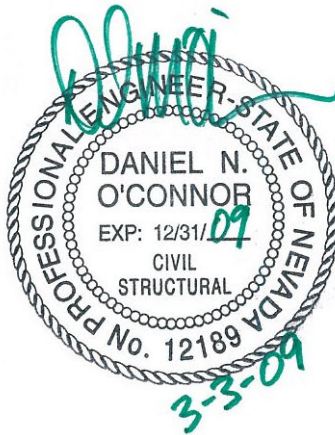
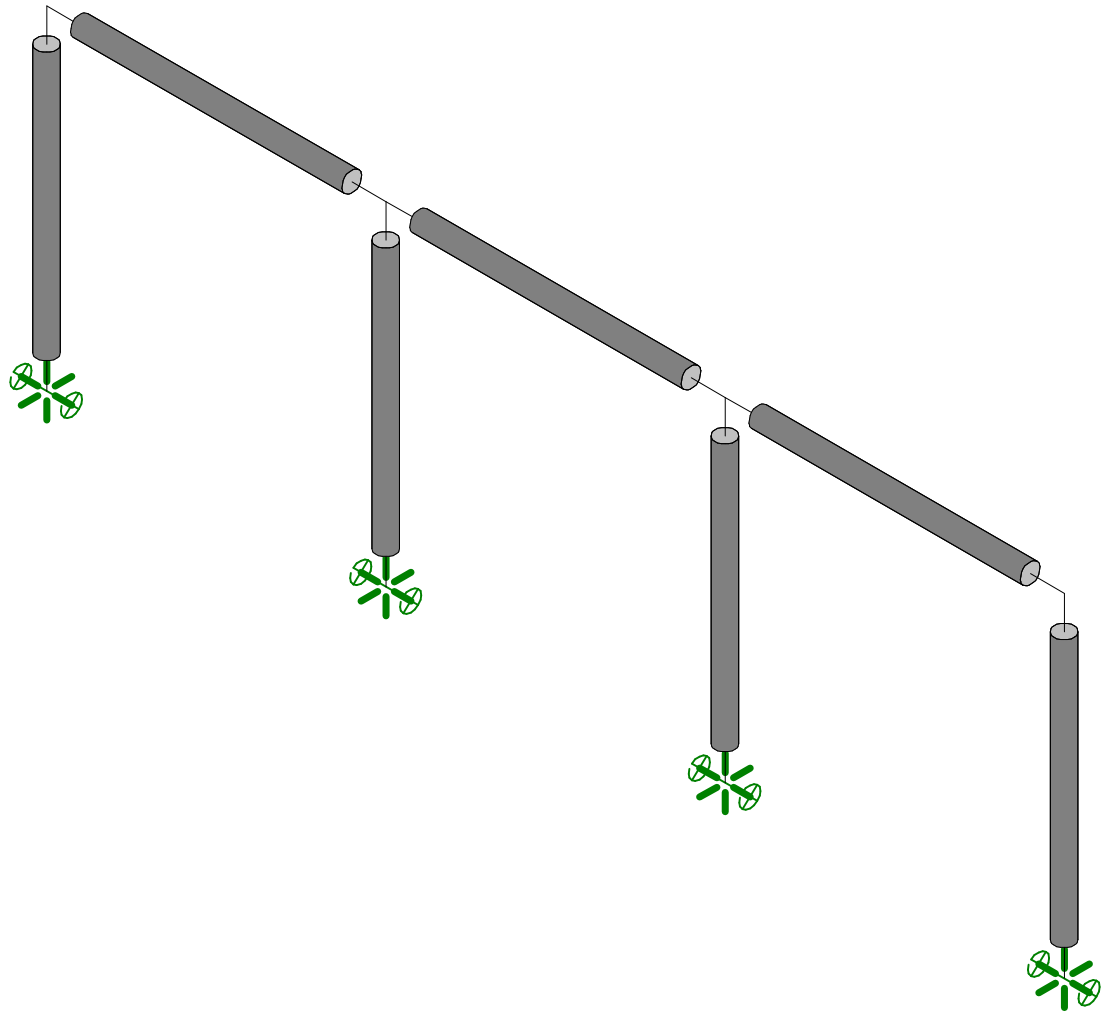
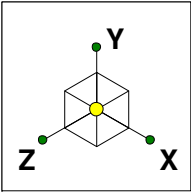


**D20—2" PIPE x 42-1/2" HIGH RAIL WITHOUT BOTTOM RAIL**

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 or 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>2" XXS (2.375" OD x 0.436") Pipe</b>
Intermediate Posts:	<b>2" SCHD 40 (2.375" OD x 0.154") Pipe</b>
Top Rail:	<b>2" SCHD 40 (2.375" OD x 0.154") Pipe</b>
Bottom Rail:	<b>None</b>
Number of Cables:	<b>12</b>
Cable Spacing:	<b>3.09"</b>
Cable Prestress:	<b>325 lbs</b>



