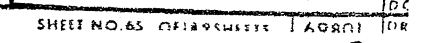


General







PROJECT MnDOT Special Structures — Assumptions / possibilities
PROJECT # 090147 DATE _____ BY jdf SHEET NO. _____ OF _____

- 1) Due to web thickness, the pier caps are non-compact reducing their capacity.
- 2) Bridge 3A, Pier 5 dimensions at the 1 1/2" plate (bottom flange) and 3/4" sloped bottom flange plate do not dimensionally work out. The profile used is conservative.
- 3) ~~At circular bearing, the design shear is 0.85r from the 1/4 of bearing.~~
- 4) Only the exterior girder system was modeled at each pier cap to determine truck, tandem, and lane reactions. The exterior girder is the longest and therefore would contribute the most load to a pier.
- 5) For CF and BR, the two trucks @ 50' spacing controls the vertical reactions at the piers. ~~these loadings are also used for the CF and BR effects.~~
- 6) $\phi_s = ?$ Use 0.85
- 7) Web stiffeners, Use smaller of stiffener width or maximum allowed stiffener width. There are some stiffeners that are wider than the code prescribes but we just used the maximum prescribed width in the calcs (potentially both conservative and not conservative).



21 West Superior Street, Suite 500
Duluth, Minnesota 55802
218 727-8446
Fax 218 727-8456
www.LHBcorp.com

250 3rd Avenue North, Suite 450
Minneapolis, Minnesota 55401
612 338-2029
Fax 612 338-2088

PROJECT MnDOT - BR69801 - File Locations
PROJECT # 090147 DATE _____ BY jdf SHEET NO. _____ OF _____

Existing Bridge drawings are downloaded and
Located under 090133



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Fax 218 727-8456
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Minneapolis, Minnesota 55401
612 338-2029
Fax 612 338-2088

PROJECT MnDOT - BR69801 - References - Pier caps.
PROJECT # 090147 DATE 11/13/09 BY jdf SHEET NO. _____ OF _____

Main Design Code:

The Manual for Bridge Evaluation
First Edition / 2008 By AASHTO, MBE-1

Also Standard Specifications for Highway
Bridges, 17th Edition - 2002, HB-17 } Not Used
once we
went to
LRFD

And AASHTO LRFD Bridge Design Specifications
Customary U.S. Units 4th Edition with
2009 Interim Revisions.



21 West Superior Street, Suite 500
Duluth, Minnesota 55802
218 727-8446
Fax 218 727-8456
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Minneapolis, Minnesota 55401
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PROJECT MnDOT - 69801 - Fixity Summary
PROJECT # 090147 DATE 11/9/09 BY jdf SHEET NO. _____ OF _____

Beams to
Pier Cap

Pier Cap to
Pier

3E-P2

Pinned.

Pinned.

3A-P4

Partial Fixity
Interior beams
pinned
Exterior beams 31%
of LL moment
due to Truck
(longitudinal).

Partial Fixity.
62% of LL moment
due to truck,
(longitudinal)

3A-P5

Pinned

Pinned in longitudinal
direction
Fixed in transverse
direction.

3A-P6

Pinned

Pinned

Girder 1 Service Vertical Reactions - k - Girder F for 3A

Use for
Girder
Dead Loads.

From MDX
output

Supp/Node		Noncomp Dead	Super- Imposed Dead	Max Live+ Impact	Min Live+ Impact	Sidewalk Max	Min
Governing							
1	1	22.43	9.35	46.12	-8.13	0.00	0.00
	Steel	3.71					
	Concrete	18.72					
Global x concurrent LL+I rot.				0.0000	0.0000 deg		
Global y concurrent LL+I rot.				0.0000	0.0000 deg		
2	13	82.56	31.35	64.07	-9.17	0.00	0.00
	Steel	14.17					
	Concrete	68.39					
Global x concurrent LL+I rot.				0.0000	0.0000 deg		
Global y concurrent LL+I rot.				0.0000	0.0000 deg		
3	28	80.84	30.97	64.24	-9.36	0.00	0.00
	Steel	13.97					
	Concrete	66.87					
Global x concurrent LL+I rot.				0.0000	0.0000 deg		
Global y concurrent LL+I rot.				0.0000	0.0000 deg		
4	45	128.46	49.82	109.21	-17.40	0.00	0.00
	Steel	21.94					
	Concrete	106.53					
Global x concurrent LL+I rot.				0.0000	0.0000 deg		
Global y concurrent LL+I rot.				0.0000	0.0000 deg		
5	160	271.02	90.22	121.24	-11.32	0.00	0.00
	Steel	53.13					
	Concrete	217.90					
Global x concurrent LL+I rot.				0.0000	0.0000 deg		
Global y concurrent LL+I rot.				0.0000	0.0000 deg		
6	265	226.91	77.26	111.64	-11.32	0.00	0.00
	Steel	44.43					
	Concrete	182.48					
Global x concurrent LL+I rot.				0.0000	0.0000 deg		
Global y concurrent LL+I rot.				0.0000	0.0000 deg		
7	314	105.66	39.34	76.24	-16.55	0.00	0.00
	Steel	13.80					
	Concrete	91.86					
Global x concurrent LL+I rot.				0.0000	0.0000 deg		
Global y concurrent LL+I rot.				0.0000	0.0000 deg		
8	349	68.36	20.59	75.16	-22.88	0.00	0.00
	Steel	10.05					
	Concrete	58.30					
Global x concurrent LL+I rot.				0.0000	0.0000 deg		

Global y concurrent LL+I rot. 0.0000 0.0000 deg
 9 400 107.97 21.37 81.82 -19.15 0.00 0.00 ← P6-3A
 Steel 22.06
 Concrete 85.91

Global x concurrent LL+I rot. 0.0000 0.0000 deg
 Global y concurrent LL+I rot. 0.0000 0.0000 deg
 10 445 71.74 20.58 70.85 -13.98 0.00 0.00 ← P5-3A
 Steel 13.76
 Concrete 57.98

Global x concurrent LL+I rot. 0.0000 0.0000 deg
 Global y concurrent LL+I rot. 0.0000 0.0000 deg
 11 486 77.79 24.05 64.86 -9.56 0.00 0.00 ← P4-3A
 Steel 15.18
 Concrete 62.61

Global x concurrent LL+I rot. 0.0000 0.0000 deg
 Global y concurrent LL+I rot. 0.0000 0.0000 deg
 12 514 67.03 28.03 79.17 -12.32 0.00 0.00
 Steel 10.11
 Concrete 56.93

Global x concurrent LL+I rot. 0.0000 0.0000 deg
 Global y concurrent LL+I rot. 0.0000 0.0000 deg
 13 535 62.07 24.74 62.82 -14.31 0.00 0.00
 Steel 7.67
 Concrete 54.39

Global x concurrent LL+I rot. 0.0000 0.0000 deg
 Global y concurrent LL+I rot. 0.0000 0.0000 deg
 14 547 58.45 24.02 66.90 -11.18 0.00 0.00
 Steel 8.33
 Concrete 50.11

Global x concurrent LL+I rot. 0.0000 0.0000 deg
 Global y concurrent LL+I rot. 0.0000 0.0000 deg
 15 567 26.88 10.59 45.61 -2.92 0.00 0.00
 Steel 4.22
 Concrete 22.66

Global x concurrent LL+I rot. 0.0000 0.0000 deg
 Global y concurrent LL+I rot. 0.0000 0.0000 deg

Truck Loading

1	1	46.12	0.00
2	13	63.56	0.00
3	28	63.57	0.00
4	45	98.83	0.00
5	160	76.46	0.00
6	265	76.90	0.00
7	314	73.85	0.00
8	349	74.09	0.00
9	400	72.81	0.00
10	445	69.35	0.00
11	486	64.17	0.00
12	514	78.76	0.00
13	535	62.68	0.00
14	547	66.90	0.00
15	567	45.61	0.00

Lane Loading

1	1	34.21	-6.55
2	13	63.72	-8.03
3	28	64.24	-8.84
4	45	102.87	-16.86
5	160	121.17	-10.57
6	265	111.46	-11.30
7	314	76.19	-16.33
8	349	74.27	-21.45
9	400	81.51	-17.33
10	445	69.74	-13.01
11	486	62.93	-9.08
12	514	69.45	-11.72
13	535	59.03	-13.03
14	547	59.95	-8.80
15	567	33.04	-2.25

Fatigue Truck

1	1	30.46	-5.01
2	13	46.05	-6.17
3	28	45.91	-6.22
4	45	71.15	-10.14
5	160	58.60	-7.12
6	265	58.88	-6.66
7	314	53.71	-10.94
8	349	53.29	-14.08
9	400	53.42	-13.04
10	445	48.85	-8.80
11	486	44.76	-6.39
12	514	55.05	-8.42
13	535	44.65	-9.53
14	547	45.31	-7.50
15	567	29.70	-1.94

Support Rotations - Degrees

About global axes used in Girder Geometry table

Supp/Node		Noncomp		Dead		Superimp		Dead		LL+I+SDWK Range	
		x-axis	y-axis	x-axis	y-axis	x-axis	y-axis	x-axis	y-axis	x-axis	y-axis
1	1	-0.06	0.09	-0.02	0.03	(0.00 to	0.00)	(0.00 to	0.00)	(0.00 to	0.00)
		Concurrent	live	vertical	reaction	0.00	0.00	0.00	0.00	0.00	0.00
2	13	0.01	0.01	0.00	0.01	(0.00 to	0.00)	(0.00 to	0.00)	(0.00 to	0.00)
		Concurrent	live	vertical	reaction	0.00	0.00	0.00	0.00	0.00	0.00
3	28	0.02	0.00	0.01	0.00	(0.00 to	0.00)	(0.00 to	0.00)	(0.00 to	0.00)
		Concurrent	live	vertical	reaction	0.00	0.00	0.00	0.00	0.00	0.00
4	45	-0.02	0.08	-0.01	0.02	(0.00 to	0.00)	(0.00 to	0.00)	(0.00 to	0.00)
		Concurrent	live	vertical	reaction	0.00	0.00	0.00	0.00	0.00	0.00
5	160	-0.01	0.04	0.00	0.02	(0.00 to	0.00)	(0.00 to	0.00)	(0.00 to	0.00)
		Concurrent	live	vertical	reaction	0.00	0.00	0.00	0.00	0.00	0.00
6	265	0.01	-0.07	0.00	-0.02	(0.00 to	0.00)	(0.00 to	0.00)	(0.00 to	0.00)
		Concurrent	live	vertical	reaction	0.00	0.00	0.00	0.00	0.00	0.00
7	314	0.00	0.03	0.00	0.01	(0.00 to	0.00)	(0.00 to	0.00)	(0.00 to	0.00)
		Concurrent	live	vertical	reaction	0.00	0.00	0.00	0.00	0.00	0.00
8	349	0.02	0.12	0.00	0.01	(0.00 to	0.00)	(0.00 to	0.00)	(0.00 to	0.00)
		Concurrent	live	vertical	reaction	0.00	0.00	0.00	0.00	0.00	0.00
9	400	0.00	-0.01	0.00	0.00	(0.00 to	0.00)	(0.00 to	0.00)	(0.00 to	0.00)
		Concurrent	live	vertical	reaction	0.00	0.00	0.00	0.00	0.00	0.00
10	445	-0.02	-0.06	0.00	-0.01	(0.00 to	0.00)	(0.00 to	0.00)	(0.00 to	0.00)
		Concurrent	live	vertical	reaction	0.00	0.00	0.00	0.00	0.00	0.00
11	486	-0.01	-0.04	0.00	0.00	(0.00 to	0.00)	(0.00 to	0.00)	(0.00 to	0.00)
		Concurrent	live	vertical	reaction	0.00	0.00	0.00	0.00	0.00	0.00
12	514	0.03	0.02	0.01	0.00	(0.00 to	0.00)	(0.00 to	0.00)	(0.00 to	0.00)
		Concurrent	live	vertical	reaction	0.00	0.00	0.00	0.00	0.00	0.00

13 535	0.00	-0.04	0.00	-0.01	(0.00 to 0.00)	(0.00 to 0.00)
	Concurrent live vertical reaction				0.00	0.00
14 547	0.01	0.01	0.00	0.00	(0.00 to 0.00)	(0.00 to 0.00)
	Concurrent live vertical reaction				0.00	0.00
15 567	-0.11	-0.11	-0.03	-0.02	(0.00 to 0.00)	(0.00 to 0.00)
	Concurrent live vertical reaction				0.00	0.00

✓CSM
4/23/0

Noncomp dead end reactions do not include weight of girder extensions.

Torsional and flexural rotations - member local axes

Supp/Node	Noncomp tors	Dead flex	Superimp tors	Dead flex	LL+I+SDWK Range tors flex
1 1	-0.10	0.04	-0.03	0.01	(0.00 to 0.00) (0.00 to 0.00)
2 13	0.00	0.02	0.00	0.01	(0.00 to 0.00) (0.00 to 0.00)
3 28	0.02	0.00	0.01	0.00	(0.00 to 0.00) (0.00 to 0.00)
4 45	-0.05	0.06	-0.01	0.02	(0.00 to 0.00) (0.00 to 0.00)
5 160	-0.02	0.04	-0.01	0.01	(0.00 to 0.00) (0.00 to 0.00)
6 265	0.01	-0.07	0.00	-0.02	(0.00 to 0.00) (0.00 to 0.00)
7 314	0.00	0.03	0.00	0.01	(0.00 to 0.00) (0.00 to 0.00)
8 349	0.02	0.12	0.00	0.01	(0.00 to 0.00) (0.00 to 0.00)
9 400	0.00	-0.01	0.00	0.00	(0.00 to 0.00) (0.00 to 0.00)
10 445	-0.02	-0.06	0.00	-0.01	(0.00 to 0.00) (0.00 to 0.00)
11 486	-0.03	-0.04	0.00	0.00	(0.00 to 0.00) (0.00 to 0.00)
12 514	0.04	0.00	0.01	-0.01	(0.00 to 0.00) (0.00 to 0.00)
13 535	-0.02	-0.03	0.00	-0.01	(0.00 to 0.00) (0.00 to 0.00)
14 547	0.02	0.00	0.00	0.00	(0.00 to 0.00) (0.00 to 0.00)
15 567	-0.14	0.07	-0.03	0.02	(0.00 to 0.00) (0.00 to 0.00)

← P4-3A
✓

Noncomp dead end reactions do not include weight of girder extensions.

Girder 2 Service Vertical Reactions - k

Supp/Node	Noncomp Dead	Super- Imposed Dead	Max Live+ Impact	Min Live+ Impact	Sidewalk Max	Min
-----------	-----------------	---------------------------	------------------------	------------------------	-----------------	-----

Governing

1	2	24.12	9.73	46.62	-5.16	0.00	0.00
	Steel	4.22					
	Concrete	19.90					

Global x concurrent LL+I rot. 0.0000 0.0000 deg
Global y concurrent LL+I rot. 0.0000 0.0000 deg

2	14	85.69	32.47	69.59	-5.52	0.00	0.00
	Steel	15.04					
	Concrete	70.65					

Global x concurrent LL+I rot. 0.0000 0.0000 deg
Global y concurrent LL+I rot. 0.0000 0.0000 deg

3	29	83.32	31.64	69.35	-5.66	0.00	0.00
	Steel	14.71					
	Concrete	68.61					

Global x concurrent LL+I rot. 0.0000 0.0000 deg
Global y concurrent LL+I rot. 0.0000 0.0000 deg

Truck Loading

1	2	46.62	0.00
2	14	68.14	0.00
3	29	68.13	0.00

Lane Loading

1	2	34.09	-4.25
2	14	65.49	-4.39
3	29	65.22	-4.93

Fatigue Truck

1	2	60.36	-8.65
2	14	93.73	-9.86
3	29	93.44	-9.89

Support Rotations - Degrees

About global axes used in Girder Geometry table

Supp/Node	Noncomp x-axis	Dead y-axis	Superimp x-axis	Dead y-axis	LL+I+SDWK x-axis	Range y-axis
1 2	-0.07	0.10	-0.02	0.03	(0.00 to 0.00)	(0.00 to 0.00)
	Concurrent live vertical reaction				0.00	0.00 0.00 0.00
2 14	0.00	0.00	0.00	0.01	(0.00 to 0.00)	(0.00 to 0.00)
	Concurrent live vertical reaction				0.00	0.00 0.00 0.00
3 29	0.01	-0.01	0.00	-0.01	(0.00 to 0.00)	(0.00 to 0.00)
	Concurrent live vertical reaction				0.00	0.00 0.00 0.00

Noncomp dead end reactions do not include weight of girder extensions.

Torsional and flexural rotations - member local axes

Supp/Node		Noncomp tors	Dead flex	Superimp tors	Dead flex	LL+I+SDWK tors	Range flex
1	2	-0.11	0.05	-0.03	0.01	(0.00 to 0.00)	(0.00 to 0.00)
2	14	0.00	0.00	-0.01	0.00	(0.00 to 0.00)	(0.00 to 0.00)
3	29	0.01	-0.01	0.01	-0.01	(0.00 to 0.00)	(0.00 to 0.00)

Noncomp dead end reactions do not include weight of girder extensions.

✓CJM 4/23/10

Girder 3 Service Vertical Reactions - k — Girder E for 3A

Supp/Node	Noncomp Dead	Super- Imposed Dead	Max Live+ Impact	Min Live+ Impact	Sidewalk Max Min	
-----------	-----------------	---------------------------	------------------------	------------------------	---------------------	--

Governing

1	354	68.50	20.06	104.79	-20.53	0.00	0.00
	Steel	10.29					
	Concrete	58.21					

Global x concurrent LL+I rot. 0.0000 0.0000 deg
Global y concurrent LL+I rot. 0.0000 0.0000 deg

2	401	112.81	20.86	98.35	-14.93	0.00	0.00
	Steel	25.65					
	Concrete	87.15					

← P6-3A ✓

Global x concurrent LL+I rot. 0.0000 0.0000 deg
Global y concurrent LL+I rot. 0.0000 0.0000 deg

3	446	93.64	26.09	109.70	-20.32	0.00	0.00
	Steel	19.99					
	Concrete	73.65					

← P5-3A ✓

Global x concurrent LL+I rot. 0.0000 0.0000 deg
Global y concurrent LL+I rot. 0.0000 0.0000 deg

4	490	69.60	23.34	76.53	-4.12	0.00	0.00
	Steel	16.69					
	Concrete	52.91					

← P4-3A ✓

Global x concurrent LL+I rot. 0.0000 0.0000 deg
Global y concurrent LL+I rot. 0.0000 0.0000 deg

Truck Loading

1	354	103.44	0.00
2	401	96.60	0.00
3	446	108.90	0.00
4	490	76.34	0.00

Lane Loading

1	354	88.77	-18.47
2	401	96.71	-13.35
3	446	104.10	-19.01
4	490	68.66	-3.85

Fatigue Truck

1	354	163.11	-22.52
2	401	163.26	-20.21
3	446	861.13	-125.90
4	490	109.05	-9.90

Support Rotations - Degrees

About global axes used in Girder Geometry table

Supp/Node	Noncomp x-axis	Dead y-axis	Superimp x-axis	Dead y-axis	LL+I+SDWK x-axis	Range y-axis
-----------	-------------------	----------------	--------------------	----------------	---------------------	-----------------

✓CSM
4/23/10

2 354	0.00	-0.02	0.00	0.00	(0.00 to 0.00)	(0.00 to 0.00)
	Concurrent	live	vertical	reaction	0.00	0.00
3 401	-0.02	-0.06	0.00	-0.01	(0.00 to 0.00)	(0.00 to 0.00)
	Concurrent	live	vertical	reaction	0.00	0.00
4 446	-0.02	-0.04	0.00	-0.01	(0.00 to 0.00)	(0.00 to 0.00)
	Concurrent	live	vertical	reaction	0.00	0.00

Noncomp dead end reactions do not include weight of girder extensions.

Torsional and flexural rotations - member local axes

Supp/Node	Noncomp tors	Dead flex	Superimp tors	Dead flex	LL+I+SDWK Range tors	flex
2 354	0.00	-0.02	0.00	0.00	(0.00 to 0.00)	(0.00 to 0.00)
3 401	-0.02	-0.06	-0.01	-0.01	(0.00 to 0.00)	(0.00 to 0.00)
4 446	-0.03	-0.03	0.00	0.00	(0.00 to 0.00)	(0.00 to 0.00)

← P4-3A ✓

Noncomp dead end reactions do not include weight of girder extensions.

Girder 4 Service Vertical Reactions - k

Supp/Node	Noncomp Dead	Super- Imposed Dead	Max Live+ Impact	Min Live+ Impact	Sidewalk Max	Min
-----------	-----------------	---------------------------	------------------------	------------------------	-----------------	-----

Governing

1	5	24.31	10.10	48.36	-9.12	0.00	0.00
	Steel	4.12					
	Concrete	20.19					
Global x concurrent LL+I rot. 0.0000 0.0000 deg							
Global y concurrent LL+I rot. 0.0000 0.0000 deg							
2	15	82.98	32.35	65.79	-10.05	0.00	0.00
	Steel	13.89					
	Concrete	69.09					
Global x concurrent LL+I rot. 0.0000 0.0000 deg							
Global y concurrent LL+I rot. 0.0000 0.0000 deg							
3	30	80.85	31.79	65.66	-10.20	0.00	0.00
	Steel	13.45					
	Concrete	67.39					
Global x concurrent LL+I rot. 0.0000 0.0000 deg							
Global y concurrent LL+I rot. 0.0000 0.0000 deg							
4	46	135.51	52.96	111.57	-18.39	0.00	0.00
	Steel	22.61					
	Concrete	112.90					
Global x concurrent LL+I rot. 0.0000 0.0000 deg							
Global y concurrent LL+I rot. 0.0000 0.0000 deg							
5	166	263.47	90.55	124.67	-13.91	0.00	0.00
	Steel	51.69					
	Concrete	211.78					
Global x concurrent LL+I rot. 0.0000 0.0000 deg							
Global y concurrent LL+I rot. 0.0000 0.0000 deg							
6	267	222.80	78.20	116.35	-14.52	0.00	0.00
	Steel	41.41					
	Concrete	181.39					
Global x concurrent LL+I rot. 0.0000 0.0000 deg							
Global y concurrent LL+I rot. 0.0000 0.0000 deg							
7	318	101.69	38.92	78.59	-20.81	0.00	0.00
	Steel	11.55					
	Concrete	90.13					
Global x concurrent LL+I rot. 0.0000 0.0000 deg							
Global y concurrent LL+I rot. 0.0000 0.0000 deg							
8	357	67.06	21.55	87.25	-17.51	0.00	0.00
	Steel	10.27					
	Concrete	56.79					
Global x concurrent LL+I rot. 0.0000 0.0000 deg							

✓ CSM 4/23/10

Global y concurrent LL+I rot. 0.0000 0.0000 deg
 9 402 74.65 20.18 127.68 -33.64 0.00 0.00
 Steel 22.56
 Concrete 52.09

← P6-3A
 ✓

Global x concurrent LL+I rot. 0.0000 0.0000 deg
 Global y concurrent LL+I rot. 0.0000 0.0000 deg
 10 447 -10.74 -0.16 36.87 -18.78 0.00 0.00
 Steel -0.41
 Concrete -10.33

← P5-3A
 ✓

Global x concurrent LL+I rot. 0.0000 0.0000 deg
 Global y concurrent LL+I rot. 0.0000 0.0000 deg

Truck Loading

1	5	48.36	0.00
2	15	63.89	0.00
3	30	63.71	0.00
4	46	98.35	0.00
5	166	76.99	0.00
6	267	78.47	0.00
7	318	74.33	0.00
8	357	86.98	0.00
9	402	127.47	0.00
10	447	36.81	0.00

Lane Loading

1	5	36.30	-7.46
2	15	65.62	-8.72
3	30	65.66	-9.43
4	46	105.83	-17.82
5	166	124.58	-13.01
6	267	115.98	-14.46
7	318	78.51	-20.43
8	357	79.86	-16.50
9	402	112.56	-31.61
10	447	29.54	-15.11

Fatigue Truck

1	5	92.59	-14.51
2	15	209.79	-29.30
3	30	209.66	-27.02
4	46	933.27	-136.13
5	166	168.06	-18.19
6	267	707.54	-82.21
7	318	107.56	-24.46
8	357	114.93	-25.79
9	402	144.15	-35.60
10	447	72.34	-21.42

Support Rotations - Degrees

About global axes used in Girder Geometry table

Supp/Node	Noncomp	Dead	Superimp	Dead	LL+I+SDWK	Range
	x-axis	y-axis	x-axis	y-axis	x-axis	y-axis
1 5	-0.07	0.10	-0.02	0.03	(0.00 to 0.00)	(0.00 to 0.00)
	Concurrent	live	vertical	reaction	0.00	0.00
2 15	0.01	0.01	0.00	0.01	(0.00 to 0.00)	(0.00 to 0.00)
	Concurrent	live	vertical	reaction	0.00	0.00
3 30	0.02	-0.01	0.01	-0.01	(0.00 to 0.00)	(0.00 to 0.00)
	Concurrent	live	vertical	reaction	0.00	0.00
4 46	-0.03	0.09	-0.01	0.02	(0.00 to 0.00)	(0.00 to 0.00)
	Concurrent	live	vertical	reaction	0.00	0.00

5	166	-0.01	0.04	0.00	0.01	(0.00 to 0.00)	(0.00 to 0.00)
		Concurrent live vertical reaction				0.00	0.00
6	267	0.01	-0.07	0.00	-0.02	(0.00 to 0.00)	(0.00 to 0.00)
		Concurrent live vertical reaction				0.00	0.00
7	318	0.00	0.03	0.00	0.01	(0.00 to 0.00)	(0.00 to 0.00)
		Concurrent live vertical reaction				0.00	0.00
8	357	0.01	0.11	0.00	0.01	(0.00 to 0.00)	(0.00 to 0.00)
		Concurrent live vertical reaction				0.00	0.00
9	402	0.00	-0.03	0.00	0.00	(0.00 to 0.00)	(0.00 to 0.00)
		Concurrent live vertical reaction				0.00	0.00
10	447	-0.02	-0.09	-0.01	-0.02	(0.00 to 0.00)	(0.00 to 0.00)
		Concurrent live vertical reaction				0.00	0.00

Noncomp dead end reactions do not include weight of girder extensions.

Torsional and flexural rotations - member local axes

Supp/Node	Noncomp tors	Dead flex	Superimp tors	Dead flex	LL+I+SDWK tors	Range flex
1 5	-0.12	0.05	-0.03	0.01	(0.00 to 0.00)	(0.00 to 0.00)
2 15	0.01	0.02	0.00	0.01	(0.00 to 0.00)	(0.00 to 0.00)
3 30	0.02	0.00	0.01	0.00	(0.00 to 0.00)	(0.00 to 0.00)
4 46	-0.06	0.08	-0.01	0.02	(0.00 to 0.00)	(0.00 to 0.00)
5 166	-0.01	0.03	-0.01	0.01	(0.00 to 0.00)	(0.00 to 0.00)
6 267	0.01	-0.07	0.00	-0.02	(0.00 to 0.00)	(0.00 to 0.00)
7 318	0.00	0.03	0.00	0.01	(0.00 to 0.00)	(0.00 to 0.00)
8 357	0.02	0.11	0.00	0.01	(0.00 to 0.00)	(0.00 to 0.00)
9 402	-0.01	-0.03	0.00	0.00	(0.00 to 0.00)	(0.00 to 0.00)
10 447	-0.04	-0.08	-0.01	-0.02	(0.00 to 0.00)	(0.00 to 0.00)

Noncomp dead end reactions do not include weight of girder extensions.

- Girder C for 3A
- Girder F for 3E

Girder 5 Service Vertical Reactions - k

✓CSM
4/23/10

Supp/Node	Noncomp Dead	Super- Imposed Dead	Max Live+ Impact	Min Live+ Impact	Sidewalk Max	Min
Governing						
1 175	12.51	7.89	40.66	-7.68	0.00	0.00
Steel	2.40					
Concrete	10.11					
Global x concurrent LL+I rot. -0.0007 0.0026 deg						
Global y concurrent LL+I rot. -0.0003 -0.0001 deg						
2 128	53.01	24.68	52.33	-8.95	0.00	0.00
Steel	7.84					
Concrete	45.17					
Global x concurrent LL+I rot. 0.0005 0.0020 deg						
Global y concurrent LL+I rot. 0.0008 -0.0041 deg						
3 72	59.56	25.12	75.91	-6.95	0.00	0.00
Steel	9.04					
Concrete	50.52					
Global x concurrent LL+I rot. -0.0004 -0.0022 deg						
Global y concurrent LL+I rot. 0.0014 -0.0015 deg						
4 53	49.16	20.29	57.56	-14.60	0.00	0.00
Steel	9.42					
Concrete	39.74					
Global x concurrent LL+I rot. 0.0015 -0.0022 deg						
Global y concurrent LL+I rot. 0.0013 0.0020 deg						
5 90	61.13	17.20	69.18	-19.30	0.00	0.00
Steel	13.27					
Concrete	47.86					
Global x concurrent LL+I rot. 0.0003 -0.0006 deg						
Global y concurrent LL+I rot. -0.0016 0.0027 deg						
6 161	55.66	19.79	59.76	-13.24	0.00	0.00
Steel	9.65					
Concrete	46.01					
Global x concurrent LL+I rot. -0.0002 -0.0001 deg						
Global y concurrent LL+I rot. -0.0014 0.0012 deg						
7 219	77.23	33.07	69.43	-13.71	0.00	0.00
Steel	10.95					
Concrete	66.29					
Global x concurrent LL+I rot. 0.0000 0.0000 deg						
Global y concurrent LL+I rot. -0.0001 0.0001 deg						
8 263	95.93	37.99	78.87	-13.18	0.00	0.00
Steel	14.64					
Concrete	81.29					
Global x concurrent LL+I rot. 0.0000 0.0000 deg						

← P2-3E
✓

Global y concurrent LL+I rot. 0.0000 0.0000 deg

9 313 99.36 38.62 77.54 -13.64 0.00 0.00

Steel 15.24

Concrete 84.12

VCSM
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Global x concurrent LL+I rot. 0.0000 0.0000 deg

Global y concurrent LL+I rot. 0.0000 0.0000 deg

10 360 67.36 23.22 81.98 -15.58 0.00 0.00

Steel 10.36

Concrete 56.99

Global x concurrent LL+I rot. 0.0000 0.0000 deg

Global y concurrent LL+I rot. 0.0000 0.0000 deg

11 403 90.56 16.10 159.38 -53.96 0.00 0.00

Steel 18.60

Concrete 71.96

← PG-3A
✓

Global x concurrent LL+I rot. 0.0000 0.0000 deg

Global y concurrent LL+I rot. 0.0000 0.0000 deg

Truck Loading

1	175	40.66	-1.40
2	128	52.33	-2.23
3	72	75.91	-2.24
4	53	56.82	-1.32
5	90	68.68	-1.30
6	161	59.24	-0.27
7	219	64.94	-0.02
8	263	68.30	-0.01
9	313	68.45	0.00
10	360	81.48	0.00
11	403	159.38	0.00

Lane Loading

1	175	29.38	-5.80
2	128	47.50	-6.90
3	72	61.68	-6.11
4	53	57.01	-13.42
5	90	66.52	-17.05
6	161	58.33	-12.89
7	219	69.30	-13.28
8	263	78.84	-13.17
9	313	77.52	-13.08
10	360	78.51	-14.41
11	403	143.34	-51.37

Fatigue Truck

1	175	119.47	-19.32
2	128	246.50	-34.98
3	72	260.87	-31.62
4	53	974.41	-146.11
5	90	218.47	-31.48
6	161	748.64	-90.56
7	219	155.10	-34.28
8	263	165.52	-33.52
9	313	194.53	-44.83
10	360	131.41	-32.20
11	403	161.00	-44.73

Support Rotations - Degrees

About global axes used in Girder Geometry table

Supp/Node	Noncomp Dead		Superimp Dead		LL+I+SDWK Range	
	x-axis	y-axis	x-axis	y-axis	x-axis	y-axis
1 175	0.04	0.02	0.02	0.01	(0.00 to 0.00)	(0.00 to 0.00)

		Concurrent live vertical reaction	0.54	-0.67	0.51	0.02	
2	128	0.00	0.02	0.00	0.01	(0.00 to 0.00)	(0.00 to 0.00)
		Concurrent live vertical reaction	-0.62	-1.32	-1.22	-0.74	
3	72	-0.02	0.00	-0.01	0.00	(-0.01 to 0.00)	(0.00 to 0.00)
		Concurrent live vertical reaction	-1.28	-1.18	-1.07	-1.37	
4	53	0.03	0.08	0.01	0.03	(0.00 to 0.00)	(-0.01 to 0.00)
		Concurrent live vertical reaction	-0.81	-0.42	-0.42	-0.81	
5	90	0.00	0.02	0.00	-0.01	(0.00 to 0.00)	(0.00 to 0.00)
		Concurrent live vertical reaction	-0.74	0.71	0.71	-0.74	
6	161	-0.01	-0.10	0.00	0.00	(0.00 to 0.00)	(0.00 to 0.00)
		Concurrent live vertical reaction	0.33	0.01	0.34	-0.15	
7	219	0.00	-0.02	0.00	0.00	(0.00 to 0.00)	(0.00 to 0.00)
		Concurrent live vertical reaction	0.00	0.01	0.01	-0.01	
8	263	0.00	0.05	0.00	0.02	(0.00 to 0.00)	(0.00 to 0.00)
		Concurrent live vertical reaction	0.00	0.01	0.01	0.00	
9	313	0.01	-0.05	0.00	-0.02	(0.00 to 0.00)	(0.00 to 0.00)
		Concurrent live vertical reaction	0.00	0.00	0.00	0.00	
10	360	0.01	0.10	0.00	0.00	(0.00 to 0.00)	(0.00 to 0.00)
		Concurrent live vertical reaction	0.00	0.00	0.00	0.00	
11	403	0.00	-0.02	0.00	0.00	(0.00 to 0.00)	(0.00 to 0.00)
		Concurrent live vertical reaction	0.00	0.00	0.00	0.00	

Noncomp dead end reactions do not include weight of girder extensions.

Torsional and flexural rotations - member local axes

Supp/Node	Noncomp tors	Dead flex	Superimp tors	Dead flex	LL+I+SDWK Range tors	flex
1 175	0.04	-0.02	0.02	-0.01	(0.00 to 0.01)	(0.00 to 0.00)
2 128	0.01	0.01	0.00	0.01	(0.00 to 0.00)	(0.00 to 0.00)
3 72	-0.01	0.01	-0.01	0.00	(0.00 to 0.01)	(0.00 to 0.01)
4 53	0.06	0.06	0.02	0.02	(0.00 to 0.00)	(0.00 to 0.01)
5 90	0.01	0.02	0.00	-0.01	(0.00 to 0.00)	(0.00 to 0.01)
6 161	-0.01	-0.09	0.00	0.00	(0.00 to 0.00)	(0.00 to 0.00)
7 219	0.00	-0.02	0.00	0.00	(0.00 to 0.00)	(0.00 to 0.00)
8 263	0.00	0.05	0.00	0.02	(0.00 to 0.00)	(0.00 to 0.00)
9 313	0.00	-0.05	0.00	-0.02	(0.00 to 0.00)	(0.00 to 0.00)
10 360	0.02	0.10	0.00	0.00	(0.00 to 0.00)	(0.00 to 0.00)
11 403	-0.01	-0.02	0.00	0.00	(0.00 to 0.00)	(0.00 to 0.00)

Noncomp dead end reactions do not include weight of girder extensions.

Girder B for 3A

Girder E for 3E

✓ CSM 4/23/10

Girder 6 Service Vertical Reactions - k

Supp/Node	Noncomp Dead	Super- Imposed Dead	Max Live+ Impact	Min Live+ Impact	Sidewalk Max	Min
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Governing

1	102	94.97	21.71	100.22	-13.58	0.00	0.00
	Steel	23.71					
	Concrete	71.26					

← P2-3E
✓

Global x concurrent LL+I rot.	0.0000	0.0001 deg
Global y concurrent LL+I rot.	0.0004	-0.0018 deg

2	169	66.15	22.78	75.06	-11.66	0.00	0.00
	Steel	12.06					
	Concrete	54.08					

Global x concurrent LL+I rot.	0.0000	-0.0001 deg
Global y concurrent LL+I rot.	0.0002	0.0012 deg

3	223	81.73	34.31	70.53	-7.77	0.00	0.00
	Steel	12.42					
	Concrete	69.31					

Global x concurrent LL+I rot.	0.0000	0.0000 deg
Global y concurrent LL+I rot.	-0.0001	0.0000 deg

4	264	99.53	38.78	78.23	-6.12	0.00	0.00
	Steel	15.74					
	Concrete	83.80					

Global x concurrent LL+I rot.	0.0000	0.0000 deg
Global y concurrent LL+I rot.	0.0000	0.0000 deg

5	316	99.93	38.34	76.73	-5.45	0.00	0.00
	Steel	16.02					
	Concrete	83.91					

Global x concurrent LL+I rot.	0.0000	0.0000 deg
Global y concurrent LL+I rot.	0.0000	0.0000 deg

6	362	74.02	23.96	89.94	-15.16	0.00	0.00
	Steel	12.32					
	Concrete	61.70					

Global x concurrent LL+I rot.	0.0000	0.0000 deg
Global y concurrent LL+I rot.	0.0000	0.0000 deg

7	404	84.30	20.43	117.17	-29.18	0.00	0.00
	Steel	22.77					
	Concrete	61.53					

← P6-3A
✓

Global x concurrent LL+I rot.	0.0000	0.0000 deg
Global y concurrent LL+I rot.	0.0000	0.0000 deg

8	450	97.05	26.50	112.08	-17.82	0.00	0.00
	Steel	22.21					
	Concrete	74.84					

← P5-3A
✓

Global x concurrent LL+I rot.	0.0000	0.0000 deg
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✓ 05m 4/23/10

⇐ P4 -3A

✓

Global y concurrent LL+I rot.	0.0000	0.0000 deg	
9 491 66.62 22.66 73.19 -4.60 0.00 0.00			
Steel 16.79			
Concrete 49.83			

Global x concurrent LL+I rot.	0.0000	0.0000 deg	
Global y concurrent LL+I rot.	0.0000	0.0000 deg	
10 515 71.33 29.06 91.21 -9.97 0.00 0.00			
Steel 11.82			
Concrete 59.51			

Global x concurrent LL+I rot.	0.0000	0.0000 deg	
Global y concurrent LL+I rot.	0.0000	0.0000 deg	
11 538 64.03 25.53 66.02 -11.37 0.00 0.00			
Steel 8.34			
Concrete 55.69			

Global x concurrent LL+I rot.	0.0000	0.0000 deg	
Global y concurrent LL+I rot.	0.0000	0.0000 deg	
12 550 61.03 24.46 70.09 -9.02 0.00 0.00			
Steel 9.36			
Concrete 51.67			

Global x concurrent LL+I rot.	0.0000	0.0000 deg	
Global y concurrent LL+I rot.	0.0000	0.0000 deg	
13 569 26.80 10.60 45.58 -0.85 0.00 0.00			
Steel 4.58			
Concrete 22.22			

Global x concurrent LL+I rot.	0.0000	0.0000 deg	
Global y concurrent LL+I rot.	0.0000	0.0000 deg	

Truck Loading

1 102	98.27	-2.60
2 169	74.13	-0.67
3 223	69.44	0.00
4 264	72.86	-0.01
5 316	73.63	0.00
6 362	87.16	0.00
7 404	117.17	0.00
8 450	111.60	0.00
9 491	71.34	0.00
10 515	90.34	0.00
11 538	65.65	0.00
12 550	70.09	0.00
13 569	45.58	0.00

Lane Loading

1 102	89.70	-12.00
2 169	67.97	-10.86
3 223	67.78	-7.30
4 264	76.60	-6.11
5 316	74.62	-4.94
6 362	86.38	-14.78
7 404	106.00	-25.77
8 450	105.60	-16.83
9 491	65.00	-4.00
10 515	79.23	-9.37
11 538	60.18	-10.40
12 550	58.74	-7.04
13 569	33.23	-0.73

Fatigue Truck

1 102	314.04	-44.06
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A-23

2	169	309.70	-39.25
3	223	1023.28	-151.87
4	264	271.19	-35.13
5	316	801.48	-94.47
6	362	216.21	-43.81
7	404	251.20	-53.96
8	450	274.38	-57.18
9	491	178.99	-35.25
10	515	222.91	-51.62
11	538	651.31	-100.08
12	550	92.15	-15.39
13	569	74.23	-8.16

✓CSM
4/23/10

Support Rotations - Degrees

About global axes used in Girder Geometry table

Supp/Node	Noncomp	Dead	Superimp	Dead	LL+I+SDWK	Range
	x-axis	y-axis	x-axis	y-axis	x-axis	y-axis
2 102	0.00	-0.06	0.00	0.00	(0.00 to 0.00)	(0.00 to 0.00)
	Concurrent	live vertical	reaction		-0.36	0.26 0.14 -0.36
3 169	0.00	-0.02	0.00	0.00	(0.00 to 0.00)	(0.00 to 0.00)
	Concurrent	live vertical	reaction		0.00	0.01 0.01 0.00
4 223	0.00	0.06	0.00	0.02	(0.00 to 0.00)	(0.00 to 0.00)
	Concurrent	live vertical	reaction		0.00	0.00 0.00 0.00
5 264	0.00	-0.06	0.00	-0.02	(0.00 to 0.00)	(0.00 to 0.00)
	Concurrent	live vertical	reaction		0.00	0.00 0.00 0.00
6 316	0.01	0.10	0.00	0.00	(0.00 to 0.00)	(0.00 to 0.00)
	Concurrent	live vertical	reaction		0.00	0.00 0.00 0.00
7 362	0.00	-0.03	0.00	0.00	(0.00 to 0.00)	(0.00 to 0.00)
	Concurrent	live vertical	reaction		0.00	0.00 0.00 0.00
8 404	-0.02	-0.06	0.00	-0.02	(0.00 to 0.00)	(0.00 to 0.00)
	Concurrent	live vertical	reaction		0.00	0.00 0.00 0.00
9 450	-0.02	-0.04	0.00	-0.01	(0.00 to 0.00)	(0.00 to 0.00)
	Concurrent	live vertical	reaction		0.00	0.00 0.00 0.00
10 491	0.01	0.03	0.00	0.01	(0.00 to 0.00)	(0.00 to 0.00)
	Concurrent	live vertical	reaction		0.00	0.00 0.00 0.00
11 515	-0.02	-0.03	-0.01	-0.01	(0.00 to 0.00)	(0.00 to 0.00)
	Concurrent	live vertical	reaction		0.00	0.00 0.00 0.00
12 538	0.01	0.01	0.00	0.00	(0.00 to 0.00)	(0.00 to 0.00)
	Concurrent	live vertical	reaction		0.00	0.00 0.00 0.00
13 550	-0.11	-0.12	-0.03	-0.03	(0.00 to 0.00)	(0.00 to 0.00)
	Concurrent	live vertical	reaction		0.00	0.00 0.00 0.00

Noncomp dead end reactions do not include weight of girder extensions.

Torsional and flexural rotations - member local axes

Supp/Node	Noncomp	Dead	Superimp	Dead	LL+I+SDWK	Range
	tors	flex	tors	flex	tors	flex
2 102	-0.02	-0.06	0.00	0.00	(0.00 to 0.00)	(0.00 to 0.00)
3 169	0.00	-0.02	0.00	0.00	(0.00 to 0.00)	(0.00 to 0.00)
4 223	0.00	0.06	0.00	0.02	(0.00 to 0.00)	(0.00 to 0.00)
5 264	-0.01	-0.06	0.00	-0.02	(0.00 to 0.00)	(0.00 to 0.00)
6 316	0.02	0.10	0.00	0.00	(0.00 to 0.00)	(0.00 to 0.00)
7 362	-0.01	-0.02	0.00	0.00	(0.00 to 0.00)	(0.00 to 0.00)
8 404	-0.03	-0.06	-0.01	-0.01	(0.00 to 0.00)	(0.00 to 0.00)
9 450	-0.03	-0.04	0.00	-0.01	(0.00 to 0.00)	(0.00 to 0.00)
10 491	0.02	0.02	0.00	0.00	(0.00 to 0.00)	(0.00 to 0.00)
11 515	-0.03	-0.02	-0.01	-0.01	(0.00 to 0.00)	(0.00 to 0.00)

← P4-3A ✓

12 538	0.01	0.01	0.00	0.00	(0.00 to 0.00)	(0.00 to 0.00)
13 550	-0.16	-0.01	-0.04	0.00	(0.00 to 0.00)	(0.00 to 0.00)

Noncomp dead end reactions do not include weight of girder extensions.

Girder 7 Service Vertical Reactions - k

- Girder A for 3A
Girder D for 3E

Supp/Node	Noncomp Dead	Super- Imposed Dead	Max Live+ Impact	Min Live+ Impact	Sidewalk Max	Min
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Governing

1	63	40.23	16.42	66.53	-7.67	0.00	0.00
	Steel	7.41					
	Concrete	32.82					

Global x concurrent LL+I rot. 0.0001 -0.0002 deg
Global y concurrent LL+I rot. 0.0010 -0.0006 deg

2	110	65.60	18.36	95.28	-10.03	0.00	0.00
	Steel	16.14					
	Concrete	49.46					

Global x concurrent LL+I rot. 0.0003 -0.0001 deg
Global y concurrent LL+I rot. -0.0010 -0.0009 deg

3	176	60.72	21.15	75.76	-13.10	0.00	0.00
	Steel	11.11					
	Concrete	49.60					

Global x concurrent LL+I rot. 0.0000 -0.0001 deg
Global y concurrent LL+I rot. 0.0006 -0.0003 deg

4	225	77.76	33.00	68.32	-13.96	0.00	0.00
	Steel	11.39					
	Concrete	66.37					

Global x concurrent LL+I rot. 0.0000 0.0000 deg
Global y concurrent LL+I rot. 0.0000 0.0000 deg

5	266	96.70	38.30	78.15	-12.94	0.00	0.00
	Steel	15.22					
	Concrete	81.48					

Global x concurrent LL+I rot. 0.0000 0.0000 deg
Global y concurrent LL+I rot. 0.0000 0.0000 deg

6	320	97.52	38.18	77.78	-12.50	0.00	0.00
	Steel	15.76					
	Concrete	81.76					

Global x concurrent LL+I rot. 0.0000 0.0000 deg
Global y concurrent LL+I rot. 0.0000 0.0000 deg

7	365	68.65	23.22	74.22	-18.80	0.00	0.00
	Steel	11.23					
	Concrete	57.41					

Global x concurrent LL+I rot. 0.0000 0.0000 deg
Global y concurrent LL+I rot. 0.0000 0.0000 deg

8	408	109.61	20.81	85.36	-17.80	0.00	0.00
	Steel	23.51					
	Concrete	86.10					

Global x concurrent LL+I rot. 0.0000 0.0000 deg

← P2-3E ✓

← P6-3A ✓

✓ 4/23/10

Global y concurrent LL+I rot.	0.0000	0.0000 deg	
9 456 80.33 22.19 73.91 -15.60 0.00 0.00			
Steel 18.71			
Concrete 61.62			

← P5-3A ✓

Global x concurrent LL+I rot.	0.0000	0.0000 deg	
Global y concurrent LL+I rot.	0.0000	0.0000 deg	
10 492 86.24 24.02 68.77 -10.56 0.00 0.00			
Steel 18.93			
Concrete 67.31			

← P4-3A ✓

Global x concurrent LL+I rot.	0.0000	0.0000 deg	
Global y concurrent LL+I rot.	0.0000	0.0000 deg	
11 519 68.52 27.19 66.54 -12.87 0.00 0.00			
Steel 11.33			
Concrete 57.19			

Global x concurrent LL+I rot.	0.0000	0.0000 deg	
Global y concurrent LL+I rot.	0.0000	0.0000 deg	
12 540 63.62 25.50 63.56 -14.12 0.00 0.00			
Steel 9.32			
Concrete 54.30			

Global x concurrent LL+I rot.	0.0000	0.0000 deg	
Global y concurrent LL+I rot.	0.0000	0.0000 deg	
13 553 66.61 26.26 67.48 -10.15 0.00 0.00			
Steel 11.65			
Concrete 54.96			

Global x concurrent LL+I rot.	0.0000	0.0000 deg	
Global y concurrent LL+I rot.	0.0000	0.0000 deg	
14 570 34.09 12.79 50.99 -2.49 0.00 0.00			
Steel 6.70			
Concrete 27.39			

Global x concurrent LL+I rot.	0.0000	0.0000 deg	
Global y concurrent LL+I rot.	0.0000	0.0000 deg	

Truck Loading

1 63	66.16	-0.75
2 110	95.28	-0.66
3 176	75.47	-0.28
4 225	63.84	0.00
5 266	67.12	0.00
6 320	68.99	0.00
7 365	70.42	0.00
8 408	72.69	0.00
9 456	68.15	0.00
10 492	67.88	0.00
11 519	65.48	0.00
12 540	63.25	0.00
13 553	67.48	0.00
14 570	50.99	0.00

Lane Loading

1 63	56.68	-7.27
2 110	78.65	-8.69
3 176	66.02	-12.11
4 225	68.22	-13.47
5 266	78.12	-12.93
6 320	77.58	-12.11
7 365	73.97	-18.40
8 408	85.22	-17.31

A-27

9	456	73.79	-14.78
10	492	68.61	-9.72
11	519	66.19	-12.75
12	540	61.47	-13.96
13	553	62.34	-8.41
14	570	37.96	-1.92

✓CSM
4/23/10

Fatigue Truck

1	63	356.99	-49.09
2	110	376.58	-46.03
3	176	1073.71	-160.95
4	225	317.89	-45.20
5	266	851.47	-101.84
6	320	267.12	-52.32
7	365	302.04	-65.67
8	408	328.20	-68.96
9	456	228.12	-45.03
10	492	271.82	-58.75
11	519	699.31	-108.44
12	540	137.97	-24.93
13	553	121.12	-14.80
14	570	64.25	-3.62

Support Rotations - Degrees

About global axes used in Girder Geometry table

Supp/Node	Noncomp	Dead	Superimp	Dead	LL+I+SDWK	Range
	x-axis	y-axis	x-axis	y-axis	x-axis	y-axis
2 63	0.00	0.02	0.00	0.00	(0.00 to 0.00)	(0.00 to 0.00)
	Concurrent	live vertical	reaction		-0.30	0.84 0.84 -0.30
3 110	0.00	-0.08	0.00	-0.01	(0.00 to 0.00)	(0.00 to 0.00)
	Concurrent	live vertical	reaction		-0.14	0.07 0.00 -0.16
4 176	0.00	-0.03	0.00	0.00	(0.00 to 0.00)	(0.00 to 0.00)
	Concurrent	live vertical	reaction		0.00	0.01 0.01 0.00
5 225	0.00	0.06	0.00	0.02	(0.00 to 0.00)	(0.00 to 0.00)
	Concurrent	live vertical	reaction		0.00	0.00 0.00 0.00
6 266	0.01	-0.06	0.00	-0.02	(0.00 to 0.00)	(0.00 to 0.00)
	Concurrent	live vertical	reaction		0.00	0.00 0.00 0.00
7 320	0.01	0.11	0.00	0.00	(0.00 to 0.00)	(0.00 to 0.00)
	Concurrent	live vertical	reaction		0.00	0.00 0.00 0.00
8 365	0.00	-0.01	0.00	0.01	(0.00 to 0.00)	(0.00 to 0.00)
	Concurrent	live vertical	reaction		0.00	0.00 0.00 0.00
9 408	-0.02	-0.06	0.00	-0.01	(0.00 to 0.00)	(0.00 to 0.00)
	Concurrent	live vertical	reaction		0.00	0.00 0.00 0.00
10 456	-0.01	-0.04	0.00	-0.01	(0.00 to 0.00)	(0.00 to 0.00)
	Concurrent	live vertical	reaction		0.00	0.00 0.00 0.00
11 492	0.03	0.03	0.01	0.01	(0.00 to 0.00)	(0.00 to 0.00)
	Concurrent	live vertical	reaction		0.00	0.00 0.00 0.00
12 519	0.00	-0.05	0.00	-0.01	(0.00 to 0.00)	(0.00 to 0.00)
	Concurrent	live vertical	reaction		0.00	0.00 0.00 0.00
13 540	0.03	0.02	0.01	0.00	(0.00 to 0.00)	(0.00 to 0.00)
	Concurrent	live vertical	reaction		0.00	0.00 0.00 0.00
14 553	-0.10	-0.11	-0.03	-0.03	(0.00 to 0.00)	(0.00 to 0.00)
	Concurrent	live vertical	reaction		0.00	0.00 0.00 0.00

← P4-3A ✓

Noncomp dead end reactions do not include weight of girder extensions.

Torsional and flexural rotations - member local axes

Supp/Node	Noncomp tors	Dead flex	Superimp tors	Dead flex	LL+I+SDWK Range tors flex
2 63	0.01	0.02	0.00	0.00	(0.00 to 0.00) (0.00 to 0.00)
3 110	-0.01	-0.07	0.00	-0.01	(0.00 to 0.00) (0.00 to 0.00)
4 176	0.00	-0.02	0.00	0.00	(0.00 to 0.00) (0.00 to 0.00)
5 225	0.00	0.06	0.00	0.02	(0.00 to 0.00) (0.00 to 0.00)
6 266	0.00	-0.06	0.00	-0.02	(0.00 to 0.00) (0.00 to 0.00)
7 320	0.02	0.10	0.00	0.00	(0.00 to 0.00) (0.00 to 0.00)
8 365	0.00	-0.01	0.00	0.01	(0.00 to 0.00) (0.00 to 0.00)
9 408	-0.03	-0.06	-0.01	-0.01	(0.00 to 0.00) (0.00 to 0.00)
10 456	-0.02	<u>-0.04</u>	0.00	<u>-0.01</u>	(0.00 to 0.00) (0.00 to 0.00)
11 492	0.04	0.02	0.01	0.00	(0.00 to 0.00) (0.00 to 0.00)
12 519	-0.02	-0.04	-0.01	-0.01	(0.00 to 0.00) (0.00 to 0.00)
13 540	0.03	0.00	0.01	0.00	(0.00 to 0.00) (0.00 to 0.00)
14 553	-0.12	-0.08	-0.03	-0.02	(0.00 to 0.00) (0.00 to 0.00)

VGM
4/23/10

✓
← P4-3A

Noncomp dead end reactions do not include weight of girder extensions.

Girder 8 Service Vertical Reactions - k

Supp/Node	Noncomp Dead	Super- Imposed Dead	Max Live+ Impact	Min Live+ Impact	Sidewalk Max	Min
Governing						
1 184	48.40	18.80	65.22	-14.31	0.00	0.00
Steel	8.83					
Concrete	39.57					
Global x concurrent LL+I rot. 0.0020 -0.0004 deg						
Global y concurrent LL+I rot. -0.0034 -0.0002 deg						
2 230	76.94	32.20	62.93	-9.84	0.00	0.00
Steel	12.99					
Concrete	63.95					
Global x concurrent LL+I rot. -0.0006 -0.0004 deg						
Global y concurrent LL+I rot. 0.0022 -0.0034 deg						
3 268	71.57	28.43	64.86	-10.68	0.00	0.00
Steel	11.06					
Concrete	60.52					
Global x concurrent LL+I rot. 0.0019 -0.0011 deg						
Global y concurrent LL+I rot. 0.0028 -0.0022 deg						
4 297	50.82	21.36	63.10	-11.03	0.00	0.00
Steel	7.60					
Concrete	43.22					
Global x concurrent LL+I rot. 0.0022 -0.0034 deg						
Global y concurrent LL+I rot. 0.0032 -0.0047 deg						
5 336	76.71	30.47	63.99	-9.35	0.00	0.00
Steel	11.62					
Concrete	65.09					
Global x concurrent LL+I rot. -0.0003 -0.0003 deg						
Global y concurrent LL+I rot. 0.0020 -0.0030 deg						
6 384	71.86	28.69	63.85	-10.85	0.00	0.00
Steel	11.01					
Concrete	60.85					
Global x concurrent LL+I rot. 0.0019 -0.0010 deg						
Global y concurrent LL+I rot. 0.0026 -0.0022 deg						
7 415	52.07	21.13	60.31	-9.70	0.00	0.00
Steel	7.44					
Concrete	44.63					
Global x concurrent LL+I rot. 0.0025 -0.0016 deg						
Global y concurrent LL+I rot. 0.0028 -0.0015 deg						
8 451	70.02	26.41	59.77	-8.37	0.00	0.00
Steel	9.51					
Concrete	60.51					
Global x concurrent LL+I rot. -0.0007 -0.0020 deg						

Global y concurrent LL+I rot.	0.0026	-0.0045 deg
9 487 68.88 26.61 60.41 -7.85 0.00 0.00		
Steel 9.01		
Concrete 59.87		

Global x concurrent LL+I rot.	0.0002	-0.0007 deg
Global y concurrent LL+I rot.	0.0027	-0.0028 deg
10 516 70.72 26.55 60.10 -8.31 0.00 0.00		
Steel 9.10		
Concrete 61.62		

Global x concurrent LL+I rot.	0.0000	0.0004 deg
Global y concurrent LL+I rot.	-0.0011	0.0034 deg
11 539 21.00 8.50 42.76 -6.43 0.00 0.00		
Steel 2.60		
Concrete 18.40		

Global x concurrent LL+I rot.	-0.0020	0.0009 deg
Global y concurrent LL+I rot.	-0.0004	0.0017 deg

Truck Loading

1	184	65.07	-3.44
2	230	62.75	-3.18
3	268	64.74	-3.00
4	297	62.92	-2.78
5	336	63.90	-2.79
6	384	63.60	-2.71
7	415	60.19	-1.54
8	451	59.57	-1.83
9	487	60.39	-1.68
10	516	60.10	-1.87
11	539	42.76	-1.10

Lane Loading

1	184	57.54	-12.05
2	230	62.54	-8.55
3	268	63.85	-10.68
4	297	57.54	-10.59
5	336	63.80	-8.20
6	384	63.36	-10.77
7	415	55.46	-9.70
8	451	56.54	-7.15
9	487	57.94	-7.82
10	516	56.18	-6.64
11	539	31.56	-5.04

Fatigue Truck

1	184	401.84	-58.74
2	230	421.36	-52.42
3	268	1121.20	-167.93
4	297	360.66	-51.78
5	336	898.67	-107.91
6	384	313.80	-59.36
7	415	343.17	-71.39
8	451	371.26	-74.57
9	487	271.63	-49.67
10	516	314.98	-64.25
11	539	727.32	-112.64

Support Rotations - Degrees

About global axes used in Girder Geometry table

Supp/Node	Noncomp Dead		Superimp Dead		LL+I+SDWK Range	
	x-axis	y-axis	x-axis	y-axis	x-axis	y-axis
2 184	0.00	0.01	0.00	0.00	(0.00 to 0.00)	(-0.01 to 0.01)

		Concurrent live vertical reaction	0.88	-1.90	-1.89	-1.22	
3	230	0.01	-0.02	0.00	-0.01	(0.00 to 0.00)	(-0.01 to 0.01)
		Concurrent live vertical reaction	-0.72	-1.56	-0.87	-1.78	
4	268	0.02	-0.05	0.00	-0.01	(0.00 to 0.01)	(0.00 to 0.01)
		Concurrent live vertical reaction	0.68	0.10	-1.33	0.10	
5	297	-0.01	0.01	0.00	0.01	(0.00 to 0.00)	(-0.01 to 0.01)
		Concurrent live vertical reaction	0.43	-0.97	-1.65	-1.02	
6	336	0.00	-0.03	0.00	-0.01	(0.00 to 0.00)	(-0.01 to 0.01)
		Concurrent live vertical reaction	-0.88	-1.47	-0.88	-1.60	
7	384	0.01	-0.03	0.00	-0.01	(0.00 to 0.01)	(0.00 to 0.01)
		Concurrent live vertical reaction	0.74	-0.42	-0.86	-0.32	
8	415	-0.02	-0.01	-0.01	0.00	(0.00 to 0.00)	(0.00 to 0.00)
		Concurrent live vertical reaction	-1.12	-0.07	-0.98	-0.43	
9	451	0.00	-0.01	0.00	0.00	(0.00 to 0.00)	(-0.01 to 0.01)
		Concurrent live vertical reaction	0.52	0.40	-0.88	-0.80	
10	487	0.00	0.01	0.00	0.00	(0.00 to 0.00)	(0.00 to 0.01)
		Concurrent live vertical reaction	-0.33	-1.11	-0.33	-1.05	
11	516	0.08	-0.14	0.02	-0.03	(0.00 to 0.00)	(0.00 to 0.00)
		Concurrent live vertical reaction	0.62	-0.55	0.60	-0.59	

Noncomp dead end reactions do not include weight of girder extensions.

Torsional and flexural rotations - member local axes

Supp/Node	Noncomp tors	Dead flex	Superimp tors	Dead flex	LL+I+SDWK tors	Range flex
2 184	0.00	0.01	0.00	0.00	(0.00 to 0.00)	(-0.01 to 0.00)
3 230	0.01	-0.02	0.00	-0.01	(0.00 to 0.00)	(-0.01 to 0.01)
4 268	0.03	-0.04	0.01	-0.01	(-0.01 to 0.00)	(-0.01 to 0.01)
5 297	-0.01	0.01	-0.01	0.00	(0.00 to 0.00)	(-0.01 to 0.00)
6 336	0.01	-0.03	0.00	-0.01	(0.00 to 0.00)	(-0.01 to 0.00)
7 384	0.02	-0.03	0.01	-0.01	(-0.01 to 0.00)	(-0.01 to 0.01)
8 415	-0.01	-0.01	-0.01	0.00	(0.00 to 0.00)	(-0.01 to 0.00)
9 451	0.01	-0.01	0.00	0.00	(0.00 to 0.00)	(-0.01 to 0.00)
10 487	-0.01	0.01	0.00	0.00	(0.00 to 0.00)	(-0.01 to 0.00)
11 516	0.13	-0.08	0.03	-0.02	(0.00 to 0.00)	(0.00 to 0.00)

Noncomp dead end reactions do not include weight of girder extensions.

Girder B for 3E

✓ CSM
4/23/10

Girder 9 Service Vertical Reactions - k

Supp/Node	Noncomp Dead	Super- Imposed Dead	Max Live+ Impact	Min Live+ Impact	Sidewalk Max	Min
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Governing

1	180	13.99	7.26	37.36	-4.01	0.00	0.00
	Steel	2.31					
	Concrete	11.67					

Global x concurrent LL+I rot. -0.0043 0.0008 deg
Global y concurrent LL+I rot. 0.0078 -0.0035 deg

2	137	50.26	23.30	52.29	-5.42	0.00	0.00
	Steel	7.33					
	Concrete	42.92					

Global x concurrent LL+I rot. -0.0060 -0.0001 deg
Global y concurrent LL+I rot. 0.0106 -0.0022 deg

3	88	60.11	24.96	80.11	-4.22	0.00	0.00
	Steel	9.30					
	Concrete	50.81					

Global x concurrent LL+I rot. 0.0047 -0.0020 deg
Global y concurrent LL+I rot. 0.0034 -0.0011 deg

4	78	51.81	17.51	69.93	-10.33	0.00	0.00
	Steel	9.17					
	Concrete	42.64					

Global x concurrent LL+I rot. -0.0046 -0.0031 deg
Global y concurrent LL+I rot. 0.0286 -0.0060 deg

5	122	97.92	22.52	98.03	-10.31	0.00	0.00
	Steel	22.94					
	Concrete	74.98					

Global x concurrent LL+I rot. 0.0008 -0.0001 deg
Global y concurrent LL+I rot. 0.0071 -0.0045 deg

6	188	54.12	19.00	66.87	-7.44	0.00	0.00
	Steel	10.95					
	Concrete	43.17					

Global x concurrent LL+I rot. 0.0011 -0.0018 deg
Global y concurrent LL+I rot. 0.0049 -0.0102 deg

7	231	70.91	29.22	62.77	-5.40	0.00	0.00
	Steel	11.06					
	Concrete	59.86					

Global x concurrent LL+I rot. 0.0031 -0.0021 deg
Global y concurrent LL+I rot. 0.0091 -0.0063 deg

8	269	73.32	28.27	66.49	-8.14	0.00	0.00
	Steel	11.55					
	Concrete	61.78					

Global x concurrent LL+I rot. 0.0024 -0.0023 deg

✓
← P2-3E

Global y concurrent LL+I rot.	0.0072	-0.0069 deg				
9 299 56.24 22.47 65.19 -8.49 0.00 0.00						
Steel 8.71						
Concrete 47.53						
Global x concurrent LL+I rot.	0.0048	-0.0030 deg				
Global y concurrent LL+I rot.	0.0173	-0.0115 deg				
10 337 77.60 30.01 66.39 -5.27 0.00 0.00						
Steel 11.92						
Concrete 65.68						
Global x concurrent LL+I rot.	0.0083	-0.0020 deg				
Global y concurrent LL+I rot.	0.0242	-0.0060 deg				
11 385 72.91 28.47 66.32 -7.43 0.00 0.00						
Steel 11.18						
Concrete 61.72						
Global x concurrent LL+I rot.	0.0025	-0.0035 deg				
Global y concurrent LL+I rot.	0.0074	-0.0090 deg				
12 416 53.95 21.00 60.72 -7.12 0.00 0.00						
Steel 7.93						
Concrete 46.02						
Global x concurrent LL+I rot.	0.0034	-0.0037 deg				
Global y concurrent LL+I rot.	0.0119	-0.0107 deg				
13 452 72.76 26.33 60.98 -5.71 0.00 0.00						
Steel 9.84						
Concrete 62.92						
Global x concurrent LL+I rot.	0.0049	-0.0039 deg				
Global y concurrent LL+I rot.	0.0061	-0.0054 deg				
14 488 71.57 26.54 62.30 -5.59 0.00 0.00						
Steel 9.55						
Concrete 62.02						
Global x concurrent LL+I rot.	-0.0063	0.0015 deg				
Global y concurrent LL+I rot.	-0.0084	0.0024 deg				
15 517 73.97 26.63 62.20 -5.88 0.00 0.00						
Steel 9.81						
Concrete 64.15						
Global x concurrent LL+I rot.	-0.0056	0.0017 deg				
Global y concurrent LL+I rot.	-0.0089	0.0030 deg				
16 537 22.08 8.49 41.96 -4.97 0.00 0.00						
Steel 2.90						
Concrete 19.18						
Global x concurrent LL+I rot.	-0.0020	0.0016 deg				
Global y concurrent LL+I rot.	-0.0112	0.0052 deg				

Truck Loading

1 180	37.36	-1.31
2 137	52.29	-0.98
3 88	80.04	-0.84
4 78	69.93	-1.58
5 122	97.02	-2.10
6 188	66.35	-1.40
7 231	61.56	-1.57
8 269	65.83	-2.01
9 299	65.19	-1.78

10	337	65.88	-1.57
11	385	65.94	-1.52
12	416	60.72	-1.50
13	452	60.52	-1.17
14	488	62.16	-1.33
15	517	62.20	-1.41
16	537	41.96	-0.74

Lane Loading

1	180	27.82	-2.99
2	137	45.64	-3.96
3	88	66.69	-3.63
4	78	60.58	-9.57
5	122	88.20	-9.60
6	188	57.51	-6.82
7	231	57.81	-4.40
8	269	61.95	-7.61
9	299	56.74	-8.48
10	337	61.59	-4.33
11	385	61.76	-7.07
12	416	53.61	-7.12
13	452	55.74	-4.74
14	488	57.48	-5.52
15	517	56.41	-4.53
16	537	30.93	-3.85

Fatigue Truck

1	180	143.86	-21.88
2	137	435.22	-62.09
3	88	474.58	-55.00
4	78	1167.62	-174.83
5	122	430.08	-58.49
6	188	941.15	-112.72
7	231	354.86	-62.85
8	269	389.76	-76.70
9	299	415.36	-79.40
10	337	318.94	-53.08
11	385	361.64	-68.94
12	416	768.13	-116.76
13	452	180.67	-28.78
14	488	164.54	-18.17
15	517	107.75	-7.49
16	537	27.21	-3.30

Support Rotations - Degrees

About global axes used in Girder Geometry table

Supp/Node	Noncomp x-axis	Dead y-axis	Superimp x-axis	Dead y-axis	LL+I+SDWK x-axis	Range y-axis
1 180	0.04	0.02	0.01	0.01	(-0.01 to 0.00)	(0.00 to 0.01)
	Concurrent	live	vertical	reaction	3.92	-0.11 -0.11 3.92
2 137	0.01	0.01	0.00	0.00	(-0.01 to 0.01)	(-0.01 to 0.01)
	Concurrent	live	vertical	reaction	5.12	3.82 3.82 5.23
3 88	-0.01	-0.01	0.00	-0.01	(-0.01 to 0.01)	(-0.01 to 0.01)
	Concurrent	live	vertical	reaction	5.08	5.39 5.25 5.15
4 78	0.03	0.08	0.01	0.02	(-0.01 to 0.00)	(-0.01 to 0.03)
	Concurrent	live	vertical	reaction	6.33	-0.86 3.31 6.42
5 122	0.00	0.01	0.00	0.00	(0.00 to 0.00)	(-0.02 to 0.02)
	Concurrent	live	vertical	reaction	8.96	5.28 5.28 8.96
6 188	0.00	-0.08	0.00	-0.01	(0.00 to 0.00)	(-0.03 to 0.01)
	Concurrent	live	vertical	reaction	3.88	4.60 5.10 3.88
7 231	-0.01	0.02	0.00	0.01	(-0.01 to 0.01)	(-0.02 to 0.02)
	Concurrent	live	vertical	reaction	6.46	5.08 6.46 5.08
8 269	0.01	-0.03	0.00	-0.01	(-0.01 to 0.01)	(-0.02 to 0.02)
	Concurrent	live	vertical	reaction	5.89	4.07 5.89 4.07

9 299	0.01	-0.02	0.00	-0.01	(-0.01 to 0.01)	(-0.03 to 0.02)
	Concurrent live vertical reaction	-0.65	5.84	-0.65	5.84	
10 337	0.00	0.01	0.00	0.01	(-0.01 to 0.01)	(-0.02 to 0.02)
	Concurrent live vertical reaction	3.39	6.15	3.47	6.15	
11 385	0.01	-0.03	0.00	-0.01	(-0.01 to 0.01)	(-0.02 to 0.02)
	Concurrent live vertical reaction	5.65	3.96	5.65	3.90	
12 416	0.01	-0.03	0.00	-0.01	(-0.01 to 0.00)	(-0.03 to 0.01)
	Concurrent live vertical reaction	1.13	-0.83	1.13	-0.83	
13 452	0.00	0.00	0.00	0.00	(-0.01 to 0.01)	(-0.01 to 0.02)
	Concurrent live vertical reaction	2.26	2.81	2.46	2.79	
14 488	0.00	-0.01	0.00	0.00	(-0.01 to 0.02)	(-0.02 to 0.02)
	Concurrent live vertical reaction	4.19	1.96	4.19	1.96	
15 517	-0.01	0.00	0.00	0.00	(-0.01 to 0.01)	(-0.02 to 0.01)
	Concurrent live vertical reaction	3.98	2.54	3.98	2.54	
16 537	0.08	-0.13	0.02	-0.03	(0.00 to 0.00)	(-0.02 to 0.01)
	Concurrent live vertical reaction	0.74	-0.42	0.74	-0.42	

Noncomp dead end reactions do not include weight of girder extensions.

Torsional and flexural rotations - member local axes

Supp/Node	Noncomp tors	Dead flex	Superimp tors	Dead flex	LL+I+SDWK tors	Range flex
1 180	0.04	-0.02	0.01	-0.01	(0.00 to 0.01)	(0.00 to 0.01)
2 137	0.01	0.00	0.00	0.00	(0.00 to 0.01)	(0.00 to 0.01)
3 88	-0.01	0.00	-0.01	0.00	(0.00 to 0.01)	(-0.01 to 0.01)
4 78	0.06	0.06	0.01	0.02	(-0.01 to 0.01)	(0.00 to 0.03)
5 122	0.00	0.01	0.00	0.00	(0.00 to 0.00)	(-0.02 to 0.02)
6 188	0.01	-0.08	0.00	-0.01	(0.00 to 0.00)	(-0.03 to 0.01)
7 231	-0.01	0.02	-0.01	0.01	(-0.01 to 0.01)	(-0.02 to 0.02)
8 269	0.02	-0.03	0.01	-0.01	(-0.01 to 0.00)	(-0.03 to 0.01)
9 299	0.01	-0.02	0.00	0.00	(-0.01 to 0.00)	(-0.03 to 0.01)
10 337	-0.01	0.01	0.00	0.01	(-0.01 to 0.01)	(-0.03 to 0.02)
11 385	0.02	-0.02	0.01	-0.01	(-0.01 to 0.00)	(-0.03 to 0.01)
12 416	0.03	-0.02	0.01	-0.01	(-0.01 to 0.00)	(-0.03 to 0.00)
13 452	0.00	0.00	0.00	0.00	(-0.01 to 0.01)	(-0.02 to 0.01)
14 488	0.01	-0.01	0.00	0.00	(-0.02 to 0.01)	(-0.02 to 0.01)
15 517	-0.01	0.00	0.00	0.00	(-0.02 to 0.01)	(-0.02 to 0.00)
16 537	0.13	-0.08	0.03	-0.02	(0.00 to 0.00)	(-0.02 to 0.00)

Noncomp dead end reactions do not include weight of girder extensions.

