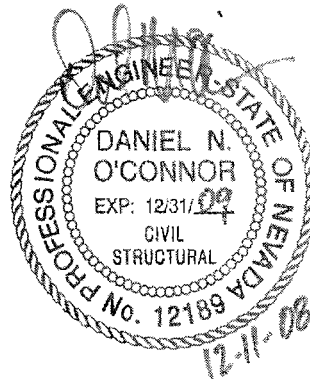
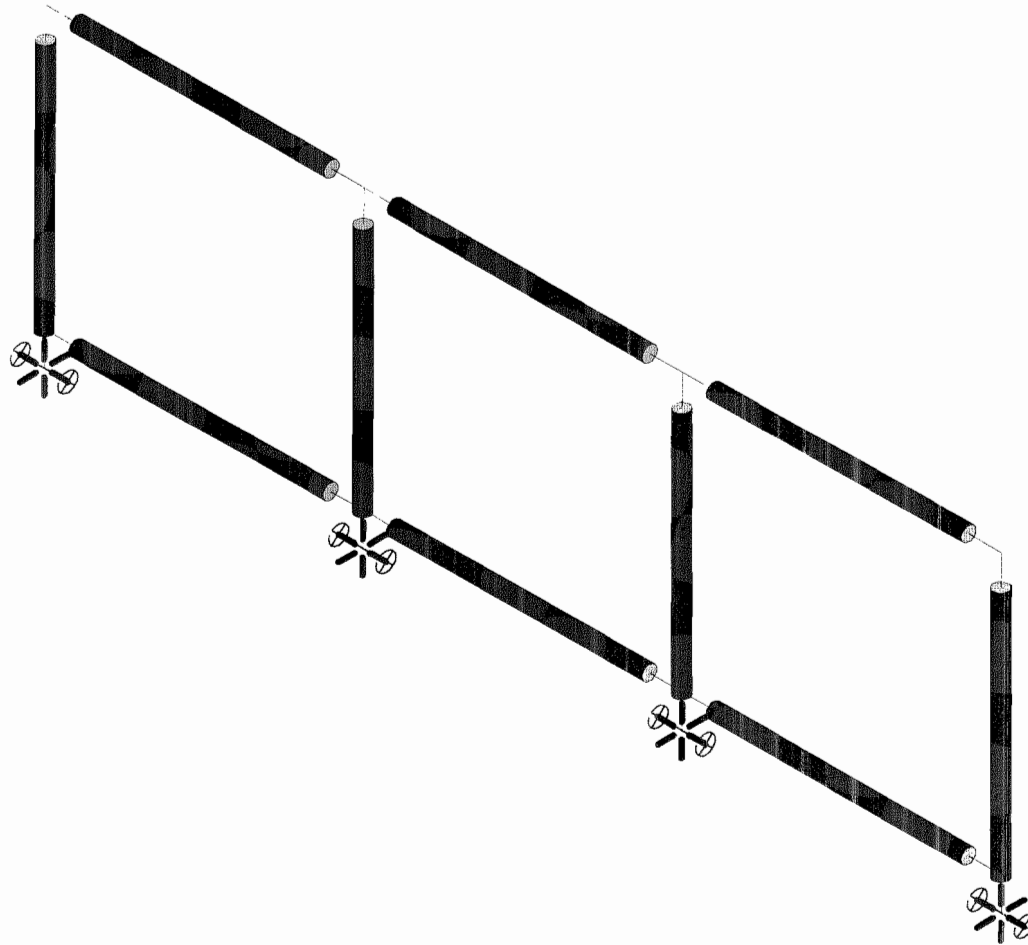
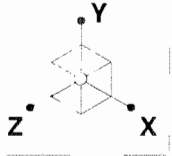


**D23—1-1/2" PIPE x 42-1/2" HIGH RAIL WITH BOTTOM RAIL**

Building Code:	<b>2006 <i>International Building Code</i> 2007 <i>California Building Code</i> AISC <i>Steel Construction Manual</i>, 13th ed—ASD</b>
Material:	<b>Carbon Steel, A53, Grade B, Fy = 35 ksi Carbon Steel, A501, Grade B, Fy = 36 ksi Stainless Steel, A312, Grade TP-304 or TP-316, Fy = 30 ksi</b>
Height:	<b>42.5"</b>
Anchor Post:	<b>1.5" XXS (1.90" OD x 0.400") Pipe</b>
Intermediate Posts:	<b>1.5" SCHD 40 (1.90" OD x 0.145") Pipe</b>
Top Rail Adjacent to Anchor Post:	<b>1.5" XXS (1.90" OD x 0.400") Pipe</b>
Top Rail Elsewhere:	<b>1.5" SCHD 40 (1.90" OD x 0.145") Pipe</b>
Bottom Rail:	<b>1.5" SCHD 40 (1.90" OD x 0.145") Pipe</b>
Number of Cables:	<b>10</b>
Cable Spacing:	<b>3.2"</b>



**Disclaimer:** Analysis and Structural Certification DOES NOT include base plates or anchorage to supporting structure. Where required by the Local Building Official, these shall be reviewed and designed by the project Structural Engineer of Record.



Ferrari Shields & Associates

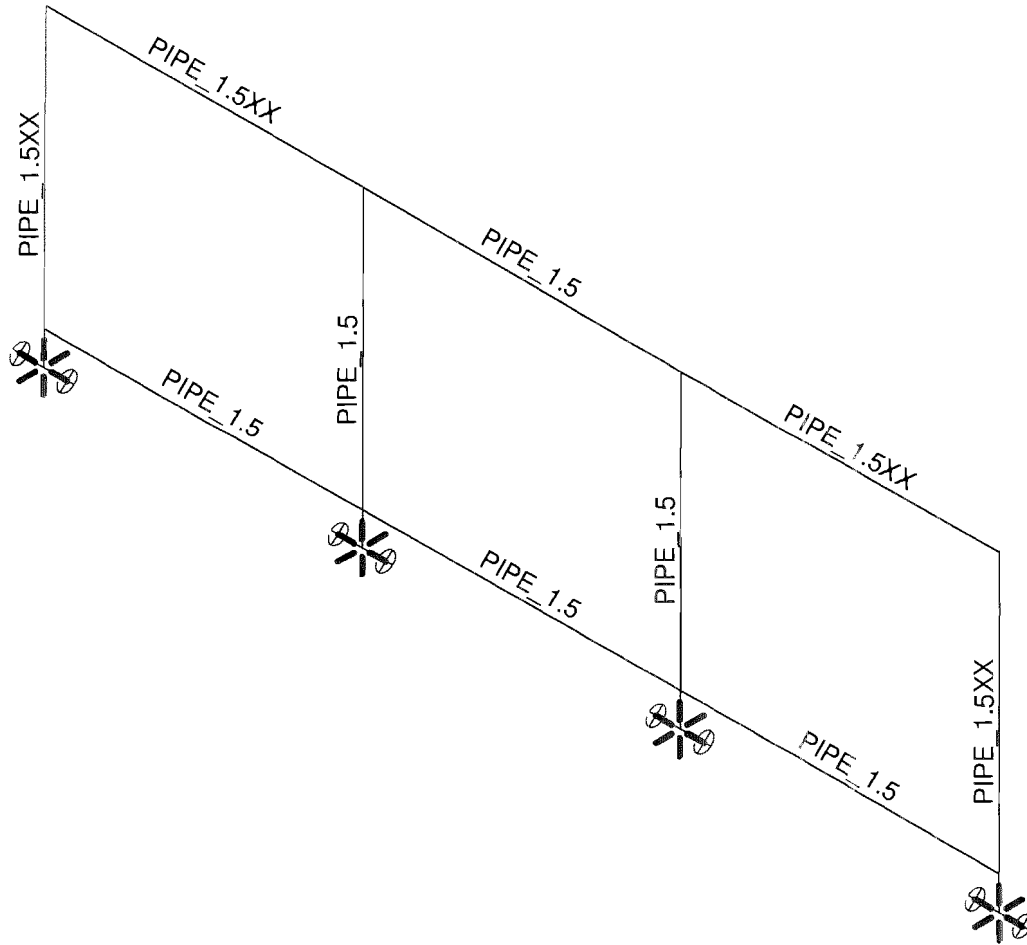
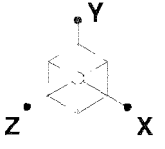
Dan O'Connor

