638	1314	1087	912	781	3.84	17.82	1203	51.41	2006
25-#10	3.11	3680	2807	2807	2807	2725	2342	2015	1537	1229	1006	837	711	3.67	16.48	1199	46.47	1761
25-#11	3.83	3968	3013	3013	3013	2925	2518	2172	1668	1340	1111	935	801	3.90	18.27	1203	52.91	2077
26-#10	3.24	3731	2845	2845	2845	2761	2374	2046	1562	1250	1026	856	729	3.76	16.91	1195	47.64	1823
26-#11	3.98	4029	3059	3059	3059	2970	2556	2209	1697	1365	1135	959	821	4.00	18.78	1199	54.39	2147
27-#10	3.36	3781	2881	2881	2881	2798	2407	2075	1588	1272	1048	876	746	3.75	17.08	1206	48.94	1880
27-#11	4.13	4091	3103	3103	3103	3013	2596	2244	1728	1391	1159	979	841	3.98	18.99	1211	55.83	2218

(1) See "Slender Columns, Capacity Reduction for", page 2-11.
(2) See "Control Points for Interaction Curves"; "Typical Interaction Curve", Fig. 4-1, page 4-4.
(3) "OT" is zero tension in bars on tension side. Splices carry design compression only.

ROUND TIED COLUMNS 12″ DIA.

Short columns; no sidesway (1)

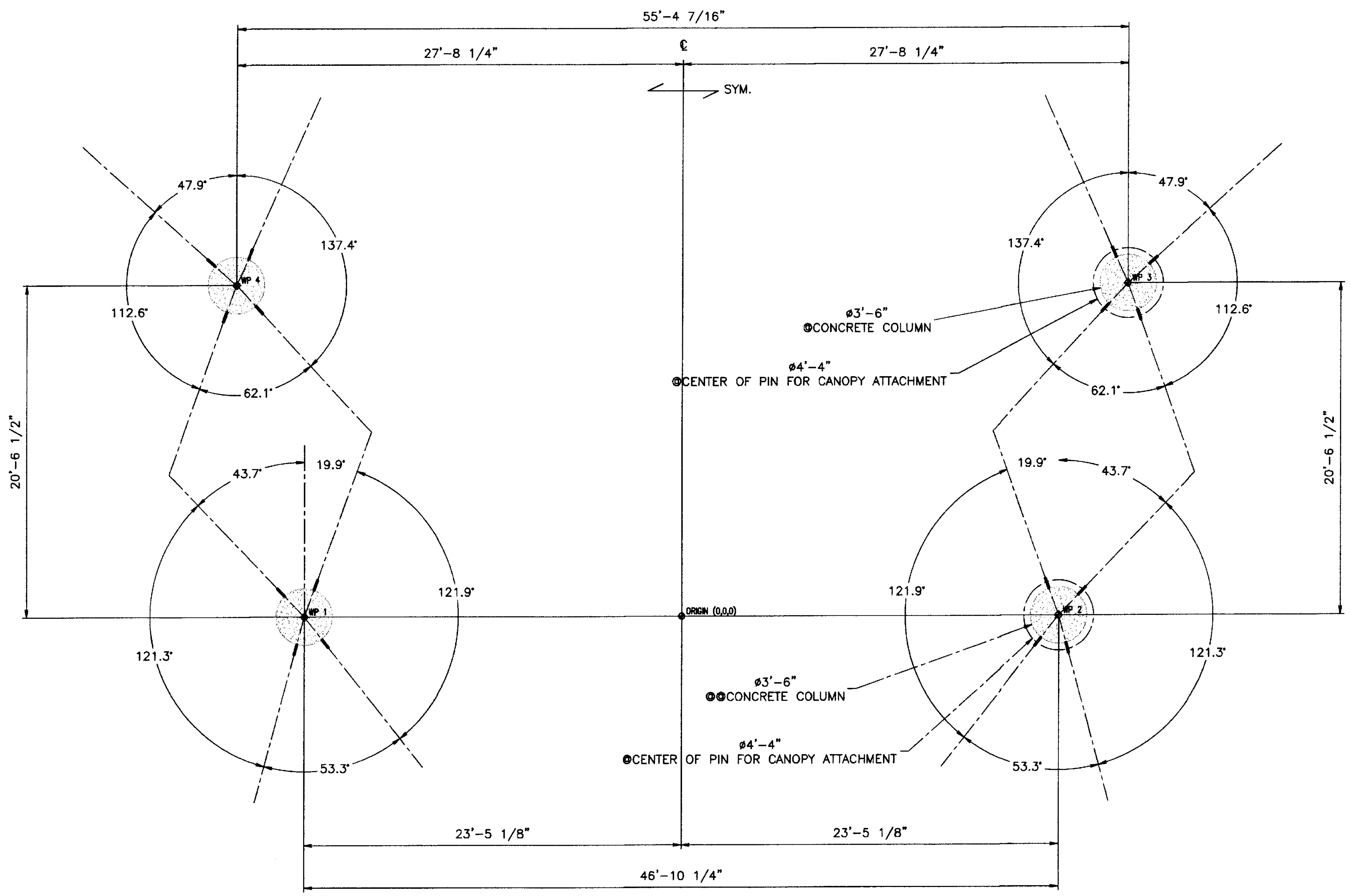
Bars Grade 60 — Concrete $f'_c = 5{,}000$ psi — $0.10 f'_c A_g = 5$ — For P_u at

P_u (kips)—Ultimate Usable Capacity; $M_u/P_u = e$ (in.) ($\phi = 0.70$)