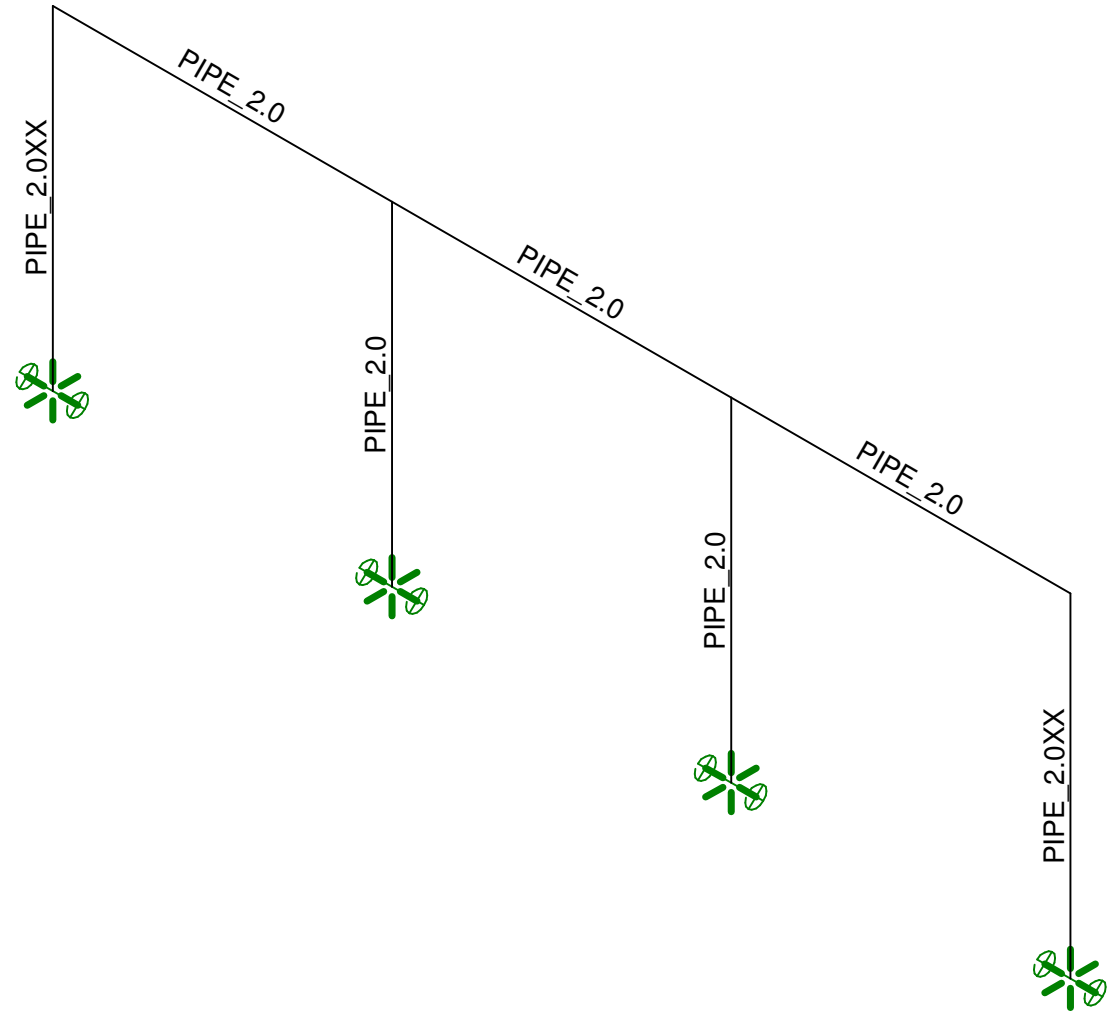
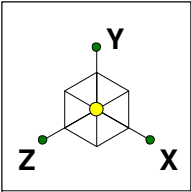
**Disclaimer:** Analysis and Structural Certification DOES NOT include base plates or anchorage to supporting structure. Where required by the Local Building Official, these shall be reviewed and designed by the project Structural Engineer of Record.



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D20 - 2" PIPE x 42.5" HIGH TOP RAIL W/O BTM RAIL

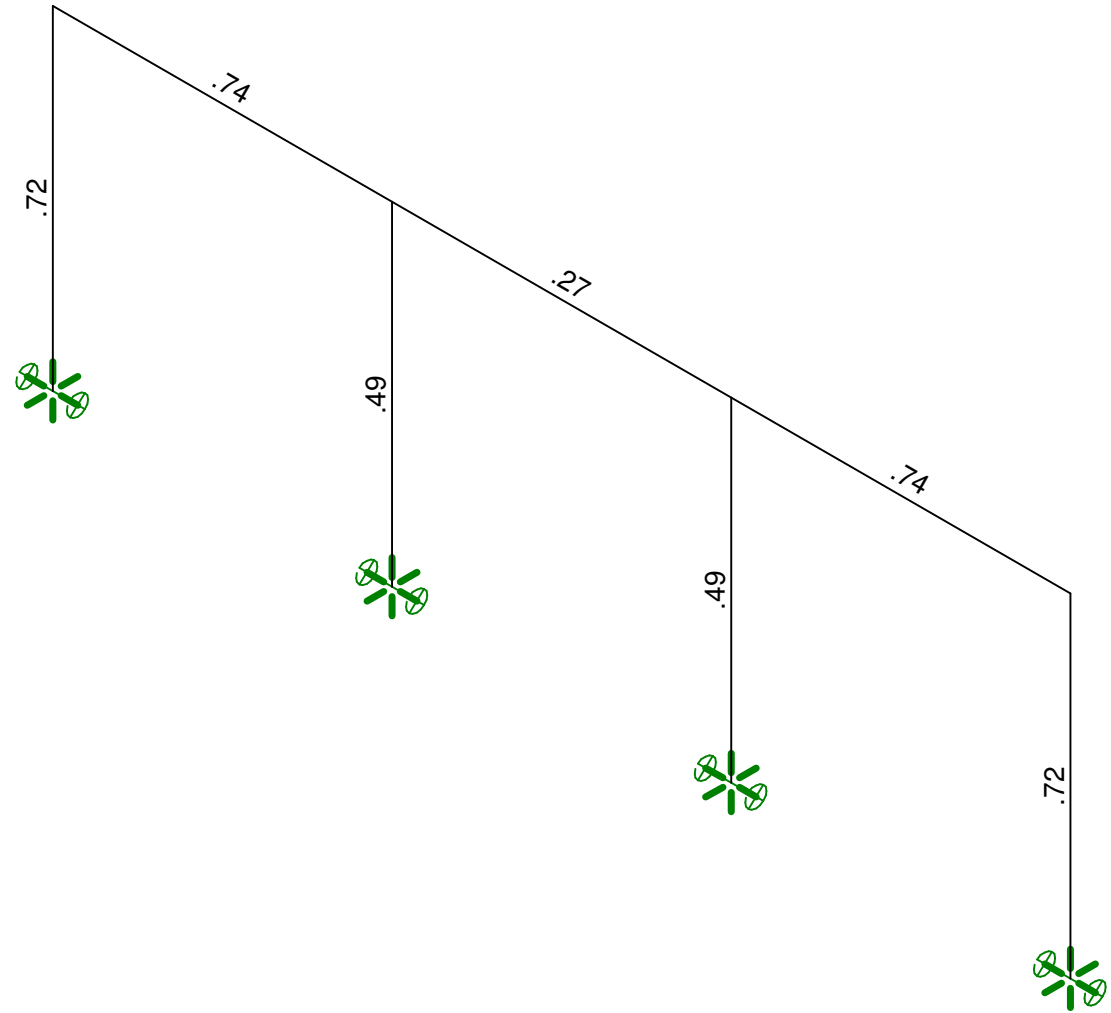
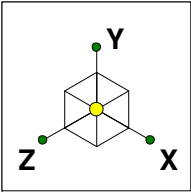
Mar 3, 2009 at 2:13 PM  
D20.r3d



