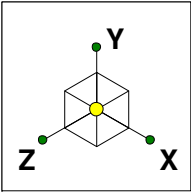


**D22—1-1/2" PIPE x 36-1/2" HIGH RAIL WITHOUT BOTTOM RAIL**

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 Carbon Steel, A501, Grade B, Fy = 36 ksi Stainless Steel, A312, Grade TP-304 or TP-316, Fy = 30 ksi</b>
Height:	<b>36.5"</b>
Anchor Post:	<b>1-1/2" <i>SPECIAL—NO SCHD</i> (1.90" OD x 0.525") Pipe</b>
Intermediate Posts:	<b>1-1/2" SCHD 40 (1.90" OD x 0.145") Pipe</b>
Top Rail at Anchor Posts:	<b>1-1/2" XXS (1.90" OD x 0.400") Pipe</b>
Top Rail Elsewhere:	<b>1-1/2" SCHD 40 (1.90" OD x 0.145") Pipe</b>
Bottom Rail:	<b>None</b>
Number of Cables:	<b>10</b>
Cable Spacing:	<b>3.15"</b>
Cable Prestress:	<b>400 lbs</b>



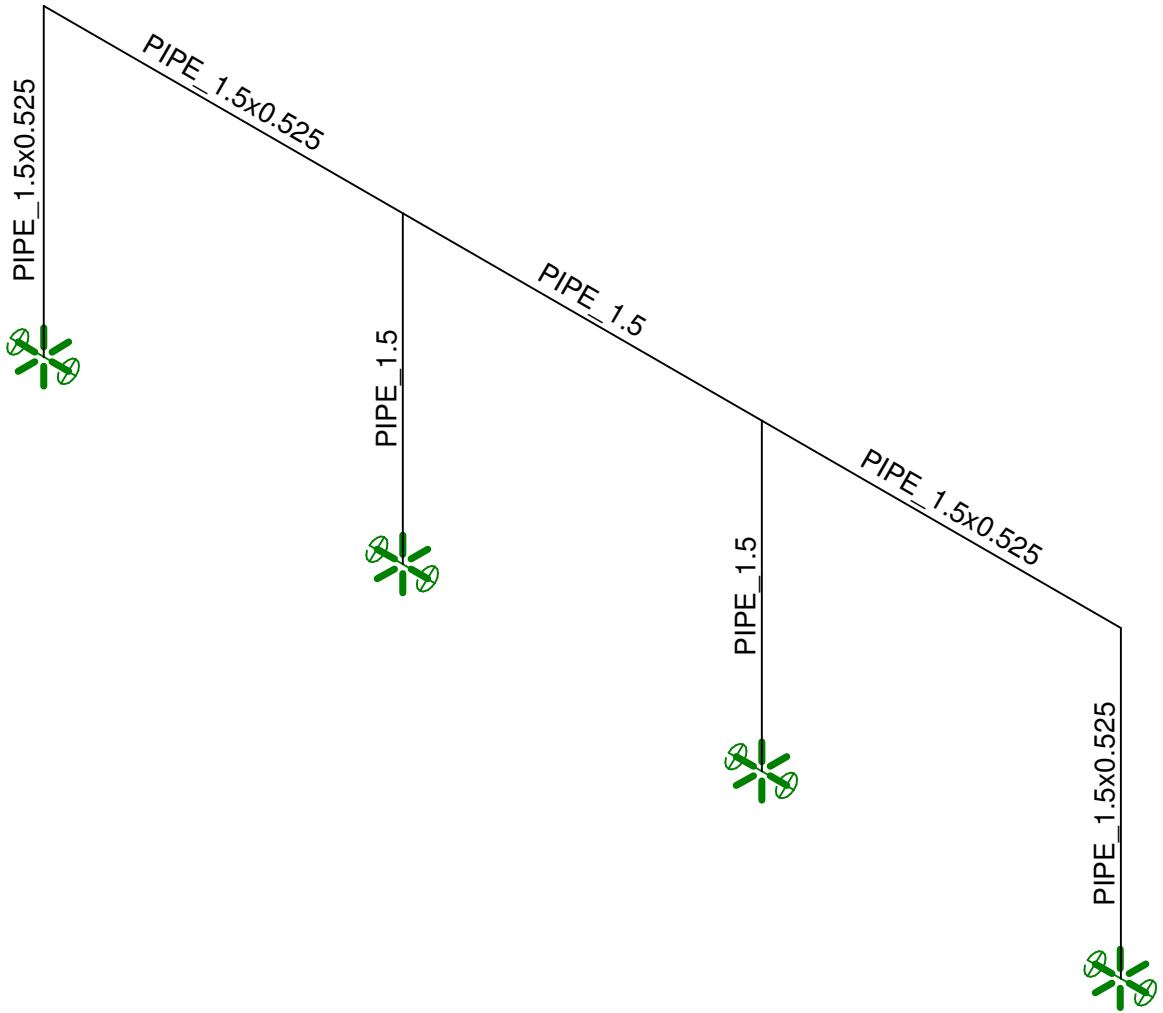
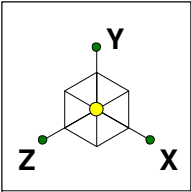
**Disclaimer:** Analysis and Structural Certification DOES NOT include base plates or anchorage to supporting structure. Where required by the Local Building Official, these shall be reviewed and designed by the project Structural Engineer of Record.