Vcom 4/23/10
Girder A for 3E

From MDX
output

Girder 10 Service Vertical Reactions - k

Supp/Node	Noncomp Dead	Super- Imposed Dead	Max Live+ Impact	Min Live+ Impact	Sidewalk Max	Min
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Governing

1 185	13.88	6.29	37.33	-6.66	0.00	0.00
Steel	1.91					
Concrete	11.97					

Global x concurrent LL+I rot. -0.0245 0.0007 deg
Global y concurrent LL+I rot. 0.0197 -0.0092 deg

2 144	53.64	21.96	54.43	-7.63	0.00	0.00
Steel	7.33					
Concrete	46.32					

Global x concurrent LL+I rot. 0.0052 -0.0005 deg
Global y concurrent LL+I rot. 0.0224 -0.0060 deg

3 106	54.21	20.40	56.54	-6.94	0.00	0.00
Steel	7.27					
Concrete	46.94					

Global x concurrent LL+I rot. 0.0193 -0.0040 deg
Global y concurrent LL+I rot. 0.0052 -0.0037 deg

4 96	50.90	15.92	60.40	-9.25	0.00	0.00
Steel	8.11					
Concrete	42.79					

Global x concurrent LL+I rot. 0.0173 -0.0025 deg
Global y concurrent LL+I rot. 0.0147 -0.0002 deg

5 133	88.48	19.12	65.18	-10.83	0.00	0.00
Steel	17.05					
Concrete	71.44					

Global x concurrent LL+I rot. 0.0024 -0.0023 deg
Global y concurrent LL+I rot. 0.0042 -0.0193 deg

6 195	53.37	17.35	64.25	-13.95	0.00	0.00
Steel	8.29					
Concrete	45.09					

Global x concurrent LL+I rot. 0.0144 -0.0015 deg
Global y concurrent LL+I rot. 0.0348 -0.0064 deg

7 233	71.85	28.64	63.41	-9.85	0.00	0.00
Steel	10.24					
Concrete	61.62					

Global x concurrent LL+I rot. 0.0167 -0.0078 deg
Global y concurrent LL+I rot. 0.0356 -0.0149 deg

8 271	72.24	28.47	62.99	-12.19	0.00	0.00
Steel	11.22					
Concrete	61.02					

Global x concurrent LL+I rot. 0.0048 -0.0077 deg

✓
← P2-3E

Global y concurrent LL+I rot.	0.0008	-0.0198 deg				
9 301 52.83 22.17 64.24 -11.37 0.00 0.00						
Steel 8.01						
Concrete 44.82						
Global x concurrent LL+I rot.	0.0132	-0.0080 deg				
Global y concurrent LL+I rot.	0.0562	-0.0484 deg				
10 339 75.73 29.81 63.07 -8.99 0.00 0.00						
Steel 11.62						
Concrete 64.10						
Global x concurrent LL+I rot.	0.0157	-0.0071 deg				
Global y concurrent LL+I rot.	0.0354	-0.0141 deg				
11 387 70.99 28.29 63.25 -10.95 0.00 0.00						
Steel 10.64						
Concrete 60.36						
Global x concurrent LL+I rot.	0.0099	-0.0087 deg				
Global y concurrent LL+I rot.	-0.0031	-0.0159 deg				
12 418 51.07 20.78 60.29 -8.70 0.00 0.00						
Steel 7.17						
Concrete 43.90						
Global x concurrent LL+I rot.	0.0185	-0.0125 deg				
Global y concurrent LL+I rot.	0.0456	-0.0465 deg				
13 453 68.89 26.01 59.85 -8.20 0.00 0.00						
Steel 8.76						
Concrete 60.13						
Global x concurrent LL+I rot.	0.0288	-0.0177 deg				
Global y concurrent LL+I rot.	0.0340	-0.0138 deg				
14 489 68.59 26.44 60.03 -7.59 0.00 0.00						
Steel 8.90						
Concrete 59.70						
Global x concurrent LL+I rot.	0.0378	-0.0227 deg				
Global y concurrent LL+I rot.	0.0357	-0.0324 deg				
15 518 70.35 26.36 60.14 -8.13 0.00 0.00						
Steel 9.16						
Concrete 61.19						
Global x concurrent LL+I rot.	0.0086	0.0063 deg				
Global y concurrent LL+I rot.	-0.0004	0.0096 deg				
16 536 20.42 8.33 42.77 -6.71 0.00 0.00						
Steel 2.51						
Concrete 17.91						
Global x concurrent LL+I rot.	-0.0199	0.0049 deg				
Global y concurrent LL+I rot.	-0.0752	0.0218 deg				

Truck Loading

1 185	37.33	-3.20
2 144	54.43	-2.74
3 106	56.47	-2.22
4 96	60.38	-3.57
5 133	64.90	-4.33
6 195	64.23	-5.82
7 233	62.95	-4.81
8 271	62.64	-7.23
9 301	64.07	-5.20

10	339	62.77	-4.25
11	387	62.96	-6.12
12	418	60.16	-4.95
13	453	59.63	-5.24
14	489	60.01	-4.31
15	518	60.14	-4.91
16	536	42.77	-4.77

Lane Loading

1	185	26.40	-4.95
2	144	46.81	-6.37
3	106	49.01	-6.55
4	96	53.96	-8.62
5	133	64.23	-10.27
6	195	59.65	-12.76
7	233	61.37	-8.76
8	271	62.39	-11.54
9	301	59.00	-11.14
10	339	62.01	-8.14
11	387	62.03	-10.89
12	418	54.69	-8.70
13	453	55.92	-7.01
14	489	57.45	-7.59
15	518	55.97	-6.52
16	536	31.48	-5.25

Fatigue Truck

1	185	167.82	-25.58
2	144	471.73	-66.77
3	106	513.06	-59.21
4	96	1208.16	-180.67
5	133	475.61	-65.44
6	195	984.34	-121.95
7	233	399.75	-69.01
8	271	435.68	-84.85
9	301	459.02	-85.97
10	339	365.29	-59.02
11	387	407.59	-76.11
12	418	808.70	-121.94
13	453	223.53	-34.29
14	489	207.59	-22.70
15	518	150.88	-12.88
16	536	55.06	-7.68

Support Rotations - Degrees

About global axes used in Girder Geometry table

Supp/Node	Noncomp	Dead	Superimp	Dead	LL+I+SDWK	Range
	x-axis	y-axis	x-axis	y-axis	x-axis	y-axis
1 185	0.04	0.02	0.01	0.00	(-0.04 to 0.01)	(-0.01 to 0.03)
	Concurrent	live	vertical	reaction	19.23	0.06 0.06 26.73
2 144	0.00	0.02	0.00	0.01	(-0.03 to 0.03)	(-0.02 to 0.05)
	Concurrent	live	vertical	reaction	38.97	36.78 36.78 38.97
3 106	-0.02	0.00	-0.01	0.00	(-0.02 to 0.04)	(-0.04 to 0.05)
	Concurrent	live	vertical	reaction	36.83	39.70 39.70 38.91
4 96	0.02	0.07	0.01	0.02	(-0.02 to 0.03)	(-0.04 to 0.08)
	Concurrent	live	vertical	reaction	33.72	48.09 48.09 33.72
5 133	0.00	0.00	0.00	-0.01	(-0.01 to 0.01)	(-0.05 to 0.05)
	Concurrent	live	vertical	reaction	43.72	43.57 43.57 43.72
6 195	-0.01	-0.07	0.00	0.00	(0.00 to 0.01)	(-0.09 to 0.05)
	Concurrent	live	vertical	reaction	-0.68	45.23 34.62 52.31
7 233	-0.01	0.03	0.00	0.01	(-0.02 to 0.04)	(-0.06 to 0.08)
	Concurrent	live	vertical	reaction	40.88	43.08 40.88 42.96
8 271	0.01	-0.04	0.00	-0.01	(-0.02 to 0.03)	(-0.09 to 0.07)
	Concurrent	live	vertical	reaction	41.42	40.62 41.69 40.62

9	301	0.01	-0.02	0.00	0.00	(-0.02 to 0.02)	(-0.12 to 0.09)
		Concurrent live vertical reaction	45.28	51.47	31.23	51.47	
10	339	-0.01	0.01	0.00	0.01	(-0.02 to 0.04)	(-0.08 to 0.08)
		Concurrent live vertical reaction	45.91	41.57	40.88	40.96	
11	387	0.00	-0.03	0.00	-0.01	(-0.02 to 0.04)	(-0.09 to 0.07)
		Concurrent live vertical reaction	41.06	40.23	41.06	40.23	
12	418	0.01	-0.04	0.00	-0.01	(-0.03 to 0.03)	(-0.11 to 0.07)
		Concurrent live vertical reaction	45.03	52.10	30.10	52.10	
13	453	-0.02	-0.01	-0.01	0.00	(-0.02 to 0.08)	(-0.08 to 0.07)
		Concurrent live vertical reaction	48.27	42.97	39.40	41.70	
14	489	0.00	-0.01	0.00	0.00	(-0.06 to 0.10)	(-0.08 to 0.07)
		Concurrent live vertical reaction	43.02	42.71	38.68	41.53	
15	518	0.00	0.00	0.00	0.00	(-0.06 to 0.07)	(-0.09 to 0.08)
		Concurrent live vertical reaction	40.05	35.75	40.05	43.14	
16	536	0.07	-0.13	0.02	-0.03	(-0.03 to 0.01)	(-0.12 to 0.04)
		Concurrent live vertical reaction	35.88	-2.46	34.44	-2.71	

Noncomp dead end reactions do not include weight of girder extensions.

Torsional and flexural rotations - member local axes

Supp/Node	Noncomp tors	Dead flex	Superimp tors	Dead flex	LL+I+SDWK Range tors flex
1 185	0.04	-0.02	0.01	-0.01	(-0.01 to 0.04) (0.02 to 0.02)
2 144	0.01	0.01	0.01	0.01	(0.00 to 0.05) (0.02 to 0.05)
3 106	-0.02	0.01	-0.01	0.00	(0.01 to 0.04) (-0.01 to 0.06)
4 96	0.05	0.06	0.01	0.01	(-0.01 to 0.03) (-0.01 to 0.09)
5 133	0.00	0.00	0.00	-0.01	(-0.01 to 0.01) (-0.04 to 0.06)
6 195	0.00	-0.07	0.00	0.00	(0.00 to 0.01) (-0.09 to 0.04)
7 233	-0.02	0.03	-0.01	0.01	(-0.04 to 0.03) (-0.09 to 0.06)
8 271	0.02	-0.03	0.01	-0.01	(-0.03 to 0.02) (-0.11 to 0.04)
9 301	0.01	-0.01	0.00	0.00	(-0.03 to 0.01) (-0.14 to 0.04)
10 339	-0.01	0.01	-0.01	0.00	(-0.03 to 0.03) (-0.10 to 0.05)
11 387	0.01	-0.03	0.00	-0.01	(-0.03 to 0.03) (-0.11 to 0.03)
12 418	0.04	-0.01	0.01	0.00	(-0.04 to -0.01) (-0.12 to -0.05)
13 453	-0.01	-0.02	-0.01	0.00	(-0.05 to 0.06) (-0.11 to 0.03)
14 489	0.00	-0.01	0.00	0.00	(-0.10 to 0.06) (-0.11 to 0.03)
15 518	0.00	0.01	0.00	0.00	(-0.08 to 0.03) (-0.11 to 0.03)
16 536	0.12	-0.08	0.03	-0.02	(-0.03 to -0.01) (-0.13 to -0.02)

Noncomp dead end reactions do not include weight of girder extensions.

Steel cross section, haunch, and slab

0.98 k/ft	0.98 k/ft	0.98 k/ft	0.98 k/ft	0.98 k/ft
0.98 k/ft	0.98 k/ft	0.98 k/ft	0.98 k/ft	1.03 k/ft
1.03 k/ft	1.03 k/ft	0.98 k/ft	0.98 k/ft	0.98 k/ft
0.98 k/ft	0.98 k/ft	0.98 k/ft	0.98 k/ft	1.03 k/ft
1.03 k/ft	1.03 k/ft	0.98 k/ft	0.98 k/ft	0.98 k/ft
0.98 k/ft	0.98 k/ft	0.98 k/ft	1.43 k/ft	1.43 k/ft
1.53 k/ft	1.68 k/ft	1.68 k/ft	1.68 k/ft	1.68 k/ft
1.68 k/ft	1.68 k/ft	1.68 k/ft	1.68 k/ft	1.76 k/ft
1.98 k/ft	1.74 k/ft	1.68 k/ft	1.68 k/ft	1.68 k/ft
1.68 k/ft	1.68 k/ft	1.68 k/ft	1.68 k/ft	1.68 k/ft
1.92 k/ft	1.79 k/ft	1.78 k/ft	1.67 k/ft	1.66 k/ft
1.65 k/ft	1.65 k/ft	1.64 k/ft	1.63 k/ft	1.63 k/ft
1.62 k/ft	1.62 k/ft	1.57 k/ft	1.56 k/ft	1.56 k/ft
1.56 k/ft	1.56 k/ft	1.56 k/ft	1.56 k/ft	1.59 k/ft
1.09 k/ft	0.98 k/ft	0.98 k/ft	0.98 k/ft	0.98 k/ft
0.98 k/ft	0.98 k/ft	0.98 k/ft	1.01 k/ft	1.06 k/ft
1.06 k/ft	1.06 k/ft	1.01 k/ft	0.99 k/ft	0.99 k/ft
0.99 k/ft	0.99 k/ft	0.99 k/ft	0.99 k/ft	0.99 k/ft
1.03 k/ft	1.01 k/ft	0.99 k/ft	0.98 k/ft	0.97 k/ft
0.97 k/ft	0.97 k/ft	0.98 k/ft	0.98 k/ft	0.97 k/ft
1.01 k/ft	0.95 k/ft	0.93 k/ft	0.87 k/ft	0.85 k/ft
0.83 k/ft	0.80 k/ft	0.77 k/ft	0.97 k/ft	0.96 k/ft
1.00 k/ft	0.94 k/ft	0.94 k/ft	0.94 k/ft	0.94 k/ft
0.94 k/ft	0.94 k/ft	0.94 k/ft	0.94 k/ft	0.94 k/ft
0.98 k/ft	0.98 k/ft	0.94 k/ft	0.94 k/ft	0.94 k/ft
0.94 k/ft	0.94 k/ft	0.94 k/ft	0.94 k/ft	0.94 k/ft
0.94 k/ft	0.94 k/ft	0.97 k/ft	0.97 k/ft	0.97 k/ft
0.97 k/ft	0.97 k/ft	0.97 k/ft	0.97 k/ft	0.97 k/ft
0.97 k/ft				

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[illegible]

Total

1.06 k/ft	1.06 k/ft	1.06 k/ft	1.06 k/ft	1.06 k/ft
1.06 k/ft	1.06 k/ft	1.06 k/ft	1.06 k/ft	1.11 k/ft
1.11 k/ft	1.11 k/ft	1.06 k/ft	1.06 k/ft	1.06 k/ft
1.06 k/ft	1.06 k/ft	1.06 k/ft	1.06 k/ft	1.11 k/ft
1.11 k/ft	1.11 k/ft	1.06 k/ft	1.06 k/ft	1.06 k/ft
1.06 k/ft	1.06 k/ft	1.06 k/ft	1.51 k/ft	1.49 k/ft
1.60 k/ft	1.76 k/ft	1.76 k/ft	1.76 k/ft	1.76 k/ft
1.76 k/ft	1.76 k/ft	1.76 k/ft	1.76 k/ft	1.83 k/ft
2.06 k/ft	1.82 k/ft	1.76 k/ft	1.76 k/ft	1.76 k/ft
1.76 k/ft	1.76 k/ft	1.76 k/ft	1.76 k/ft	1.76 k/ft
2.00 k/ft	1.86 k/ft	1.85 k/ft	1.74 k/ft	1.73 k/ft
1.73 k/ft	1.72 k/ft	1.71 k/ft	1.71 k/ft	1.70 k/ft
1.70 k/ft	1.70 k/ft	1.64 k/ft	1.63 k/ft	1.63 k/ft
1.63 k/ft	1.63 k/ft	1.63 k/ft	1.65 k/ft	1.69 k/ft
1.16 k/ft	1.06 k/ft	1.06 k/ft	1.06 k/ft	1.06 k/ft
1.06 k/ft	1.06 k/ft	1.06 k/ft	1.09 k/ft	1.13 k/ft
1.14 k/ft	1.13 k/ft	1.09 k/ft	1.07 k/ft	1.07 k/ft
1.07 k/ft	1.07 k/ft	1.07 k/ft	1.07 k/ft	1.07 k/ft
1.11 k/ft	1.09 k/ft	1.07 k/ft	1.06 k/ft	1.05 k/ft
1.05 k/ft	1.05 k/ft	1.05 k/ft	1.05 k/ft	1.05 k/ft
1.08 k/ft	1.02 k/ft	1.01 k/ft	0.95 k/ft	0.93 k/ft
0.90 k/ft	0.88 k/ft	0.85 k/ft	1.04 k/ft	1.03 k/ft
1.07 k/ft	1.02 k/ft	1.02 k/ft	1.02 k/ft	1.02 k/ft
1.02 k/ft	1.02 k/ft	1.02 k/ft	1.02 k/ft	1.02 k/ft
1.06 k/ft	1.06 k/ft	1.02 k/ft	1.02 k/ft	1.02 k/ft
1.02 k/ft	1.02 k/ft	1.02 k/ft	1.02 k/ft	1.02 k/ft
1.02 k/ft	1.02 k/ft	1.05 k/ft	1.05 k/ft	1.05 k/ft
1.05 k/ft	1.05 k/ft	1.05 k/ft	1.05 k/ft	1.05 k/ft
1.05 k/ft				

Bracing off of Girder 1

0.51 K	0.29 K	0.29 K	0.29 K	0.29 K
0.29 K	0.29 K	0.29 K	0.29 K	0.29 K
0.29 K	0.29 K	0.28 K	1.11 K	0.96 K
0.96 K	0.96 K	0.96 K	0.96 K	0.96 K
0.96 K	0.96 K	0.96 K	0.96 K	7.11 K
0.96 K	0.96 K	0.96 K	0.96 K	0.96 K
0.96 K	0.96 K	0.96 K	0.96 K	0.96 K
0.96 K	7.01 K	0.96 K	0.96 K	0.96 K
0.96 K	0.96 K	0.96 K	0.96 K	0.96 K
0.96 K	0.96 K	0.96 K	0.96 K	1.02 K
0.36 K	0.36 K	0.36 K	0.36 K	0.36 K
5.98 K	0.36 K	0.36 K	0.36 K	0.36 K
2.93 K	0.29 K	0.28 K	0.28 K	0.26 K
0.27 K	0.27 K	2.19 K	0.23 K	0.19 K
0.55 K	0.29 K	0.29 K	0.29 K	0.29 K
0.29 K	0.29 K	0.28 K	0.29 K	0.29 K
0.29 K	0.29 K	0.28 K	0.29 K	0.29 K
0.51 K				

Half applied to each connected node.

Girder 2 Noncomposite Self Weight

Steel cross section, haunch, and slab

1.06 k/ft	1.06 k/ft	1.06 k/ft	1.06 k/ft	1.06 k/ft
1.06 k/ft	1.06 k/ft	1.06 k/ft	1.06 k/ft	1.12 k/ft
1.12 k/ft	1.12 k/ft	1.06 k/ft	1.06 k/ft	1.06 k/ft
1.06 k/ft	1.06 k/ft	1.06 k/ft	1.06 k/ft	1.12 k/ft
1.12 k/ft	1.12 k/ft	1.06 k/ft	1.06 k/ft	1.06 k/ft
1.06 k/ft	1.06 k/ft	1.06 k/ft	1.06 k/ft	1.06 k/ft
1.06 k/ft				

Steel in addition to cross section

0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft
0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft
0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft
0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft
0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft
0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft
0.01 k/ft				

Conc in addition to slab t and haunch

0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft
0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft
0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft
0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft
0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft
0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft
0.01 k/ft				

Total

1.09 k/ft	1.09 k/ft	1.09 k/ft	1.09 k/ft	1.09 k/ft
1.09 k/ft	1.09 k/ft	1.09 k/ft	1.09 k/ft	1.14 k/ft
1.14 k/ft	1.14 k/ft	1.09 k/ft	1.09 k/ft	1.09 k/ft
1.09 k/ft	1.09 k/ft	1.09 k/ft	1.09 k/ft	1.14 k/ft
1.14 k/ft	1.14 k/ft	1.09 k/ft	1.09 k/ft	1.09 k/ft
1.09 k/ft	1.09 k/ft	1.09 k/ft	1.09 k/ft	1.09 k/ft
1.09 k/ft				

Bracing off of Girder 2

0.51 K	0.29 K	0.29 K	0.29 K	0.29 K
0.28 K	0.28 K	0.29 K	0.29 K	0.28 K
0.29 K	0.29 K	0.29 K	1.11 K	

Half applied to each connected node.

✓CSM
4/23/10

Girder 3 Noncomposite Self Weight

Steel cross section, haunch, and slab

1.06 k/ft	1.06 k/ft	1.06 k/ft	1.06 k/ft	1.06 k/ft
1.06 k/ft	1.06 k/ft	1.06 k/ft	1.06 k/ft	1.06 k/ft
1.06 k/ft	1.06 k/ft	1.06 k/ft	1.06 k/ft	1.06 k/ft
1.06 k/ft	1.06 k/ft	1.06 k/ft	1.09 k/ft	1.14 k/ft
1.15 k/ft	1.13 k/ft	1.09 k/ft	1.05 k/ft	1.04 k/ft
1.02 k/ft	1.00 k/ft	0.98 k/ft	0.95 k/ft	0.92 k/ft
0.89 k/ft	1.10 k/ft	1.08 k/ft	1.04 k/ft	1.00 k/ft
0.96 k/ft	0.92 k/ft	0.88 k/ft	0.85 k/ft	0.82 k/ft
0.81 k/ft	0.79 k/ft	0.75 k/ft	0.74 k/ft	0.72 k/ft
0.71 k/ft	0.70 k/ft	0.68 k/ft	0.67 k/ft	0.66 k/ft
0.66 k/ft				

Steel in addition to cross section

0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft
0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft
0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft
0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft
0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft
0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft
0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft
0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft
0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft
0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft
0.01 k/ft				

Conc in addition to slab t and haunch

0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft
0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft
0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft
0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft
0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft
0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft
0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft
0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft
0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft
0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft
0.01 k/ft				

Total

1.08 k/ft	1.08 k/ft	1.08 k/ft	1.08 k/ft	1.08 k/ft
1.08 k/ft	1.08 k/ft	1.08 k/ft	1.08 k/ft	1.08 k/ft
1.08 k/ft	1.08 k/ft	1.08 k/ft	1.08 k/ft	1.08 k/ft
1.08 k/ft	1.08 k/ft	1.08 k/ft	1.11 k/ft	1.16 k/ft
1.17 k/ft	1.16 k/ft	1.11 k/ft	1.07 k/ft	1.06 k/ft
1.04 k/ft	1.02 k/ft	1.00 k/ft	0.97 k/ft	0.94 k/ft
0.91 k/ft	1.13 k/ft	1.10 k/ft	1.06 k/ft	1.02 k/ft
0.98 k/ft	0.94 k/ft	0.90 k/ft	0.87 k/ft	0.84 k/ft
0.83 k/ft	0.81 k/ft	0.77 k/ft	0.76 k/ft	0.74 k/ft
0.73 k/ft	0.72 k/ft	0.71 k/ft	0.70 k/ft	0.69 k/ft
0.68 k/ft				

Bracing off of Girder 3

1.02 K	0.36 K	0.36 K	0.36 K	0.36 K
0.36 K	5.98 K	0.35 K	0.33 K	0.30 K
0.26 K	2.57 K	0.32 K	0.31 K	0.28 K
0.24 K	0.19 K	0.14 K	3.34 K	0.11 K
0.12 K	0.55 K			

Half applied to each connected node.

Girder 4 Noncomposite Self Weight

Steel cross section, haunch, and slab

0.98 k/ft	0.98 k/ft	0.98 k/ft	0.98 k/ft	0.98 k/ft
0.98 k/ft	0.98 k/ft	0.98 k/ft	0.98 k/ft	1.03 k/ft
1.03 k/ft	1.03 k/ft	0.98 k/ft	0.98 k/ft	0.98 k/ft
0.98 k/ft	0.98 k/ft	0.98 k/ft	0.98 k/ft	1.03 k/ft
1.03 k/ft	1.03 k/ft	0.98 k/ft	0.98 k/ft	0.98 k/ft
0.98 k/ft	0.98 k/ft	0.98 k/ft	1.43 k/ft	1.43 k/ft
1.53 k/ft	1.68 k/ft	1.68 k/ft	1.68 k/ft	1.68 k/ft
1.68 k/ft	1.68 k/ft	1.68 k/ft	1.68 k/ft	1.91 k/ft
2.05 k/ft	1.78 k/ft	1.70 k/ft	1.70 k/ft	1.70 k/ft
1.70 k/ft	1.70 k/ft	1.70 k/ft	1.70 k/ft	1.70 k/ft
1.95 k/ft	1.82 k/ft	1.81 k/ft	1.67 k/ft	1.66 k/ft
1.65 k/ft	1.65 k/ft	1.64 k/ft	1.63 k/ft	1.63 k/ft
1.64 k/ft	1.64 k/ft	1.58 k/ft	1.56 k/ft	1.56 k/ft
1.56 k/ft	1.56 k/ft	1.71 k/ft	1.71 k/ft	1.20 k/ft
1.16 k/ft	1.01 k/ft	0.98 k/ft	0.95 k/ft	0.93 k/ft
0.90 k/ft	0.88 k/ft	0.86 k/ft	0.84 k/ft	0.88 k/ft
0.88 k/ft	0.86 k/ft	0.82 k/ft	0.96 k/ft	0.93 k/ft
0.89 k/ft	0.85 k/ft	0.81 k/ft	0.77 k/ft	0.73 k/ft
0.69 k/ft				

Steel in addition to cross section

0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft
0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft
0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft
0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft
0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft
0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft
0.03 k/ft	0.03 k/ft	0.03 k/ft	0.03 k/ft	0.03 k/ft
0.03 k/ft	0.03 k/ft	0.03 k/ft	0.03 k/ft	0.03 k/ft
0.03 k/ft	0.03 k/ft	0.03 k/ft	0.03 k/ft	0.03 k/ft
0.03 k/ft	0.03 k/ft	0.03 k/ft	0.03 k/ft	0.03 k/ft
0.03 k/ft	0.03 k/ft	0.03 k/ft	0.03 k/ft	0.03 k/ft
0.03 k/ft	0.03 k/ft	0.03 k/ft	0.03 k/ft	0.03 k/ft
0.03 k/ft	0.03 k/ft	0.03 k/ft	0.03 k/ft	0.03 k/ft
0.03 k/ft	0.03 k/ft	0.03 k/ft	0.03 k/ft	0.03 k/ft
0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft
0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft
0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft
0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft
0.01 k/ft				

Conc in addition to slab t and haunch

0.07 k/ft	0.07 k/ft	0.07 k/ft	0.07 k/ft	0.07 k/ft
0.07 k/ft	0.07 k/ft	0.07 k/ft	0.07 k/ft	0.07 k/ft
0.07 k/ft	0.07 k/ft	0.07 k/ft	0.07 k/ft	0.07 k/ft
0.07 k/ft	0.07 k/ft	0.07 k/ft	0.07 k/ft	0.07 k/ft
0.07 k/ft	0.07 k/ft	0.07 k/ft	0.07 k/ft	0.07 k/ft
0.05 k/ft	0.05 k/ft	0.05 k/ft	0.05 k/ft	0.05 k/ft
0.05 k/ft	0.05 k/ft	0.05 k/ft	0.05 k/ft	0.05 k/ft
0.05 k/ft	0.05 k/ft	0.05 k/ft	0.05 k/ft	0.05 k/ft
0.05 k/ft	0.05 k/ft	0.05 k/ft	0.05 k/ft	0.05 k/ft
0.05 k/ft	0.05 k/ft	0.05 k/ft	0.05 k/ft	0.05 k/ft
0.05 k/ft	0.05 k/ft	0.05 k/ft	0.05 k/ft	0.05 k/ft
0.05 k/ft	0.05 k/ft	0.05 k/ft	0.05 k/ft	0.05 k/ft
0.05 k/ft	0.05 k/ft	0.05 k/ft	0.05 k/ft	0.05 k/ft
0.05 k/ft	0.05 k/ft	0.05 k/ft	0.05 k/ft	0.05 k/ft
0.05 k/ft	0.05 k/ft	0.05 k/ft	0.05 k/ft	0.05 k/ft
0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft
0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft
0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft
0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft
0.01 k/ft				

Total

1.06 k/ft	1.06 k/ft	1.06 k/ft	1.06 k/ft	1.06 k/ft
1.06 k/ft	1.06 k/ft	1.06 k/ft	1.06 k/ft	1.11 k/ft
1.11 k/ft	1.11 k/ft	1.06 k/ft	1.06 k/ft	1.06 k/ft
1.06 k/ft	1.06 k/ft	1.06 k/ft	1.06 k/ft	1.11 k/ft
1.11 k/ft	1.11 k/ft	1.06 k/ft	1.06 k/ft	1.06 k/ft

1.06 k/ft	1.06 k/ft	1.06 k/ft	1.51 k/ft	1.49 k/ft
1.60 k/ft	1.76 k/ft	1.76 k/ft	1.76 k/ft	1.76 k/ft
1.76 k/ft	1.76 k/ft	1.76 k/ft	1.76 k/ft	1.99 k/ft
2.12 k/ft	1.85 k/ft	1.77 k/ft	1.77 k/ft	1.77 k/ft
1.77 k/ft	1.77 k/ft	1.77 k/ft	1.77 k/ft	1.77 k/ft
2.03 k/ft	1.89 k/ft	1.88 k/ft	1.74 k/ft	1.73 k/ft
1.73 k/ft	1.72 k/ft	1.71 k/ft	1.71 k/ft	1.70 k/ft
1.71 k/ft	1.71 k/ft	1.65 k/ft	1.63 k/ft	1.63 k/ft
1.63 k/ft	1.63 k/ft	1.78 k/ft	1.78 k/ft	1.23 k/ft
1.18 k/ft	1.04 k/ft	1.01 k/ft	0.98 k/ft	0.95 k/ft
0.93 k/ft	0.90 k/ft	0.88 k/ft	0.87 k/ft	0.91 k/ft
0.90 k/ft	0.89 k/ft	0.84 k/ft	0.99 k/ft	0.95 k/ft
0.91 k/ft	0.87 k/ft	0.83 k/ft	0.79 k/ft	0.75 k/ft
0.71 k/ft				

✓ 5m
4/23/10

Bracing off of Girder 4

0.48 K	0.35 K	0.29 K	0.24 K	0.20 K
0.17 K	3.14 K	0.46 K	0.28 K	0.24 K
0.22 K	2.57 K			

3AP6 ✓

3AP5 ✓

Half applied to each connected node.

Girder 5 Noncomposite Self Weight

Steel cross section, haunch, and slab

0.56 k/ft	0.58 k/ft	0.60 k/ft	0.63 k/ft	0.67 k/ft
0.71 k/ft	0.76 k/ft	0.82 k/ft	0.89 k/ft	0.91 k/ft
0.89 k/ft	0.84 k/ft	0.85 k/ft	0.85 k/ft	0.86 k/ft
0.87 k/ft	0.88 k/ft	0.89 k/ft	0.90 k/ft	0.91 k/ft
0.97 k/ft	0.94 k/ft	0.95 k/ft	0.72 k/ft	0.72 k/ft
0.71 k/ft	0.71 k/ft	0.71 k/ft	0.72 k/ft	0.78 k/ft
0.79 k/ft	0.80 k/ft	0.82 k/ft	0.84 k/ft	0.87 k/ft
0.90 k/ft	0.94 k/ft	0.98 k/ft	1.02 k/ft	0.81 k/ft
0.95 k/ft	0.85 k/ft	0.87 k/ft	0.88 k/ft	0.90 k/ft
0.91 k/ft	0.92 k/ft	0.93 k/ft	0.94 k/ft	0.94 k/ft
0.95 k/ft	0.87 k/ft	0.88 k/ft	0.88 k/ft	0.89 k/ft
0.89 k/ft	0.90 k/ft	0.90 k/ft	0.91 k/ft	0.91 k/ft
0.96 k/ft	0.91 k/ft	0.92 k/ft	0.92 k/ft	0.93 k/ft
0.93 k/ft	0.93 k/ft	0.94 k/ft	0.97 k/ft	0.97 k/ft
1.03 k/ft	0.95 k/ft	0.96 k/ft	0.96 k/ft	0.96 k/ft
0.96 k/ft	0.96 k/ft	0.96 k/ft	0.96 k/ft	0.95 k/ft
1.03 k/ft	0.98 k/ft	0.98 k/ft	0.95 k/ft	0.95 k/ft
0.95 k/ft	0.95 k/ft	0.95 k/ft	0.95 k/ft	1.05 k/ft
1.01 k/ft	0.97 k/ft	0.93 k/ft	0.89 k/ft	0.85 k/ft
0.81 k/ft	0.77 k/ft	0.73 k/ft	0.68 k/ft	0.69 k/ft
0.66 k/ft	0.65 k/ft	0.64 k/ft	0.64 k/ft	0.62 k/ft
0.61 k/ft	0.61 k/ft	0.60 k/ft	0.59 k/ft	0.59 k/ft
0.58 k/ft				

Steel in addition to cross section

[illegible]

Conc in addition to slab t and haunch

[illegible]

0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft
0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft
0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft
0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft
0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft

✓CSM
4/23/10

Total

0.64 k/ft	0.66 k/ft	0.68 k/ft	0.71 k/ft	0.74 k/ft
0.79 k/ft	0.84 k/ft	0.90 k/ft	0.97 k/ft	0.99 k/ft
0.96 k/ft	0.92 k/ft	0.92 k/ft	0.93 k/ft	0.94 k/ft
0.94 k/ft	0.95 k/ft	0.96 k/ft	0.98 k/ft	0.99 k/ft
1.05 k/ft	1.02 k/ft	1.03 k/ft	0.80 k/ft	0.79 k/ft
0.79 k/ft	0.79 k/ft	0.79 k/ft	0.79 k/ft	0.86 k/ft
0.87 k/ft	0.88 k/ft	0.90 k/ft	0.92 k/ft	0.95 k/ft
0.98 k/ft	1.01 k/ft	1.05 k/ft	1.10 k/ft	0.89 k/ft
1.03 k/ft	0.93 k/ft	0.94 k/ft	0.96 k/ft	0.97 k/ft
0.99 k/ft	1.00 k/ft	1.01 k/ft	1.01 k/ft	1.02 k/ft
1.03 k/ft	0.95 k/ft	0.95 k/ft	0.96 k/ft	0.96 k/ft
0.97 k/ft	0.98 k/ft	0.98 k/ft	0.99 k/ft	0.99 k/ft
1.04 k/ft	0.99 k/ft	0.99 k/ft	1.00 k/ft	1.00 k/ft
1.01 k/ft	1.01 k/ft	1.02 k/ft	1.05 k/ft	1.05 k/ft
1.11 k/ft	1.03 k/ft	1.04 k/ft	1.04 k/ft	1.04 k/ft
1.04 k/ft	1.04 k/ft	1.04 k/ft	1.04 k/ft	1.03 k/ft
1.11 k/ft	1.06 k/ft	1.06 k/ft	1.03 k/ft	1.03 k/ft
1.03 k/ft	1.03 k/ft	1.03 k/ft	1.03 k/ft	1.07 k/ft
1.03 k/ft	0.99 k/ft	0.95 k/ft	0.91 k/ft	0.87 k/ft
0.83 k/ft	0.79 k/ft	0.75 k/ft	0.71 k/ft	0.71 k/ft
0.68 k/ft	0.67 k/ft	0.67 k/ft	0.66 k/ft	0.64 k/ft
0.64 k/ft	0.63 k/ft	0.62 k/ft	0.62 k/ft	0.61 k/ft
0.60 k/ft				

Bracing off of Girder 5

P2-3E ✓

0.22 K	0.21 K	0.21 K	0.20 K	0.20 K
0.21 K	0.22 K	0.23 K	0.24 K	0.26 K
0.50 K	0.12 K	0.12 K	0.12 K	0.12 K
0.13 K	0.15 K	0.17 K	0.20 K	0.24 K
0.51 K	2.40 K	0.18 K	0.20 K	0.21 K
0.22 K	0.23 K	0.23 K	0.24 K	0.24 K
0.24 K	0.25 K	0.25 K	0.33 K	0.34 K
0.34 K	0.35 K	0.36 K	0.36 K	0.36 K
0.36 K	0.36 K	0.36 K	0.36 K	0.36 K
0.36 K	0.36 K	0.36 K	0.36 K	0.46 K
0.36 K	0.34 K	0.32 K	0.29 K	0.25 K
3.14 K	0.46 K			

✓P63A ✓

Half applied to each connected node.

Girder 6 Noncomposite Self Weight

Steel cross section, haunch, and slab

0.61 k/ft	0.62 k/ft	0.63 k/ft	0.64 k/ft	0.64 k/ft
0.65 k/ft	0.77 k/ft	0.78 k/ft	0.79 k/ft	0.79 k/ft
0.80 k/ft	0.74 k/ft	0.77 k/ft	0.80 k/ft	0.83 k/ft
0.86 k/ft	0.88 k/ft	0.90 k/ft	0.91 k/ft	0.93 k/ft
0.94 k/ft	0.88 k/ft	0.89 k/ft	0.90 k/ft	0.91 k/ft
0.92 k/ft	0.93 k/ft	0.94 k/ft	0.95 k/ft	1.00 k/ft
1.01 k/ft	0.97 k/ft	0.98 k/ft	0.99 k/ft	1.00 k/ft
1.01 k/ft	1.02 k/ft	1.03 k/ft	1.06 k/ft	1.06 k/ft
1.12 k/ft	1.04 k/ft	1.05 k/ft	1.05 k/ft	1.05 k/ft
1.05 k/ft	1.05 k/ft	1.05 k/ft	1.05 k/ft	1.04 k/ft
1.12 k/ft	1.07 k/ft	1.07 k/ft	1.04 k/ft	1.04 k/ft
1.04 k/ft	1.04 k/ft	1.04 k/ft	1.04 k/ft	1.06 k/ft
1.06 k/ft	1.05 k/ft	1.04 k/ft	1.03 k/ft	1.01 k/ft
1.00 k/ft	0.98 k/ft	0.96 k/ft	0.96 k/ft	0.97 k/ft
0.95 k/ft	0.91 k/ft	1.06 k/ft	1.01 k/ft	0.99 k/ft
0.97 k/ft	0.95 k/ft	0.93 k/ft	0.92 k/ft	0.91 k/ft
1.16 k/ft	1.11 k/ft	1.09 k/ft	1.06 k/ft	1.03 k/ft
1.00 k/ft	0.95 k/ft	0.91 k/ft	0.88 k/ft	0.85 k/ft
0.87 k/ft	0.84 k/ft	0.83 k/ft	0.83 k/ft	0.84 k/ft
0.85 k/ft	0.86 k/ft	0.88 k/ft	1.12 k/ft	1.05 k/ft
1.09 k/ft	1.04 k/ft	1.03 k/ft	1.03 k/ft	1.03 k/ft
1.03 k/ft	1.03 k/ft	1.03 k/ft	1.03 k/ft	1.03 k/ft
1.07 k/ft	1.07 k/ft	1.02 k/ft	1.02 k/ft	1.02 k/ft
1.02 k/ft	1.02 k/ft	1.02 k/ft	1.02 k/ft	1.02 k/ft
1.02 k/ft	1.02 k/ft	1.05 k/ft	1.05 k/ft	1.05 k/ft
1.05 k/ft	1.05 k/ft	1.05 k/ft	1.05 k/ft	1.05 k/ft
1.05 k/ft				

Steel in addition to cross section

[illegible]

Conc in addition to slab t and haunch

[illegible]

[illegible]

0.64 k/ft	0.64 k/ft	0.65 k/ft	0.66 k/ft	0.67 k/ft
0.67 k/ft	0.79 k/ft	0.80 k/ft	0.81 k/ft	0.82 k/ft
0.82 k/ft	0.76 k/ft	0.79 k/ft	0.82 k/ft	0.85 k/ft
0.88 k/ft	0.90 k/ft	0.92 k/ft	0.94 k/ft	0.95 k/ft
0.96 k/ft	0.90 k/ft	0.91 k/ft	0.92 k/ft	0.93 k/ft
0.94 k/ft	0.95 k/ft	0.96 k/ft	0.97 k/ft	1.02 k/ft
1.03 k/ft	1.00 k/ft	1.00 k/ft	1.01 k/ft	1.02 k/ft
1.03 k/ft	1.04 k/ft	1.05 k/ft	1.08 k/ft	1.08 k/ft
1.14 k/ft	1.06 k/ft	1.07 k/ft	1.07 k/ft	1.07 k/ft
1.07 k/ft	1.07 k/ft	1.07 k/ft	1.07 k/ft	1.06 k/ft
1.14 k/ft	1.09 k/ft	1.09 k/ft	1.06 k/ft	1.06 k/ft
1.06 k/ft	1.06 k/ft	1.06 k/ft	1.06 k/ft	1.08 k/ft
1.08 k/ft	1.07 k/ft	1.06 k/ft	1.05 k/ft	1.04 k/ft
1.02 k/ft	1.00 k/ft	0.98 k/ft	0.98 k/ft	1.00 k/ft
0.98 k/ft	0.94 k/ft	1.09 k/ft	1.03 k/ft	1.01 k/ft
0.99 k/ft	0.97 k/ft	0.95 k/ft	0.94 k/ft	0.93 k/ft
1.19 k/ft	1.14 k/ft	1.12 k/ft	1.09 k/ft	1.05 k/ft
1.02 k/ft	0.97 k/ft	0.94 k/ft	0.90 k/ft	0.87 k/ft
0.89 k/ft	0.86 k/ft	0.86 k/ft	0.86 k/ft	0.86 k/ft
0.87 k/ft	0.88 k/ft	0.90 k/ft	1.14 k/ft	1.07 k/ft
1.11 k/ft	1.06 k/ft	1.06 k/ft	1.05 k/ft	1.05 k/ft
1.05 k/ft	1.05 k/ft	1.05 k/ft	1.05 k/ft	1.05 k/ft
1.09 k/ft	1.09 k/ft	1.04 k/ft	1.04 k/ft	1.04 k/ft
1.04 k/ft	1.04 k/ft	1.04 k/ft	1.04 k/ft	1.04 k/ft
1.04 k/ft	1.04 k/ft	1.07 k/ft	1.07 k/ft	1.07 k/ft
1.07 k/ft	1.07 k/ft	1.07 k/ft	1.07 k/ft	1.07 k/ft
1.07 k/ft				

0.51 K	2.40 K	0.18 K	0.20 K	0.21 K
0.22 K	0.23 K	0.23 K P_1	0.24 K	0.24 K
0.24 K	0.25 K	0.25 K	0.33 K P_3	0.34 K
0.34 K	0.35 K	0.36 K	0.36 K P_2	0.36 K
0.36 K	0.36 K	0.36 K	0.36 K	0.36 K P_1
0.36 K	0.36 K	0.36 K	0.36 K	0.46 K
0.36 K P_7	0.36 K	0.36 K	0.36 K	0.36 K
5.98 K	0.36 K	0.36 K	0.36 K	0.36 K
2.96 K	0.29 K	0.29 K	0.29 K	0.29 K
0.29 K	0.29 K	2.43 K	0.29 K	0.29 K
0.29 K	0.29 K P_3	0.29 K	0.29 K	0.29 K
0.29 K P_2	0.29 K	0.29 K	0.29 K P_1	0.29 K
0.29 K	0.29 K	0.29 K	0.29 K	0.29 K
0.51 K				

A-50

Steel cross section, haunch, and slab

0.58 k/ft	0.59 k/ft	0.60 k/ft	0.62 k/ft	0.63 k/ft
0.65 k/ft	0.66 k/ft	0.68 k/ft	0.70 k/ft	0.73 k/ft
0.75 k/ft	0.78 k/ft	0.81 k/ft	0.85 k/ft	0.89 k/ft
0.93 k/ft	0.97 k/ft	1.01 k/ft	1.05 k/ft	0.85 k/ft
0.98 k/ft	0.95 k/ft	0.74 k/ft	0.76 k/ft	0.79 k/ft
0.82 k/ft	0.86 k/ft	0.89 k/ft	0.93 k/ft	0.98 k/ft
1.02 k/ft	0.98 k/ft	1.04 k/ft	0.88 k/ft	0.89 k/ft
0.89 k/ft	0.90 k/ft	0.90 k/ft	0.91 k/ft	0.91 k/ft
0.96 k/ft	0.91 k/ft	0.92 k/ft	0.92 k/ft	0.93 k/ft
0.93 k/ft	0.93 k/ft	0.94 k/ft	0.97 k/ft	0.97 k/ft
1.03 k/ft	0.95 k/ft	0.97 k/ft	0.97 k/ft	0.97 k/ft
0.97 k/ft	0.97 k/ft	0.97 k/ft	0.97 k/ft	0.95 k/ft
1.04 k/ft	0.99 k/ft	0.99 k/ft	0.95 k/ft	0.95 k/ft
0.95 k/ft	0.95 k/ft	0.95 k/ft	0.95 k/ft	0.99 k/ft
0.99 k/ft	0.99 k/ft	0.99 k/ft	0.99 k/ft	0.99 k/ft
0.99 k/ft	0.99 k/ft	0.99 k/ft	1.01 k/ft	1.08 k/ft
1.08 k/ft	1.08 k/ft	1.03 k/ft	1.00 k/ft	1.00 k/ft
1.00 k/ft	1.00 k/ft	1.00 k/ft	1.00 k/ft	1.00 k/ft
1.05 k/ft	1.03 k/ft	1.02 k/ft	1.02 k/ft	1.02 k/ft
1.02 k/ft	1.02 k/ft	1.02 k/ft	1.02 k/ft	1.02 k/ft
1.10 k/ft	1.10 k/ft	0.98 k/ft	0.98 k/ft	0.98 k/ft
0.98 k/ft	0.98 k/ft	0.98 k/ft	0.98 k/ft	0.96 k/ft
1.01 k/ft	1.01 k/ft	0.96 k/ft	0.96 k/ft	0.96 k/ft
0.96 k/ft	0.96 k/ft	0.96 k/ft	0.96 k/ft	0.96 k/ft
1.01 k/ft	1.01 k/ft	0.95 k/ft	0.95 k/ft	0.95 k/ft
0.95 k/ft	0.95 k/ft	0.95 k/ft	0.95 k/ft	0.95 k/ft
0.95 k/ft	1.01 k/ft	1.01 k/ft	1.01 k/ft	1.01 k/ft
1.01 k/ft	1.01 k/ft	1.01 k/ft	1.01 k/ft	1.01 k/ft
1.01 k/ft				

[illegible][illegible]

[illegible]

0	0.60 k/ft	0.61 k/ft	0.63 k/ft	0.64 k/ft	0.66 k/ft
	0.67 k/ft	0.69 k/ft	0.70 k/ft	0.72 k/ft	0.75 k/ft
1	0.77 k/ft	0.80 k/ft	0.84 k/ft	0.87 k/ft	0.91 k/ft
	0.95 k/ft	0.99 k/ft	1.03 k/ft	1.07 k/ft	0.87 k/ft
2	1.00 k/ft	0.98 k/ft	0.76 k/ft	0.79 k/ft	0.81 k/ft
	0.85 k/ft	0.88 k/ft	0.92 k/ft	0.96 k/ft	1.00 k/ft
P1-3E3	1.10 k/ft	1.06 k/ft	1.12 k/ft	0.96 k/ft	0.96 k/ft
	0.97 k/ft	0.98 k/ft	0.98 k/ft	0.99 k/ft	0.99 k/ft
P3-3C4	1.04 k/ft	0.99 k/ft	0.99 k/ft	1.00 k/ft	1.00 k/ft
	1.01 k/ft	1.01 k/ft	1.02 k/ft	1.05 k/ft	1.05 k/ft
P2-3C5	1.11 k/ft	1.03 k/ft	1.05 k/ft	1.05 k/ft	1.05 k/ft
	1.05 k/ft	1.05 k/ft	1.05 k/ft	1.05 k/ft	1.03 k/ft
P1-3C6	1.12 k/ft	1.07 k/ft	1.07 k/ft	1.03 k/ft	1.03 k/ft
	1.03 k/ft	1.03 k/ft	1.03 k/ft	1.03 k/ft	1.07 k/ft
P7-3A7	1.07 k/ft	1.07 k/ft	1.07 k/ft	1.07 k/ft	1.07 k/ft
	1.07 k/ft	1.07 k/ft	1.07 k/ft	1.09 k/ft	1.15 k/ft
P6-3A8	1.16 k/ft	1.15 k/ft	1.11 k/ft	1.08 k/ft	1.08 k/ft
	1.08 k/ft	1.08 k/ft	1.08 k/ft	1.08 k/ft	1.08 k/ft
P5-3A9	1.13 k/ft	1.11 k/ft	1.10 k/ft	1.10 k/ft	1.10 k/ft
	1.10 k/ft	1.10 k/ft	1.10 k/ft	1.10 k/ft	1.10 k/ft
P4-3A10	1.17 k/ft	1.17 k/ft	1.06 k/ft	1.06 k/ft	1.06 k/ft
	1.06 k/ft	1.06 k/ft	1.06 k/ft	1.06 k/ft	1.03 k/ft
P3-3A11	1.09 k/ft	1.09 k/ft	1.03 k/ft	1.03 k/ft	1.03 k/ft
	1.03 k/ft	1.03 k/ft	1.03 k/ft	1.03 k/ft	1.03 k/ft
P2-3A12	1.09 k/ft	1.09 k/ft	1.02 k/ft	1.02 k/ft	1.02 k/ft
	1.02 k/ft	1.02 k/ft	1.02 k/ft	1.02 k/ft	1.02 k/ft
P1-3B13	1.02 k/ft	1.02 k/ft	1.02 k/ft	1.02 k/ft	1.02 k/ft
	1.09 k/ft	1.09 k/ft	1.09 k/ft	1.09 k/ft	1.09 k/ft
	1.09 k/ft	1.09 k/ft	1.09 k/ft	1.09 k/ft	1.09 k/ft
45 14	1.09 k/ft				

0.50 K	0.16 K	0.19 K	0.22 K	0.22 K
0.23 K	0.25 K	0.27 K	0.28 K	0.28 K
0.28 K	4.14 K	0.53 K	0.15 K	0.17 K
0.20 K	0.23 K	0.27 K	0.30 K	

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Girder 8 Noncomposite Self Weight

Steel cross section, haunch, and slab

0.61	k/ft	0.62	k/ft	0.64	k/ft	0.66	k/ft	0.68	k/ft
0.71	k/ft	0.74	k/ft	0.77	k/ft	0.80	k/ft	0.84	k/ft
0.88	k/ft	0.95	k/ft	1.01	k/ft	0.86	k/ft	0.87	k/ft
0.88	k/ft	0.88	k/ft	0.89	k/ft	0.90	k/ft	0.91	k/ft
0.97	k/ft	0.92	k/ft	0.91	k/ft	0.92	k/ft	0.93	k/ft
0.94	k/ft	0.95	k/ft	0.96	k/ft	0.96	k/ft	1.01	k/ft
1.01	k/ft	1.01	k/ft	0.96	k/ft	0.96	k/ft	0.96	k/ft
0.96	k/ft	0.96	k/ft	0.96	k/ft	0.96	k/ft	0.96	k/ft
0.96	k/ft	0.96	k/ft	0.96	k/ft	0.96	k/ft	0.96	k/ft
0.96	k/ft	0.96	k/ft	0.96	k/ft	0.96	k/ft	1.01	k/ft
1.01	k/ft	0.96	k/ft	0.96	k/ft	0.96	k/ft	0.96	k/ft
0.96	k/ft	0.96	k/ft	0.96	k/ft	0.96	k/ft	1.00	k/ft
1.00	k/ft	1.00	k/ft	0.96	k/ft	0.96	k/ft	0.96	k/ft
0.96	k/ft	0.96	k/ft	0.96	k/ft	0.96	k/ft	0.96	k/ft
0.96	k/ft	1.04	k/ft	1.04	k/ft	1.04	k/ft	1.04	k/ft
1.04	k/ft	1.04	k/ft	1.04	k/ft	1.03	k/ft	1.08	k/ft
1.08	k/ft	1.03	k/ft	1.03	k/ft	1.03	k/ft	1.03	k/ft
1.03	k/ft	1.03	k/ft	1.03	k/ft	1.03	k/ft	1.07	k/ft
1.08	k/ft	1.02	k/ft	1.02	k/ft	1.02	k/ft	1.02	k/ft
1.02	k/ft	1.02	k/ft	1.02	k/ft	1.02	k/ft	1.07	k/ft
1.07	k/ft	1.07	k/ft	1.02	k/ft	1.02	k/ft	1.02	k/ft
1.02	k/ft	1.02	k/ft	1.02	k/ft	1.02	k/ft	1.02	k/ft
1.02	k/ft								

Steel in addition to cross section

[illegible]

Conc in addition to slab t and haunch

0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft
0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft
0.01 k/ft	0.07 k/ft	0.07 k/ft	0.07 k/ft	0.07 k/ft
0.07 k/ft	0.07 k/ft	0.07 k/ft	0.07 k/ft	0.07 k/ft
0.07 k/ft	0.07 k/ft	0.07 k/ft	0.07 k/ft	0.07 k/ft
0.07 k/ft	0.07 k/ft	0.07 k/ft	0.07 k/ft	0.07 k/ft
0.07 k/ft	0.07 k/ft	0.07 k/ft	0.07 k/ft	0.07 k/ft
0.07 k/ft	0.07 k/ft	0.07 k/ft	0.07 k/ft	0.07 k/ft
0.07 k/ft	0.07 k/ft	0.07 k/ft	0.07 k/ft	0.07 k/ft
0.07 k/ft	0.07 k/ft	0.07 k/ft	0.07 k/ft	0.07 k/ft
0.07 k/ft	0.07 k/ft	0.07 k/ft	0.07 k/ft	0.07 k/ft
0.07 k/ft	0.07 k/ft	0.07 k/ft	0.07 k/ft	0.07 k/ft
0.07 k/ft	0.07 k/ft	0.07 k/ft	0.07 k/ft	0.07 k/ft
0.06 k/ft	0.06 k/ft	0.06 k/ft	0.06 k/ft	0.06 k/ft
0.06 k/ft	0.06 k/ft	0.06 k/ft	0.06 k/ft	0.06 k/ft
0.06 k/ft	0.06 k/ft	0.06 k/ft	0.06 k/ft	0.06 k/ft

0.06 k/ft	0.06 k/ft	0.06 k/ft	0.06 k/ft	0.06 k/ft
0.06 k/ft	0.06 k/ft	0.06 k/ft	0.06 k/ft	0.06 k/ft
0.06 k/ft	0.06 k/ft	0.06 k/ft	0.06 k/ft	0.06 k/ft
0.06 k/ft	0.06 k/ft	0.06 k/ft	0.06 k/ft	0.06 k/ft
0.06 k/ft				

Total

0.63 k/ft	0.64 k/ft	0.66 k/ft	0.68 k/ft	0.70 k/ft
0.73 k/ft	0.76 k/ft	0.79 k/ft	0.83 k/ft	0.87 k/ft
0.90 k/ft	1.03 k/ft	1.09 k/ft	0.94 k/ft	0.95 k/ft
0.95 k/ft	0.96 k/ft	0.97 k/ft	0.98 k/ft	0.98 k/ft
1.04 k/ft	1.00 k/ft	0.99 k/ft	1.00 k/ft	1.01 k/ft
1.02 k/ft	1.03 k/ft	1.04 k/ft	1.04 k/ft	1.09 k/ft
1.09 k/ft	1.09 k/ft	1.04 k/ft	1.04 k/ft	1.04 k/ft
1.04 k/ft	1.04 k/ft	1.04 k/ft	1.04 k/ft	1.04 k/ft
1.04 k/ft	1.04 k/ft	1.04 k/ft	1.04 k/ft	1.04 k/ft
1.04 k/ft	1.04 k/ft	1.04 k/ft	1.04 k/ft	1.09 k/ft
1.09 k/ft	1.04 k/ft	1.04 k/ft	1.04 k/ft	1.04 k/ft
1.04 k/ft	1.04 k/ft	1.04 k/ft	1.04 k/ft	1.08 k/ft
1.08 k/ft	1.08 k/ft	1.04 k/ft	1.04 k/ft	1.04 k/ft
1.04 k/ft	1.04 k/ft	1.04 k/ft	1.04 k/ft	1.04 k/ft
1.04 k/ft	1.11 k/ft	1.11 k/ft	1.11 k/ft	1.11 k/ft
1.11 k/ft	1.11 k/ft	1.11 k/ft	1.10 k/ft	1.15 k/ft
1.15 k/ft	1.10 k/ft	1.10 k/ft	1.10 k/ft	1.10 k/ft
1.10 k/ft	1.10 k/ft	1.10 k/ft	1.10 k/ft	1.14 k/ft
1.15 k/ft	1.09 k/ft	1.09 k/ft	1.09 k/ft	1.09 k/ft
1.09 k/ft	1.09 k/ft	1.09 k/ft	1.09 k/ft	1.14 k/ft
1.14 k/ft	1.14 k/ft	1.09 k/ft	1.09 k/ft	1.09 k/ft
1.09 k/ft	1.09 k/ft	1.09 k/ft	1.09 k/ft	1.09 k/ft
1.09 k/ft				

Bracing off of Girder 8

0.54 K	0.15 K	0.16 K	0.17 K	0.18 K
0.19 K	0.19 K	0.20 K	0.20 K	0.21 K
0.22 K	0.23 K	0.24 K	0.26 K	0.27 K
0.29 K	0.29 K	0.29 K	0.29 K	0.29 K
0.29 K	0.29 K	0.29 K	0.29 K	0.29 K
0.29 K	0.29 K	0.29 K	0.29 K	0.28 K
0.29 K	0.29 K	0.17 K	0.29 K	0.17 K
0.17 K	0.17 K	0.17 K	0.17 K	0.17 K
0.17 K	0.17 K	0.17 K	0.17 K	0.17 K
0.17 K	0.17 K	0.29 K		

Half applied to each connected node.

Girder 9 Noncomposite Self Weight

Steel cross section, haunch, and slab

0.85 k/ft	0.85 k/ft	0.85 k/ft	0.85 k/ft	0.84 k/ft
0.84 k/ft	0.85 k/ft	0.85 k/ft	0.85 k/ft	0.85 k/ft
0.86 k/ft	0.86 k/ft	0.87 k/ft	0.88 k/ft	0.89 k/ft
0.90 k/ft	0.91 k/ft	0.92 k/ft	0.94 k/ft	0.95 k/ft
1.01 k/ft	0.98 k/ft	1.00 k/ft	0.80 k/ft	0.82 k/ft
0.85 k/ft	0.87 k/ft	0.89 k/ft	0.91 k/ft	0.97 k/ft
0.98 k/ft	1.01 k/ft	1.02 k/ft	1.04 k/ft	1.05 k/ft
1.06 k/ft	1.07 k/ft	1.07 k/ft	1.08 k/ft	1.08 k/ft
1.21 k/ft	1.14 k/ft	0.92 k/ft	0.93 k/ft	0.93 k/ft
0.94 k/ft	0.95 k/ft	0.96 k/ft	0.97 k/ft	0.98 k/ft
0.99 k/ft	0.90 k/ft	0.90 k/ft	0.91 k/ft	0.92 k/ft
0.93 k/ft	0.93 k/ft	0.94 k/ft	0.95 k/ft	0.96 k/ft
1.01 k/ft	0.97 k/ft	1.00 k/ft	1.01 k/ft	1.02 k/ft
1.02 k/ft	1.03 k/ft	1.04 k/ft	1.05 k/ft	1.09 k/ft
1.09 k/ft	1.09 k/ft	1.05 k/ft	1.05 k/ft	1.05 k/ft
1.05 k/ft	1.05 k/ft	1.05 k/ft	1.05 k/ft	1.05 k/ft
1.05 k/ft	1.05 k/ft	1.05 k/ft	1.05 k/ft	1.05 k/ft
1.05 k/ft	1.05 k/ft	1.05 k/ft	1.05 k/ft	1.08 k/ft
1.08 k/ft	1.05 k/ft	1.05 k/ft	1.05 k/ft	1.05 k/ft
1.05 k/ft	1.05 k/ft	1.05 k/ft	1.05 k/ft	1.05 k/ft
1.05 k/ft	1.05 k/ft	1.05 k/ft	1.05 k/ft	1.05 k/ft
1.05 k/ft	1.13 k/ft	1.13 k/ft	1.13 k/ft	1.13 k/ft
1.13 k/ft	1.13 k/ft	1.13 k/ft	1.12 k/ft	1.17 k/ft
1.17 k/ft	1.12 k/ft	1.12 k/ft	1.12 k/ft	1.12 k/ft
1.12 k/ft	1.12 k/ft	1.12 k/ft	1.12 k/ft	1.16 k/ft
1.16 k/ft	1.12 k/ft	1.12 k/ft	1.12 k/ft	1.12 k/ft
1.12 k/ft	1.12 k/ft	1.12 k/ft	1.12 k/ft	1.16 k/ft
1.16 k/ft	1.16 k/ft	1.12 k/ft	1.12 k/ft	1.12 k/ft
1.12 k/ft	1.12 k/ft	1.12 k/ft	1.12 k/ft	1.12 k/ft
1.12 k/ft				

Steel in addition to cross section

[illegible]

Conc in addition to slab t and haunch

0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft
0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft	0.01 k/ft

✓ cgm
4/23/10

0.87 k/ft	0.87 k/ft	0.87 k/ft	0.87 k/ft	0.87 k/ft
0.87 k/ft	0.87 k/ft	0.87 k/ft	0.87 k/ft	0.87 k/ft
0.88 k/ft	0.88 k/ft	0.89 k/ft	0.90 k/ft	0.91 k/ft
0.92 k/ft	0.93 k/ft	0.94 k/ft	0.96 k/ft	0.97 k/ft
1.04 k/ft	1.01 k/ft	1.02 k/ft	0.82 k/ft	0.85 k/ft
0.87 k/ft	0.89 k/ft	0.91 k/ft	0.93 k/ft	0.99 k/ft
1.01 k/ft	1.03 k/ft	1.05 k/ft	1.06 k/ft	1.07 k/ft
1.08 k/ft	1.09 k/ft	1.10 k/ft	1.10 k/ft	1.10 k/ft
1.23 k/ft	1.17 k/ft	0.94 k/ft	0.95 k/ft	0.96 k/ft
0.97 k/ft	0.98 k/ft	0.98 k/ft	0.99 k/ft	1.00 k/ft
1.01 k/ft	0.92 k/ft	0.93 k/ft	0.93 k/ft	0.94 k/ft
0.95 k/ft	0.96 k/ft	0.96 k/ft	0.97 k/ft	0.98 k/ft
1.03 k/ft	1.00 k/ft	1.02 k/ft	1.03 k/ft	1.04 k/ft
1.05 k/ft	1.06 k/ft	1.06 k/ft	1.07 k/ft	1.12 k/ft
1.12 k/ft	1.12 k/ft	1.07 k/ft	1.07 k/ft	1.07 k/ft
1.07 k/ft	1.07 k/ft	1.07 k/ft	1.07 k/ft	1.07 k/ft
1.07 k/ft	1.07 k/ft	1.07 k/ft	1.07 k/ft	1.07 k/ft
1.07 k/ft	1.07 k/ft	1.07 k/ft	1.07 k/ft	1.11 k/ft
1.11 k/ft	1.07 k/ft	1.07 k/ft	1.07 k/ft	1.07 k/ft
1.07 k/ft	1.07 k/ft	1.07 k/ft	1.07 k/ft	1.07 k/ft
1.11 k/ft	1.11 k/ft	1.07 k/ft	1.07 k/ft	1.07 k/ft
1.07 k/ft	1.07 k/ft	1.07 k/ft	1.07 k/ft	1.07 k/ft
1.07 k/ft	1.15 k/ft	1.15 k/ft	1.15 k/ft	1.15 k/ft
1.15 k/ft	1.15 k/ft	1.15 k/ft	1.14 k/ft	1.19 k/ft
1.19 k/ft	1.14 k/ft	1.14 k/ft	1.14 k/ft	1.14 k/ft
1.14 k/ft	1.14 k/ft	1.14 k/ft	1.14 k/ft	1.19 k/ft
1.19 k/ft	1.14 k/ft	1.14 k/ft	1.14 k/ft	1.14 k/ft
1.14 k/ft	1.14 k/ft	1.14 k/ft	1.14 k/ft	1.18 k/ft
1.18 k/ft	1.18 k/ft	1.14 k/ft	1.14 k/ft	1.14 k/ft
1.14 k/ft	1.14 k/ft	1.14 k/ft	1.14 k/ft	1.14 k/ft
1.14 k/ft				

Pier 2-3E

A-56

Half applied to each connected node.

Girder 10 Noncomposite Self Weight

Steel cross section, haunch, and slab

0.87 k/ft	0.87 k/ft	0.87 k/ft	0.88 k/ft	0.88 k/ft
0.88 k/ft	0.88 k/ft	0.89 k/ft	0.89 k/ft	0.89 k/ft
0.89 k/ft	0.90 k/ft	0.90 k/ft	0.90 k/ft	0.91 k/ft
0.91 k/ft	0.91 k/ft	0.92 k/ft	0.92 k/ft	0.92 k/ft
0.92 k/ft	0.93 k/ft	0.93 k/ft	0.93 k/ft	0.93 k/ft
0.93 k/ft	0.93 k/ft	0.94 k/ft	0.94 k/ft	0.98 k/ft
0.98 k/ft	0.98 k/ft	0.98 k/ft	0.99 k/ft	0.99 k/ft
0.99 k/ft	0.99 k/ft	0.99 k/ft	0.99 k/ft	0.99 k/ft
1.09 k/ft	1.00 k/ft	1.00 k/ft	1.00 k/ft	1.00 k/ft
1.00 k/ft	1.00 k/ft	1.00 k/ft	1.00 k/ft	1.00 k/ft
1.00 k/ft	0.98 k/ft	0.94 k/ft	0.94 k/ft	0.94 k/ft
0.94 k/ft	0.94 k/ft	0.94 k/ft	0.94 k/ft	0.98 k/ft
0.98 k/ft	0.94 k/ft	0.96 k/ft	0.96 k/ft	0.96 k/ft
0.96 k/ft	0.96 k/ft	0.96 k/ft	0.96 k/ft	1.01 k/ft
1.01 k/ft	1.01 k/ft	0.96 k/ft	0.96 k/ft	0.96 k/ft
0.96 k/ft	0.96 k/ft	0.96 k/ft	0.96 k/ft	0.96 k/ft
0.96 k/ft	0.96 k/ft	0.96 k/ft	0.96 k/ft	0.96 k/ft
0.96 k/ft	0.96 k/ft	0.96 k/ft	0.96 k/ft	1.00 k/ft
1.00 k/ft	0.96 k/ft	0.96 k/ft	0.96 k/ft	0.96 k/ft
0.96 k/ft	0.96 k/ft	0.96 k/ft	0.96 k/ft	0.96 k/ft
1.00 k/ft	0.96 k/ft	0.96 k/ft	0.96 k/ft	0.96 k/ft
0.96 k/ft	0.96 k/ft	0.96 k/ft	0.96 k/ft	0.96 k/ft
0.96 k/ft	1.02 k/ft	1.02 k/ft	1.02 k/ft	1.02 k/ft
1.02 k/ft	1.02 k/ft	1.02 k/ft	1.02 k/ft	1.07 k/ft
1.07 k/ft	1.02 k/ft	1.02 k/ft	1.02 k/ft	1.02 k/ft
1.02 k/ft	1.02 k/ft	1.02 k/ft	1.02 k/ft	1.07 k/ft
1.07 k/ft	1.02 k/ft	1.02 k/ft	1.02 k/ft	1.02 k/ft
1.02 k/ft	1.02 k/ft	1.02 k/ft	1.02 k/ft	1.07 k/ft
1.07 k/ft	1.07 k/ft	1.02 k/ft	1.02 k/ft	1.02 k/ft
1.02 k/ft	1.02 k/ft	1.02 k/ft	1.02 k/ft	1.02 k/ft
1.02 k/ft				

Steel in addition to cross section

[illegible]

Conc in addition to slab t and haunch

0.07 k/ft	0.07 k/ft	0.07 k/ft	0.07 k/ft	0.07 k/ft
0.07 k/ft	0.07 k/ft	0.07 k/ft	0.07 k/ft	0.07 k/ft

Total

A-59

Jon Siiter

From: Jennifer French
Sent: Monday, December 07, 2009 10:09 AM
To: Jon Siiter
Cc: Jennifer French
Subject: FW: Request Design Speed - Revised

JWS 12-7-09

Jon, I need the design speeds for:

CHART

FORMULAS

Pier P2-3E
Radius of 254.25'
Superelevation of .020 ft/ft

DESIGN SPEED = 20 MPH
USE 30

$$0.02 + 0.17 = \frac{V^2}{15(254)}$$
$$V = 27 \text{ MPH}$$

Radius of 320.14'
Superelevation of 0.020 ft/ft

DESIGN SPEED = 28 MPH
USE 30

$$0.02 + 0.16 = \frac{V^2}{15(320)}$$

Pier P4-3A
Radius of 473.71'
Superelevation of .056 ft/ft

DESIGN SPEED = 38 MPH
USE 40

$$V = 29 \text{ MPH}$$
$$0.056 + 0.15 = \frac{V^2}{15(474)}$$
$$V = 38 \text{ MPH}$$

Pier P5-3A
Radius of 826.26'
Superelevation of .056 ft/ft

DESIGN SPEED = 50 MPH
USE 50

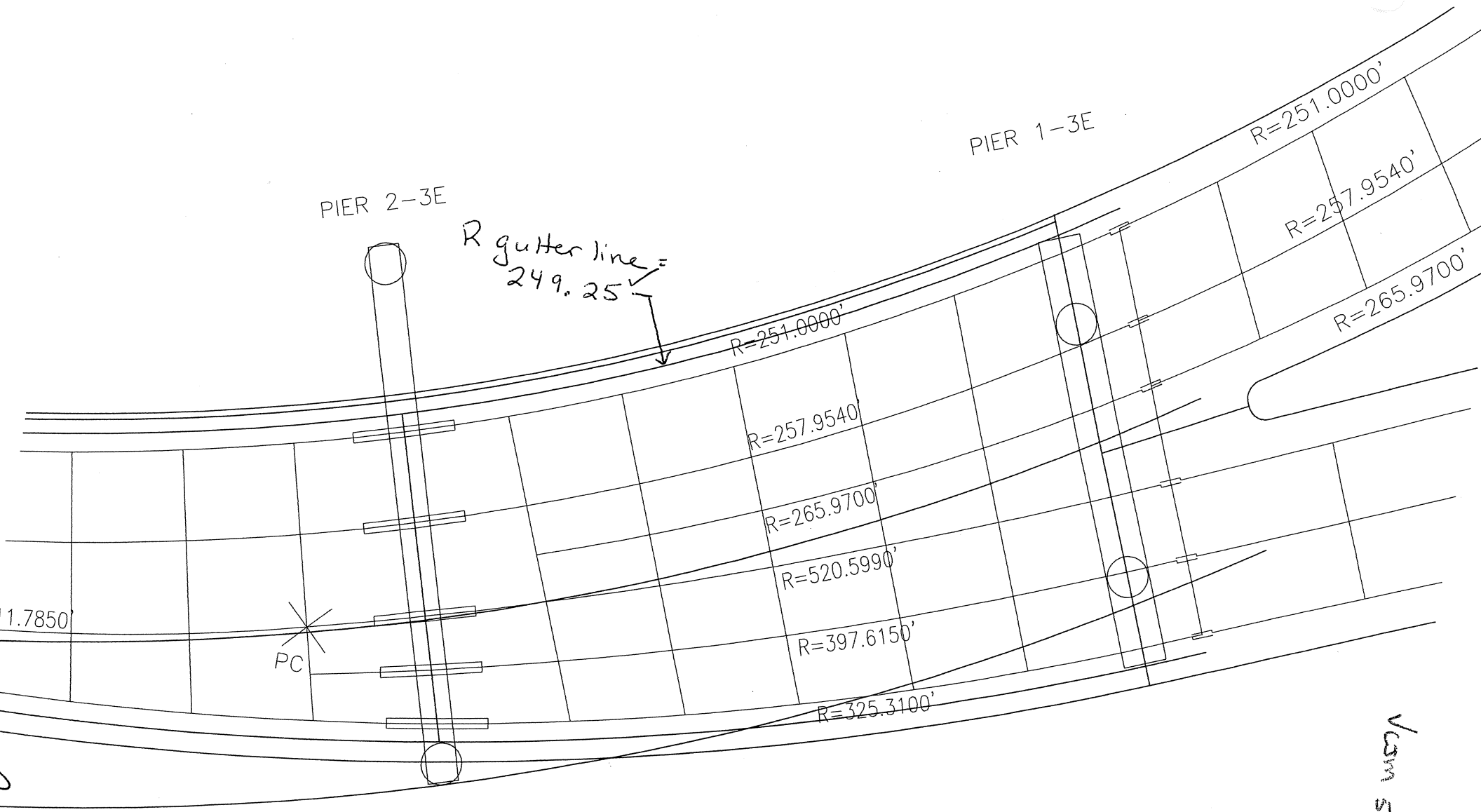
$$0.056 + 0.14 = \frac{V^2}{15(826)}$$
$$V = 49 \text{ MPH}$$

Pier P6-3A
Radius of 826.26'
Superelevation of .051 ft/ft

DESIGN SPEED = 47 MPH
USE 50

$$0.051 + 0.14 = \frac{V^2}{15(826)}$$
$$V = 48 \text{ MPH}$$

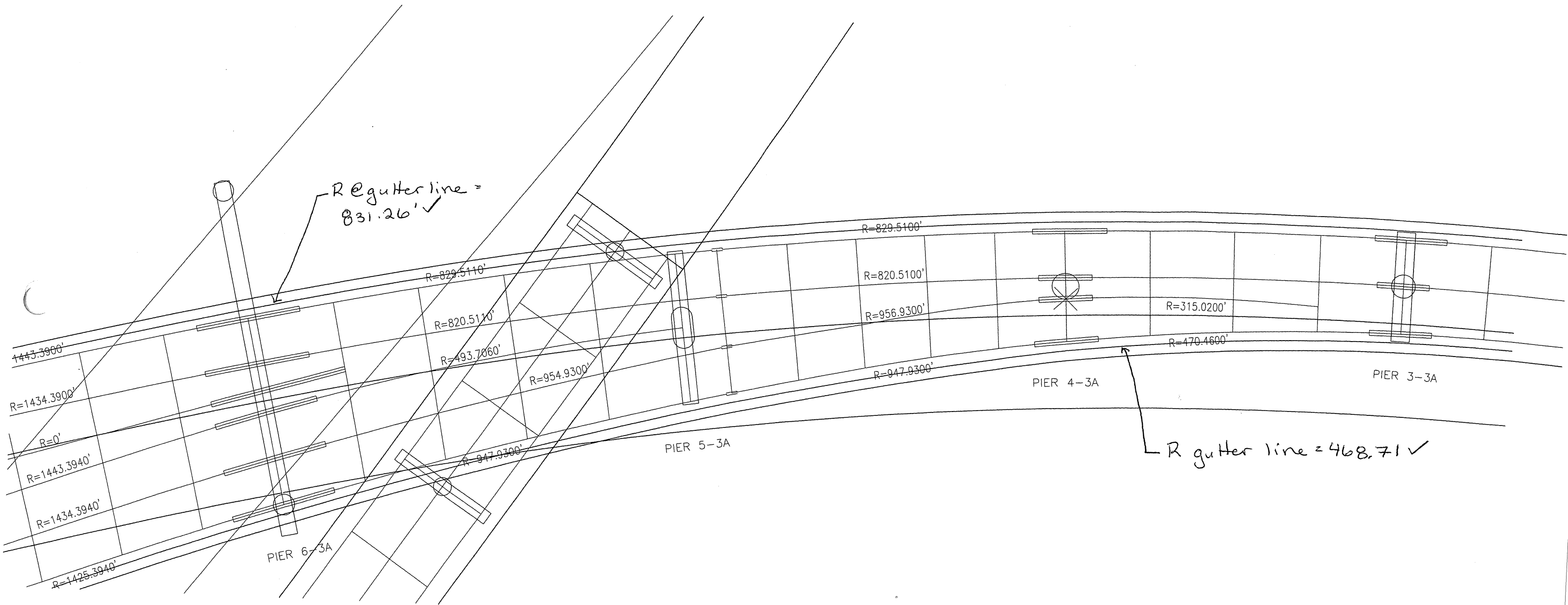
Thanks!



$$249.25 + 5' = 254.25' \checkmark$$

↑ Center of lane ✓
 $= 2'-0" + \frac{1}{2}(6'-0")$

69801N
3-E-3C61RDER MODEL



Radius used $= 831.26 - 5' = 826.26 ✓$

Radius used $= 468.71 + 5' = 473.71' ✓$



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218 727-8446
Fax 218 727-8456
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PROJECT MnDOT SS-69801 - Centrifugal Forces - LRFD -1
PROJECT # 090147 DATE 1/12/09 BY jadP SHEET NO. 5/14/10 OF

Determine Centrifugal forces on pier cap.
See 3.6.3

$$C = f \frac{v^2}{gR}$$

C = factor to apply to axle weight of the design truck or tandem.

f = $\frac{4}{3}$ for local comb. other than fatigue

v = design speed (ft/sec)

g = 32.2 ft/sec²

R = Radius of curvature (ft).