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D20 - 2" PIPE x 42.5" HIGH TOP RAIL W/O BTM RAIL

Mar 3, 2009 at 2:14 PM  
D20.r3d

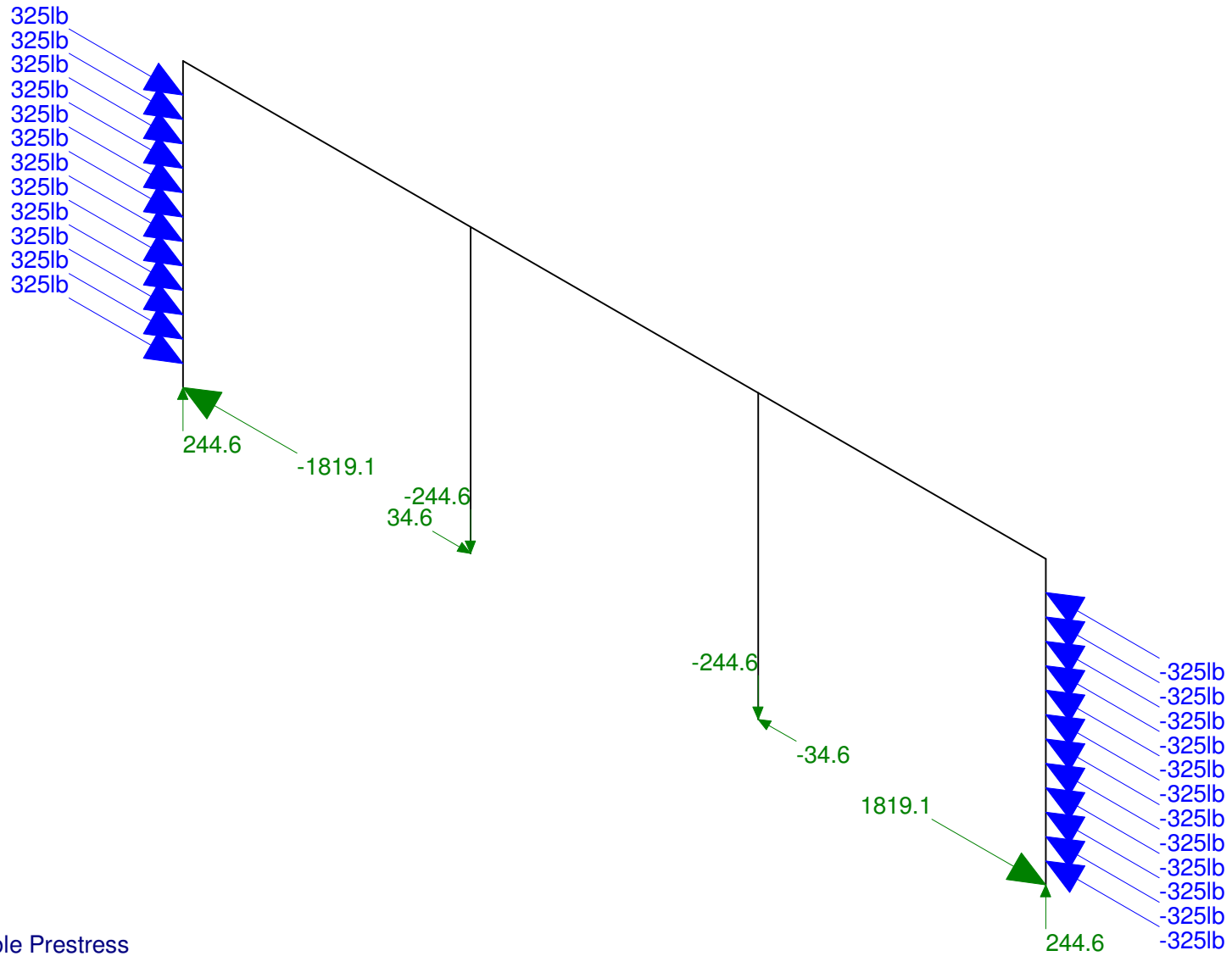
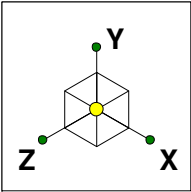


Member Code Checks Displayed  
Solution: Envelope  
Reaction units are lb and k-ft