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D22 - 1.5" PIPE x 36.5" HIGH RAIL W/O BTM RAIL

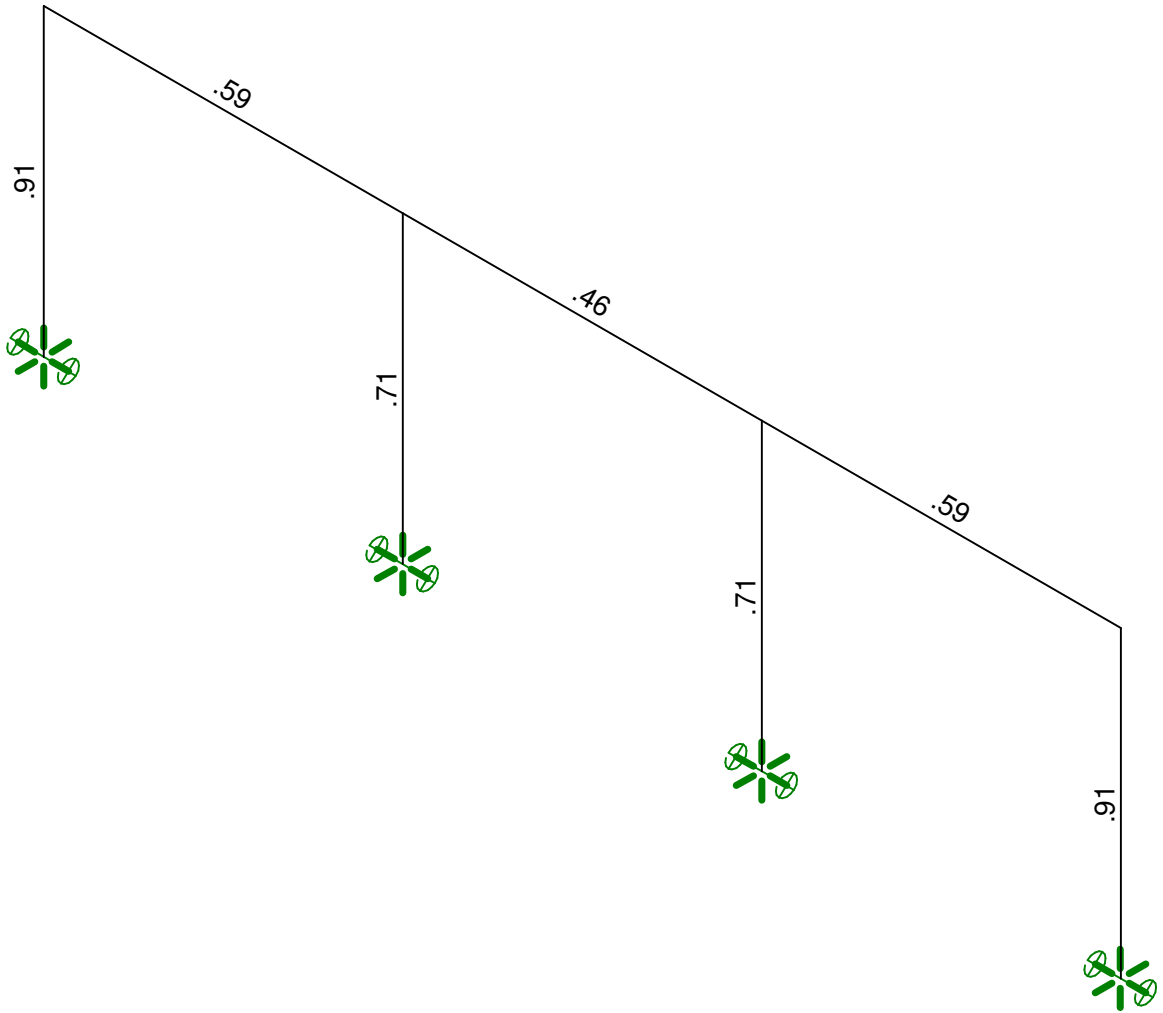
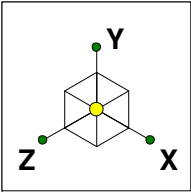
Dec 10, 2008 at 11:39 AM  
D22.r3d