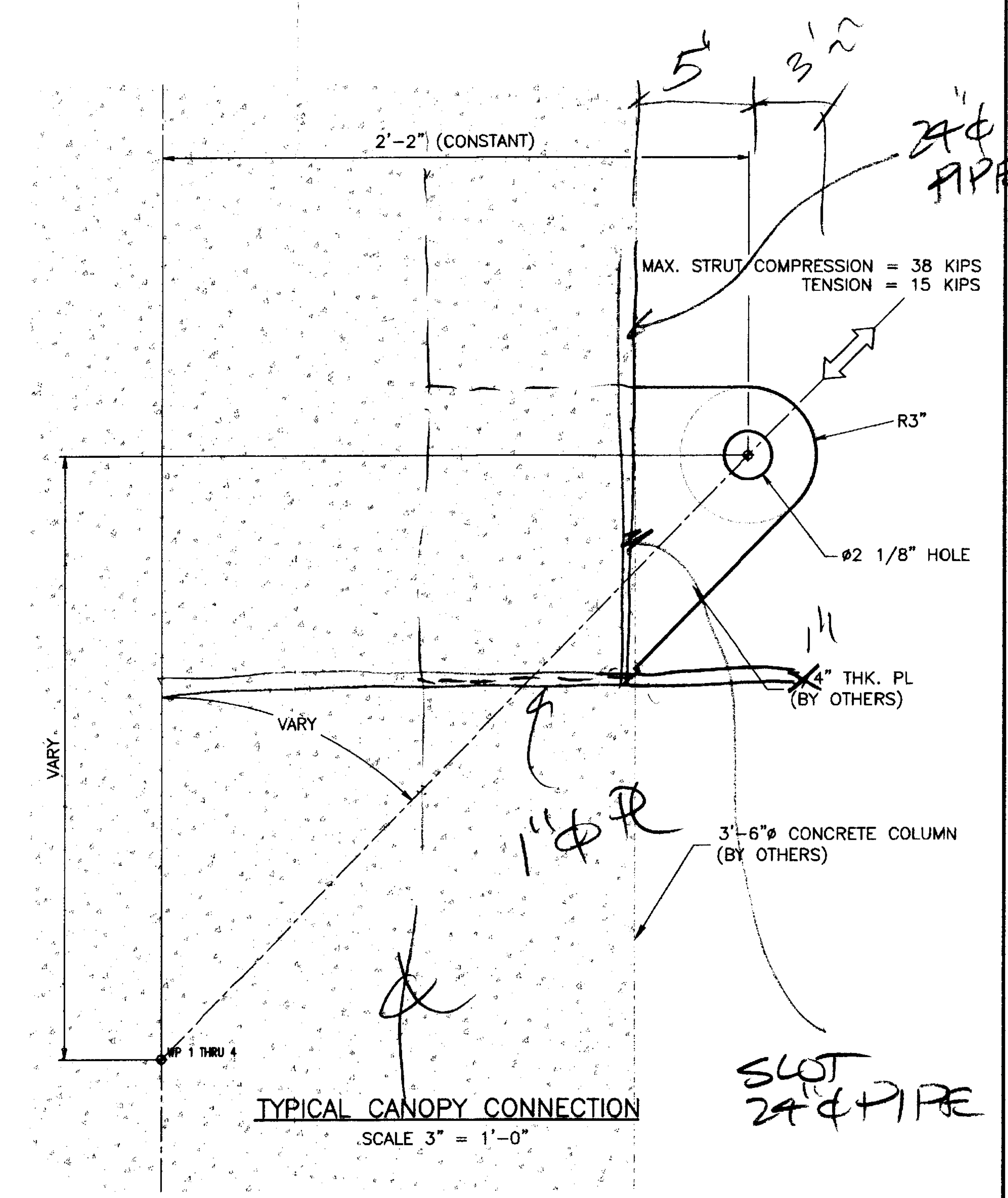
Bars	p %	0	0.1t	2″	3″	4″	6″	8″	12″	16″	20″	24″	28″	OT (3) e (in.)	Balance e (in.)	Balance P_u (k)
4-#5	1.09	385	289	229	166	122	69	0	0	0	0	0	0	1.60	4.16	117
4-#6	1.55	405	301	239	176	131	79	0	0	0	0	0	0	1.63	4.57	114
4-#7	2.12	430	316	251	186	141	89	62	0	0	0	0	0	1.66	5.10	110
4-#8	2.79	460	334	264	197	151	99	70	0	0	0	0	0	1.68	5.78	104
4-#9	3.53	492	353	279	208	161	108	79	0	0	0	0	0	1.70	6.62	98
4-#10	4.49	535	378	297	221	172	117	88	0	0	0	0	0	1.72	7.88	90
4-#11	5.51	580	401	313	231	178	122	92	60	0	0	0	0	1.75	10.22	73
4-#14	7.95	688	460	352	259	201	138	105	71	0	0	0	0	1.75	19.63	44
5-#5	1.37	397	298	236	172	128	78	0	0	0	0	0	0	1.69	4.59	110
5-#6	1.94	422	314	249	183	138	88	62	0	0	0	0	0	1.71	5.19	105
5-#7	2.65	453	334	264	195	149	99	72	0	0	0	0	0	1.74	6.02	99
5-#8	3.49	490	357	281	209	161	109	81	0	0	0	0	0	1.76	7.13	92
5-#9	4.42	531	381	300	222	173	118	89	58	0	0	0	0	1.78	8.64	83
5-#10	5.61	584	413	323	239	187	128	97	65	0	0	0	0	1.79	11.18	71
5-#11	6.89	641	442	340	250	194	133	102	69	0	0	0	0	1.80	17.45	48
6-#5	1.64	409	306	244	178	134	83	57	0	0	0	0	0	1.85	5.27	100
6-#6	2.33	439	325	259	191	145	97	67	0	0	0	0	0	1.88	6.24	93
6-#7	3.18	477	348	278	205	158	107	79	0	0	0	0	0	1.91	7.65	84
6-#8	4.19	521	376	299	221	172	117	89	58	0	0	0	0	1.94	9.79	73
6-#9	5.30	570	406	321	238	186	128	97	65	0	0	0	0	1.95	13.16	60
6-#10	6.73	634	445	348	258	203	140	107	72	0	0	0	0	1.96	20.78	42
7-#5	1.91	421	314	249	184	139	89	62	0	0	0	0	0	1.67	5.01	110
7-#6	2.72	457	336	267	198	152	102	74	0	0	0	0	0	1.70	5.86	104
7-#7	3.71	500	364	288	215	166	113	85	0	0	0	0	0	1.73	7.04	97
7-#8	4.88	552	396	312	233	182	125	96	63	0	0	0	0	1.75	8.73	87
7-#9	6.18	609	431	338	253	198	137	104	70	0	0	0	0	1.77	11.17	76
8-#8	5.58	583	418	326	245	192	133	101	67	0	0	0	0	1.69	9.09	90

(1) See "Slender Columns, Capacity Reduction for", page 2-11.
(2) See "Control Points for Interaction Curves"; "Typical Interaction Curve", Fig. 4-1, pag
(3) "OT" is zero tension in bars on tension side. Splices carry design compression only.

#23111 5/K4

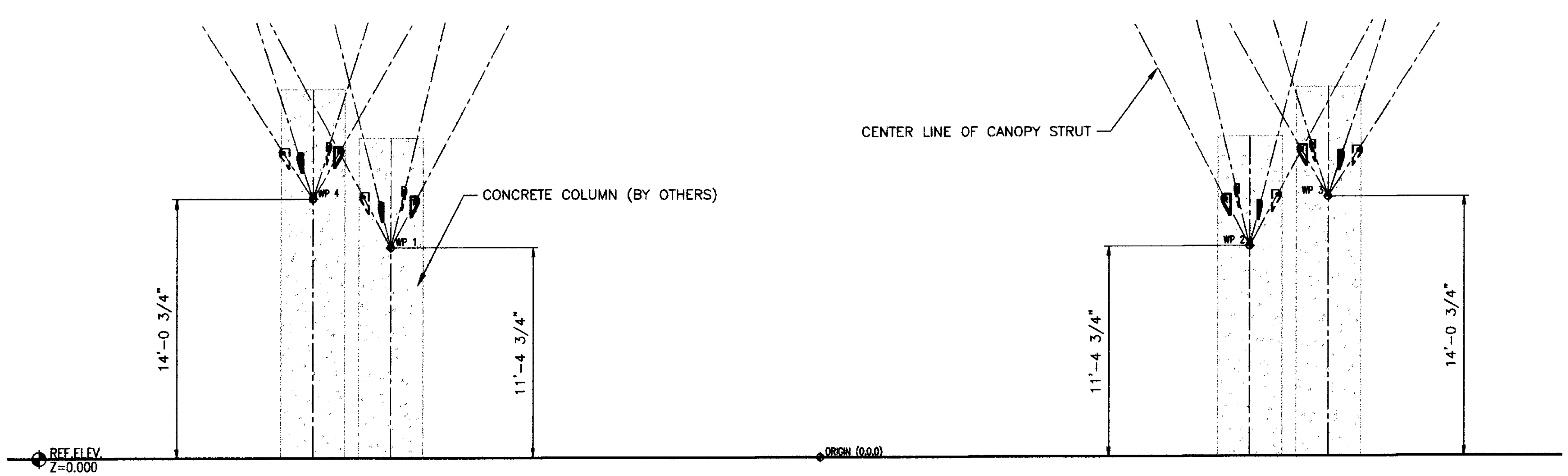


ANCHOR KEY PLAN
SCALE 1/4" = 1'-0"



TYPICAL CANOPY CONNECTION
SCALE 3" = 1'-0"

SLOT 24" ø PIPE



ANCHOR FRONT VIEW
SCALE 1/4" = 1'-0"

FOR INFORMATION ONLY
Oct 13 2023
DO NOT USE FOR CONSTRUCTION OR FABRICATION

REV	DESCRIPTION	DATE	DRWN	CHKD	ENGR
	REVISIONS				

	NAME	DATE
DRAWN BY	MI	10/13/23
CHECKED BY	MI	10/13/23
ENGINEER	MI	10/13/23
FINAL REVIEW		
SCALE: AS NOTED	DRAWING SIZE	

BIRDAIR
6461 MAIN STREET
AMHERST, N.Y. 14221-7075, U.S.A.
TELEPHONE: 716-633-9500 FAX: 716-204-1234

TITLE: INTERFACE
ANCHOR KEY PLAN
WASHINGTON STATE FAIRGROUNDS

DWG. NO. 23008 - 1010
REV

#23111 6/14

REACTION LOAD (NOTE) LOADS ARE ASD COMBINATION LOAD

1 PRESTRESS

No.	RFx(Kip)	RFy(Kip)	RFz(Kip)	RMx(Kip*ft)	RMy(Kip*ft)	RMz(Kip*ft)
1	-2.5	2.4	-11.2	0.0	0.1	0.1
2	2.5	2.4	-11.2	0.0	-0.1	-0.1
3	4.7	-2.4	-19.2	0.0	-0.1	-0.1
4	-4.7	-2.4	-19.2	0.0	0.1	0.1
Total	0.0	0.0	-60.7			

2 SNOW LOAD (BALANCED LOAD)

No.	RFx(Kip)	RFy(Kip)	RFz(Kip)	RMx(Kip*ft)	RMy(Kip*ft)	RMz(Kip*ft)
1	-6.5	5.7	-27.6	-0.1	0.2	0.1
2	6.5	5.7	-27.6	-0.1	-0.2	-0.1
3	11.9	-5.7	-47.2	-0.1	-0.4	-0.2
4	-11.9	-5.7	-47.2	-0.1	0.4	0.2
Total	0.0	0.0	-149.6			

3 SNOW LOAD (X UNBALANCED LOAD)

No.	RFx(Kip)	RFy(Kip)	RFz(Kip)	RMx(Kip*ft)	RMy(Kip*ft)	RMz(Kip*ft)
1	-3.6	2.3	-12.8	0.0	0.1	0.1
2	4.5	6.1	-31.9	-0.1	-0.2	0.0
3	5.9	-6.1	-49.2	-0.1	-0.3	-0.2
4	-6.8	-2.2	-19.7	0.0	0.2	0.1
Total	0.0	0.0	-113.6			