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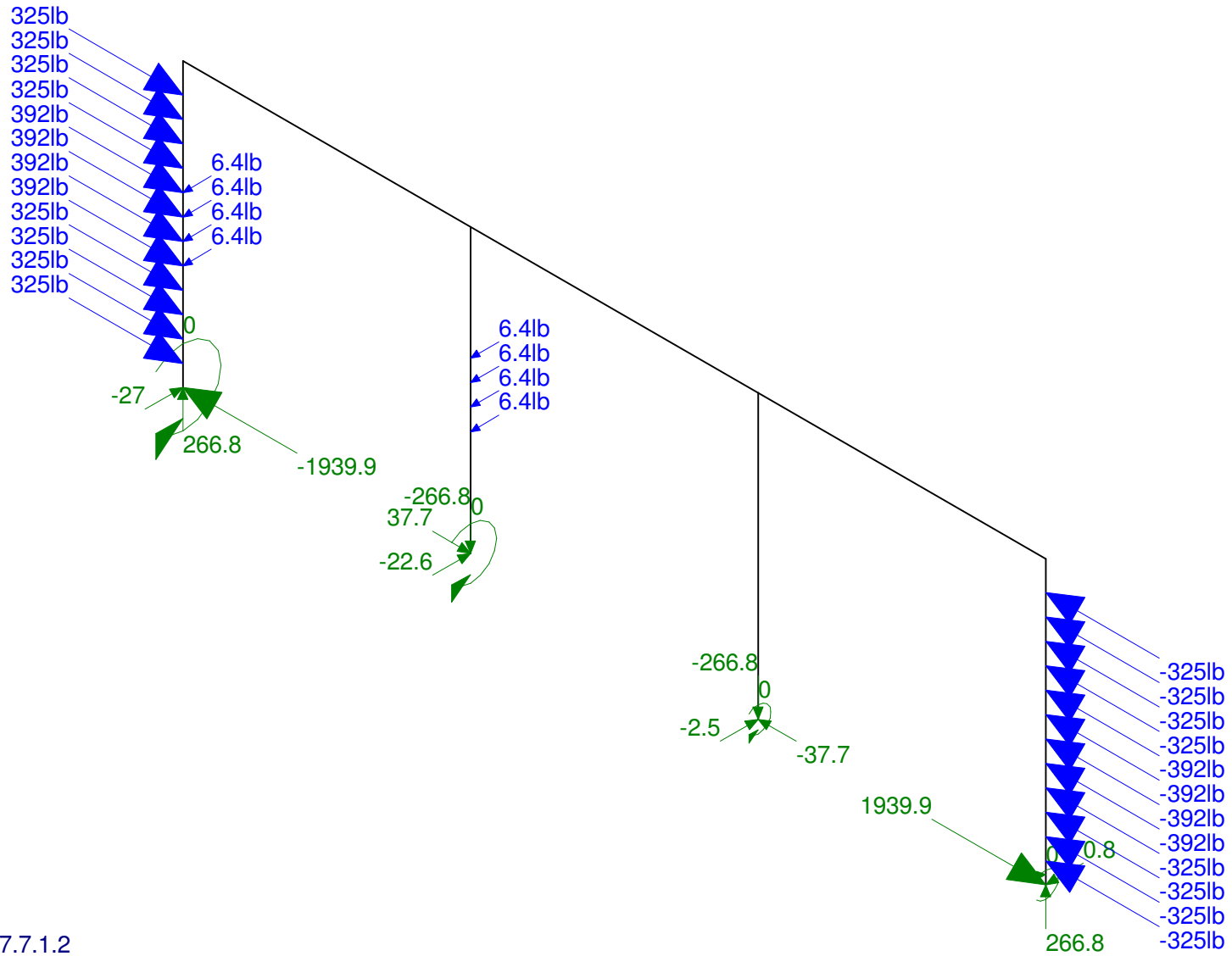
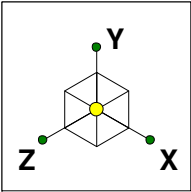
D20 - 2" PIPE x 42.5" HIGH TOP RAIL W/O BTM RAIL

Mar 3, 2009 at 2:20 PM  
D20.r3d



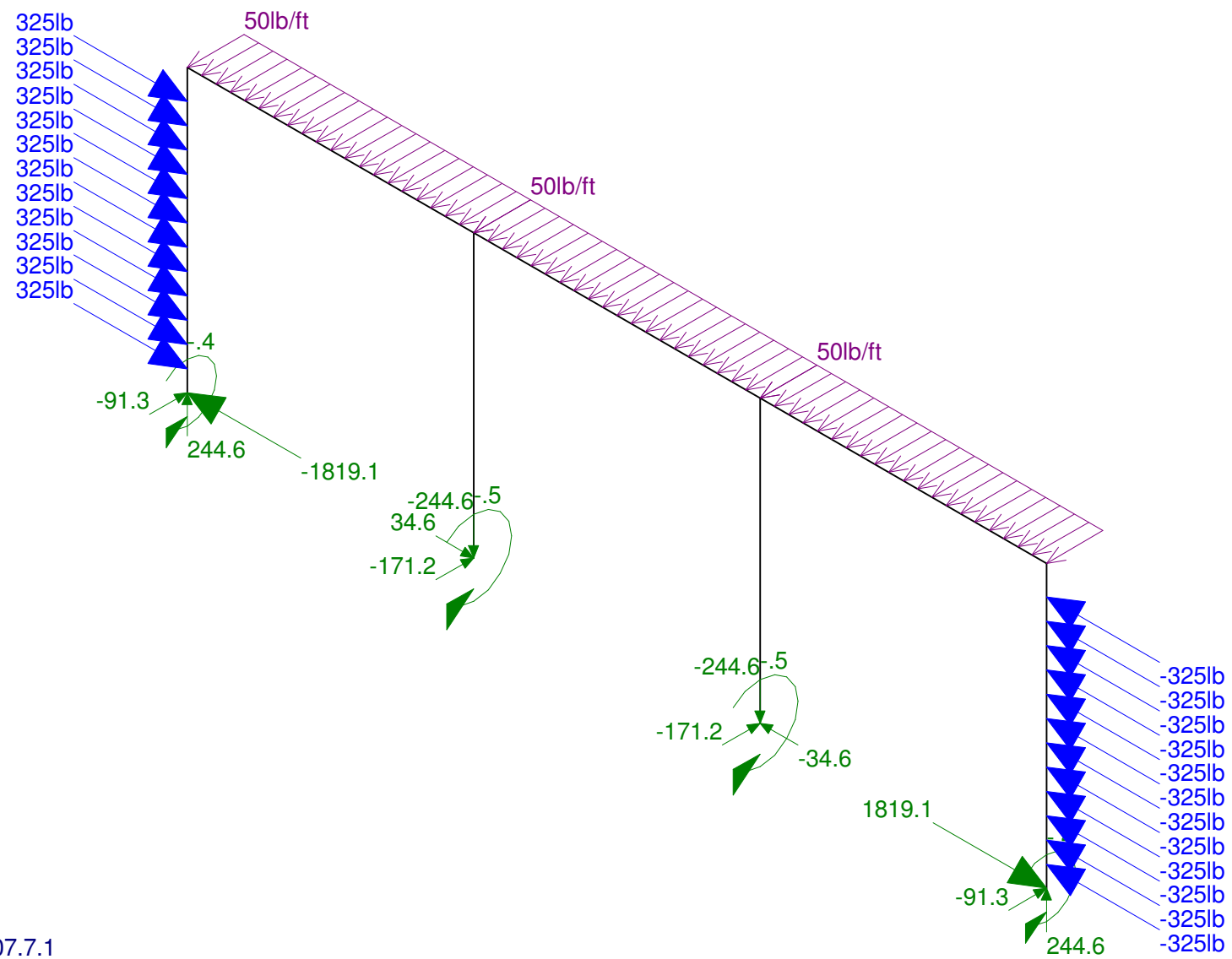
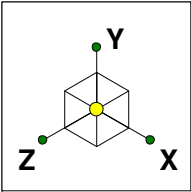
Loads: LC 1, Cable Prestress  
 Results for LC 1, Cable Prestress  
 Reaction units are lb and k-ft