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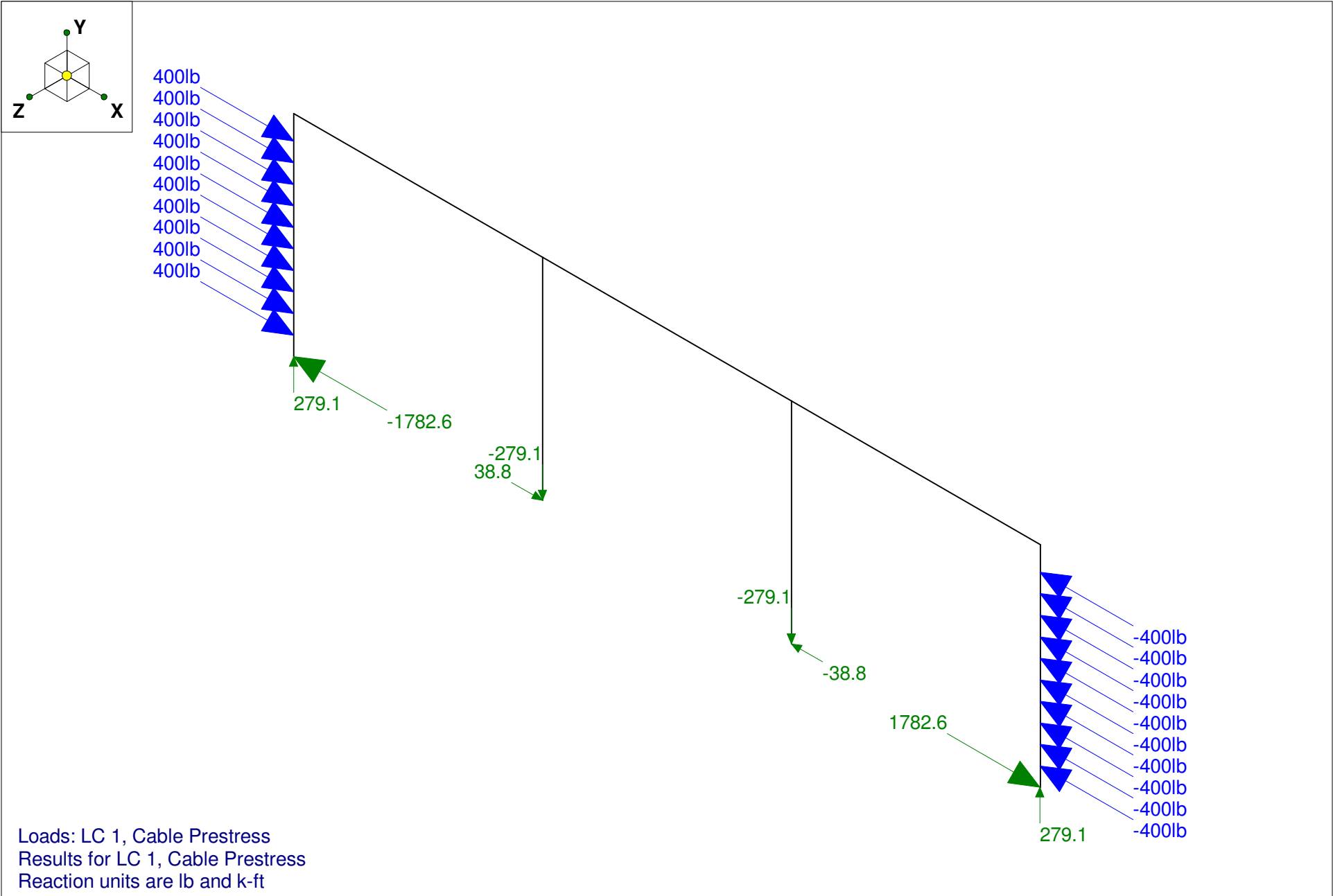
D22 - 1.5" PIPE x 36.5" HIGH RAIL W/O BTM RAIL