4 SNOW LOAD (Y UNBALANCED LOAD)

No.	RFx(Kip)	RFy(Kip)	RFz(Kip)	RMx(Kip*ft)	RMy(Kip*ft)	RMz(Kip*ft)
1	-8.7	5.2	-43.5	-0.1	0.2	0.0
2	8.7	5.2	-43.5	-0.1	-0.2	0.0
3	2.6	-5.2	-9.4	0.0	-0.1	-0.1
4	-2.6	-5.2	-9.4	0.0	0.1	0.1
Total	0.0	0.0	-105.9			

5 UNIFORM UPLIFT WIND LOAD

No.	RFx(Kip)	RFy(Kip)	RFz(Kip)	RMx(Kip*ft)	RMy(Kip*ft)	RMz(Kip*ft)
1	-1.1	-2.1	-6.8	0.0	0.0	0.0
2	1.1	-2.1	-6.8	0.0	0.0	0.0
3	-0.4	-1.3	3.4	0.0	0.0	0.0
4	0.4	-1.3	3.4	0.0	0.0	0.0
Total	0.0	-6.8	-6.8			

6 +X WIND LOAD AT CASE A

No.	RFx(Kip)	RFy(Kip)	RFz(Kip)	RMx(Kip*ft)	RMy(Kip*ft)	RMz(Kip*ft)
1	-2.7	2.4	-5.9	0.0	0.0	0.0
2	1.9	0.8	-10.1	0.0	0.0	-0.1
3	3.5	-1.8	-11.2	0.0	-0.1	-0.1
4	-1.8	-2.8	-22.3	-0.1	0.1	0.0
Total	0.9	-1.5	-49.5			

7 +Y WIND LOAD AT CASE A

No.	RFx(Kip)	RFy(Kip)	RFz(Kip)	RMx(Kip*ft)	RMy(Kip*ft)	RMz(Kip*ft)
1	-4.5	4.4	-22.7	-0.1	0.2	0.1
2	4.5	4.4	-22.7	-0.1	-0.2	-0.1
3	9.8	-1.3	-26.3	0.0	-0.3	-0.2
4	-9.8	-1.3	-26.3	0.0	0.3	0.2
Total	0.0	6.2	-98.0			

8 -Y WIND LOAD AT CASE A

No.	RFx(Kip)	RFy(Kip)	RFz(Kip)	RMx(Kip*ft)	RMy(Kip*ft)	RMz(Kip*ft)
1	-2.2	0.7	-10.3	0.0	0.0	0.0
2	2.2	0.7	-10.3	0.0	0.0	0.0
3	2.6	-1.7	-10.6	0.0	-0.1	-0.1
4	-2.6	-1.7	-10.6	0.0	0.1	0.1
Total	0.0	-2.1	-41.9			

9 +X+Y WIND LOAD AT CASE A

No.	RFx(Kip)	RFy(Kip)	RFz(Kip)	RMx(Kip*ft)	RMy(Kip*ft)	RMz(Kip*ft)
1	-3.3	5.2	-17.4	-0.1	0.2	0.1
2	3.7	1.7	-11.1	0.0	0.0	-0.1
3	7.5	-2.0	-16.2	0.0	-0.1	-0.1
4	-5.0	-2.3	-32.9	-0.1	0.3	0.1
Total	3.0	2.7	-77.6			

10 +X WIND LOAD AT CASE B

No.	RFx(Kip)	RFy(Kip)	RFz(Kip)	RMx(Kip*ft)	RMy(Kip*ft)	RMz(Kip*ft)
1	-1.1	-1.0	-1.5	0.0	0.0	0.0
2	0.6	-2.8	-5.8	0.0	0.0	0.0
3	-0.6	-1.4	7.0	0.0	0.0	0.0
4	1.9	-2.3	-4.3	0.0	0.0	0.0
Total	0.8	-7.5	-4.5			

11 +Y WIND LOAD AT CASE B

No.	RFx(Kip)	RFy(Kip)	RFz(Kip)	RMx(Kip*ft)	RMy(Kip*ft)	RMz(Kip*ft)
1	-3.0	0.8	-17.6	0.0	0.1	0.0
2	3.0	0.8	-17.6	0.0	-0.1	0.0
3	5.0	-0.7	-8.5	0.0	-0.2	-0.1
4	-5.0	-0.7	-8.5	0.0	0.2	0.1
Total	0.0	0.1	-52.1			

12 -Y WIND LOAD AT CASE B

No.	RFx(Kip)	RFy(Kip)	RFz(Kip)	RMx(Kip*ft)	RMy(Kip*ft)	RMz(Kip*ft)
1	-0.8	-2.9	-5.9	0.0	0.0	0.0
2	0.8	-2.9	-5.9	0.0	0.0	0.0
3	-1.3	-1.2	7.5	0.0	0.0	0.0
4	1.3	-1.2	7.5	0.0	0.0	0.0
Total	0.0	-8.1	3.1			

13 +X+Y WIND LOAD AT CASE B

No.	RFx(Kip)	RFy(Kip)	RFz(Kip)	RMx(Kip*ft)	RMy(Kip*ft)	RMz(Kip*ft)
1	-1.7	1.6	-12.2	0.0	0.1	0.0
2	2.2	-1.8	-6.7	0.0	0.0	0.0
3	3.0	-1.5	2.0	0.0	0.0	-0.1
4	-0.8	-1.7	-15.2	0.0	0.1	0.0
Total	2.8	-3.4	-32.1			

14 BALANCED SNOW + WIND

No.	RFx(Kip)	RFy(Kip)	RFz(Kip)	RMx(Kip*ft)	RMy(Kip*ft)	RMz(Kip*ft)
1	-6.9	6.6	-31.7	-0.1	0.3	0.1
2	6.9	6.6	-31.7	-0.1	-0.3	-0.1
3	14.2	-4.3	-46.8	-0.1	-0.4	-0.3
4	-14.2	-4.3	-46.8	-0.1	0.4	0.3
Total	0.0	4.5	-157.0			

15 X UNBALANCED SNOW + WIND

No.	RFx(Kip)	RFy(Kip)	RFz(Kip)	RMx(Kip*ft)	RMy(Kip*ft)	RMz(Kip*ft)
1	-4.8	4.0	-20.6	-0.1	0.2	0.1
2	5.4	6.9	-34.9	-0.1	-0.2	-0.1
3	9.8	-4.6	-48.3	-0.1	-0.3	-0.2
4	-10.3	-1.7	-26.2	0.0	0.3	0.2
Total	0.0	4.6	-130.0			

16 Y UNBALANCED SNOW + WIND

No.	RFx(Kip)	RFy(Kip)	RFz(Kip)	RMx(Kip*ft)	RMy(Kip*ft)	RMz(Kip*ft)
1	-8.6	6.2	-43.6	-0.1	0.2	0.1
2	8.6	6.2	-43.6	-0.1	-0.2	-0.1
3	7.2	-3.9	-18.5	0.0	-0.2	-0.2
4	-7.2	-3.9	-18.5	0.0	0.2	0.2
Total	0.0	4.7	-124.2			

17 +X SEISMIC LOAD

No.	RFx(Kip)	RFy(Kip)	RFz(Kip)	RMx(Kip*ft)	RMy(Kip*ft)	RMz(Kip*ft)
1	4.0	3.3	-5.9	-0.1	0.4	0.0
2	9.7	6.8	-13.0	0.0	0.2	-0.2
3	17.0	-0.4	-30.9	0.1	0.2	-0.3
4	5.6	1.1	-15.7	-0.1	0.5	0.0
Total	36.2	10.9	-65.5			

18 +Y SEISMIC LOAD

No.	RFx(Kip)	RFy(Kip)	RFz(Kip)	RMx(Kip*ft)	RMy(Kip*ft)	RMz(Kip*ft)
1	-0.6	11.2	1.8	-0.1	0.2	0.2
2	4.7	12.2	-0.3	0.0	0.0	-0.2
3	12.0	6.2	-35.8	0.0	-0.1	-0.2
4	-5.3	6.6	-31.2	-0.1	0.3	0.2
Total	10.9	36.2	-65.5			

19 -Y SEISMIC LOAD

No.	RFx(Kip)	RFy(Kip)	RFz(Kip)	RMx(Kip*ft)	RMy(Kip*ft)	RMz(Kip*ft)
1	-5.3	-6.7	-29.5	0.0	0.0	-0.1
2	1.2	-7.7	-27.4	-0.1	-0.2	0.1
3	-3.0	-10.7	-2.0	0.0	-0.2	0.1
4	-3.8	-11.1	-6.6	0.0	0.0	0.0
Total	-10.9	-36.2	-65.5			