P2-3E ✓

S = 30 mph ✓ See JWS calcs 12-7-09 = 40 ft/sec ✓

R = 254.25' ✓

$$C = \frac{4}{3} \times \frac{40^2}{32.2 \times 254.25} = \boxed{0.26} \quad \checkmark$$

P4-3A

S = 40 mph = 58.7 ft/sec ✓

R = 473.7' ✓

$$\boxed{C = 0.30} \quad \checkmark$$

P5-3A

S = 50 mph = 73.3 ft/sec ✓

R = 826.26' ✓

$$\boxed{C = 0.27} \quad \checkmark$$

P6-3A

S = 50 mph = 73.3 ft/sec ✓

R = 826.26' ✓

$$\boxed{C = 0.27} \quad \checkmark$$

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Fax 218 727-8456
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612 338-2029
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PROJECT MnDOT-SS-69801N+J - Rating Equation -1

PROJECT # 090147 DATE 1.22.10 BY Jdf SHEET NO. 1 OF 1

1/20/10

Standard Rating Equation
MBE 6A.4.2

$$RF = \frac{C - \gamma_{DC} DC - \gamma_{DW} DW \pm \gamma_P P}{\gamma_{LL} (LL + Im)} \checkmark$$

$$C = \phi_c \phi_s \phi R_n \checkmark$$

$$\gamma_{DC} = \gamma_{DW} = \gamma_P = 1.25 \text{ per Jon S.} \checkmark$$

$$DC + DW + P = \text{All Dead Loads.} \checkmark$$

$$\gamma_{LL} = 1.75 \text{ for inventory} \checkmark$$

$$= 1.35 \text{ for operating} \checkmark$$

$$LL + Im = \text{Live Load effect} + \text{Dynamic load allowance (unfactored).} \checkmark$$

For Rating Flexural Strength we have both strong and weak axis bending. Standard limit state equation per Article A.6.1.2 is

↳ LRFD 4.4.4.1

$$M_u + \frac{1}{3} f_e S_{xt} \leq \phi_f M_{nt} \checkmark$$

(where M_u and f_e are factored loads).

To fit this into the Rating Equation,

$$\gamma_{LL} (LL + Im) = M_u + \frac{1}{3} f_e S_{xt} \text{ (for Live Loads w/ impact).}$$

$$\text{divide by } \gamma_{LL} \Rightarrow (LL + Im) = M_{\text{strong axis}} + \frac{1}{3} (\text{weak axis stress}) \times S_{xt} \checkmark$$

$$M_{\text{strong axis}} = M_x \checkmark$$

$$\text{weak axis stress} = \frac{m_y}{s_y}$$

$$\therefore (LL + Im) = M_x + \frac{1}{3} \frac{m_y}{s_y} \times S_{xt} \checkmark$$

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218 727-8446
Fax 218 727-8456
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612 338-2029
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PROJECT MnDOT - SS - 69801N+J - Rating Equation -2
PROJECT # 090147 DATE 1.22.10 BY jdf SHEET NO. _____ OF _____
✓ LSm 5/4/10

The resulting equation is:

$$RF = \frac{C - \gamma_{DC} \times DL}{\gamma_{LL} (LL + Im)} \quad \checkmark$$

Where $\gamma_{DC} = 1.25 \quad \checkmark$

DL = All dead Load effects $\checkmark$

$\gamma_{LL} = 1.75$ for inventory $\checkmark$

1.35 for operating $\checkmark$

$C = \phi_c \phi_s \phi R_n \quad \checkmark$

$LL + Im = m_x + \frac{1}{3} \frac{m_y}{S_y} \times S_{xt} \quad \checkmark$

where m_x = Live Load w/ impact strong axis moment $\checkmark$

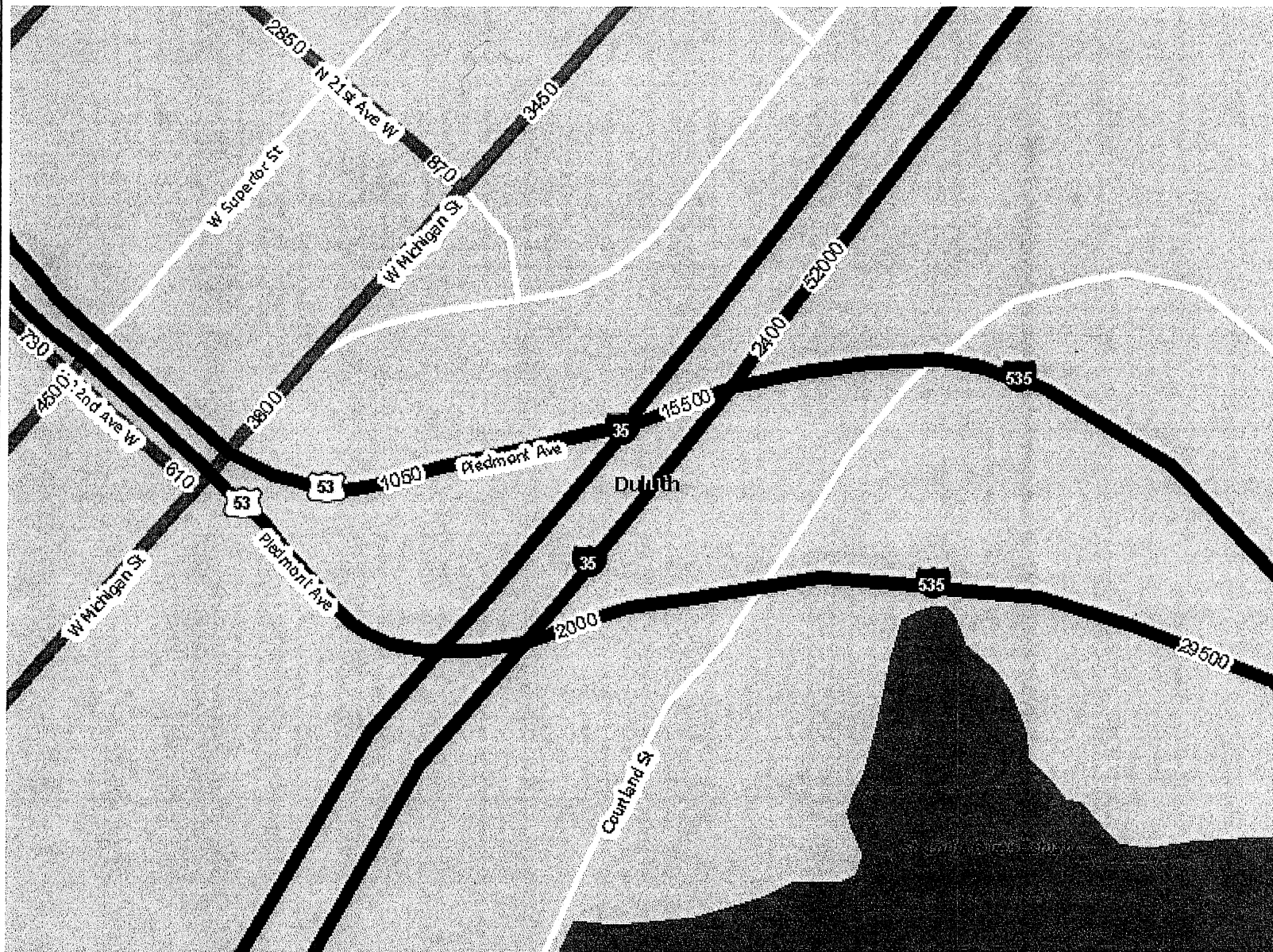
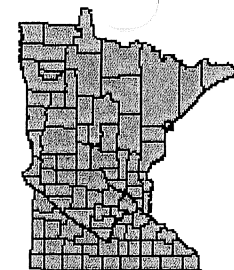
m_y = Live Load w/ impact weak axis moment $\checkmark$

S_y = Section modulus in weak axis $\checkmark$

S_{xt} = Section modulus about strong axis to the tension flange ($m_y + F_y t$) $\checkmark$

Tension Flange $\Rightarrow$

$LL + Im = m_x + \frac{1}{3} \frac{m_y}{S_y} \times S_{xc} \quad \checkmark$ for compression flange check



Legend

HCADT

- 1 - 99
- 100 - 249
- 250 - 499
- 500 - 999
- 1000 - 4999
- 5000 and above

AADT

- 1 - 99
- 100 - 499
- 500 - 999
- 1000 - 4999
- 5000 - 24999
- 25000 - 49999
- 50000 and above

Streetnames

- Interstate (1-3,000,000)
- US Hwys (1-100,000)
- State Hwys (1-100,000)
- County Hwys (1-50,000)
- Municipal Roads (1-50,000)
- Other Roads (1-50,000)
- Township roads
- Other roads

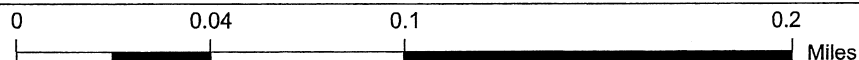
Lakes all

Counties (1-1,500,000)

Municipalities

- 6 - 4699
- 4700 - 15197
- 15198 - 34947
- 34948 - 86918

1:2,472



MNDOT

Created: 02/26/2010

This map is a user generated static output from an Internet mapping site and is for reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable.

THIS MAP IS NOT TO BE USED FOR NAVIGATION

Notes

Enter Map Description

4-166



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PROJECT MnDOT SS-69801 - Posting + Permit Loads
PROJECT # 090147 DATE 4/19/10 BY jdf SHEET NO. _____ OF _____

There are three types of loads

- 1) Posting Loads: Minnesota Legal (Posting) Loads. These are also legal loads.
- Type 3
 - Type 3S2-40
 - Type 3S3

- 2) Legal Loads which are not posting loads.
From MBE.
- SU4
 - SU5
 - SU6
 - SU7

- 3) Permit Trucks: Minnesota Standard Permit Trucks, G-80 and G-07
- | | |
|-------------|---------------|
| - Std A | - Std C198-23 |
| - Std B | - Std C214b |
| - Std C | - Std C237b |
| - P411 | - Std C256b |
| - P413 | - Std C200j |
| - Std C152b | |
| - Std C174b | |

Combinations:

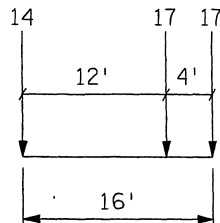
Posting: Combine the posting truck with the legal truck (from 1 or 2 above) which causes the greatest effect.

Permit: Combine the permit truck (from 3) with the legal truck (1 or 2 above) which causes the greatest effect.

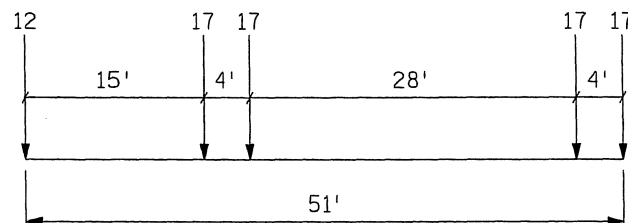
A-67

APPENDIX 15-D**MINNESOTA LEGAL (POSTING) LOADS**

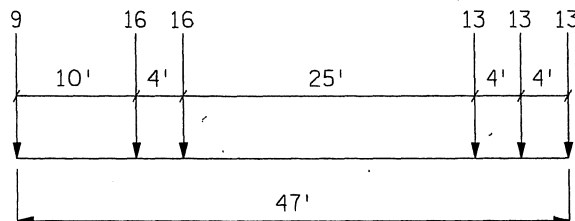
TYPE 3 UNIT
GVW = 48K
L = 16'



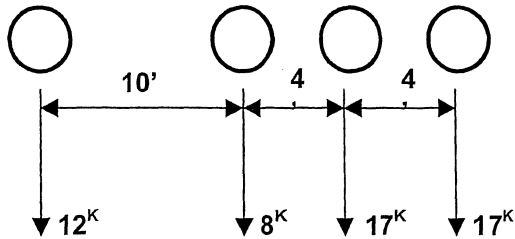
TYPE 3S2-40 UNIT
GVW = 80K
L = 51'



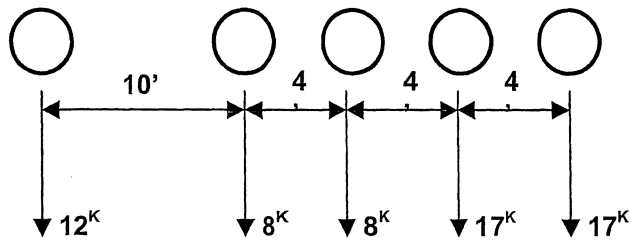
TYPE 3S3 UNIT
GVW = 80K
L = 47'



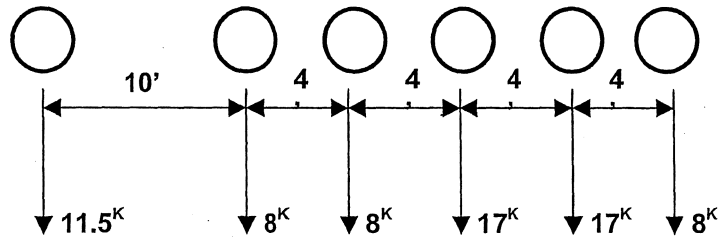
e. Single-Unit Bridge Posting Loads



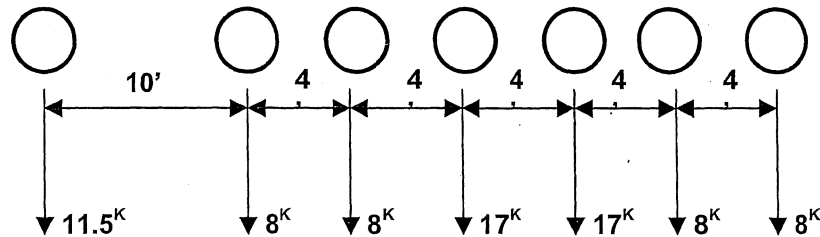
SU4 TRUCK
GVW = 54 KIPS



SU5 TRUCK
GVW = 62 KIPS



SU6 TRUCK
GVW = 69.5 KIPS



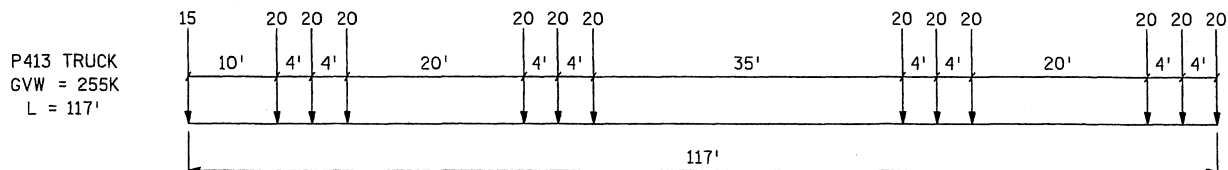
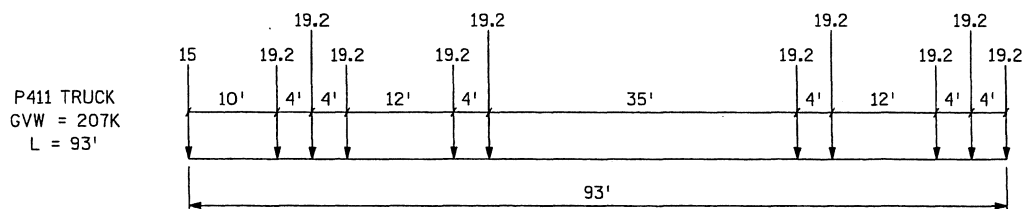
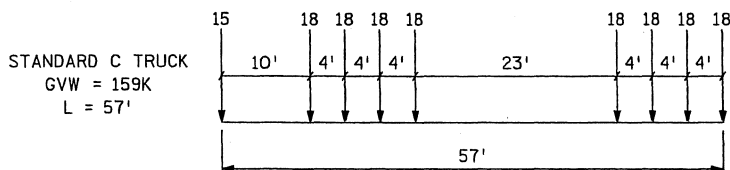
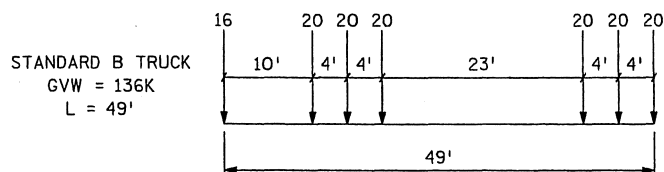
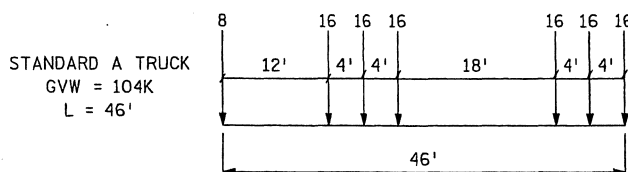
SU7 TRUCK
GVW = 77.5 KIPS

Figure D6A-7—Bridge Posting Loads for Single-Unit SHVs that Meet Federal Bridge Formula B

Legal Trucks (But not posting for mn)

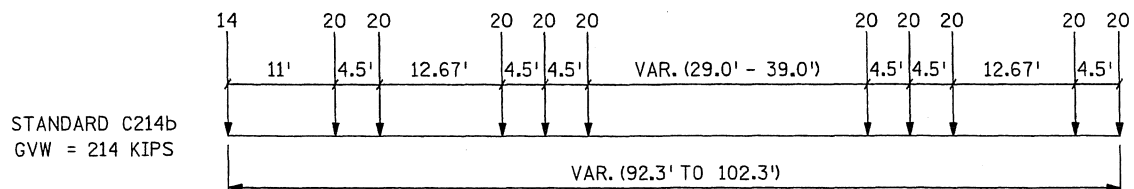
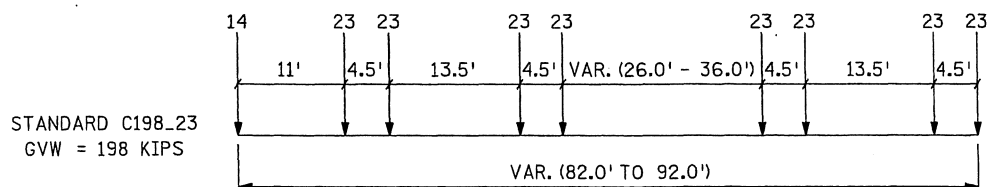
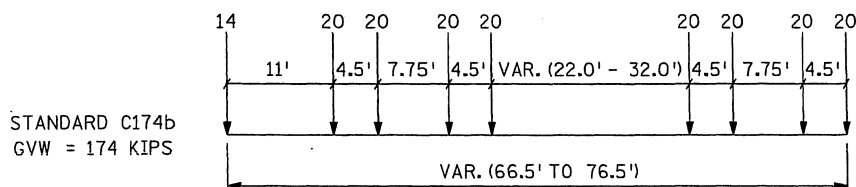
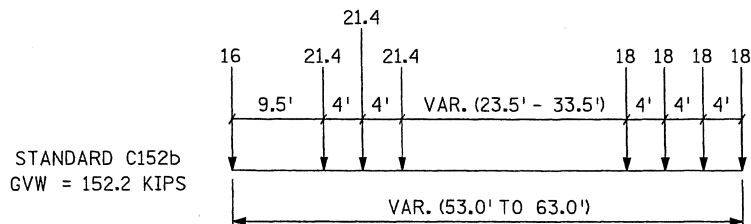
APPENDIX 15-E

MINNESOTA STANDARD PERMIT TRUCKS G-80



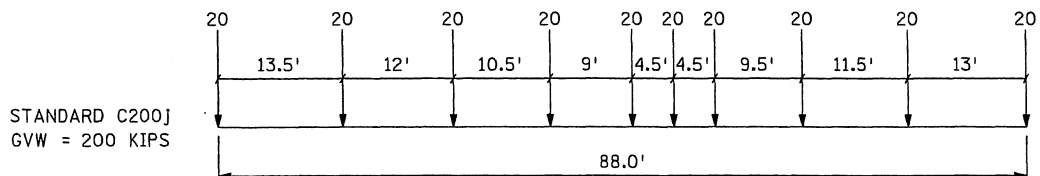
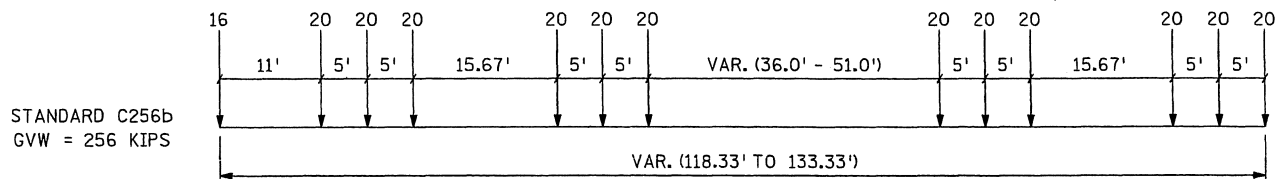
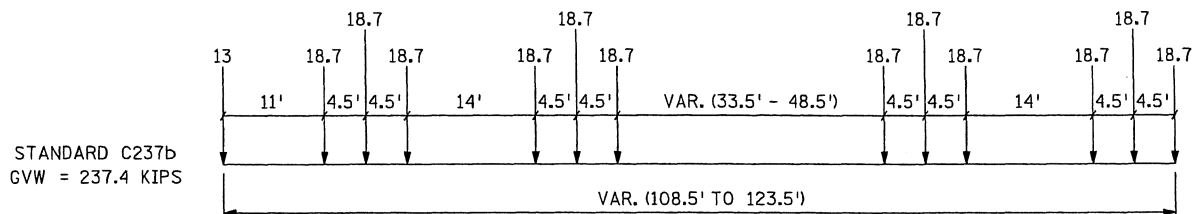
APPENDIX 15-F

MINNESOTA STANDARD PERMIT TRUCKS G-07

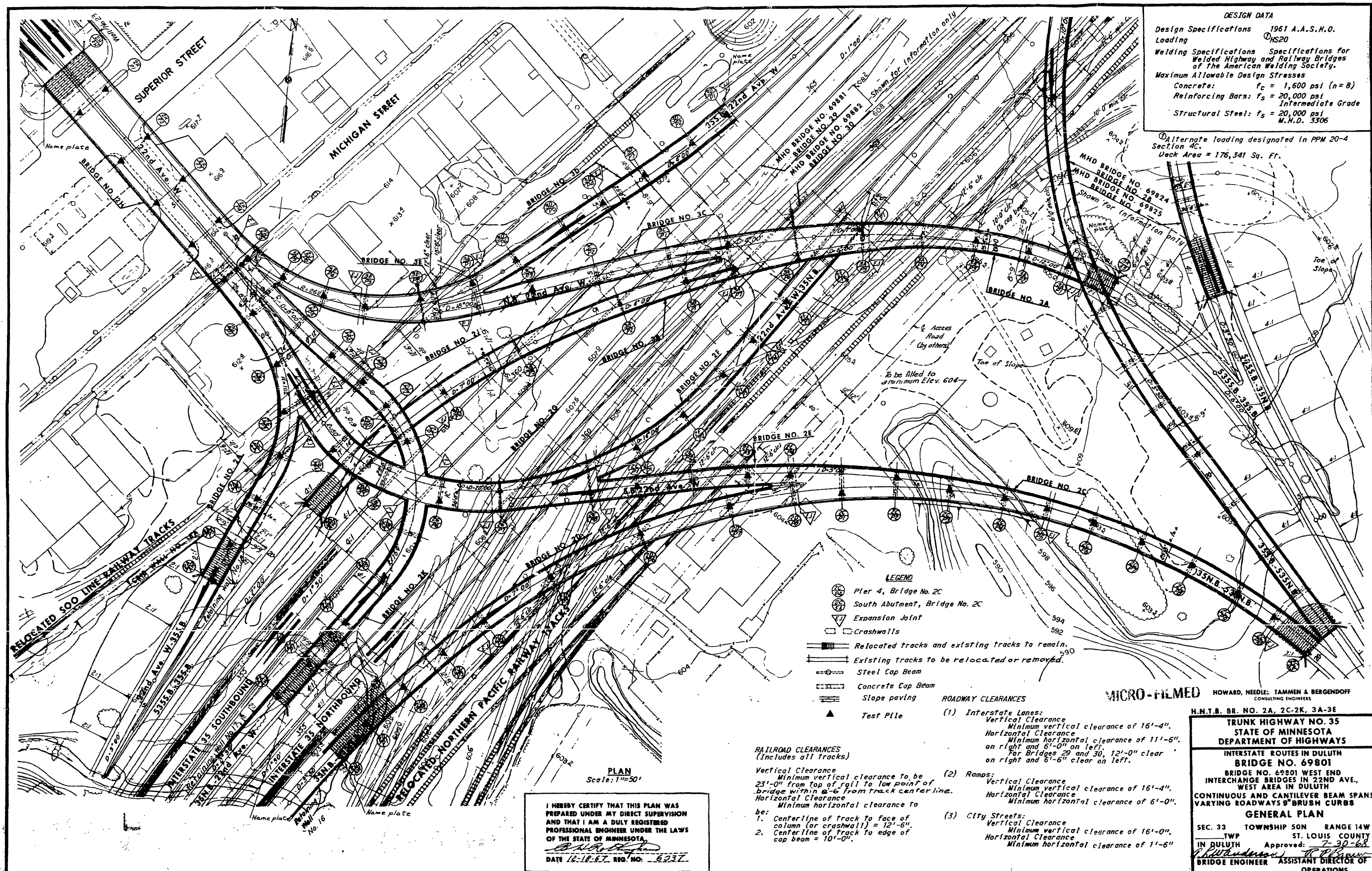


APPENDIX 15-F (Continued)

MINNESOTA STANDARD PERMIT TRUCKS G-07



69801N
3-E-3C GIRDER MODEL



REVIEWED BY G.WELLHAUSEN DESIGN SQUAD

AREA 10 JOB 223

FED. PROJ. NO. 1535-7 (25) 258

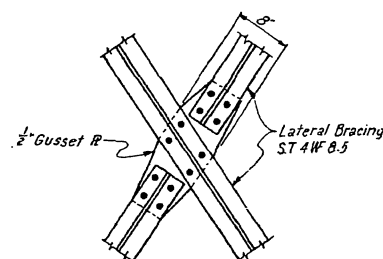
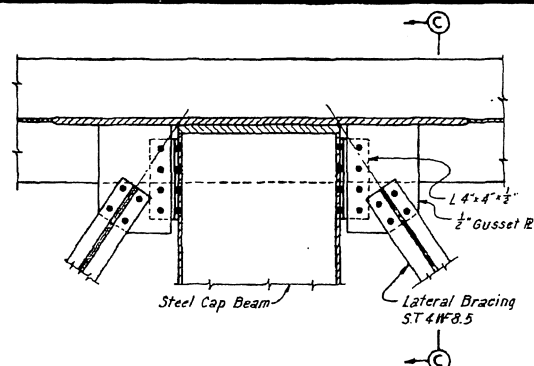
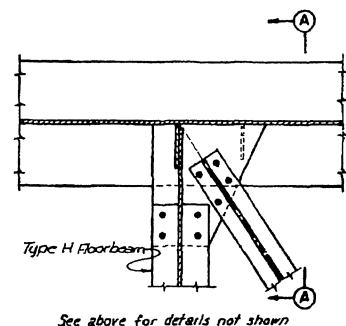
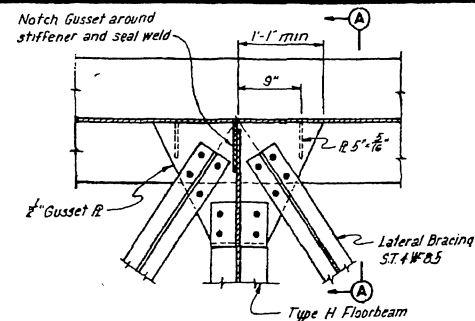
STATE PROJ. NO. 6980-16 (T.H. 535-390)

SHEET NO. 1 OF 18 SHEETS

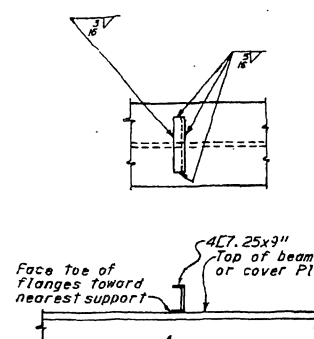
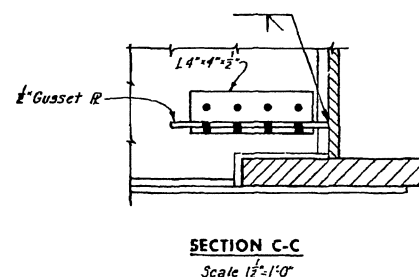
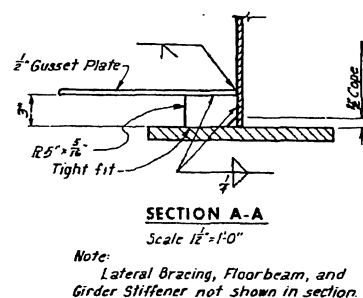
69801

OR CH. 275 RYS

B-1



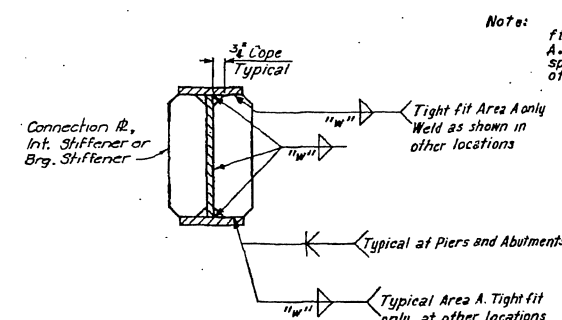
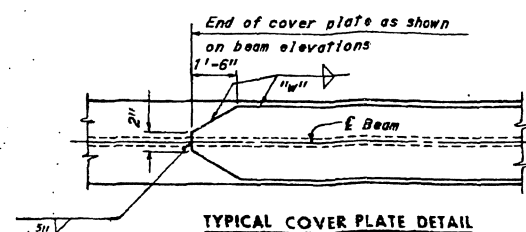
LATERAL BRACING CONNECTIONS



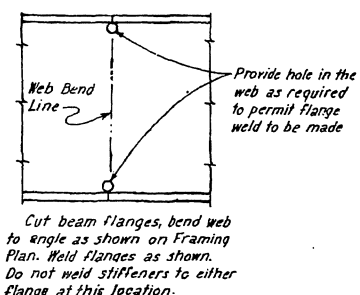
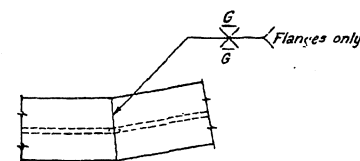
SHEAR LUG DETAILS

Note: Shear lugs shall conform to M.H.O. 3306

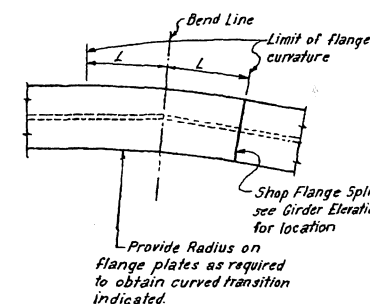
Note: Length of shear lugs is typical except for shear lugs required for Type H Floorbeam where the length shall be 6 inch



TYPICAL BEAM AND GIRDER WELDS



ROLLED BEAM BEND POINT DETAILS



WELDED GIRDER BEND POINT DETAILS

SHOP SPLICE NOTES:

All flange and web welds to be made by the submerged arc process. Parts of unequal thickness to be transitioned as outlined by the A.W.S. Specifications except the transition shall be a maximum of 12 to 1 bevel. All of the full penetration welds shall be backgouged and welded after welding for side. But welds on girder flange and web R's shall be ground flush, the finish grinding being parallel to the direction of stress. See the A.W.S. Specifications for pre-heating requirements under A36 steel for all groove and fillet welding of thick plates.

M.N.T.B. BR. NO. 2A, 2C-2K, 3A-3E

TRUNK HIGHWAY NO. 35
STATE OF MINNESOTA
DEPARTMENT OF HIGHWAYS

INTERSTATE ROUTES IN DULUTH

BRIDGE NO. 69801

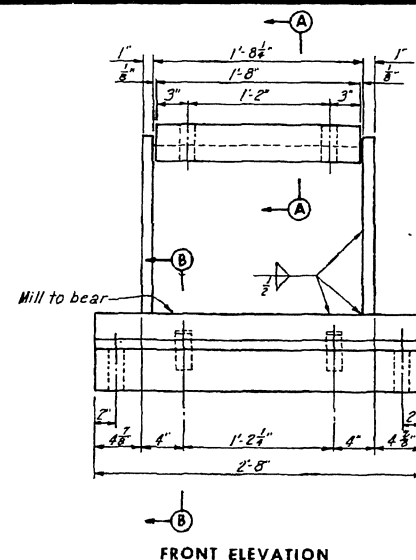
MISCELLANEOUS STEEL DETAILS

MICRO-FILM

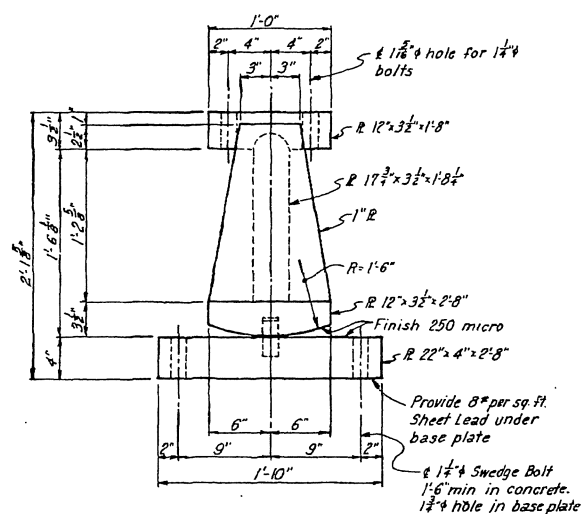
APPROVED: 7-30-68

SHEET NO. 106 OF 109 SHEETS 69801

DES. HWL
DCH
DR. HWL
CH. RGC



FRONT ELEVATION

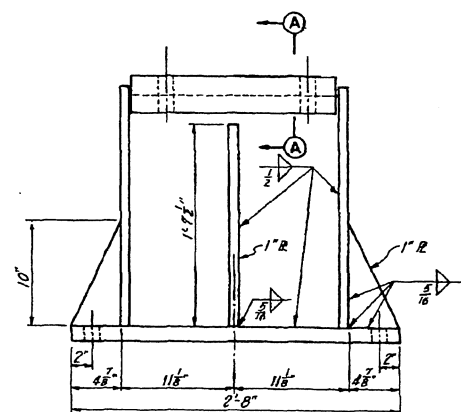


END ELEVATION

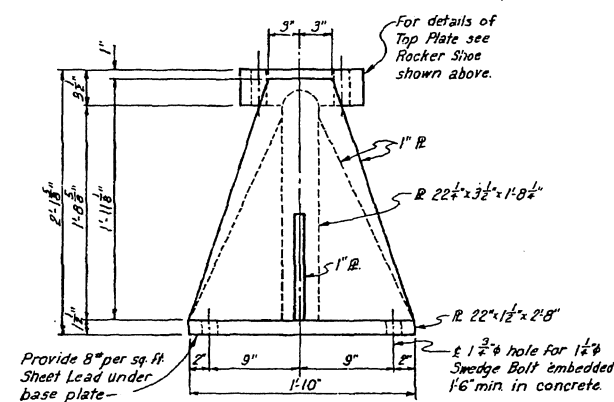
Note:
Pintles shall conform to
M.H.D. 3314 Type II. All other
Structural Steel shall conform
to M.H.D. 3306.

EXPANSION BEARING ASSEMBLY-TYPE S.E.-1

Scale 1/2"=1'-0"



FRONT ELEVATION

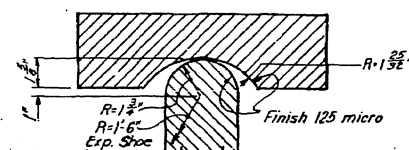


END ELEVATION

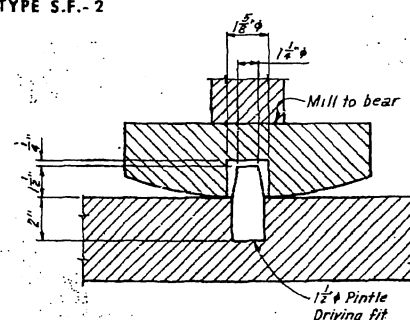
Note:
All Structural Steel shall
conform to M.H.D. 3306

FIXED BEARING ASSEMBLY-TYPE S.F.-2

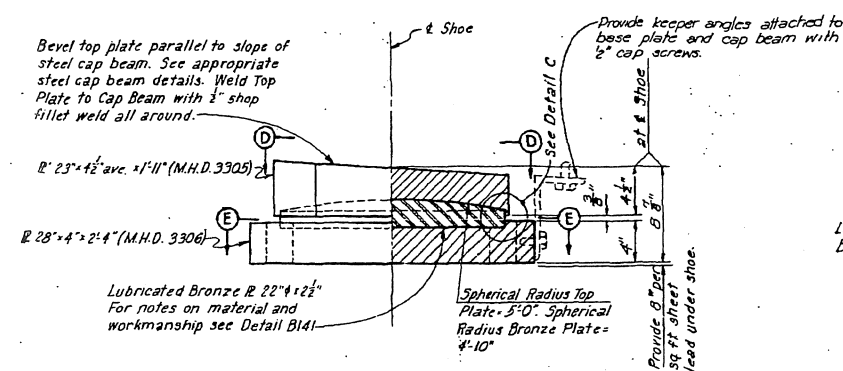
Scale 1/2"=1'-0"



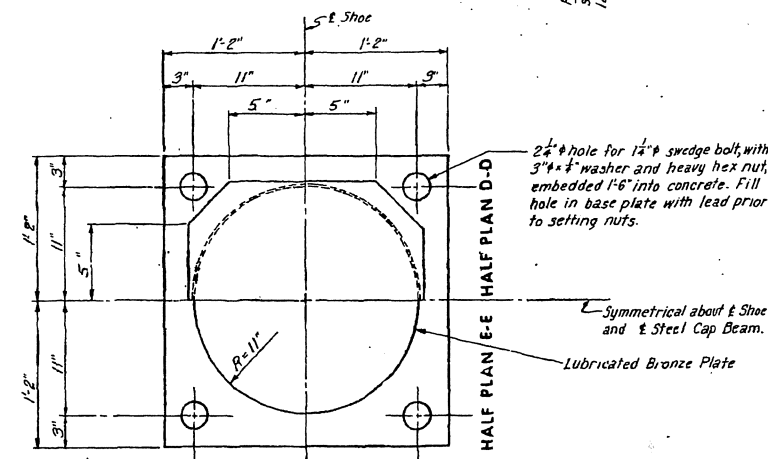
SECTION A-A
No Scale



SECTION B-B
No Scale

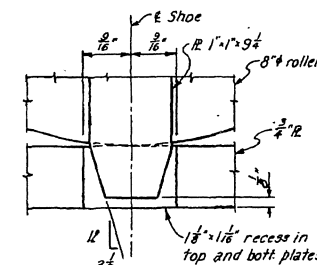
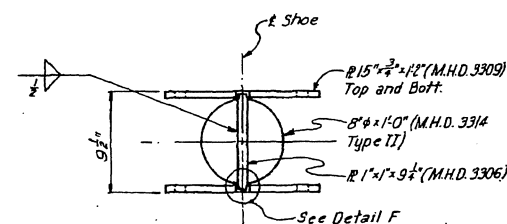


DETAIL C
No Scale

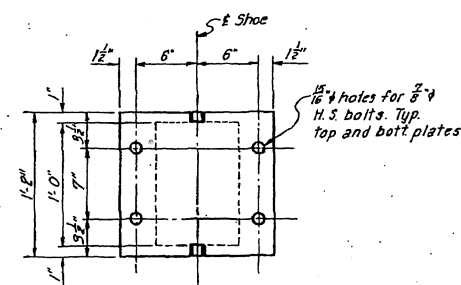


FIXED BEARING ASSEMBLY-TYPE S.F.-1

Scale 1/2"=1'-0"



DETAIL F
No Scale



EXPANSION BEARING ASSEMBLY-TYPE S.E.-2

Scale 1/2"=1'-0"

H.N.T.B. BR. NO. 2A, 2C-2K, 3A-3E
TRUNK HIGHWAY NO. 35
STATE OF MINNESOTA
DEPARTMENT OF HIGHWAYS
INTERSTATE ROUTES IN DULUTH
BRIDGE NO. 69801

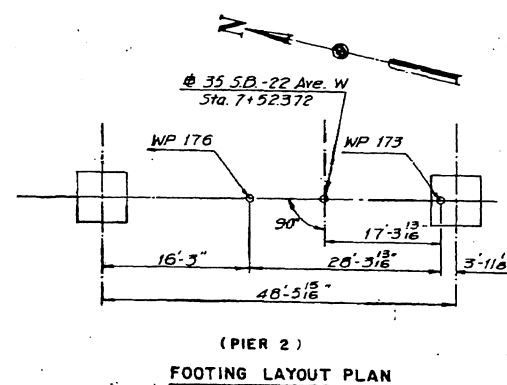
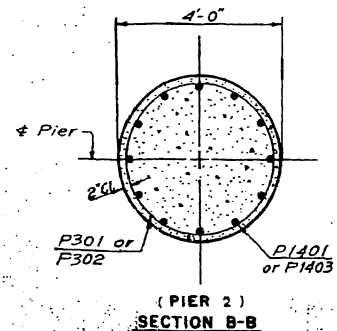
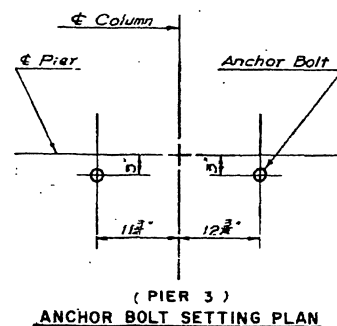
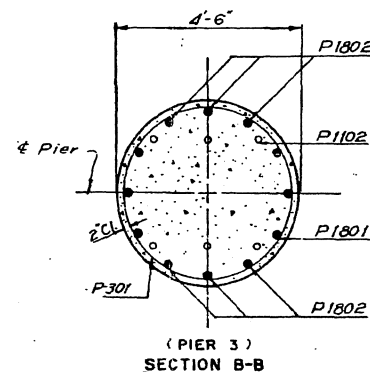
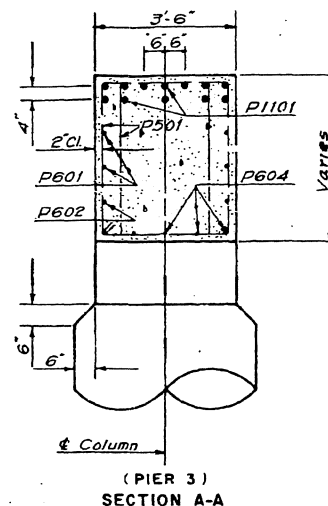
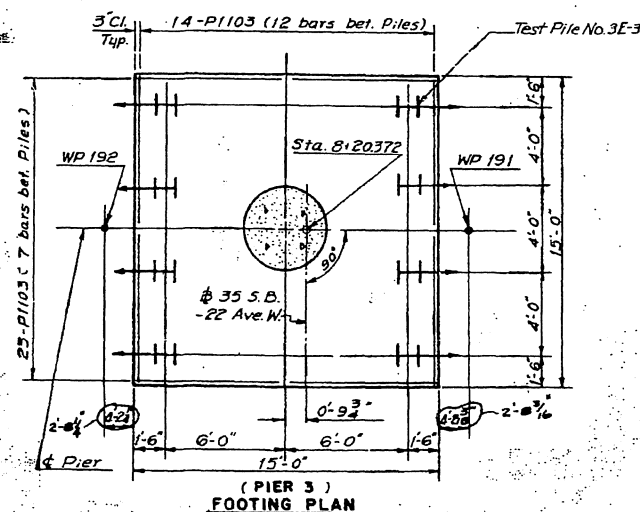
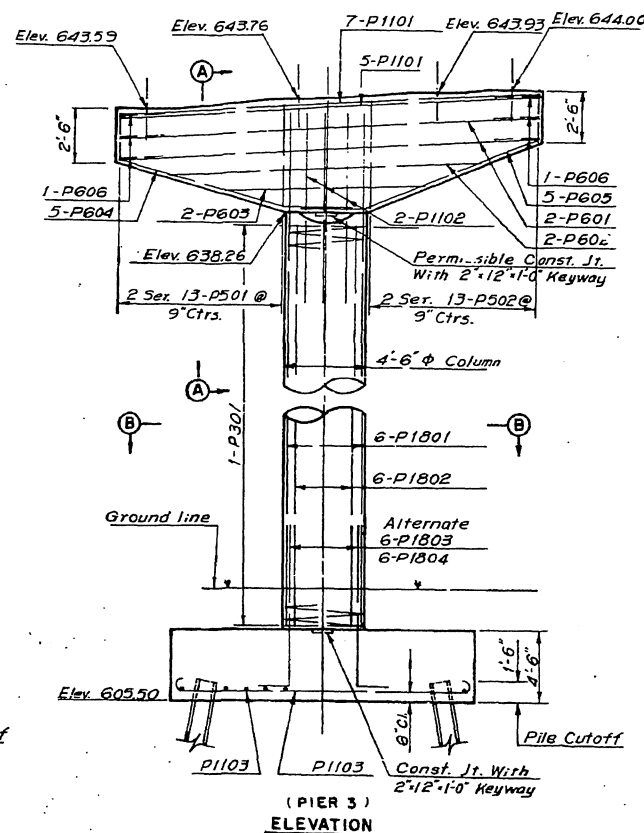
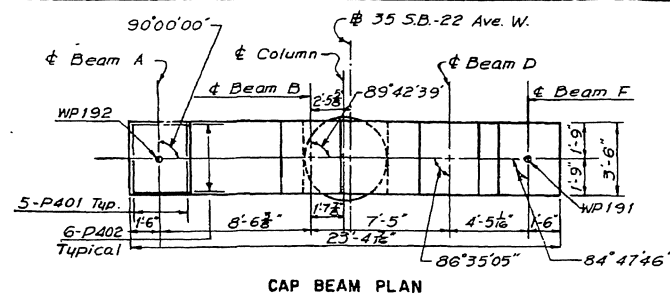
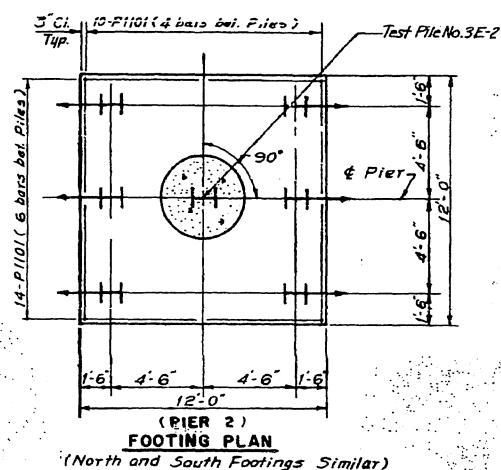
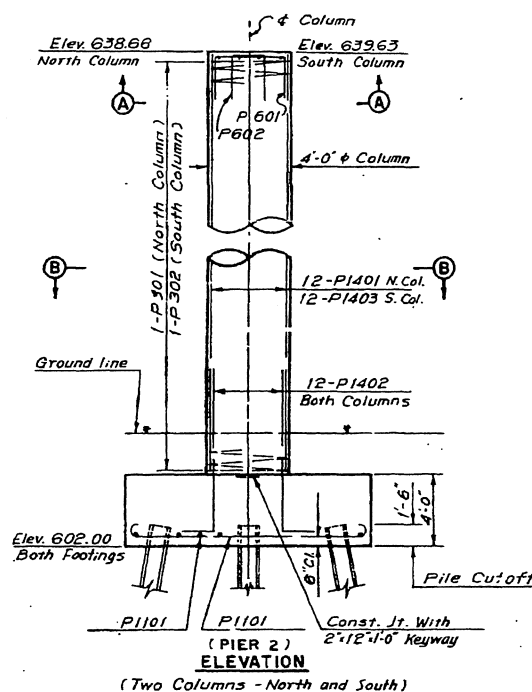
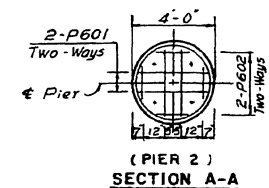
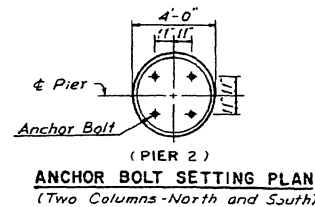
BEARING ASSEMBLY DETAILS

APPROVED: 7-30-68

SHEET NO. 109 OF 189 SHEETS

69801

DEC 1968
DCH
BR. HNL
CH. JGC



SPIRAL DATA			
	Pier 2	Pier 3	
Defn	N. Col.	S. Col.	
Outside Diameter	3'-8"	3'-8"	4'-2"
Height	32'-3"	32'-3"	27'-7"
Pitch	0'-6"	0'-6"	0'-6"
Spiral Rod Size	1/2"	1/2"	1/2"
Estimated Weight	294lb.	303lb.	288lb.

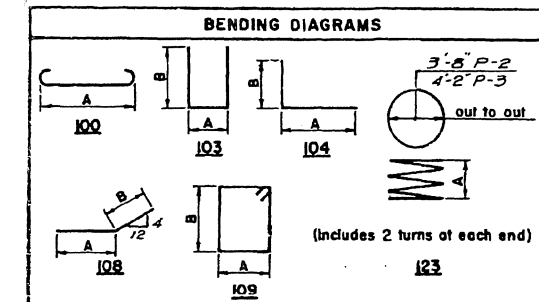
COMPUTED PILE LOADS-TONS/PILE			
Pile	Loads	Pier 2	Pier 3
Dead Load		28	26
Live Load		6	7
Overturning		35	28
Total		69	61

PILE DATA			
Pile Type	Number and Estimated Length	Pier 2	Pier 3
12BP53 Piles	13@75'	7@70'	
12BP53 Test Piles	1 @ 85'	1 @ 80'	
REVISIONS			
DATE	ITEM	DR	CHK
2-6-69	DIMENSION CHANGE PIER 3		

QUANTITIES			
Item	Unit	Pier 2	Pier 3
Excavation Class UE	Cu. Yd.	50	78
Concrete Mix 1 A6	Cu. Yd.	43	38
Concrete Mix 3 Y 6	Cu. Yd.	31	30
Reinforcement Bars	Lbs.	12,220	14,035
12 BP 53 Piles Delivered	Lbs.	51,675	25,970
12BP53 Test Piles, 85' long	Each	1	
12BP53 Test Piles, 80' long	Each		1
Expansion Bearing Assemblies, Type ETA	Each		4
Bridge Ground	No.	1	

① To be included in price bid for other items. ② Does not include test piles.

BILL OF REINFORCEMENT						
BAR	NO.	SIZE	LENGTH	TYPE	DIMENSIONS	LOCATION
P301	1	3	--	Pier 2	32'-3"	Column
P302	1	3	--	123	33'-3"	Column
P601	8	6	7'-4"	103	3'-4"	Column
P602	8	6	5'-7"	103	1'-7"	Column
P1101	48	11	14'-8"	100	11'-8"	Footings
P1401	12	14	32'-3"	STR.		Column
P1402	24	14	10'-3"	104	9'-3"	Footings and Col.
P1403	12	14	33'-3"	STR.		Column
Pier 3						
P401	20	4	6'-2"	103	3'-2"	Bridge Seat
P402	24	4	5'-8"	103	2'-8"	Bridge Seat
P301	1	3	--	123	27'-7"	Column
P501	2Ser	5	10'-4"	109	2'-8"	Cap Beam
P502	2Ser	5	10'-8"	109	2'-8"	Cap Beam
P601	4	6	23'-0"	STR.		Cap Beam
P602	2	6	16'-10"	STR.		Cap Beam
P603	2	6	10'-8"	STR.		Cap Beam
P604	5	6	13'-10"	108	9'-8"	Cap Beam
P605	5	6	13'-11"	108	9'-9"	Cap Beam
P606	6	6	7'-6"	103	3'-0"	Cap Beam
P1101	12	11	23'-0"	STR.		Cap Beam
P1102	6	11	9'-0"	STR.		Cap Beam
P1103	37	11	17'-8"	100	14'-6"	Footings
P1801	6	18	33'-0"	STR.		Column
P1802	6	18	27'-9"	STR.		Column
P1803	6	18	13'-9"	104	11'-9"	Footings and Col.
P1804	6	18	12'-9"	104	10'-9"	Footings and Col.



H.N.T.B. BR. NO. 2A, 2C-2K, 3A-3E

TRUNK HIGHWAY NO. 35
STATE OF MINNESOTA
DEPARTMENT OF HIGHWAYS

INTERSTATE ROUTES IN DULUTH

BRIDGE NO. 69801

PIERS 2 AND 3

BRIDGE 3E

MICRO-FILMED

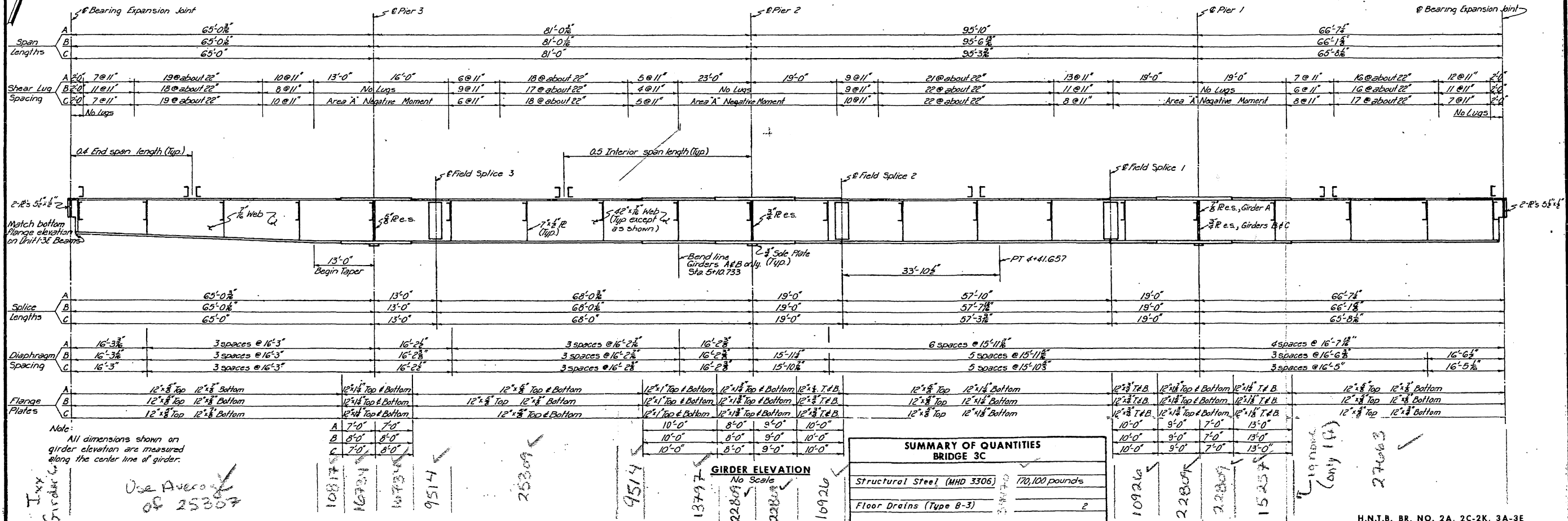
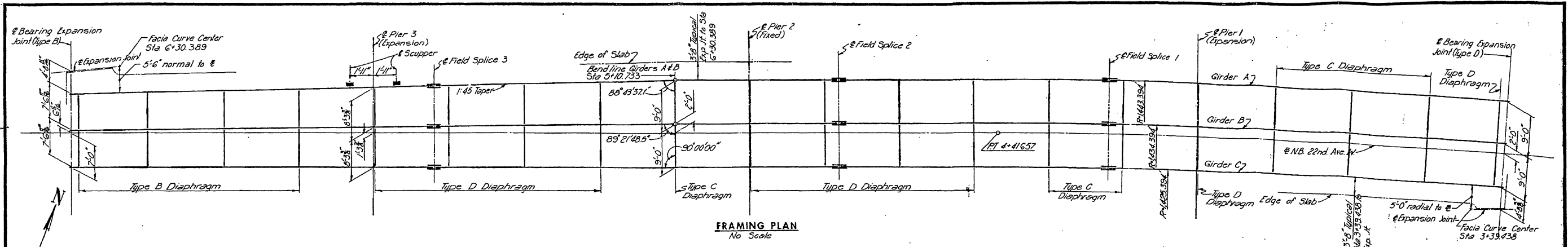
REVISED 2-6-69
APPROVED: 7-30-68

SHEET NO. 62 OF 109 SHEETS 69801 DES. T.C.Y. DRN. J.S.M. CH. D.E.A.

B-5

To 3E-P1

4/28/10



Note: All dimensions shown on girder elevation are measured along the center line of girder.

Use Avero of 25307

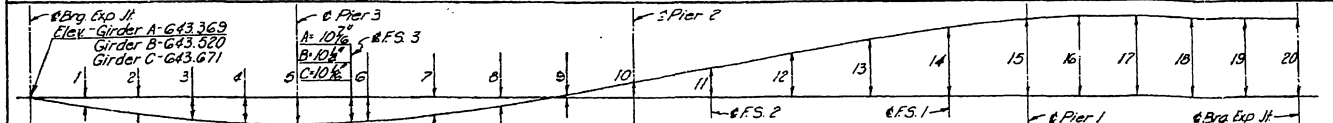
SUMMARY OF QUANTITIES BRIDGE 3C

Structural Steel (MHD 3306)	170,100 pounds
Floor Drains (Type B-3)	2

DEAD LOAD DEFLECTIONS

GIRDER	5 Equal Spaces	5 Equal Spaces	5 Equal Spaces	5 Equal Spaces
A	ΔC .007, .029, .046, .036, .015 ΔT .010, .032, .050, .040, .016	ΔC .003, .015, .011, .004, 0 ΔT .003, .017, .012, .005, 0	ΔC .044, .092, .050, .040, 0 ΔT .050, .103, .101, .045, 0	ΔC .004, .010, .018, .010, .013 ΔT .004, .011, .020, .010, .016
B	ΔC .011, .021, .034, .027, .009 ΔT .014, .023, .036, .030, .010	ΔC .004, .018, .014, .003, 0 ΔT .004, .020, .018, .002, 0	ΔC .032, .070, .069, .030, 0 ΔT .037, .081, .080, .035, 0	ΔC .003, .004, .012, .003, .016 ΔT .007, .004, .012, .004, .019
C	ΔC .008, .029, .043, .034, .012 ΔT .010, .031, .048, .038, .014	ΔC .005, .022, .020, .003, 0 ΔT .005, .022, .020, .003, 0	ΔC .045, .092, .091, .045, 0 ΔT .051, .103, .102, .051, 0	ΔC .002, .008, .017, .010, .014 ΔT .002, .009, .018, .008, .017

CAMBER DIAGRAM



CAMBER DIMENSIONS

GIRDER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
A	-0'-4 1/2"	-0'-7 1/2"	-0'-9 1/2"	-0'-10 1/2"	-0'-11 1/2"	-0'-10 1/2"	-0'-7 1/2"	-0'-3 1/2"	0'-0 1/2"	0'-5 1/2"	0'-11 1/2"	1'-6 1/2"	2'-0 1/2"	2'-5 1/2"	2'-9 1/2"	2'-10 1/2"	2'-10 1/2"	2'-10 1/2"	2'-9 1/2"	2'-8 1/2"
B	-0'-4 1/2"	-0'-7 1/2"	-0'-9 1/2"	-0'-10 1/2"	-0'-10 1/2"	-0'-9 1/2"	-0'-7 1/2"	-0'-3 1/2"	0'-1 1/2"	0'-6 1/2"	0'-11 1/2"	1'-5 1/2"	1'-11 1/2"	2'-3 1/2"	2'-5 1/2"	2'-6 1/2"	2'-6 1/2"	2'-5 1/2"	2'-4 1/2"	2'-2 1/2"
C	-0'-4 1/2"	-0'-7 1/2"	-0'-9 1/2"	-0'-10 1/2"	-0'-10 1/2"	-0'-9 1/2"	-0'-7 1/2"	-0'-3 1/2"	0'-1 1/2"	0'-6 1/2"	1'-0 1/2"	1'-5 1/2"	1'-9 1/2"	2'-0 1/2"	2'-2 1/2"	2'-2 1/2"	2'-2 1/2"	2'-0 1/2"	1'-10 1/2"	1'-8 1/2"

H.N.T.B. BR. NO. 2A, 2C-2K, 3A-3E
TRUNK HIGHWAY NO. 35
STATE OF MINNESOTA
DEPARTMENT OF HIGHWAYS
INTERSTATE ROUTES IN DULUTH
BRIDGE NO. 69801
FRAMING PLAN

BRIDGE 3C
MICRO-FILMED

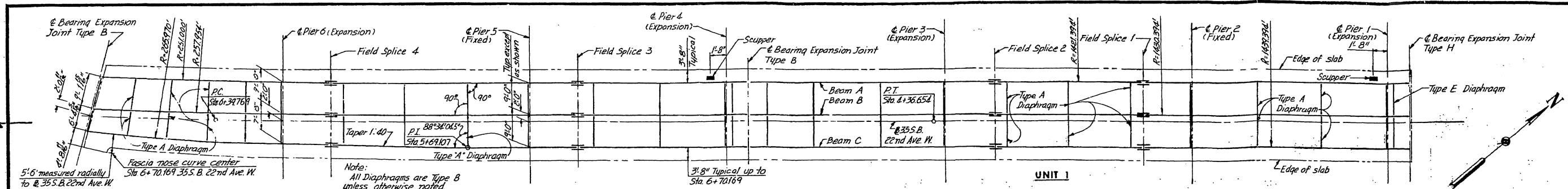
APPROVED: 7-30-68

SHEET NO. 91 OF 189 SHEETS 69801

DES. T.C.Y.
DCH. A.T.K.
DR. L.D.L.
CH. J.D.T.

B-6

TO 3E-P1



FRAMING PLAN

UNIT 2

Area "A" Negative Moment (All Beams)

Span lengths (along & Beams)

Shear lug spacing (along & Beams)

No lugs

Q4 End Span length Typical

Q5 Interior Span length Typical

Field Splice 4

Field Splice 3

Q5 Interior Span length

Field Splice 2

Field Splice 1

Beam Sizes

Splice lines & Cover Plates (along & Beams)

Diaphragm Spacing (along & Beams)

Beam A

Beam B

Beam C

Beam A

Beam B

Beam C

Beam A

Beam B

Beam C

Beam A

Beam B

Beam C

Beam A

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BEAM ELEVATION
No Scale

DEAD LOAD DEFLECTIONS

UNIT 2

UNIT 1

(FS.3)

BEAM	Exp. Jt.	.75	.50	.25	Pier 6	FS.4	.75	.50	.25	Pier 5	.75	.50	.25	Pier 4	Exp. Jt.	.75	.50	.25	Pier 3	FS.2	.75	.50	.25	FS.1	Pier 2	.75	.50	.25	Pier 1	Exp. Jt.	
A	ΔC	-.007	.005	.004	-.003	0	.022	.030	.049	.029	0	.002	.012	.010	0	-.002	.022	.026	.009	0	.013	.019	.037	.022	.016	0	.005	.017	.014	0	-.004
A	ΔT	-.009	.005	.005	-.003	0	.025	.033	.056	.033	0	.003	.014	.012	0	-.002	.025	.029	.011	0	.015	.022	.042	.025	.018	0	.006	.019	.016	0	-.004
B	ΔC	-.007	.011	.013	.003	0	.010	.014	.028	.017	0	.003	.011	.009	0	-.002	.019	.022	.008	0	.013	.018	.035	.020	.015	0	.005	.016	.013	0	-.004
B	ΔT	-.009	.011	.014	.004	0	.012	.017	.034	.021	0	.004	.013	.011	0	-.002	.022	.026	.009	0	.015	.022	.041	.024	.018	0	.006	.018	.015	0	-.004
C	ΔC	-.007	.018	.024	.010	0	.011	.017	.034	.020	0	.006	.016	.013	0	-.003	.020	.023	.008	0	.017	.024	.043	.025	.018	0	.005	.018	.015	0	-.004
C	ΔT	-.009	.020	.027	.011	0	.013	.019	.038	.023	0	.007	.018	.014	0	-.003	.023	.026	.009	0	.019	.027	.049	.029	.021	0	.006	.020	.017	0	-.005

CAMBER DIAGRAM

Diagram illustrating the camber profile of a bridge deck, showing spans (FS.1 to FS.6) and piers (Pier 1 to Pier 6). The profile is defined by a line graph showing the camber values across the spans. A callout indicates the beam types and their deflection values:

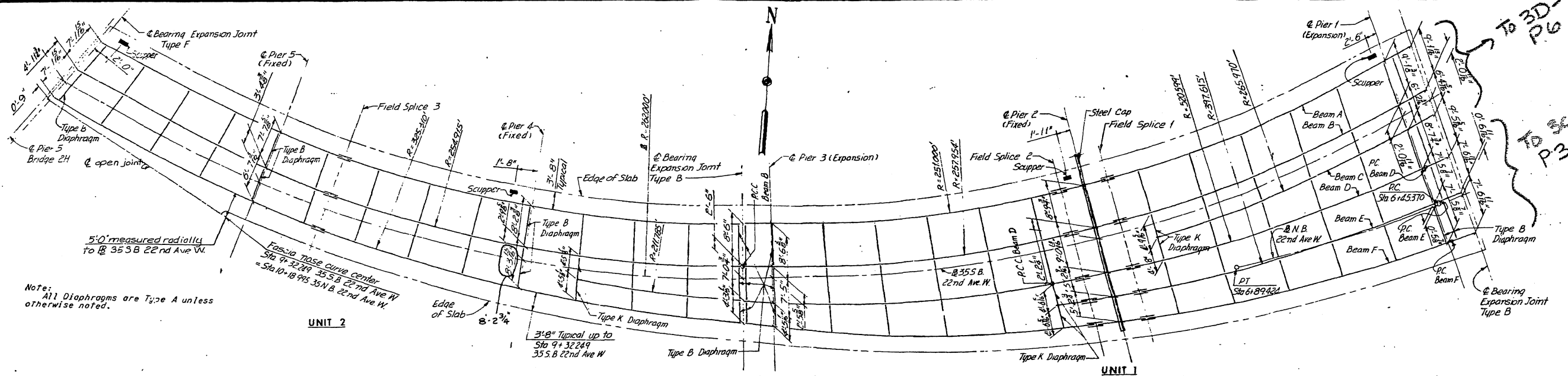
- Beam A Def. 623.965
- Beam B Def. 624.262
- Beam C Def. 624.559

BEAM	Exp.Jt	Pier 6	FS.4	Pier 5	FS.3	Pier 4	Exp.Jt	Pier 3	FS.2	FS.1	Pier 2	Pier 1	Exp.Jt
A	18'-6 $\frac{1}{8}$ "	15'-11 $\frac{1}{2}$ "	15'-3"	12'-5 $\frac{3}{8}$ "	11'-9"	9'-8 $\frac{1}{4}$ "	9'-4 $\frac{1}{2}$ "	6'-6 $\frac{3}{8}$ "	5'-9 $\frac{3}{8}$ "	3'-8 $\frac{1}{4}$ "	3'-0"	0'-3"	0
B	18'-6 $\frac{1}{8}$ "	15'-9 $\frac{3}{8}$ "	15'-1 $\frac{1}{2}$ "	12'-3 $\frac{3}{8}$ "	11'-7 $\frac{3}{8}$ "	9'-6 $\frac{3}{8}$ "	9'-3 $\frac{1}{2}$ "	6'-6"	5'-9 $\frac{3}{8}$ "	3'-8 $\frac{1}{4}$ "	3'-0"	0'-3"	0
C	18'-5 $\frac{1}{4}$ "	15'-8 $\frac{1}{4}$ "	14'-11 $\frac{3}{8}$ "	12'-2 $\frac{1}{2}$ "	11'-6 $\frac{1}{4}$ "	9'-5 $\frac{3}{8}$ "	9'-1 $\frac{3}{8}$ "	6'-5 $\frac{1}{2}$ "	5'-9 $\frac{3}{8}$ "	3'-8 $\frac{1}{4}$ "	3'-0"	0'-3"	0

SUMMARY OF QUANTITIES UNIT 1 AND UNIT 2	
Structural Steel (MHD 3306)	212,450 pounds
Floor Drains (Type B-3)	2

H.N.T.B. BR. NO. 2A, 2C-2K, 3A-3E
 TRUNK HIGHWAY NO. 35
 STATE OF MINNESOTA
 DEPARTMENT OF HIGHWAYS
 INTERSTATE ROUTES IN DULUTH
 BRIDGE NO. 69801
 FRAMING PLAN
 UNIT 1 AND UNIT 2
 BRIDGE 3D
 APPROVED: 7-30-68

B-7



Note: All Diaphragms are Type A unless otherwise noted.