Dec 10, 2008 at 11:39 AM  
D22.r3d

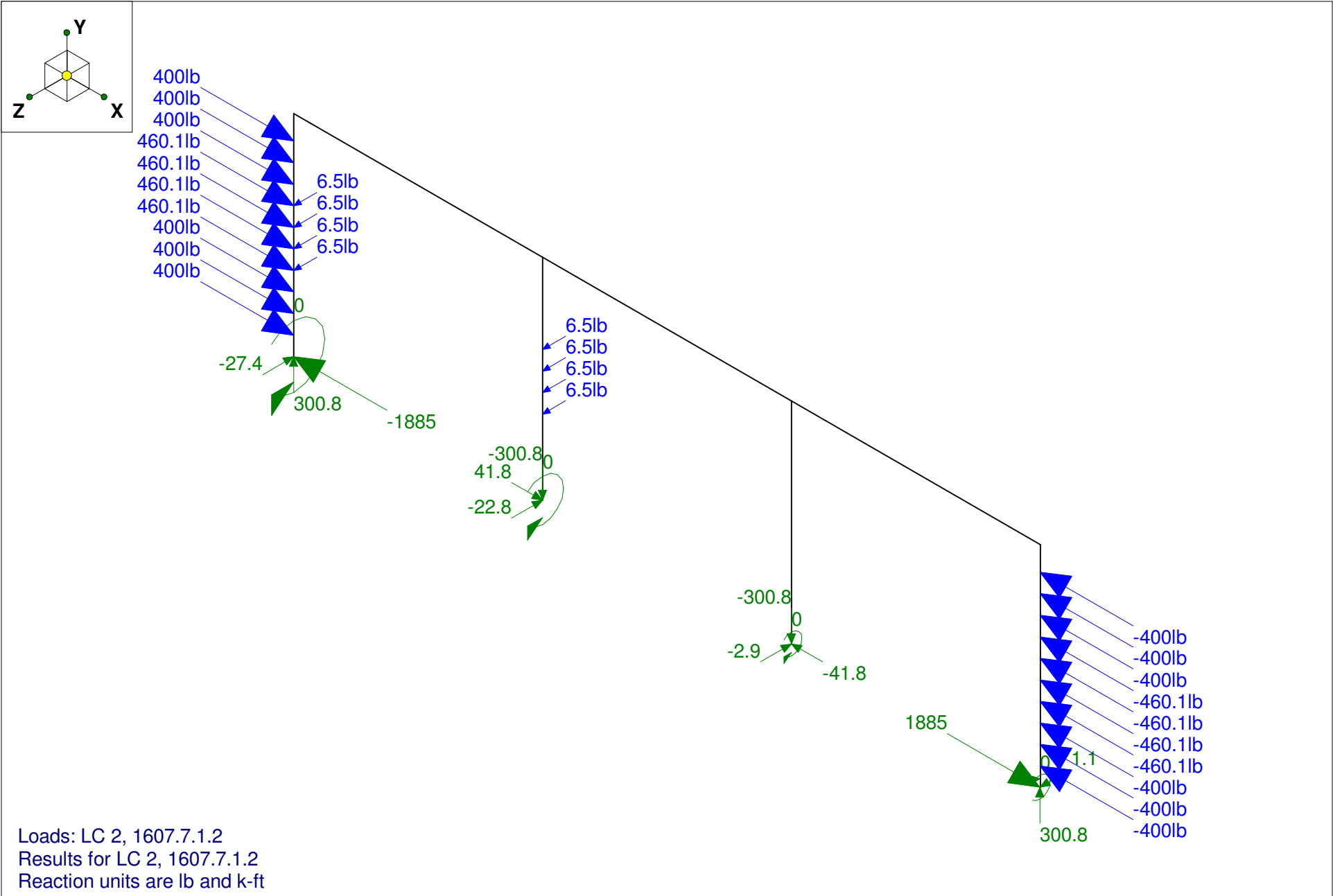


Member Code Checks Displayed  
Solution: Envelope

Ferrari Shields & Associates	D22 - 1.5" PIPE x 36.5" HIGH RAIL W/O BTM RAIL	
Dan O'Connor		Dec 10, 2008 at 11:39 AM
08196		D22.r3d