Ferrari Shields & Associates	D20 - 2" PIPE x 42.5" HIGH TOP RAIL W/O BTM RAIL	
Dan O'Connor		Mar 3, 2009 at 2:19 PM
08196		D20.r3d



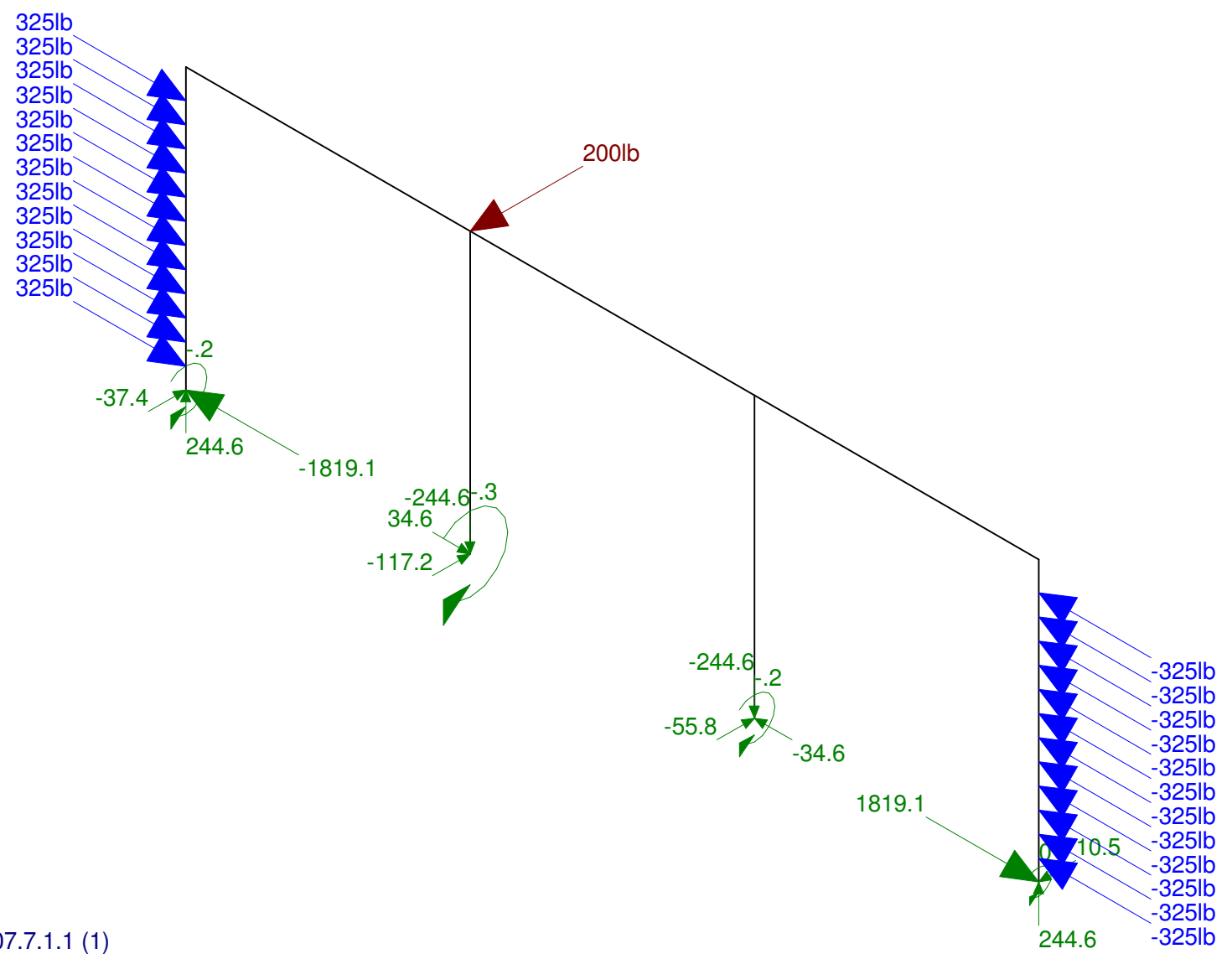
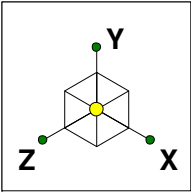
Loads: LC 2, 1607.7.1.2  
 Results for LC 2, 1607.7.1.2  
 Reaction units are lb and k-ft

Ferrari Shields & Associates	D20 - 2" PIPE x 42.5" HIGH TOP RAIL W/O BTM RAIL	
Dan O'Connor		Mar 3, 2009 at 2:19 PM
08196		D20.r3d