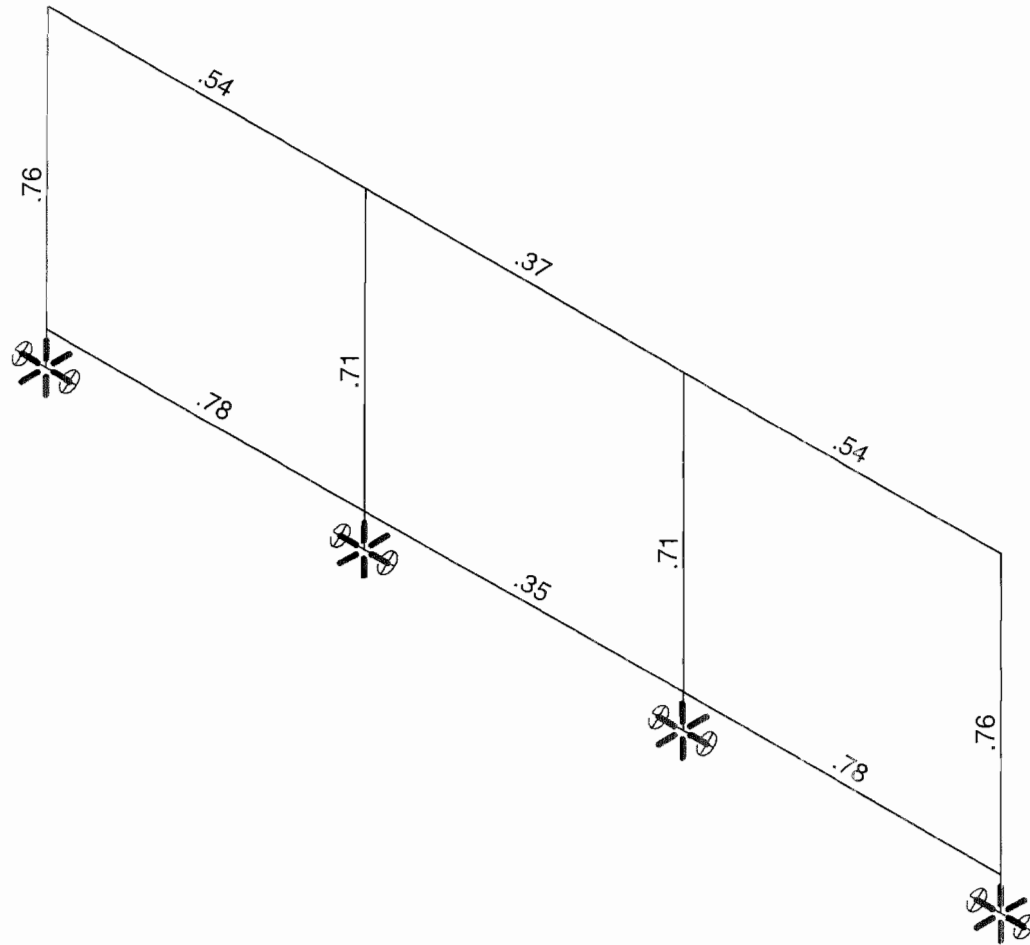
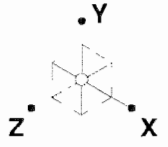
08196