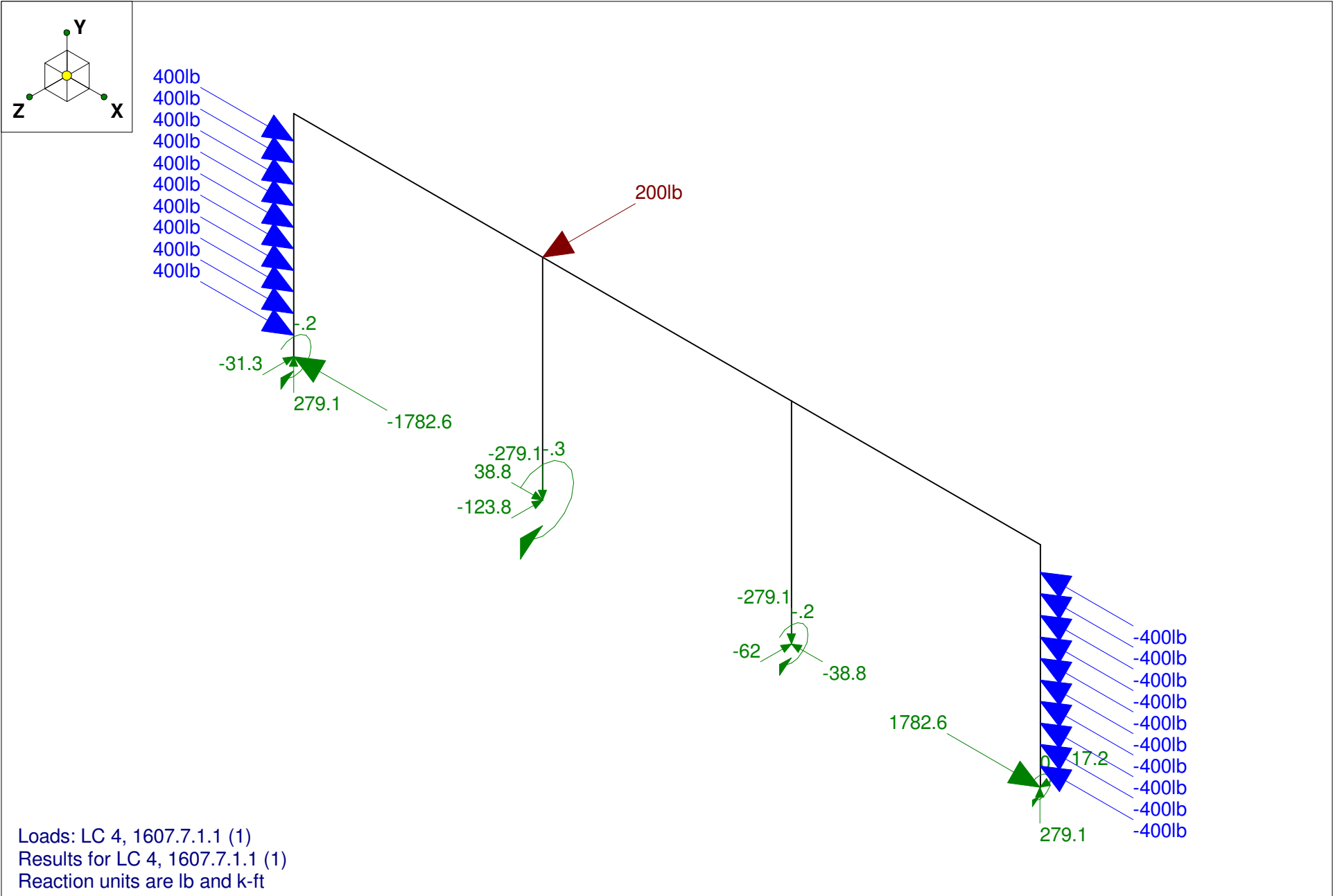
Ferrari Shields & Associates	D22 - 1.5" PIPE x 36.5" HIGH RAIL W/O BTM RAIL	
Dan O'Connor		Dec 10, 2008 at 11:41 AM
08196		D22.r3d



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	D22 - 1.5" PIPE x 36.5" HIGH RAIL W/O BTM RAIL	
Dan O'Connor		Dec 10, 2008 at 11:41 AM
08196		D22.r3d