Note: For stub beams C, D and E deflections and camber dimensions shown are at points of intersection of lines drawn normal to beam B at the .25, .50, .75 (along beam B) with beams C, D and E.

DEAD LOAD DEFLECTIONS														
UNIT 2							UNIT 1							
BEAM	Exp Jt	.75	.50	.25	Pier 5	.75	FS 3	.50	.25	Pier 4	.75	.50	.25	Exp Jt
A	ΔC	0	.006	.006	.002	0	.006	.007	.011	.003	0	.001	.005	.003
	ΔT	0	.007	.007	.002	0	.007	.008	.013	.007	0	.001	.007	.004
B	ΔC	0	.006	.007	.002	0	.006	.006	.010	.005	0	.004	.008	.005
	ΔT	0	.008	.009	.003	0	.007	.007	.012	.006	0	.004	.010	.006
C	ΔC													
	ΔT													
D	ΔC													
	ΔT													
E	ΔC													
	ΔT													
F	ΔC	0	.011	.013	.025	0	.008	.008	.014	.007	0	.004	.011	.025
	ΔT	0	.013	.015	.006	0	.009	.009	.016	.007	0	.005	.012	.006

* indicates deflections at end of beam.

CAMBER DIAGRAM														
BEAM	Exp Jt	FS 3	Pier 4	FS 2	Pier 3	FS 1	Pier 2	Exp Jt	FS 1	Pier 1	Exp Jt	FS 1	Pier 1	Exp Jt
A	5'-10 1/8"	5'-11 1/8"	5'-11 1/8"	5'-9 1/8"	5'-3 3/8"	5'-2 1/8"	3'-7"	3'-4 1/8"	3'-2 1/8"	0'-3 3/8"	0			
B	5'-0 3/8"	5'-10 3/8"	5'-10 3/8"	5'-0 3/8"	5'-2 1/8"	5'-1 1/8"	3'-5 3/8"	3'-3 3/8"	3'-1 1/8"	0'-3 3/8"	0			
C														
D														
E														
F	4'-11 1/8"	5'-1 1/8"	5'-1 1/8"	4'-11 1/8"	4'-6 3/8"	2'-11 1/8"	2'-6 3/8"	2'-6 3/8"	2'-6 3/8"	0'-2 3/8"	0			

* indicates camber dimensions at end of beam.

REVISIONS			
DATE	ITEM	DN.	CK.
12-26-69	DIMENSION CHANGES AS SHOWN IN CAMBER DIAGRAM	G.W.	CAC
3-31-70	DIMENSION AT PIER NO. 4	G.W.	

SUMMARY OF QUANTITIES	
UNIT 1 AND UNIT 2	
Structural Steel (MHD 3306)	289,750 pounds
Floor Drains Type B 3	4
Bearing Assemblies Type SF1	2 Units

H.N.T.B. BR. NO. 2A, 2C-2K, 3A-3E

TRUNK HIGHWAY NO. 35

STATE OF MINNESOTA

DEPARTMENT OF HIGHWAYS

INTERSTATE ROUTES IN DULUTH

BRIDGE NO. 69801

MICRO-FILMED

FRAMING PLAN

DEFLECTIONS AND

CAMBER DIAGRAM

UNIT 1 AND UNIT 2

BRIDGE 3E

APPROVED: 7-30-68

REVISED 12-26-69

REVISED 3-31-70

SHEET NO. 93 OF 18 SHEETS

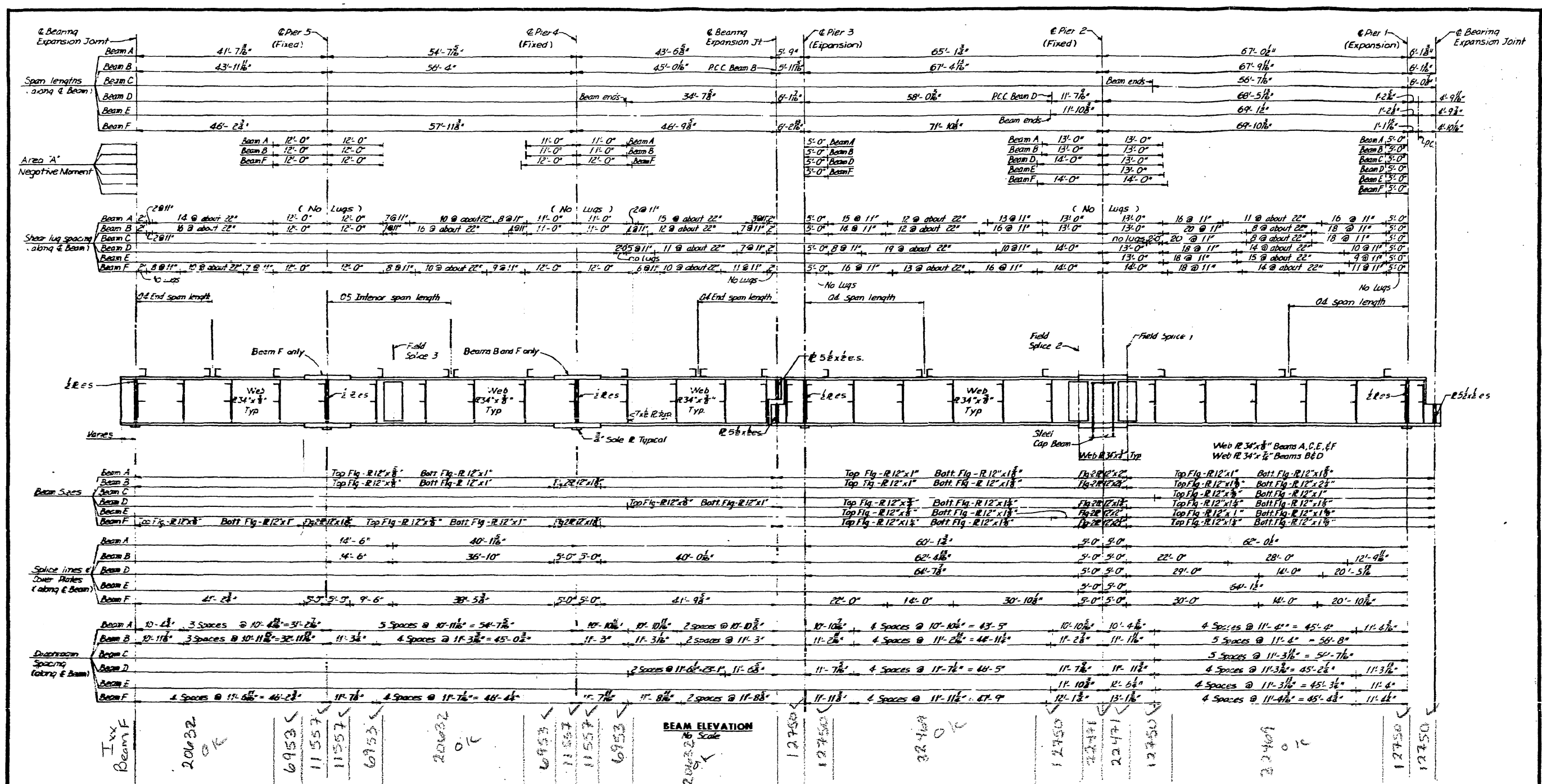
69801

DES. 727

CHK. 727

CH. 727

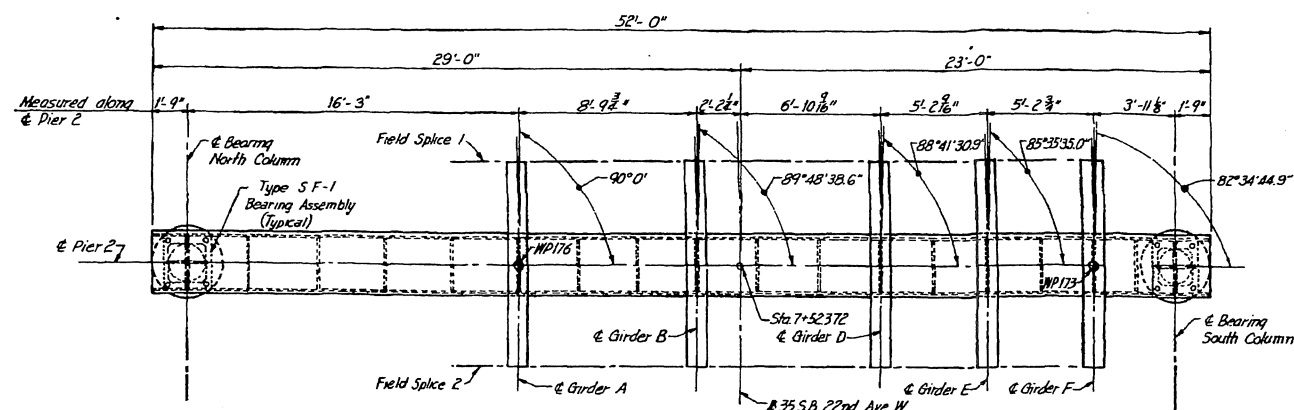
✓CSM
4/12/110



N.M.T.B. BR. NO. 2A, 2C-2E, 3A-3E
 TRUNK HIGHWAY NO. 35
 STATE OF MINNESOTA
 DEPARTMENT OF HIGHWAYS
 INTERSTATE ROUTES IN DULUTH
 BRIDGE NO. 69801
 BEAM ELEVATIONS
 UNIT 1 AND UNIT 2
 BRIDGE 3E
 MINN. EN. MED
 APPROVED: 7-30-68

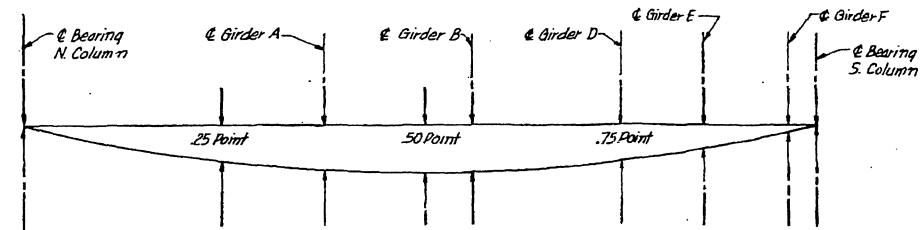
SHEET NO. 14 OF 18 SHEETS 69801

B-9



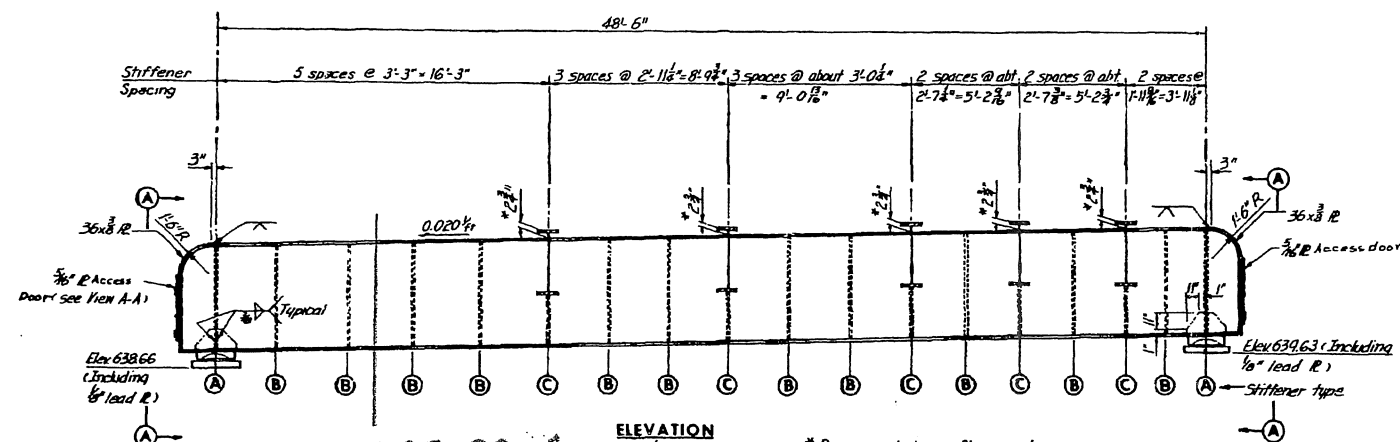
PLAN
Scale: 1/4" = 1'-0"

Notes:
Radii of Girders shown shall correspond to radii shown on Framing Plan Sheet.



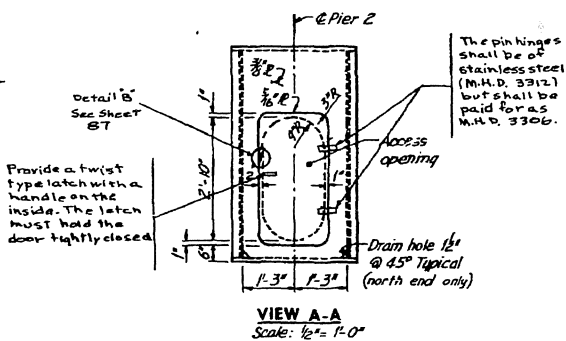
Deflection								
N. Brg.	25 Pt.	Girder A	50 Pt.	Girder B	75 Pt. (Gir. D)	Girder E	Girder F	S. Brg.
0	5/16"	3/8"	7/16"	7/16"	5/16"	7/16"	1/8"	0

DEAD LOAD DEFLECTION DIAGRAM
No Scale



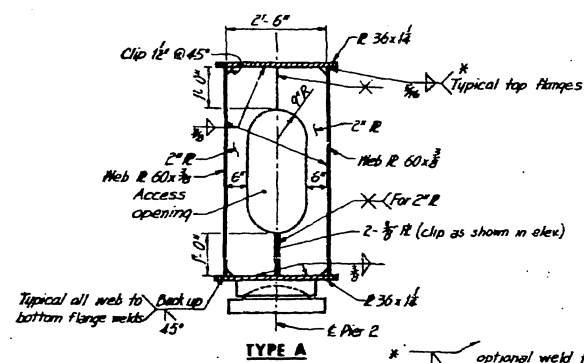
ELEVATION
Scale: 1/4" = 1'-0"

* Dimension between flanges at & girder and & Pier 2.



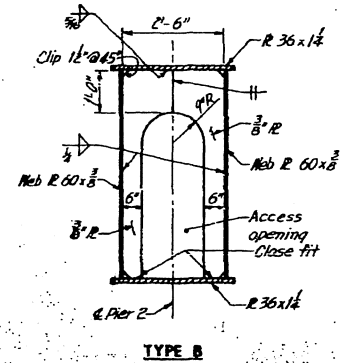
VIEW A-A
Scale: 1/2" = 1'-0"

Notes:
For details of materials and finish not shown on shoes see Bearing Assembly Details.
For details of girder and beam sections not shown see Framing Plans.
Prior to placement of the deck concrete the entire area of the cap beam that will be in contact with the concrete shall be covered with a protective coating similar or equal to Koppers Company Bitumastic 50.
The deck slab shall be haunched to the top of the cap beam.
The cap beam shall be cambered for dead load deflection.
Anchor bolts shall be held in position during concreting by a 1/2" steel template.



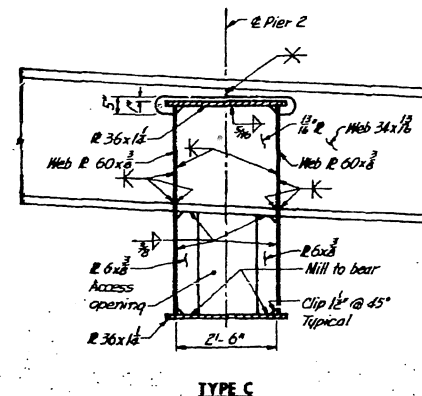
TYPE A

* optional weld for top flange to web



TYPE B

STIFFENER TYPES
Scale: 1/2" = 1'-0"



TYPE C

M.N.T.S. BR. NO. 2A, 2C-2K, 3A-3E
TRUNK HIGHWAY NO. 35
STATE OF MINNESOTA
DEPARTMENT OF HIGHWAYS
INTERSTATE ROUTES IN DULUTH
BRIDGE NO. 69801

STEEL CAP BEAM DETAILS
PIER 2 BRIDGE 3E

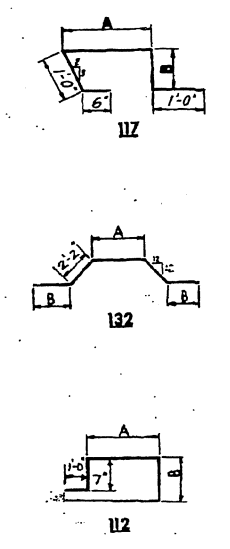
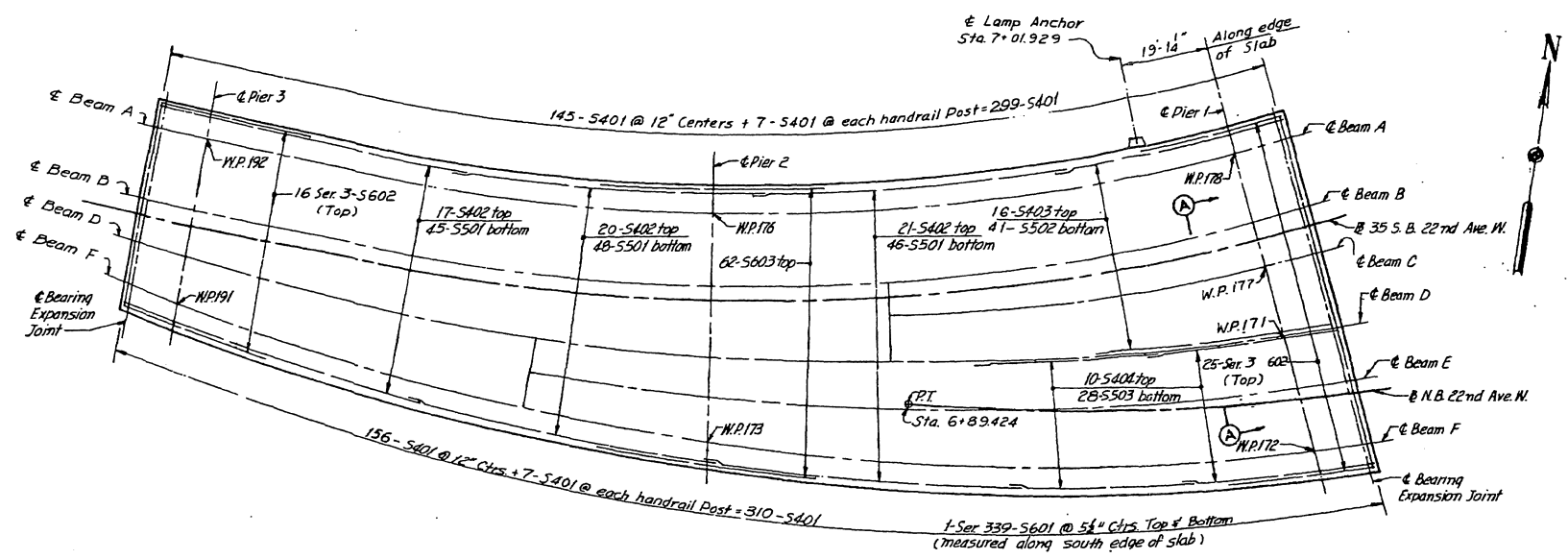
APPROVED: 7-30-68

SHEET NO. 95 OF 109 SHEETS

69801

DES. 727
DCH. 727
CH. 727

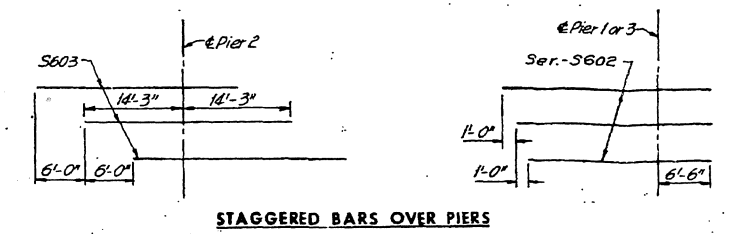
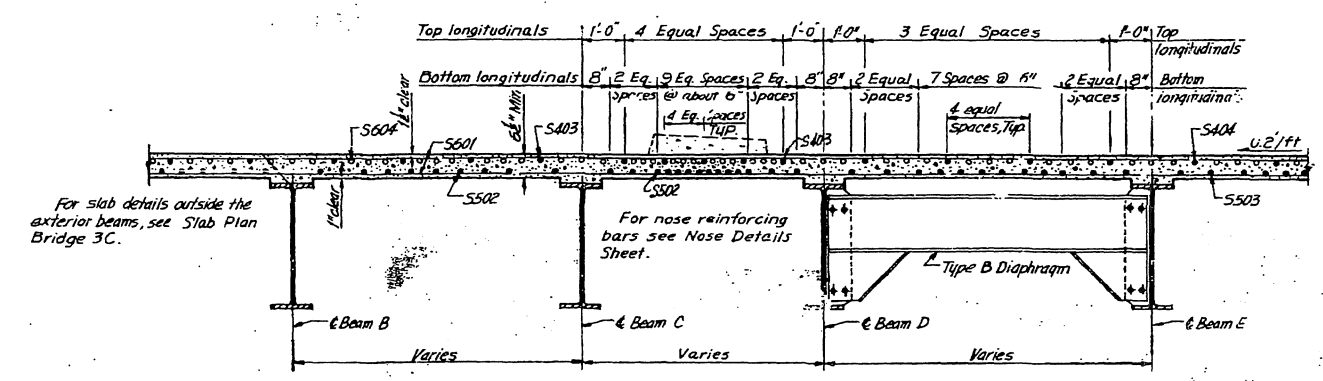
B-10



BILL OF REINFORCEMENT									
BAR	NO.	SIZE	LENGTH	TYPE	DIMENSIONS		LOCATION		
					A	B			
S401	609	4	41'-9"	Str.	1'-6"	0'-9"	Safety Curb		
S402	58	4	40'-0"	Str.			Longitudinal		
S403	16	4	36'-0"	Str.			"		
S404	20	4	24'-0"	Str.			"		
S501	139	5	40'-0"	Str.			Longitudinal		
S502	41	5	36'-0"	Str.			"		
S503	56	5	24'-0"	Str.			"		
S601	25	6	26'-5"	Str.			Transverse		
S602	41	6	19'-6"	Str.			Long-over Pier 1 & 3		
S603	62	6	28'-6"	Str.			" Pier 2		
S604	8	6	4'-0"	Str.			Scupper		
L612	4	6	7'-5"	112	2'-5"	0'-10"	Lamp Anchor		
L801	4	8	7'-3"	132	0'-11"	1'-0"	"		

UNIT 1 BRIDGE 3E QUANTITIES		
ITEM	UNIT	QUANTITY
Concrete Mix 3Y6	Cu. Yd.	116
Reinforcing Bars	Pounds	57,180
1 1/4" Conduit with caps	Each	1 @ 8'-0"
Concrete Mix 3Y60	Cu. Yd.	5

① Included in Price bid for other items.
 ② Median Island and nose quantities are included.



H.N.T.B. BR. NO. 2A, 2C-2K, 3A-3E
 TRUNK HIGHWAY NO. 35
 STATE OF MINNESOTA
 DEPARTMENT OF HIGHWAYS
 INTERSTATE ROUTES IN DULUTH
 BRIDGE NO. 69801
 SLAB PLAN
 UNIT 1
 BRIDGE 3E
 APPROVED: 7-30-68

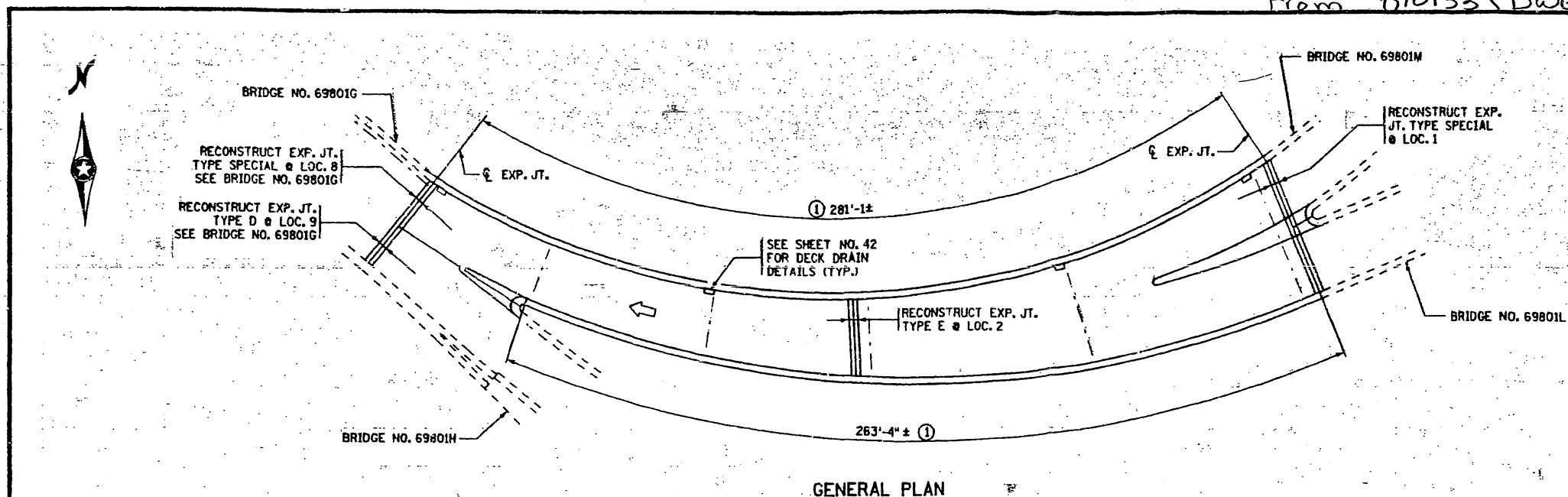
STATE FUNDS

DESIGN DATA

MAXIMUM ALLOWABLE DESIGN STRESSES:
REINFORCED CONCRETE:
f'c = 4000 p.s.i. n=8
fy = 60000 p.s.i. REINFORCEMENT

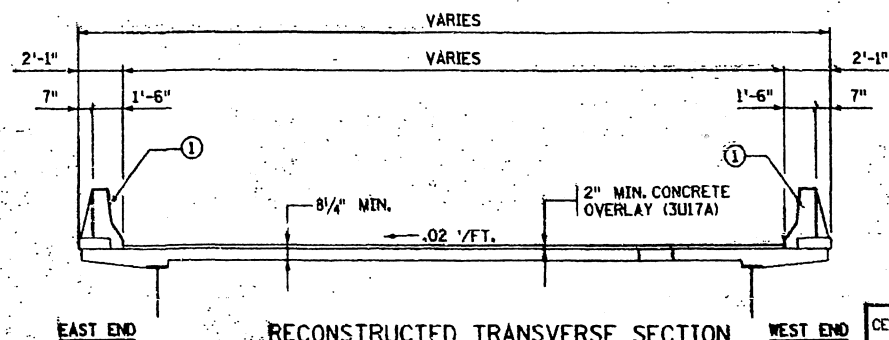
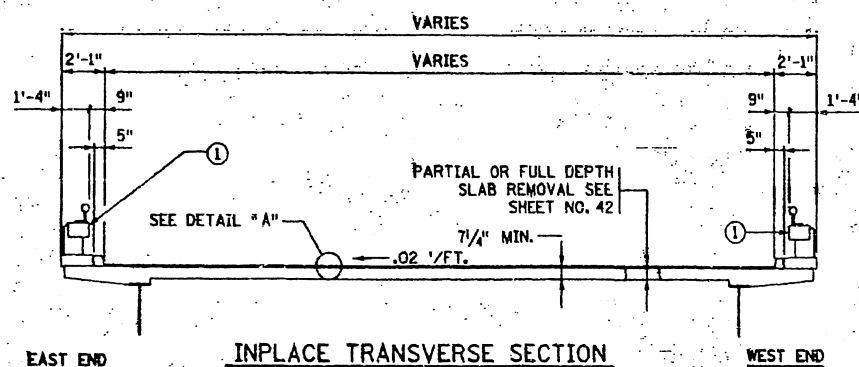
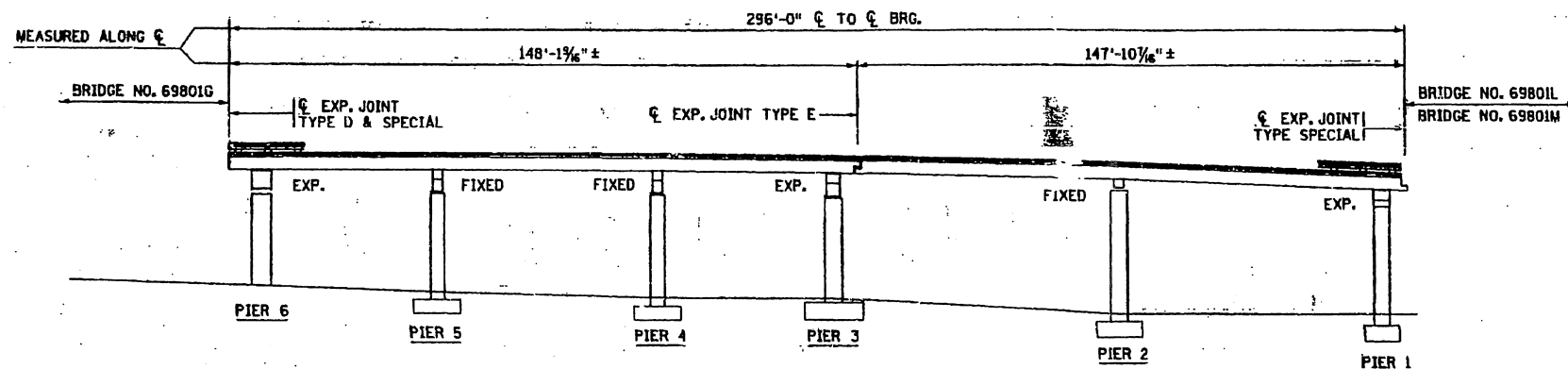
(2001)[1], TIF

Page 33



NOTES:

- REMOVE AND REPLACE CONCRETE RAILING AND PIPE RAILING WITH TYPE F MODIFIED RAILING. (RECONSTRUCT CONCRETE RAILING) SURFACE FINISH RAIL AFTER RECONSTRUCTION (POLYMER SURFACE FINISH)



REMOVE 3/4" LATEX MODIFIED CONCRETE OVERLAY (SCARIFY BRIDGE DECK)
SCARIFY BRIDGE DECK, 1/4" MIN. (SCARIFY BRIDGE DECK)

DETAIL "A"

TRUNK HIGHWAY NO. 535 MINNESOTA	
DEPARTMENT OF TRANSPORTATION	
BRIDGE NO. 69801N	
T.H. 535 N.B. SEG. 3 OVER R.R. AT THE JCT. (IN DULUTH) OF T.H. 535 & T.H. 35	
IDENTIFICATION NO. 401	
GENERAL PLAN AND ELEVATION	
SEC. 33..	T. 50. N R. 34. W
DULUTH.. CITY	ST. LOUIS.. COUNTY
APPROVED: <i>David J. Dahlberg</i>	
DATE: 4-16-01	
DES.	CHK. MAX
CHK.	MAX
69801N	

CERTIFIED BY: *David J. Dahlberg* 4/16/01
LICENSED PROFESSIONAL ENGINEER
NAME: DAVID J. DAHLBERG LIC. NO. 20646

JOB NO. T17005

DESIGN UNIT: DAVID J. DAHLBERG

STATE PROJ. NO. 6980 -69801N

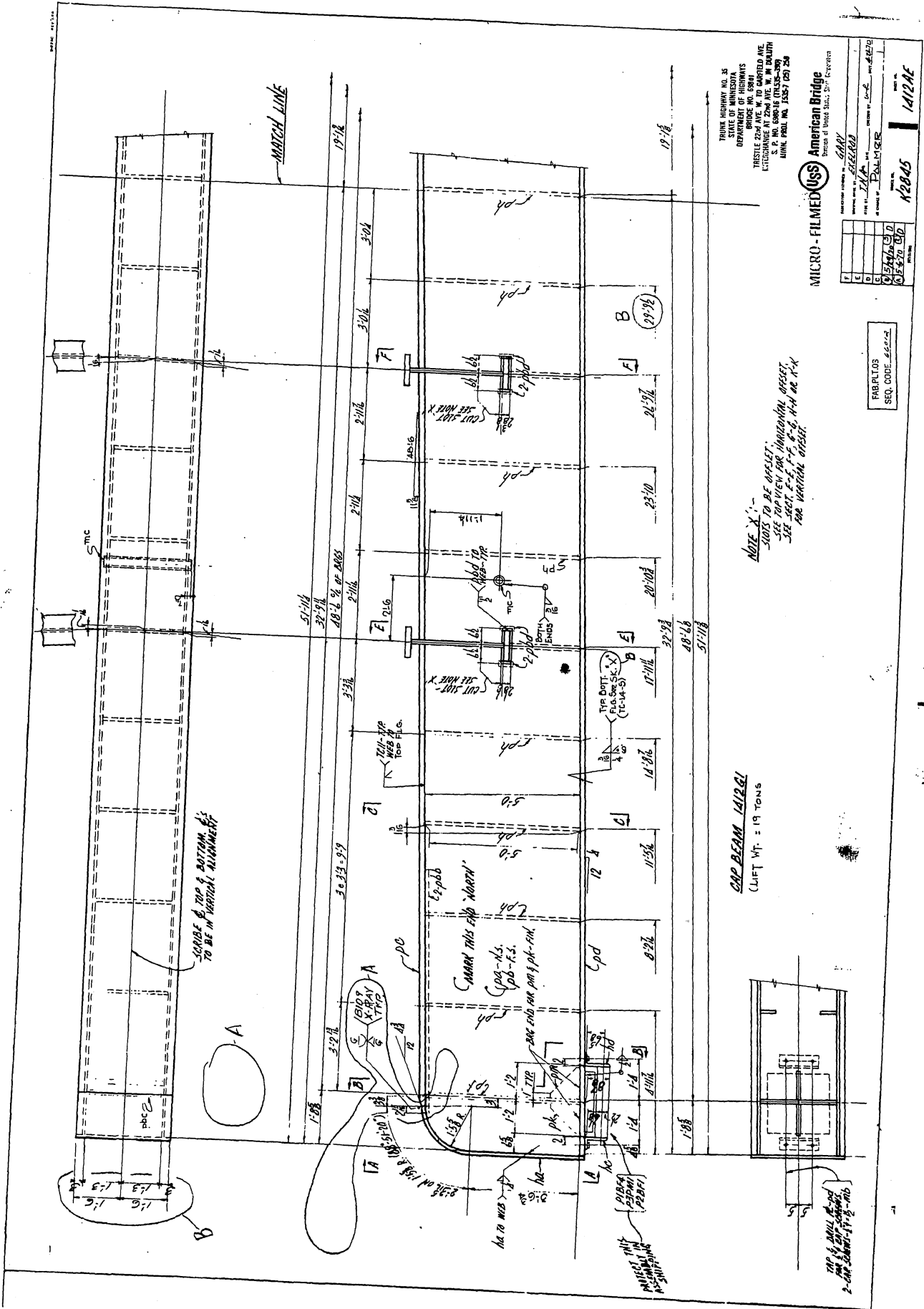
(T.H. 535-390)

SHEET NO. 33 OF 92 SHEETS

ADJACENT DOCUMENT WAS SUPPLIED BY AGENCY NAMED BELOW. DURING THE REGULAR COURSE OF BUSINESS, TO BE FILMED BY STATE OF MINNESOTA MICROGRAPHIC SERVICES UNIT ACCORDING TO NATIONAL BUREAU OF STANDARDS REQUIREMENTS FOR PERMANENT MICROFILM AND ACCORDING TO PROCEDURES FOR THE DOCUMENT SERIES.

Record Series Titled

B-12



TRUNK HIGHWAY NO. 35
 BRIDGE NO. 5881
 TRUSSEL 224 AVE. W. TO GARFIELD AVE.
 LOCATED IN THE TOWN OF GARFIELD
 S. & N. NO. 5881
 BRIDGE NO. 5881
 BRIDGE NO. 5881

US American Bridge
 Division of United States Steel Corporation

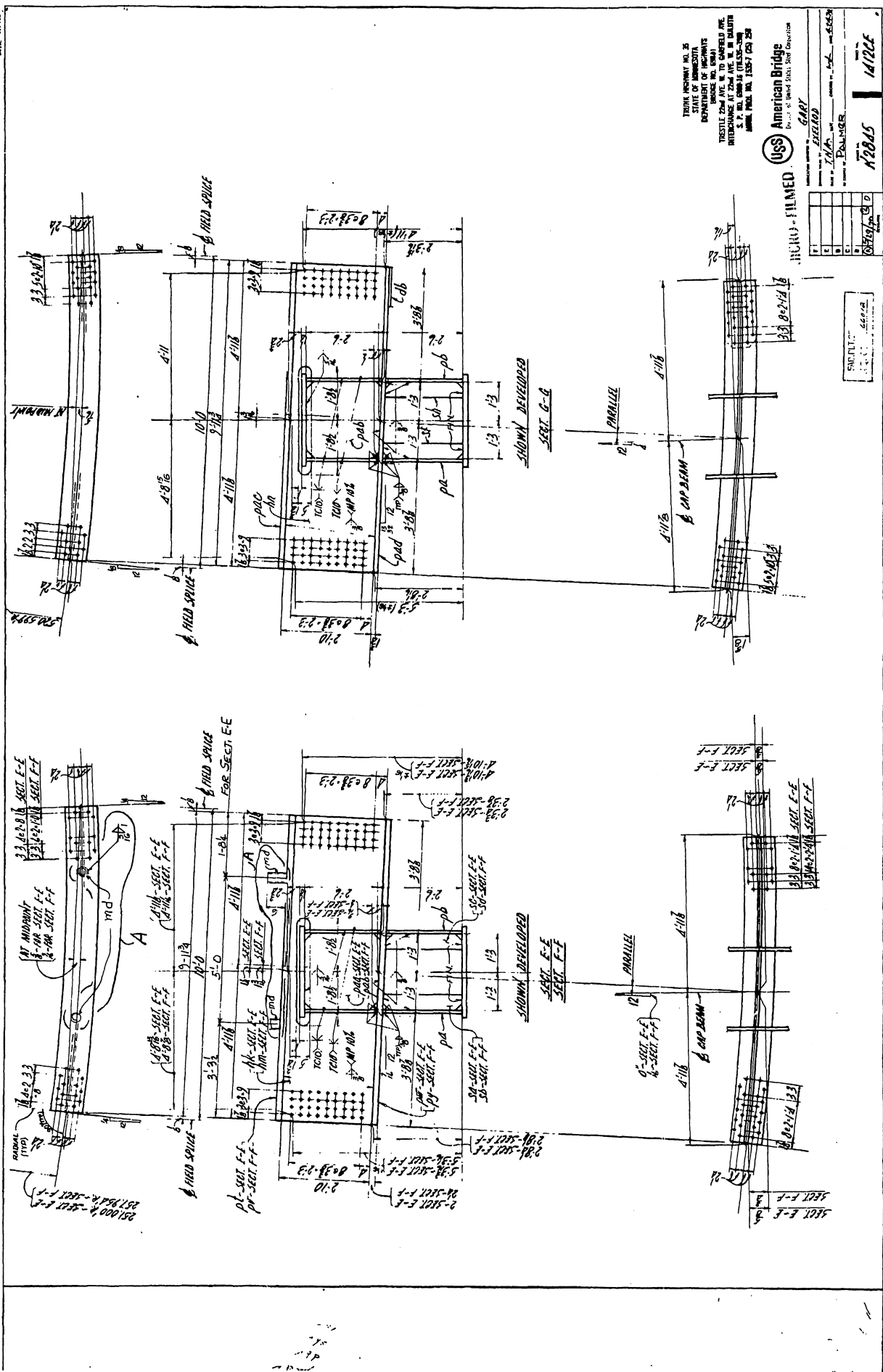
DATE	1/12/61
BY	W. J. PALMER
CHECKED BY	W. J. PALMER
APPROVED BY	W. J. PALMER
SCALE	AS SHOWN
PROJECT	BRIDGE NO. 5881
SEQ. CODE	5881-1

NOTE: X-1-
 STUDY TO BE OBTAINED
 SEE SECTION FOR DIMENSIONAL OFFSET
 SEE SECTION FOR DIMENSIONAL OFFSET
 SEE SECTION FOR DIMENSIONAL OFFSET

CAP BEAM 141261
 (LIFT WT. = 19 TONS)

(1971) = pg 533-537

B-13

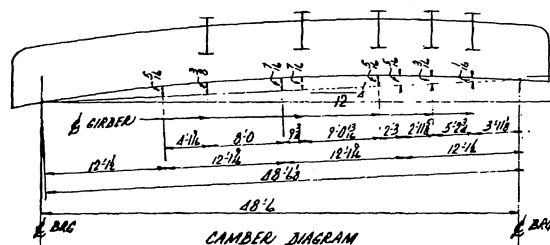
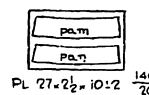


TRUSS BRIDGE NO. 25
 INTERSECTION OF 23RD AVENUE
 DEPARTMENT OF HIGHWAYS
 BRIDGE NO. 25
 TRUSS BRIDGE NO. 25
 INTERSECTION OF 23RD AVENUE
 DEPARTMENT OF HIGHWAYS
 BRIDGE NO. 25
 TRUSS BRIDGE NO. 25
 INTERSECTION OF 23RD AVENUE
 DEPARTMENT OF HIGHWAYS
 BRIDGE NO. 25

US American Bridge
 Bridge No. 25
 TRUSS BRIDGE NO. 25
 INTERSECTION OF 23RD AVENUE
 DEPARTMENT OF HIGHWAYS
 BRIDGE NO. 25

BRIDGE NO. 25
 TRUSS BRIDGE NO. 25
 INTERSECTION OF 23RD AVENUE
 DEPARTMENT OF HIGHWAYS
 BRIDGE NO. 25

BRIDGE NO. 25
 TRUSS BRIDGE NO. 25
 INTERSECTION OF 23RD AVENUE
 DEPARTMENT OF HIGHWAYS
 BRIDGE NO. 25



63								
64								
65								
66								
67	2	FIL	2	3	49	6	Pbb	Docu-UP 12-10-74
68	0	m						12-10-74
69	2	FIL	2	3	5		Pbd	12-10-74
70	2	M	BEARING	PL			PIBFA	12-10-74
71	2	M	BEARING	PL			PIBFA	12-10-74
72	2	M	BROWNE	PL			PIBFA	12-10-74
73	8	M	CAP SCANS	11	12		MA	12-10-74
74	8	M	CAP SCANS	11	12		MA	12-10-74
75	22	SB	3				NO CABLE	
76	1	PM	2	STB	2	7A	MC	P 5
77								
78	1	PM	2	STB	2	7A	MC	P 5
79								
80	3	MP	2	STB	6		MD	12-10-74
81								
82								
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100								

GENERAL NOTES

SPEC'S : MINN. DEPT. OF HWY'S. SPEC'S. PG&A EDITION AND SUPPLEMENTARY SPEC'S. FEB. 1966 & SPECIAL PROVISIONS AND AASHO 1965.

MATL: MHD 330G (A36 MODIFIED)
MATL MARKED "E" SHALL BE UM, FLAT, MACHINE
FLAME CUT AND GROUND $\frac{1}{16}$, OR EDGE PLANED.
SEE MHD 2471.3C4 AND D4.
OPEN HOLES: 13/4 OR 1/2" DIA.

SEE MHD 2411, SC4 AND D4.
OPEN HOLES: $\frac{1}{2}$ " ϕ FOR HS BOLTS
REAMING: HOLES TO BE
 SUBPUNCHED OR SUBDRILLED $\frac{1}{2}$ " AND REAMED
 TO SIZE WHILE MATCHING MEMBERS ARE
 ASSEMBLED. SEE DWG. E-11; FOR MATCH
 MARKS & BLOCKING. SEE NOTE "A"

SPLICE REAMING AS PER MHD 2471.3E1B.
OTHER REAMING AS PER MHD 2471.3E1C.

CAMBER : SEE CAMBER DIAGRAM.
INSPECTION : SHOP INSPECTION BY M.M.D

INSPECTION : SHOP INSPECTION BY MMD
MAGNETIC PARTICLE INSP. : PER MMD 2471.3J4d2 ✓

MAGNETIC PARTICLE INSP. : PER MHD 2471. BJ4 d2 &
SPECIAL PROVISIONS. (100% BRG. STIFFS. &
10% WEB & FLG. WELDS).

WELDING: PER MHD 2471.5T, 3339 AND SPECIAL PROVISIONS. REMOVE ALL SHOP TACK WELDING ON SPLICE PLATES.

PIPE NOTE: WELDING OF PIPE TO TOP FLG. MUST BE STRICTLY MAINTAINED. DO NOT DEVIATE FROM WELD SHOWN.
DO NOT PAINT PIPE

NOTE "A"--HOLES AT SPLICES MAY BE DRILLED
FULL SIZE FROM THE SOLID IN THE MAIN
MATERIAL USING SPLICE PLATES AS
TEMPLETS WHICH HAVE BEEN DRILLED
FULL SIZE USING NUMERICAL CONTROLLED
TAP DRILL OR SUBPUNCHING AND REAMED.

PAINT NOTE:
ONE COAT INORGANIC ZINC LEAD SILICATE
COATING ON THE INSIDE PER SPECS.
SEE SPECIAL PROVISIONS PAGE 195B FOR
SANDBLASTING.
ONE COAT RED LEAD (MHD 3506
SANDBLAST) ON THE OUTSIDE.

[illegible]

DIV. 8
UNIT 1-3E
CAP BEAM

PAGE 1. SEE PAINT NOTE

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	-----

FAB. 09		MO CODE 66012		F
R1				E
NO C N		EXTENT EXTENSIVE		D

Q. NO.	PROB.	PROB.	CODE	C
A	33		40	B

WEIGHT KEY NO.	DESCRIPTION SWP DIVISION	LINE CONTROL	A	5
2	8	60		

TOP LOCATION OF SHIPPING PIECES SHOWN ON
SECTION PLANS

ADV. BILL 1402-1407

MRCT

TRUNK HIGHWAY NO. 35
STATE OF MINNESOTA
DEPARTMENT OF HIGHWAYS
BRIDGE NO. 69801
RESTLE 22nd AVE. W. TO GARFIELD AVE.
INTERCHANGE AT 22nd AVE. W. IN DULUTH


 S. F. NO. 8980-16 (1H335-394)
 MILWA. PROJ. NO. 1535-7 (25) 258
American Bridge
 Division of United States Steel Corporation

7/28/70 68
TABULATION ASSIGNED TO GARY
DOWNS NAME BY EXELROD

6-70 4D
NAME BY INA DATE 6-70 (CHECKED BY 6-70 DATE 6-70)
REVENUE
IN CHARGE BY PALMER
THIS BAGGAGE MUST BE
ORDER NO. 1 END OF BAG.

	K2845	1412E
-1404	[A] [C]	



21 West Superior Street, Suite 500
Duluth, Minnesota 55802
218 727-8446
Fax 218 727-8456
www.LHBcorp.com

250 3rd Avenue North, Suite 450
Minneapolis, Minnesota 55401
612 338-2029
Fax 612 338-2088

PROJECT MDOT-SS - 69801 3E - P2 ; Pinned or Fixed
PROJECT # 090147 DATE 11/9/09 BY jdf SHEET NO. _____ OF _____

Are the beams fixed, pinned, or partially restrained to the pier cap?

Existing Beam calcs show no moment restraint at the pier cap as the beam design moments are equal ^{negative} at the support from both sides.

Refer to Bridge 3E Beam A

Ident 160.170 continuous beam analysis and steel beam design computer Run.

The pier cap is connected to the Pier by SF-1 bearing assemblies. SF-1 has a spherical radius top to allow Rotation but not translation.

Reviewing Existing Pier Cap calculations, pier cap was designed for shear, moment, and bearing only. NO torsion.

The top beam flange is not connected to the pier cap, only the beam webs and bottom flanges are "no moment connection."

Beams are pinned to pier cap.

Pier cap is pinned to piers



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PROJECT MDOT SS-69801-3E-P2 - Girder Model -1
PROJECT # 090147 DATE 12/2/09 BY jdf SHEET NO. _____ OF _____

Model the multi-span Line girder in Risa

Span lengths from original construction drawings were used

Since we are only using this model for Reactions, only loading and stiffness need to be accurate.

Members are created using I_{xx} from MDX calculations. Only I_{zz} in Risa model is correct, Area, Max thickness, d_z , I_{yy} , d_y are all approximate and should not be used.

Modeled 3E - Beam F and 3C - Girder C combination as it has the longest spans which will cause the largest Reactions.

MDX Output

Girder Member Properties - Girder 5

pg 43

Girder 5 Member Properties Used in Reanalysis

Point	Noncomp Dead			Superimposed Dead			Live Load		
	Ix (in4)	J (in4)	Iy (in4)	Ix (in4)	J (in4)	Iy (in4)	Ix (in4)	J (in4)	Iy (in4)
0	6953	5	234	15638	624	19218	20632	1863	57187
1	6953	5	234	15638	624	19218	20632	1863	57187
2	6953	5	234	15638	624	19218	20632	1863	57187
3	6953	5	234	15638	624	19218	20632	1863	57187
4	6953	5	234	15638	624	19218	20632	1863	57187
5	6953	5	234	15638	624	19218	20632	1863	57187
6	6953	5	234	15638	624	19218	20632	1863	57187
7	6953	5	234	15638	624	19218	20632	1863	57187
8	6953	5	234	6953	5	234	6953	5	234
9	11557	21	396	11557	21	396	11557	21	396
10	11557	21	396	11557	21	396	11557	21	396
11	6953	5	234	6953	5	234	6953	5	234
12	6953	5	234	6953	5	234	6953	5	234
13	6953	5	234	15638	624	19218	20632	1863	57187
14	6953	5	234	15638	624	19218	20632	1863	57187
15	6953	5	234	15638	624	19218	20632	1863	57187
16	6953	5	234	15638	624	19218	20632	1863	57187
17	6953	5	234	15638	624	19218	20632	1863	57187
18	6953	5	234	6953	5	234	6953	5	234
19	6953	5	234	6953	5	234	6953	5	234
20	11557	21	396	11557	21	396	11557	21	396
21	6953	5	234	6953	5	234	6953	5	234
22	6953	5	234	6953	5	234	6953	5	234
23	6953	5	234	15638	624	19218	20632	1863	57187
24	6953	5	234	15638	624	19218	20632	1863	57187
25	6953	5	234	15638	624	19218	20632	1863	57187
26	6953	5	234	15638	624	19218	20632	1863	57187
27	6953	5	234	15638	624	19218	20632	1863	57187
28	6953	5	234	15638	624	19218	20632	1863	57187
29	12750	34	450	12750	34	450	12750	34	450
30	12750	34	450	12750	34	450	12750	34	450
31	12750	34	450	23946	646	19434	32469	1886	57403
32	12750	34	450	23946	646	19434	32469	1886	57403
33	12750	34	450	23946	646	19434	32469	1886	57403
34	12750	34	450	23946	646	19434	32469	1886	57403
35	12750	34	450	23946	646	19434	32469	1886	57403
36	12750	34	450	23946	646	19434	32469	1886	57403
37	12750	34	450	23946	646	19434	32469	1886	57403
38	12750	34	450	23946	646	19434	32469	1886	57403
39	12750	34	450	12750	34	450	12750	34	450
40	22471	129	721	22471	129	721	22471	129	721
41	12750	34	450	12750	34	450	12750	34	450
42	12750	34	450	12750	34	450	12750	34	450
43	12750	34	450	23946	646	19434	32469	1886	57403
44	12750	34	450	23946	646	19434	32469	1886	57403
45	12750	34	450	23946	646	19434	32469	1886	57403
46	12750	34	450	23946	646	19434	32469	1886	57403
47	12750	34	450	23946	646	19434	32469	1886	57403
48	12750	34	450	23946	646	19434	32469	1886	57403
49	12750	34	450	23946	646	19434	32469	1886	57403
50	12750	34	450	12750	34	450	12750	34	450
51	6863	4	216	6863	4	216	6863	4	216
52	7352	4	216	16031	623	19200	21146	1862	57169
53	7860	4	216	17016	623	19200	22453	1863	57169
54	8389	4	216	18035	623	19200	23807	1863	57169
55	8939	4	216	19088	623	19200	25210	1863	57169
56	9509	4	216	20177	623	19200	26661	1863	57169
57	10100	4	216	21300	623	19200	28161	1863	57169
58	10712	4	216	22460	623	19200	29711	1863	57169
59	10817	4	216	10817	4	216	10817	4	216
60	16734	16	360	16734	16	360	16734	16	360
61	9514	3	180	9514	3	180	9514	3	180
62	9514	3	180	19474	621	19164	25309	1861	57133
63	9514	3	180	19474	621	19164	25309	1861	57133
64	9514	3	180	19474	621	19164	25309	1861	57133
65	9514	3	180	19474	621	19164	25309	1861	57133
66	9514	3	180	19474	621	19164	25309	1861	57133
67	9514	3	180	19474	621	19164	25309	1861	57133

Typ Area

$$= 12 \times 1 \times 2$$

$$+ 34 \times 3/8 = 36.75 \text{ in}^2$$

Use 40 in²

Max thickness, use 1"

$$dz = 6"$$

$$I_{yy} \text{ Rise} = I_y \text{ MDX}$$

$$I_{zz} \text{ Rise} = I_x \text{ MDX}$$

dy-top, see MDX

dy-bot, see MDX

P4-3E

P3-3E

P2-3E

P1-3E

P3-3C

Tapered Section
Use average.
 $I_x = 25307$

B-21

Ix J Iy

68	13797	9	288	13797	9	288	13797	9	288
69	13797	9	288	13797	9	288	13797	9	288
70	22809	44	504	22809	44	504	22809	44	504
71	10926	4	216	10926	4	216	10926	4	216
72	11948	7	252	25602	626	19236	34470	1866	57205
73	11948	7	252	25602	626	19236	34470	1866	57205
74	11948	7	252	25602	626	19236	34470	1866	57205
75	11948	7	252	25602	626	19236	34470	1866	57205
76	11948	7	252	25602	626	19236	34470	1866	57205
77	11948	7	252	25602	626	19236	34470	1866	57205
78	11948	7	252	25602	626	19236	34470	1866	57205
79	10926	4	216	10926	4	216	10926	4	216
80	22809	44	504	22809	44	504	22809	44	504
81	15257	12	324	15257	12	324	15257	12	324
82	15257	12	324	15257	12	324	15257	12	324
83	10190	3	198	21097	622	19182	27663	1862	57151
84	10190	3	198	21097	622	19182	27663	1862	57151
85	10190	3	198	21097	622	19182	27663	1862	57151
86	10190	3	198	21097	622	19182	27663	1862	57151
87	10190	3	198	21097	622	19182	27663	1862	57151
88	10190	3	198	21097	622	19182	27663	1862	57151
89	10190	3	198	10190	3	198	10190	3	198
90	10190	3	198	10190	3	198	10190	3	198
91	10190	3	198	21097	622	19182	27663	1862	57151
92	10190	3	198	21097	622	19182	27663	1862	57151
93	10190	3	198	21097	622	19182	27663	1862	57151
94	10190	3	198	21097	622	19182	27663	1862	57151
95	10190	3	198	21097	622	19182	27663	1862	57151
96	10190	3	198	21097	622	19182	27663	1862	57151
97	10190	3	198	21097	622	19182	27663	1862	57151
98	10190	3	198	21097	622	19182	27663	1862	57151
99	16734	16	360	16734	16	360	16734	16	360
100	17120	17	360	17120	17	360	17120	17	360
101	17120	17	360	17120	17	360	17120	17	360
102	17120	17	360	17120	17	360	17120	17	360
103	17120	17	360	17120	17	360	17120	17	360
104	16734	16	360	16734	16	360	16734	16	360
105	16734	16	360	16734	16	360	16734	16	360
106	16734	16	360	16734	16	360	16734	16	360
107	16734	16	360	16734	16	360	16734	16	360
108	16734	16	360	16734	16	360	16734	16	360
109	16734	16	360	16734	16	360	16734	16	360
110	16734	16	360	28888	628	19344	37914	1868	57313

P2-3C

P1-3C

P7-3A

Elastic Section Properties for Stiffness Analysis

Girder 5 Elastic Section Properties for Stiffness Analysis

 $f'_c \text{ conc} = 4000 \text{ psi}$ $n = 8 \text{ per}$
10.38.1.3.

Tenth Point	I	Noncomp		I	Comp (n = 8)		I	Comp (3n = 24)	
		na from Bott	na from Top Flg		na from Bott	na from Top Flg		na from Bott	na from Top Flg
0	6953.	15.51	20.11	20632.	32.78	2.85	15638.	26.63	9.00
1	6953.	15.51	20.11	20632.	32.78	2.85	15638.	26.63	9.00
2	6953.	15.51	20.11	20632.	32.78	2.85	15638.	26.63	9.00
3	6953.	15.51	20.11	20632.	32.78	2.85	15638.	26.63	9.00
4	6953.	15.51	20.11	20632.	32.78	2.85	15638.	26.63	9.00
5	6953.	15.51	20.11	20632.	32.78	2.85	15638.	26.63	9.00
6	6953.	15.51	20.11	20632.	32.78	2.85	15638.	26.63	9.00
7	6953.	15.51	20.11	20632.	32.78	2.85	15638.	26.63	9.00
8	6953.	15.51	20.11	6953.	15.51	20.11	6953.	15.51	20.11
9	11557.	18.38	18.38	11557.	18.38	18.38	11557.	18.38	18.38
10	11557.	18.38	18.38	11557.	18.38	18.38	11557.	18.38	18.38
11	6953.	15.51	20.11	6953.	15.51	20.11	6953.	15.51	20.11
12	6953.	15.51	20.11	6953.	15.51	20.11	6953.	15.51	20.11
13	6953.	15.51	20.11	20632.	32.78	2.85	15638.	26.63	9.00
14	6953.	15.51	20.11	20632.	32.78	2.85	15638.	26.63	9.00
15	6953.	15.51	20.11	20632.	32.78	2.85	15638.	26.63	9.00
16	6953.	15.51	20.11	20632.	32.78	2.85	15638.	26.63	9.00
17	6953.	15.51	20.11	20632.	32.78	2.85	15638.	26.63	9.00
18	6953.	15.51	20.11	6953.	15.51	20.11	6953.	15.51	20.11
19	6953.	15.51	20.11	6953.	15.51	20.11	6953.	15.51	20.11
20	11557.	18.38	18.38	11557.	18.38	18.38	11557.	18.38	18.38
21	6953.	15.51	20.11	6953.	15.51	20.11	6953.	15.51	20.11
22	6953.	15.51	20.11	6953.	15.51	20.11	6953.	15.51	20.11
23	6953.	15.51	20.11	20632.	32.78	2.85	15638.	26.63	9.00
24	6953.	15.51	20.11	20632.	32.78	2.85	15638.	26.63	9.00
25	6953.	15.51	20.11	20632.	32.78	2.85	15638.	26.63	9.00
26	6953.	15.51	20.11	20632.	32.78	2.85	15638.	26.63	9.00
27	6953.	15.51	20.11	20632.	32.78	2.85	15638.	26.63	9.00
28	6953.	15.51	20.11	20632.	32.78	2.85	15638.	26.63	9.00
29	12750.	16.10	21.02	12750.	16.10	21.02	12750.	16.10	21.02
30	12750.	16.10	21.02	12750.	16.10	21.02	12750.	16.10	21.02
31	12750.	16.10	21.02	32470.	31.63	5.50	23946.	24.99	12.13
32	12750.	16.10	21.02	32470.	31.63	5.50	23946.	24.99	12.13
33	12750.	16.10	21.02	32470.	31.63	5.50	23946.	24.99	12.13
34	12750.	16.10	21.02	32470.	31.63	5.50	23946.	24.99	12.13
35	12750.	16.10	21.02	32470.	31.63	5.50	23946.	24.99	12.13
36	12750.	16.10	21.02	32470.	31.63	5.50	23946.	24.99	12.13
37	12750.	16.10	21.02	32470.	31.63	5.50	23946.	24.99	12.13
38	12750.	16.10	21.02	32470.	31.63	5.50	23946.	24.99	12.13
39	12750.	16.10	21.02	12750.	16.10	21.02	12750.	16.10	21.02
40	22472.	19.50	19.50	22472.	19.50	19.50	22472.	19.50	19.50
41	12750.	16.10	21.02	12750.	16.10	21.02	12750.	16.10	21.02
42	12750.	16.10	21.02	12750.	16.10	21.02	12750.	16.10	21.02
43	12750.	16.10	21.02	32470.	31.63	5.50	23946.	24.99	12.13
44	12750.	16.10	21.02	32470.	31.63	5.50	23946.	24.99	12.13
45	12750.	16.10	21.02	32470.	31.63	5.50	23946.	24.99	12.13
46	12750.	16.10	21.02	32470.	31.63	5.50	23946.	24.99	12.13
47	12750.	16.10	21.02	32470.	31.63	5.50	23946.	24.99	12.13
48	12750.	16.10	21.02	32470.	31.63	5.50	23946.	24.99	12.13
49	12750.	16.10	21.02	32470.	31.63	5.50	23946.	24.99	12.13
50	12750.	16.10	21.02	12750.	16.10	21.02	12750.	16.10	21.02
51	6863.	16.34	19.33	6863.	16.34	19.33	6863.	16.34	19.33
52	7352.	16.86	19.91	21147.	33.80	2.96	16032.	27.67	9.10
53	7861.	17.38	20.48	22454.	34.66	3.20	17016.	28.36	9.49
54	8390.	17.90	21.05	23808.	35.52	3.43	18035.	29.06	9.89
55	8939.	18.42	21.62	25210.	36.37	3.67	19089.	29.75	10.29
56	9509.	18.95	22.19	26661.	37.23	3.91	20177.	30.44	10.69
57	10100.	19.47	22.76	28161.	38.08	4.15	21301.	31.13	11.10
58	10713.	19.99	23.32	29711.	38.92	4.39	22460.	31.81	11.50
59	10817.	20.08	23.42	10817.	20.08	23.42	10817.	20.08	23.42
60	16734.	22.25	22.25	16734.	22.25	22.25	16734.	22.25	22.25
61	9515.	21.62	21.62	9515.	21.62	21.62	9515.	21.62	21.62
62	9515.	21.62	21.62	25309.	39.81	3.44	19474.	33.23	10.02
63	9515.	21.62	21.62	25309.	39.81	3.44	19474.	33.23	10.02
64	9515.	21.62	21.62	25309.	39.81	3.44	19474.	33.23	10.02
65	9515.	21.62	21.62	25309.	39.81	3.44	19474.	33.23	10.02
66	9515.	21.62	21.62	25309.	39.81	3.44	19474.	33.23	10.02

P5-2H

P5-3E

P4-3E

P3-3E

P2-3E

P1-3E

P3-3C

✓ CSM 4/29/10

Tapered Section:
 Use I = 25307 ✓
 na Bot = 36.4 ✓
 na Top = 3.67 ✓

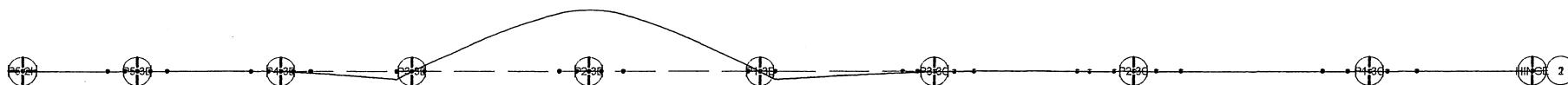
B-23

			I	na (Bot)	na (Top)			
67	9515.	21.62	21.62	25309.	39.81	3.44	19474.	33.23 10.02
68	13797.	22.00	22.00	13797.	22.00	22.00	13797.	22.00 22.00
69	13797.	22.00	22.00	13797.	22.00	22.00	13797.	22.00 22.00
70	22810.	22.75	22.75	22810.	22.75	22.75	22810.	22.75 22.75
71	10926.	21.75	21.75	10926.	21.75	21.75	10926.	21.75 21.75
72	11949.	18.79	24.96	34470.	38.37	5.38	25602.	30.75 13.00
73	11949.	18.79	24.96	34470.	38.37	5.38	25602.	30.75 13.00
74	11949.	18.79	24.96	34470.	38.37	5.38	25602.	30.75 13.00
75	11949.	18.79	24.96	34470.	38.37	5.38	25602.	30.75 13.00
76	11949.	18.79	24.96	34470.	38.37	5.38	25602.	30.75 13.00
77	11949.	18.79	24.96	34470.	38.37	5.38	25602.	30.75 13.00
78	11949.	18.79	24.96	34470.	38.37	5.38	25602.	30.75 13.00
79	10926.	21.75	21.75	10926.	21.75	21.75	10926.	21.75 21.75
80	22810.	22.75	22.75	22810.	22.75	22.75	22810.	22.75 22.75
81	15257.	22.12	22.12	15257.	22.12	22.12	15257.	22.12 22.12
82	15257.	22.12	22.12	15257.	22.12	22.12	15257.	22.12 22.12
83	10190.	20.82	22.56	27664.	39.43	3.94	21097.	32.56 10.81
84	10190.	20.82	22.56	27664.	39.43	3.94	21097.	32.56 10.81
85	10190.	20.82	22.56	27664.	39.43	3.94	21097.	32.56 10.81
86	10190.	20.82	22.56	27664.	39.43	3.94	21097.	32.56 10.81
87	10190.	20.82	22.56	27664.	39.43	3.94	21097.	32.56 10.81
88	10190.	20.82	22.56	27664.	39.43	3.94	21097.	32.56 10.81
89	10190.	20.82	22.56	10190.	20.82	22.56	10190.	20.82 22.56
90	10190.	20.82	22.56	10190.	20.82	22.56	10190.	20.82 22.56
91	10190.	20.82	22.56	27664.	39.43	3.94	21097.	32.56 10.81
92	10190.	20.82	22.56	27664.	39.43	3.94	21097.	32.56 10.81
93	10190.	20.82	22.56	27664.	39.43	3.94	21097.	32.56 10.81
94	10190.	20.82	22.56	27664.	39.43	3.94	21097.	32.56 10.81
95	10190.	20.82	22.56	27664.	39.43	3.94	21097.	32.56 10.81
96	10190.	20.82	22.56	27664.	39.43	3.94	21097.	32.56 10.81
97	10190.	20.82	22.56	27664.	39.43	3.94	21097.	32.56 10.81
98	10190.	20.82	22.56	27664.	39.43	3.94	21097.	32.56 10.81
99	16734.	22.25	22.25	16734.	22.25	22.25	16734.	22.25 22.25
100	17120.	22.25	22.25	17120.	22.25	22.25	17120.	22.25 22.25
101	17120.	22.25	22.25	17120.	22.25	22.25	17120.	22.25 22.25
102	17120.	22.25	22.25	17120.	22.25	22.25	17120.	22.25 22.25
103	17120.	22.25	22.25	17120.	22.25	22.25	17120.	22.25 22.25
104	16734.	22.25	22.25	16734.	22.25	22.25	16734.	22.25 22.25
105	16734.	22.25	22.25	16734.	22.25	22.25	16734.	22.25 22.25
106	16734.	22.25	22.25	16734.	22.25	22.25	16734.	22.25 22.25
107	16734.	22.25	22.25	16734.	22.25	22.25	16734.	22.25 22.25
108	16734.	22.25	22.25	16734.	22.25	22.25	16734.	22.25 22.25
109	16734.	22.25	22.25	16734.	22.25	22.25	16734.	22.25 22.25
110	16734.	22.25	22.25	37915.	38.78	5.72	28889.	31.81 12.89

P2-3C

P1-3C

P7-3A



Results for LC 12, Influence Reaction

LHB	Pier 2-3E, Beam F and Girder C Influence Line for Reaction at P2-3E	
jdf		Apr 26, 2010 at 3:00 PM
090147		090147_3E_P2_BeamFGirderC.r3d

B-25

Company : LHB
 Designer : jdf
 Job Number : 090147

Pier 2-3E, Beam F and Girder C

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 Checked By: *CJM*

4/29/10

Global

Display Sections for Member Calcs	20
Max Internal Sections for Member Calcs	39
Include Shear Deformation	Yes
Include Warping	No
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 (Direct Analysis Method)
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	Exact Integration
Parame Beta Factor (PCA)	.65
Concrete Stress Block	Rectangular
Use Cracked Sections	Yes
Bad Framing Warnings	No
Unused Force Warnings	Yes

Footing Overturning Safety Factor	1.5
Check Concrete Bearing	Yes
Self Wt, Overburden in DL for Design	Yes
Footing Concrete Weight	.145 k/ft^3
Footing Concrete f _c	3 ksi
Footing Concrete E _c	4000 ksi
Footing Steel f _y	60 ksi
Minimum Steel	0.0018
Maximum Steel	0.0075
Footing Top Bar	#3
Footing Top Bar Cover	3.5 in
Footing Bottom Bar	#4
Footing Bottom Bar Cover	3.5 in
Pedestal Bar	#3
Pedestal Bar Cover	1.5 in
Pedestal Ties	#3

Note: From P5-2H to P1-3E, the effective slab width tapers @ composite sections. Averages should have been used. Does not affect Results significantly.