20 +XY SEISMIC LOAD

No.	RFx(Kip)	RFy(Kip)	RFz(Kip)	RMx(Kip*ft)	RMy(Kip*ft)	RMz(Kip*ft)
1	2.4	14.5	9.6	-0.1	0.3	0.2
2	7.4	17.0	4.5	0.0	0.2	-0.3
3	18.4	9.6	-45.2	0.0	0.1	-0.3
4	-2.4	10.6	-34.3	-0.1	0.4	0.1
Total	25.9	51.7	-65.5			

21 +X SEISMIC LOAD + SNOW LOAD

No.	RFx(Kip)	RFy(Kip)	RFz(Kip)	RMx(Kip*ft)	RMy(Kip*ft)	RMz(Kip*ft)
1	-0.6	5.8	-19.0	-0.1	0.4	0.1
2	10.9	8.5	-24.4	0.0	0.0	-0.2
3	19.7	-3.6	-50.3	0.0	-0.1	-0.3
4	-2.8	-2.5	-38.9	-0.1	0.6	0.1
Total	27.2	8.2	-132.6			

22 +Y SEISMIC LOAD + SNOW LOAD

No.	RFx(Kip)	RFy(Kip)	RFz(Kip)	RMx(Kip*ft)	RMy(Kip*ft)	RMz(Kip*ft)
1	-4.0	11.7	-13.2	-0.1	0.3	0.2
2	7.1	12.5	-14.8	-0.1	-0.1	-0.2
3	16.0	1.3	-54.0	0.0	-0.3	-0.3
4	-10.9	1.6	-50.6	-0.1	0.4	0.3
Total	8.2	27.2	-132.6			

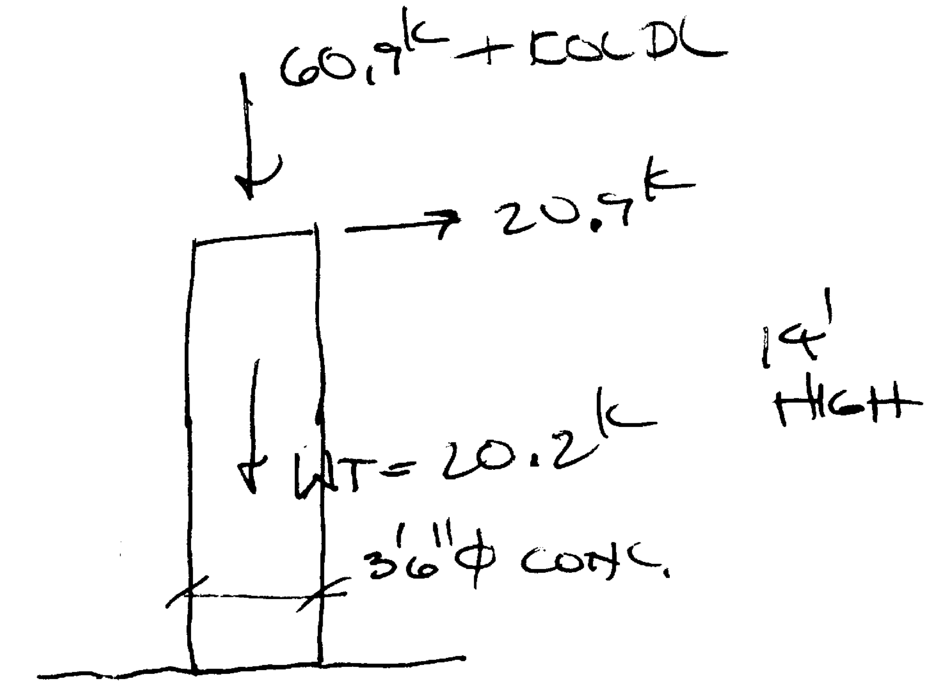
23 -Y SEISMIC LOAD + SNOW LOAD

No.	RFx(Kip)	RFy(Kip)	RFz(Kip)	RMx(Kip*ft)	RMy(Kip*ft)	RMz(Kip*ft)
1	-7.6	-1.7	-36.8	-0.1	0.1	0.0
2	4.5	-2.5	-35.2	-0.1	-0.3	0.0
3	4.7	-11.3	-28.6	-0.1	-0.4	-0.1
4	-9.8	-11.7	-32.1	0.0	0.2	0.2
Total	-8.2	-27.2	-132.6			

24 +XY SEISMIC LOAD + SNOW LOAD

No.	RFx(Kip)	RFy(Kip)	RFz(Kip)	RMx(Kip*ft)	RMy(Kip*ft)	RMz(Kip*ft)
1	-1.8	14.1	-7.6	-0.1	0.3	0.2
2	9.1	16.0	-11.4	0.0	0.0	-0.3
3	20.6	3.7	-60.9	0.0	-0.2	-0.4
4	-8.8	4.5	-52.8	-0.1	0.5	0.2
Total	19.2	38.4	-132.6			

20.9



FOR INFORMATION ONLY
Oct 13 2023
DO NOT USE FOR CONSTRUCTION OR FABRICATION

REV	DESCRIPTION	DATE	DRWN	CHKD	ENGR
	REVISIONS				

	NAME	DATE
DRAWN BY	MI	10/13/23
CHECKED BY	MI	10/13/23
ENGINEER	MI	10/13/23
FINAL REVIEW		

SCALE AS NOTED DRAWING SIZE

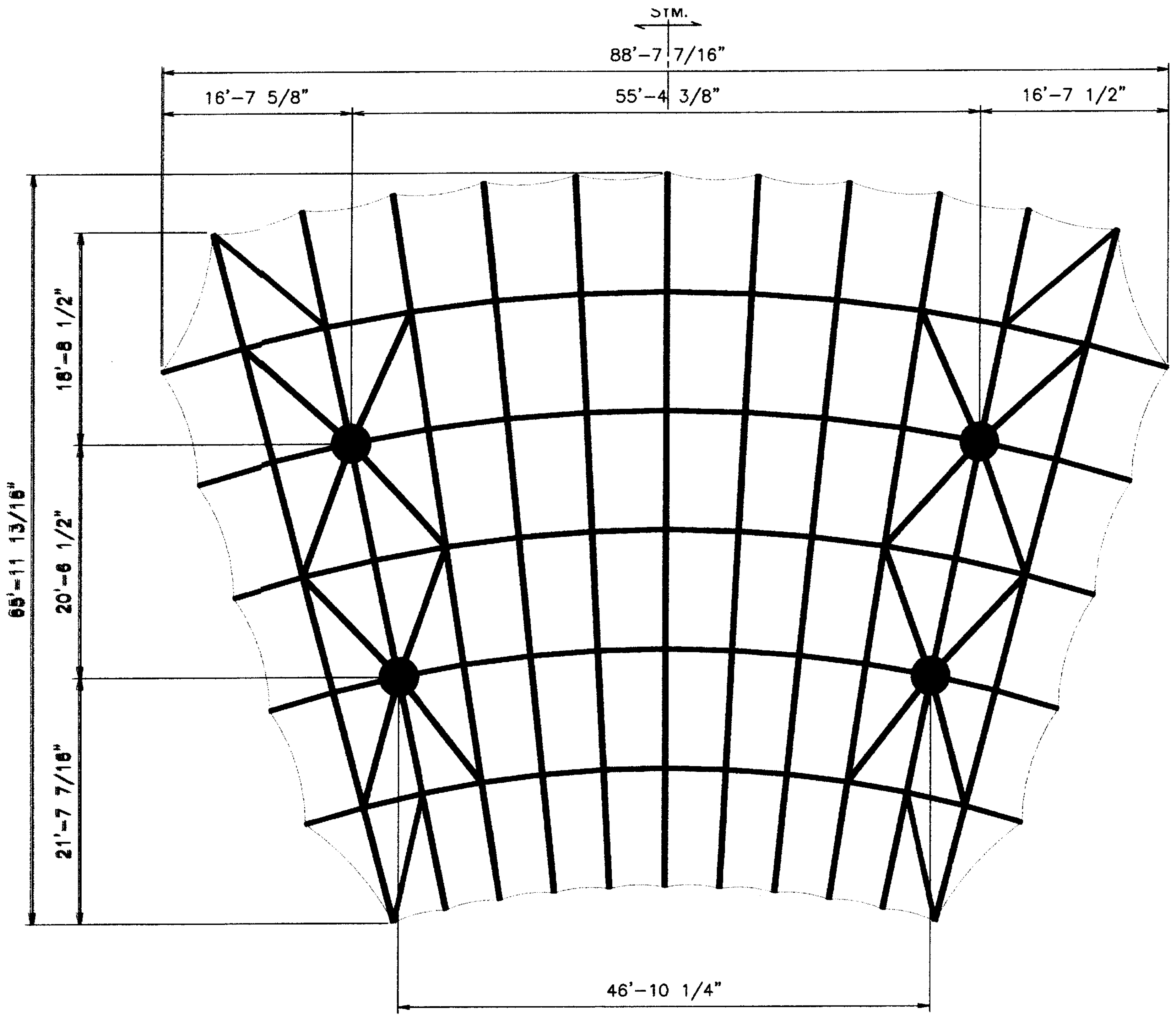
BIRDAIR
6461 MAIN STREET
AMHERST, N.Y. 14221-7075, U.S.A.
TELEPHONE: 716-633-9500 FAX: 716-204-1234