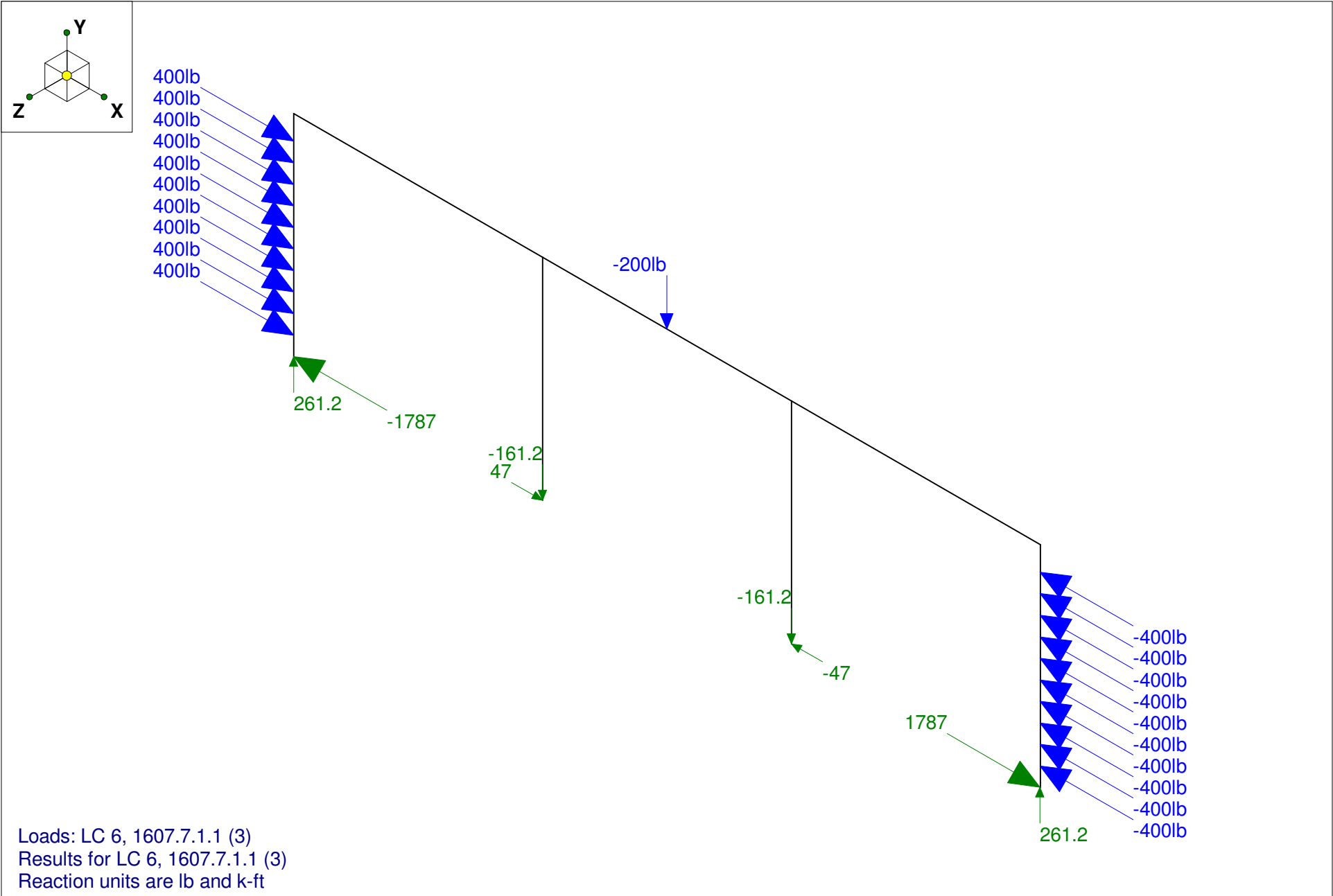




Loads: LC 4, 1607.7.1.1 (1)  
 Results for LC 4, 1607.7.1.1 (1)  
 Reaction units are lb and k-ft

Ferrari Shields & Associates	D22 - 1.5" PIPE x 36.5" HIGH RAIL W/O BTM RAIL	
Dan O'Connor		Dec 10, 2008 at 11:41 AM
08196		D22.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	D22 - 1.5" PIPE x 36.5" HIGH RAIL W/O BTM RAIL	
Dan O'Connor		Dec 10, 2008 at 11:42 AM
08196		D22.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
Parme 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 (\1E5 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 1.5	Beam	Pipe	A53GrB/A501/S...	Typical	.75	.293	.293	.586
2	ERAIL	PIPE 1.5x0.525	Beam	Pipe	A53GrB/A501/S...	Typical	2.268	.614	.614	1.228
3	IPOST	PIPE 1.5	Column	Pipe	A53GrB/A501/S...	Typical	.75	.293	.293	.586
4	EPOST	PIPE 1.5x0.525	Column	Pipe	A53GrB/A501/S...	Typical	2.268	.614	.614	1.228