General Material Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (1/E5 F)	Density[k/ft^3]
1	gen Conc4NW	3644	1584	.15	.6	.145
2	gen Alum	10600	4077	.3	1.29	.173
3	gen Steel	29000	11154	.3	.65	.49
4	RIGID	1e+6		.3	0	0

Member Primary Data

These values were not Revised

	Label	I Joint	J Joint	K Joint	Rotate(deg)	Section/Shape	Type	Design List	Material	Design Rules
1	M1-1	P5-2H	N13		194.67 → Avg	I20632	Beam	None	gen_Steel	Typical
2	M1-2	N13	N14			I06953	Beam	None	gen_Steel	Typical
3	M1-3	N14	P5-3E			I11557	Beam	None	gen_Steel	Typical
4	M2-1	P5-3E	N15			I11557	Beam	None	gen_Steel	Typical

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Company : LHB
 Designer : jdf
 Job Number : 090147

Pier 2-3E, Beam F and Girder C

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Member Primary Data (Continued)

	Label	I Joint	J Joint	K Joint	Rotate(deg)	Section/Shape	Type	Design List	Material	Design Rules
5	M2-2	N15	N16			I06953	Beam	None	gen_Steel	Typical
6	M2-3	N16	N17	Avg = 20712 →		I20632	Beam	None	gen_Steel	Typical
7	M2-4	N17	N18			I06953	Beam	None	gen_Steel	Typical
8	M2-5	N18	P4-3E			I11557	Beam	None	gen_Steel	Typical
9	M3-1	P4-3E	N20			I11557	Beam	None	gen_Steel	Typical
10	M3-2	N20	N19			I06953	Beam	None	gen_Steel	Typical
11	M3-3	N19	H1	Avg = 18314 →		I20632	Beam	None	gen_Steel	Typical
12	M4-1	H1	P3-3E			I12750	Beam	None	gen_Steel	Typical
13	M5-1	P3-3E	N23			I12750	Beam	None	gen_Steel	Typical
14	M5-2	N23	N22	Avg = 31463 →		I32469	Beam	None	gen_Steel	Typical
15	M5-3	N22	N21			I12750	Beam	None	gen_Steel	Typical
16	M5-4	N21	P2-3E			I22471	Beam	None	gen_Steel	Typical
17	M6-1	P2-3E	N26			I22471	Beam	None	gen_Steel	Typical
18	M6-2	N26	N25			I12750	Beam	None	gen_Steel	Typical
19	M6-3	N25	N24	Avg = 32251 →		I32469	Beam	None	gen_Steel	Typical
20	M6-4	N24	P1-3E			I12750	Beam	None	gen_Steel	Typical
21	M7-1	P1-3E	H2			I12750	Beam	None	gen_Steel	Typical
22	M8-1	H2	N27			I25307	Beam	None	gen_Steel	Typical
23	M8-2	N27	N28			I10817	Beam	None	gen_Steel	Typical
24	M8-3	N28	P3-3C			I16734	Beam	None	gen_Steel	Typical
25	M9-1	P3-3C	N33			I16734	Beam	None	gen_Steel	Typical
26	M9-2	N33	N32			I09514	Beam	None	gen_Steel	Typical
27	M9-3	N32	N31			I25309	Beam	None	gen_Steel	Typical
28	M9-4	N31	N30			I09514	Beam	None	gen_Steel	Typical
29	M9-5	N30	N29			I13797	Beam	None	gen_Steel	Typical
30	M9-6	N29	P2-3C			I22809	Beam	None	gen_Steel	Typical
31	M10-1	P2-3C	N37			I22809	Beam	None	gen_Steel	Typical
32	M10-2	N37	N36			I10926	Beam	None	gen_Steel	Typical
33	M10-3	N36	N35			I34470	Beam	None	gen_Steel	Typical
34	M10-4	N35	N34			I10926	Beam	None	gen_Steel	Typical
35	M10-5	N34	P1-3C			I22809	Beam	None	gen_Steel	Typical
36	M11-1	P1-3C	N39			I22809	Beam	None	gen_Steel	Typical
37	M11-2	N39	N38			I15257	Beam	None	gen_Steel	Typical
38	M11-3	N38	H3			I27663	Beam	None	gen_Steel	Typical

Member Advanced Data

	Label	I Release	J Release	I Offset[in]	J Offset[in]	T/C Only	Physical	TOM	Inactive
1	M1-1						Yes		
2	M1-2						Yes		
3	M1-3						Yes		
4	M2-1						Yes		
5	M2-2						Yes		
6	M2-3						Yes		
7	M2-4						Yes		
8	M2-5						Yes		
9	M3-1						Yes		
10	M3-2						Yes		
11	M3-3		BenPIN				Yes		
12	M4-1						Yes		
13	M5-1						Yes		
14	M5-2						Yes		
15	M5-3						Yes		
16	M5-4						Yes		
17	M6-1						Yes		
18	M6-2						Yes		
19	M6-3						Yes		

Company : LHB
 Designer : jdf
 Job Number : 090147

Pier 2-3E, Beam F and Girder C

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Member Advanced Data (Continued) ✓

	Label	I Release	J Release	I Offset[in]	J Offset[in]	T/C Only	Physical	TOM	Inactive
20	M6-4						Yes		
21	M7-1						Yes		
22	M8-1	BenPIN					Yes		
23	M8-2						Yes		
24	M8-3						Yes		
25	M9-1						Yes		
26	M9-2						Yes		
27	M9-3						Yes		
28	M9-4						Yes		
29	M9-5						Yes		
30	M9-6						Yes		
31	M10-1						Yes		
32	M10-2						Yes		
33	M10-3						Yes		
34	M10-4						Yes		
35	M10-5						Yes		
36	M11-1						Yes		
37	M11-2						Yes		
38	M11-3						Yes		

Joint Coordinates and Temperatures ✓

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Diap...
1	P5-2H	0	0	0	0	
2	P5-3E	46.23	0	0	0	
3	P4-3E	104.18	0	0	0	
4	H1	150.98	0	0	0	
5	P3-3E	157.21	0	0	0	
6	P2-3E	229.05	0	0	0	
7	P1-3E	298.9	0	0	0	
8	H2	304.9	0	0	0	
9	P3-3C	369.9	0	0	0	
10	P2-3C	450.9	0	0	0	
11	P1-3C	546.2	0	0	0	
12	H3	611.87	0	0	0	
13	N13	34.23	0	0	0	
14	N14	41.23	0	0	0	
15	N15	51.48	← Should have been 51.23'	0	0	
16	N16	58.23	0	0	0	
17	N17	92.18	0	0	0	
18	N18	99.18	0	0	0	
19	N19	116.18	0	0	0	
20	N20	109.18	0	0	0	
21	N21	224.05	0	0	0	
22	N22	217.05	← Should have been 213.05'	0	0	
23	N23	162.21	0	0	0	
24	N24	293.9	0	0	0	
25	N25	243.05	0	0	0	
26	N26	234.05	0	0	0	
27	N27	356.9	0	0	0	
28	N28	362.9	0	0	0	
29	N29	442.9	0	0	0	
30	N30	432.9	0	0	0	
31	N31	427.9	0	0	0	
32	N32	385.9	0	0	0	
33	N33	377.9	0	0	0	
34	N34	537.2	0	0	0	

Joint Coordinates and Temperatures (Continued)

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Diap...
35	N35	527.2	0	0	0	
36	N36	469.9	0	0	0	
37	N37	459.9	0	0	0	
38	N38	565.2	0	0	0	
39	N39	553.2	0	0	0	

Joint Boundary Conditions

	Joint 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]	Footing
1	P5-2H	Reaction	Reaction	Reaction	Reaction			
2	P5-3E		Reaction	Reaction	Reaction			
3	P4-3E		Reaction	Reaction	Reaction			
4	P3-3E		Reaction	Reaction	Reaction			
5	P2-3E		Reaction	Reaction	Reaction			
6	P1-3E		Reaction	Reaction	Reaction			
7	P3-3C		Reaction	Reaction	Reaction			
8	P2-3C		Reaction	Reaction	Reaction			
9	P1-3C		Reaction	Reaction	Reaction			
10	H3		Reaction	Reaction	Reaction			

Joint Loads and Enforced Displacements (BLC 6 : Influence Line)

	Joint Label	L.D.M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft...]
1	P2-3E	D	Y	1

Member Point Loads (BLC 3 : Design Truck)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M5-3	Y	-32	2
2	M6-1	Y	-32	4
3	M6-3	Y	-8	4

Member Point Loads (BLC 4 : Design Tandem)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M5-4	Y	-25	3
2	M6-1	Y	-25	2

Member Point Loads (BLC 5 : 2 Trucks at 50FT) ✓

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M5-2	Y	-32	16.5 ✓
2	M5-2	Y	-32	30.5 ✓
3	M5-2	Y	-8	44.5 ✓
4	M6-3	Y	-32	13.66 ✓
5	M6-3	Y	-32	27.66 ✓
6	M6-3	Y	-8	41.66 ✓

Member Distributed Loads (BLC 1 : Test Uniform Load)

	Member Label	Direction	Start Magnitude[k/ft,d...]	End Magnitude[k/ft,d...]	Start Location[ft,%]	End Location[ft,%]
1	M1-1	Y	-1	-1	0	0
2	M1-2	Y	-1	-1	0	0
3	M1-3	Y	-1	-1	0	0
4	M2-1	Y	-1	-1	0	0
5	M2-2	Y	-1	-1	0	0
6	M2-3	Y	-1	-1	0	0

Company : LHB
 Designer : jdf
 Job Number : 090147

Pier 2-3E, Beam F and Girder C

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Member Distributed Loads (BLC 1 : Test Uniform Load) (Continued)

	Member Label	Direction	Start Magnitude[k/ft.d...]	End Magnitude[k/ft.d...	Start Location[ft.%]	End Location[ft.%]
7	M2-4	Y	-1	-1	0	0
8	M2-5	Y	-1	-1	0	0
9	M3-1	Y	-1	-1	0	0
10	M3-2	Y	-1	-1	0	0
11	M3-3	Y	-1	-1	0	0
12	M4-1	Y	-1	-1	0	0
13	M5-1	Y	-1	-1	0	0
14	M5-2	Y	-1	-1	0	0
15	M5-3	Y	-1	-1	0	0
16	M5-4	Y	-1	-1	0	0
17	M6-1	Y	-1	-1	0	0
18	M6-2	Y	-1	-1	0	0
19	M6-3	Y	-1	-1	0	0
20	M6-4	Y	-1	-1	0	0
21	M7-1	Y	-1	-1	0	0
22	M8-1	Y	-1	-1	0	0
23	M8-2	Y	-1	-1	0	0
24	M8-3	Y	-1	-1	0	0
25	M9-1	Y	-1	-1	0	0
26	M9-2	Y	-1	-1	0	0
27	M9-3	Y	-1	-1	0	0
28	M9-4	Y	-1	-1	0	0
29	M9-5	Y	-1	-1	0	0
30	M9-6	Y	-1	-1	0	0
31	M10-1	Y	-1	-1	0	0
32	M10-2	Y	-1	-1	0	0
33	M10-3	Y	-1	-1	0	0
34	M10-4	Y	-1	-1	0	0
35	M10-5	Y	-1	-1	0	0
36	M11-1	Y	-1	-1	0	0
37	M11-2	Y	-1	-1	0	0
38	M11-3	Y	-1	-1	0	0

Member Distributed Loads (BLC 2 : Design Lane Load)

	Member Label	Direction	Start Magnitude[k/ft.d...]	End Magnitude[k/ft.d...	Start Location[ft.%]	End Location[ft.%]
1	M5-1 ✓	Y	-64	-64	0	0
2	M5-2 ✓	Y	-64	-64	0	0
3	M5-3 ✓	Y	-64	-64	0	0
4	M5-4 ✓	Y	-64	-64	0	0
5	M6-1 ✓	Y	-64	-64	0	0
6	M6-2 ✓	Y	-64	-64	0	0
7	M6-3 ✓	Y	-64	-64	0	0
8	M6-4 ✓	Y	-64	-64	0	0
9	M2-5 ✓	Y	-64	-64	0	0
10	M2-4 ✓	Y	-64	-64	0	0
11	M2-3 ✓	Y	-64	-64	0	0
12	M2-2 ✓	Y	-64	-64	0	0
13	M2-1 ✓	Y	-64	-64	0	0
14	M9-1 ✓	Y	-64	-64	0	0
15	M9-3 ✓	Y	-64	-64	0	0
16	M9-2 ✓	Y	-64	-64	0	0
17	M9-4 ✓	Y	-64	-64	0	0
18	M9-5 ✓	Y	-64	-64	0	0
19	M9-6 ✓	Y	-64	-64	0	0
20	M11-1 ✓	Y	-64	-64	0	0
21	M11-2 ✓	Y	-64	-64	0	0
22	M11-3 ✓	Y	-64	-64	0	0

Company : LHB
 Designer : jdf
 Job Number : 090147

Pier 2-3E, Beam F and Girder C

Apr 26, 2010
 2:46 PM
 Checked By: CSM

4/27/10

Moving Loads

	Tag	Pattern	Increme...	Both Ways	1st Joint	2nd J...	3rd J...	4th J...	5th J...	6th J...	7th J...	8th J...	9th J...	10th ...
1	M1	HS20-44-14FT	1	Yes	P5-2H	H3								
2	M2	HS20-44-18FT	1	Yes	P5-2H	H3								
3	M3	HS20-44-22FT	1	Yes	P5-2H	H3								
4	M4	HS20-44-26FT	1	Yes	P5-2H	H3								
5	M5	HS20-44-30FT	1	Yes	P5-2H	H3								
6	M6	2TRUCKSAT50FT	1	Yes	P3-3E	P1-3E								
7	M7	POST-TYPE3UNIT	1	Yes	P5-2H	H3								
8	M8	POST-TYPE3S2-4...	1	Yes	P5-2H	H3								
9	M9	POST-TYPE3S3U...	1	Yes	P5-2H	H3								
10	M10	POST-SU4-TRUCK	1	Yes	P5-2H	H3								
11	M11	POST-SU5-TRUCK	1	Yes	P5-2H	H3								
12	M12	POST-SU6-TRUCK	1	Yes	P5-2H	H3								
13	M13	POST-SU7-TRUCK	1	Yes	P5-2H	H3								
14	M14	PERMIT-STD-A-TR...	1	Yes	P5-2H	H3								
15	M15	PERMIT-STD-B-TR...	1	Yes	P5-2H	H3								
16	M16	PERMIT-STD-C-TR...	1	Yes	P5-2H	H3								
17	M17	PERMIT-P411-TRU...	1	Yes	P5-2H	H3								
18	M18	PERMIT-P413-TRU...	1	Yes	P5-2H	H3								
19	M19	PERMIT-STD-C152B	1	Yes	P5-2H	H3								
20	M20	PERMIT-STD-C174B	1	Yes	P5-2H	H3								
21	M21	PERMIT-STD-C198...	1	Yes	P5-2H	H3								
22	M22	PERMIT-STD-C214B	1	Yes	P5-2H	H3								
23	M23	PERMIT-STD-C237B	1	Yes	P5-2H	H3								
24	M24	PERMIT-STD-C256B	1	Yes	P5-2H	H3								
25	M25	PERMIT-STD-C200J	1	Yes	P5-2H	H3								

Moving Load Patterns

Pattern Label	Load (k)	Direction	Distance (ft)
HS20-44-14FT	-8	V	0
	-32	V	14
	-32	V	14
HS20-44-18FT	-8	V	0
	-32	V	14
	-32	V	18
HS20-44-22FT	-8	V	0
	-32	V	14
	-32	V	22
HS20-44-26FT	-8	V	0
	-32	V	14
	-32	V	26
HS20-44-30FT	-8	V	0
	-32	V	14
	-32	V	30
2TRUCKSAT50FT	-8	Y	0
	-32	Y	14
	-32	Y	14
	-8	Y	50
	-32	Y	14
	-32	Y	14

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Company : LHB
 Designer : jdf
 Job Number : 090147

Pier 2-3E, Beam F and Girder C

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4/27/10

Moving Load Patterns

Pattern Label	Load (k)	Direction	Distance (ft)
POST-TYPE3UNIT	-14	Y	0
	-17	Y	12
	-17	Y	4
POST-TYPE3S2-40UNIT	-12	Y	0
	-17	Y	15
	-17	Y	4
	-17	Y	28
	-17	Y	4
POST-TYPE3S3UNIT	-9	Y	0
	-16	Y	10
	-16	Y	4
	-13	Y	25
	-13	Y	4
	-13	Y	4
POST-SU4-TRUCK	-12	Y	0
	-8	Y	10
	-17	Y	4
	-17	Y	4
POST-SU5-TRUCK	-12	Y	0
	-8	Y	10
	-8	Y	4
	-17	Y	4
	-17	Y	4
POST-SU6-TRUCK	-11.5	Y	0
	-8	Y	10
	-8	Y	4
	-17	Y	4
	-17	Y	4
	-8	Y	4
POST-SU7-TRUCK	-11.5	Y	0
	-8	Y	10
	-8	Y	4
	-17	Y	4
	-17	Y	4
	-8	Y	4
	-8	Y	4
PERMIT-STD-A-TRUCK	-8	Y	0
	-16	Y	12
	-16	Y	4
	-16	Y	4
	-16	Y	18
	-16	Y	4
	-16	Y	4

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Moving Load Patterns

4/27/10

Pattern Label	Load (k)	Direction	Distance (ft)
PERMIT-STD-B-TRUCK	-16	Y	0
	-20	Y	10
	-20	Y	4
	-20	Y	4
	-20	Y	23
	-20	Y	4
	-20	Y	4

✓

PERMIT-STD-C-TRUCK	-15	Y	0
	-18	Y	10
	-18	Y	4
	-18	Y	4
	-18	Y	4
	-18	Y	23
	-18	Y	4
	-18	Y	4

✓

PERMIT-P411-TRUCK	-15	Y	0
	-19.2	Y	10
	-19.2	Y	4
	-19.2	Y	4
	-19.2	Y	12
	-19.2	Y	4
	-19.2	Y	35
	-19.2	Y	4
	-19.2	Y	12
	-19.2	Y	4
	-19.2	Y	4

✓

PERMIT-P413-TRUCK	-15	Y	0
	-20	Y	10
	-20	Y	4
	-20	Y	4
	-20	Y	20
	-20	Y	4
	-20	Y	4
	-20	Y	35
	-20	Y	4
	-20	Y	4
	-20	Y	20
	-20	Y	4
	-20	Y	4

✓

PERMIT-STD-C152B	-16	Y	0
	-21.4	Y	9.5
	-21.4	Y	4
	-21.4	Y	4
	-18	Y	23.5
	-18	Y	4
	-18	Y	4
	-18	Y	4

✓

Company : LHB
Designer : jdf
Job Number : 090147

Pier 2-3E, Beam F and Girder C

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2:46 PM
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Moving Load Patterns

4/27/10

Pattern Label	Load (k)	Direction	Distance (ft)
PERMIT-STD-C174B	-14	Y	0
	-20	Y	11
	-20	Y	4.5
	-20	Y	7.75
	-20	Y	4.5
	-20	Y	22
	-20	Y	4.5
	-20	Y	7.75
	-20	Y	4.5

✓

PERMIT-STD-C198 23	-14	Y	0
	-23	Y	11
	-23	Y	4.5
	-23	Y	13.5
	-23	Y	4.5
	-23	Y	26
	-23	Y	4.5
	-23	Y	13.5
	-23	Y	4.5

✓

PERMIT-STD-C214B	-14	Y	0
	-20	Y	11
	-20	Y	4.5
	-20	Y	12.67
	-20	Y	4.5
	-20	Y	4.5
	-20	Y	29
	-20	Y	4.5
	-20	Y	4.5
	-20	Y	12.67
	-20	Y	4.5

✓

PERMIT-STD-C237B	-13	Y	0
	-18.7	Y	11
	-18.7	Y	4.5
	-18.7	Y	4.5
	-18.7	Y	14
	-18.7	Y	4.5
	-18.7	Y	4.5
	-18.7	Y	33.5
	-18.7	Y	4.5
	-18.7	Y	4.5
	-18.7	Y	14
	-18.7	Y	4.5
	-18.7	Y	4.5

✓

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Company : LHB
 Designer : jdf
 Job Number : 090147

Pier 2-3E, Beam F and Girder C

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 2:46 PM
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Moving Load Patterns

9/27/10

Pattern Label	Load (k)	Direction	Distance (ft)
PERMIT-STD-C256B	-16	Y	0
	-20	Y	11
	-20	Y	5
	-20	Y	5
	-20	Y	15.67
	-20	Y	5
	-20	Y	5
	-20	Y	36
	-20	Y	5
	-20	Y	5
	-20	Y	15.67
	-20	Y	5
	-20	Y	5

PERMIT-STD-C200J	-20	Y	0
	-20	Y	13.5
	-20	Y	12
	-20	Y	10.5
	-20	Y	9
	-20	Y	4.5
	-20	Y	4.5
	-20	Y	9.5
	-20	Y	11.5
	-20	Y	13

Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Joint	Point	Distributed Area (Me...	Surface (...)
1	Test Uniform Load	None						38	
2	Design Lane Load	None						22	
3	Design Truck	None					3		
4	Design Tandem	None					2		
5	2 Trucks at 50FT	None					6		
6	Influence Line	None				1			

Load Combinations

	Description	Sol...	PD...	SR...	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor
1	Test Uniform Load				1	1													
2	HS20-14ft				M1	1													
3	HS20-18ft				M2	1													
4	HS20-22ft				M3	1													
5	HS20-26ft				M4	1													
6	HS20-30ft				M5	1													
7	2 Trucks at 50 FT Moving				M6	1													
8	Design Lane Load				2	1													
9	Design Truck Load				3	1													
10	Design Tandem Load				4	1													
11	2 Trucks at 50 FT				5	1													
12	Influence Reaction				6	1													
13	POST-TYPE3UNIT				M7	1													
14	POST-TYPE3S2-40UNIT				M8	1													
15	POST-TYPE3S3UNIT				M9	1													
16	POST-SU4-TRUCK				M10	1													
17	POST-SU5-TRUCK				M11	1													
18	POST-SU6-TRUCK				M12	1													

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Company : LHB
Designer : jdf
Job Number : 090147

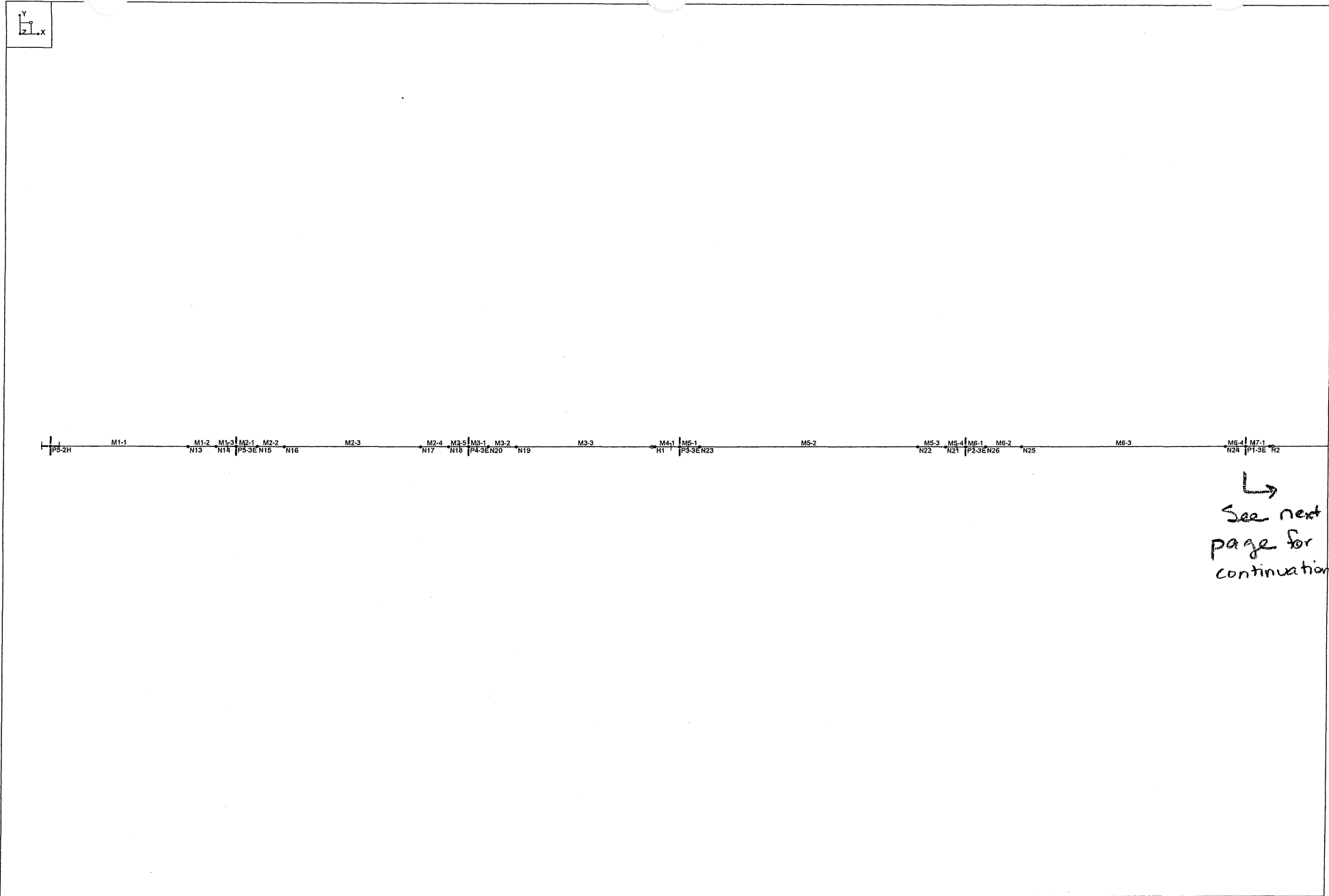
Pier 2-3E, Beam F and Girder C

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2:46 PM
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4/27/10

Load Combinations (Continued)

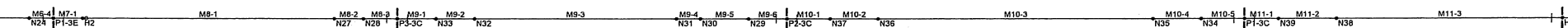
	Description	Sol...	PD...	SR...	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor
19	POST-SU7-TRUCK				M13	1	✓											
20	PERMIT-STD-A-TRUCK				M14	1	✓											
21	PERMIT-STD-B-TRUCK				M15	1	✓											
22	PERMIT-STD-C-TRUCK				M16	1	✓											
23	PERMIT-P411-TRUCK				M17	1	✓											
24	PERMIT-P413-TRUCK				M18	1	✓											
25	PERMIT-STD-C152B				M19	1	✓											
26	PERMIT-STD-C174B				M20	1	✓											
27	PERMIT-STD-C198_23				M21	1	✓											
28	PERMIT-STD-C214B				M22	1	✓											
29	PERMIT-STD-C237B				M23	1	✓											
30	PERMIT-STD-C256B				M24	1	✓											
31	PERMIT-STD-C200J				M25	1	✓											



See next page for continuation

B-37

$\begin{matrix} y \\ \hline Lx \end{matrix}$



See previous
 page for
 continuation

LHB

jdf

090147

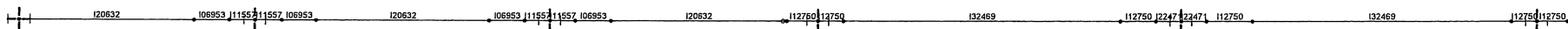
Pier 2-3E, Beam F and Girder C

Node and Member Layout

Dec 11, 2009 at 9:07 AM

090147_3E_P2_BeamFGirderC.r3d

8-28



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See next
page for
continuation

LHB

jdf

090147

Pier 2-3E, Beam F and Girder C

Shape Labels (I_{xx})

Dec 11, 2009 at 9:04 AM

090147_3E_P2_BeamFGirderC.r3d

B-39

Y
Lx

112750 112750 125307 110817 116734 116734 109514 125309 109514 113797 122809 122809 110926 134470 110926 122809 122809 115257 127663

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See previous
page for
continuation.

LHB

jdf

090147

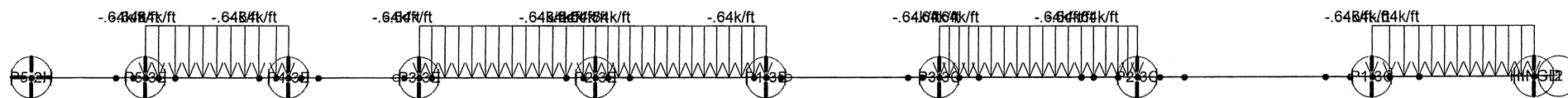
Pier 2-3E, Beam F and Girder C

Shape Labels (I_{xx})

Dec 11, 2009 at 9:03 AM

090147_3E_P2_BeamFGirderC.r3d

B-40



Loads: BLC 2, Design Lane Load

LHB

jdf

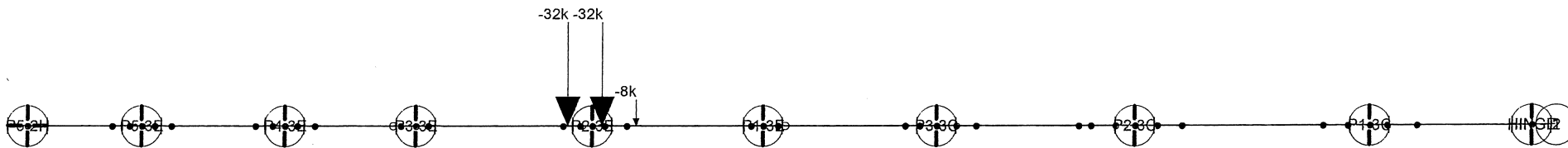
090147

Pier 2-3E, Beam F and Girder C

Jan 12, 2010 at 2:12 PM

090147_3E_P2_BeamFGirderC.r3d

1/12/10
JSM

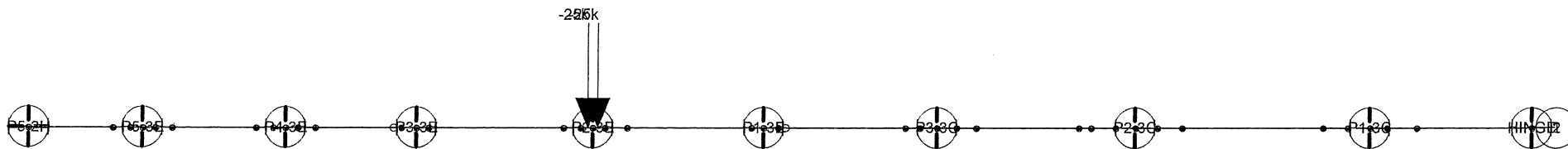


4/28/10
VLSM

Loads: BLC 3, Design Truck

LHB	Pier 2-3E, Beam F and Girder C	
jdf		Jan 12, 2010 at 2:13 PM
090147		090147_3E_P2_BeamFGirderC.r3d

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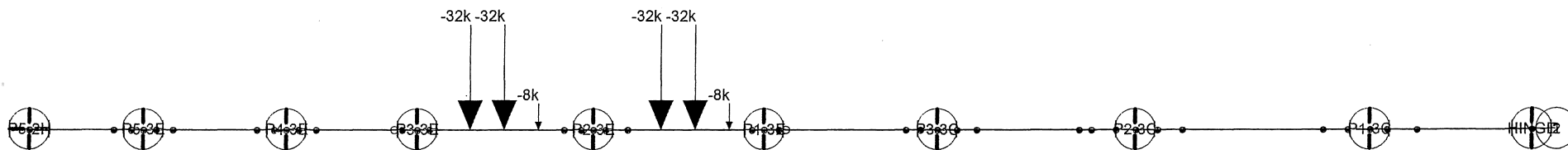


4/26/10
JCM

Loads: BLC 4, Design Tandem

LHB	Pier 2-3E, Beam F and Girder C	
jdf		Jan 12, 2010 at 2:13 PM
090147		090147_3E_P2_BeamFGirderC.r3d

B-47-9



Loads: BLC 5, 2 Trucks at 50FT

LHB

jdf

090147

Pier 2-3E, Beam F and Girder C

Jan 12, 2010 at 2:13 PM

090147_3E_P2_BeamFGirderC.r3d

01/12/10
14:13
JDF

B-44

Company : LHB
 Designer : jdf
 Job Number : 090147

Pier 2-3E, Beam F and Girder C

Jan 12, 2010
 2:14 PM
 Checked By: *CDM*

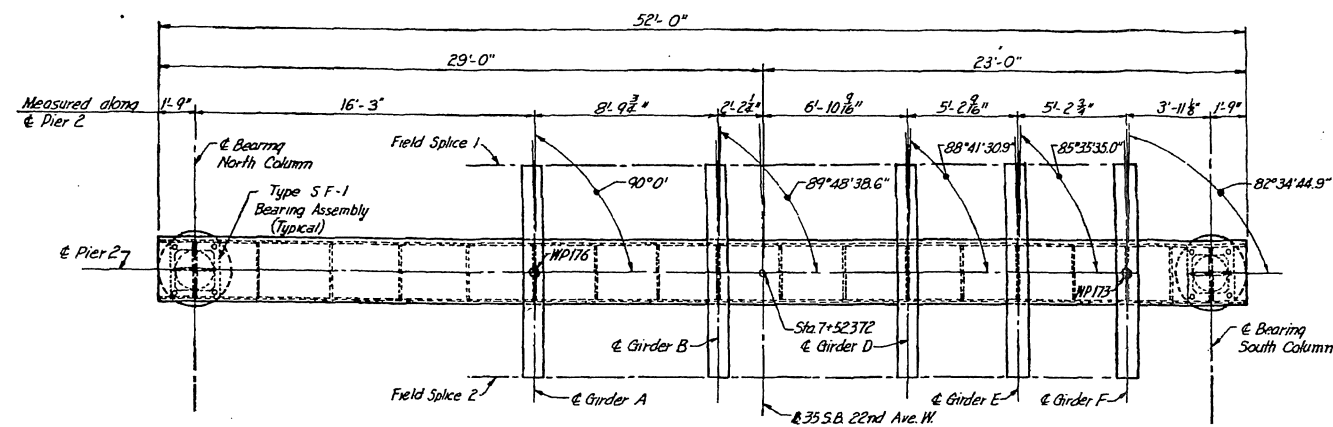
4/29/10

Joint Reactions (By Combination)

	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	8	P5-2H	0	-2.122	0	0	0	0
2	8	P5-3E	0	20.872	0	0	0	0
3	8	P4-3E	0	20.178	0	0	0	0
4	8	P3-3E	0	16.372	0	0	0	0
5	8	P2-3E	0	55.141 ← <i>Lane</i>	0	0	0	0
6	8	P1-3E	0	14.124	0	0	0	0
7	8	P3-3C	0	29.436	0	0	0	0
8	8	P2-3C	0	26.627	0	0	0	0
9	8	P1-3C	0	21.302	0	0	0	0
10	8	H3	0	19.708	0	0	0	0
11	8	Totals:	0	221.638	0			
12	8	COG (ft):	X: 311.683	Y: 0	Z: 0			
13	9	P5-2H	0	-.008	0	0	0	0
14	9	P5-3E	0	.045	0	0	0	0
15	9	P4-3E	0	-.075	0	0	0	0
16	9	P3-3E	0	1.441	0	0	0	0
17	9	P2-3E	0	69.844 ← <i>Truck</i>	0	0	0	0
18	9	P1-3E	0	.761	0	0	0	0
19	9	P3-3C	0	-.017	0	0	0	0
20	9	P2-3C	0	.01	0	0	0	0
21	9	P1-3C	0	-.002	0	0	0	0
22	9	H3	0	0	0	0	0	0
23	9	Totals:	0	72	0			
24	9	COG (ft):	X: 228.383	Y: 0	Z: 0			
25	10	P5-2H	0	0	0	0	0	0
26	10	P5-3E	0	.001	0	0	0	0
27	10	P4-3E	0	-.002	0	0	0	0
28	10	P3-3E	0	.033	0	0	0	0
29	10	P2-3E	0	49.935 ← <i>Tandem</i>	0	0	0	0
30	10	P1-3E	0	.033	0	0	0	0
31	10	P3-3C	0	-.001	0	0	0	0
32	10	P2-3C	0	0	0	0	0	0
33	10	P1-3C	0	0	0	0	0	0
34	10	H3	0	0	0	0	0	0
35	10	Totals:	0	50	0			
36	10	COG (ft):	X: 229.05	Y: 0	Z: 0			
37	11	P5-2H	0	-.095	0	0	0	0
38	11	P5-3E	0	.525	0	0	0	0
39	11	P4-3E	0	-.868	0	0	0	0
40	11	P3-3E	0	32.315	0	0	0	0
41	11	P2-3E	0	83.495 ← <i>2 Truck @ 50'</i>	0	0	0	0
42	11	P1-3E	0	28.84	0	0	0	0
43	11	P3-3C	0	-.424	0	0	0	0
44	11	P2-3C	0	.256	0	0	0	0
45	11	P1-3C	0	-.056	0	0	0	0
46	11	H3	0	.012	0	0	0	0
47	11	Totals:	0	144	0			
48	11	COG (ft):	X: 227.043	Y: 0	Z: 0			

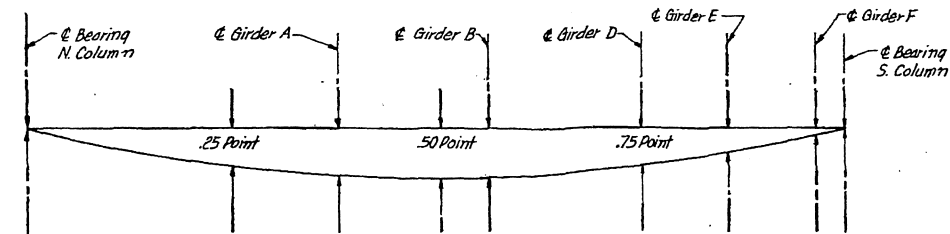
B-45

64801N-3E-P2
GENERAL



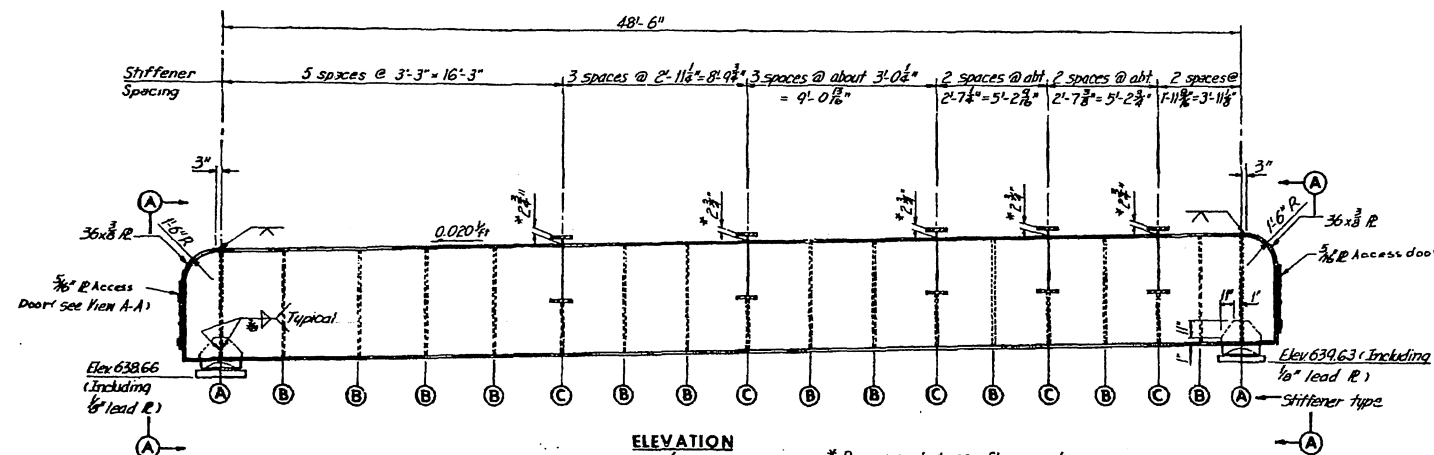
PLAN
Scale: $\frac{1}{4}'' = 1'-0''$

Notes:
Radii of Girders shown shall correspond to radii shown on Framing Plan Sheet.



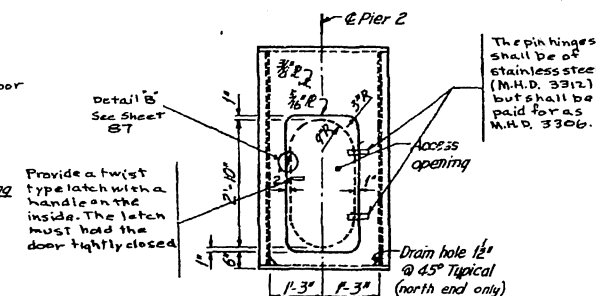
Deflection								
N. Brq.	25 Pt.	Girder A	50 Pt.	Girder B	75 Pt. (Gir. D)	Girder E	Girder F	S. Brq.
0	$\frac{5}{16}''$	$\frac{3}{8}''$	$\frac{7}{16}''$	$\frac{7}{16}''$	$\frac{5}{16}''$	$\frac{3}{16}''$	$\frac{1}{16}''$	0

DEAD LOAD DEFLECTION DIAGRAM
No Scale



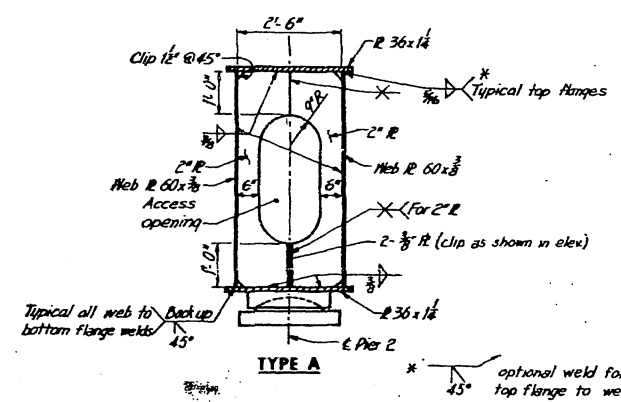
ELEVATION
Scale: $\frac{1}{4}'' = 1'-0''$

* Dimension between flanges at $\frac{1}{4}$ girder and $\frac{1}{4}$ Pier 2.

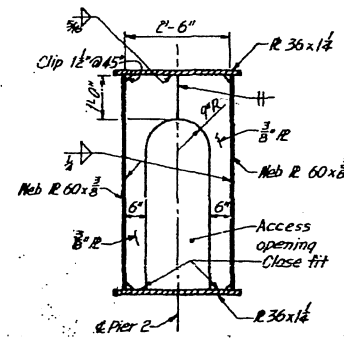


VIEW A-A
Scale: $\frac{1}{2}'' = 1'-0''$

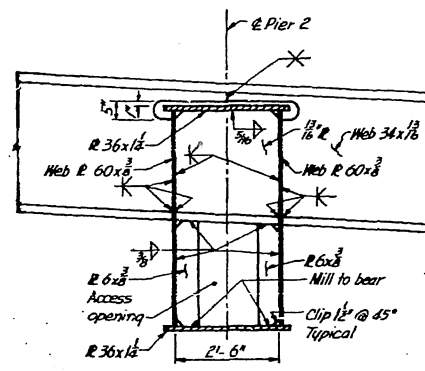
Notes:
For details of materials and finish not shown on shoes see Bearing Assembly Details.
For details of girder and beam sections not shown see Framing Plans.
Prior to placement of the deck concrete the entire area of the cap beam that will be in contact with the concrete shall be covered with a protective coating similar or equal to Koppers Company Bitumastic 50.
The deck slab shall be haunched to the top of the cap beam.
The cap beam shall be cambered for dead load deflection.
Anchor bolts shall be held in position during concreting by a $\frac{1}{2}''$ steel template.



TYPE A



TYPE B



TYPE C

STIFFENER TYPES
Scale: $\frac{1}{4}'' = 1'-0''$

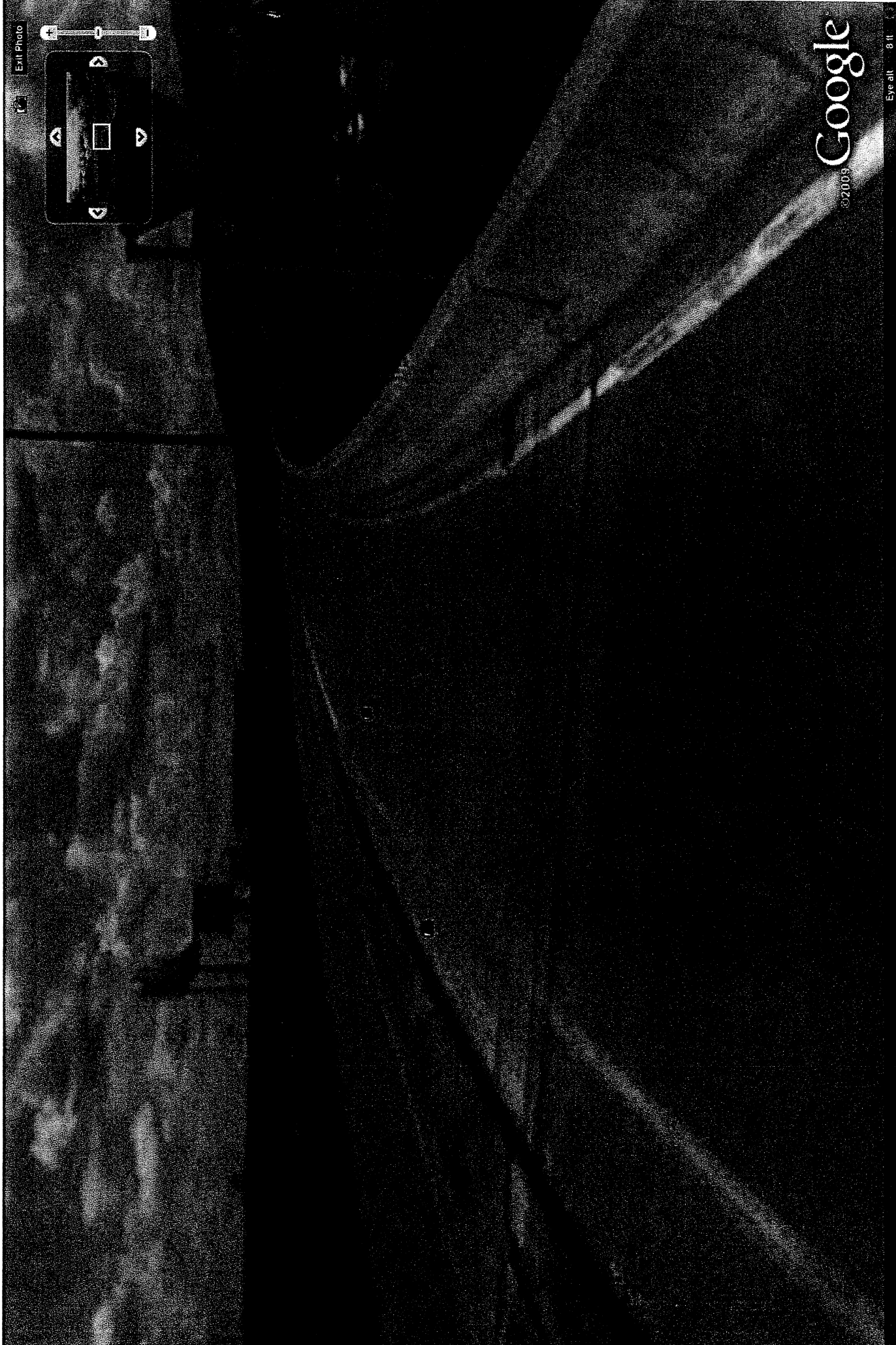
H.N.T.B. BR. NO. 2A, 2C-2K, 3A-3E
TRUNK HIGHWAY NO. 35
STATE OF MINNESOTA
DEPARTMENT OF HIGHWAYS
INTERSTATE ROUTES IN DULUTH
BRIDGE NO. 69801

STEEL CAP BEAM DETAILS
PIER 2 BRIDGE 3E
APPROVED: 7-30-68

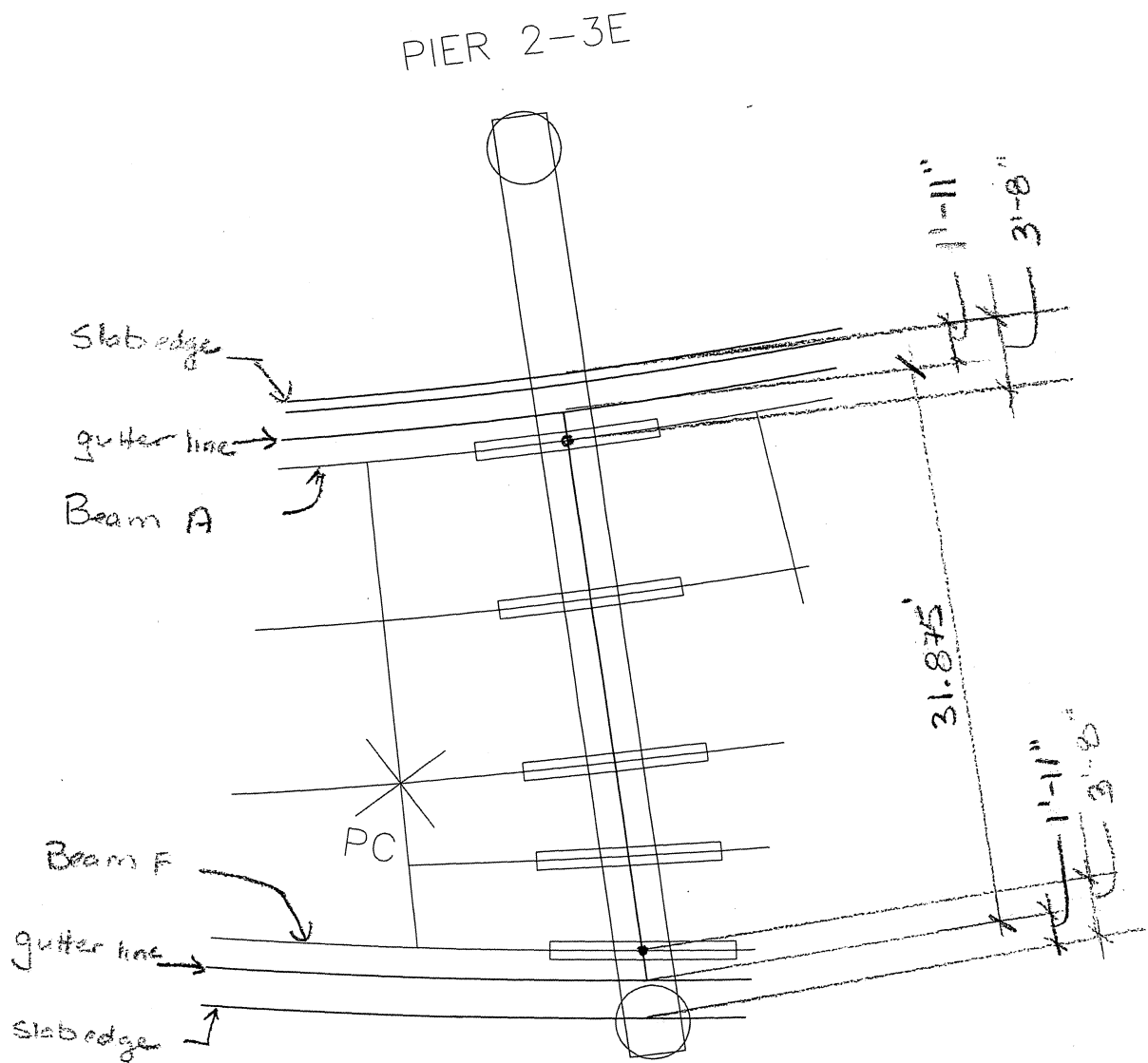
SHEET NO. 95 OF 189 SHEETS **69801**

DES. ZCY
DCH RGC
DR. RCY
CH. JST

C-1

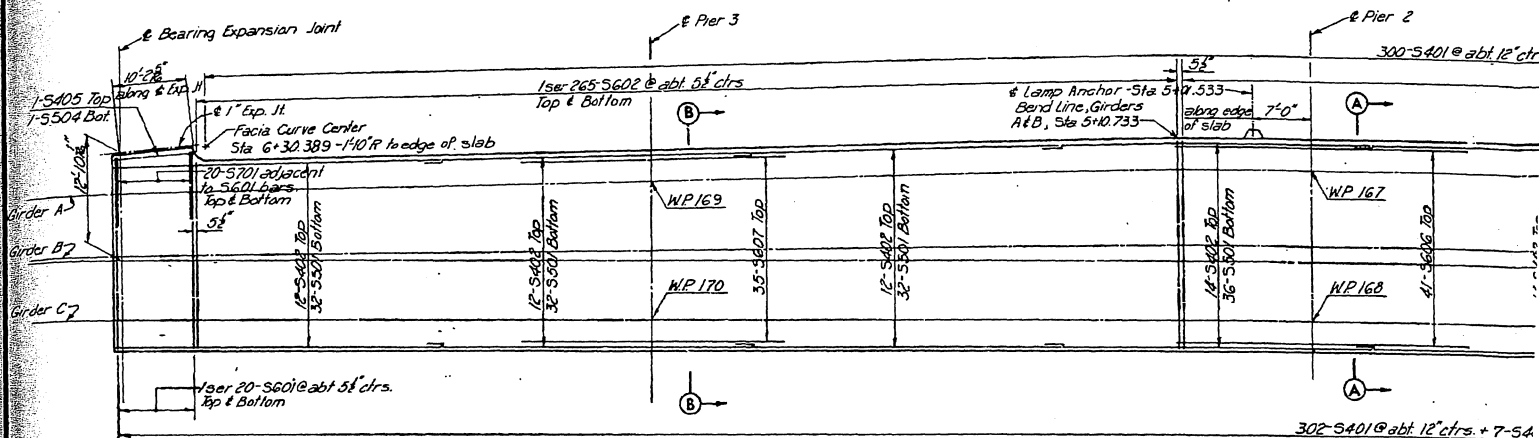


VC5m
4/24/10



$24' < 31.54 < 36'$ design for 2 lanes
of traffic at pier

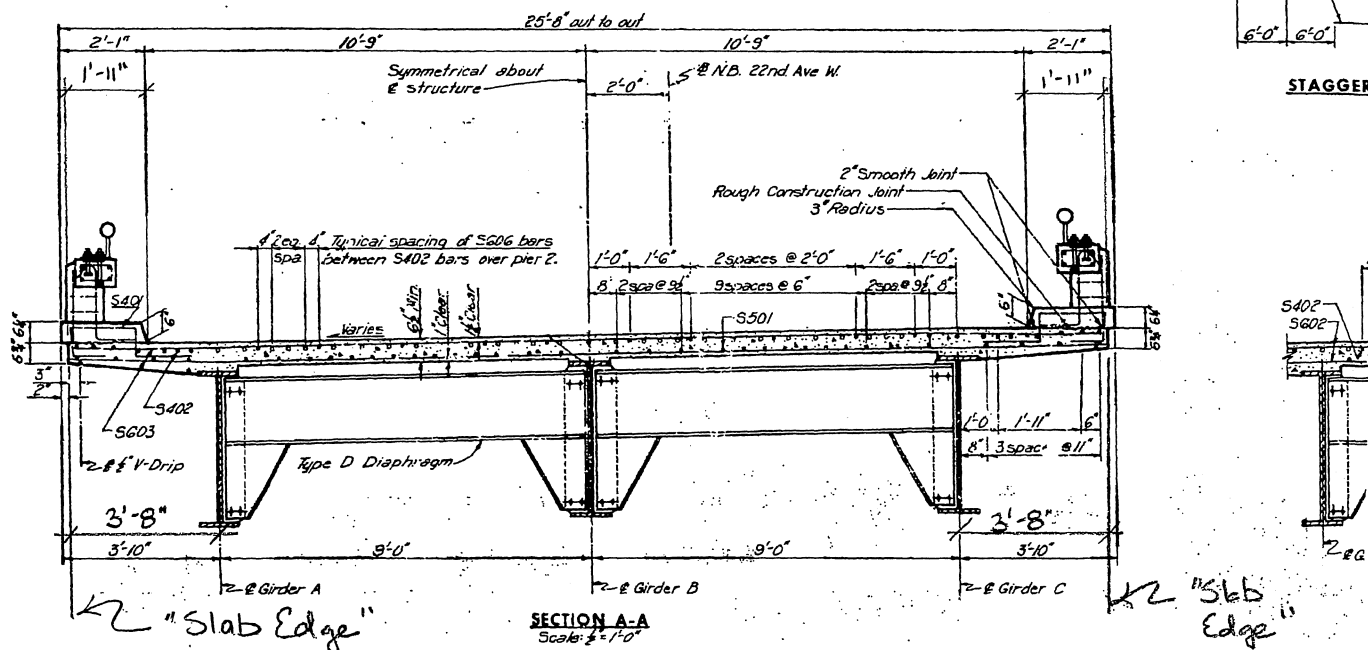
NTS.



SLAB PLAN

BRIDGE 3C QUANTITIES		
ITEM	UNIT	QUANTITY
Concrete Mix 3Y6	Cu. Yd.	168
Reinforcing Bars	Pounds	76,510
① 1 1/2" Conduit with caps	Each	1 @ 8'-0"
Concrete Mix 3Y60	Cu. Yd.	2

- ① Included in Price bid for other items.
② Nose quantities are included.





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P2-3E

PROJECT MnDOT SS-69801N - Controlling Load Combination

PROJECT # 090147 DATE 1/12/10 BY jdf SHEET NO. 4/29/10 OF 4

Design Pier Cap Loading for

- ①- 2 lanes of lane + truck loading
or
②- 2 lanes of lane + tandem loading
or
③- 2 lanes of 0.9 lane + 0.9 (2 truck @ 50')

Reaction due to Lane = 55.1 k ✓
" " " Truck = 69.8 k ✓
" " " Tandem = 49.9 k ✓
" " " 2 trucks @ 50' = 83.5 k ✓

What will control?

Impact factor is $1 + \frac{33}{100} = 1.33$ to truck or tandem only (not lane).

Reaction per lane:

- ① $55.1 + 1.33 \times 69.8 = 147.9 \text{ k} \checkmark$
② $55.1 + 1.33 \times 49.9 = 121.5 \text{ k} \checkmark$
③ $0.9 \times 55.1 + 0.9 \times 1.33 \times 83.5 = 149.5 \text{ k} \checkmark \leftarrow \text{controls.}$

0.9 Lane + 0.9 (2 truck @ 50') controls ✓

C-6

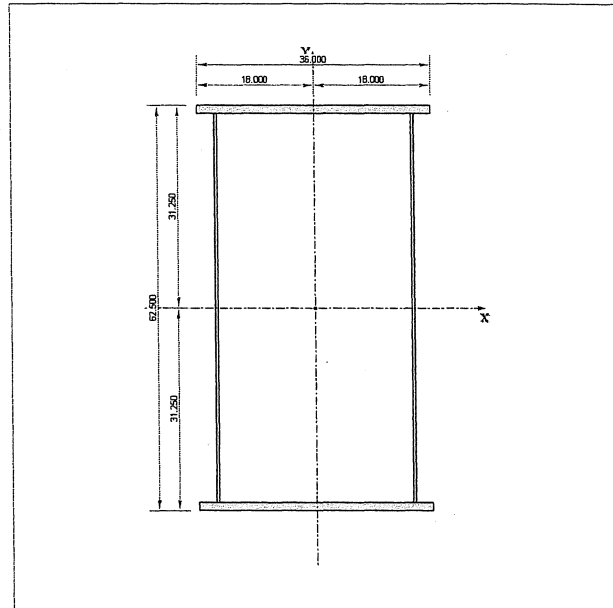
4/29/10

Section Properties: BR3E-P2-1

Number of Shapes	=	4	
Total Width	=	36.000	in
Total Height	=	62.500	in
Center, Xo	=	0.000	in
Center, Yo	=	0.000	in
X-bar(Right)	=	18.000	in
X-bar(Left)	=	18.000	in
Y-bar(Top)	=	31.250	in
Y-bar(Bot)	=	31.250	in

Equivalent Properties:

Area, Ax	=	135.00	in ²
Inertia, Ixx	=	9.792E+004	in ⁴
Inertia, Iyy	=	2.010E+004	in ⁴
Inertia, Ixy	=	0.000	in ⁴
Modulus, Sx(Top)	=	3133.50	in ³
Modulus, Sx(Bot)	=	3133.50	in ³
Modulus, Sy(Left)	=	1116.68	in ³
Modulus, Sy(Right)	=	1116.68	in ³
Radius, rx	=	26.932	in
Radius, ry	=	12.202	in
Plastic Modulus, Zx	=	3431.25	in ³
Plastic Modulus, Zy	=	1493.44	in ³
Torsional, J	=	48.220	in ⁴



Section Diagram

Company : LHB
Designer : jdf
Job Number: 090147

Nov 12, 2009
14:54 PM
Checked By: *CTM*
4/24/10

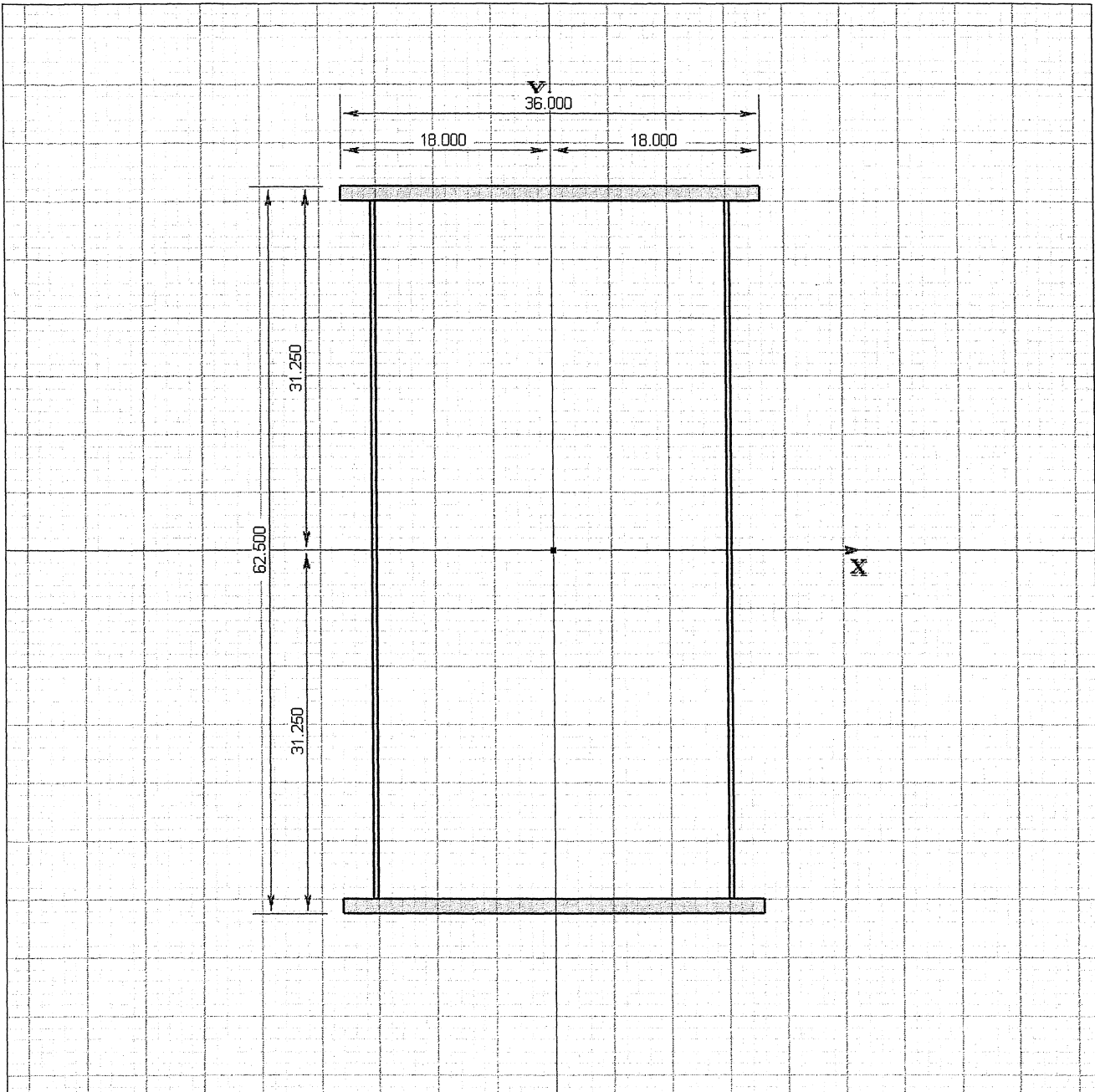
Basic Properties of Shapes in Section: BR3E-P2-1 (Local Axis, for n=1)

Sh.No.	1	2	3	4
Shape	Top Flange	Bottom Flange	Left Web	Right Web
Ratio(n)	1.000	1.000	1.000	1.000
Width (in)	36.000	36.000	0.375	0.375
Height (in)	1.250	1.250	60.000	60.000
Xo (in)	0.000	0.000	-15.188	15.188
Yo (in)	30.625	-30.625	0.000	0.000
Ax (in^2)	45.000	45.000	22.500	22.500
Ixx (in^4)	5.859	5.859	6750.00	6750.00
Iyy (in^4)	4860.00	4860.00	0.264	0.264

Additional Properties of Shapes in Section: BR3E-P2-1 (Local Axis, for n=1)

Sx-Top (in^3)	9.375	9.375	225.00	225.00
Sy-Right (in^3)	270.00	270.00	1.406	1.406
rx (in)	0.361	0.361	17.321	17.321
ry (in)	10.392	10.392	0.108	0.108
Zx (in^3)	14.063	14.063	337.50	337.50
Zy (in^3)	405.00	405.00	2.109	2.109
J (in^4)	1.054	23.056	23.056	0.000E+000

Section view: BR3E-P2-1





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PROJECT MnDOT SS - BR 69801 3E - PZ - Cap Beam Self wt
PROJECT # 090147 DATE 11/12/09 BY jdf SHEET NO. VC5m4/24/10 OF

Determine the Cap Beam's Self wt

Area of box girder = 135 in^2 ✓ (see Risa Section)

Typical stiffener is $3/8"$ plate $\times$ $2'-6"$ $\times$ $60"$
minus $1'-6"$ $\times$ $42"$ @ $5' 2'-8"$ o.c.

$\xrightarrow{\text{approx}}$
stiffener wt = $.375 \times (2.5' \times 5' - 1.5' \times 3.5') \div 12" \times 490 \text{ pcf}$
 $= 111 \text{ lb} \checkmark$
 $111 \text{ lb @ } 2'-8" \text{ o.c.} \rightarrow 42 \text{ plf} \checkmark$

Model weight = $135 \text{ in}^2 \div 12" + (12" \div 12")^2 \times 490 + 42 = 501.4 \text{ plf} \checkmark$
Use 10% more for other plates and fasteners $501.4 \times 1.1 = 552 \text{ plf} \checkmark$
Use 552 plf ✓



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PROJECT MnDOT SS - 69801N - P2 - 3E - Dead Loads -1

PROJECT # 090147 DATE 12/8/09 BY jdf SHEET NO. VCJM 4/24/10 OF

Dead Loads:

Non composite Dead from MDX
Superimposed Dead from MDX
Selfweight of 552 plf

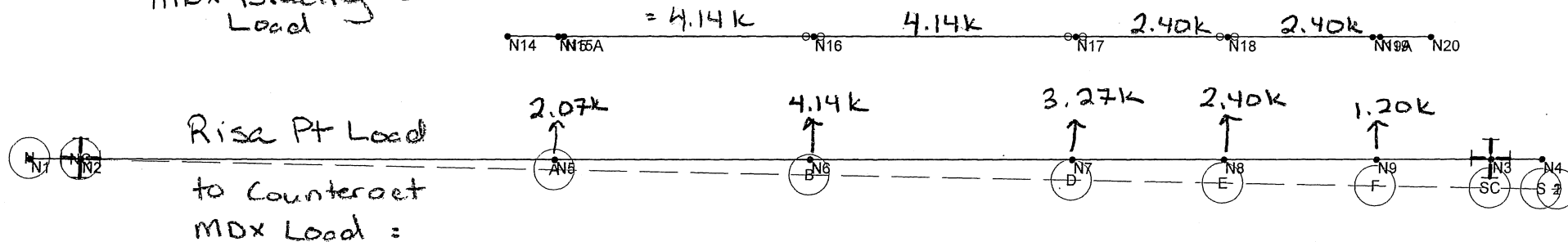
Max moment = 3773.7 kip-ft OK
Max Shear = 334.8 kip OK

See Risa 3D.

C-11



MDX Bracing =
Load



1/6.5m
4/12/10

LHB

jdf

090147

Bridge 69801 3E Pier 2

MDX Bracing Loads

Jan 18, 2010 at 3:11 PM

090147_3E_P2_Pier.r3d

C-12

PROJECT Mn DOT SS-69801 - Centrifugal Forces - LRFD - 1

PROJECT # 090147 DATE 1/12/09 BY JAP SHEET NO. _____ OF _____
VCSM 5/4/10

Determine Centrifugal forces on pier cap.
See 3.6.3

$$C = f \frac{v^2}{gR}$$

C = Factor to apply to axle weight of the design truck or tandem.

$f = 4/3$ for local comb. other than fatigue

$$V = \text{Design speed (ft/sec)}$$
$$q = 32.2 \text{ ft/sec}^2$$

R = Radius of curvature (ft)

P2-37

$S = 30 \text{ mph} \Leftarrow$ See JWS calcs 12-7-09 = 40 ft/sec

$$R = 254.25' \checkmark$$

$$C = \frac{4}{3} \times \frac{40^2 \cdot 44^2}{32 \cdot 2 \times 254 \cdot 25} = \boxed{0.26}$$

P4-3A

$$S = 40 \text{ mph} = 58.7 \text{ ft/sec}$$

$R = 473.7' \checkmark$

$$C = 0.30 \checkmark$$

105-3A

$$S = 50 \text{ mph} = 73.3 \text{ ft/sec}$$
$$R = 826.26' \checkmark$$

$$C = 0.27 \checkmark$$

P6-3A

$$S = 50 \text{ mph} = 73.3 \text{ ft/sec}$$

R = 826.26' ✓

$$C = 0.27 \checkmark$$



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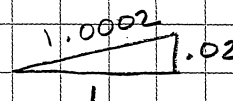
PROJECT MnDOT SS-69801N-P2-BE-Centrifugal Forces -1
PROJECT # 090147 DATE 1/12/2010 BY jdf SHEET NO. 1 OF 1
VC5M 5/4/10

$$S = 30 \text{ mph}$$

$$R = 320.14'$$

$$C = \cancel{.26} .32 \checkmark$$

Superelevation is 0.020 ft/ft



$$CF \text{ balanced by Superelevation} = \cancel{.26} \checkmark - \cancel{.02} \checkmark = \cancel{.24} \checkmark$$

$\swarrow$ 2 lanes $\swarrow$ Design Truck Reaction

$$\text{Controlling Reaction at pier} = 2 \times 69.8 \text{ k} = 139.6 \text{ k}$$

$$\text{Total CF Load} = \cancel{.24} \checkmark \times 139.6 = \cancel{33.5} \checkmark$$

Distribute by "Pile group distribution"

I supports $\Rightarrow$

NA from Beam F:

$$\frac{5.23 + 10.44 + 19.51 + 28.32}{5} = 12.7' \checkmark$$

$$I = 12.7^2 + (12.7 - 5.23)^2 + (12.7 - 10.44)^2 + (19.51 - 12.7)^2 + (28.32 - 12.7)^2 = 512.6 \text{ ft}^2 \checkmark$$

$$\begin{aligned} \text{Moment arm} &= 6' \times 1.0002 \\ &+ .67' \\ &+ .25 + .23 \\ &+ \frac{1}{2} \times 62.5'' \times \frac{1}{12}'' \\ &= 9.76' \checkmark \end{aligned}$$

6' above slab
Slab depth (uniform)
bot slab to T/cap
 $\frac{1}{2}$ cap beam depth

$$P_{\downarrow} @ \text{beam F} = \cancel{33.5} \checkmark \times 9.76' \times 12.7 \div 512.6 = \cancel{8.10} \checkmark$$

$$P_{\downarrow} @ \text{beam E} = \cancel{33.5} \checkmark \times 9.76' \times (12.7 - 5.23) \div 512.6 = \cancel{4.76} \checkmark$$

$$P_{\downarrow} @ \text{beam D} = \cancel{33.5} \checkmark \times 9.76' \times (12.7 - 10.44) \div 512.6 = \cancel{1.44} \checkmark$$

$P_{\downarrow} @ \text{beams B \& A} = 0 \text{ k}$ as it would be uplift.

and the tire would lift before pulling up on deck.

C-14



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PROJECT Mn DOT SS - 69801 N - P2-3E - Centrifugal Forces - 2

PROJECT # 090147 DATE 12/8/09 BY idf SHEET NO. _____ OF _____

✓ csm 5/4/10

P → at each beam @ 4 of cap beam =
 $33.5k \div 5 = 6.70k$ 8.38 ✓
41.9 ✓ ↑ 5 girders.

C-15



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PROJECT MnDOT SS-69801N-P2-3E - Braking Force

PROJECT # 090147

DATE 1/21/2010

BY

jdf

SHEET NO.

OF

VCSm 4/29/10

Determine Braking Force: BR

Greater of. (per lane). ✓

- 1) 25% of axle weights of design truck or design tandem. ✓

$$= .25 \times (8 + 32 + 32) = 18.0 \text{ kip} \leftarrow \text{controls.}$$

- 2) 5% of the design truck plus lane load or 5% of the design tandem plus lane load

$$0.05 \times (8 + 32 + 32) + .05 \times .640 \text{ kip} \times 153.9' = 8.5 \text{ kip.}$$

Since we have 2 lanes $BR = 2 \times 18.0 = 36 \text{ kip}$ ✓

* Distance between expansion joints =
 $(6' - 2\frac{3}{16}) + (71' - 10\frac{1}{8}) + (69' - 10\frac{3}{16}) + (1' - 1\frac{15}{16}) + (4' - 10\frac{1}{16})$
 $= 153.9'$ ✓

Total Braking Force = 36 kip. ✓

Apply it to the Pier Cap as a distributed slab load

Slab length = 31.82' ✓

$$w = 36 \text{ kip} \div 31.82' = 1.131 \text{ kip/ft} \checkmark$$

Torsion is not considered as Piercap is allowed to Rotate in the longitudinal direction.

C-16



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PROJECT MnDOT SS-69801N-Load Distribution along Pier Cap
PROJECT # 090147 DATE 1/12/10 BY jdf SHEET NO. 1 OF 1
✓ 4/24/10

Loads to distribute:

Lane = 55.1 kip each lane ✓
divide over 10' width = $55.1 \text{ k} \div 10' = 5.51 \text{ klf}$ ✓
and at ends = 2.76 klf ✓

2 Truck @ 50' = 83.5 k each lane ✓
divide over 2 tires = $83.5 \div 2 = 41.75 \text{ k}$ each. ✓

Distribute these Loads as if the slab acts as
a simple span between interior beams and
the slab cantilevers over the top of the
exterior beam. ✓

See Risa Loading Print-outs for Moment & Shear
Load Layout. ✓

Determine Load Combination Factors to use in
Risa.

Since $0.9 \text{ Lane} + 0.9 (2 \text{ trucks @ } 50')$ controls,
and impact only applies to the truck load (or
tandem) portion of the live Load, (Impact
factor is 1.33)

Use $0.9 \text{ Lane} + 0.9 \times 1.33 \times (2 \text{ trucks @ } 50') + 1.0 \times \text{CF} +$
 1.197 ✓
+ 1.0 BR ✓
Uses one truck per lane



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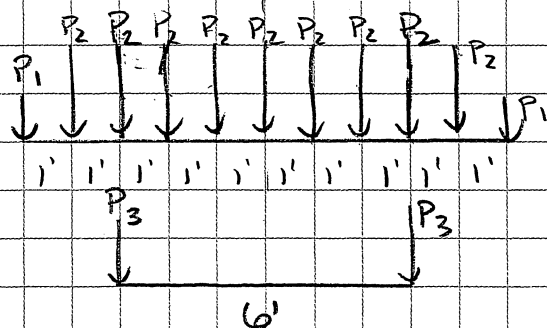
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PROJECT MnDOT SS-69801N - P2-3E - One Lane Loading

PROJECT # 090147 DATE 3/17/10 BY jdf 4/30/10 SHEET NO. _____ OF _____

Verify / check if one Lane Loading w/ a Multiple Presence Factor, m , of 1.20 controls.
See 3.6.1.1.2.