TITLE
INTERFACE
REACTION LOAD
WASHINGTON STATE FAIRGROUNDS

DWG. NO. 23008 - 1001 REV

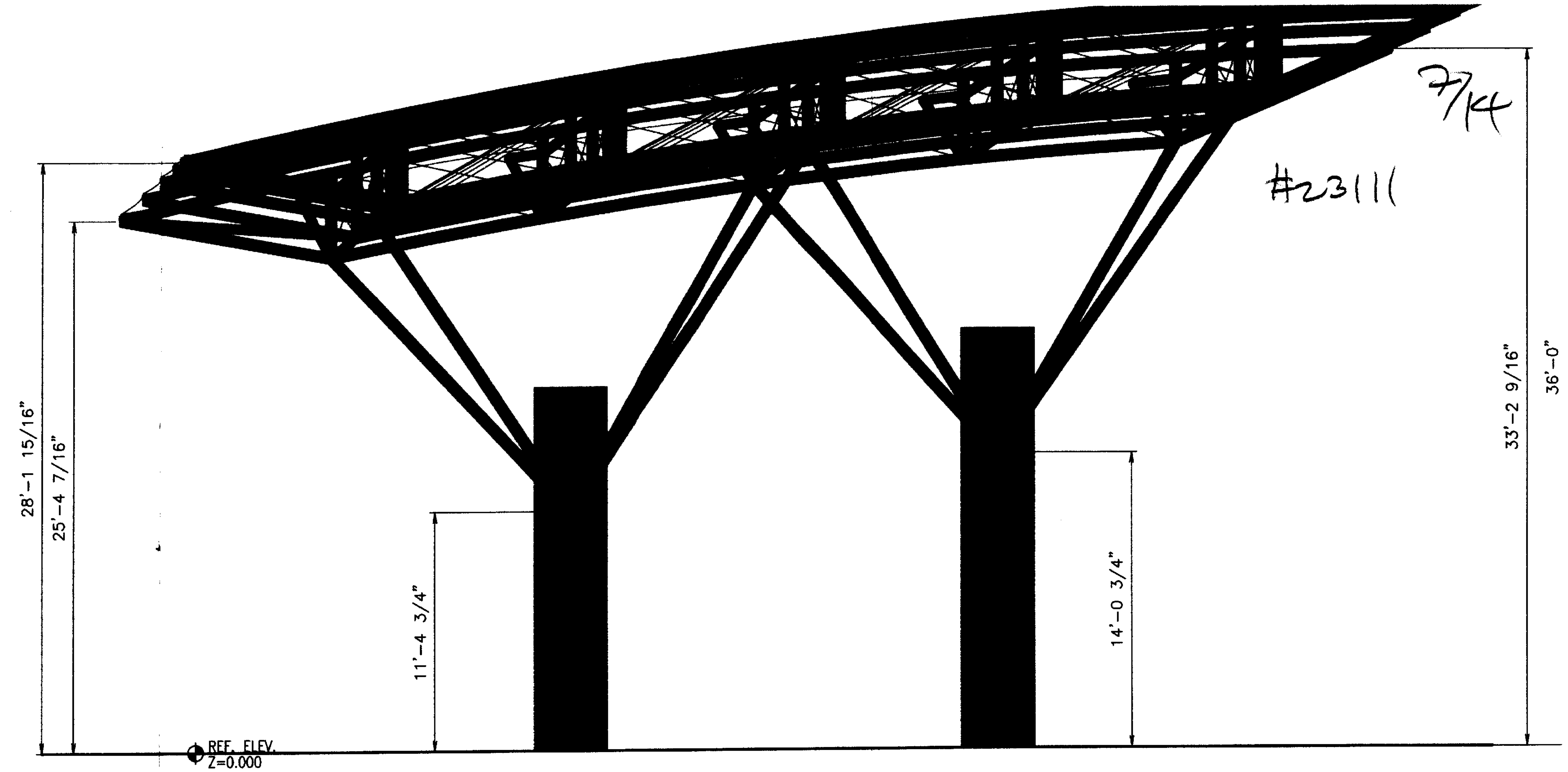
7/14

#23111



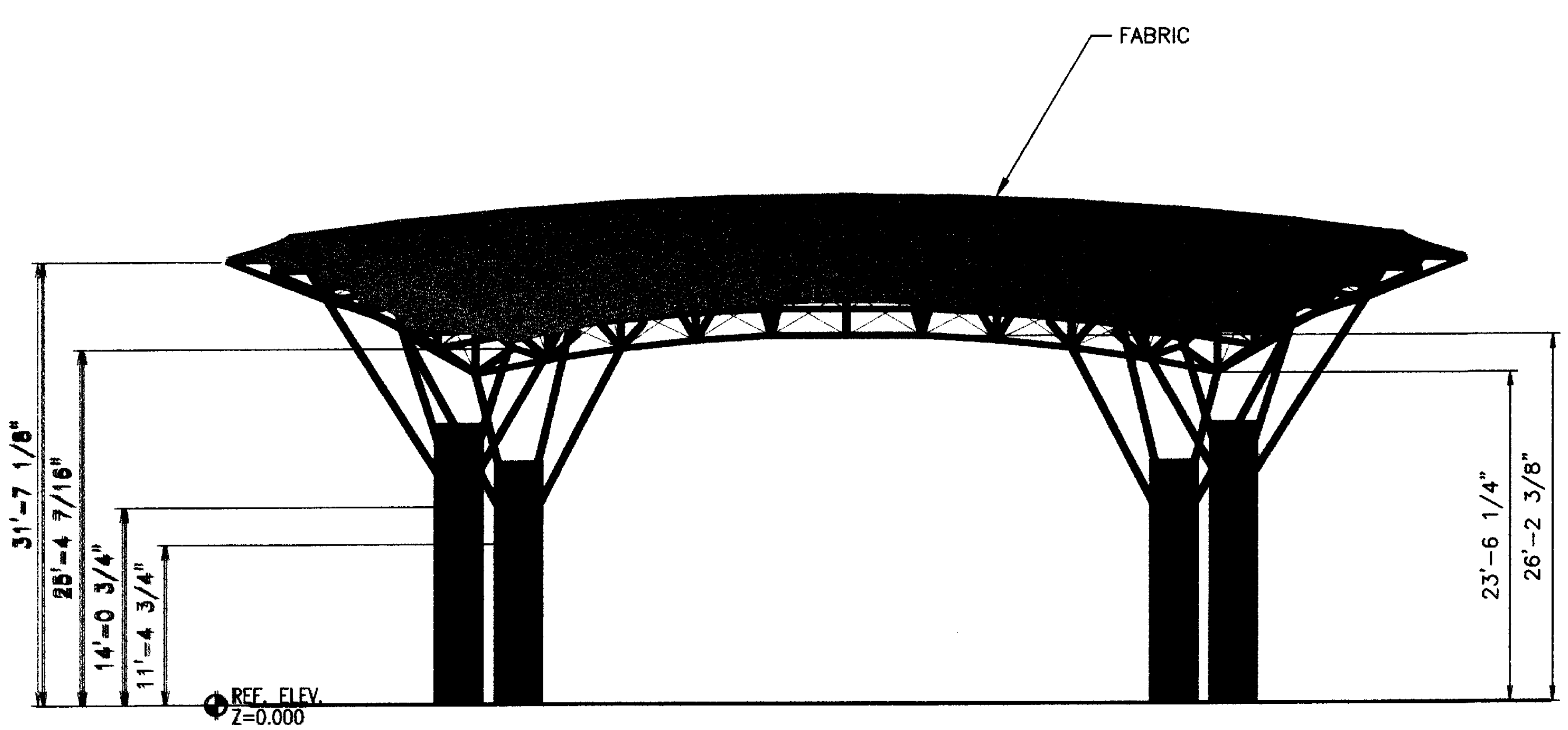
OVERALL PLAN

SCALE 1/8" = 1'-0"