**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	A53GrB/A...	Typical
2	M2	N3	N4			IPOST	Column	Pipe	A53GrB/A...	Typical
3	M3	N2	N4			ERAIL	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			IPOST	Column	Pipe	A53GrB/A...	Typical
7	M7	N8	N6			ERAIL	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	-1782.611	4	300.799	2	9.873	5	0	1	0	1	0	1
2		min	-1884.981	2	261.246	6	-82.368	3	-.342	3	0	1	0	1
3	N3	max	47.028	6	-161.246	6	0	1	0	1	0	1	0	1
4		min	38.79	1	-300.799	2	-180.132	3	-.44	3	0	1	0	1
5	N5	max	1884.981	2	300.799	2	17.169	4	0	2	0	1	0	1
6		min	1782.611	4	261.246	6	-82.368	3	-.342	3	0	1	0	1
7	N7	max	-38.79	1	-161.246	6	0	1	0	1	0	1	0	1
8		min	-47.028	6	-300.799	2	-180.132	3	-.44	3	0	1	0	1
9	Totals:	max	0	4	200	6	0	1						
10		min	0	6	0	1	-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	300.799	2	1889.787	2	9.813	5	0	1	.342	3	0	1
2			min	261.246	6	1786.721	1	-82.757	3	0	1	0	1	0	1
3		2	max	300.799	2	1087.236	2	9.683	5	0	1	.281	3	-1.046	1
4			min	261.246	6	984.527	1	-83.444	3	0	1	0	1	-1.122	2
5		3	max	300.799	2	-213.954	6	9.537	5	0	1	.219	3	-1.257	1
6			min	261.246	6	-236.434	2	-83.998	3	0	1	0	1	-1.373	2
7		4	max	300.799	2	-1415.95	6	9.376	5	0	1	.156	3	-.633	1
8			min	261.246	6	-1559.104	2	-84.419	3	0	1	0	1	-.674	2
9		5	max	300.799	2	-2216.164	6	9.247	5	0	1	.094	3	.856	2
10			min	261.246	6	-2359.328	2	-84.651	3	0	1	0	2	.781	6
11	M2	1	max	-161.246	6	-38.79	1	0	1	0	1	.44	3	0	1
12			min	-300.799	2	-47.028	6	-180.132	3	0	1	0	1	0	1
13		2	max	-161.246	6	-38.79	1	0	1	0	1	.306	3	.035	6
14			min	-300.799	2	-47.028	6	-180.132	3	0	1	0	1	.029	1
15		3	max	-161.246	6	-38.79	1	0	1	0	1	.173	3	.07	6
16			min	-300.799	2	-47.028	6	-180.132	3	0	1	-.002	2	.057	1
17		4	max	-161.246	6	-38.79	1	3.201	2	0	1	.04	3	.104	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	-300.799	2	-47.028	6	-180.132	3	0	1	-.003	2	.086	1	
19	5	max	-161.246	6	-38.79	1	3.201	2	0	1	0	1	.139	6	
20		min	-300.799	2	-47.028	6	-180.132	3	0	1	-.094	3	.115	1	
21	M3	1	max	2355.419	2	300.725	2	1.307	5	0	2	0	1	.856	2
22		min	2212.993	6	261.203	6	-92.8	3	-.094	3	0	1	.781	6	
23		2	max	2355.419	2	300.725	2	1.307	5	0	2	.001	5	.593	2
24		min	2212.993	6	261.203	6	-49.05	3	-.094	3	-.062	3	.55	1	
25		3	max	2355.419	2	300.725	2	1.307	5	0	2	.002	5	.33	2
26		min	2212.993	6	261.203	6	-38.857	4	-.094	3	-.086	3	.306	1	
27		4	max	2355.419	2	300.725	2	38.45	3	0	2	.003	5	.096	6
28		min	2212.993	6	261.203	6	-38.857	4	-.094	3	-.102	4	.062	1	
29		5	max	2355.419	2	300.725	2	82.2	3	0	2	.005	5	-.133	6
30		min	2212.993	6	261.203	6	-38.857	4	-.094	3	-.136	4	-.196	2	
31	M4	1	max	2397.243	2	100	6	50.151	4	.025	4	.005	5	.006	6
32		min	2256.176	1	0	1	-100	5	0	1	-.136	4	-.072	2	
33		2	max	2397.243	2	100	6	50.151	4	.025	4	0	1	-.067	1