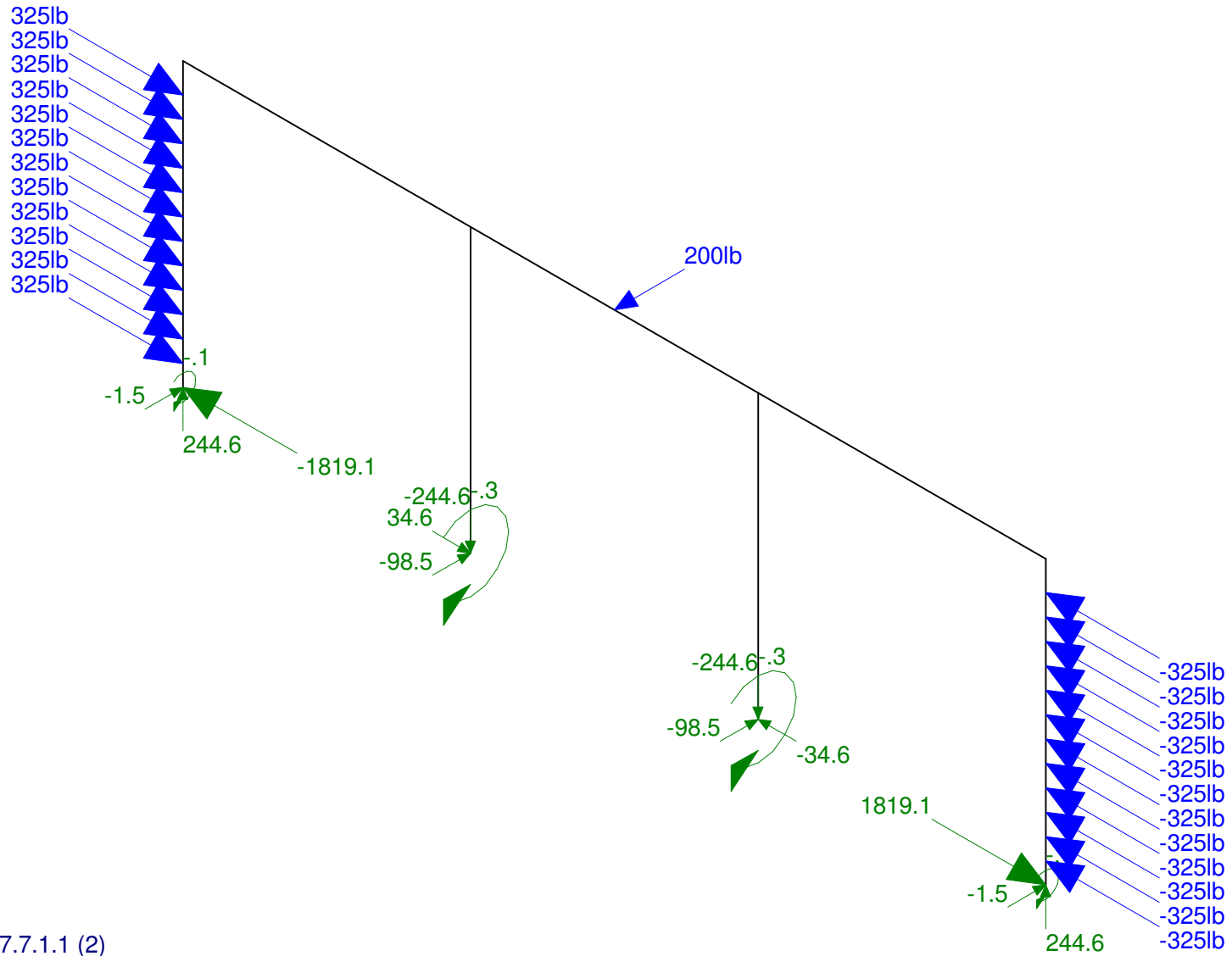
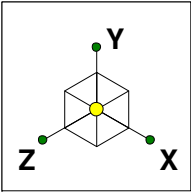
Loads: LC 3, 1607.7.1  
 Results for LC 3, 1607.7.1  
 Reaction units are lb and k-ft

Ferrari Shields & Associates	D20 - 2" PIPE x 42.5" HIGH TOP RAIL W/O BTM RAIL	
Dan O'Connor		Mar 3, 2009 at 2:19 PM
08196		D20.r3d



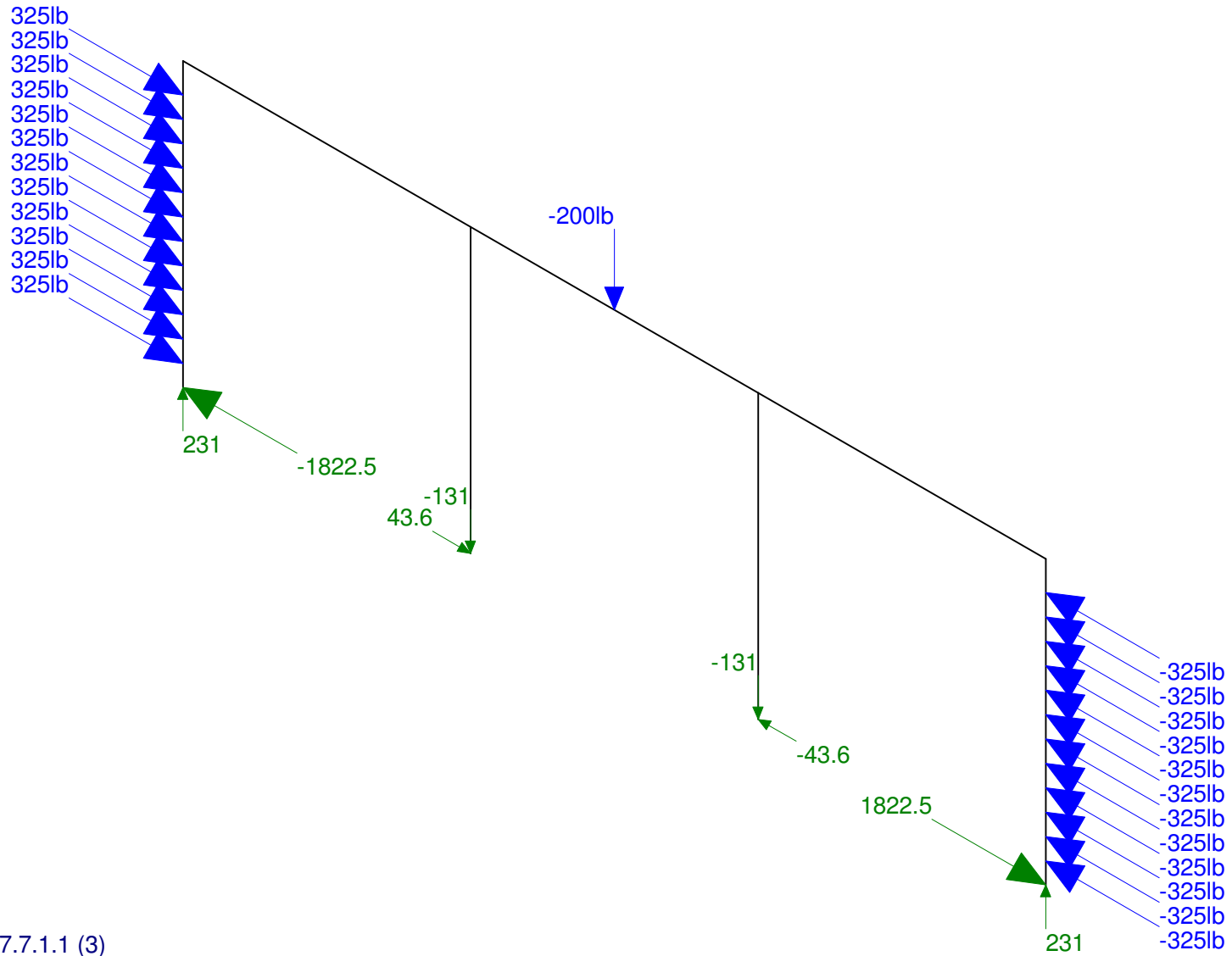
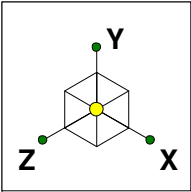
Loads: LC 4, 1607.7.1.1 (1)  
 Results for LC 4, 1607.7.1.1 (1)  
 Reaction units are lb and k-ft