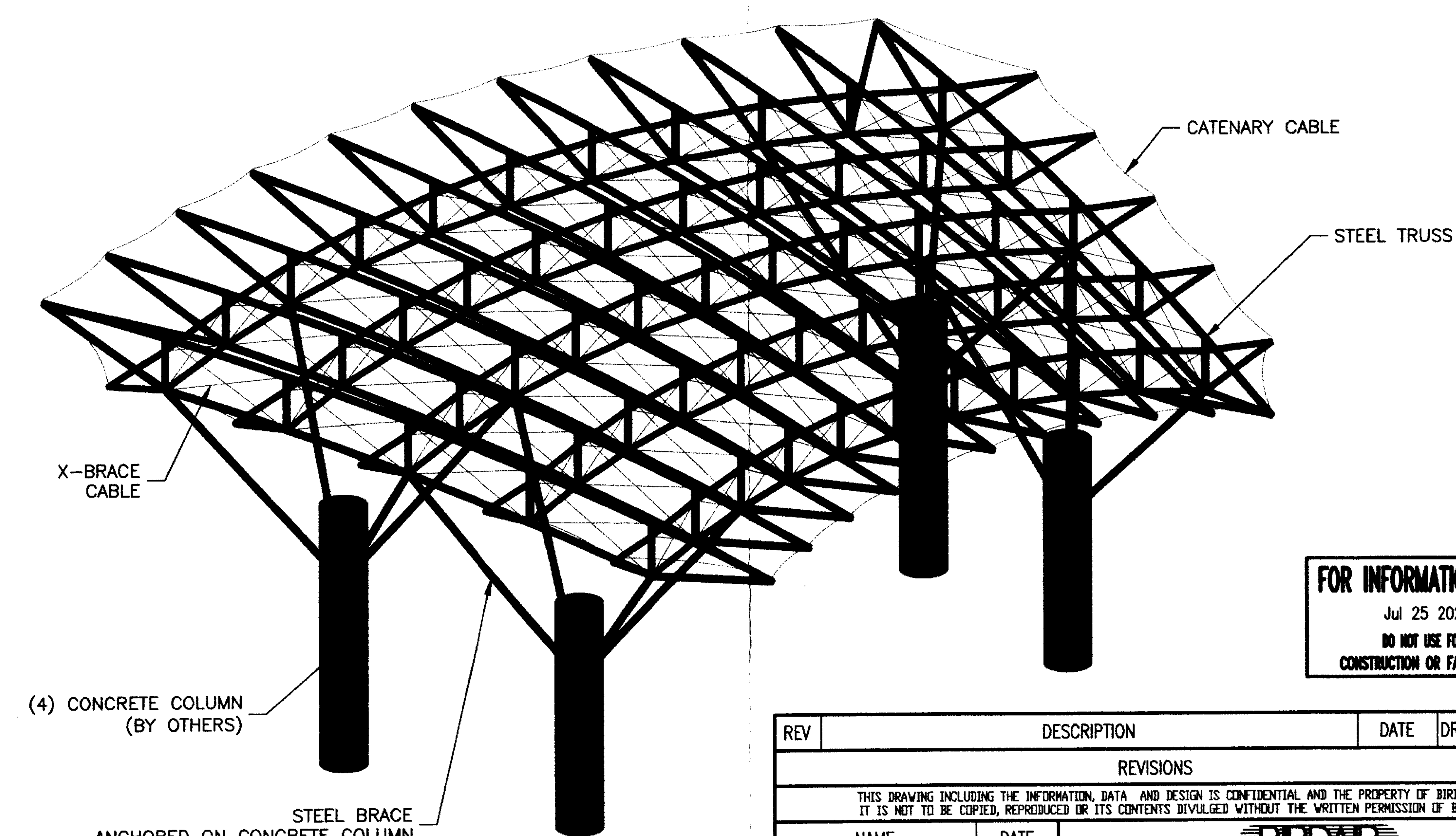
SIDE VIEW

SCALE 3/16" = 1'-0"



FRONT VIEW

SCALE 1/8" = 1'-0"



(NOTE) FABRIC NOT SHOWN FOR CLARITY

PERSPECTIVE VIEW

NTS

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REV	DESCRIPTION	DATE	DRWN	CHKD

REVISIONS

	NAME	DATE
DRAWN BY	MI	7/25/23
CHECKED BY	MI	7/25/23
ENGINEER	MI	7/25/23
FINAL REVIEW		

BIRDAIR
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TITLE

INFORMATION
OVERALL VIEW
WASHINGTON STATE FAIRGROUNDS

#23111 8/14

Settlement Estimates & Discussion

From a geotechnical standpoint, the proposed structures could utilize any of the preceding subgrade preparation and foundation support recommendations. Based on our evaluations, the following settlement estimates could be experienced with the various foundation preparation and improvement strategies:

Foundation Preparation Strategy	**Static Settlement (in)**		**Seismically Induced Settlement (in)**	
	Total	*Differential*	*Total*	*Differential*
Surcharge Program	1.0	0.5	2.0	1.0
Subgrade Improvement	2.0 to 3.0	1.0 to 1.5	3.0 to 5.0	1.5 to 2.5
Alternative Pile Support	1.0	0.5	1.0	0.5

Please note that the above static and seismically induced settlement estimates are independent. As such, the building designer should account for both static and seismically induced settlements in their designs. Based on our experience, targeted subgrade improvements would likely be the most cost- and time-efficient mitigation strategy. However, there is a higher risk of both static and seismically induced settlements with this approach. If the anticipated settlements associated with these targeted subgrade improvements are not tolerable, the project should consider implementing a surcharge program or utilizing alternative foundation designs.

Provided the foundations will be supported using one of the strategies outlined herein, the following parameters may be used for design:

- Allowable soil bearing capacity 2,500 psf
- Passive earth pressure 300 pcf (equivalent fluid)
- Coefficient of friction 0.35

A one-third increase in the allowable soil bearing capacity may be assumed for short-term wind and seismic loading conditions. The above passive pressure and friction values include a factor-of-safety of 1.5.

The recommendations and evaluations provided in this report regarding foundation support should be considered preliminary. ESNW should be afforded the opportunity to review the site layout and building load plans to confirm the recommendations provided in this report are applicable and appropriate for the project. Additional foundation preparation and design considerations may be provided at that time, as necessary.

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Seismic Design

The 2018 International Building Code recognizes the most recent edition of the Minimum Design Loads for Buildings and Other Structures manual (ASCE 7-16) for seismic design, specifically with respect to earthquake loads. ESNW recognizes that the presence of potentially liquefiable soils typically warrants a Site Class F designation; however, as presented in section 20.3.1.1, projects with structures that possess a fundamental period of vibration equal to or less than 0.5 seconds (which is assumed to apply to the proposed structures) do not require a site response analysis. As such, a site class determination in accordance with Section 20.3 and the corresponding values of F_a and F_v is permitted.

Based on the data collected at the SCPT location, in accordance with the designation criteria provided in Table 20.1-1 of ASCE 7-16, Site Class E should be used for the subject site and project. This determination is based on the calculated averaged shear wave velocity of 552 ft/sec for the upper 100 feet.

Further discussion between the project structural engineer and ESNW may be prudent to determine appropriate earthquake design parameters for the project. ESNW can provide additional consulting services to aid with design efforts, including supplementary geotechnical and geophysical investigation, upon request. ESNW can assist in determining appropriate seismic design coefficients during the appropriate phase of the project. Additionally, more stringent seismic design criteria may be necessary for the proposed fire station, which is presumably comprised of a Risk Category IV structure(s).

Slab-on-Grade Floors

Slab-on-grade floors for the proposed structures should be supported by competent, firm, and unyielding subgrades. Unstable or yielding subgrade areas should be recompacted or overexcavated and replaced with suitable structural fill before slab construction. A capillary break consisting of at least four inches of free-draining crushed rock or gravel should be placed below each slab. The free-draining material should have a fines content of 5 percent or less (where the fines content is defined as the percent passing the Number 200 sieve, based on the minus three-quarter-inch fraction). In areas where slab moisture is undesirable, the installation of a vapor barrier below the slab should be considered. Vapor barriers should be made from material specifically designed for use as a vapor barrier and should be installed in accordance with the manufacturer's recommendations.

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Retaining Walls

Retaining walls must be designed to resist earth pressures and applicable surcharge loads. The following parameters may be used for the design:

- Active earth pressure (unrestrained condition) 40 pcf (equivalent fluid)
- At-rest earth pressure (restrained condition) 60 pcf
- Traffic surcharge* (passenger vehicles) 70 psf (rectangular distribution)
- Passive earth pressure 225 pcf (equivalent fluid)
- Coefficient of friction 0.35
- Seismic surcharge 8H psf†

* *Where applicable.*
† *Where H equals the retained height (in feet).*

The above passive pressure and friction values include a factor-of-safety of 1.5 and are based on a level backfill condition and level grade at the wall toe. The design parameters provided above assume native soil will be retained behind the wall. If a sufficient thick zone of structural fill is retained by the wall (with respect to vertical and lateral extent), less stringent design parameters can be provided. Revised design values will be necessary if sloping grades are to be used above or below retaining walls. Additional surcharge loading from adjacent foundations, sloped backfill, or other relevant loads should be included in the retaining wall design.