D23 - 1.5" PIPE x 42.5" HIGH RAIL W/ BTM RAIL

Oct 28, 2008 at 2:30 PM

D23.R3D





Member Code Checks Displayed  
Solution: Envelope

Ferrari Shields & Associates

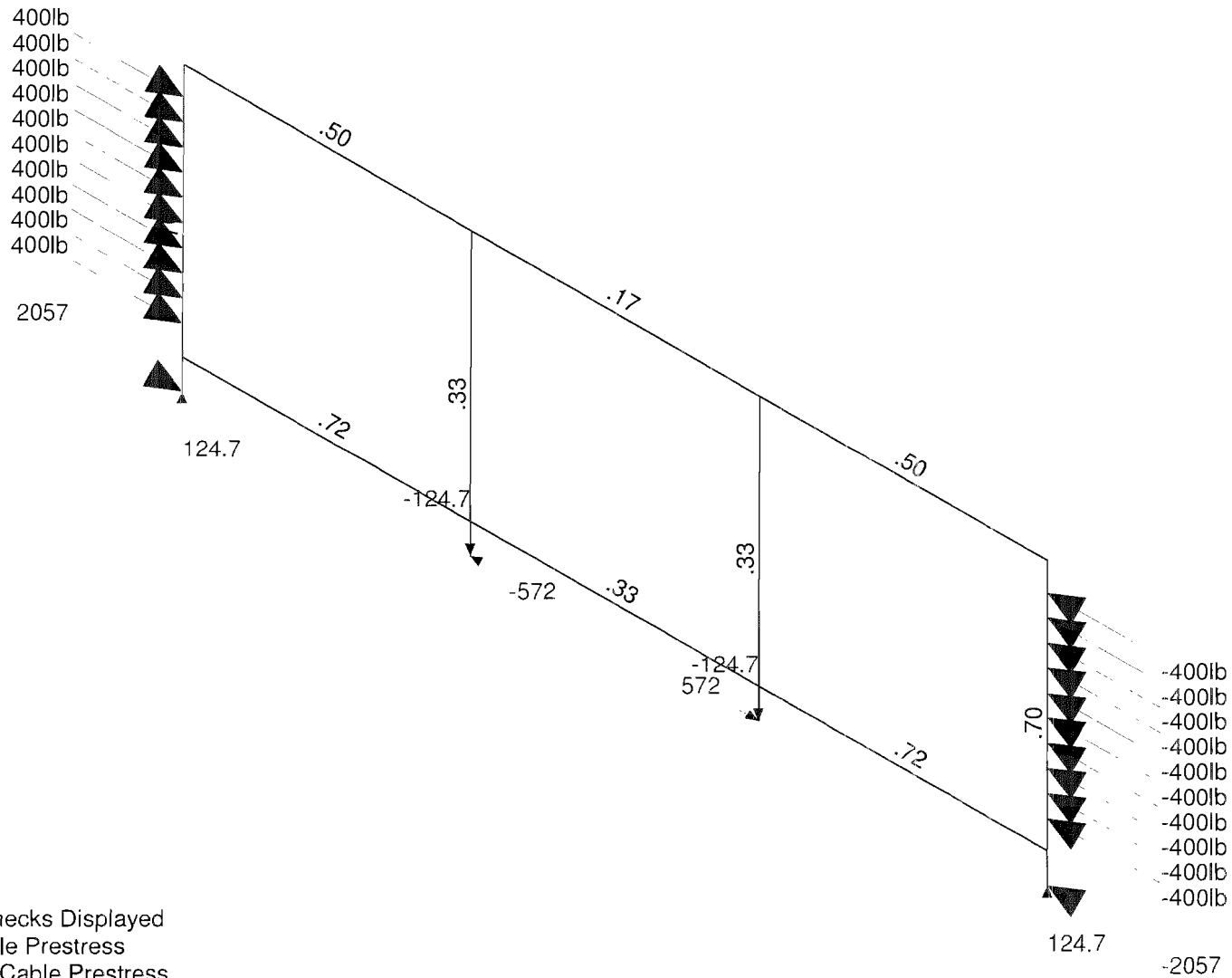
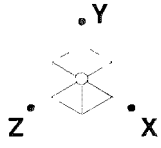
Dan O'Connor

08196

D23 - 1.5" PIPE x 42.5" HIGH RAIL W/ BTM RAIL

Oct 28, 2008 at 2:30 PM

D23.R3D



Member Code Checks Displayed  
 Loads: LC 1, Cable Prestress  
 Results for LC 1, Cable Prestress  
 Reaction units are lb and k-ft

Ferrari Shields & Associates

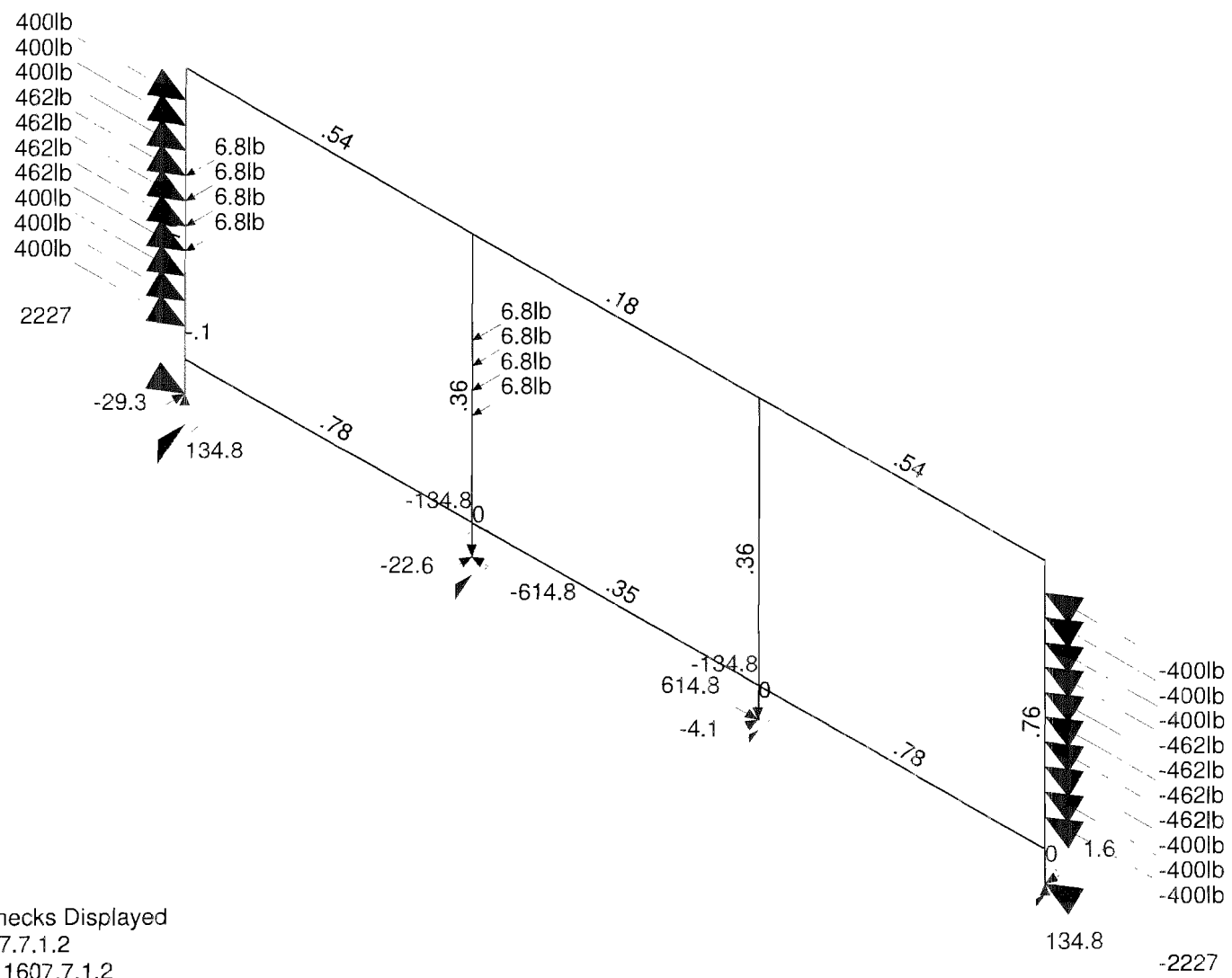
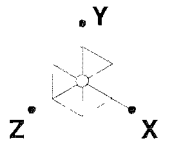
Dan O'Connor