Model a moving Live Load to determine the maximum Shear and moment to compare to 2-lane Shears and moments.



$$\begin{aligned} P_1 &= 2.76 \text{ k} \\ P_2 &= 5.51 \text{ k} \\ P_3 &= 41.75 \text{ kip} \end{aligned}$$

← 1 Lane

← 1 Lane of 2 trucks at 50'

Model as unit loads

+ include magnitude in LC's

Combine these moving Loads as follows

$$\underbrace{5.51 \times 0.9 \times 1.2 \text{ Lane}}_{5.95 \checkmark} + \underbrace{41.75 \times 0.9 \times 1.33 \times 1.2 (2 \text{ trucks @ } 50')}_{60.0 \checkmark} + \underbrace{0.5 \times 1.2 (BR + CF)}_{0.6 \checkmark}$$

	<u>One Lane</u>	<u>2 lanes</u>
V north	113.3 k $\checkmark$	148.1 k $\checkmark$
V south	165.2 k $\checkmark$	234.7 k $\checkmark$
M_x	1917.3 k.ft $\checkmark$	2880.0 k.ft $\checkmark$
M_y	162.9 kip.ft $\checkmark$	273.5 k.ft $\checkmark$

All One Lane Forces are less than 2 lane Forces.

2 lanes control

C-18

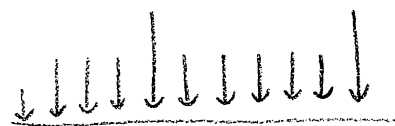
4/30/10

Envelope Member Section Forces

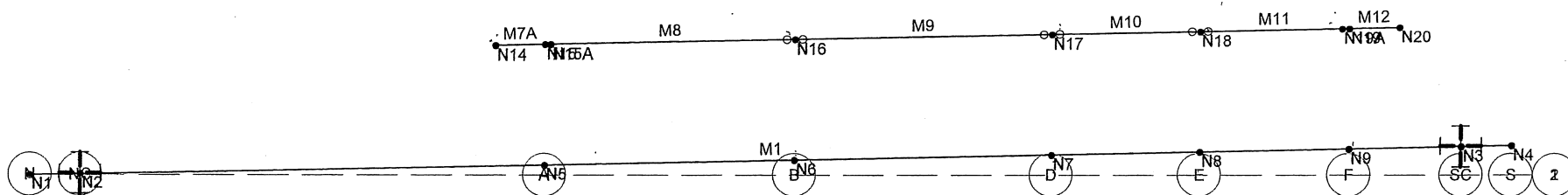
	Member	Sec		Axial[k]	LC	y Shear[k]	LC	z Shear[k]	LC	Torque[k-ft]	LC	y-y Momen...	LC	z-z Momen...	LC
1	M1	1	max	0	7	0	7	0	7	0	7	0	7	0	7
2			min	0	7	0	7	0	7	0	7	0	7	0	7
3		2	max	-4.616	7	113.291	7	-8.058	7	-0.002	7	-7.954	7	-1.309	7
4	min		-6.762	7	1.326	7	-8.058	7	-0.002	7	-7.954	7	-111.823	7	
5		3	max	-4.616	7	113.291	7	-8.058	7	-0.002	7	-30.012	7	-4.939	7
6	min		-6.762	7	1.326	7	-8.058	7	-0.002	7	-30.012	7	-421.945	7	
7		4	max	-4.616	7	113.291	7	-8.058	7	-0.002	7	-52.071	7	-8.57	7
8	min		-6.762	7	1.326	7	-8.058	7	-0.002	7	-52.071	7	-732.067	7	
9		5	max	-4.616	7	113.291	7	-8.058	7	-0.002	7	-74.129	7	-12.2	7
10	min		-6.762	7	1.326	7	-8.058	7	-0.002	7	-74.129	7	-1042.19	7	
11		6	max	-4.616	7	113.291	7	-8.058	7	-0.002	7	-96.188	7	-15.831	7
12	min		-6.762	7	1.326	7	-8.058	7	-0.002	7	-96.188	7	-1352.312	7	
13		7	max	-4.616	7	113.291	7	-8.058	7	-0.002	7	-118.247	7	-19.461	7
14	min		-6.762	7	1.326	7	-8.058	7	-0.002	7	-118.247	7	-1662.434	7	
15		8	max	-1.195	7	74.366	7	-3.76	7	-0.002	7	-135.328	7	-22.998	7
16	min		-3.064	7	-36.862	7	-3.76	7	-0.002	7	-135.328	7	-1811.59	7	
17		9	max	-1.195	7	74.366	7	-3.76	7	-0.002	7	-145.621	7	-26.409	7
18	min		-3.064	7	-36.862	7	-3.76	7	-0.002	7	-145.621	7	-1756.004	7	
19		10	max	-1.195	7	74.366	7	-3.76	7	-0.002	7	-155.915	7	-29.819	7
20	min		-3.064	7	-36.862	7	-3.76	7	-0.002	7	-155.915	7	-1860.842	7	
21		11	max	1.904	7	40.61	7	2.192	7	-0.002	7	-162.902	7	-33.185	7
22	min		-3.06	7	-77.783	7	2.192	7	-0.002	7	-162.902	7	-1917.28	7	
23		12	max	1.904	7	40.61	7	2.192	7	-0.002	7	-156.902	7	-36.375	7
24	min		-3.06	7	-77.783	7	2.192	7	-0.002	7	-156.902	7	-1780.742	7	
25		13	max	1.904	7	40.61	7	2.192	7	-0.002	7	-150.903	7	-39.565	7
26	min		-3.06	7	-77.783	7	2.192	7	-0.002	7	-150.903	7	-1675.701	7	
27		14	max	1.904	7	40.61	7	2.192	7	-0.002	7	-144.904	7	-42.755	7
28	min		-3.06	7	-77.783	7	2.192	7	-0.002	7	-144.904	7	-1681.412	7	
29		15	max	5.252	7	20.27	7	7.04	7	-0.002	7	-127.094	7	-43.645	7
30	min		2.758	7	-112.023	7	7.04	7	-0.002	7	-127.094	7	-1422.164	7	
31		16	max	5.252	7	20.27	7	7.04	7	-0.002	7	-107.824	7	-44.251	7
32	min		2.758	7	-112.023	7	7.04	7	-0.002	7	-107.824	7	-1252.426	7	
33		17	max	8.608	7	21.183	7	10.386	7	-0.002	7	-79.532	7	-36.942	7
34	min		6.037	7	-134.381	7	10.386	7	-0.002	7	-79.532	7	-898.483	7	
35		18	max	13.162	7	-7.654	7	13.548	7	-0.002	7	-50.459	7	-28.507	7
36	min		10.066	7	-165.218	7	13.548	7	-0.002	7	-50.459	7	-615.341	7	
37		19	max	13.162	7	-7.654	7	13.548	7	-0.002	7	-13.372	7	-7.555	7
38	min		10.066	7	-165.218	7	13.548	7	-0.002	7	-13.372	7	-163.076	7	
39		20	max	0	7	0	7	0	7	0	7	0	7	0	7
40	min		0	7	0	7	0	7	0	7	0	7	0	7	0

Moving LL, one Lane, For Comparison
 to 2-lane Loadings.

Worst case
 Lane w/ truck
 configuration.



69801N-3E-P2
MODEL INPUT



Results for LC 1, Max LL Moment

LHB

jdf

090147

Bridge 69801 3E Pier 2

Jan 14, 2010 at 4:10 PM

090147_3E_P2_Pier.r3d

C-20

Global

4/30/10
 6/23/10

Display Sections for Member Calcs	20
Max Internal Sections for Member Calcs	191
Include Shear Deformation	Yes
Include Warping	No
Area Load Mesh (in^2)	144
Merge Tolerance (in)	.12
P-Delta Analysis Tolerance	0.50%
Vertical Axis	Y

- This section was
 checked on 4/30/10
 + updated per those
 checks
 CJM

Hot Rolled Steel Code	None
Cold Formed Steel Code	None
Wood Code	None
Wood Temperature	< 100F
Concrete Code	None
Masonry Code	None

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

Footing Overturning Safety Factor	1.5
Check Concrete Bearing	Yes
Self Wt, Overburden in DL for Design	Yes
Footing Concrete Weight	.145 k/ft^3
Footing Concrete f'c	3 ksi
Footing Concrete Ec	4000 ksi
Footing Steel fy	60 ksi
Minimum Steel	0.0018
Maximum Steel	0.0075
Footing Top Bar	#3
Footing Top Bar Cover	3.5 in
Footing Bottom Bar	#4
Footing Bottom Bar Cover	3.5 in
Pedestal Bar	#3
Pedestal Bar Cover	1.5 in
Pedestal Ties	#3

General Material Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (1/E5 F)	Density[k/ft^3]
1	A36 Steel	29000	11154	.3	.65	.49

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (1/E5 F)	Density[k/ft^3]	Yield[ksi]
1	A36	29000	11154	.3	.65	.49	36

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design Rules	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	Slab	W8X40	Beam	None	A36	Typical	11.7	49.1	146	1.12

4/30/10

Member Primary Data ✓

	Label	I Joint	J Joint	K Joint	Rotate(deg)	Section/Shape	Type	Design List	Material	Design Rules
1	M1	N1	N4			BR3E-P2-1	Beam	None	A36 Steel	Default
2	M7A	N14	N15			Slab	Beam	None	A36	Typical
3	M8	N15	N16			Slab	Beam	None	A36	Typical
4	M9	N16	N17			Slab	Beam	None	A36	Typical
5	M10	N17	N18			Slab	Beam	None	A36	Typical
6	M11	N18	N19			Slab	Beam	None	A36	Typical
7	M12	N19	N20			Slab	Beam	None	A36	Typical

Member Advanced Data ✓

	Label	I Release	J Release	I Offset[in]	J Offset[in]	T/C Only	Physical	TOM	Inactive
1	M1						Yes	Yes	
2	M7A						Yes	Yes	
3	M8		BenPIN				Yes	Yes	
4	M9	BenPIN	BenPIN				Yes	Yes	
5	M10	BenPIN	BenPIN				Yes	Yes	
6	M11	BenPIN					Yes	Yes	
7	M12						Yes	Yes	

Joint Coordinates and Temperatures ✓

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Diap...
1	N1	0	0	0	0	
2	N2	1.75	.035	0	0	
3	N3	50.25	1.005	0	0	
4	N4	52	1.04	0	0	
5	N5	18	.36	0	0	
6	N6	26.813	.536	0	0	
7	N7	35.88	.718	0	0	
8	N8	41.094	.822	0	0	
9	N9	46.323	.926	0	0	
10	N14	16.25	4.554	0	0	
11	N15	18	4.589	0	0	
12	N15A	18.2	4.59399	0	0	
13	N16	26.813	4.765	0	0	
14	N17	35.88	4.947	0	0	
15	N18	41.094	5.051	0	0	
16	N19	46.323	5.155	0	0	
17	N19A	46.072016	5.15001	0	0	
18	N20	48.073	5.19	0	0	
19	N16A	28.25	4.794	0	0	

Joint Boundary Conditions ✓

	Joint 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]	Footing
1	N2	Reaction	Reaction	Reaction	Reaction			
2	N3	Reaction	Reaction	Reaction	Reaction			
3	N15	SlaveN5	SlaveN5	SlaveN5	SlaveN5			
4	N16	SlaveN6	SlaveN6	SlaveN6	SlaveN6			
5	N17	SlaveN7	SlaveN7	SlaveN7	SlaveN7			
6	N18	SlaveN8	SlaveN8	SlaveN8	SlaveN8			
7	N19	SlaveN9	SlaveN9	SlaveN9	SlaveN9			

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Joint Loads and Enforced Displacements (BLC 6 : Centrifugal Force) ✓

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in.rad), (k*s^2/ft...]
1	N9	L	Y	-10.13
2	N8	L	Y	-5.95
3	N7	L	Y	-1.8
4	N5	L	X	8.38
5	N6	L	X	8.38
6	N7	L	X	8.38
7	N8	L	X	8.38
8	N9	L	X	8.38

Joint Loads and Enforced Displacements (BLC 7 : Noncomp Dead) ✓

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in.rad), (k*s^2/ft...]
1	N9	L	Y	-61.13
2	N8	L	Y	-94.97
3	N7	L	Y	-65.6
4	N6	L	Y	-97.92
5	N5	L	Y	-88.48

Joint Loads and Enforced Displacements (BLC 8 : Superimposed Dead) ✓

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in.rad), (k*s^2/ft...]
1	N5	L	Y	-19.12
2	N6	L	Y	-22.52
3	N7	L	Y	-18.36
4	N8	L	Y	-21.71
5	N9	L	Y	-17.2

Joint Loads and Enforced Displacements (BLC 9 : MDX Bracing Weight) ✓

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in.rad), (k*s^2/ft...]
1	N5	L	Y	2.07
2	N6	L	Y	4.14
3	N7	L	Y	3.27
4	N8	L	Y	2.4
5	N9	L	Y	1.2

Member Point Loads (BLC 2 : Lane Moment) ✓

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M8	Y	-2.76	.25
2	M8	Y	-5.51	1.25
3	M8	Y	-5.51	2.25
4	M8	Y	-5.51	3.25
5	M8	Y	-5.51	4.25
6	M8	Y	-5.51	5.25
7	M8	Y	-5.51	6.25
8	M8	Y	-5.51	7.25
9	M8	Y	-5.51	8.25
10	M9	Y	-5.51	.437
11	M9	Y	-2.76	1.437
12	M9	Y	-2.76	1.437
13	M9	Y	-5.51	2.437
14	M9	Y	-5.51	3.437
15	M9	Y	-5.51	4.437
16	M9	Y	-5.51	5.437
17	M9	Y	-5.51	6.437
18	M9	Y	-5.51	7.437
19	M9	Y	-5.51	8.437

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Member Point Loads (BLC 2 : Lane Moment) (Continued) ✓

	Member Label	Direction	Magnitude[k.k-ft]	Location[ft. %]
20	M10	Y	-5.51	.37
21	M10	Y	-5.51	1.37
22	M10	Y	-2.76	2.37

Member Point Loads (BLC 3 : Lane Shear) ✓

	Member Label	Direction	Magnitude[k.k-ft]	Location[ft. %]
1	M8	Y	-2.76	8.073
2	M9	Y	-5.51	.26
3	M9	Y	-5.51	1.26
4	M9	Y	-5.51	2.26
5	M9	Y	-5.51	3.26
6	M9	Y	-5.51	4.26
7	M9	Y	-5.51	5.26
8	M9	Y	-5.51	6.26
9	M9	Y	-5.51	7.26
10	M9	Y	-5.51	8.26
11	M10	Y	-2.76	.193
12	M10	Y	-2.76	2.193
13	M10	Y	-5.51	3.193
14	M10	Y	-5.51	4.193
15	M10	Y	-5.51	5.193
16	M11	Y	-5.51	.979
17	M11	Y	-5.51	1.979
18	M11	Y	-5.51	2.979
19	M11	Y	-5.51	3.979
20	M11	Y	-5.51	4.979
21	M12	Y	-5.51	.75
22	M12	Y	-2.76	1.75

Member Point Loads (BLC 4 : 2Truck at 50 Moment) ✓

	Member Label	Direction	Magnitude[k.k-ft]	Location[ft. %]
1	M8	Y	-41.75	.25
2	M8	Y	-41.75	6.25
3	M9	Y	-41.75	1.437
4	M9	Y	-41.75	7.437

Member Point Loads (BLC 5 : 2Truck at 50 Shear) ✓

	Member Label	Direction	Magnitude[k.k-ft]	Location[ft. %]
1	M9	Y	-41.75	3.26
2	M10	Y	-41.75	.193
3	M10	Y	-41.75	4.193
4	M11	Y	-41.75	4.979

Member Point Loads (BLC 11 : Mom Type 3 + SU7) ✓

	Member Label	Direction	Magnitude[k.k-ft]	Location[ft. %]
1	M8	Y	-37.7	2.813
2	M9	Y	-37.7	0
3	M9	Y	-23.67	4
4	M10	Y	-23.67	.933

Member Point Loads (BLC 12 : Mom Type 3S2-40 + SU7) ✓

	Member Label	Direction	Magnitude[k.k-ft]	Location[ft. %]
1	M8	Y	-37.7	.25
2	M8	Y	-37.7	6.25
3	M9	Y	-35.31	1.437

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Member Point Loads (BLC 12 : Mom Type 3S2-40 + SU7) ✓

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft, %]
4	M9	Y	-35.31	7.437

Member Point Loads (BLC 13 : Mom Type 3S3 + SU7) ✓

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft, %]
1	M8	Y	-37.7	.25
2	M8	Y	-37.7	6.25
3	M9	Y	-35.91	1.437
4	M9	Y	-35.91	7.437

Member Point Loads (BLC 14 : Mom Std A + SU7) ✓

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft, %]
1	M8	Y	-48.04	2.813
2	M9	Y	-48.04	0
3	M9	Y	-37.7	4
4	M10	Y	-37.7	.933

Member Point Loads (BLC 15 : Mom Std B + SU7) ✓

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft, %]
1	M8	Y	-60.93	2.813
2	M9	Y	-60.93	0
3	M9	Y	-37.7	4
4	M10	Y	-37.7	.933

Member Point Loads (BLC 16 : Mom Std C +SU7) ✓

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft, %]
1	M8	Y	-69.37	2.813
2	M9	Y	-69.37	0
3	M9	Y	-37.7	4
4	M10	Y	-37.7	.933

Member Point Loads (BLC 17 : Mom P411 + SU7) ✓

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft, %]
1	M8	Y	-71.85	2.813
2	M9	Y	-71.85	0
3	M9	Y	-37.7	4
4	M10	Y	-37.7	.933

Member Point Loads (BLC 18 : Mom P413 + SU7) ✓

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft, %]
1	M8	Y	-76.46	2.813
2	M9	Y	-76.46	0
3	M9	Y	-37.7	4
4	M10	Y	-37.7	.933

Member Point Loads (BLC 19 : Mom Std C152b + SU7) ✓

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft, %]
1	M8	Y	-67.13	2.813
2	M9	Y	-67.13	0
3	M9	Y	-37.7	4
4	M10	Y	-37.7	.933

Member Point Loads (BLC 20 : Mom Std C174b + SU7) ✓

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft, %]
1	M8	Y	-73.51	2.813

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Member Point Loads (BLC 20 : Mom Std C174b + SU7) ✓

	Member Label	Direction	Magnitude[k.k-ft]	Location[ft. %]
2	M9	Y	-73.51	0
3	M9	Y	-37.7	4
4	M10	Y	-37.7	.933

Member Point Loads (BLC 21 : Mom Std C198 23 + SU7) ✓

	Member Label	Direction	Magnitude[k.k-ft]	Location[ft. %]
1	M8	Y	-76.92	2.813
2	M9	Y	-76.92	0
3	M9	Y	-37.7	4
4	M10	Y	-37.7	.933

Member Point Loads (BLC 22 : Mom Std 214b + SU7) ✓

	Member Label	Direction	Magnitude[k.k-ft]	Location[ft. %]
1	M8	Y	-79.19	2.813
2	M9	Y	-79.19	0
3	M9	Y	-37.7	4
4	M10	Y	-37.7	.933

Member Point Loads (BLC 23 : Mom Std C237b + SU7) ✓

	Member Label	Direction	Magnitude[k.k-ft]	Location[ft. %]
1	M8	Y	-77.16	2.813
2	M9	Y	-77.16	0
3	M9	Y	-37.7	4
4	M10	Y	-37.7	.933

Member Point Loads (BLC 24 : Mom Std C256b + SU7) ✓

	Member Label	Direction	Magnitude[k.k-ft]	Location[ft. %]
1	M8	Y	-76.12	2.813
2	M9	Y	-76.12	0
3	M9	Y	-37.7	4
4	M10	Y	-37.7	.933

Member Point Loads (BLC 25 : Mom Std C200j + SU7) ✓

	Member Label	Direction	Magnitude[k.k-ft]	Location[ft. %]
1	M8	Y	-81.34	2.813
2	M9	Y	-81.34	0
3	M9	Y	-37.7	4
4	M10	Y	-37.7	.933

Member Point Loads (BLC 26 : Mom Std A) ✓

	Member Label	Direction	Magnitude[k.k-ft]	Location[ft. %]
1	M8	Y	-48.04	2.813
2	M9	Y	-48.04	0

Member Point Loads (BLC 27 : Mom Std B) ✓

	Member Label	Direction	Magnitude[k.k-ft]	Location[ft. %]
1	M8	Y	-60.93	2.813
2	M9	Y	-60.93	0

Member Point Loads (BLC 28 : Mom Std C) ✓

	Member Label	Direction	Magnitude[k.k-ft]	Location[ft. %]
1	M8	Y	-69.37	2.813
2	M9	Y	-69.37	0

Member Point Loads (BLC 29 : Mom P411) ✓

	Member Label	Direction	Magnitude[k, k-ft]	Location[ft, %]
1	M8	Y	-71.85	2.813
2	M9	Y	-71.85	0

Member Point Loads (BLC 30 : Mom P413) ✓

	Member Label	Direction	Magnitude[k, k-ft]	Location[ft, %]
1	M8	Y	-76.46	2.813
2	M9	Y	-76.46	0

Member Point Loads (BLC 31 : Mom Std C152b) ✓

	Member Label	Direction	Magnitude[k, k-ft]	Location[ft, %]
1	M8	Y	-67.13	2.813
2	M9	Y	-67.13	0

Member Point Loads (BLC 32 : Mom Std C174b) ✓

	Member Label	Direction	Magnitude[k, k-ft]	Location[ft, %]
1	M8	Y	-73.51	2.813
2	M9	Y	-73.51	0

Member Point Loads (BLC 33 : Mom Std C198 23) ✓

	Member Label	Direction	Magnitude[k, k-ft]	Location[ft, %]
1	M8	Y	-76.92	2.813
2	M9	Y	-76.92	0

Member Point Loads (BLC 34 : Mom Std 214b) ✓

	Member Label	Direction	Magnitude[k, k-ft]	Location[ft, %]
1	M8	Y	-79.19	2.813
2	M9	Y	-79.19	0

Member Point Loads (BLC 35 : Mom Std C237b) ✓

	Member Label	Direction	Magnitude[k, k-ft]	Location[ft, %]
1	M8	Y	-77.16	2.813
2	M9	Y	-77.16	0

Member Point Loads (BLC 36 : Mom Std C256b) ✓

	Member Label	Direction	Magnitude[k, k-ft]	Location[ft, %]
1	M8	Y	-76.12	2.813
2	M9	Y	-76.12	0

Member Point Loads (BLC 37 : Mom Std C200j) ✓

	Member Label	Direction	Magnitude[k, k-ft]	Location[ft, %]
1	M8	Y	-81.34	2.813
2	M9	Y	-81.34	0

Member Point Loads (BLC 38 : Shr Std C200j + SU7) ✓

	Member Label	Direction	Magnitude[k, k-ft]	Location[ft, %]
1	M9	Y	-37.7	3.26
2	M10	Y	-37.7	.193
3	M10	Y	-81.34	4.193
4	M11	Y	-81.34	4.979

Member Point Loads (BLC 39 : Mom SU4 + SU7) ✓

	Member Label	Direction	Magnitude[k, k-ft]	Location[ft, %]
1	M8	Y	-37.7	2.813

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Member Point Loads (BLC 39 : Mom SU4 + SU7) ✓

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
2	M9	Y	-37.7	0
3	M9	Y	-26.6	4
4	M10	Y	-26.6	.933

Member Point Loads (BLC 40 : Mom SU5 + SU7) ✓

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M8	Y	-37.7	2.813
2	M9	Y	-37.7	0
3	M9	Y	-30.35	4
4	M10	Y	-30.35	.933

Member Point Loads (BLC 41 : Mom SU6 + SU7) ✓

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M8	Y	-37.7	2.813
2	M9	Y	-37.7	0
3	M9	Y	-33.95	4
4	M10	Y	-33.95	.933

Member Point Loads (BLC 42 : Mom SU7 + SU7) ✓

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M8	Y	-37.7	.25
2	M8	Y	-37.7	6.25
3	M9	Y	-37.7	1.437
4	M9	Y	-37.7	7.437

Member Distributed Loads (BLC 1 : Pier Cap Weight) ✓

	Member Label	Direction	Start Magnitude[k/ft,d...]	End Magnitude[k/ft,d...]	Start Location[ft,%]	End Location[ft,%]
1	M1	Y	-.552	-.552	0	0

Member Distributed Loads (BLC 10 : Braking Force) ✓

	Member Label	Direction	Start Magnitude[k/ft,d...]	End Magnitude[k/ft,d...]	Start Location[ft,%]	End Location[ft,%]
1	M7A	Z	1.131	1.131	0	0
2	M8	Z	1.131	1.131	0	0
3	M9	Z	1.131	1.131	0	0
4	M10	Z	1.131	1.131	0	0
5	M11	Z	1.131	1.131	0	0
6	M12	Z	1.131	1.131	0	0

Moving Loads ✓

	Tag	Pattern	Increme...	Both Ways	1st Joint	2nd J...	3rd J...	4th J...	5th J...	6th J...	7th J...	8th J...	9th J...	10th ...
1	M1	1UNITLANE	.25		N14	N20								
2	M2	1UNITLANEOFTR...	.25		N14	N20								

Moving Load Patterns

Pattern Label	Load (k)	Direction	Distance (ft)
---------------	----------	-----------	---------------

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Moving Load Patterns

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Pattern Label	Load (k)	Direction	Distance (ft)
1UNITLANE ✓	-5	Y	0
	-1	Y	1
	-1	Y	1
	-1	Y	1
	-1	Y	1
	-1	Y	1
	-1	Y	1
	-1	Y	1
	-5	Y	1
1UNITLANEOFTRUCKS ✓	0	Y	0
	-1	Y	0
	-1	Y	6
	0	Y	5

Basic Load Cases ✓

	BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Joint	Point	Distributed	Area (M...	Surface (...)
1	Pier Cap Weight	DL						1		
2	Lane Moment	LL					22			
3	Lane Shear	LL					22			
4	2Truck at 50 Moment	LL					4			
5	2Truck at 50 Shear	LL					4			
6	Centrifugal Force	LL				8				
7	Noncomp Dead	DL				5				
8	Superimposed Dead	DL				5				
9	MDX Bracing Weight	DL				5				
10	Braking Force	LL						6		
11	Mom Type 3 + SU7	LL					4			
12	Mom Type 3S2-40 ...	LL					4			
13	Mom Type 3S3 + S...	LL					4			
14	Mom Std A + SU7	LL					4			
15	Mom Std B + SU7	LL					4			
16	Mom Std C +SU7	LL					4			
17	Mom P411 + SU7	LL					4			
18	Mom P413 + SU7	LL					4			
19	Mom Std C152b + ...	LL					4			
20	Mom Std C174b + ...	LL					4			
21	Mom Std C198_23 ...	LL					4			
22	Mom Std 214b + SU7	LL					4			
23	Mom Std C237b + ...	LL					4			
24	Mom Std C256b + ...	LL					4			
25	Mom Std C200j + S...	LL					4			
26	Mom Std A	LL					2			
27	Mom Std B	LL					2			
28	Mom Std C	LL					2			
29	Mom P411	LL					2			
30	Mom P413	LL					2			
31	Mom Std C152b	LL					2			
32	Mom Std C174b	LL					2			
33	Mom Std C198_23	LL					2			
34	Mom Std 214b	LL					2			
35	Mom Std C237b	LL					2			
36	Mom Std C256b	LL					2			

Company : LHB
 Designer : jdf
 Job Number : 090147

Bridge 69801 3E Pier 2

June 18, 2010
 10:46 AM
 Checked By: CJM

4/30/10

Basic Load Cases (Continued) ✓

	BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Joint	Point	Distributed Area (M...	Surface (...)
37	Mom Std C200j	LL					2		
38	Shr Std C200j + SU7	LL					4		
39	Mom SU4 + SU7	LL					4		
40	Mom SU5 + SU7	LL					4		
41	Mom SU6 + SU7	LL					4		
42	Mom SU7 + SU7	LL					4		

Load Combinations ✓

	Description	Sol... P...	SR...	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor
1	Max LL Moment			2	.9	4	1.197	6	1	10	1								
2	Max LL Shear			3	.9	5	1.197	6	1	10	1								
3	All Dead Loads			DL	1														
4	Moving LL One Lane			M1	5.95	M2	.60	6	.6	10	.6								
5	Mom Type 3 + SU7			11	1.33	6	.88	10	.87										
6	Mom Type 3S2-40 + SU7			12	1.33	6	1.05	10	1.09										
7	Mom Type 3S3 + SU7			13	1.33	6	1.05	10	1.09										
8	Mom Std A + SU7			14	1.33	6	1.23	10	1.26										
9	Mom Std B + SU7			15	1.33	6	1.41	10	1.48										
10	Mom Std C + SU7			16	1.33	6	1.53	10	1.64										
11	Mom P411 + SU7			17	1.33	6	1.57	10	1.98										
12	Mom P413 + SU7			18	1.33	6	1.64	10	2.31										
13	Mom Std C152b + SU7			19	1.33	6	1.5	10	1.6										
14	Mom Std C174b + SU7			20	1.33	6	1.59	10	1.75										
15	Mom Std C198_23 + SU7			21	1.33	6	1.64	10	1.91										
16	Mom Std 214b + SU7			22	1.33	6	1.67	10	2.02										
17	Mom Std C237b + SU7			23	1.33	6	1.65	10	2.19										
18	Mom Std C256b + SU7			24	1.33	6	1.63	10	2.32										
19	Mom Std C200j + SU7			25	1.33	6	1.71	10	1.93										
20	Mom Std A			26	1.596	6	.83	10	.87										
21	Mom Std B			27	1.596	6	1.05	10	1.13										
22	Mom Std C			28	1.596	6	1.19	10	1.33										
23	Mom P411			29	1.596	6	1.24	10	1.73										
24	Mom P413			30	1.596	6	1.31	10	2.13										
25	Mom Std C152b			31	1.596	6	1.15	10	1.27										
26	Mom Std C174b			32	1.596	6	1.26	10	1.45										
27	Mom Std C198_23			33	1.596	6	1.32	10	1.65										
28	Mom Std 214b			34	1.596	6	1.36	10	1.78										
29	Mom Std C237b			35	1.596	6	1.33	10	1.98										
30	Mom Std C256b			36	1.596	6	1.31	10	2.13										
31	Mom Std C200j			37	1.596	6	1.4	10	1.67										
32	Shr Std C200j + SU7			38	1.33	6	1.71	10	1.93										
33	Mom SU4 + SU7	Yes		39	1.33	6	.92	10	.91										
34	Mom SU5 + SU7	Yes		40	1.33	6	.97	10	.97										
35	Mom SU6 + SU7	Yes		41	1.33	6	1.03	10	1.02										
36	Mom SU7 + SU7	Yes		42	1.33	6	1.08	10	1.08										

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Global

Display Sections for Member Calcs	20
Max Internal Sections for Member Calcs	191
Include Shear Deformation	Yes
Include Warping	No
Area Load Mesh (in^2)	144
Merge Tolerance (in)	.12
P-Delta Analysis Tolerance	0.50%
Vertical Axis	Y

Hot Rolled Steel Code	None
Cold Formed Steel Code	None
Wood Code	None
Wood Temperature	< 100F
Concrete Code	None
Masonry Code	None

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

Footing Overturning Safety Factor	1.5
Check Concrete Bearing	Yes
Self Wt, Overburden in DL for Design	Yes
Footing Concrete Weight	.145 k/ft^3
Footing Concrete f'c	3 ksi
Footing Concrete Ec	4000 ksi
Footing Steel fy	60 ksi
Minimum Steel	0.0018
Maximum Steel	0.0075
Footing Top Bar	#3
Footing Top Bar Cover	3.5 in
Footing Bottom Bar	#4
Footing Bottom Bar Cover	3.5 in
Pedestal Bar	#3
Pedestal Bar Cover	1.5 in
Pedestal Ties	#3

Superseded

*added
 SV4+SV7
 SV5+SV2
 SV6+SV1
 SV7+SV4
 in addition to
 change to
 none*

*See calcs immediately
 before for
 updated calcs*

General Material Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (1E5 F)	Density[k/ft^3]
1	A36 Steel	29000	11154	.3	.65	.49

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (1E5 F)	Density[k/ft^3]	Yield[ksi]
1	A36	29000	11154	.3	.65	.49	36

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design Rules	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	Slab	W8X40	Beam	None	A36	Typical	11.7	49.1	146	1.12

Company : LHB
 Designer : jdf
 Job Number : 090147

Bridge 69801 3E Pier 2

Apr 19, 2010
 8:57 AM
 Checked By: _____

Member Primary Data

	Label	I Joint	J Joint	K Joint	Rotate(deg)	Section/Shape	Type	Design List	Material	Design Rules
1	M1	N1	N4			BR3E-P2-1	Beam	None	A36 Steel	Default
2	M7A	N14	N15			Slab	Beam	None	A36	Typical
3	M8	N15	N16			Slab	Beam	None	A36	Typical
4	M9	N16	N17			Slab	Beam	None	A36	Typical
5	M10	N17	N18			Slab	Beam	None	A36	Typical
6	M11	N18	N19			Slab	Beam	None	A36	Typical
7	M12	N19	N20			Slab	Beam	None	A36	Typical

Member Advanced Data

	Label	I Release	J Release	I Offset[in]	J Offset[in]	T/C Only	Physical	TOM	Inactive
1	M1						Yes	Yes	
2	M7A						Yes	Yes	
3	M8		BenPIN				Yes	Yes	
4	M9	BenPIN	BenPIN				Yes	Yes	
5	M10	BenPIN	BenPIN				Yes	Yes	
6	M11	BenPIN					Yes	Yes	
7	M12						Yes	Yes	

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Diap...
1	N1	0	0	0	0	
2	N2	1.75	.035	0	0	
3	N3	50.25	1.005	0	0	
4	N4	52	1.04	0	0	
5	N5	18	.36	0	0	
6	N6	26.813	.536	0	0	
7	N7	35.88	.718	0	0	
8	N8	41.094	.822	0	0	
9	N9	46.323	.926	0	0	
10	N14	16.25	4.554	0	0	
11	N15	18	4.589	0	0	
12	N15A	18.2	4.59399	0	0	
13	N16	26.813	4.765	0	0	
14	N17	35.88	4.947	0	0	
15	N18	41.094	5.051	0	0	
16	N19	46.323	5.155	0	0	
17	N19A	46.072016	5.15001	0	0	
18	N20	48.073	5.19	0	0	
19	N16A	28.25	4.794	0	0	

Joint Boundary Conditions

	Joint 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]	Footing
1	N2	Reaction	Reaction	Reaction	Reaction			
2	N3	Reaction	Reaction	Reaction	Reaction			
3	N15	SlaveN5	SlaveN5	SlaveN5	SlaveN5			
4	N16	SlaveN6	SlaveN6	SlaveN6	SlaveN6			
5	N17	SlaveN7	SlaveN7	SlaveN7	SlaveN7			
6	N18	SlaveN8	SlaveN8	SlaveN8	SlaveN8			
7	N19	SlaveN9	SlaveN9	SlaveN9	SlaveN9			

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Joint Loads and Enforced Displacements (BLC 6 : Centrifugal Force)

5/21/10

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in.rad), (k*s^2/ft...]
1	N9	L	Y	-8.1 -10.13
2	N8	L	Y	-4.76 -5.95
3	N7	L	Y	-1.44 -1.80
4	N5	L	X	6.7
5	N6	L	X	6.7
6	N7	L	X	6.7
7	N8	L	X	6.7
8	N9	L	X	6.7

Joint Loads and Enforced Displacements (BLC 7 : Noncomp Dead)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in.rad), (k*s^2/ft...]
1	N9	L	Y	-61.13
2	N8	L	Y	-94.97
3	N7	L	Y	-65.6
4	N6	L	Y	-97.92
5	N5	L	Y	-88.48

Joint Loads and Enforced Displacements (BLC 8 : Superimposed Dead)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in.rad), (k*s^2/ft...]
1	N5	L	Y	-19.12
2	N6	L	Y	-22.52
3	N7	L	Y	-18.36
4	N8	L	Y	-21.71
5	N9	L	Y	-17.2

Joint Loads and Enforced Displacements (BLC 9 : MDX Bracing Weight)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in.rad), (k*s^2/ft...]
1	N5	L	Y	2.07
2	N6	L	Y	4.14
3	N7	L	Y	3.27
4	N8	L	Y	2.4
5	N9	L	Y	1.2

Member Point Loads (BLC 2 : Lane Moment)

5/21/10

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M7A m8	Y	-2.76	0 6.25
2	M7A m8	Y	-5.51	1 1.25
3	M8	Y	-5.51	25 2.25
4	M8	Y	-5.51	1.25 3.25
5	M8	Y	-5.51	2.25 4.25
6	M8	Y	-5.51	3.25 5.25
7	M8	Y	-5.51	4.25 6.25
8	M8	Y	-5.51	5.25 7.25
9	M8	Y	-5.51	6.25 8.25
10	M8 m9	Y	-5.51	7.25 0.437
11	M8 m9	Y	-2.76	8.25 1.437
12	M9	Y	-2.76	1.437
13	M9	Y	-5.51	2.437
14	M9	Y	-5.51	3.437
15	M9	Y	-5.51	4.437
16	M9	Y	-5.51	5.437
17	M9	Y	-5.51	6.437
18	M9	Y	-5.51	7.437
19	M9	Y	-5.51	8.437

Member Point Loads (BLC 2 : Lane Moment) (Continued)

	Member Label	Direction	Magnitude[k.k-ft]	Location[ft. %]
20	M10	Y	-5.51	.37
21	M10	Y	-5.51	1.37
22	M10	Y	-2.76	2.37

Member Point Loads (BLC 3 : Lane Shear)

	Member Label	Direction	Magnitude[k.k-ft]	Location[ft. %]
1	M8	Y	-2.76	8.073
2	M9	Y	-5.51	.26
3	M9	Y	-5.51	1.26
4	M9	Y	-5.51	2.26
5	M9	Y	-5.51	3.26
6	M9	Y	-5.51	4.26
7	M9	Y	-5.51	5.26
8	M9	Y	-5.51	6.26
9	M9	Y	-5.51	7.26
10	M9	Y	-5.51	8.26
11	M10	Y	-2.76	.193
12	M10	Y	-2.76	2.193
13	M10	Y	-5.51	3.193
14	M10	Y	-5.51	4.193
15	M10	Y	-5.51	5.193
16	M11	Y	-5.51	.979
17	M11	Y	-5.51	1.979
18	M11	Y	-5.51	2.979
19	M11	Y	-5.51	3.979
20	M11	Y	-5.51	4.979
21	M12	Y	-5.51	.75
22	M12	Y	-2.76	1.75

Member Point Loads (BLC 4 : 2Truck at 50 Moment)

	Member Label	Direction	Magnitude[k.k-ft]	Location[ft. %]
1	M8	Y	-41.75	.25
2	M8	Y	-41.75	6.25
3	M9	Y	-41.75	1.437
4	M9	Y	-41.75	7.437

Member Point Loads (BLC 5 : 2Truck at 50 Shear)

	Member Label	Direction	Magnitude[k.k-ft]	Location[ft. %]
1	M9	Y	-41.75	3.26
2	M10	Y	-41.75	.193
3	M10	Y	-41.75	4.193
4	M11	Y	-41.75	4.979

Member Point Loads (BLC 11 : Mom Type 3 + SU7)

	Member Label	Direction	Magnitude[k.k-ft]	Location[ft. %]
1	M8	Y	-37.7	2.813
2	M9	Y	-37.7	0
3	M9	Y	-23.67	4
4	M10	Y	-23.67	.933

Member Point Loads (BLC 12 : Mom Type 3S2-40 + SU7)

	Member Label	Direction	Magnitude[k.k-ft]	Location[ft. %]
1	M8	Y	-37.7	.25
2	M8	Y	-37.7	6.25
3	M9	Y	-35.31	1.437

Member Point Loads (BLC 12 : Mom Type 3S2-40 + SU7) (Continued)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft. %]
4	M9	Y	-35.31	7.437

Member Point Loads (BLC 13 : Mom Type 3S3 + SU7)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft. %]
1	M8	Y	-37.7	1.25 <i>5/21/10</i>
2	M8	Y	-37.7	7.25 <i>0.25</i>
3	M9	Y	-35.91	2.437 <i>6.25</i>
4	M9	Y	-35.91	8.437 <i>1.437</i>

Member Point Loads (BLC 14 : Mom Std A + SU7)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft. %]
1	M8	Y	-48.04	2.813
2	M9	Y	-48.04	0
3	M9	Y	-37.7	4
4	M10	Y	-37.7	.933

Member Point Loads (BLC 15 : Mom Std B + SU7)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft. %]
1	M8	Y	-60.93	2.813
2	M9	Y	-60.93	0
3	M9	Y	-37.7	4
4	M10	Y	-37.7	.933

Member Point Loads (BLC 16 : Mom Std C +SU7)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft. %]
1	M8	Y	-69.37	2.813
2	M9	Y	-69.37	0
3	M9	Y	-37.7	4
4	M10	Y	-37.7	.933

Member Point Loads (BLC 17 : Mom P411 + SU7)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft. %]
1	M8	Y	-71.85	2.813
2	M9	Y	-71.85	0
3	M9	Y	-37.7	4
4	M10	Y	-37.7	.933

Member Point Loads (BLC 18 : Mom P413 + SU7)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft. %]
1	M8	Y	-76.46	2.813
2	M9	Y	-76.46	0
3	M9	Y	-37.7	4
4	M10	Y	-37.7	.933

Member Point Loads (BLC 19 : Mom Std C152b + SU7)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft. %]
1	M8	Y	-67.13	2.813
2	M9	Y	-67.13	0
3	M9	Y	-37.7	4
4	M10	Y	-37.7	.933

Member Point Loads (BLC 20 : Mom Std C174b + SU7)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft. %]
1	M8	Y	-73.51	2.813

Member Point Loads (BLC 20 : Mom Std C174b + SU7) (Continued)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
2	M9	Y	-73.51	0
3	M9	Y	-37.7	4
4	M10	Y	-37.7	.933

Member Point Loads (BLC 21 : Mom Std C198 23 + SU7)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M8	Y	-76.92	2.813
2	M9	Y	-76.92	0
3	M9	Y	-37.7	4
4	M10	Y	-37.7	.933

Member Point Loads (BLC 22 : Mom Std 214b + SU7)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M8	Y	-79.19	2.813
2	M9	Y	-79.19	0
3	M9	Y	-37.7	4
4	M10	Y	-37.7	.933

Member Point Loads (BLC 23 : Mom Std C237b + SU7)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M8	Y	-77.16	2.813
2	M9	Y	-77.16	0
3	M9	Y	-37.7	4
4	M10	Y	-37.7	.933

Member Point Loads (BLC 24 : Mom Std C256b + SU7)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M8	Y	-76.12	2.813
2	M9	Y	-76.12	0
3	M9	Y	-37.7	4
4	M10	Y	-37.7	.933

Member Point Loads (BLC 25 : Mom Std C200j + SU7)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M8	Y	-81.34	2.813
2	M9	Y	-81.34	0
3	M9	Y	-37.7	4
4	M10	Y	-37.7	.933

Member Point Loads (BLC 26 : Mom Std A)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M8	Y	-48.04	2.813
2	M9	Y	-48.04	0

Member Point Loads (BLC 27 : Mom Std B)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M8	Y	-60.93	2.813
2	M9	Y	-60.93	0

Member Point Loads (BLC 28 : Mom Std C)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M8	Y	-69.37	2.813
2	M9	Y	-69.37	0

Member Point Loads (BLC 29 : Mom P411)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft. %]
1	M8	Y	-71.85	2.813
2	M9	Y	-71.85	0

Member Point Loads (BLC 30 : Mom P413)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft. %]
1	M8	Y	-76.46	2.813
2	M9	Y	-76.46	0

Member Point Loads (BLC 31 : Mom Std C152b)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft. %]
1	M8	Y	-67.13	2.813
2	M9	Y	-67.13	0

Member Point Loads (BLC 32 : Mom Std C174b)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft. %]
1	M8	Y	-73.51	2.813
2	M9	Y	-73.51	0

Member Point Loads (BLC 33 : Mom Std C198 23)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft. %]
1	M8	Y	-76.92	2.813
2	M9	Y	-76.92	0

Member Point Loads (BLC 34 : Mom Std 214b)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft. %]
1	M8	Y	-79.19	2.813
2	M9	Y	-79.19	0

Member Point Loads (BLC 35 : Mom Std C237b)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft. %]
1	M8	Y	-77.16	2.813
2	M9	Y	-77.16	0

Member Point Loads (BLC 36 : Mom Std C256b)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft. %]
1	M8	Y	-76.12	2.813
2	M9	Y	-76.12	0

Member Point Loads (BLC 37 : Mom Std C200j)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft. %]
1	M8	Y	-81.34	2.813
2	M9	Y	-81.34	0

Member Point Loads (BLC 38 : Shr Std C200j + SU7)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft. %]
1	M9	Y	-37.7	3.26
2	M10	Y	-37.7	.193
3	M10	Y	-81.34	4.193
4	M11	Y	-81.34	4.979

Member Distributed Loads (BLC 1 : Pier Cap Weight)

	Member Label	Direction	Start Magnitude[k/ft,d...	End Magnitude[k/ft,d...	Start Location[ft.%]	End Location[ft.%]
1	M1	Y	-552	-552	0	0

Member Distributed Loads (BLC 10 : Braking Force)

	Member Label	Direction	Start Magnitude[k/ft,d...	End Magnitude[k/ft,d...	Start Location[ft.%]	End Location[ft.%]
1	M7A	Z	1.131	1.131	0	0
2	M8	Z	1.131	1.131	0	0
3	M9	Z	1.131	1.131	0	0
4	M10	Z	1.131	1.131	0	0
5	M11	Z	1.131	1.131	0	0
6	M12	Z	1.131	1.131	0	0

Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Joint	Point	Distributed Area (Me...	Surface (...)
1	Pier Cap Weight	DL						1	
2	Lane Moment	LL					22		
3	Lane Shear	LL					22		
4	2Truck at 50 Moment	LL					4		
5	2Truck at 50 Shear	LL					4		
6	Centrifugal Force	LL				8			
7	Noncomp Dead	DL				5			
8	Superimposed Dead	DL				5			
9	MDX Bracing Weight	DL				5			
10	Braking Force	LL						6	
11	Mom Type 3 + SU7	LL					4		
12	Mom Type 3S2-40 + ...	LL					4		
13	Mom Type 3S3 + SU7	LL					4		
14	Mom Std A + SU7	LL					4		
15	Mom Std B + SU7	LL					4		
16	Mom Std C +SU7	LL					4		
17	Mom P411 + SU7	LL					4		
18	Mom P413 + SU7	LL					4		
19	Mom Std C152b + SU7	LL					4		
20	Mom Std C174b + SU7	LL					4		
21	Mom Std C198_23 + ...	LL					4		
22	Mom Std 214b + SU7	LL					4		
23	Mom Std C237b + SU7	LL					4		
24	Mom Std C256b + SU7	LL					4		
25	Mom Std C200j + SU7	LL					4		
26	Mom Std A	LL					2		
27	Mom Std B	LL					2		
28	Mom Std C	LL					2		
29	Mom P411	LL					2		
30	Mom P413	LL					2		
31	Mom Std C152b	LL					2		
32	Mom Std C174b	LL					2		
33	Mom Std C198_23	LL					2		
34	Mom Std 214b	LL					2		
35	Mom Std C237b	LL					2		
36	Mom Std C256b	LL					2		
37	Mom Std C200j	LL					2		
38	Shr Std C200j + SU7	LL					4		

Company : LHB
 Designer : jdf
 Job Number : 090147

Bridge 69801 3E Pier 2

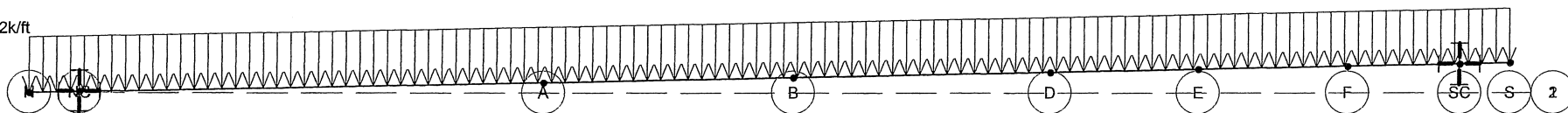
Apr 19, 2010
 8:57 AM
 Checked By: _____

Load Combinations

	Description	Sol...	PD...	SR...	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor
1	Max LL Moment				2	.9	4	1.197	6	1	10	1							
2	Max LL Shear				3	.9	5	1.197	6	1	10	1							
3	All Dead Loads				DL	1													
4	Moving LL One Lane				M1	5.95	M2	60	6	.6	10	.6							
5	Mom Type 3 + SU7				11	1.33	6	.88	10	.87									
6	Mom Type 3S2-40 + SU7				12	1.33	6	1.05	10	1.09									
7	Mom Type 3S3 + SU7				13	1.33	6	1.05	10	1.09									
8	Mom Std A + SU7				14	1.33	6	1.23	10	1.26									
9	Mom Std B + SU7				15	1.33	6	1.41	10	1.48									
10	Mom Std C + SU7				16	1.33	6	1.53	10	1.64									
11	Mom P411 + SU7				17	1.33	6	1.57	10	1.98									
12	Mom P413 + SU7				18	1.33	6	1.64	10	2.31									
13	Mom Std C152b + SU7				19	1.33	6	1.5	10	1.6									
14	Mom Std C174b + SU7				20	1.33	6	1.59	10	1.75									
15	Mom Std C198_23 + SU7				21	1.33	6	1.64	10	1.91									
16	Mom Std 214b + SU7				22	1.33	6	1.67	10	2.02									
17	Mom Std C237b + SU7				23	1.33	6	1.65	10	2.19									
18	Mom Std C256b + SU7				24	1.33	6	1.63	10	2.32									
19	Mom Std C200j + SU7				25	1.33	6	1.71	10	1.93									
20	Mom Std A				26	1.596	6	.83	10	.87									
21	Mom Std B				27	1.596	6	1.05	10	1.13									
22	Mom Std C				28	1.596	6	1.19	10	1.33									
23	Mom P411				29	1.596	6	1.24	10	1.73									
24	Mom P413				30	1.596	6	1.31	10	2.13									
25	Mom Std C152b				31	1.596	6	1.15	10	1.27									
26	Mom Std C174b				32	1.596	6	1.26	10	1.45									
27	Mom Std C198_23				33	1.596	6	1.32	10	1.65									
28	Mom Std 214b				34	1.596	6	1.36	10	1.78									
29	Mom Std C237b				35	1.596	6	1.33	10	1.98									
30	Mom Std C256b				36	1.596	6	1.31	10	2.13									
31	Mom Std C200j				37	1.596	6	1.4	10	1.67									
32	Shr Std C200j + SU7	Yes			38	1.33	6	1.71	10	1.93									



-552k/ft



✓
4/30/10

Loads: BLC 1, Pier Cap Weight

LHB

jdf

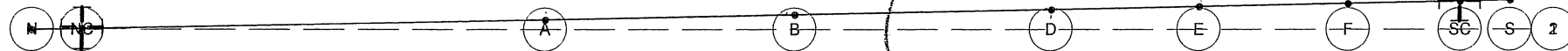
090147

Bridge 69801 3E Pier 2

Jan 14, 2010 at 4:11 PM

090147_3E_P2_Pier.r3d

C-40



$\rightarrow \text{Shift } 2'$

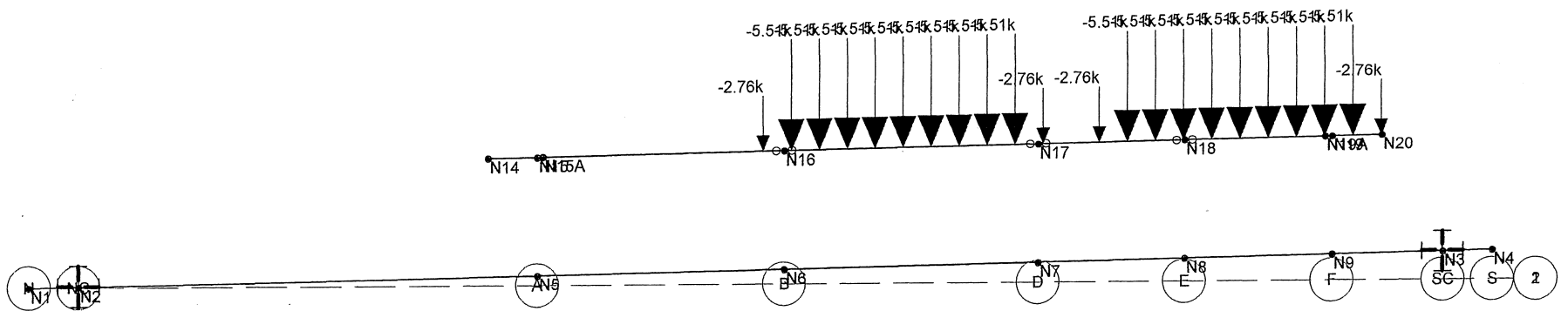
- Shifted 6/18/10

LHB
jdf
090147

Bridge 69801 3E Pier 2

090147_3E_P2_Pier.r3d

C-41



✓
4/30/10

Loads: BLC 3, Lane Shear

LHB

jdf

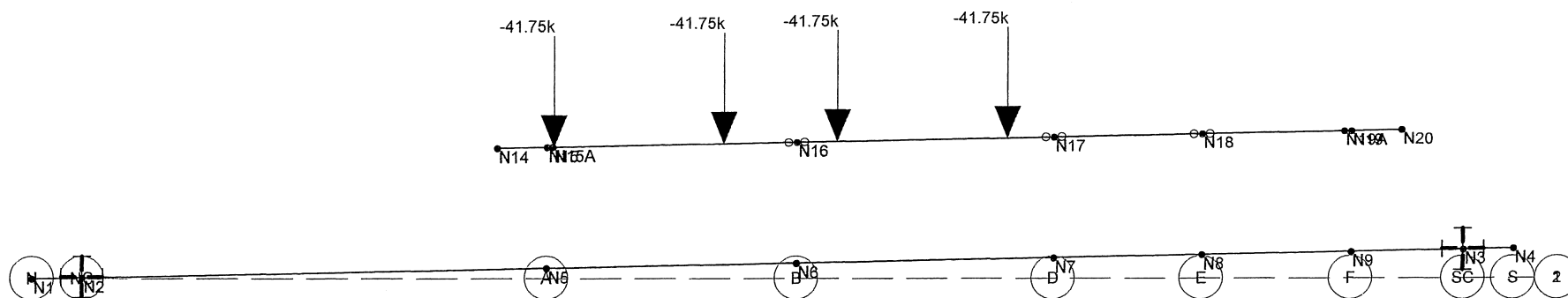
090147

Bridge 69801 3E Pier 2

Jan 15, 2010 at 2:22 PM

090147_3E_P2_Pier.r3d

C-42



VC5m 4/30/10

Loads: BLC 4, 2Truck at 50 Moment

LHB

jdf

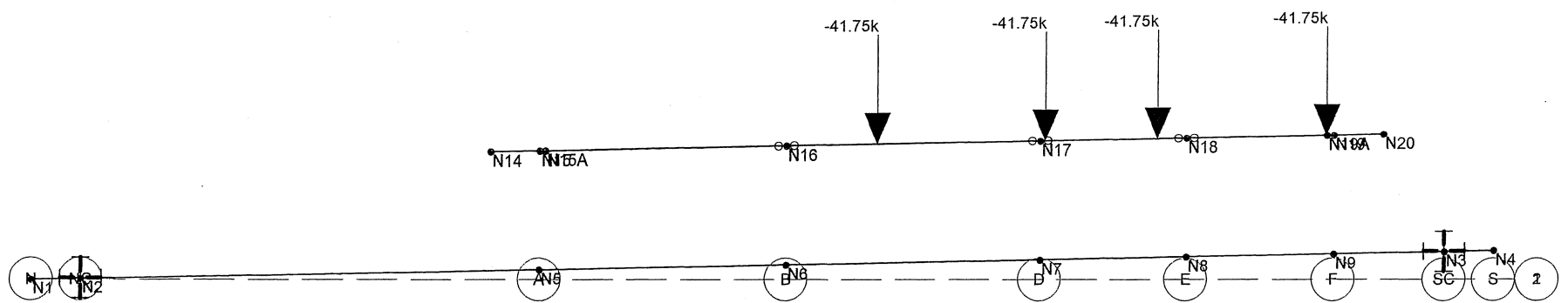
090147

Bridge 69801 3E Pier 2

Jan 15, 2010 at 2:23 PM

090147_3E_P2_Pier.r3d

C-47



Loads: BLC 5, 2Truck at 50 Shear

LHB

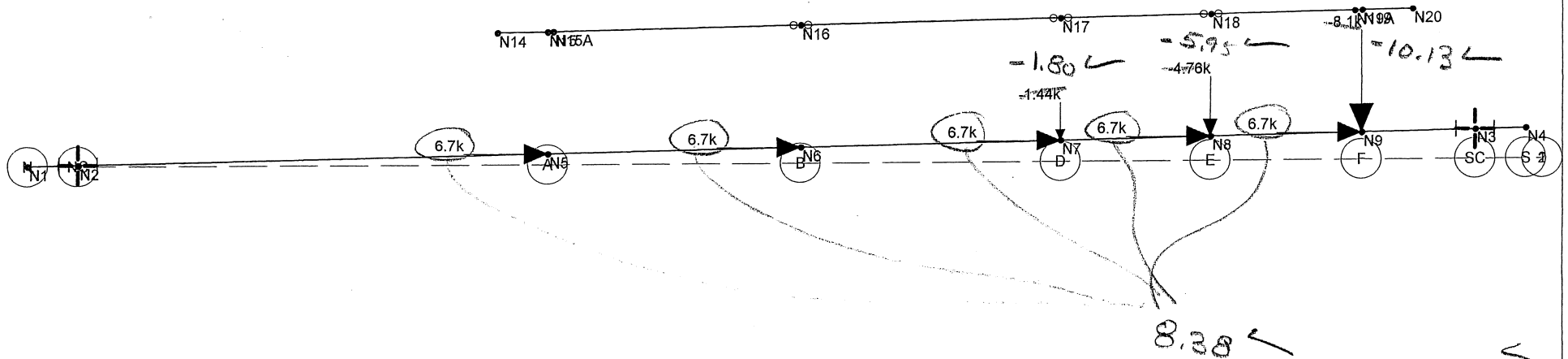
jdf

090147

Bridge 69801 3E Pier 2

Jan 15, 2010 at 2:23 PM

090147_3E_P2_Pier.r3d



Loads: BLC 6, Centrifugal Force

LHB

jdf

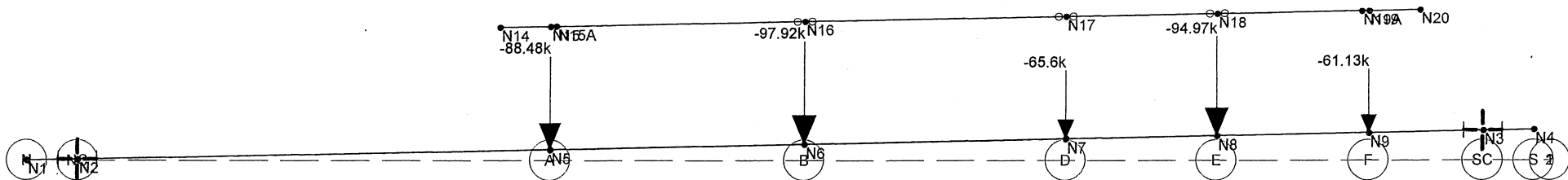
090147

Bridge 69801 3E Pier 2

Feb 1, 2010 at 2:57 PM

090147_3E_P2_Pier.r3d

045



Loads: BLC 7, Noncomp Dead

LHB

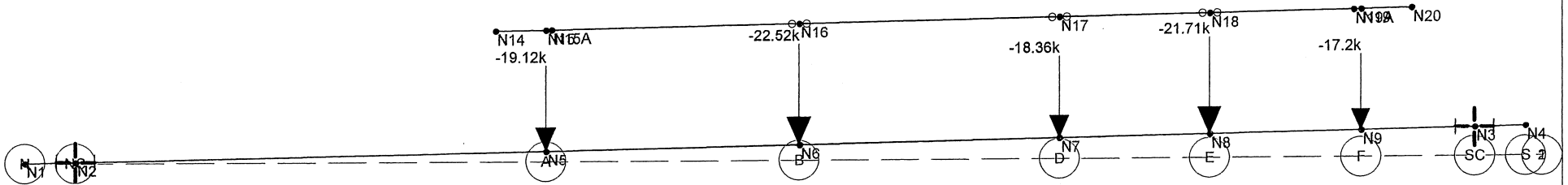
jdf

090147

Bridge 69801 3E Pier 2

Feb 1, 2010 at 2:58 PM

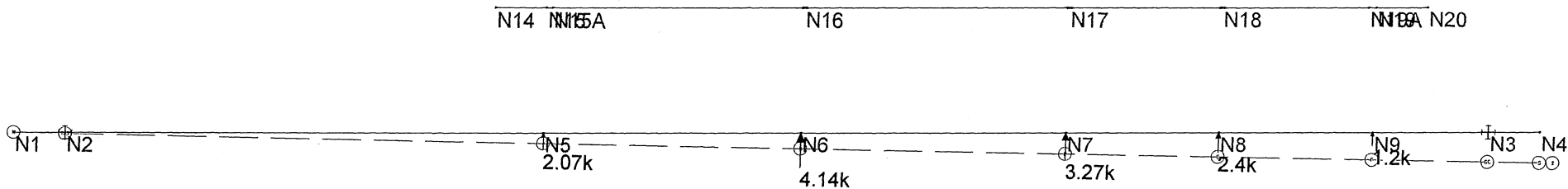
090147_3E_P2_Pier.r3d



090147_3E_P2_Pier.r3d

15m 4/30/10

E.L.