Retaining walls should be backfilled with free-draining material that extends along with the height of the wall and to a distance of at least 18 inches behind the wall. The upper 12 inches of the wall backfill may consist of less permeable soil, if desired. A sheet drain may be considered instead of free-draining backfill. A perforated drainpipe should be placed along the base of the wall and connected to an approved discharge location. A typical retaining wall drainage detail is provided on Plate 3. Hydrostatic pressures should be included in the wall design if drainage is not provided.

Drainage

Zones of perched groundwater seepage could develop in site excavations depending on the time of year grading operations take place, particularly within deeper excavations for utilities and/or the stormwater facility. Temporary measures to control surface water runoff and groundwater during construction would likely involve interceptor trenches, interceptor swales, and sumps. ESNW should be consulted during preliminary grading to both identify areas of seepage and provide recommendations to reduce the potential for seepage-related instability.

Finish grades must be designed to direct surface drain water away from structures and slopes. Water must not be allowed to pond adjacent to structures or slopes. In our opinion, foundation drains should be installed along building perimeter footings. A typical foundation drain detail is provided on Plate 4.

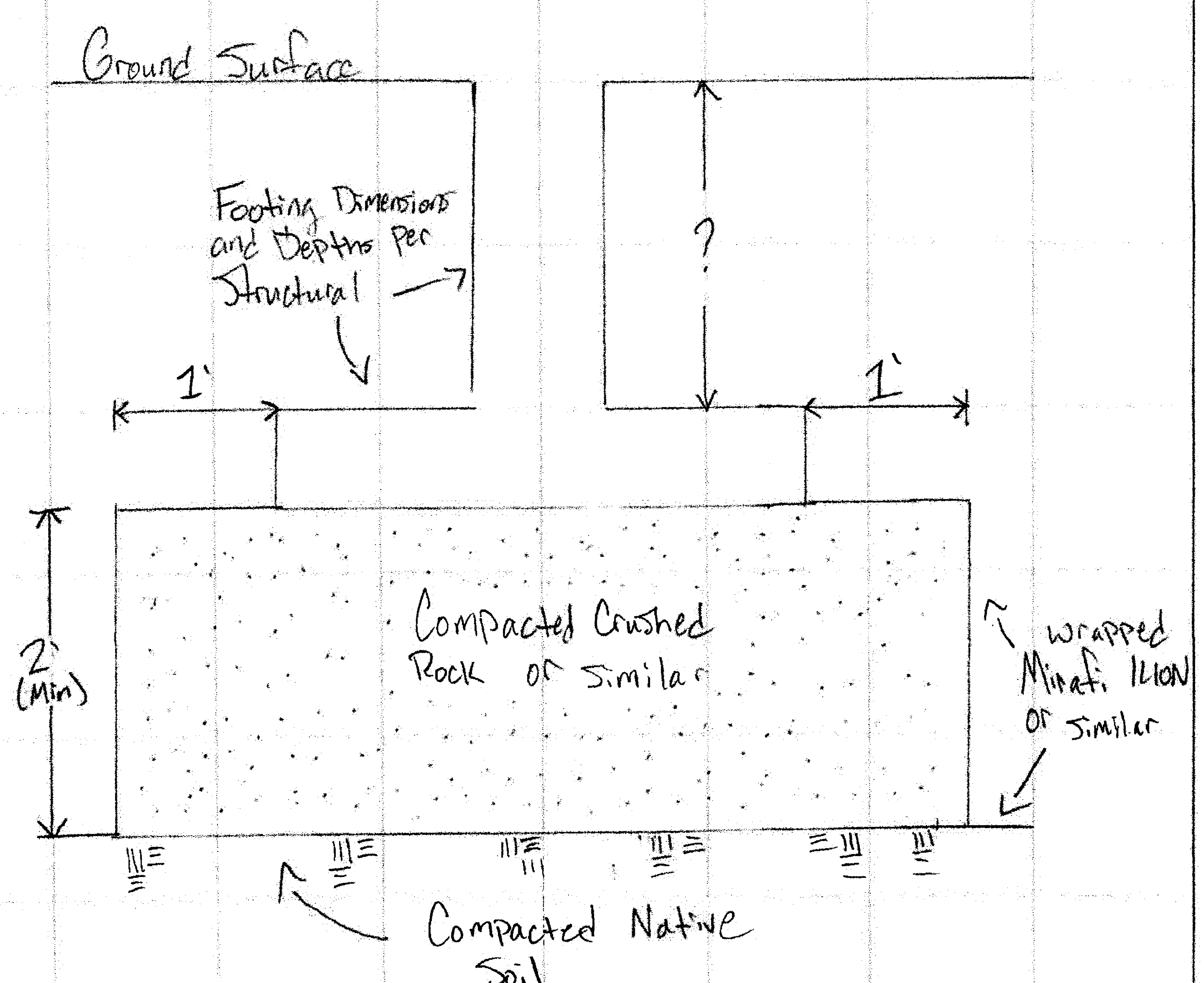
Earth Solutions NW LLC
CALCULATION SHEET

Name: Overexcavation Sketch
Date: 10/24/23
Project Number: ES-9092.01
Project Name: WSF - Golden Gate

#23111 11/14

Reference ES-9092 Draft Report
for Recommendations, Settlement Estimations, etc.

Not to Scale



christian fynboe pe
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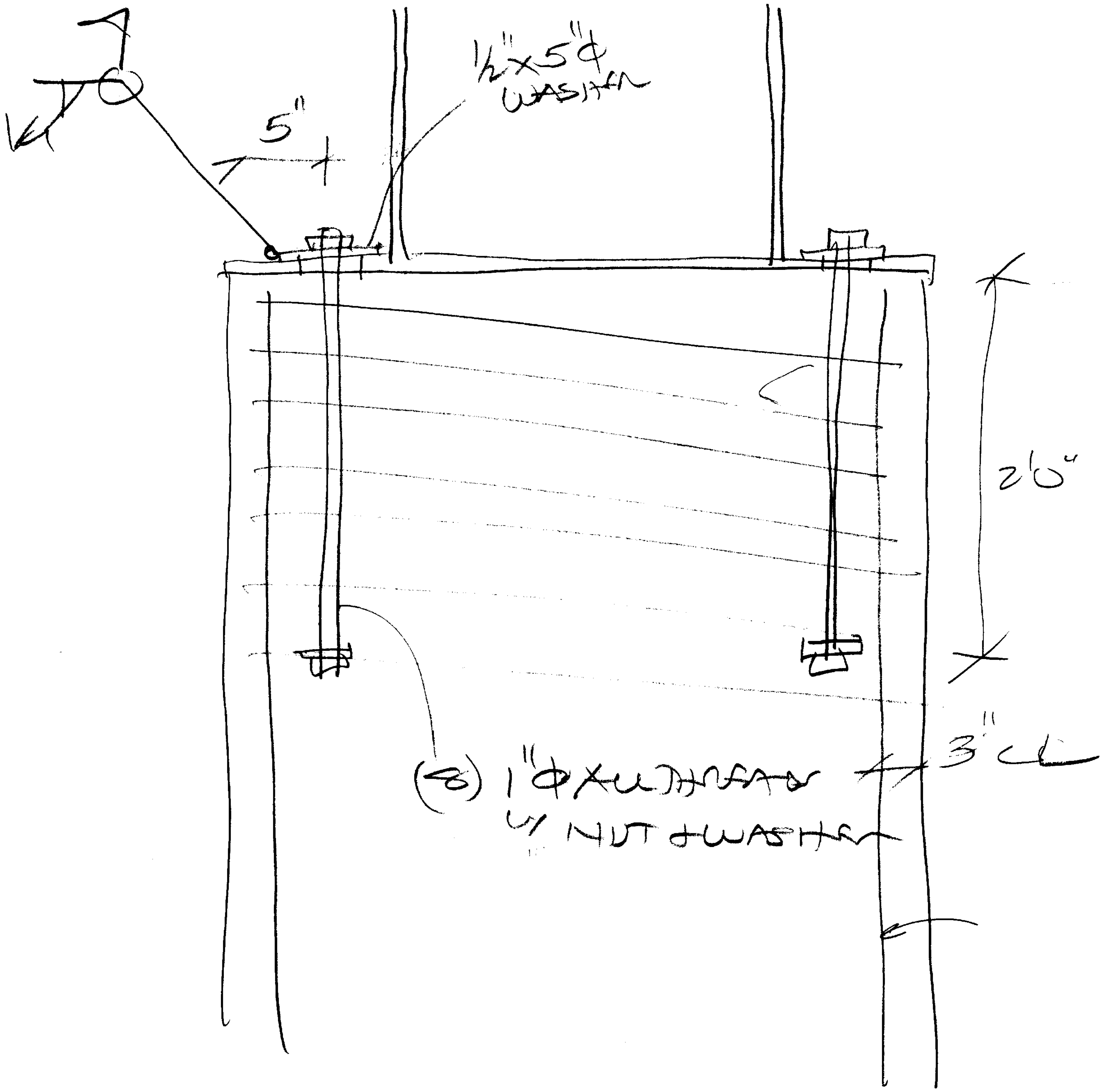
PROJECT:			SHEET NO. 12/14
BY:	DATE:	JOB NO. 23111	



l_d #10 = 40(1.25) = 50"