08196

D23 - 1.5" PIPE x 42.5" HIGH RAIL W/ BTM RAIL

Oct 28, 2008 at 2:32 PM

D23.R3D

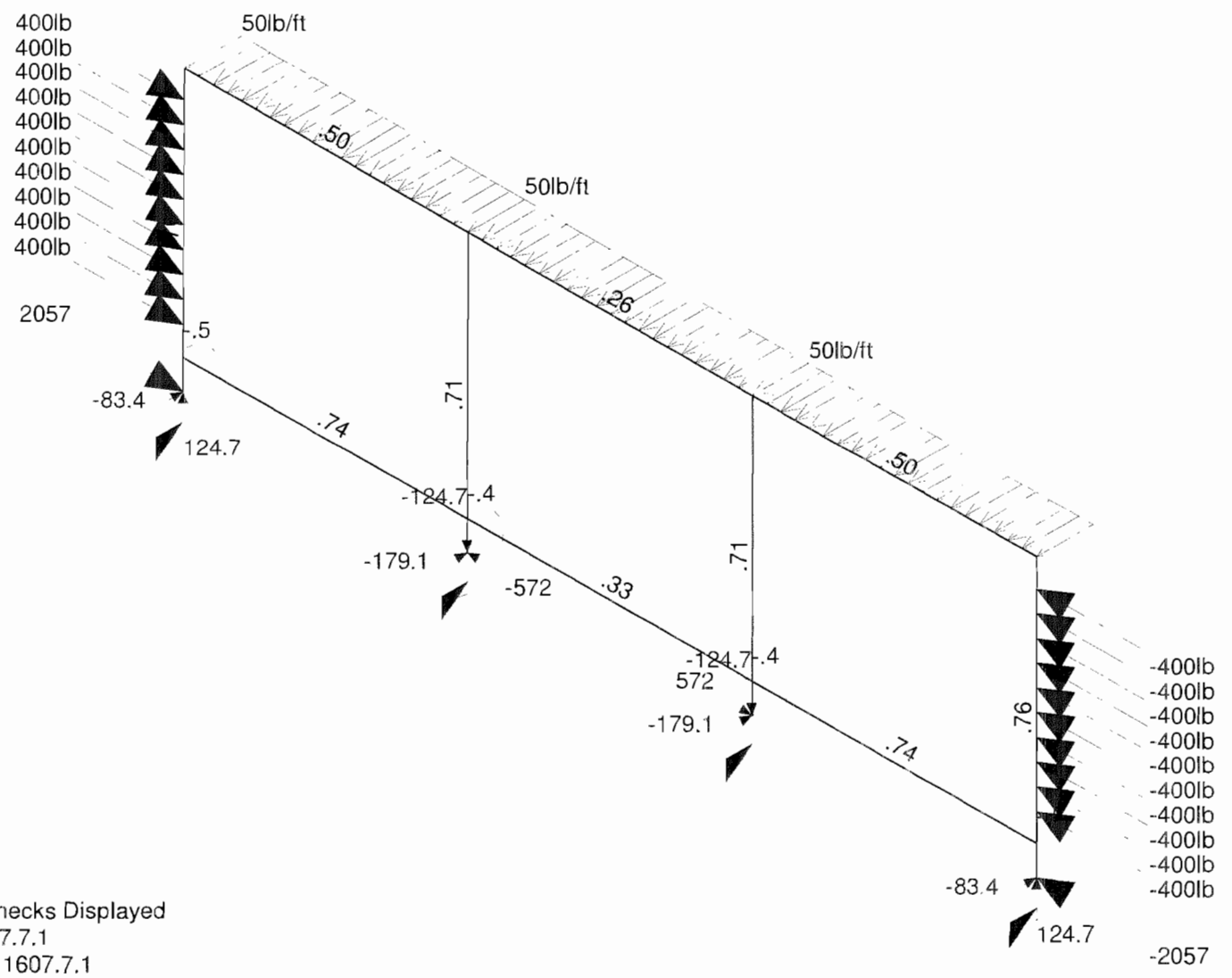
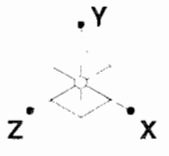


Member Code Checks Displayed  
 Loads: LC 2, 1607.7.1.2  
 Results for LC 2, 1607.7.1.2  
 Reaction units are lb and k-ft

Ferrari Shields & Associates  
 Dan O'Connor  
 08196

D23 - 1.5" PIPE x 42.5" HIGH RAIL W/ BTM RAIL

Oct 28, 2008 at 2:32 PM  
 D23.R3D

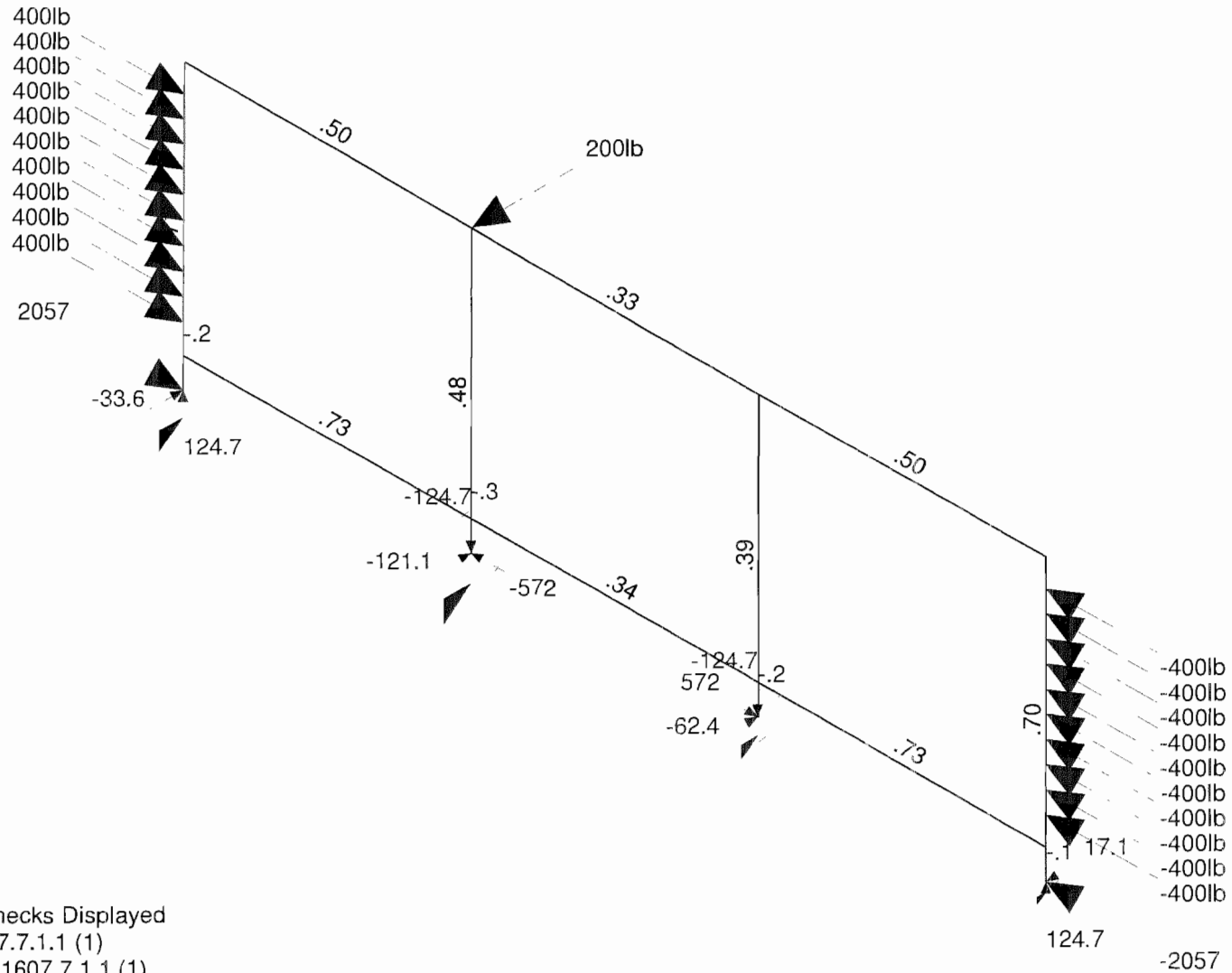
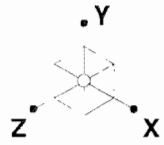