34		min	2256.176	1	0	1	-100	5	0	1	-.092	4	-.081	6	
35		3	max	2397.243	2	0	1	100	5	.025	4	0	1	-.067	1
36		min	2256.176	1	-100	6	0	1	0	1	-.17	5	-.169	6	
37		4	max	2397.243	2	0	1	100	5	.025	4	0	2	-.067	1
38		min	2256.176	1	-100	6	0	1	0	1	-.083	5	-.081	6	
39		5	max	2397.243	2	0	1	100	5	.025	4	.04	4	.006	6
40		min	2256.176	1	-100	6	0	1	0	1	-.019	3	-.072	2	
41	M5	1	max	300.799	2	-1786.721	1	17.156	4	0	1	.342	3	0	1
42		min	261.246	6	-1889.787	2	-82.757	3	0	1	0	2	0	1	
43		2	max	300.799	2	-984.527	1	17.111	4	0	1	.281	3	1.122	2
44		min	261.246	6	-1087.236	2	-83.444	3	0	1	0	1	1.046	1	
45		3	max	300.799	2	236.434	2	17.038	4	0	1	.219	3	1.373	2
46		min	261.246	6	213.954	6	-83.998	3	0	1	0	1	1.257	1	
47		4	max	300.799	2	1559.104	2	16.939	4	0	1	.156	3	.674	2
48		min	261.246	6	1415.95	6	-84.419	3	0	1	0	1	.633	1	
49		5	max	300.799	2	2359.328	2	16.848	4	0	1	.094	3	-.781	6
50		min	261.246	6	2216.164	6	-84.651	3	0	1	0	1	-.856	2	
51	M6	1	max	-161.246	6	47.028	6	0	1	0	1	.44	3	0	1
52		min	-300.799	2	38.79	1	-180.132	3	0	1	0	1	0	1	
53		2	max	-161.246	6	47.028	6	0	1	0	1	.306	3	-.029	1
54		min	-300.799	2	38.79	1	-180.132	3	0	1	0	1	-.035	6	
55		3	max	-161.246	6	47.028	6	0	1	0	1	.173	3	-.057	1
56		min	-300.799	2	38.79	1	-180.132	3	0	1	0	1	-.07	6	
57		4	max	-161.246	6	47.028	6	0	1	0	1	.04	3	-.086	1
58		min	-300.799	2	38.79	1	-180.132	3	0	1	0	1	-.104	6	
59		5	max	-161.246	6	47.028	6	0	1	0	1	0	1	-.115	1
60		min	-300.799	2	38.79	1	-180.132	3	0	1	-.094	3	-.139	6	
61	M7	1	max	2355.419	2	-261.203	6	0	1	.094	3	.04	4	-.133	6
62		min	2212.993	6	-300.725	2	-82.2	3	0	1	-.019	3	-.196	2	
63		2	max	2355.419	2	-261.203	6	0	1	.094	3	.03	4	.096	6
64		min	2212.993	6	-300.725	2	-38.45	3	0	1	-.071	3	.062	1	
65		3	max	2355.419	2	-261.203	6	5.3	3	.094	3	.02	4	.33	2
66		min	2212.993	6	-300.725	2	-11.293	4	0	1	-.086	3	.306	1	
67		4	max	2355.419	2	-261.203	6	49.05	3	.094	3	.01	4	.593	2
68		min	2212.993	6	-300.725	2	-11.293	4	0	1	-.062	3	.55	1	
69		5	max	2355.419	2	-261.203	6	92.8	3	.094	3	0	1	.856	2
70		min	2212.993	6	-300.725	2	-11.293	4	0	1	0	1	.781	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	LRFD E...
1	M1	PIPE_1.5x0.5...	.909	15.925	2	.193	31.849	2	33195.616	40739.59	1.558	1.558	1...	H1-1b
2	M2	PIPE 1.5	.708	0	3	.046	0	3	11690.208	13473.054	.63	.63	1...	H1-1b
3	M3	PIPE_1.5x0.5...	.588	0	2	.105	0	3	30612.475	40739.59	1.558	1.558	1...	H1-1b
4	M4	PIPE 1.5	.463	21	5	.058	0	4	11051.888	13473.054	.63	.63	1	H1-1a
5	M5	PIPE_1.5x0.5...	.909	15.925	2	.193	31.849	2	33195.616	40739.59	1.558	1.558	1...	H1-1b
6	M6	PIPE 1.5	.708	0	3	.046	0	3	11690.208	13473.054	.63	.63	1...	H1-1b
7	M7	PIPE_1.5x0.5...	.588	42	2	.105	42	3	30612.475	40739.59	1.558	1.558	1...	H1-1b

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