Loads: BLC 9, MDX Bracing Weight

LHB

jdf

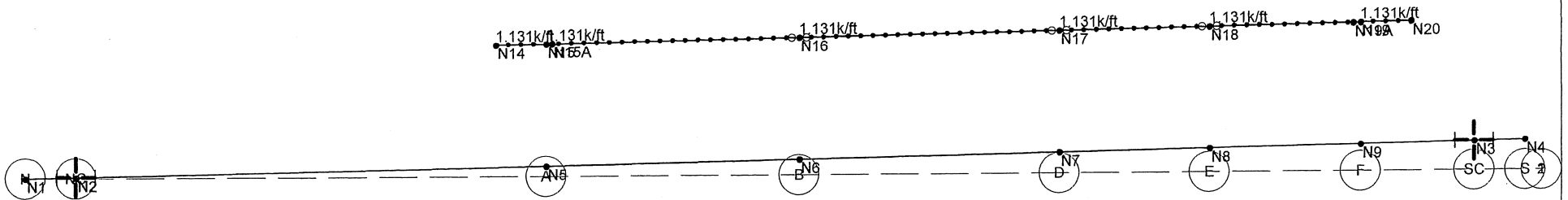
090147

Bridge 69801 3E Pier 2

Jan 18, 2010 at 4:21 PM

090147_3E_P2_Pier.r3d

87-1



VC5m 4/30/10

Loads: BLC 10, Braking Force

LHB

jdf

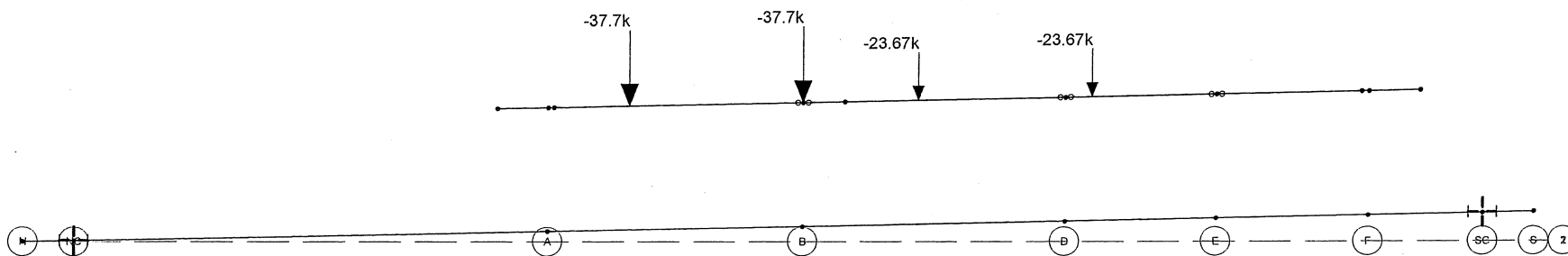
090147

Bridge 69801 3E Pier 2

Feb 1, 2010 at 2:58 PM

090147_3E_P2_Pier.r3d

C-49



105m 4/30/10

Loads: BLC 11, Mom Type 3 + SU7

LHB

jdf

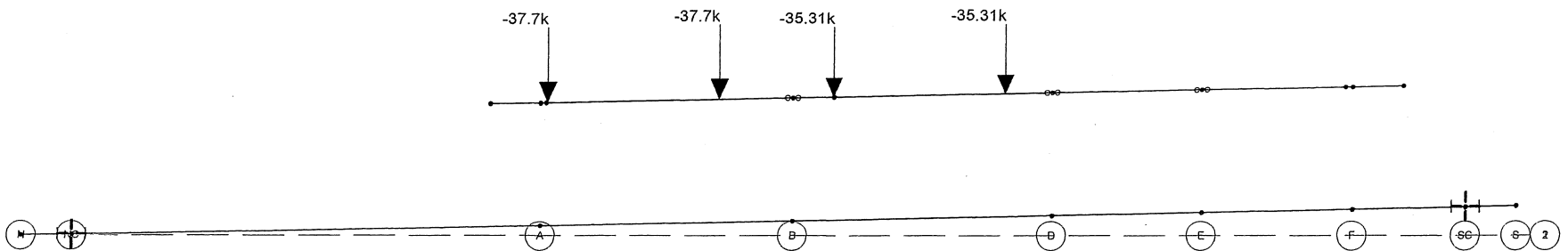
090147

Bridge 69801 3E Pier 2

Apr 19, 2010 at 9:00 AM

090147_3E_P2_Pier.r3d

6-50



VCsm 4/30/10

Loads: BLC 12, Mom Type 3S2-40 + SU7

LHB

jdf

090147

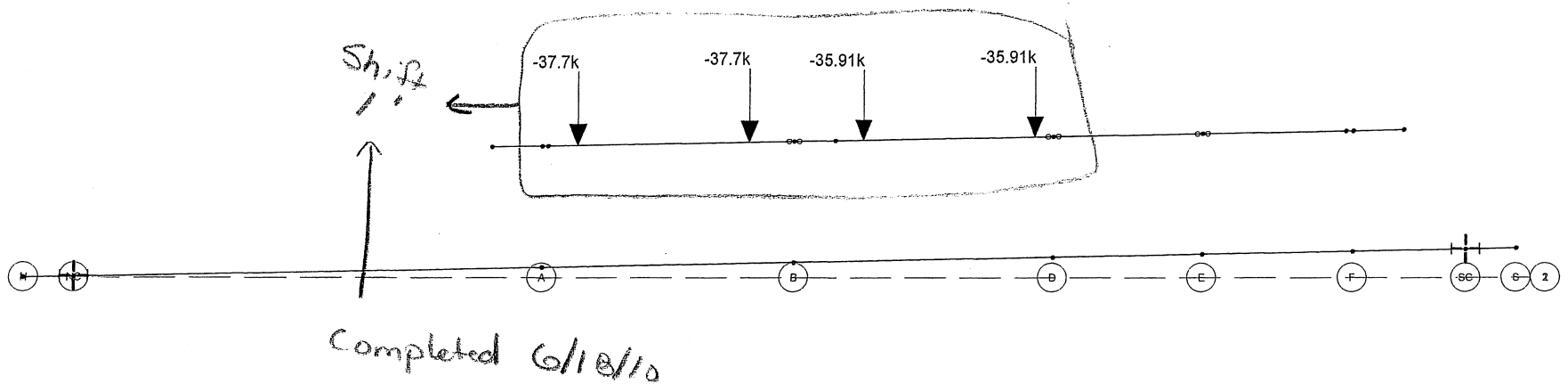
Bridge 69801 3E Pier 2

Apr 19, 2010 at 9:01 AM

090147_3E_P2_Pier.r3d

0-5-1

Y
Z Lx



Loads: BLC 13, Mom Type 3S3 + SU7

LHB

jdf

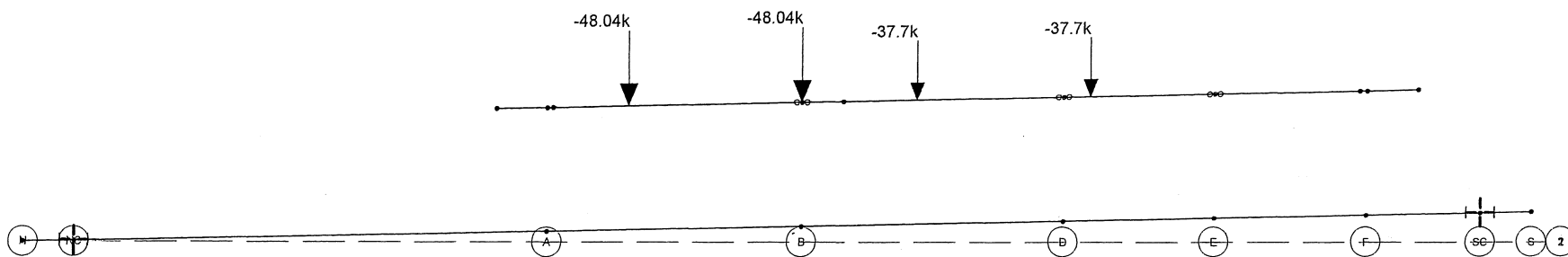
090147

Bridge 69801 3E Pier 2

Apr 19, 2010 at 9:01 AM

090147_3E_P2_Pier.r3d

C-52

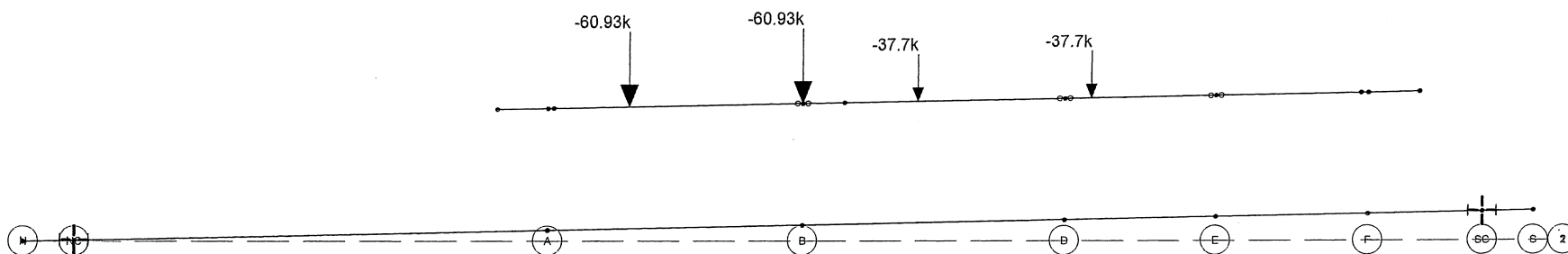


1/25/10
4/30/10

Loads: BLC 14, Mom Std A + SU7

LHB	Bridge 69801 3E Pier 2	
jdf		Apr 19, 2010 at 9:01 AM
090147		090147_3E_P2_Pier.r3d

6-53

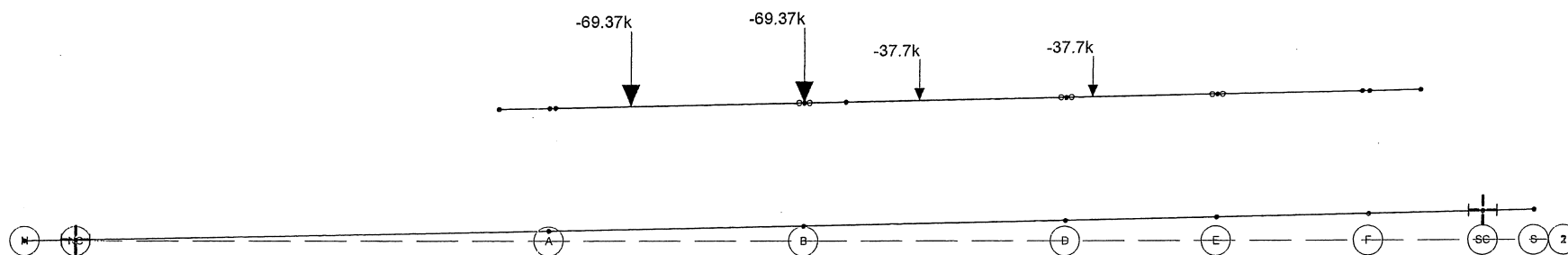


1/5m 4/30/10

Loads: BLC 15, Mom Std B + SU7

LHB	Bridge 69801 3E Pier 2	
jdf		Apr 19, 2010 at 9:01 AM
090147		090147_3E_P2_Pier.r3d

C-54

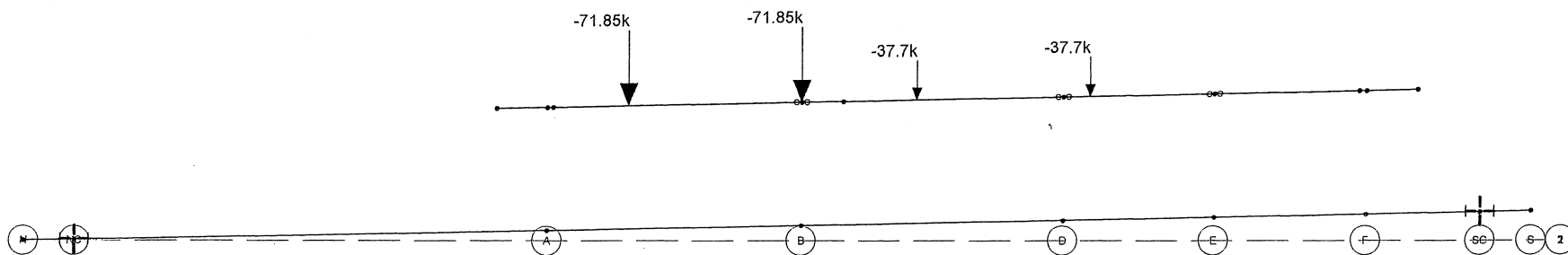


1/45m
4/130/10

Loads: BLC 16, Mom Std C +SU7

LHB	Bridge 69801 3E Pier 2	
jdf		Apr 19, 2010 at 9:01 AM
090147		090147_3E_P2_Pier.r3d

C-55



4/30/10
JCSM

Loads: BLC 17, Mom P411 + SU7

LHB

jdf

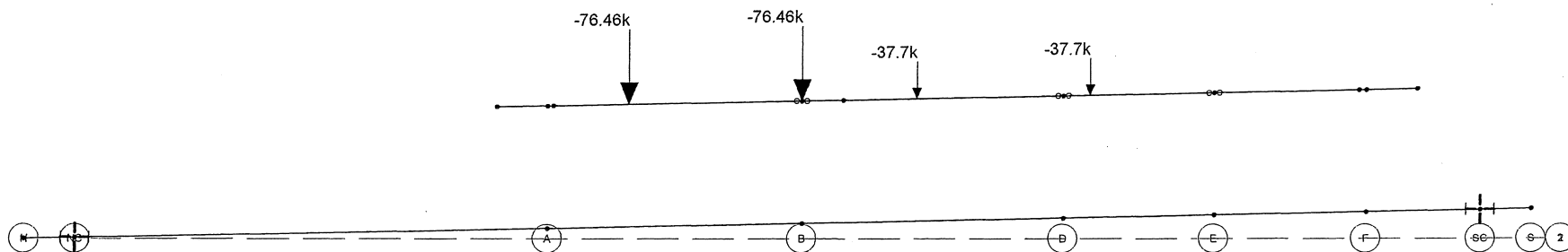
090147

Bridge 69801 3E Pier 2

Apr 19, 2010 at 9:01 AM

090147_3E_P2_Pier.r3d

95-1



W30x10
430.0

Loads: BLC 18, Mom P413 + SU7

LHB

jdf

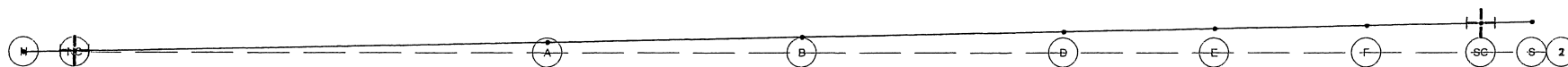
090147

Bridge 69801 3E Pier 2

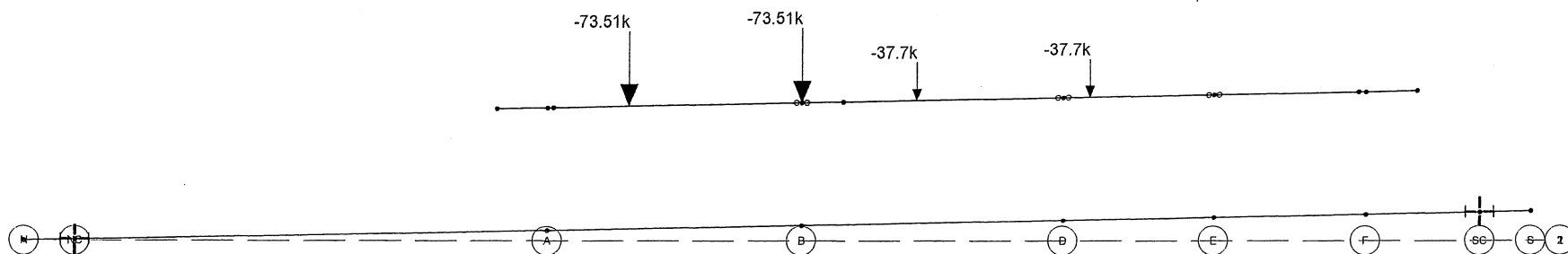
Apr 19, 2010 at 9:01 AM

090147_3E_P2_Pier.r3d

25-2



[Handwritten signature]



1/25/10
5/13/10

Loads: BLC 20, Mom Std C174b + SU7

LHB

jdf

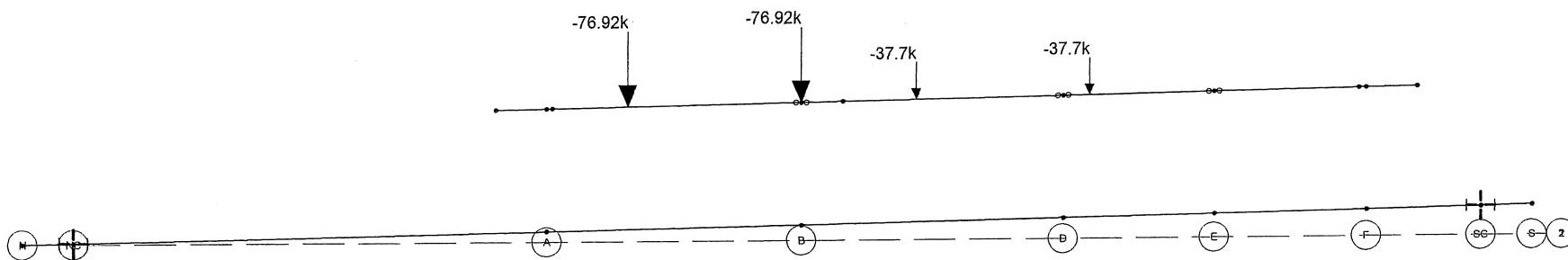
090147

Bridge 69801 3E Pier 2

Apr 19, 2010 at 9:01 AM

090147_3E_P2_Pier.r3d

C-59



1/25m
4/30/10

Loads: BLC 21, Mom Std C198_23 + SU7

LHB

jdf

090147

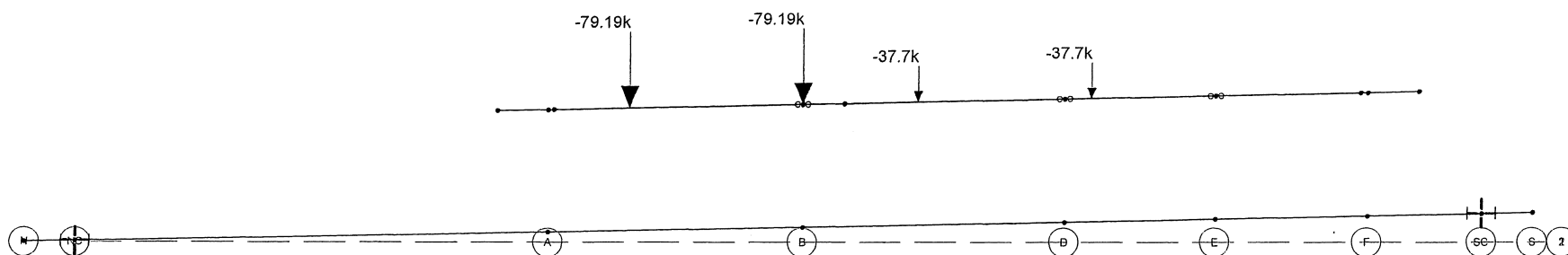
Bridge 69801 3E Pier 2

Apr 19, 2010 at 9:02 AM

090147_3E_P2_Pier.r3d

00-60

Y
L_z L_x



1/30/10
VCSM

Loads: BLC 22, Mom Std 214b + SU7

LHB

jdf

090147

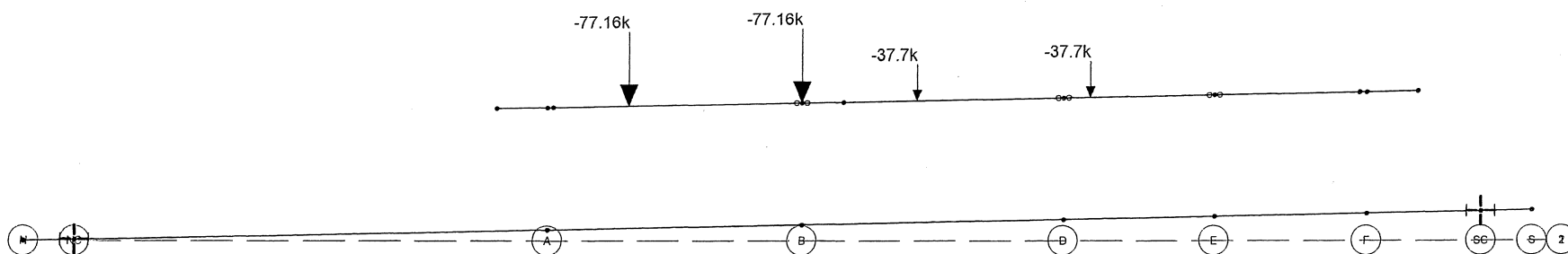
Bridge 69801 3E Pier 2

Apr 19, 2010 at 9:02 AM

090147_3E_P2_Pier.r3d

10-61

Y
Z Lx

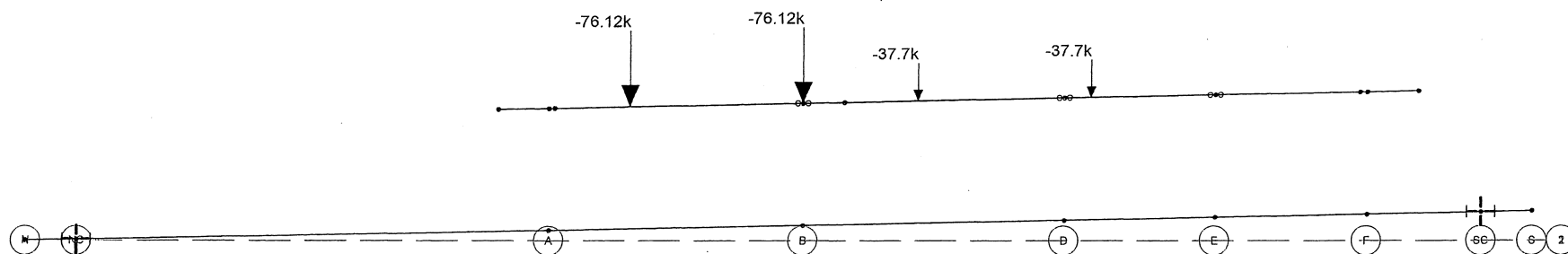


✓cm
4/19/10

Loads: BLC 23, Mom Std C237b + SU7

LHB	Bridge 69801 3E Pier 2	
jdf		Apr 19, 2010 at 9:02 AM
090147		090147_3E_P2_Pier.r3d

C-62



Loads: BLC 24, Mom Std C256b + SU7

LHB

jdf

090147

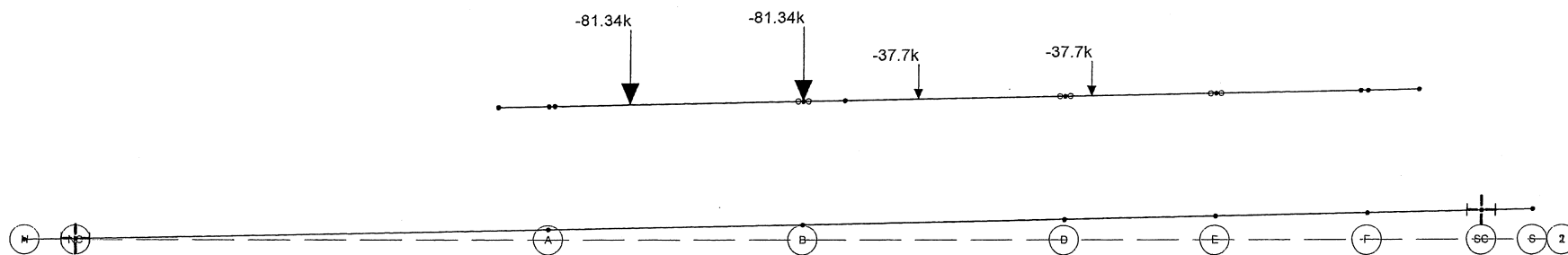
Bridge 69801 3E Pier 2

Apr 19, 2010 at 9:02 AM

090147_3E_P2_Pier.r3d

VCM
4/30/10

C-63



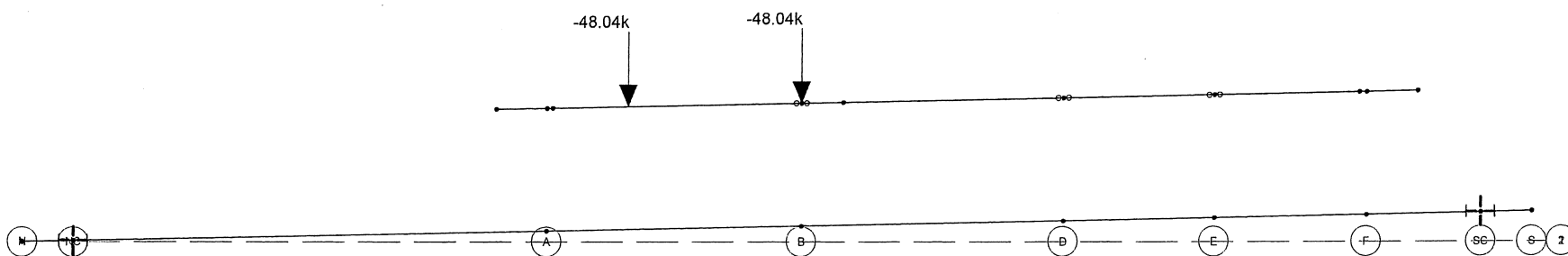
4/19/10
LHB

Loads: BLC 25, Mom Std C200j + SU7

LHB	Bridge 69801 3E Pier 2	
jdf		Apr 19, 2010 at 9:02 AM
090147		090147_3E_P2_Pier.r3d

79-1

Y
L_x



1/5m
4/30/10

Loads: BLC 26, Mom Std A

LHB

jdf

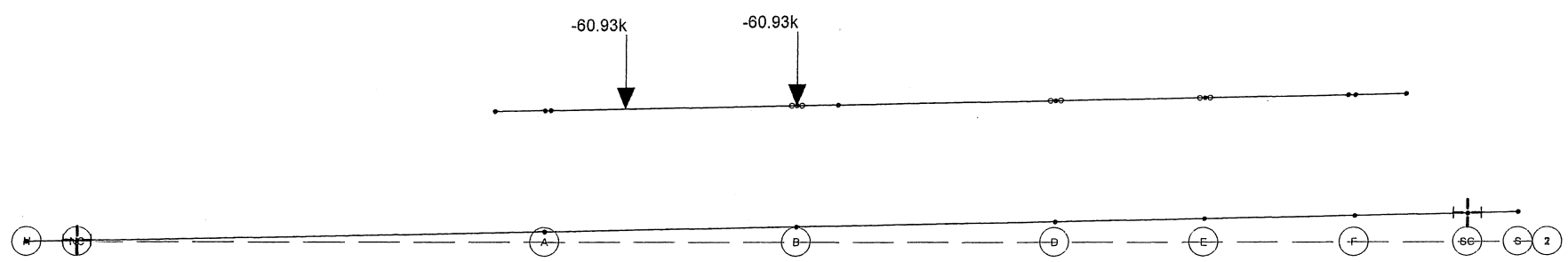
090147

Bridge 69801 3E Pier 2

Apr 19, 2010 at 9:02 AM

090147_3E_P2_Pier.r3d

2-65

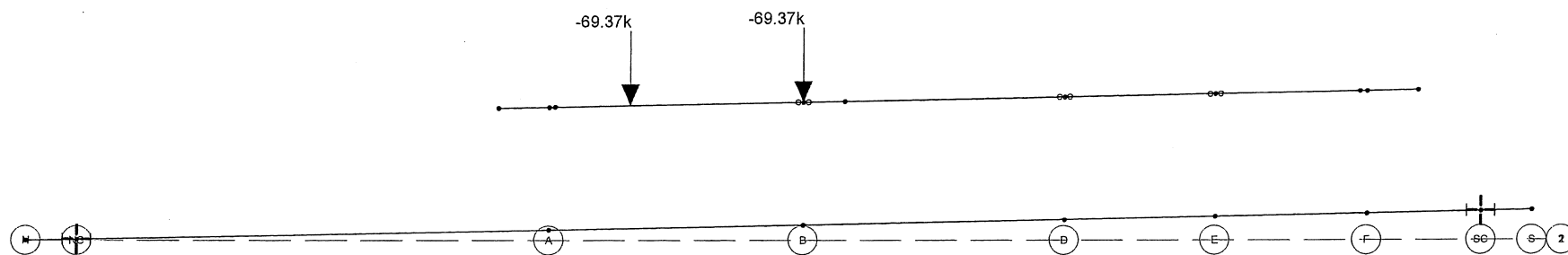


✓ CSM
4/20/10

Loads: BLC 27, Mom Std B

LHB	Bridge 69801 3E Pier 2	
jdf		Apr 19, 2010 at 9:02 AM
090147		090147_3E_P2_Pier.r3d

C-66



✓CSM
4/20/10

Loads: BLC 28, Mom Std C

LHB

jdf

090147

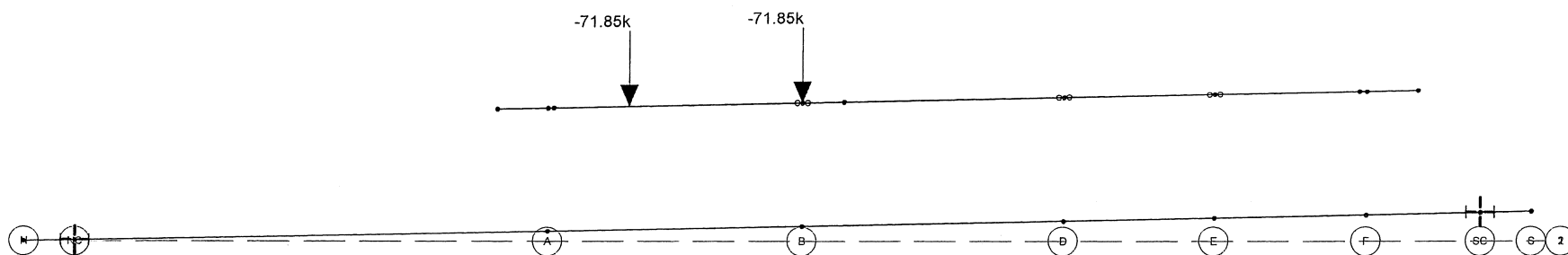
Bridge 69801 3E Pier 2

Apr 19, 2010 at 9:02 AM

090147_3E_P2_Pier.r3d

0-67

Y
Z Lx

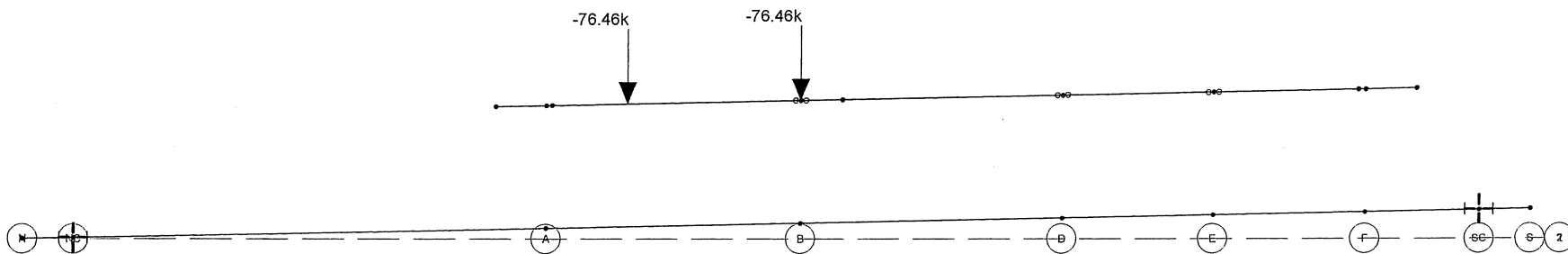


✓asm
4/20/10

Loads: BLC 29, Mom P411

LHB	Bridge 69801 3E Pier 2	
jdf		Apr 19, 2010 at 9:02 AM
090147		090147_3E_P2_Pier.r3d

C-68



vcam
4/13/10

Loads: BLC 30, Mom P413

LHB

jdf

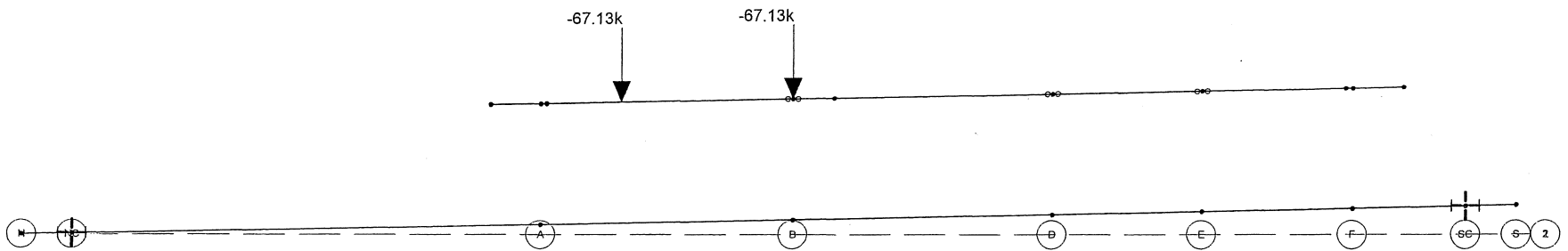
090147

Bridge 69801 3E Pier 2

Apr 19, 2010 at 9:02 AM

090147_3E_P2_Pier.r3d

C-69



✓
4/30/10
LJM

Loads: BLC 31, Mom Std C152b

LHB

jdf

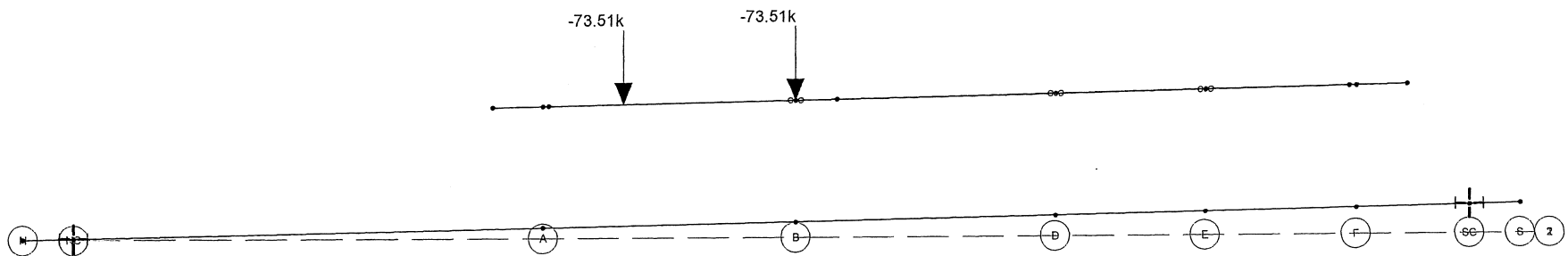
090147

Bridge 69801 3E Pier 2

Apr 19, 2010 at 9:03 AM

090147_3E_P2_Pier.r3d

04-70



Ucm
4/30/10

Loads: BLC 32, Mom Std C174b

LHB

jdf

090147

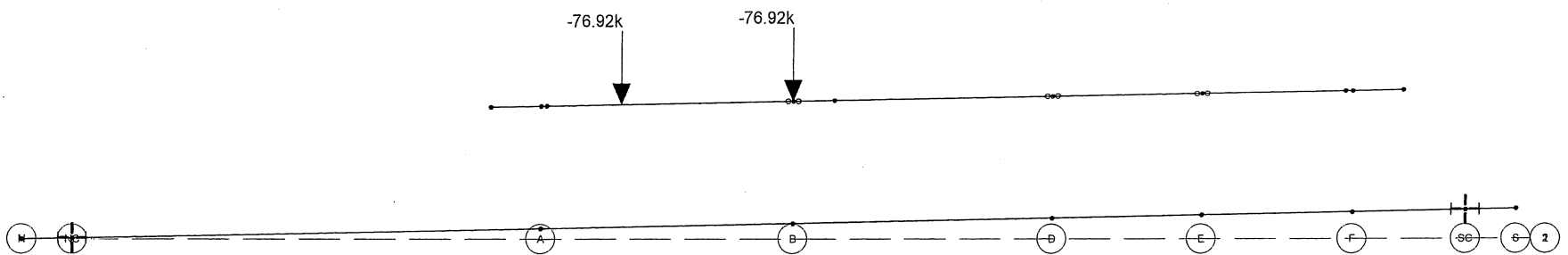
Bridge 69801 3E Pier 2

Apr 19, 2010 at 9:03 AM

090147_3E_P2_Pier.r3d

ht-1

Y
Z L X



1/5m 4/30/10

Loads: BLC 33, Mom Std C198_23

LHB

jdf

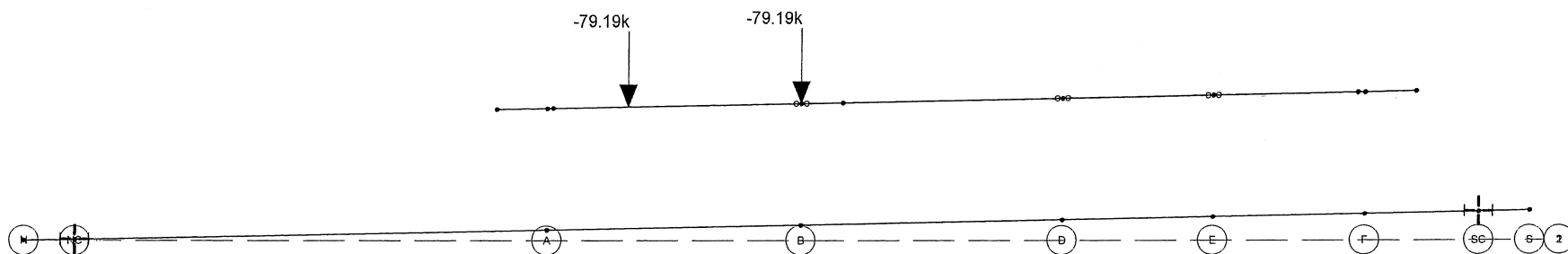
090147

Bridge 69801 3E Pier 2

Apr 19, 2010 at 9:03 AM

090147_3E_P2_Pier.r3d

C-72



1/CSM
4/30/10

Loads: BLC 34, Mom Std 214b

LHB

jdf

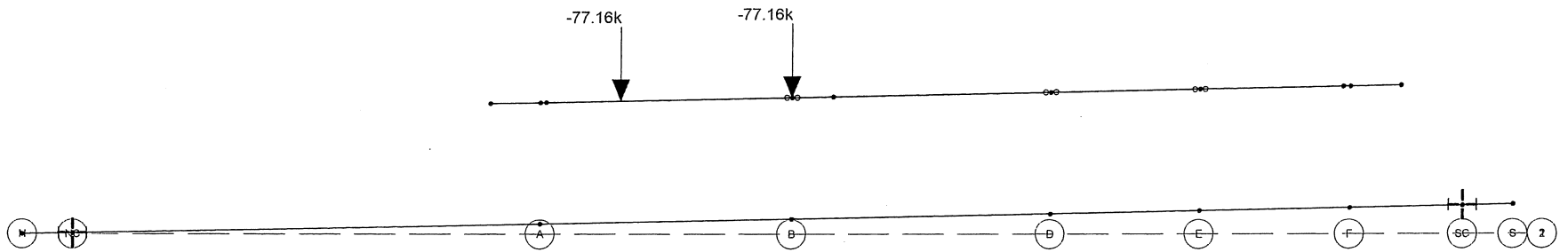
090147

Bridge 69801 3E Pier 2

Apr 19, 2010 at 9:03 AM

090147_3E_P2_Pier.r3d

C-79



WCSM
4/30/10

Loads: BLC 35, Mom Std C237b

LHB

jdf

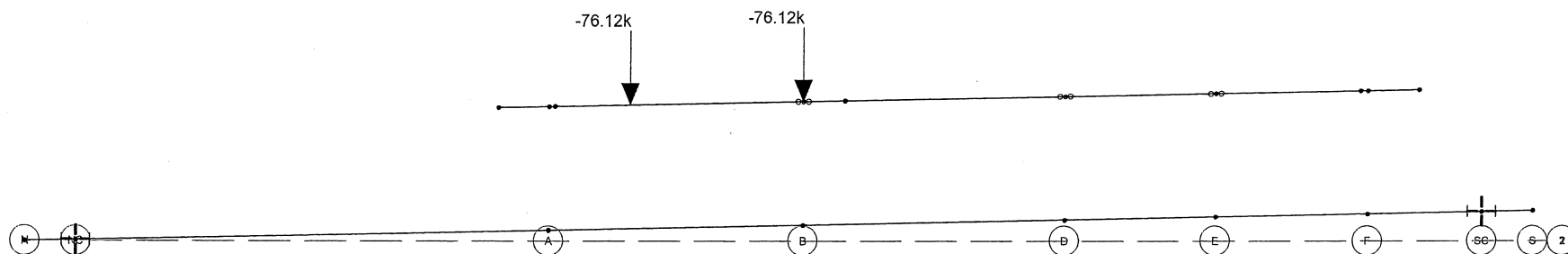
090147

Bridge 69801 3E Pier 2

Apr 19, 2010 at 9:03 AM

090147_3E_P2_Pier.r3d

44-0



✓
4/13/2010
4/13/2010

Loads: BLC 36, Mom Std C256b

LHB

jdf

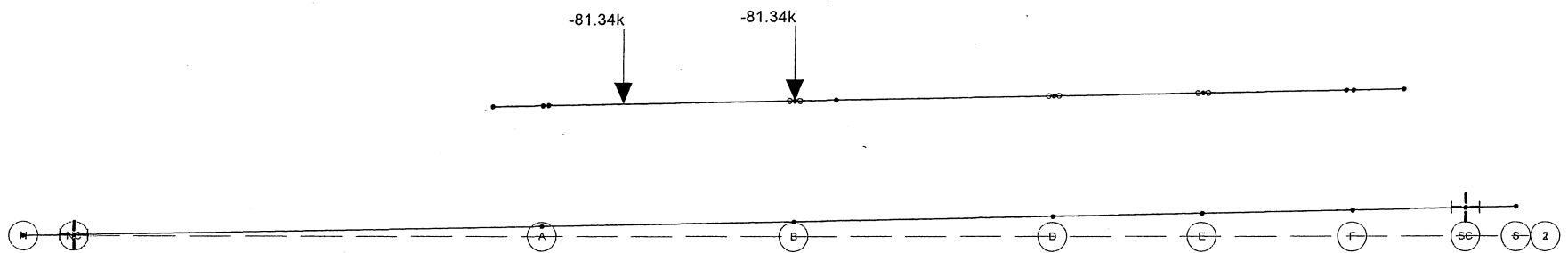
090147

Bridge 69801 3E Pier 2

Apr 19, 2010 at 9:03 AM

090147_3E_P2_Pier.r3d

St-1

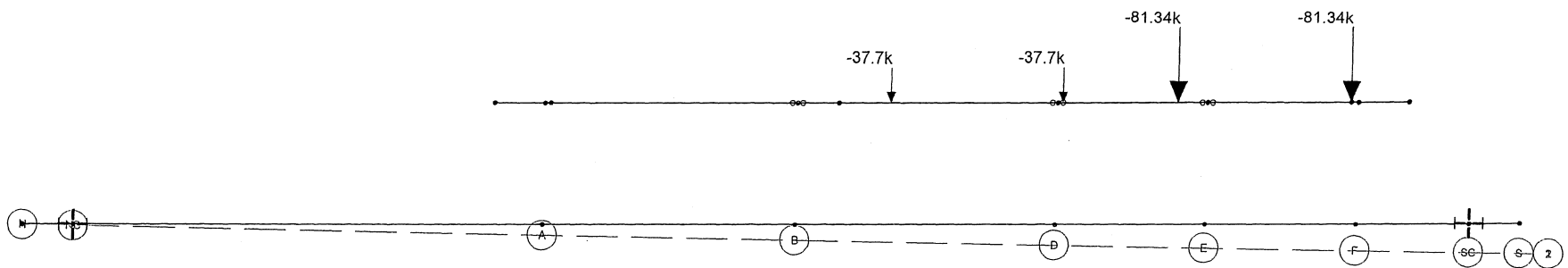


465m
4130/10

Loads: BLC 37, Mom Std C200j

LHB	Bridge 69801 3E Pier 2	
jdf		Apr 19, 2010 at 9:03 AM
090147		090147_3E_P2_Pier.r3d

04-0



dcsm
4/30/10

Loads: BLC 38, Shr Std C200j + SU7

LHB

jdf

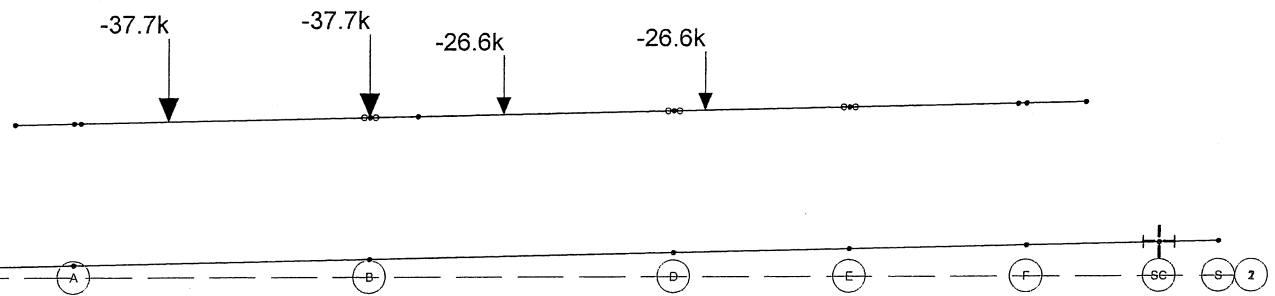
090147

Bridge 69801 3E Pier 2

Apr 19, 2010 at 9:03 AM

090147_3E_P2_Pier.r3d

0-77



16/23/10

Loads: BLC 39, Mom SU4 + SU7

LHB

jdf

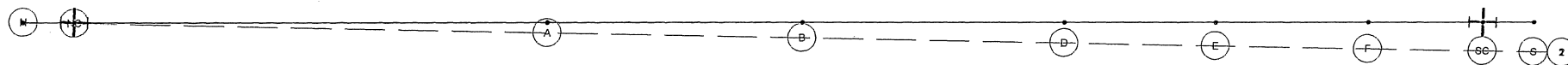
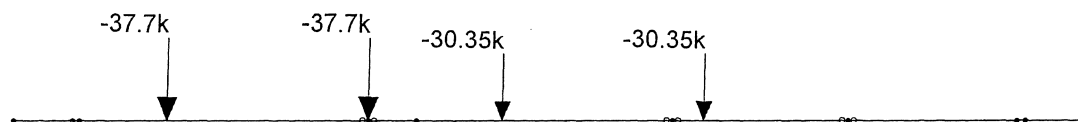
090147

Bridge 69801 3E Pier 2

June 18, 2010 at 10:40 AM

090147_3E_P2_Pier.r3d

C-78



VC5M
6/23/10

Loads: BLC 40, Mom SU5 + SU7

LHB

jdf

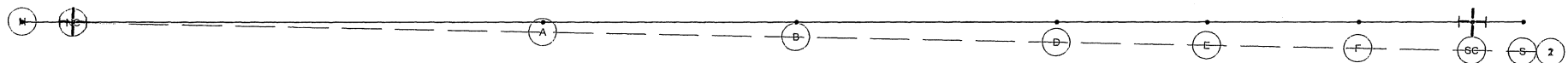
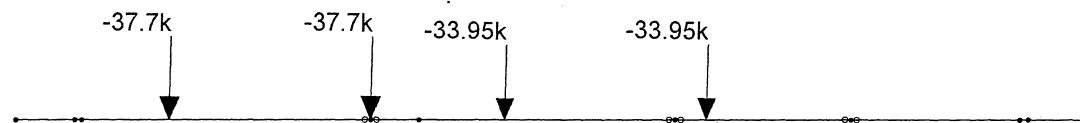
090147

Bridge 69801 3E Pier 2

June 18, 2010 at 10:40 AM

090147_3E_P2_Pier.r3d

C-79



✓
6/23/10
[Signature]

Loads: BLC 41, Mom SU6 + SU7

LHB

jdf

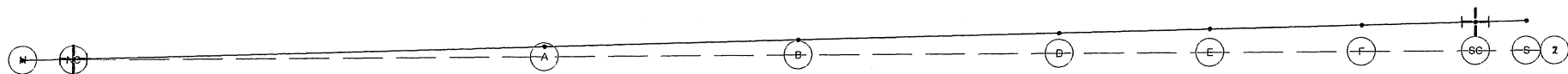
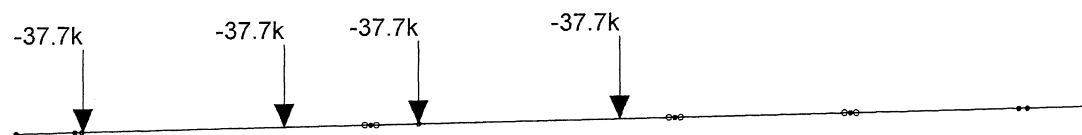
090147

Bridge 69801 3E Pier 2

June 18, 2010 at 10:40 AM

090147_3E_P2_Pier.r3d

C-80



1/31M
6/23/10

Loads: BLC 42, Mom SU7 + SU7

LHB

jdf

090147

Bridge 69801 3E Pier 2

June 18, 2010 at 10:40 AM

090147_3E_P2_Pier.r3d

18-C

69801N-3E-P2
MODEL-RESULT

✓CSM
4/30/10

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

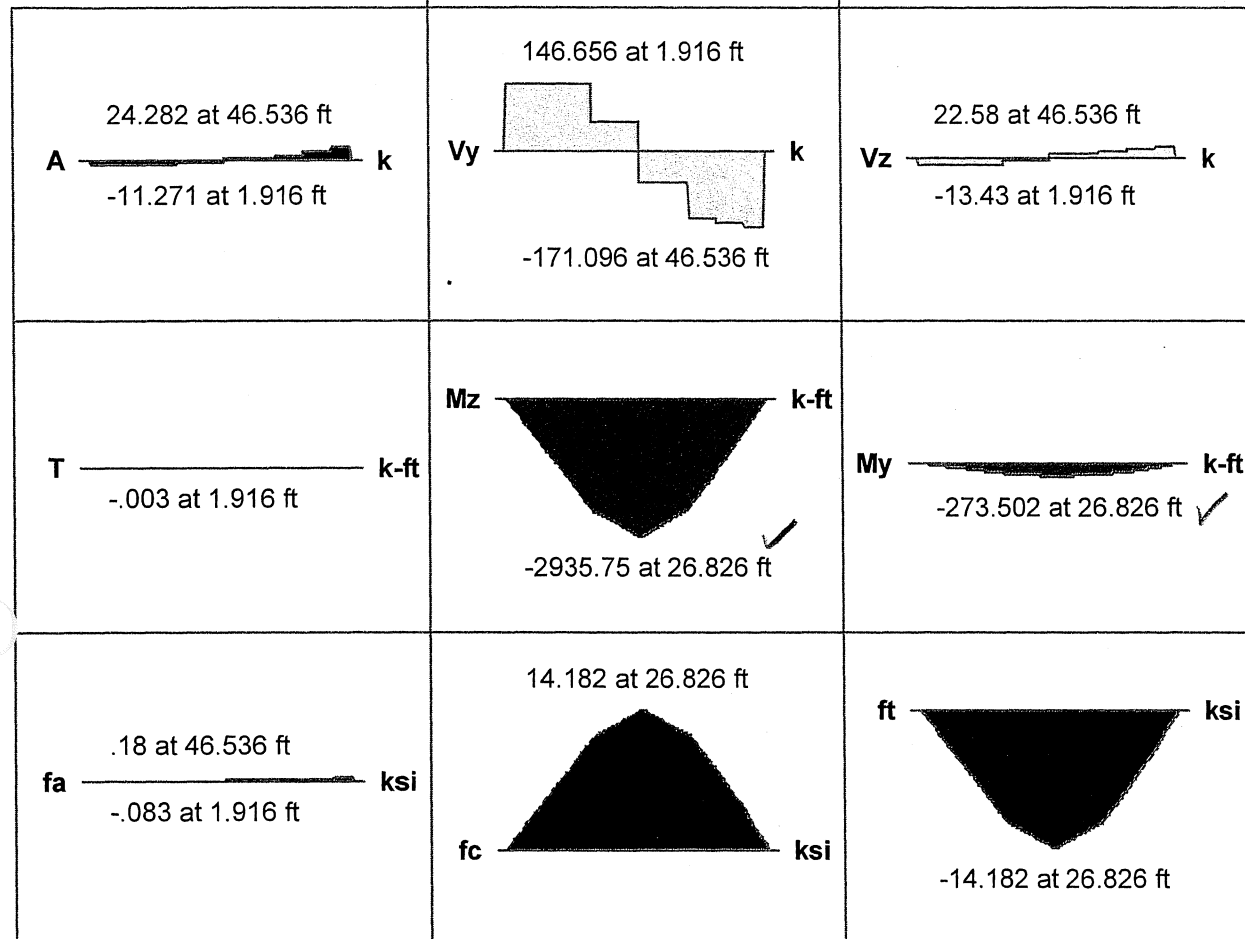
I Joint: **N1**

J Joint: **N4**

LC 1: Max LL Moment

Code Check: **0.000 (bending)**

Report Based On 191 Sections



Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

I Joint: **N1**

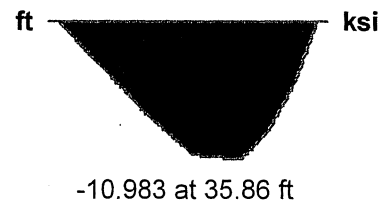
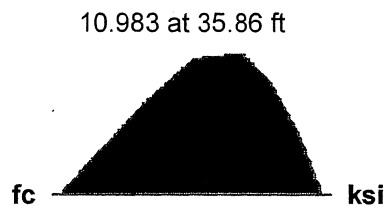
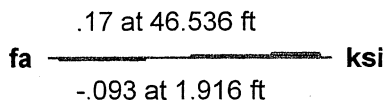
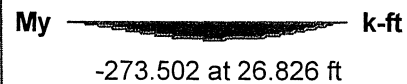
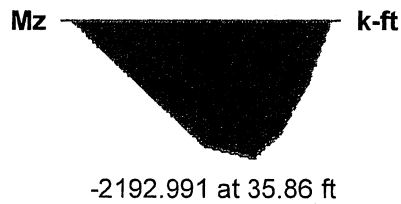
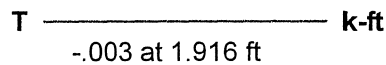
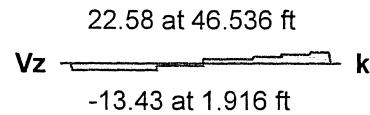
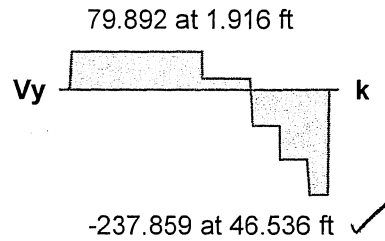
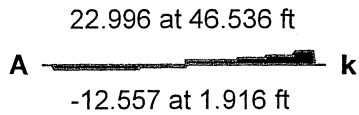
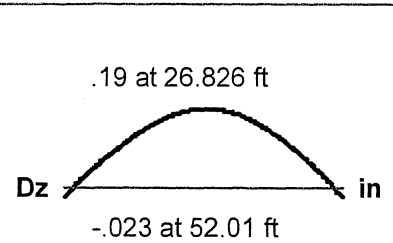
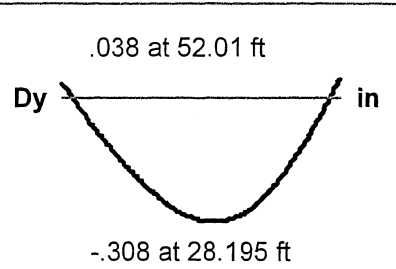
J Joint: **N4**

LC 2: Max LL Shear

Code Check: **0.000 (bending)**

Report Based On 191 Sections

✓ GJM
4/30/10



Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

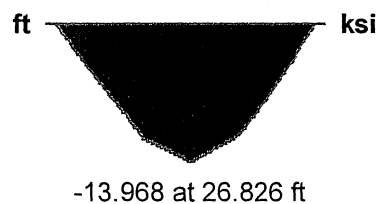
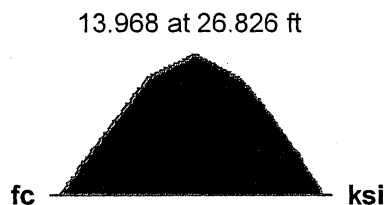
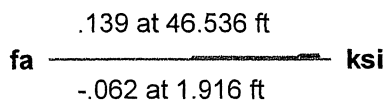
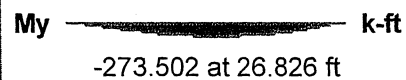
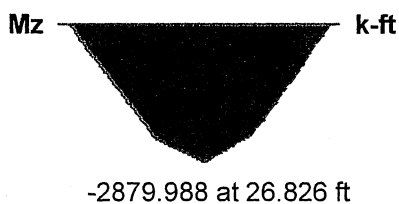
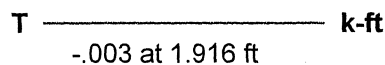
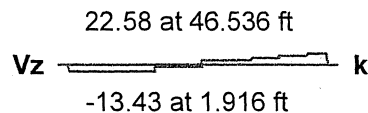
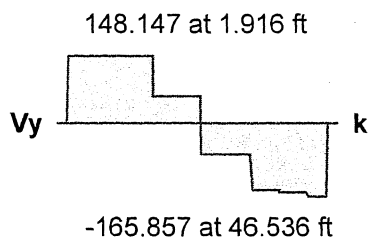
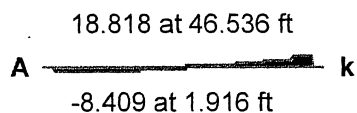
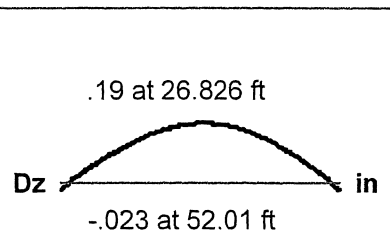
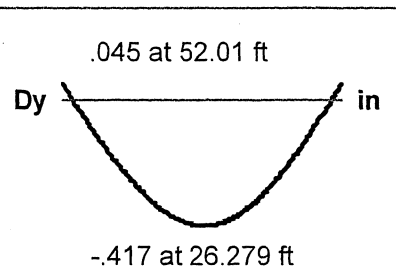
I Joint: **N1**

J Joint: **N4**

LC 1: **Max LL Moment**

Code Check: **0.000 (bending)**

Report Based On 191 Sections



S 5/21/10

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

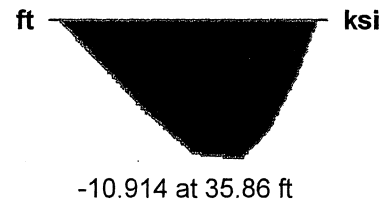
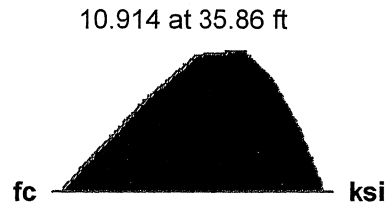
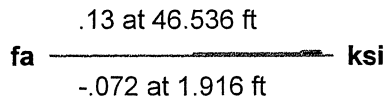
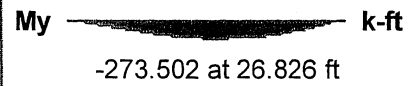
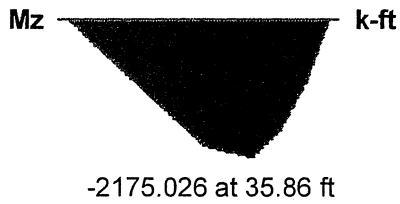
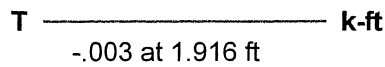
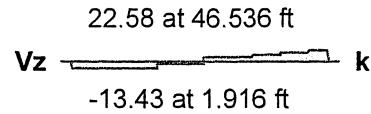
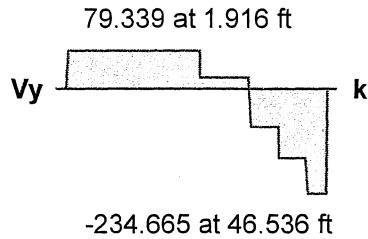
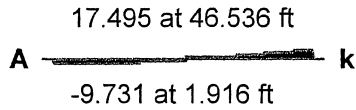
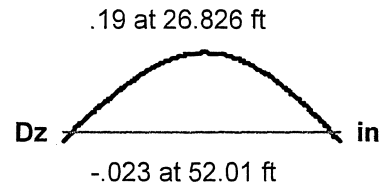
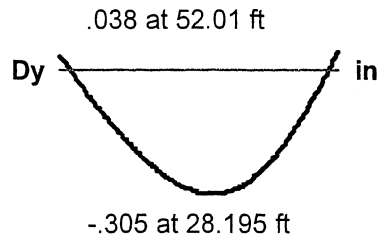
I Joint: **N1**

J Joint: **N4**

LC 2: **Max LL Shear**

Code Check: **0.000 (bending)**

Report Based On 191 Sections



S 5/21/10

VGM
5/3/10

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

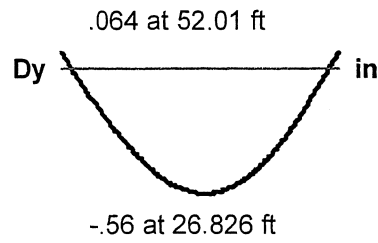
I Joint: **N1**

J Joint: **N4**

LC 3: All Dead Loads

Code Check: **0.000 (bending)**

Report Based On 191 Sections

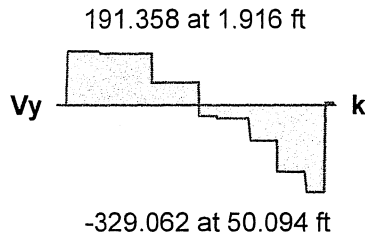


Dz ————— in

A ————— k

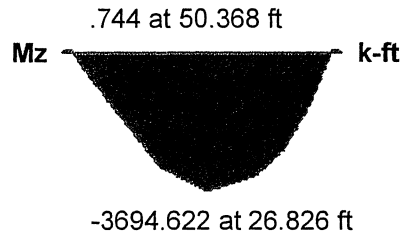
3.777 at 1.916 ft

-6.632 at 50.094 ft



Vz ————— k

T ————— k-ft

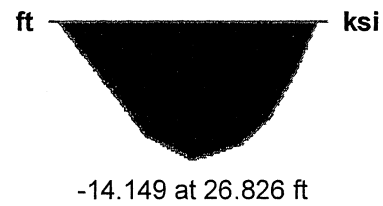
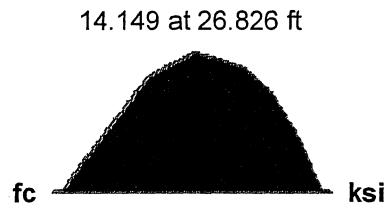


My ————— k-ft

fa ————— ksi

.028 at 1.916 ft

-.049 at 50.094 ft





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PROJECT MnDOT SS-69801N-3E-P2 - Pier model Results
PROJECT # 090147 DATE 4/19/10 BY jdf SHEET NO. 1 OF 1
Verms 5/3/10

See Previous calculations for
LC 4: moving LL one Lane ✓

See Posting & Permit calculations for
Results for LC 5 - LC ¹⁹20, 2 lanes traffic
LC ²⁰21 - LC 31, one Lane traffic
LC 32, Maximum Shear.

69801N-3E-P2
STRENGTH



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PROJECT MnDOT SS-69801N-3E-P2- Flexural Strength LRFD -1
PROJECT # 090147 DATE 1.21.10 BY jadf SHEET NO. 1 OF 5
5/3/10

Follow Article 6.10 in LRFD for I-shaped members.
Check provisions of 6.10.1 and 6.10.6

See 6.10.6 for Strength Limit States ✓

See 6.10.6.2.3 for Non-composite Sections.

- $F_y = 36 \text{ ksi}$ OK ✓
- $\frac{2 D_c}{t_w} = \frac{2 \times \frac{1}{2} \times 60''}{.375} = 160 < 5.7 \sqrt{\frac{E}{F_{yc}}} = 5.7 \sqrt{\frac{29000}{36}} = 161.8$ OK ✓
- $\frac{I_{xc}}{I_{yc}} = 1.0 \geq 0.3$ OK ✓

Since these 3 provisions are met, proportion per Appendix A (not 6.10.8) ✓

A6.1.1

$$M_u + \frac{1}{3} f_y S_{xc} \leq \phi_s m_{nc} \checkmark$$

$$\phi_s = 1.0 \checkmark$$

$m_{nc} \Rightarrow$ See A6.3 $\Rightarrow$ Smaller of A6.3.2 + A6.3.3

$$A6.3.2 \Rightarrow \lambda_f = \frac{b_{fc}}{2 t_{fc}} = \frac{36}{2 \times 1.25} = 14.4 \checkmark$$

$\lambda_{pf} = 0.38 \sqrt{E/F_{yc}}$ = limiting slenderness Ratio for a compact flange (for I-sections per AISC) Use appropriate value for HSS

Sections, from AISC ✓

between webs $= 1.12 \sqrt{E/F_{yc}} = 1.12 \sqrt{\frac{29000}{36}} = 31.8$ ✓

Compare to $b/t = 30/1.25 = 24$ ✓ OK

flange overhang $= 0.38 \sqrt{E/F_{yc}} = 10.79$ ✓

compared to $\frac{b}{t} = 3/1.25 = 2.4$ ✓ OK

Compact Flange $\therefore$ Use A6.3.2-1 ✓

E-1



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PROJECT MnDOT SS-69801N-3E-P2-Flexural Strength LRFD-2

PROJECT # 09D147 DATE 1.21.10 BY jdF SHEET NO. 5/3/10 OF 5

$$M_{nc} = R_{pc} \times M_{yc} \checkmark$$

$$R_{pc} \Rightarrow A6.2.1 \text{ or } A6.2.2 \checkmark \checkmark \text{ non-compact web}$$

Is the web compact?

A6.2.1 $\rightarrow$

$$\frac{2 D_{cp}}{t_w} \leq \lambda_{pw}(D_{cp}) \checkmark$$

$$D_{cp} \Rightarrow D6.3.2, \text{ use } D6.3.2-3 \checkmark$$

$$\text{For } F_{yw} A_w = 36 \times 2 \times 37.5 \times 60 = 16200 \geq |F_{yc} A_c - F_{yt} A_t| \checkmark$$

$$\text{then } D_{cp} = \frac{D}{2 A_w F_{yw}} [F_{yc} A_c + F_{yw} A_w - F_{yt} A_t] \checkmark$$

$$= \frac{D}{2} = \frac{60}{2} = 30" \checkmark$$

$$D_{cp} = 30"$$

$$t_w = .375"$$

$$\lambda_{pw}(D_{cp}) = \frac{\sqrt{E/F_{yc}}}{\left(0.54 \frac{M_p}{R_h M_y} - 0.09\right)^2} \leq \lambda_{rw} \left(\frac{D_{cp}}{D_c}\right)$$

$$M_p = F_y \times Z_x = 36 \times 3431.25 \text{ in}^3 = 123525 \text{ kip-in} \checkmark$$

$R_h \Rightarrow$ Article 6.10.1.10.1, Flange-Strength Reduction Factor. $\checkmark$

$= 1.0$ since homogeneous $\checkmark$

$$M_y = F_y S_x = 36 \times 3133.50 = 112806 \text{ kip-in}$$

$$\lambda_{rw} = 5.7 \sqrt{E/F_{yc}} = 161.8 \checkmark$$

$$D_{cp} = 30" \checkmark$$

$$D_c = 30" \checkmark$$

$$\frac{\sqrt{\frac{29000}{36}}}{\left(0.54 \frac{123525}{1.0 \times 112806} - 0.09\right)^2} = 112.9 \leq 161.8 \times \frac{30}{30} = 161.8 \checkmark$$

E-2



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PROJECT MnDOT SS-69801N-3E-P2-Flexural Strength LRFD-3
PROJECT # 090147 DATE 1.21.10 BY jdf SHEET NO. 1 OF 5
VCm 5/3/10

$$\frac{2D_{cp}}{t_w} = \frac{2 \times 30}{1.375} = 160 > \lambda_{pw(D_{cp})} = 112.9$$

" web is not compact, go to
A6.2.2 ✓

A6.2.2: Non compact web section

$$\lambda_w = \frac{2D}{t_w} = \frac{2 \times 30}{1.375} = 160 \checkmark$$

$$\lambda_{rw} = 5.7 \sqrt{\frac{E}{F_{yc}}} = 161.8 \checkmark$$

Since $\lambda_w < \lambda_{rw}$ we are non-compact. ✓

$$R_{pc} = \left[1 - \left(1 - \frac{R_h m_{yc}}{m_p} \right) \left(\frac{\lambda_w - \lambda_{pw(D_c)}}{\lambda_{rw} - \lambda_{pw(D_c)}} \right) \right] \frac{m_p}{m_{yc}} \leq \frac{m_p}{m_{yc}}$$

$$R_h = 1.0 \checkmark$$

$$m_{yc} = m_y = 112806 \text{ kip}\cdot\text{in} \checkmark$$

$$m_p = 123525 \text{ kip}\cdot\text{in} \checkmark$$

$$\lambda_w = 160 \checkmark$$

$$\lambda_{rw} = 161.8 \checkmark$$

$$\lambda_{pw(D_c)} = \lambda_{pw(D_{cp})} \left(\frac{D_c}{D_{cp}} \right)^{1.0} \leq \lambda_{rw} \checkmark$$

$$= 112.9 \checkmark$$

$$R_{pc} = \left[1 - \left(1 - \frac{1.0 \times 112806}{123525} \right) \left(\frac{160 - 112.9}{161.8 - 112.9} \right) \right] \frac{123525}{112806} = 1.003 \leq 1.095 \checkmark$$

$$m_{yc} = 112806 \text{ kip}\cdot\text{in} \checkmark$$

$$m_{nc} = 1.003 \times 112806 = 113144 \text{ kip}\cdot\text{in} \text{ per A6.3.2} \checkmark$$



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PROJECT MDOT SS - G9801N-3E-P2 - Flexural Strength LRFD - 4

PROJECT # 090147 DATE 1.27.10 BY jdP SHEET NO. 5/31/10 OF 5

Ab. 3.3 =>

$$L_b = 195'' \checkmark \text{ (see } f_e \text{ calc)}$$

$$L_p = 283'' \checkmark \text{ (see } f_e \text{ calc)}$$

$$L_b \leq L_p \therefore \text{ Use eq Ab. 3.3-1,}$$

$$M_{nc} = R_{pc} M_{yc} \checkmark$$

$$R_{pc} \Rightarrow \text{ See Ab. 2.1 or Ab. 2.2}$$

↑ applicable since
non-compact web.

$$R_{pc} = 1.003 \checkmark \text{ (see pg 3)}$$

$$M_{yc} = 112806 \text{ kip}\cdot\text{in} = F_y S_x \checkmark$$

$$M_{nc} = 1.003 \times 112806 = 113144 \text{ kip}\cdot\text{in} \text{ per Ab. 3.3}$$

(matches Ab. 3.2) ✓

Ab. 4 => Flexural Resistance based on tension Flange
Yielding

$$M_{nt} = R_{pt} M_{yt}$$

$$R_{pt} \Rightarrow \text{ See Ab. 2.1 or Ab. 2.2 } \checkmark$$

↑ controls.

$$R_{pt} = R_{pc} \text{ since } M_{yc} = M_{yt}$$

$$R_{pt} = 1.003 \checkmark$$

$$M_{yt} = S_x \times F_y = 112806 \text{ kip}\cdot\text{in} \checkmark$$

$$M_{nt} = 1.003 \times 112806 = 113144 \text{ kip}\cdot\text{in} \checkmark$$

$$M_n = 113144 \text{ kip}\cdot\text{in} \checkmark$$



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PROJECT MnDOT SS-69801N-3E-P2 - Flexural Strength LRFD - 5

PROJECT # 090147 DATE 1.21.10 BY jdf SHEET NO. ✓ 5/11/10 OF 5/11/10

f_{ℓ} = flange Lateral bending stress, Article 6.10.1.6

Use first-order elastic analysis if:

$$L_b \leq 1.2 L_p \sqrt{\frac{C_b R_b}{m_u / m_{yc}}} \quad \checkmark$$

$$L_b = \text{unbraced length} = 16.25' = 195'' \quad \checkmark$$

$$L_p \Rightarrow \text{Article 6.10.8.2.3} \\ = 11.0 \cdot r_t \sqrt{E / F_{yc}} \quad \checkmark$$

$$r_t = \frac{b_{fc}}{\sqrt{12 \left(1 + \frac{1}{3} \frac{D_t t_w}{b_{fc} t_{fc}} \right)}} = \frac{36}{\sqrt{12 \left(1 + \frac{1}{3} \frac{30 \times 1.375}{36 \times 1.25} \right)}} \\ = 9.98'' \quad \checkmark \quad (\text{conservative})$$

$$L_p = 1.0 \times 9.98 \sqrt{\frac{29000}{36}} = 283'' \quad \checkmark$$

$$C_b \Rightarrow \text{See A6.3.3, use } 1.0 \quad \checkmark \quad (\text{conservative})$$

$$R_b \Rightarrow \text{See 6.10.1.10.2}$$

$$\text{Since } \frac{2 D_c}{t_w} = 160 \leq \lambda_{rw} = 161.8, \quad R_b = 1.0 \quad \checkmark$$

$$\text{Assume } m_u / m_{yc} = 1.00 \quad \checkmark \quad (\text{conservative})$$

$$L_b = 195'' \leq 1.2 \times 283 \sqrt{\frac{1.0 \times 1.0}{1.0}} = 283'' \quad \checkmark \quad \therefore \text{use first-order analysis.}$$

$$f_{\ell} = \frac{m_{ux}}{S_y} \quad \text{by first-order analysis}$$

M_u varies, See Risa

Project: MnDOT Special Structures - 69801J - Bridge 3E Pier 2
 Date: 21-May-10
 RisaSection Name: BR3E-P2-1

Project Number: 90147
 Eng: JDF
 Checked By: Cjm

on file + updated
 per findings

Spreadsheet has been created for use with Box Steel Beam Caps Only.
 For sections with compact, non-compact, or slender flanges.
 For sections with compact or non-compact webs.

Yield Strengths:	F _y :	36 ksi	F _y :	36 ksi	F _w :	36 ksi
Modulus of Elasticity:	E:	29000 ksi				
Compression Flange:	b _{fc} :	36 in	t _{fc} :	1.25 in		
Tension Flange:	b _{tt} :	36 in	t _{tt} :	1.25 in		
Webs:	D:	60 in	t _w :	0.375 in		
Clear Space between webs:		30 in				
Unbraced Length:	L _b :	195 in				
Neutral Axis:	Y-bar (Comp)	31.25 in	Y bar (Ten)	31.25 in	X-bar	18 in
Moment of Inertia:	I _{xx}	97920 in ⁴	I _{yy}	20100 in ⁴		
Section Modulus:	S _x (Comp)	3133.5 in ³	S _x (Ten)	3133.5 in ³	S _y	1116.68 in ³
Radius:	r _x	26.932 in	r _y	12.202 in		
Plastic Modulus:	Z _x	3431.25 in ³	Z _y	1493.44 in ³		
Torsional Constant:	J	48.22 in ⁴				

Based on AASHTO LRFD Bridge Design Specifications, Customary U.S. Units, 4th Edition, 2007, With 2008 & 2009 Interim Revisions

Article 6.10 - I-Section Flexural Members

Article 6.10.6 - Strength Limit State

Article 6.10.6.2 - Flexure

Article 6.10.6.2.3 - Composite Sections in Negative Flexure and Noncomposite Sections

If the following conditions are met, proportion the section according to the provisions for compact or noncompact web sections specified in Appendix A. Otherwise, the section shall be proportioned according to provisions specified in Article 6.10.8.

Depth of Web in Comp:	D _c :	30 in
Moment of Inertia Comp Flange:	I _{yc} :	4860.0 in ⁴
Moment of Inertia Tens Flange:	I _{yt} :	4860.0 in ⁴

Yield Strength Limit:	Max F _y :	36 ksi	Limit F _y :	70 ksi	OK - Keep Going
Web Slenderness Limit (slender):	2*D _c /t _w :	160	5.7*(E/F _{yc}) ^{0.5} :	161.8 ksi	OK - Keep Going
Flange Ratio:	I _{yc} /I _{yt} :	1	Limit:	0.3	OK - Keep Going

Appendix A6: Flexural Resistance of Straight Composite I-Sections in Negative Flexure and Straight Non-composite I-sections with Compact or Noncompact Webs

Article A6.1 - General - Same as Article 6.10.6.2.3 above.

Article A6.1.1 - Sections with Discretely Braced Compression Flanges

At the limit state the following requirement shall be satisfied: $M_u + (1/3) * f_i * S_{xc} \leq \phi(f) * M_{nc}$

Bending Moment - Major Axis:	M _u :	Varies, see Risa 3D
Flange Lateral Bending Stress:	f _i :	See Article 6.10.1.6

Flange lateral bending stress, f_i, may be determined directly from first-order elastic analysis in discretely braced compression flanges for which: $b \leq 1.2 * L_p * (C_b * R_b / (M_u / M_{yc}))^{0.5}$

Limiting Unbraced Length:	L _p :	See Article 6.10.8.2.3
	L _p :	1.0 * r _t * (E/F _{yc}) ^{0.5}
Effective Radius of Gyration:	r _t :	$b_{fc} / (12 * (1 + (1/3) * (D_c * t_w / (b_{fc} * t_{fc}))))^{0.5}$
	r _t :	10.0 in
	L _p :	283.4 in

Moment Gradient Modifier:	C _b :	See Article 6.10.8.2.3 or Article A6.3.3, as applicable
	C _b :	1 Since M _{mid} /M ₂ > 1 at most situations. May be conservative at some locations.

Web Load-shedding Factor:	R _b :	See Article 6.10.1.10.2 1.0 if 2*D _c /t _w ≤ λ _{da} (rw)
Web Slenderness Limit (noncompact):	λ _{da} (rw):	5.7*(E/F _{yc}) ^{0.5} 161.8
	2*D _c /t _w :	160
	R _b :	1

Major Axis Bending to Yield Moment:	M _u /M _{yc} :	1 Assume 1.0. Conservative.
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Unbraced Limit for f _i :	L _b :	195 in	1.2 * L _p * (C _b * R _b / (M _u / M _{yc})) ^{0.5}	340.1 in	OK - Keep Going, First-order elastic analysis
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Flange Lateral Bending Stress:	f _i :	M _u /S _y First-order elastic analysis
Factored Weak Axis Bending Moment:	M _{uy} :	See Risa

Resistance Factor for Flexure:	φ(f):	1 As specified in Article 6.5.4.2
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Nominal Flexural Resistance:	M _{nc} :	See Article A6.3
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Nominal Flexural Resistance based on compression flange, M_{nc}, shall be taken as the smaller of the local buckling resistance determined as specified in Article A6.3.2, and the lateral torsional buckling resistance determined as specified in Article A6.3.3.

Article A6.3.2 - Local Buckling Resistance:

Determine if the compression flange is compact:

Limiting Slenderness Ratio for Compact Flange: Use two ratios, one for the flange between the webs, and the other for the flange overhang. See AISC Table B4.1.

Case 12: Uniform compression in flanges of rectangular box and hollow structural sections of uniform thickness subject to bending or compression.

λ_{mf}	b/t	24.00 <i>Clear space between webs/t</i>
λ_{mpf}	$1.12*(E/F_y)^{.5}$	31.79
λ_{mrf}	$1.40*(E/F_y)^{.5}$	39.74

Case 12: Compact Flange

Case 2: Flexure in flanges of doubly and singly symmetric I-shaped built-up sections.

λ_{mf}	b/t	2.25 <i>Flange overhang measured from mid-web/t</i>
λ_{mpf}	$0.38*(E/F_y)^{.5}$	10.79
λ_{mrf}	$0.95*(E*k_c/F_y)^{.5}$	19.07

k_c : $4/(D/t_w)^{.5}$: 0.32 but $0.35 \leq k_c \leq 0.76$

k_c : 0.35

F_y : smaller of 3 items below:

$0.7*F_{yc}$: 25.2 ksi

$R_h*F_{yt}*S_{xt}/S_{xc}$: 36.0 ksi

F_{yw} : 36.0 ksi

but not less than:

$0.5*F_{yc}$: 18.0 ksi

F_y : 25.2 ksi

Case 2: Compact Flange

If Case 2 Flange is Noncompact or Slender, then check λ_{md} s used.

Compression Flange: Compact Flange *Worse condition of Case 12 and Case 2*

Nominal Flexural Resistance: M_{nc} : $M_{nc} = R_{pc}*M_{yc}$

Equation A6.3.2-1 or A6.3.2-2

Web Plastification Factor - Comp: R_{pc} : See Article A6.2.1 or A6.2.2, as applicable

Article A6.2.1 - Compact Web Sections:

Determine if the web is compact:

Compact if $2*D_{cp}/t_w \leq \lambda_{md}(pw(D_{cp}))$

Depth of Web in Comp at Plastic Mom: D_{cp} : See Article D6.3.2

For non composite sections where: $F_{yw}*A_w \geq |F_{yc}*A_c - F_{yt}*A_t|$, $D_{cp} = D/(2*A_w*F_{yw})[F_{yt}*A_t + F_{yw}*A_w - F_{yc}*A_c]$, otherwise $D_{cp} = D$.

$F_{yw}*A_w$: 1620 kip $|F_{yc}*A_c - F_{yt}*A_t|$: 0 kip *Use $2*D*t_w$ for A_w due to two webs*

D_{cp} : 30.0 in

Limiting Slenderness Ratio for Compact Web:

$\lambda_{md}(pw(D_{cp}))$: $((E/F_y)^{.5})/(0.54*(M_p/(R_h*M_y)) - 0.09)^{.2} \leq \lambda_{md}(rw)*(D_{cp}/D_c)$

Plastic Moment M_p : See Article D6.1

Article D6.1 - Plastic Moment:

M_p : See Table D6.1-2, Case I

M_p : $P_w/(2*D)*[Y(\bar{b})^2 + (D - Y(\bar{b}))^2] + [P_{rt}*d_{rt} + P_{rb}*d_{rb} + P_t*d_t + P_c*d_c]$

$Y(\bar{b})$: $(D/2)*[(P_c - P_t - P_{rt} - P_{rb})/P_w + 1]$

P_c : $F_{yc}*b_c*t_c$: 1620 kip

P_t : $F_{yt}*b_t*t_t$: 1620 kip

P_{rt} : 0 *no concrete reinforcing steel*

P_{rb} : 0 *no concrete reinforcing steel*

P_w : $F_{yw}*D*t_w$: 1620 kip

This is multiplied by 2 due to two webs

$Y(\bar{b})$: 30

d_{rt} : 0 *no concrete reinforcing steel*

d_{rb} : 0 *no concrete reinforcing steel*

d_t : $Y(\bar{b}) + t_t/2$: 30.625 in

d_c : $D - Y(\bar{b}) + t_c/2$: 30.625 in

M_p : 123525 kip-in

Hybrid factor: R_h : See Article 6.10.1.10.1

R_h : 1

Yield Moment

M_y : Smaller of M_{yc} and M_{yt} , See Article D6.2.