Member Code Checks Displayed  
 Loads: LC 3, 1607.7.1  
 Results for LC 3, 1607.7.1  
 Reaction units are lb and k-ft

Ferrari Shields & Associates  
 Dan O'Connor  
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D23 - 1.5" PIPE x 42.5" HIGH RAIL W/ BTM RAIL.

Oct 28, 2008 at 2:33 PM  
 D23.R3D



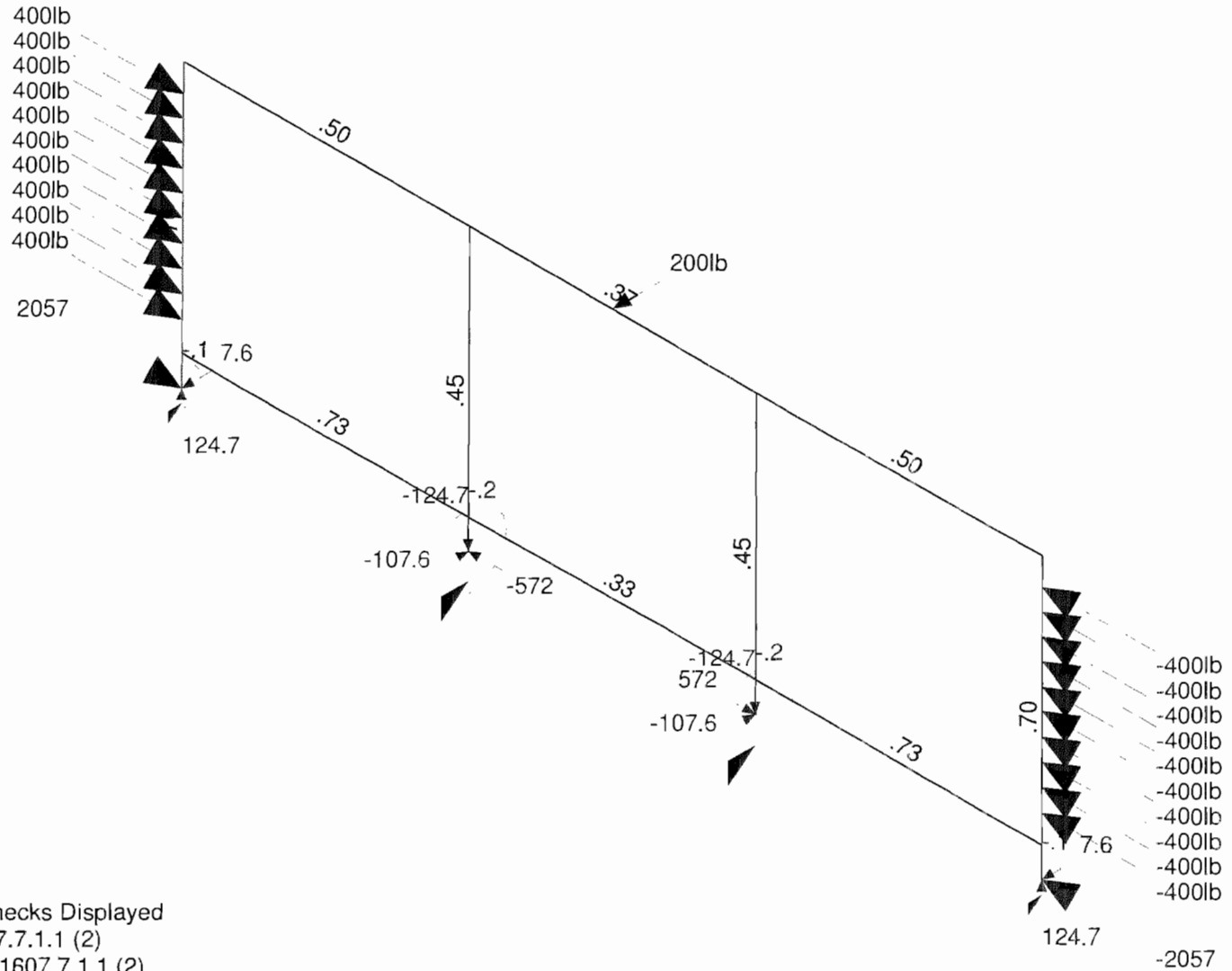
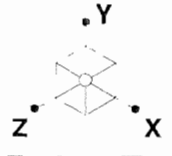
Member Code Checks Displayed  
 Loads: LC 4, 1607.7.1.1 (1)  
 Results for LC 4, 1607.7.1.1 (1)  
 Reaction units are lb and k-ft

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 Dan O'Connor  
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D23 - 1.5" PIPE x 42.5" HIGH RAIL W/ BTM RAIL