TENSION AW IN #10 = 16(20) 29/50 (4.9) = 78^k

TENSION 8(1"Φ) = 17.7(8) = 142^k — OK

CONC SHEAR (8) 1"Φ = 10.6(8) = 84.8^k OK

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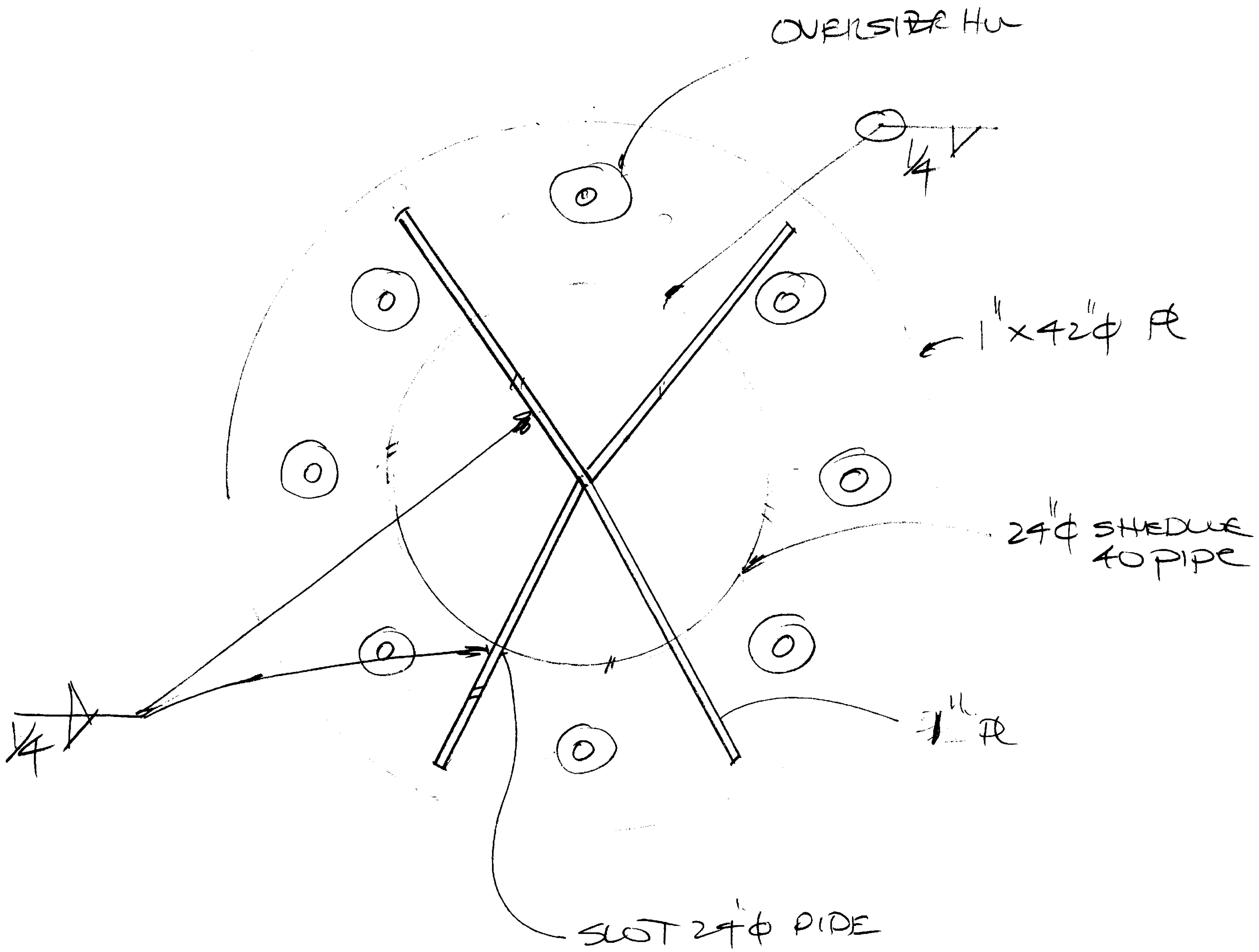

Table 7-1
Available Shear Strength of Bolts, kips

Nominal Bolt Diameter, d, in.					5/8		3/4		7/8		1	
Nominal Bolt Area, in.²					0.307		0.442		0.601		0.785	
ASTM Desig.	Thread Cond.	F_{nv}/Ω (ksi)	ϕF_{nv} (ksi)	Loading	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n
		ASD	LRFD		ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
Group A	N	27.0	40.5	S	8.29	12.4	11.9	17.9	16.2	24.3	21.2	[illegible]
				D	16.6	24.9	23.9	35.8	32.5	48.7	42.4	[illegible]
	X	34.0	51.0	S	10.4	15.7	15.0	22.5	20.4	30.7	[illegible]	[illegible]
				D	20.9	31.3	30.1	45.1	40.9	61.3	[illegible]	[illegible]
Group B	N	34.0	51.0	S	10.4	15.7	15.0	22.5	20.4	30.7	[illegible]	[illegible]
				D	20.9	31.3	30.1	45.1	40.9	61.3	[illegible]	[illegible]
	X	42.0	63.0	S	12.9	19.3	18.6	27.8	25.2	37.9	[illegible]	[illegible]
				D	25.8	38.7	37.1	55.7	50.5	75.7	[illegible]	[illegible]
A307	–	13.5	20.3	S	4.14	6.23	5.97	8.97	8.11	12.2	[illegible]	[illegible]
				D	8.29	12.5	11.9	17.9	16.2	24.4	[illegible]	[illegible]

Nominal Bolt Diameter, d, in.					1 1/8		1 1/4		1 3/8		1 1/2	
Nominal Bolt Area, in.²					0.994		1.23		1.48		1.77	
ASTM Desig.	Thread Cond.	F_{nv}/Ω (ksi)	ϕF_{nv} (ksi)	Loading	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n
		ASD	LRFD		ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
Group A	N	27.0	40.5	S	26.8	40.3	33.2	49.8	40.0	59.9	[illegible]	[illegible]
				D	53.7	80.5	66.4	99.6	79.9	120	[illegible]	[illegible]
	X	34.0	51.0	S	33.8	50.7	41.8	62.7	50.3	75.5	[illegible]	[illegible]
				D	67.6	101	83.6	125	101	151	[illegible]	[illegible]
Group B	N	34.0	51.0	S	33.8	50.7	41.8	62.7	50.3	75.5	[illegible]	[illegible]
				D	67.6	101	83.6	125	101	151	[illegible]	[illegible]
	X	42.0	63.0	S	41.7	62.6	51.7	77.5	62.2	93.2	[illegible]	[illegible]
				D	83.5	125	103	155	124	186	[illegible]	[illegible]
A307	–	13.5	20.3	S	13.4	20.2	16.6	25.0	20.0	30.0	[illegible]	[illegible]
				D	26.8	40.4	33.2	49.9	40.0	60.1	[illegible]	[illegible]

ASD	LRFD
$\Omega = 2.00$	$\phi = 0.75$

For end loaded connections greater than 38 in., see AISC *Specification* Table J3.2 footnote b.

Table 7-2
Available Tensile Strength of Bolts, kips

Nominal Bolt Diameter, d, in.			5/8		3/4		7/8		1	
Nominal Bolt Area, in.²			0.307		0.442		0.601		0.785	
ASTM Desig.	F_{nt}/Ω (ksi)	ϕF_{nt} (ksi)	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n
	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
Group A	45.0	67.5	13.8	20.7	19.9	29.8	27.1	40.6	35.3	53.0
Group B	56.5	84.8	17.3	26.0	25.0	37.4	34.0	51.0	44.4	66.6
A307	22.5	33.8	6.90	10.4	9.94	14.9	13.5	20.3	17.7	26.5

Nominal Bolt Diameter, d, in.			1 1/8		1 1/4		1 3/8		1 1/2	
Nominal Bolt Area, in.²			0.994		1.23		1.48		1.77	
ASTM Desig.	F_{nt}/Ω (ksi)	ϕF_{nt} (ksi)	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n
	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
Group A	45.0	67.5	44.7	67.1	55.2	82.8	66.8	100	79.5	119
Group B	56.5	84.8	56.2	84.2	69.3	104	83.9	126	99.8	150
A307	22.5	33.8	22.4	33.5	27.6	41.4	33.4	50.1	39.8	59.6

ASD	LRFD
$\Omega = 2.00$	$\phi = 0.75$

#23111

14/14