Ferrari Shields & Associates	D20 - 2" PIPE x 42.5" HIGH TOP RAIL W/O BTM RAIL	
Dan O'Connor		Mar 3, 2009 at 2:19 PM
08196		D20.r3d



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	D20 - 2" PIPE x 42.5" HIGH TOP RAIL W/O BTM RAIL	
Dan O'Connor		Mar 3, 2009 at 2:19 PM
08196		D20.r3d



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	D20 - 2" PIPE x 42.5" HIGH TOP RAIL W/O BTM RAIL	
Dan O'Connor		Mar 3, 2009 at 2:20 PM
08196		D20.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
Masonry Code	MSJC 05/IBC 06 ASD

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	A53GrB/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 2.0	Beam	Pipe	A53GrB/A501/S...	Typical	1	.627	.627	1.25
2	IPOST	PIPE 2.0	Column	Pipe	A53GrB/A501/S...	Typical	1	.627	.627	1.25
3	EPOST	PIPE 2.0XX	Column	Pipe	A53GrB/A501/S...	Typical	2.51	1.27	1.27	2.54

### Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Joint	Point	Distributed	Area (Mem...	Surface (Pl...
1	Cable Prestress	None					24			
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	A53GrB/A...	Typical
2	M2	N3	N4			RAIL	Beam	Pipe	A53GrB/A...	Typical
3	M3	N2	N4			RAIL	Beam	Pipe	A53GrB/A...	Typical
4	M4	N4	N8			RAIL	Beam	Pipe	A53GrB/A...	Typical
5	M5	N5	N6			EPOST	Column	Pipe	A53GrB/A...	Typical
6	M6	N7	N8			RAIL	Beam	Pipe	A53GrB/A...	Typical
7	M7	N8	N6			RAIL	Beam	Pipe	A53GrB/A...	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	-1819.112	4	266.785	2	0	1	0	1	0	1	0	1
2		min	-1939.916	2	230.997	6	-91.299	3	-.394	3	0	1	0	1
3	N3	max	43.623	6	-130.997	6	0	1	0	1	0	1	0	1
4		min	34.588	4	-266.785	2	-171.201	3	-.513	3	0	1	0	1
5	N5	max	1939.916	2	266.785	2	10.473	4	0	2	0	1	0	1
6		min	1819.112	4	230.997	6	-91.299	3	-.394	3	0	1	0	1
7	N7	max	-34.588	4	-130.997	6	0	1	0	1	0	1	0	1
8		min	-43.623	6	-266.785	2	-171.201	3	-.513	3	0	1	0	1
9	Totals:	max	0	4	200	6	0	1						
10		min	0	1	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	266.785	2	1939.966	2	0	1	0	1	.394	3	0	1
2			min	230.997	6	1819.155	1	-92.061	3	0	1	0	1	0	1
3		2	max	266.785	2	964.966	2	0	1	0	1	.314	3	-1.224	1
4			min	230.997	6	844.155	1	-92.061	3	0	1	0	1	-1.328	2
5		3	max	266.785	2	-127.476	6	0	1	0	1	.235	3	-1.522	1
6			min	230.997	6	-144.034	2	-92.061	3	0	1	0	1	-1.689	2
7		4	max	266.785	2	-1427.476	6	0	1	0	1	.156	3	-.892	1
8			min	230.997	6	-1578.034	2	-92.061	3	0	1	0	1	-.959	2
9		5	max	266.785	2	-2077.476	6	0	1	0	1	.077	3	.715	2
10			min	230.997	6	-2228.034	2	-92.061	3	0	1	0	2	.644	6
11	M2	1	max	-130.997	6	-34.588	4	0	1	0	1	.513	3	0	1
12			min	-266.785	2	-43.623	6	-171.201	3	0	1	0	1	0	1
13		2	max	-130.997	6	-34.588	4	0	1	0	1	.365	3	.038	6
14			min	-266.785	2	-43.623	6	-171.201	3	0	1	0	1	.03	4
15		3	max	-130.997	6	-34.588	4	0	1	0	1	.218	3	.075	6
16			min	-266.785	2	-43.623	6	-171.201	3	0	1	-.003	2	.06	4
17		4	max	-130.997	6	-34.588	4	3.031	2	0	1	.071	3	.113	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	
18		min	-266.785	2	-43.623	6	-171.201	3	0	1	-.003	2	.089	4	
19	5	max	-130.997	6	-34.588	4	3.031	2	0	1	0	1	.15	6	
20		min	-266.785	2	-43.623	6	-171.201	3	0	1	-.081	4	.119	4	
21	M3	1	max	2228.084	2	266.737	2	0	1	0	2	0	1	.715	2
22		min	2077.517	6	230.969	6	-99.105	3	-.077	3	0	1	.644	6	
23	2	max	2228.084	2	266.737	2	0	1	0	2	0	1	.482	2	
24		min	2077.517	6	230.969	6	-55.355	3	-.077	3	-.068	3	.442	4	