Oct 28, 2008 at 2:33 PM  
 D23.R3D



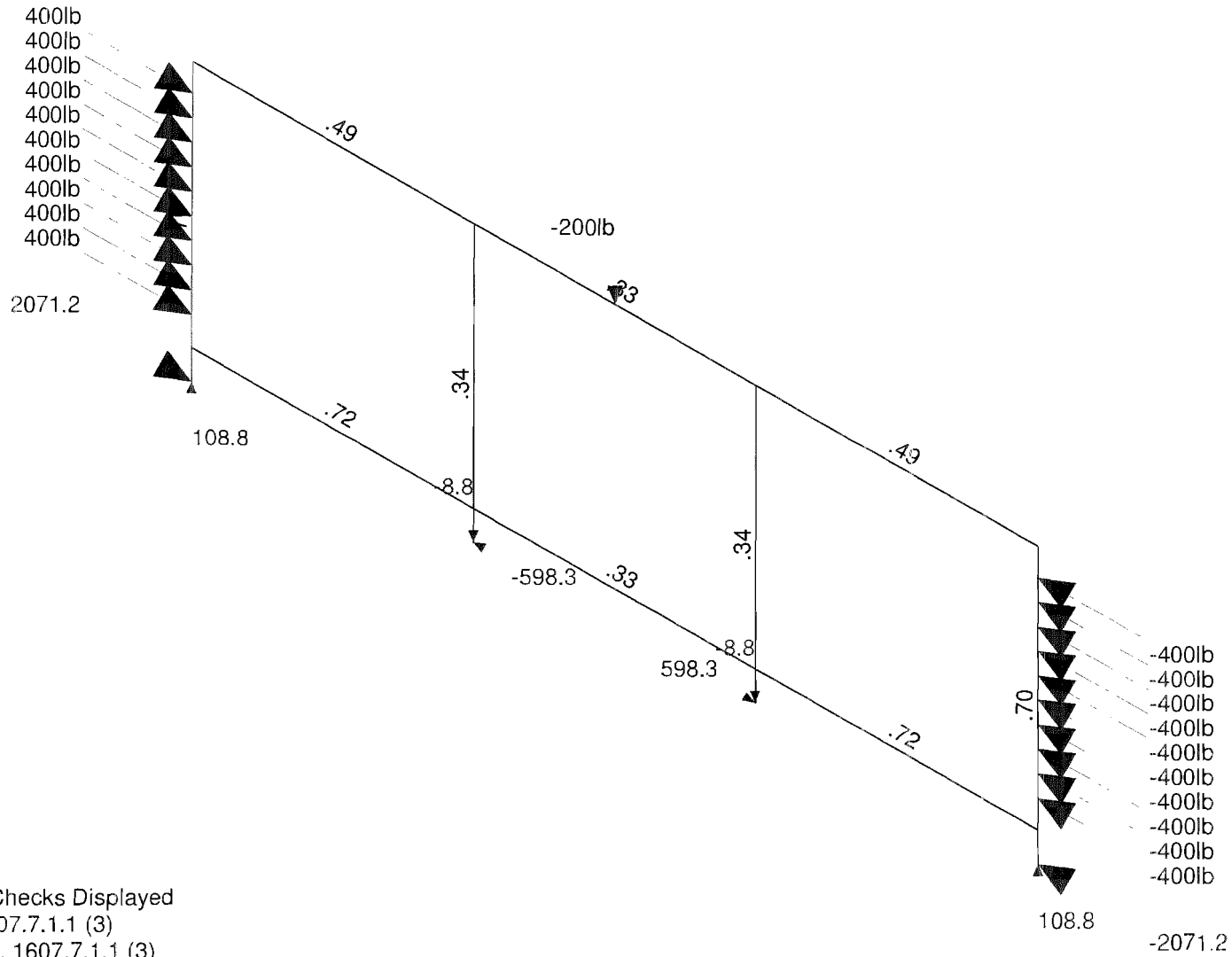
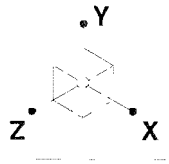


Member Code Checks Displayed  
 Loads: LC 5, 1607.7.1.1 (2)  
 Results for LC 5, 1607.7.1.1 (2)  
 Reaction units are lb and k-ft

Ferrari Shields & Associates  
 Dan O'Connor  
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D23 - 1.5" PIPE x 42.5" HIGH RAIL W/ BTM RAIL

Oct 28, 2008 at 2:33 PM  
 D23.R3D



Member Code Checks Displayed  
 Loads: LC 6, 1607.7.1.1 (3)  
 Results for LC 6, 1607.7.1.1 (3)  
 Reaction units are lb and k-ft

Ferrari Shields & Associates  
 Dan O'Connor  
 08196

D23 - 1.5" PIPE x 42.5" HIGH RAIL W/ BTM RAIL

Oct 28, 2008 at 2:33 PM  
 D23.R3D

**Global**

Display Sections for Member Calcs	5
Max Internal Sections for Member Calcs	97
Include Shear Deformation	Yes
Include Warping	Yes
Area Load Mesh (in^2)	144
Merge Tolerance (in)	.12
P-Delta Analysis Tolerance	0.50%
Vertical Axis	Y

Hot Rolled Steel Code	AISC . ASD 13th
Cold Formed Steel Code	AISI 01: ASD
Wood Code	NDS 2005: ASD
Wood Temperature	< 100F
Concrete Code	ACI 2005

Number of Shear Regions	4
Region Spacing Increment (in)	4
Biaxial Column Method	PCA Load Contour
Parame Beta Factor (PCA)	.65
Concrete Stress Block	Rectangular
Use Cracked Sections	Yes
Bad Framing Warnings	No
Unused Force Warnings	Yes

**Hot Rolled Steel Properties**

	Label	E [ksi]	G [ksi]	Nu	Therm (1/E5 F)	Density[k/ft^3]	Yield[ksi]
1	A53 Gr B/A501/SS316	29000	11154	.3	.65	.49	30

**Hot Rolled Steel Section Sets**

	Label	Shape	Type	Design List	Material	Design Rules	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	RAIL	PIPE 1.5	Beam	Pipe	A53 Gr B/A50...	Typical	.75	.293	.293	.586
2	ERAIL	PIPE 1.5XX	Beam	Pipe	A53 Gr B/A50...	Typical	1.885	.568	.568	1.136
3	EPOST	PIPE 1.5XX	Column	Pipe	A53 Gr B/A50...	Typical	1.885	.568	.568	1.136
4	IPOST	PIPE 1.5	Column	Pipe	A53 Gr B/A50...	Typical	.75	.293	.293	.586

**Basic Load Cases**

	BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Joint	Point	Distributed	Area (Mem...	Surface (Pl...
1	Cable Prestress	None					20			
2	1607.7.1.2	None					16			
3	1607.7.1	None						3		
4	1607.7.1.1 (1)	None				1				
5	1607.7.1.1 (2)	None					1			
6	1607.7.1.1 (3)	None					1			

**Load Combinations**

	Description	Solve PDelta	SR...	BLC_Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor
1	Cable Prestress	Yes	C	1	1						

**Load Combinations (Continued)**

	Description	Solve	PDelta	SR...	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor
2	1607.7.1.2	Yes	C		1	1	2	1					
3	1607.7.1	Yes	C		1	1	3	1					
4	1607.7.1.1 (1)	Yes	C		1	1	4	1					
5	1607.7.1.1 (2)	Yes	C		1	1	5	1					
6	1607.7.1.1 (3)	Yes	C		1	1	6	1					

**Member Primary Data**

	Label	I Joint	J Joint	K Joint	Rotate(deg)	Section/Shape	Type	Design List	Material	Design Rules
1	M1	N1	N2			EPOST	Column	Pipe	A53 Gr B/...	Typical
2	M2	N3	N4			IPOST	Column	Pipe	A53 Gr B/...	Typical
3	M3	N2	N4			ERAIL	Beam	Pipe	A53 Gr B/...	Typical
4	M4	N4	N8			RAIL	Beam	Pipe	A53 Gr B/...	Typical
5	M5	N5	N6			EPOST	Column	Pipe	A53 Gr B/...	Typical
6	M6	N7	N8			IPOST	Column	Pipe	A53 Gr B/...	Typical
7	M7	N8	N6			ERAIL	Beam	Pipe	A53 Gr B/...	Typical
8	M8	N9	N10			RAIL	Beam	Pipe	A53 Gr B/...	Typical
9	M9	N10	N12			RAIL	Beam	Pipe	A53 Gr B/...	Typical
10	M10	N12	N11			RAIL	Beam	Pipe	A53 Gr B/...	Typical

**Envelope Joint Reactions**

	Joint		X [lb]	lc	Y [lb]	lc	Z [lb]	lc	MX [k-ft]	lc	MY [k-ft]	lc	MZ [k-ft]	lc
1	N1	max	2226.985	2	134.797	2	7.63	5	0	1	0	1	0	1
2		min	2056.986	1	108.805	6	-83.385	3	-468	3	0	1	0	1
3	N3	max	-571.974	1	-8.805	6	0	1	0	1	0	1	0	1
4		min	-614.789	2	-134.797	2	-179.115	3	-448	3	0	1	0	1
5	N5	max	-2056.986	1	134.797	2	17.115	4	0	1	0	1	0	1
6		min	-2226.985	2	108.805	6	-83.385	3	-468	3	0	1	0	1
7	N7	max	614.789	2	-8.805	6	0	1	0	1	0	1	0	1
8		min	571.974	1	-134.797	2	-179.115	3	-448	3	0	1	0	1
9	Totals:	max	0	1	200	6	0	1						
10		min	0	4	0	2	-525	3						

**Envelope Member Section Forces**

	Member	Sec		Axial[lb]	lc	y Shear[lb]	lc	z Shear[lb]	lc	Torque[k-ft]	lc	y-y Moment[...]	lc	z-z Moment[...]	lc
1	M1	1	max	134.797	2	-2056.472	4	7.593	5	0	1	.468	3	0	1
2			min	108.805	6	-2226.388	2	-83.535	3	0	1	0	1	0	1
3		2	max	250.376	2	1853.012	2	0	1	.065	3	.366	3	.034	2
4			min	215.734	6	1718.904	4	-112.891	3	0	1	0	1	.019	4
5		3	max	250.376	2	591.012	2	0	1	.065	3	.268	3	-.892	1
6			min	215.734	6	518.904	4	-112.891	3	0	1	0	1	-.979	2
7		4	max	250.376	2	-1075.418	6	0	1	.065	3	.171	3	-.679	1
8			min	215.734	6	-1194.988	2	-112.891	3	0	1	0	2	-.727	2
9		5	max	250.376	2	-1875.418	6	0	1	.065	3	.073	3	.69	2
10			min	215.734	6	-1994.988	2	-112.891	3	0	1	-.002	2	.627	6
11	M2	1	max	-8.805	6	614.789	2	0	1	0	1	.448	3	0	1
12			min	-134.797	2	571.974	1	-179.115	3	0	1	0	1	0	1
13		2	max	-115.734	6	-63.725	1	0	1	.034	5	.321	3	-.043	1
14			min	-250.376	2	-77.194	6	-151.694	3	-.001	2	0	1	-.049	6

**Envelope Member Section Forces (Continued)**

Member	Sec		Axial[lb]	lc	y Shear[lb]	lc	z Shear[lb]	lc	Torque[k-ft]	lc	y-y Moment[...]	lc	z-z Moment[...]	lc	
15	3	max	-115.734	6	-63.725	1	0	1	.034	5	.19	3	.018	6	
16		min	-250.376	2	-77.194	6	-151.694	3	-.001	2	-.001	2	.012	4	
17	4	max	-115.734	6	-63.725	1	4.818	2	.034	5	.058	3	.085	6	
18		min	-250.376	2	-77.194	6	-151.694	3	-.001	2	-.004	2	.068	1	
19	5	max	-115.734	6	-63.725	1	4.818	2	.034	5	0	2	.152	6	
20		min	-250.376	2	-77.194	6	-151.694	3	-.001	2	-.073	3	.123	1	
21	M3	1	max	1994.893	2	250.316	2	0	1	.002	2	.065	3	.69	2
22		min	1875.342	6	215.703	6	-119.748	3	-.073	3	0	1	.627	6	
23	2	max	1994.893	2	250.316	2	0	1	.002	2	.026	5	.471	2	
24		min	1875.342	6	215.703	6	-75.998	3	-.073	3	-.021	3	.437	1	
25	3	max	1994.893	2	250.316	2	0	1	.002	2	.008	5	.252	2	
26		min	1875.342	6	215.703	6	-57.604	4	-.073	3	-.068	3	.234	1	
27	4	max	1994.893	2	250.316	2	11.502	3	.002	2	0	1	.061	6	
28		min	1875.342	6	215.703	6	-57.604	4	-.073	3	-.106	4	.031	4	
29	5	max	1994.893	2	250.316	2	55.252	3	.002	2	0	1	-.127	6	
30		min	1875.342	6	215.703	6	-57.604	4	-.073	3	-.157	4	-.186	2	
31	M4	1	max	2063.555	2	100	6	55.53	4	.027	4	.005	5	.024	6
32		min	1944.74	4	0	1	-100	5	0	1	-.146	4	-.053	2	
33	2	max	2063.555	2	100	6	55.53	4	.027	4	0	1	-.05	1	
34		min	1944.74	4	0	1	-100	5	0	1	-.098	4	-.063	6	
35	3	max	2063.555	2	0	1	100	5	.027	4	0	1	-.05	1	
36		min	1944.74	4	-100	6	0	1	0	1	-.17	5	-.151	6	
37	4	max	2063.555	2	0	1	100	5	.027	4	.002	2	-.05	1	
38		min	1944.74	4	-100	6	0	1	0	1	-.083	5	-.063	6	
39	5	max	2063.555	2	0	1	100	5	.027	4	.048	4	.024	6	
40		min	1944.74	4	-100	6	0	1	0	1	-.018	3	-.053	2	
41	M5	1	max	134.797	2	2226.388	2	17.097	4	0	1	.468	3	0	1
42		min	108.805	6	2056.472	4	-83.535	3	0	1	0	1	0	1	
43	2	max	250.376	2	-1718.904	4	1.514	4	0	1	.366	3	-.019	4	
44		min	215.734	6	-1853.012	2	-112.891	3	-.065	3	0	1	-.034	2	
45	3	max	250.376	2	-518.904	4	1.514	4	0	1	.268	3	.979	2	
46		min	215.734	6	-591.012	2	-112.891	3	-.065	3	0	1	.892	1	
47	4	max	250.376	2	1194.988	2	1.514	4	0	1	.171	3	.727	2	
48		min	215.734	6	1075.418	6	-112.891	3	-.065	3	0	1	.679	1	
49	5	max	250.376	2	1994.988	2	1.514	4	0	1	.073	3	-.627	6	
50		min	215.734	6	1875.418	6	-112.891	3	-.065	3	0	1	-.69	2	
51	M6	1	max	-8.805	6	-571.974	1	0	1	0	1	.448	3	0	1
52		min	-134.797	2	-614.789	2	-179.115	3	0	1	0	1	0	1	
53	2	max	-115.734	6	77.194	6	0	1	0	1	.321	3	.049	6	
54		min	-250.376	2	63.725	1	-151.694	3	-.034	5	0	1	.043	1	
55	3	max	-115.734	6	77.194	6	0	1	0	1	.19	3	-.012	4	
56		min	-250.376	2	63.725	1	-151.694	3	-.034	5	0	1	-.018	6	
57	4	max	-115.734	6	77.194	6	0	1	0	1	.058	3	-.068	1	
58		min	-250.376	2	63.725	1	-151.694	3	-.034	5	0	1	-.085	6	
59	5	max	-115.734	6	77.194	6	0	1	0	1	0	1	-.123	1	
60		min	-250.376	2	63.725	1	-151.694	3	-.034	5	-.073	3	-.152	6	
61	M7	1	max	1994.893	2	-215.703	6	21.019	5	.073	3	.017	4	-.127	6
62		min	1875.342	6	-250.316	2	-55.252	3	0	1	-.048	3	-.186	2	
63	2	max	1994.893	2	-215.703	6	21.019	5	.073	3	.021	4	.061	6	
64		min	1875.342	6	-250.316	2	-11.502	3	0	1	-.077	3	.031	4	
65	3	max	1994.893	2	-215.703	6	32.248	3	.073	3	.024	4	.252	2	
66		min	1875.342	6	-250.316	2	-.069	2	0	1	-.068	3	.234	1	
67	4	max	1994.893	2	-215.703	6	75.998	3	.073	3	.028	4	.471	2	