25	3	max	2228.084	2	266.737	2	0	1	0	2	0	1	.248	2	
26		min	2077.517	6	230.969	6	-42.879	4	-.077	3	-.097	3	.228	4	
27	4	max	2228.084	2	266.737	2	32.145	3	0	2	0	1	.038	6	
28		min	2077.517	6	230.969	6	-42.879	4	-.077	3	-.113	4	.014	1	
29	5	max	2228.084	2	266.737	2	75.895	3	0	2	0	1	-.164	6	
30		min	2077.517	6	230.969	6	-42.879	4	-.077	3	-.15	4	-.218	2	
31	M4	1	max	2265.825	2	100	6	48.892	4	.032	4	0	1	-.014	6
32		min	2115.475	1	0	1	-100	5	0	1	-.15	4	-.089	2	
33	2	max	2265.825	2	100	6	48.892	4	.032	4	0	1	-.081	4	
34		min	2115.475	1	0	1	-100	5	0	1	-.114	5	-.102	6	
35	3	max	2265.825	2	0	1	100	5	.032	4	0	1	-.081	4	
36		min	2115.475	1	-100	6	0	1	0	1	-.202	5	-.189	6	
37	4	max	2265.825	2	0	1	100	5	.032	4	0	2	-.081	4	
38		min	2115.475	1	-100	6	0	1	0	1	-.114	5	-.102	6	
39	5	max	2265.825	2	0	1	100	5	.032	4	.021	4	-.014	6	
40		min	2115.475	1	-100	6	0	1	0	1	-.041	3	-.089	2	
41	M5	1	max	266.785	2	-1819.155	1	10.409	4	0	1	.394	3	0	1
42		min	230.997	6	-1939.966	2	-92.061	3	0	1	0	2	0	1	
43	2	max	266.785	2	-844.155	1	10.409	4	0	1	.314	3	1.328	2	
44		min	230.997	6	-964.966	2	-92.061	3	0	1	0	1	1.224	1	
45	3	max	266.785	2	144.034	2	10.409	4	0	1	.235	3	1.689	2	
46		min	230.997	6	127.476	6	-92.061	3	0	1	0	1	1.522	1	
47	4	max	266.785	2	1578.034	2	10.409	4	0	1	.156	3	.959	2	
48		min	230.997	6	1427.476	6	-92.061	3	0	1	0	1	.892	1	
49	5	max	266.785	2	2228.034	2	10.409	4	0	1	.077	3	-.644	6	
50		min	230.997	6	2077.476	6	-92.061	3	0	1	0	1	-.715	2	
51	M6	1	max	-130.997	6	43.623	6	0	1	0	1	.513	3	0	1
52		min	-266.785	2	34.588	4	-171.201	3	0	1	0	1	0	1	
53	2	max	-130.997	6	43.623	6	0	1	0	1	.365	3	-.03	4	
54		min	-266.785	2	34.588	4	-171.201	3	0	1	0	1	-.038	6	
55	3	max	-130.997	6	43.623	6	0	1	0	1	.218	3	-.06	4	
56		min	-266.785	2	34.588	4	-171.201	3	0	1	0	1	-.075	6	
57	4	max	-130.997	6	43.623	6	0	1	0	1	.071	3	-.089	4	
58		min	-266.785	2	34.588	4	-171.201	3	0	1	0	1	-.113	6	
59	5	max	-130.997	6	43.623	6	0	1	0	1	0	1	-.119	4	
60		min	-266.785	2	34.588	4	-171.201	3	0	1	-.077	3	-.15	6	
61	M7	1	max	2228.084	2	-230.969	6	7.591	5	.077	3	.021	4	-.164	6
62		min	2077.517	6	-266.737	2	-75.895	3	0	1	-.041	3	-.218	2	
63	2	max	2228.084	2	-230.969	6	7.591	5	.077	3	.016	4	.038	6	
64		min	2077.517	6	-266.737	2	-32.145	3	0	1	-.088	3	.014	1	
65	3	max	2228.084	2	-230.969	6	11.605	3	.077	3	.011	4	.248	2	
66		min	2077.517	6	-266.737	2	-6.013	4	0	1	-.097	3	.228	4	
67	4	max	2228.084	2	-230.969	6	55.355	3	.077	3	.005	4	.482	2	
68		min	2077.517	6	-266.737	2	-6.013	4	0	1	-.068	3	.442	4	
69	5	max	2228.084	2	-230.969	6	99.105	3	.077	3	0	1	.715	2	
70		min	2077.517	6	-266.737	2	-6.013	4	0	1	0	1	.644	6	

**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	Eqn
1	M1	PIPE 2.0XX	.719	18.505	2	.165	37.439	2	38887.627	45089.82	2.395	2.395	1... H1-1b
2	M2	PIPE 2.0	.487	0	3	.032	0	3	15941.992	17964.072	1.067	1.067	1... H1-1b
3	M3	PIPE 2.0	.740	0	2	.130	0	3	15878.23	17964.072	1.067	1.067	2... H1-1b
4	M4	PIPE 2.0	.270	21	5	.042	0	4	15878.23	17964.072	1.067	1.067	1 H1-1b
5	M5	PIPE 2.0XX	.719	18.505	2	.165	37.439	2	38887.627	45089.82	2.395	2.395	1... H1-1b
6	M6	PIPE 2.0	.487	0	3	.032	0	3	15941.992	17964.072	1.067	1.067	1... H1-1b
7	M7	PIPE 2.0	.740	42	2	.130	42	3	15878.23	17964.072	1.067	1.067	2... H1-1b

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