**Envelope Member Section Forces (Continued)**

Member	Sec		Axial[lb]	lc	y Shear[lb]	lc	z Shear[lb]	lc	Torque[k-ft]	lc	y-y Momentf...	lc	z-z Momentf...	lc
68		min	1875.342	6	-250.316	2	-.069	2	0	1	-.021	3	.437	1
69	5	max	1994.893	2	-215.703	6	119.748	3	.073	3	.065	3	.69	2
70		min	1875.342	6	-250.316	2	-.069	2	0	1	0	1	.627	6
71	M8	1	max	4480.092	2	-106.931	6	26.978	3	0	1	0	-.245	6
72		min	4175.971	1	-115.588	2	-.166	2	-.015	3	-.065	3	-.263	2
73	2	max	4480.092	2	-106.931	6	26.978	3	0	1	0	1	-.151	1
74		min	4175.971	1	-115.588	2	-.166	2	-.015	3	-.041	3	-.162	2
75	3	max	4480.092	2	-106.931	6	26.978	3	0	1	0	1	-.057	1
76		min	4175.971	1	-115.588	2	-.166	2	-.015	3	-.018	3	-.061	2
77	4	max	4480.092	2	-106.931	6	26.978	3	0	1	.01	5	.04	2
78		min	4175.971	1	-115.588	2	-.166	2	-.015	3	0	2	.036	6
79	5	max	4480.092	2	-106.931	6	26.978	3	0	1	.029	3	.141	2
80		min	4175.971	1	-115.588	2	-.166	2	-.015	3	0	2	.13	6
81	M9	1	max	3796.64	2	0	1	0	.008	4	.006	4	-.006	6
82		min	3520.337	6	0	1	-4.517	4	0	1	-.006	5	-.007	2
83	2	max	3796.64	2	0	1	0	1	.008	4	.002	4	-.006	6
84		min	3520.337	6	0	1	-4.517	4	0	1	-.006	5	-.007	2
85	3	max	3796.64	2	0	1	0	1	.008	4	0	1	-.006	6
86		min	3520.337	6	0	1	-4.517	4	0	1	-.006	5	-.007	2
87	4	max	3796.64	2	0	1	0	1	.008	4	0	1	-.006	6
88		min	3520.337	6	0	1	-4.517	4	0	1	-.006	5	-.007	2
89	5	max	3796.64	2	0	1	0	1	.008	4	0	1	-.006	6
90		min	3520.337	6	0	1	-4.517	4	0	1	-.01	4	-.007	2
91	M10	1	max	4480.092	2	115.588	2	0	.015	3	.029	3	.141	2
92		min	4175.971	1	106.931	6	-26.978	3	0	1	0	1	.13	6
93	2	max	4480.092	2	115.588	2	0	1	.015	3	.01	5	.04	2
94		min	4175.971	1	106.931	6	-26.978	3	0	1	0	1	.036	6
95	3	max	4480.092	2	115.588	2	0	1	.015	3	0	1	-.057	1
96		min	4175.971	1	106.931	6	-26.978	3	0	1	-.018	3	-.061	2
97	4	max	4480.092	2	115.588	2	0	1	.015	3	0	1	-.151	1
98		min	4175.971	1	106.931	6	-26.978	3	0	1	-.041	3	-.162	2
99	5	max	4480.092	2	115.588	2	0	1	.015	3	0	1	-.245	6
100		min	4175.971	1	106.931	6	-26.978	3	0	1	-.065	3	-.263	2

**Envelope AISC 13th ASD Steel Code Checks**

Member	Shape	Code Check	Loc[in]	lc	Shear ...	Loc[in]	Dir	lc	Pnc/om [lb]	Pnt/om [lb]	Mnyy/om [k-ft]	Mnzz/om ...	Cb	LRFD E...
1	M1	PIPE 1.5XX	.760	24.67	2	.269	4.761	3	26336.428	33862.275	1.379	1.379	1...	H1-1b
2	M2	PIPE 1.5	.715	0	3	.152	0	2	11098.648	13473.054	.63	.63	2...	H1-1b
3	M3	PIPE 1.5XX	.539	0	2	.094	0	3	26192.66	33862.275	1.379	1.379	2...	H1-1b
4	M4	PIPE 1.5	.370	21	5	.063	0	4	11051.888	13473.054	.63	.63	1	H1-1b
5	M5	PIPE 1.5XX	.760	24.67	2	.269	4.761	3	26336.428	33862.275	1.379	1.379	1...	H1-1b
6	M6	PIPE 1.5	.715	0	3	.152	0	2	11098.648	13473.054	.63	.63	2...	H1-1b
7	M7	PIPE 1.5XX	.539	42	2	.094	42	3	26192.66	33862.275	1.379	1.379	2...	H1-1b
8	M8	PIPE 1.5	.777	0	2	.054	0	3	11051.888	13473.054	.63	.63	2...	H1-1a
9	M9	PIPE 1.5	.354	42	2	.015	0	4	11051.888	13473.054	.63	.63	1	H1-1a
10	M10	PIPE 1.5	.777	42	2	.054	0	3	11051.888	13473.054	.63	.63	2...	H1-1a

\*\*\* End of Calculations \*\*\*