M_{yc} : $F_{yc}*S_{xc}$: 112806 kip-in

M_{yt} : $F_{yt}*S_{xt}$: 112806 kip-in

M_y : 112806 kip-in

$\lambda_{md}(pw(D_{cp}))$: smaller of $((E/F_y)^{.5})/(0.54*(M_p/(R_h*M_y)) - 0.09)^{.2}$: 112.9

$\lambda_{md}(rw)*(D_{cp}/D_c)$: 161.8

$\lambda_{md}(pw(D_{cp}))$: 112.9

Web Compact? $2*D_{cp}/t_w$: 160.0

$\lambda_{md}(pw(D_{cp}))$: 112.9

Web is not compact, See Article A6.2.2

Web Plastification Factor - Comp: R_{pc} : M_p/M_{yc} : 1.095

Article A6.2.2 - Noncompact Web Sections

Verify the webs are non-compact and not slender.

If $\lambda_{md}(w) < \lambda_{md}(rw)$, then noncompact.

Slenderness ratio for web: $\lambda_{md}(w)$: $2*D_c/t_w$: 160

Limiting Slenderness ratio for noncompact web: $\lambda_{md}(rw)$: $5.7*(E/F_y)^{.5}$: 161.8

Noncompact vs Slender webs? Noncompact, keep going

Web Plastification Factor - Comp: R_{pc} : smaller of $[1 - (1 - R_h*M_{yc}/M_p)] * ((\lambda_{md}(w) - \lambda_{md}(pw(D_c)))/(\lambda_{md}(rw) - \lambda_{md}(pw(D_c)))) * (M_p/M_{yc})$

Limiting Slenderness ratio for a compact web:

$\lambda(pw(Dc))$: smaller of $\lambda(pw(Dcp)) * (Dc/Dcp)$
 $\lambda(pw(Dcp)) * (Dc/Dcp)$ 112.9
 $\lambda(pw(Dc))$: 112.9

$[1 - (1 - (R_h * Myc / Mp)) * ((\lambda(w) - \lambda(pw(Dc))) / (\lambda(rw) - \lambda(pw(Dc))))] * (Mp / Myc)$ 1.003
 Mp / Myc 1.095

R_{pc} : 1.003 *Use if Web is Noncompact*

Web Plastification Factor Comp: R_{pc} (FINAL): 1.003

Nominal Flexural Resistance - comp: M_{nc} : 113196 kip-in Per Article A6.3.2

Article A6.3.3 - Lateral Torsional Buckling Resistance:

If $L_b \leq L_p$, then $M_{nc} = R_{pc} * Myc$
 $L_b \leq L_p$, therefore $M_{nc} = R_{pc} * Myc$ (Same as A6.3.2)
 M_{nc} : 113196 kip-in Per Article A6.3.3

Nominal Flexural Resistance - Comp: M_{nc} : 113196 kip-in ✓

A6.4 - Flexural Resistance Based on Tension Flange Yielding

Nominal Flexural Resistance - tension: M_{nt} : $R_{pt} * Myt$

Web Plastification Factor - Ten: R_{pt} : See Article A6.2.1 or Article A6.2.2 as applicable.

Article A6.2.1 - Compact Web Sections

R_{pt} Mp / Myt : 1.095 *Use if Web is Compact*

Article A6.2.2 - Noncompact Web Sections

R_{pt} : smaller of $[1 - (1 - (R_h * Myt / Mp)) * ((\lambda(w) - \lambda(pw(Dc))) / (\lambda(rw) - \lambda(pw(Dc))))] * (Mp / Myt)$
 Mp / Myt

$[1 - (1 - (R_h * Myt / Mp)) * ((\lambda(w) - \lambda(pw(Dc))) / (\lambda(rw) - \lambda(pw(Dc))))] * (Mp / Myt)$ 1.003
 Mp / Myt 1.095

R_{pt} : 1.003 *Use if Web is Noncompact*

R_{pt} (FINAL): 1.003

Nominal Flexural Resistance - Ten: M_{nt} : 113196 kip-in ✓

Project: MnDOT Special Structures - 69801J - Bridge 3E Pier 2
 Date: 4-Feb-10
 RisaSection Name: BR3E-P2-1

Project Number: 90147
 Eng: JDF
 Checked By:

Spreadsheet has been created for use with Box Steel Beam Caps Only.
 For sections with compact, non-compact, or slender flanges.
 For sections with compact or non-compact webs.

Yield Strengths:	F _{yc} :	36 ksi	F _{yt} :	36 ksi	F _{yw} :	36 ksi
Modulus of Elasticity:	E:	29000 ksi				
Compression Flange:	b _{fc} :	36 in	t _{fc} :	1.25 in		
Tension Flange:	b _{ft} :	36 in	t _{ft} :	1.25 in		
Webs:	D:	60 in	tw:	0.375 in		
Clear Space between webs:		30 in				
Unbraced Length:	L _b :	195 in				
Neutral Axis:	Y-bar (Comp)	31.25 in	Y bar (Ten)	31.25 in	X-bar	18 in
Moment of Inertia:	I _{xx}	97920 in ⁴	I _{yy}	20100 in ⁴		
Section Modulus:	S _x (Comp)	3133.5 in ³	S _x (Ten)	3133.5 in ³	S _y	1116.68 in ³
Radius:	r _x	26.932 in	r _y	12.202 in		
Plastic Modulus:	Z _x	3431.25 in ³	Z _y	1493.44 in ³		
Torsional Constant:	J	48.22 in ⁴				

Based on AASHTO LRFD Bridge Design Specifications, Customary U.S. Units, 4th Edition, 2007, With 2008 & 2009 Interim Revisions
 Article 6.10 - I-Section Flexural Members
 Article 6.10.6 - Strength Limit State
 Article 6.10.6.2 - Flexure
 Article 6.10.6.2.3 - Composite Sections in Negative Flexure and Noncomposite Sections

If the following conditions are met, proportion the section according to the provisions for compact or noncompact web sections specified in Appendix A. Otherwise, the section shall be proportioned according to provisions specified in Article 6.10.8.

Depth of Web in Comp:	D _c :	30 in
Moment of Inertia Comp Flange:	I _{yc} :	4860.0 in ⁴
Moment of Inertia Tens Flange:	I _{yt} :	4860.0 in ⁴

Yield Strength Limit:	Max F _y :	36 ksi	Limit F _y :	70 ksi	OK - Keep Going
Web Slenderness Limit (slender):	2*D _c /tw:	160	5.7*(E/F _{yc}) ^{.5} :	161.8 ksi	OK - Keep Going
Flange Ratio:	I _{yc} /I _{yt} :	1	Limit:	0.3	OK - Keep Going

Appendix A6: Flexural Resistance of Straight Composite I-Sections in Negative Flexure and Straight Non-composite I-sections with Compact or Noncompact Webs
 Article A6.1 - General - Same as Article 6.10.6.2.3 above.
 Article A6.1.1 - Sections with Discretely Braced Compression Flanges

At the limit state the following requirement shall be satisfied: $M_u + (1/3) * f_i * S_{xc} \leq \phi(f) * M_{nc}$

Bending Moment - Major Axis:	M _u :	Varies, see Risa 3D
Flange Lateral Bending Stress:	f _i :	See Article 6.10.1.6

Flange lateral bending stress, f_i, may be determined directly from first-order elastic analysis in discretely braced compression flanges for which: $b \leq 1.2 * L_p * (C_b * R_b / (M_u / M_{yc}))^{.5}$

Limiting Unbraced Length:	L _p :	See Article 6.10.8.2.3
	L _p :	1.0 * r _t * (E/F _{yc}) ^{.5}
Effective Radius of Gyration:	r _t :	b _{fc} / (12 * (1 + (1/3) * (D _c * tw / (b _{fc} * t _{fc})))) ^{.5}
	r _t :	10.0 in
	L _p :	283.4 in

Moment Gradient Modifier:	C _b :	See Article 6.10.8.2.3 or Article A6.3.3, as applicable
	C _b :	1 Since M _{mid} /M ₂ > 1 at most situations. May be conservative at some locations.

Web Load-shedding Factor:	R _b :	See Article 6.10.1.10.2 1.0 if 2*D _c /tw ≤ λ _{md} (rw)
Web Slenderness Limit (noncompact):	λ _{md} (rw):	5.7*(E/F _{yc}) ^{.5} 161.8
	2*D _c /tw:	160
	R _b :	1

Major Axis Bending to Yield Moment:	M _u /M _{yc} :	1 Assume 1.0. Conservative.
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Unbraced Limit for f _i :	L _b :	195 in	1.2 * L _p * (C _b * R _b / (M _u / M _{yc})) ^{.5}	340.1 in	OK - Keep Going, First-order elastic analysis
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Flange Lateral Bending Stress:	f _i :	M _{uy} /S _y First-order elastic analysis
Factored Weak Axis Bending Moment:	M _{uy} :	See Risa

Resistance Factor for Flexure:	φ(f):	1 As specified in Article 6.5.4.2
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Nominal Flexural Resistance: M_{nc}: See Article A6.3
 Nominal Flexural Resistance based on compression flange, M_{nc}, shall be taken as the smaller of the local buckling resistance determined as specified in Article A6.3.2, and the lateral torsional buckling resistance determined as specified in Article A6.3.3.

Article A6.3.2 - Local Buckling Resistance:
 Determine if the compression flange is compact:

Limiting Slenderness Ratio for Compact Flange:	Use two ratios, one for the flange between the webs, and the other for the flange overhang. See AISC Table B4.1.		
	Case 12: Uniform compression in flanges of rectangular box and hollow structural sections of uniform thickness subject to bending or compression.		
	lamda(f)	b/t:	24.00 Clear space between webs/t _f
	lamda(pf)	1.12*(E/Fy) ^{.5} :	31.79
	lamda(rf)	1.40*(E/Fy) ^{.5} :	39.74
	Case 12: Compact Flange		
	Case 2: Flexure in flanges of doubly and singly symmetric I-shaped built-up sections.		
	lamda(f)	b/t:	2.25 Flange over hang measured from mid-web/t _{fc}
	lamda(pf)	0.38*(E/Fy) ^{.5} :	10.79
	lamda(rf)	0.95*(E*k _c /Fy) ^{.5} :	19.07
	k _c :	4/(D/tw) ^{.5} :	0.32 but 0.35 ≤ k _c ≤ 0.76
	k _c :	0.35	
	F _{yr} :	smaller of 3 items below:	
		0.7*F _{yc} :	25.2 ksi
		Rh*F _{yt} *S _{xt} /S _{xc} :	36.0 ksi
		F _{yw} :	36.0 ksi
		but not less than:	
		0.5*F _{yc} :	18.0 ksi
	F _{yr} :	25.2 ksi	
	Case 2: Compact Flange If Case 2 Flange is Noncompact or Slender, then check lamdas used.		
Compression Flange:	Compact Flange	Worse condition of Case 12 and Case 2	
Nominal Flexural Resistance:	M _{nc} :	M _{nc} = R _{pc} *M _{yc}	Equation A6.3.2-1 or A6.3.2-2
Web Plastification Factor - Comp:	R _{pc} :	See Article A6.2.1 or A6.2.2, as applicable	

Article A6.2.1 - Compact Web Sections:

Determine if the web is compact:	Compact if $2 \cdot D_{cp}/t_w \leq \lambda_{pw}(D_{cp})$		
Depth of Web in Comp at Plastic Mom:	Dcp:	See Article D6.3.2	
	For non composite sections where: $F_{yw} \cdot A_w \geq F_{yc} \cdot A_c - F_{yt} \cdot A_t $, $D_{cp} = D / (2 \cdot A_w \cdot F_{yw}) [F_{yt} \cdot A_t + F_{yw} \cdot A_w - F_{yc} \cdot A_c]$, otherwise $D_{cp} = D$.		
	Fyw*Aw:	1620 kip	$ F_{yc} \cdot A_c - F_{yt} \cdot A_t $: 0 kip Use $2 \cdot D \cdot t_w$ for A_w due to two webs
	Dcp:	30.0 in	

Limiting Slenderness Ratio for Compact Web:

	lamda (pw(D _{cp})):	$((E/F_{yc})^{.5})/(0.54*(M_p/(R_h*M_y)) - 0.09)^{.2} \leq \lambda_{pw}(D_{cp})$
Plastic Moment	M _p :	See Article D6.1

Article D6.1 - Plastic Moment:

M _p :	See Table D6.1-2, Case I		
M _p :	$P_w/(2*D)*[Y(\bar{b})^2 + (D - Y(\bar{b}))^2] + [P_{rt}*d_{rt} + P_{rb}*d_{rb} + P_t*d_t + P_c*d_c]$		
Y($\bar{b}$):	$(D/2)*[(P_c - P_t - P_{rt} - P_{rb})/P_w + 1]$		
P _c :	F _{yc} *b _c *t _c :	1620 kip	
P _t :	F _{yt} *b _t *t _t :	1620 kip	
P _{rt} :	0 no concrete reinforcing steel		
P _{rb} :	0 no concrete reinforcing steel		
P _w :	F _{yw} *D*t _w *2:	1620 kip	This is multiplied by 2 due to two webs
Y($\bar{b}$):	30		
d _{rt} :	0 no concrete reinforcing steel		
d _{rb} :	0 no concrete reinforcing steel		
d _t :	Y($\bar{b}$)+t _t /2	30.625 in	
d _c :	D - Y($\bar{b}$)+t _c /2	30.625 in	
M _p :	123525 kip-in		

Hybrid factor:	R _h :	See Article 6.10.1.10.1
	R _h :	1

Yield Moment

M _y :	Smaller of M _{yc} and M _{yt} , See Article D6.2.		
M _{yc} :	F _{yc} *S _{xc}	112806 kip-in	
M _{yt} :	F _{yt} *S _{xt}	112806 kip-in	
M _y :	112806 kip-in		

lamda (pw(D _{cp})):	smaller of	
$((E/F_{yc})^{.5})/(0.54*(M_p/(R_h*M_y)) - 0.09)^{.2}$		112.9
lamda(rw)*(D _{cp} /D _c)		161.8
lamda (pw(D _{cp})):	112.9	

Web Compact?	2*D _{cp} /t _w	160.0
	lamda (pw(D _{cp})):	112.9
	Web is not compact, See Article A6.2.2	

Web Plastification Factor - Comp:	R _{pc} :	M _p /M _{yc} :	1.095
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Article A6.2.2 - Noncompact Web Sections

Verify the webs are non-compact and not slender.
If lamda(w) < lamda(rw), then noncompact.

Slenderness ratio for web:	lamda(w):	2*D _c /t _w :	160
Limiting Slenderness ratio for noncompact web:	lamda(rw):	5.7*(E/F _{yc}) ^{.5} :	161.8

Noncompact vs Slender webs?	Noncompact, keep going		
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Web Plastification Factor - Comp:	R _{pc} :	smaller of	$[1 - (1 - R_h*M_{yc}/M_p)] * ((\lambda_{pw}(w) - \lambda_{pw}(D_{cp})) / (\lambda_{pw}(rw) - \lambda_{pw}(D_{cp}))) * (M_p/M_{yc})$
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Limiting Slenderness ratio for a compact web:

$\lambda(pw(Dc))$: smaller of $\lambda(pw(Dcp)) \cdot (Dc/Dcp)$
 $\lambda(pw(Dcp)) \cdot (Dc/Dcp)$ $\lambda(rw)$
 $\lambda(pw(Dc))$: 112.9
 $\lambda(pw(Dc))$: 112.9

$[1 - (1 - (R_h \cdot Myc/Mp)) \cdot ((\lambda(w) - \lambda(pw(Dc)))/(\lambda(rw) - \lambda(pw(Dc))))] \cdot (Mp/Myc)$ 1.003
 Mp/Myc 1.095

Rpc: 1.003 *Use if Web is Noncompact*

Web Plastification Factor - Comp: Rpc (FINAL): 1.003

Nominal Flexural Resistance - comp: Mnc: 113196 kip-in Per Article A6.3.2

Article A6.3.3 - Lateral Torsional Buckling Resistance:

If $L_b \leq L_p$, then $Mnc = Rpc \cdot Myc$
 $L_b \leq L_p$, therefore $Mnc = Rpc \cdot Myc$ (Same as A6.3.2)
 Mnc: 113196 kip-in Per Article A6.3.3

Nominal Flexural Resistance - Comp: Mnc: 113196 kip-in

A6.4 - Flexural Resistance Based on Tension Flange Yielding

Nominal Flexural Resistance - tension: Mnt: $Rpt \cdot Myt$

Web Plastification Factor - Ten: Rpt: See Article A6.2.1 or Article A6.2.2 as applicable.

Article A6.2.1 - Compact Web Sections

Rpt: Mp/Myc 1.095 *Use if Web is Noncompact*

Article A6.2.2 - Noncompact Web Sections

Rpt: smaller of $[1 - (1 - (R_h \cdot Myt/Mp)) \cdot ((\lambda(w) - \lambda(pw(Dc)))/(\lambda(rw) - \lambda(pw(Dc))))] \cdot (Mp/Myt)$
 Mp/Myt

$[1 - (1 - (R_h \cdot Myt/Mp)) \cdot ((\lambda(w) - \lambda(pw(Dc)))/(\lambda(rw) - \lambda(pw(Dc))))] \cdot (Mp/Myt)$ 1.003
 Mp/Myt 1.095

Rpt: 1.003 *Use if Web is Noncompact*

Rpt (FINAL): 1.003

Nominal Flexural Resistance - Ten: Mnt: 113196 kip-in



21 West Superior Street, Suite 500
Duluth, Minnesota 55802
218 727-8446
Fax 218 727-8456
www.LHBcorp.com

250 3rd Avenue North, Suite 450
Minneapolis, Minnesota 55401
612 338-2029
Fax 612 338-2088

PROJECT MnDOT SS - 69801N - P2-3E - Shear Resistance -1
PROJECT # 090147 DATE 1/13/10 BY jdF SHEET NO. 5/3/10 OF 5

determine V_n using Article 6.10.9 ✓

End panel: 6.10.9.3.3

$$V_n = V_{cr} - C V_p \checkmark$$

$$V_p = 0.58 F_{yw} D t_w \checkmark$$

$$F_{yw} = 36 \text{ ksi} \checkmark$$

$$D = 60" \checkmark \quad \checkmark (2 \text{ webs})$$

$$t_w = .375" \times 2 \checkmark$$

$$V_p = 939.6 \text{ kip} \checkmark$$

$$C \Rightarrow \frac{D}{t_w} = \frac{60}{.375} = 160 \checkmark$$

$$1.12 \sqrt{\frac{E K}{F_{yw}}} = 1.12 \sqrt{\frac{29000 \times 37.43}{36}} = 194.5 \checkmark$$

$$K = 5 + \frac{5}{\left(\frac{d_o}{D}\right)^2} = 5 + \frac{5}{\left(\frac{23.56}{60}\right)^2} = 37.43 \checkmark$$

$$d_o = 1' - 11 \frac{9}{16}" = 23.56" \checkmark$$

$$D = 60" \checkmark$$

$$\text{Since } \frac{D}{t_w} \leq 1.12 \sqrt{\frac{E K}{F_{yw}}}, C = 1.0 \checkmark$$

$$V_n = 1.0 \times 939.6 \text{ k} = 939.6 \text{ k} \checkmark$$

(South end panel).

Then

North end panel?

everything is the same except d_o . $d_o = 39" \checkmark$

$$K = 5 + \frac{5}{\left(\frac{39}{60}\right)^2} = 16.83 \checkmark$$

$$1.12 \sqrt{\frac{E K}{F_{yw}}} = 1.12 \sqrt{\frac{29000 \times 16.83}{36}} = 130.4 \checkmark$$

$$1.40 \sqrt{\frac{E K}{F_{yw}}} = 163 \checkmark$$



21 West Superior Street, Suite 500
Duluth, Minnesota 55802
218 727-8446
Fax 218 727-8456
www.LHBcorp.com

250 3rd Avenue North, Suite 450
Minneapolis, Minnesota 55401
612 338-2029
Fax 612 338-2088

PROJECT MnDOT SS-69801N-P2.3E - Shear Resistance -2
PROJECT # 090147 DATE 1/13/10 BY jdP SHEET NO. _____ OF _____
✓ CSM
5/13/10

$$\text{Since } 1.12 \sqrt{\frac{E_k}{F_{yw}}} \leq \frac{D}{t_w} \leq 1.40 \sqrt{\frac{E_k}{F_{yw}}},$$

$$C = \frac{1.12}{\left(\frac{D}{t_w}\right)} \sqrt{\frac{E_k}{F_{yw}}} = \frac{130.4}{160} = 0.815 \checkmark$$

$$V_n = 0.815 \times 939.6 = 765.8 \text{ k} \checkmark$$

(north end panel)

Interior Panels: 6.10.9.3.2

$$\text{Check that } \frac{2D + t_w}{(b_{fc} t_{fc} + b_{fw} t_{fw})} \leq 2.5 \checkmark$$

$$D = 60 \checkmark$$

$$t_w = .375 \checkmark$$

$$b_{fc} = 30" = b_{fw} \text{ (between webs)}$$

$$t_{fc} = t_{fw} = 1.25" \checkmark$$

$$= \frac{2 \times 60 \times .375}{(30 \times 1.25 + 30 \times 1.25)} = 0.6 \leq 2.5 \text{ OK}$$

$$V_n = V_p \left[C + \frac{0.87(1-C)}{\sqrt{1 + \left(\frac{d_o}{D}\right)^2}} \right] \checkmark$$

$$V_p = 0.58 \times F_{yw} \times D + t_w = 939.6 \text{ k} \checkmark$$

$$C_{\min} = 0.815 \text{ (largest stiffener spacing)}$$

$$d_o = 39" \checkmark \text{ (max spacing)}$$

$$V_n = 939.6 \left[0.815 + \frac{0.87(1-0.815)}{\sqrt{1 + \left(\frac{39}{60}\right)^2}} \right] = 0.95 \times 939.6$$

$$= 892.6 \text{ k} \checkmark$$

$$V_n \text{ interior panel} = 892.6 \text{ k} \checkmark \text{ } \leq \text{conservative}$$

E-13



21 West Superior Street, Suite 500
Duluth, Minnesota 55802
218 727-8446
Fax 218 727-8456
www.LHBcorp.com

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Minneapolis, Minnesota 55401
612 338-2029
Fax 612 338-2088

PROJECT MnDOT SS-69801N-P2-3E - Transverse Stiffeners -1

PROJECT # 090147 DATE 1/13/10 BY jdF SHEET NO. 5/3/16 OF 5/3/16

Verify the transverse stiffeners meet the requirements of Article 6.10.11.1

$$b_t \geq 2.0 + \frac{D}{30} = 2.0 + \frac{60}{30} = 4" \checkmark \text{ min projection}$$

$$16t_p \geq b_t \geq \frac{b_f}{4} \Rightarrow 16 \times .375 = 6 \geq b_t \geq \text{N.A.}$$

b_t varies from 15" to 6", use 6" in calcs.

Moment of inertia:

$$V_{cr} \Rightarrow \frac{D}{t_w} = 160 \checkmark \text{ per 6.10.9.2}$$

$$1.12 \sqrt{\frac{29000 \times 5}{36}} = 71.0 \checkmark$$

$$1.40 \sqrt{\frac{29000 \times 5}{36}} = 88.9 \checkmark$$

$$\frac{D}{t_w} > 1.40 \sqrt{\frac{E_k}{F_{yw}}} \therefore C = \frac{1.57}{\left(\frac{D}{t_w}\right)^2} \left(\frac{E_k}{F_{yw}}\right)$$

$$C = \frac{1.57}{160^2} \left(\frac{29000 \times 5}{36}\right) = 0.247 \checkmark$$

$$V_p = 939.6 \text{ k} \checkmark \text{ see shear resistance calcs.}$$

$$V_{cr} = C \times V_p = 0.247 \times 939.6 = 232.1 \text{ k.p.} = \phi_v V_{cr} \checkmark$$

1.05

Assume $V_u > \phi_v V_{cr}$

$$I_t = \frac{bd^3}{3} = \frac{.375 \times 6^3}{3} = 27 \text{ in}^4 \checkmark$$

$$I_{t1} = b t_w^3 J \quad @ d_o = 23.56" \checkmark$$

$b = 23.56 \checkmark$

$t_w = .375 \text{ in} \checkmark$



21 West Superior Street, Suite 500
Duluth, Minnesota 55802
218 727-8446
Fax 218 727-8456
www.LHBcorp.com

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Minneapolis, Minnesota 55401
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PROJECT MnDOT SS-69801 N-P2-3E- Transverse Stiffeners -2

PROJECT # 090147 DATE 1/13/10 BY jdF SHEET NO. _____ OF _____
Ver 5/3/10

$$J = \frac{2.5}{(d_o/D)^2} - 2.0 \geq 0.5$$

$$= \frac{2.5}{(\frac{23.56}{60})^2} - 2.0 = 14.21 \geq 0.5$$

$$I_{t1} = 23.56 \times .375^3 \times 14.21 = 17.65 \text{ in}^4 \text{ (@ } d_o = 23.56 \text{")}$$

$$I_{t2} = \frac{D^4 \rho_t^{1.3}}{40} \left(\frac{F_{yw}}{E} \right)^{1.5}$$

$$D = 60 \text{"} \checkmark$$

$$\rho_t = \text{larger of } F_{yw}/F_{crs} \text{ and } 1.0 \checkmark$$

$$F_{yw} = 36 \text{ ksi} \checkmark$$

$$F_{crs} = \frac{0.31 E}{\left(\frac{b_t}{t_p} \right)^2} \leq F_{ys} \checkmark$$

$$= \frac{0.31 \times 29000}{\left(\frac{6}{.375} \right)^2} = 35.11 \leq 36 \checkmark$$

$$F_{yw}/F_{crs} = \frac{36}{35.11} = 1.03 \text{ or } 1.0 \checkmark$$

$$\rho_t = 1.03$$

$$I_{t2} = \frac{60^4 \times 1.03^{1.3}}{40} \left(\frac{36}{29000} \right)^{1.5} = 14.73 \text{ in}^4 \checkmark$$

$$I_{t1} > I_{t2} \therefore \text{Use } (6, 10, 11, 1, 3 - \emptyset) \checkmark$$

$$I_t \geq I_{t2}$$

$$\text{We are OK @ } d_o = 23.56 \text{"} \checkmark$$



21 West Superior Street, Suite 500
Duluth, Minnesota 55802
218 727-8446
Fax 218 727-8456
www.LHBcorp.com

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Minneapolis, Minnesota 55401
612 338-2029
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PROJECT MnDOT SS-69801 N-P2-3E-Transverse Stiffeners -3

PROJECT # 090147 DATE 1/13/10 BY jdF SHEET NO. _____ OF _____

VCm 5/3/10

now Check w/ $d_o = 39"$ ✓

$$I_{t1} = b t_w^3 J$$

$$b = 39"$$

$$t_w = .375"$$

$$J = \frac{2.5}{\left(\frac{d_o}{D}\right)^2} - 2.0 \geq 0.5$$

$$J = \frac{2.5}{\left(\frac{39}{160}\right)^2} - 2.0 = 3.92 \geq 0.5$$

$$I_{t1} = 39 \times .375^3 \times 3.92 = 8.06 \text{ in}^4$$

$$I_{t2} = 14.73 \text{ in}^4$$

$I_{t2} > I_{t1}$ ∴ Use equation (6.10.11.1.3-7)

$$I_t \geq I_{t1} + (I_{t2} - I_{t1}) \left[\frac{V_u - \phi_v V_{cr}}{\phi_v V_n - \phi_v V_{cr}} \right]$$

will be different,
but do not calc
as stiffeners will
be used

$$V_u = 1.25 \times 194.8 + 1.75 \times 148.3 = 503.0 \text{ k (from north side)}$$

$$\phi_v V_{cr} = 1.0 \times 232.1 = 232.1 \text{ kip}$$

$$\phi_v V_n = 1.0 \times 765.8 = 765.8 \text{ k}$$

$$I_t = 27 \text{ in}^4 \geq 8.06 + (14.73 - 8.06) \left[\frac{503.0 - 232.1}{765.8 - 232.1} \right] = 11.45 \text{ in}^4$$

OK

69801N-3E-P2
HL93 RATING



21 West Superior Street, Suite 500
Duluth, Minnesota 55802
218 727-8446
Fax 218 727-8456
www.LHBcorp.com

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612 338-2029
Fax 612 338-2088

PROJECT MADOT SS-69801N-P2-3E-RF Moment $\phi_s = 0.95$ ⁸⁵ -1
PROJECT # 090147 DATE 1/21/10 BY jdj ^{✓com 5/11/10} SHEET NO. 5/11/10 OF 5/11/10

Determine the moment Rating Factor

Using Article 6.10, $R_n = M_{nc} = 113144 \text{ kip}\cdot\text{in}$
 $= 9429 \text{ kip}\cdot\text{ft}$

$$\begin{aligned} m_{DL} &= 3695 \text{ kip}\cdot\text{ft} \\ m_x &= 2880 \text{ kip}\cdot\text{ft} \\ m_y &= 274 \text{ kip}\cdot\text{ft} \\ S_x &= 3133.50 \text{ in}^3 \\ S_y &= 1116.68 \text{ in}^3 \end{aligned} \quad \left. \begin{aligned} & \\ & \\ & \\ & \\ & \end{aligned} \right\} \begin{aligned} & \\ & \text{From Risa} \\ & \\ & \\ & \end{aligned} \quad \begin{aligned} &= 44340 \text{ kip}\cdot\text{in} \\ &= 34560 \text{ kip}\cdot\text{in} \\ &= 3288 \text{ kip}\cdot\text{in} \end{aligned}$$

Rating Equation $\Rightarrow$

$$RF = \frac{C - \gamma_{DC} \times DL}{\gamma_{LL} (LL + Im)}$$

$$C = \phi_c \phi_s \phi R_n = 0.85 \times 1.0 \times 1.0 \times 113144 = 96172 \text{ kip}\cdot\text{in}$$

$$\gamma_{DC} = 1.25$$

$$DL = 44340 \text{ kip}\cdot\text{in}$$

$$\gamma_{LL} = 1.35 \text{ for operating}$$

$$= 1.75 \text{ for inventory}$$

$$\begin{aligned} LL + Im &= m_x + \frac{1}{3} \frac{m_y}{S_y} \times S_x \\ &= 34560 + \frac{1}{3} \times 3288 / 1116.68 \times 3133.50 \\ &= 37635 \text{ kip}\cdot\text{in} \quad 38307 \checkmark \end{aligned}$$

$$RF_{oper} = \frac{96172 - 1.25 \times 44340}{1.35 \times 37635} = \frac{96172 - 55425}{50707} = 0.80 \quad 0.79 \checkmark$$

$$RF_{inv} = \frac{96172 - 1.25 \times 44340}{1.75 \times 37635} = \frac{96172 - 55425}{65861} = 0.62 \quad 0.61 \checkmark$$

**** F-1**



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Duluth, Minnesota 55802
218 727-8446
Fax 218 727-8456
www.LHBcorp.com

250 3rd Avenue North, Suite 450
Minneapolis, Minnesota 55401
612 338-2029
Fax 612 338-2088

PROJECT MnDOT SS-69801N-P2-3E-RF Moment $\phi_s = 0.95$ -1
PROJECT # 090147 DATE 1/21/10 BY jdf SHEET NO. 1 OF 1
WSM 5/4/10

Determine the Moment Rating Factor.

Using Article 6.10, $R_n = M_{nc} = 113144 \text{ kip}\cdot\text{in}$
 $= 9429 \text{ kip}\cdot\text{ft.}$

$$\begin{aligned} m_{DL} &= 3695 \text{ kip}\cdot\text{ft.} \\ m_x &= \cancel{2880} 2936 \text{ kip}\cdot\text{ft.} \\ m_y &= 274 \text{ kip}\cdot\text{ft.} \\ S_x &= 3133.50 \text{ in}^3 \\ S_y &= 1116.68 \text{ in}^3 \end{aligned} \quad \left. \begin{array}{l} \\ \\ \\ \\ \end{array} \right\} \begin{array}{l} \\ \text{From Risa} \\ \\ \\ \end{array} \quad \begin{array}{l} = 44340 \text{ kip}\cdot\text{in} \\ = 34560 \text{ kip}\cdot\text{in} \\ = 3288 \text{ kip}\cdot\text{in} \end{array}$$

Rating Equation $\Rightarrow$

$$RF = \frac{C - \gamma_{DL} \times DL}{\gamma_{LL} (LL + IM)}$$

$$C = \phi_c \phi_s \phi R_n = 1.0 \times 0.95 \times 1.0 \times 113144 = 107487 \text{ kip}\cdot\text{in}$$

$$\gamma_{DL} = 1.25$$

$$DL = 44340 \text{ kip}\cdot\text{in}$$

$$\gamma_{LL} = 1.35 \text{ for operating}$$

$$= 1.75 \text{ for inventory}$$

$$\begin{aligned} LL + IM &= m_x + \frac{1}{3} \frac{m_y}{S_y} \times S_x \\ &= \cancel{34560} 35232 + \frac{1}{3} \times 3288 / 1116.68 \times 3133.50 \\ &= \cancel{37635} 38307 \text{ kip}\cdot\text{in} \end{aligned}$$

$$RF_{oper} = \frac{107487 - 1.25 \times 44340}{1.35 \times \cancel{37635} 38307} = \cancel{1.02} 1.01 \checkmark$$

$$RF_{inv} = \frac{107487 - 1.25 \times 44340}{1.75 \times \cancel{37635} 38307} = \cancel{0.79} 0.78 \checkmark$$



21 West Superior Street, Suite 500
Duluth, Minnesota 55802
218 727-8446
Fax 218 727-8456
www.LHBcorp.com

250 3rd Avenue North, Suite 450
Minneapolis, Minnesota 55401
612 338-2029
Fax 612 338-2088

PROJECT Mn DOT SS - 69801N - P2-3E - RF Shear -1
PROJECT # 090147 DATE 1/13/10 BY jdf SHEET NO. _____ OF _____
5/3/10

Determine Shear Rating Factor

Evaluate at Southern End.

$$R_n = 939.6 \text{ k}$$

$$V_{DL} = 329.1 \text{ k} \checkmark$$

$$V_{LL+Im} = \cancel{234.7} \text{ k} \quad 237.9 \checkmark$$

$$RF_{oper} = \frac{1.0 \times 1.0 \times 1.0 \times 939.6 - 1.25 \times 329.1}{1.35 \times \cancel{234.7} \quad 237.9} = \frac{1.64}{1.67} \checkmark$$

$$RF_{inv} = \frac{1.0^3 \times 939.6 - 1.25 \times 329.1}{1.75 \times \cancel{234.7} \quad 237.9} = \frac{1.29}{1.27} \checkmark$$

Evaluate the Northern End

$$R_n = 765.8 \text{ k} \checkmark$$

$$V_{DL} = 191.4 \text{ k} \checkmark$$

$$V_{LL+Im} = 148.1 \text{ k} \checkmark \quad \leftarrow \text{close enough, doesn't control}$$

$$RF_{oper} = \frac{1.0^3 \times 765.8 - 1.25 \times 191.4}{1.35 \times 148.1} = 2.63 \checkmark$$

$$RF_{inv} = \frac{1.0^3 \times 765.8 - 1.25 \times 191.4}{1.75 \times 148.1} = 2.63 \checkmark$$

Shear RF:

$$Oper = \cancel{1.67} \quad 1.64$$

$$Inv = \cancel{1.29} \quad 1.27$$

F-3
★

69601A-3E-02
posting & permit

MnDOT Special Structures, 69801N

Pier Cap P2-3E Reactions under posting and permit loads

26-Feb-10

✓CSM
4/29/10

<u>Risa LC</u>	<u>Loading:</u>	<u>Reaction at P2-3E (kip)</u> ✓
13	POST-TYPE3UNIT	47.331
14	POST-TYPE3S2-40UNIT	70.622
15	POST-TYPE3S3UNIT	71.81
16	POST-SU4-TRUCK	53.199
17	POST-SU5-TRUCK	60.705
18	POST-SU6-TRUCK	67.904
19	POST-SU7-TRUCK	75.391
20	PERMIT-STD-A-TRUCK	96.071
21	PERMIT-STD-B-TRUCK	121.859
22	PERMIT-STD-C-TRUCK	138.745
23	PERMIT-P411-TRUCK	143.708
24	PERMIT-P413-TRUCK	152.921
25	PERMIT-STD-C152B	134.268
26	PERMIT-STD-C174B	147.026
27	PERMIT-STD-C198_23	153.833
28	PERMIT-STD-C214B	158.388
29	PERMIT-STD-C237B	154.312
30	PERMIT-STD-C256B	152.232
31	PERMIT-STD-C200J	162.682

Company : LHB
Designer : jdf
Job Number : 090147

Pier 2-3E, Beam F and Girder C

Feb 26, 2010
10:34 AM
Checked By: *CJM*

4/24/10

Load Combinations

	Description	Sol...	PD...	SR...	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
1	Test Uniform Load				1	1												
2	HS20-14ft				M1	1												
3	HS20-18ft				M2	1												
4	HS20-22ft				M3	1												
5	HS20-26ft				M4	1												
6	HS20-30ft				M5	1												
7	2 Trucks at 50 FT ...				M6	1												
8	Design Lane Load				2	1												
9	Design Truck Load				3	1												
10	Design Tandem Lo...				4	1												
11	2 Trucks at 50 FT				5	1												
12	Influence Reaction				6	1												
13	POST-TYPE3UNIT				M7	1												
14	POST-TYPE3S2-4...				M8	1												
15	POST-TYPE3S3U...				M9	1												
16	POST-SU4-TRUCK				M10	1												
17	POST-SU5-TRUCK				M11	1												
18	POST-SU6-TRUCK				M12	1												
19	POST-SU7-TRUCK				M13	1												
20	PERMIT-STD-A-T...				M14	1												
21	PERMIT-STD-B-T...				M15	1												
22	PERMIT-STD-C-T...				M16	1												
23	PERMIT-P411-TR...				M17	1												
24	PERMIT-P413-TR...				M18	1												
25	PERMIT-STD-C15...				M19	1												
26	PERMIT-STD-C17...				M20	1												
27	PERMIT-STD-C19...				M21	1												
28	PERMIT-STD-C21...				M22	1												
29	PERMIT-STD-C23...				M23	1												
30	PERMIT-STD-C25...				M24	1												
31	PERMIT-STD-C200J				M25	1												

Company : LHB
 Designer : jdf
 Job Number : 090147

Pier 2-3E, Beam F and Girder C

Feb 26, 2010
 10:22 AM
 Checked By: *cm*

Post-Type 3 unit

4/29/10

Envelope Joint Reactions

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	P5-2H	max	0	13	40.696	13	0	13	0	13	0	13	0	13
2		min	0	13	-4.024	13	0	13	0	13	0	13	0	13
3	P5-3E	max	0	13	46.606	13	0	13	0	13	0	13	0	13
4		min	0	13	-4.101	13	0	13	0	13	0	13	0	13
5	P4-3E	max	0	13	46.617	13	0	13	0	13	0	13	0	13
6		min	0	13	-3.897	13	0	13	0	13	0	13	0	13
7	P3-3E	max	0	13	48.102	13	0	13	0	13	0	13	0	13
8		min	0	13	-4.327	13	0	13	0	13	0	13	0	13
9	P2-3E	max	0	13	47.331	13	0	13	0	13	0	13	0	13
10		min	0	13	-5.017	13	0	13	0	13	0	13	0	13
11	P1-3E	max	0	13	48.584	13	0	13	0	13	0	13	0	13
12		min	0	13	-4.953	13	0	13	0	13	0	13	0	13
13	P3-3C	max	0	13	47.353	13	0	13	0	13	0	13	0	13
14		min	0	13	-6.002	13	0	13	0	13	0	13	0	13
15	P2-3C	max	0	13	47.603	13	0	13	0	13	0	13	0	13
16		min	0	13	-4.102	13	0	13	0	13	0	13	0	13
17	P1-3C	max	0	13	47.891	13	0	13	0	13	0	13	0	13
18		min	0	13	-5.167	13	0	13	0	13	0	13	0	13
19	H3	max	0	13	42.77	13	0	13	0	13	0	13	0	13
20		min	0	13	-5.388	13	0	13	0	13	0	13	0	13
21	Totals:	max	0	13	48	13	0	13						
22		min	0	13	14	13	0	13						

Post Type 332-40 Unit

4/29/30

Envelope Joint Reactions

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	P5-2H	max	0	14	38.627	14	0	14	0	14	0	14	0	14
2		min	0	14	-4.095	14	0	14	0	14	0	14	0	14
3	P5-3E	max	0	14	62.482	14	0	14	0	14	0	14	0	14
4		min	0	14	-3.646	14	0	14	0	14	0	14	0	14
5	P4-3E	max	0	14	62.647	14	0	14	0	14	0	14	0	14
6		min	0	14	-3.461	14	0	14	0	14	0	14	0	14
7	P3-3E	max	0	14	63.565	14	0	14	0	14	0	14	0	14
8		min	0	14	-4.467	14	0	14	0	14	0	14	0	14
9	P2-3E	max	0	14	70.622	14	0	14	0	14	0	14	0	14
10		min	0	14	-5.681	14	0	14	0	14	0	14	0	14
11	P1-3E	max	0	14	65.149	14	0	14	0	14	0	14	0	14
12		min	0	14	-6.509	14	0	14	0	14	0	14	0	14
13	P3-3C	max	0	14	70.277	14	0	14	0	14	0	14	0	14
14		min	0	14	-8.45	14	0	14	0	14	0	14	0	14
15	P2-3C	max	0	14	73.036	14	0	14	0	14	0	14	0	14
16		min	0	14	-4.818	14	0	14	0	14	0	14	0	14
17	P1-3C	max	0	14	72.803	14	0	14	0	14	0	14	0	14
18		min	0	14	-6.53	14	0	14	0	14	0	14	0	14
19	H3	max	0	14	48.568	14	0	14	0	14	0	14	0	14
20		min	0	14	-7.617	14	0	14	0	14	0	14	0	14
21	Totals:	max	0	14	80	14	0	14						
22		min	0	14	12	14	0	14						

Company : LHB
 Designer : jdf
 Job Number : 090147

Pier 2-3E, Beam F and Girder C

Feb 26, 2010
 10:31 AM
 Checked By: *CJM*

Post-Type 353 Unit

4/24/10

Envelope Joint Reactions

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	P5-2H	max	0	15	40.539	15	0	15	0	15	0	15	0	15
2		min	0	15	-4.538	15	0	15	0	15	0	15	0	15
3	P5-3E	max	0	15	64.357	15	0	15	0	15	0	15	0	15
4		min	0	15	-4.061	15	0	15	0	15	0	15	0	15
5	P4-3E	max	0	15	64.499	15	0	15	0	15	0	15	0	15
6		min	0	15	-3.65	15	0	15	0	15	0	15	0	15
7	P3-3E	max	0	15	64.602	15	0	15	0	15	0	15	0	15
8		min	0	15	-4.881	15	0	15	0	15	0	15	0	15
9	P2-3E	max	0	15	71.81	15	0	15	0	15	0	15	0	15
10		min	0	15	-5.931	15	0	15	0	15	0	15	0	15
11	P1-3E	max	0	15	65.405	15	0	15	0	15	0	15	0	15
12		min	0	15	-6.839	15	0	15	0	15	0	15	0	15
13	P3-3C	max	0	15	71.61	15	0	15	0	15	0	15	0	15
14		min	0	15	-8.747	15	0	15	0	15	0	15	0	15
15	P2-3C	max	0	15	74.105	15	0	15	0	15	0	15	0	15
16		min	0	15	-5.197	15	0	15	0	15	0	15	0	15
17	P1-3C	max	0	15	73.898	15	0	15	0	15	0	15	0	15
18		min	0	15	-6.929	15	0	15	0	15	0	15	0	15
19	H3	max	0	15	50.676	15	0	15	0	15	0	15	0	15
20		min	0	15	-7.878	15	0	15	0	15	0	15	0	15
21	Totals:	max	0	15	80	15	0	15						
22		min	0	15	9	15	0	15						

Company : LHB
 Designer : jdf
 Job Number : 090147

Pier 2-3E, Beam F and Girder C

Feb 26, 2010
 10:31 AM
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Post - SU4 - truck

4/29/10

Envelope Joint Reactions

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	P5-2H	max	0	16	45.303	16	0	16	0	16	0	16	0	16
2		min	0	16	-4.522	16	0	16	0	16	0	16	0	16
3	P5-3E	max	0	16	52.348	16	0	16	0	16	0	16	0	16
4		min	0	16	-4.604	16	0	16	0	16	0	16	0	16
5	P4-3E	max	0	16	52.357	16	0	16	0	16	0	16	0	16
6		min	0	16	-4.373	16	0	16	0	16	0	16	0	16
7	P3-3E	max	0	16	54.176	16	0	16	0	16	0	16	0	16
8		min	0	16	-4.861	16	0	16	0	16	0	16	0	16
9	P2-3E	max	0	16	53.199	✓16	0	16	0	16	0	16	0	16
10		min	0	16	-5.604	16	0	16	0	16	0	16	0	16
11	P1-3E	max	0	16	54.645	16	0	16	0	16	0	16	0	16
12		min	0	16	-5.569	16	0	16	0	16	0	16	0	16
13	P3-3C	max	0	16	53.236	16	0	16	0	16	0	16	0	16
14		min	0	16	-6.748	16	0	16	0	16	0	16	0	16
15	P2-3C	max	0	16	53.538	16	0	16	0	16	0	16	0	16
16		min	0	16	-4.61	16	0	16	0	16	0	16	0	16
17	P1-3C	max	0	16	53.855	16	0	16	0	16	0	16	0	16
18		min	0	16	-5.807	16	0	16	0	16	0	16	0	16
19	H3	max	0	16	47.771	16	0	16	0	16	0	16	0	16
20		min	0	16	-6.057	16	0	16	0	16	0	16	0	16
21	Totals:	max	0	16	54	16	0	16						
22		min	0	16	12	16	0	16						

Company : LHB
 Designer : jdf
 Job Number : 090147

Pier 2-3E, Beam F and Girder C

Feb 26, 2010
 10:32 AM
 Checked By: CSM

Post-SU5 Truck

4/29/10

Envelope Joint Reactions

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	P5-2H	max	0	17	49.756	17	0	17	0	17	0	17	0	17
2		min	0	17	-5.089	17	0	17	0	17	0	17	0	17
3	P5-3E	max	0	17	59.404	17	0	17	0	17	0	17	0	17
4		min	0	17	-5.149	17	0	17	0	17	0	17	0	17
5	P4-3E	max	0	17	59.421	17	0	17	0	17	0	17	0	17
6		min	0	17	-4.871	17	0	17	0	17	0	17	0	17
7	P3-3E	max	0	17	61.186	17	0	17	0	17	0	17	0	17
8		min	0	17	-5.472	17	0	17	0	17	0	17	0	17
9	P2-3E	max	0	17	60.705	17	0	17	0	17	0	17	0	17
10		min	0	17	-6.241	17	0	17	0	17	0	17	0	17
11	P1-3E	max	0	17	61.576	17	0	17	0	17	0	17	0	17
12		min	0	17	-6.326	17	0	17	0	17	0	17	0	17
13	P3-3C	max	0	17	60.744	17	0	17	0	17	0	17	0	17
14		min	0	17	-7.688	17	0	17	0	17	0	17	0	17
15	P2-3C	max	0	17	61.224	17	0	17	0	17	0	17	0	17
16		min	0	17	-5.213	17	0	17	0	17	0	17	0	17
17	P1-3C	max	0	17	61.553	17	0	17	0	17	0	17	0	17
18		min	0	17	-6.587	17	0	17	0	17	0	17	0	17
19	H3	max	0	17	53.214	17	0	17	0	17	0	17	0	17
20		min	0	17	-6.902	17	0	17	0	17	0	17	0	17
21	Totals:	max	0	17	62	17	0	17						
22		min	0	17	12	17	0	17						

Company : LHB
 Designer : jdf
 Job Number : 090147

Pier 2-3E, Beam F and Girder C

Feb 26, 2010
 10:32 AM
 Checked By: *CJM*

Post - SUB Truck

4/29/10

Envelope Joint Reactions

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	P5-2H	max	0	18	51.462	18	0	18	0	18	0	18	0	18
2		min	0	18	-5.658	18	0	18	0	18	0	18	0	18
3	P5-3E	max	0	18	66.346	18	0	18	0	18	0	18	0	18
4		min	0	18	-5.696	18	0	18	0	18	0	18	0	18
5	P4-3E	max	0	18	66.357	18	0	18	0	18	0	18	0	18
6		min	0	18	-5.379	18	0	18	0	18	0	18	0	18
7	P3-3E	max	0	18	67.799	18	0	18	0	18	0	18	0	18
8		min	0	18	-6.084	18	0	18	0	18	0	18	0	18
9	P2-3E	max	0	18	67.904	18	0	18	0	18	0	18	0	18
10		min	0	18	-6.628	18	0	18	0	18	0	18	0	18
11	P1-3E	max	0	18	68.695	18	0	18	0	18	0	18	0	18
12		min	0	18	-7.062	18	0	18	0	18	0	18	0	18
13	P3-3C	max	0	18	67.919	18	0	18	0	18	0	18	0	18
14		min	0	18	-8.593	18	0	18	0	18	0	18	0	18
15	P2-3C	max	0	18	68.514	18	0	18	0	18	0	18	0	18
16		min	0	18	-5.811	18	0	18	0	18	0	18	0	18
17	P1-3C	max	0	18	68.859	18	0	18	0	18	0	18	0	18
18		min	0	18	-7.344	18	0	18	0	18	0	18	0	18
19	H3	max	0	18	56.541	18	0	18	0	18	0	18	0	18
20		min	0	18	-7.716	18	0	18	0	18	0	18	0	18
21	Totals:	max	0	18	69.5	18	0	18						
22		min	0	18	8	18	0	18						

Company : LHB
 Designer : jdf
 Job Number : 090147

Pier 2-3E, Beam F and Girder C

Feb 26, 2010
 10:32 AM
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Post - SU7 Truck

4/29/10

Envelope Joint Reactions

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	P5-2H	max	0	19	52.679	19	0	19	0	19	0	19	0	19
2		min	0	19	-6.187	19	0	19	0	19	0	19	0	19
3	P5-3E	max	0	19	73.351	19	0	19	0	19	0	19	0	19
4		min	0	19	-6.175	19	0	19	0	19	0	19	0	19
5	P4-3E	max	0	19	73.372	19	0	19	0	19	0	19	0	19
6		min	0	19	-5.805	19	0	19	0	19	0	19	0	19
7	P3-3E	max	0	19	74.764	19	0	19	0	19	0	19	0	19
8		min	0	19	-6.65	19	0	19	0	19	0	19	0	19
9	P2-3E	max	0	19	75.391	19	0	19	0	19	0	19	0	19
10		min	0	19	-6.992	19	0	19	0	19	0	19	0	19
11	P1-3E	max	0	19	75.582	19	0	19	0	19	0	19	0	19
12		min	0	19	-7.809	19	0	19	0	19	0	19	0	19
13	P3-3C	max	0	19	75.38	19	0	19	0	19	0	19	0	19
14		min	0	19	-9.525	19	0	19	0	19	0	19	0	19
15	P2-3C	max	0	19	76.135	19	0	19	0	19	0	19	0	19
16		min	0	19	-6.404	19	0	19	0	19	0	19	0	19
17	P1-3C	max	0	19	76.486	19	0	19	0	19	0	19	0	19
18		min	0	19	-8.09	19	0	19	0	19	0	19	0	19
19	H3	max	0	19	59.633	19	0	19	0	19	0	19	0	19
20		min	0	19	-8.552	19	0	19	0	19	0	19	0	19
21	Totals:	max	0	19	77.5	19	0	19						
22		min	0	19	8	19	0	19						

Company : LHB
 Designer : jdf
 Job Number : 090147

Pier 2-3E, Beam F and Girder C

Feb 26, 2010
 10:33 AM
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Permit - STD - A- Truck

4/26/10

Envelope Joint Reactions

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	P5-2H	max	0	20	56.537	20	0	20	0	20	0	20	0	20
2		min	0	20	-6.641	20	0	20	0	20	0	20	0	20
3	P5-3E	max	0	20	88.659	20	0	20	0	20	0	20	0	20
4		min	0	20	-6.177	20	0	20	0	20	0	20	0	20
5	P4-3E	max	0	20	88.811	20	0	20	0	20	0	20	0	20
6		min	0	20	-5.62	20	0	20	0	20	0	20	0	20
7	P3-3E	max	0	20	88.079	20	0	20	0	20	0	20	0	20
8		min	0	20	-7.143	20	0	20	0	20	0	20	0	20
9	P2-3E	max	0	20	96.071	20	0	20	0	20	0	20	0	20
10		min	0	20	-8.093	20	0	20	0	20	0	20	0	20
11	P1-3E	max	0	20	89.744	20	0	20	0	20	0	20	0	20
12		min	0	20	-9.424	20	0	20	0	20	0	20	0	20
13	P3-3C	max	0	20	95.942	20	0	20	0	20	0	20	0	20
14		min	0	20	-11.853	20	0	20	0	20	0	20	0	20
15	P2-3C	max	0	20	98.416	20	0	20	0	20	0	20	0	20
16		min	0	20	-7.377	20	0	20	0	20	0	20	0	20
17	P1-3C	max	0	20	98.406	20	0	20	0	20	0	20	0	20
18		min	0	20	-9.596	20	0	20	0	20	0	20	0	20
19	H3	max	0	20	69.135	20	0	20	0	20	0	20	0	20
20		min	0	20	-10.664	20	0	20	0	20	0	20	0	20
21	Totals:	max	0	20	104	20	0	20						
22		min	0	20	8	20	0	20						

Company : LHB
 Designer : jdf
 Job Number : 090147

Pier 2-3E, Beam F and Girder C

Feb 26, 2010
 10:33 AM
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Permit-Std-B-truck

4/29/10

Envelope Joint Reactions

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	P5-2H	max	0	21	64.018	21	0	21	0	21	0	21	0	21
2		min	0	21	-7.415	21	0	21	0	21	0	21	0	21
3	P5-3E	max	0	21	109.264	21	0	21	0	21	0	21	0	21
4		min	0	21	-6.549	21	0	21	0	21	0	21	0	21
5	P4-3E	max	0	21	109.5	21	0	21	0	21	0	21	0	21
6		min	0	21	-6.018	21	0	21	0	21	0	21	0	21
7	P3-3E	max	0	21	110.187	21	0	21	0	21	0	21	0	21
8		min	0	21	-7.971	21	0	21	0	21	0	21	0	21
9	P2-3E	max	0	21	121.859	21	0	21	0	21	0	21	0	21
10		min	0	21	-9.619	21	0	21	0	21	0	21	0	21
11	P1-3E	max	0	21	112.089	21	0	21	0	21	0	21	0	21
12		min	0	21	-11.458	21	0	21	0	21	0	21	0	21
13	P3-3C	max	0	21	121.417	21	0	21	0	21	0	21	0	21
14		min	0	21	-14.721	21	0	21	0	21	0	21	0	21
15	P2-3C	max	0	21	125.676	21	0	21	0	21	0	21	0	21
16		min	0	21	-8.65	21	0	21	0	21	0	21	0	21
17	P1-3C	max	0	21	125.365	21	0	21	0	21	0	21	0	21
18		min	0	21	-11.63	21	0	21	0	21	0	21	0	21
19	H3	max	0	21	82.231	21	0	21	0	21	0	21	0	21
20		min	0	21	-13.264	21	0	21	0	21	0	21	0	21
21	Totals:	max	0	21	136	21	0	21						
22		min	0	21	16	21	0	21						

Company : LHB
 Designer : jdf
 Job Number : 090147

Pier 2-3E, Beam F and Girder C

Feb 26, 2010
 10:33 AM
 Checked By: CSM

Permit - Std - C - truck

4/29/10

Envelope Joint Reactions

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	P5-2H	max	0	22	68.003	22	0	22	0	22	0	22	0	22
2		min	0	22	-7.599	22	0	22	0	22	0	22	0	22
3	P5-3E	max	0	22	121.259	22	0	22	0	22	0	22	0	22
4		min	0	22	-6.884	22	0	22	0	22	0	22	0	22
5	P4-3E	max	0	22	121.609	22	0	22	0	22	0	22	0	22
6		min	0	22	-6.656	22	0	22	0	22	0	22	0	22
7	P3-3E	max	0	22	122.492	22	0	22	0	22	0	22	0	22
8		min	0	22	-8.513	22	0	22	0	22	0	22	0	22
9	P2-3E	max	0	22	138.745	22	0	22	0	22	0	22	0	22
10		min	0	22	-10.185	22	0	22	0	22	0	22	0	22
11	P1-3E	max	0	22	125.068	22	0	22	0	22	0	22	0	22
12		min	0	22	-12.541	22	0	22	0	22	0	22	0	22
13	P3-3C	max	0	22	138.013	22	0	22	0	22	0	22	0	22
14		min	0	22	-16.412	22	0	22	0	22	0	22	0	22
15	P2-3C	max	0	22	143.73	22	0	22	0	22	0	22	0	22
16		min	0	22	-9.124	22	0	22	0	22	0	22	0	22
17	P1-3C	max	0	22	143.154	22	0	22	0	22	0	22	0	22
18		min	0	22	-12.649	22	0	22	0	22	0	22	0	22
19	H3	max	0	22	87.176	22	0	22	0	22	0	22	0	22
20		min	0	22	-14.806	22	0	22	0	22	0	22	0	22
21	Totals:	max	0	22	159	22	0	22						
22		min	0	22	15	22	0	22						

Permit - P411 - truck

4/29/10

Envelope Joint Reactions

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	P5-2H	max	0	23	68.464	23	0	23	0	23	0	23	0	23
2		min	0	23	-6.984	23	0	23	0	23	0	23	0	23
3	P5-3E	max	0	23	102.621	23	0	23	0	23	0	23	0	23
4		min	0	23	-6.87	23	0	23	0	23	0	23	0	23
5	P4-3E	max	0	23	103.246	23	0	23	0	23	0	23	0	23
6		min	0	23	-7.179	23	0	23	0	23	0	23	0	23
7	P3-3E	max	0	23	113.96	23	0	23	0	23	0	23	0	23
8		min	0	23	-7.643	23	0	23	0	23	0	23	0	23
9	P2-3E	max	0	23	143.708	23	0	23	0	23	0	23	0	23
10		min	0	23	-8.462	23	0	23	0	23	0	23	0	23
11	P1-3E	max	0	23	120.217	23	0	23	0	23	0	23	0	23
12		min	0	23	-9.42	23	0	23	0	23	0	23	0	23
13	P3-3C	max	0	23	141.526	23	0	23	0	23	0	23	0	23
14		min	0	23	-14.087	23	0	23	0	23	0	23	0	23
15	P2-3C	max	0	23	155.22	23	0	23	0	23	0	23	0	23
16		min	0	23	-8.264	23	0	23	0	23	0	23	0	23
17	P1-3C	max	0	23	153.376	23	0	23	0	23	0	23	0	23
18		min	0	23	-10.001	23	0	23	0	23	0	23	0	23
19	H3	max	0	23	80.259	23	0	23	0	23	0	23	0	23
20		min	0	23	-12.699	23	0	23	0	23	0	23	0	23
21	Totals:	max	0	23	207	23	0	23						
22		min	0	23	15	23	0	23						

Company : LHB
 Designer : jdf
 Job Number : 090147

Pier 2-3E, Beam F and Girder C

Feb 26, 2010
 10:34 AM
 Checked By: *CTM*

Permit - P413 - truck

4/29/10

Envelope Joint Reactions

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	P5-2H	max	0	24	68.133	24	0	24	0	24	0	24	0	24
2		min	0	24	-7.184	24	0	24	0	24	0	24	0	24
3	P5-3E	max	0	24	111.991	24	0	24	0	24	0	24	0	24
4		min	0	24	-6.373	24	0	24	0	24	0	24	0	24
5	P4-3E	max	0	24	110.835	24	0	24	0	24	0	24	0	24
6		min	0	24	-6.564	24	0	24	0	24	0	24	0	24
7	P3-3E	max	0	24	115.063	24	0	24	0	24	0	24	0	24
8		min	0	24	-7.757	24	0	24	0	24	0	24	0	24
9	P2-3E	max	0	24	152.921	24	0	24	0	24	0	24	0	24
10		min	0	24	-8.414	24	0	24	0	24	0	24	0	24
11	P1-3E	max	0	24	127.292	24	0	24	0	24	0	24	0	24
12		min	0	24	-9.019	24	0	24	0	24	0	24	0	24
13	P3-3C	max	0	24	150.95	24	0	24	0	24	0	24	0	24
14		min	0	24	-13.88	24	0	24	0	24	0	24	0	24
15	P2-3C	max	0	24	170.847	24	0	24	0	24	0	24	0	24
16		min	0	24	-8.57	24	0	24	0	24	0	24	0	24
17	P1-3C	max	0	24	167.384	24	0	24	0	24	0	24	0	24
18		min	0	24	-10.121	24	0	24	0	24	0	24	0	24
19	H3	max	0	24	85.58	24	0	24	0	24	0	24	0	24
20		min	0	24	-12.189	24	0	24	0	24	0	24	0	24
21	Totals:	max	0	24	255	24	0	24						
22		min	0	24	15	24	0	24						

Company : LHB
 Designer : jdf
 Job Number : 090147

Pier 2-3E, Beam F and Girder C

Feb 26, 2010
 10:34 AM
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Permit - std - C152 B

4/24/10

Envelope Joint Reactions

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	P5-2H	max	0	25	66.285	25	0	25	0	25	0	25	0	25
2		min	0	25	-7.754	25	0	25	0	25	0	25	0	25
3	P5-3E	max	0	25	118.467	25	0	25	0	25	0	25	0	25
4		min	0	25	-6.796	25	0	25	0	25	0	25	0	25
5	P4-3E	max	0	25	118.777	25	0	25	0	25	0	25	0	25
6		min	0	25	-6.406	25	0	25	0	25	0	25	0	25
7	P3-3E	max	0	25	119.208	25	0	25	0	25	0	25	0	25
8		min	0	25	-8.502	25	0	25	0	25	0	25	0	25
9	P2-3E	max	0	25	134.268	25	0	25	0	25	0	25	0	25
10		min	0	25	-10.18	25	0	25	0	25	0	25	0	25
11	P1-3E	max	0	25	121.351	25	0	25	0	25	0	25	0	25
12		min	0	25	-12.389	25	0	25	0	25	0	25	0	25
13	P3-3C	max	0	25	133.683	25	0	25	0	25	0	25	0	25
14		min	0	25	-16.069	25	0	25	0	25	0	25	0	25
15	P2-3C	max	0	25	138.893	25	0	25	0	25	0	25	0	25
16		min	0	25	-9.176	25	0	25	0	25	0	25	0	25
17	P1-3C	max	0	25	138.377	25	0	25	0	25	0	25	0	25
18		min	0	25	-12.501	25	0	25	0	25	0	25	0	25
19	H3	max	0	25	87.087	25	0	25	0	25	0	25	0	25
20		min	0	25	-14.488	25	0	25	0	25	0	25	0	25
21	Totals:	max	0	25	152.2	25	0	25						
22		min	0	25	16	25	0	25						

Company : LHB
 Designer : jdf
 Job Number : 090147

Pier 2-3E, Beam F and Girder C

Feb 26, 2010
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Permit - std - C174 B

4/29/10

Envelope Joint Reactions

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	P5-2H	max	0	26	67.231	26	0	26	0	26	0	26	0	26
2		min	0	26	-7.102	26	0	26	0	26	0	26	0	26
3	P5-3E	max	0	26	124.539	26	0	26	0	26	0	26	0	26
4		min	0	26	-6.668	26	0	26	0	26	0	26	0	26
5	P4-3E	max	0	26	125.054	26	0	26	0	26	0	26	0	26
6		min	0	26	-6.62	26	0	26	0	26	0	26	0	26
7	P3-3E	max	0	26	125.846	26	0	26	0	26	0	26	0	26
8		min	0	26	-8.195	26	0	26	0	26	0	26	0	26
9	P2-3E	max	0	26	147.026	26	0	26	0	26	0	26	0	26
10		min	0	26	-9.904	26	0	26	0	26	0	26	0	26
11	P1-3E	max	0	26	130.173	26	0	26	0	26	0	26	0	26
12		min	0	26	-12.533	26	0	26	0	26	0	26	0	26
13	P3-3C	max	0	26	146.013	26	0	26	0	26	0	26	0	26
14		min	0	26	-16.816	26	0	26	0	26	0	26	0	26
15	P2-3C	max	0	26	152.989	26	0	26	0	26	0	26	0	26
16		min	0	26	-8.848	26	0	26	0	26	0	26	0	26
17	P1-3C	max	0	26	152.239	26	0	26	0	26	0	26	0	26
18		min	0	26	-12.552	26	0	26	0	26	0	26	0	26
19	H3	max	0	26	83.743	26	0	26	0	26	0	26	0	26
20		min	0	26	-15.195	26	0	26	0	26	0	26	0	26
21	Totals:	max	0	26	174	26	0	26						
22		min	0	26	14	26	0	26						

Permit - Std - C198-23

4/29/10

Envelope Joint Reactions

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	P5-2H	max	0	27	67.919	27	0	27	0	27	0	27	0	27
2		min	0	27	-6.303	27	0	27	0	27	0	27	0	27
3	P5-3E	max	0	27	120.081	27	0	27	0	27	0	27	0	27
4		min	0	27	-6.449	27	0	27	0	27	0	27	0	27
5	P4-3E	max	0	27	120.924	27	0	27	0	27	0	27	0	27
6		min	0	27	-6.75	27	0	27	0	27	0	27	0	27
7	P3-3E	max	0	27	125.328	27	0	27	0	27	0	27	0	27
8		min	0	27	-6.928	27	0	27	0	27	0	27	0	27
9	P2-3E	max	0	27	153.833	27	0	27	0	27	0	27	0	27
10		min	0	27	-9.163	27	0	27	0	27	0	27	0	27
11	P1-3E	max	0	27	132.143	27	0	27	0	27	0	27	0	27
12		min	0	27	-11.224	27	0	27	0	27	0	27	0	27
13	P3-3C	max	0	27	152.034	27	0	27	0	27	0	27	0	27
14		min	0	27	-16.059	27	0	27	0	27	0	27	0	27
15	P2-3C	max	0	27	162.277	27	0	27	0	27	0	27	0	27
16		min	0	27	-8.049	27	0	27	0	27	0	27	0	27
17	P1-3C	max	0	27	160.84	27	0	27	0	27	0	27	0	27
18		min	0	27	-11.329	27	0	27	0	27	0	27	0	27
19	H3	max	0	27	78.476	27	0	27	0	27	0	27	0	27
20		min	0	27	-14.543	27	0	27	0	27	0	27	0	27
21	Totals:	max	0	27	198	27	0	27						
22		min	0	27	14	27	0	27						

Company : LHB
 Designer : jdf
 Job Number : 090147

Pier 2-3E, Beam F and Girder C

Feb 26, 2010
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Permit - Std - C214 B

4/29/10

Envelope Joint Reactions

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	P5-2H	max	0	28	69.643	28	0	28	0	28	0	28	0	28
2		min	0	28	-6.374	28	0	28	0	28	0	28	0	28
3	P5-3E	max	0	28	118.341	28	0	28	0	28	0	28	0	28
4		min	0	28	-6.5	28	0	28	0	28	0	28	0	28
5	P4-3E	max	0	28	119.257	28	0	28	0	28	0	28	0	28
6		min	0	28	-6.971	28	0	28	0	28	0	28	0	28
7	P3-3E	max	0	28	127.123	28	0	28	0	28	0	28	0	28
8		min	0	28	-6.96	28	0	28	0	28	0	28	0	28
9	P2-3E	max	0	28	158.388	28	0	28	0	28	0	28	0	28
10		min	0	28	-8.638	28	0	28	0	28	0	28	0	28
11	P1-3E	max	0	28	134.257	28	0	28	0	28	0	28	0	28
12		min	0	28	-10.539	28	0	28	0	28	0	28	0	28
13	P3-3C	max	0	28	156.259	28	0	28	0	28	0	28	0	28
14		min	0	28	-15.656	28	0	28	0	28	0	28	0	28
15	P2-3C	max	0	28	168.695	28	0	28	0	28	0	28	0	28
16		min	0	28	-8.211	28	0	28	0	28	0	28	0	28
17	P1-3C	max	0	28	166.818	28	0	28	0	28	0	28	0	28
18		min	0	28	-10.8	28	0	28	0	28	0	28	0	28
19	H3	max	0	28	81.585	28	0	28	0	28	0	28	0	28
20		min	0	28	-14.165	28	0	28	0	28	0	28	0	28
21	Totals:	max	0	28	214	28	0	28						
22		min	0	28	14	28	0	28						

Company : LHB
Designer : jdf
Job Number : 090147

Pier 2-3E, Beam F and Girder C

Feb 26, 2010
10:35 AM
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Permit - std - C 237 B

4/29/10

Envelope Joint Reactions

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	P5-2H	max	0	29	68.962	29	0	29	0	29	0	29	0	29
2		min	0	29	-7.062	29	0	29	0	29	0	29	0	29
3	P5-3E	max	0	29	108.954	29	0	29	0	29	0	29	0	29
4		min	0	29	-6.705	29	0	29	0	29	0	29	0	29
5	P4-3E	max	0	29	108.071	29	0	29	0	29	0	29	0	29
6		min	0	29	-7.113	29	0	29	0	29	0	29	0	29
7	P3-3E	max	0	29	118.591	29	0	29	0	29	0	29	0	29
8		min	0	29	-7.705	29	0	29	0	29	0	29	0	29
9	P2-3E	max	0	29	154.312	29	0	29	0	29	0	29	0	29
10		min	0	29	-8.408	29	0	29	0	29	0	29	0	29
11	P1-3E	max	0	29	127.772	29	0	29	0	29	0	29	0	29
12		min	0	29	-9.247	29	0	29	0	29	0	29	0	29
13	P3-3C	max	0	29	151.876	29	0	29	0	29	0	29	0	29
14		min	0	29	-14.099	29	0	29	0	29	0	29	0	29
15	P2-3C	max	0	29	169.027	29	0	29	0	29	0	29	0	29
16		min	0	29	-8.476	29	0	29	0	29	0	29	0	29
17	P1-3C	max	0	29	166.318	29	0	29	0	29	0	29	0	29
18		min	0	29	-10.027	29	0	29	0	29	0	29	0	29
19	H3	max	0	29	84.031	29	0	29	0	29	0	29	0	29
20		min	0	29	-12.583	29	0	29	0	29	0	29	0	29
21	Totals:	max	0	29	237.4	29	0	29						
22		min	0	29	13	29	0	29						

G-19

Company : LHB
 Designer : jdf
 Job Number : 090147

Pier 2-3E, Beam F and Girder C

Feb 26, 2010
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Permit - std - C256B

4/24/10

Envelope Joint Reactions

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	P5-2H	max	0	30	67.281	30	0	30	0	30	0	30	0	30
2		min	0	30	-7.352	30	0	30	0	30	0	30	0	30
3	P5-3E	max	0	30	114.472	30	0	30	0	30	0	30	0	30
4		min	0	30	-6.721	30	0	30	0	30	0	30	0	30
5	P4-3E	max	0	30	113.199	30	0	30	0	30	0	30	0	30
6		min	0	30	-6.937	30	0	30	0	30	0	30	0	30
7	P3-3E	max	0	30	115.447	30	0	30	0	30	0	30	0	30
8		min	0	30	-7.942	30	0	30	0	30	0	30	0	30
9	P2-3E	max	0	30	152.232	30	0	30	0	30	0	30	0	30
10		min	0	30	-8.381	30	0	30	0	30	0	30	0	30
11	P1-3E	max	0	30	126.497	30	0	30	0	30	0	30	0	30
12		min	0	30	-9.034	30	0	30	0	30	0	30	0	30
13	P3-3C	max	0	30	150.28	30	0	30	0	30	0	30	0	30
14		min	0	30	-13.807	30	0	30	0	30	0	30	0	30
15	P2-3C	max	0	30	170.589	30	0	30	0	30	0	30	0	30
16		min	0	30	-8.722	30	0	30	0	30	0	30	0	30
17	P1-3C	max	0	30	167.154	30	0	30	0	30	0	30	0	30
18		min	0	30	-10.207	30	0	30	0	30	0	30	0	30
19	H3	max	0	30	85.145	30	0	30	0	30	0	30	0	30
20		min	0	30	-12.105	30	0	30	0	30	0	30	0	30
21	Totals:	max	0	30	256	30	0	30						
22		min	0	30	16	30	0	30						

Company : LHB
Designer : jdf
Job Number : 090147

Pier 2-3E, Beam F and Girder C

Feb 26, 2010
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Permit - std - C200j

4/29/10

Envelope Joint Reactions

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	P5-2H	max	0	31	70.614	31	0	31	0	31	0	31	0	31
2		min	0	31	-6.31	31	0	31	0	31	0	31	0	31
3	P5-3E	max	0	31	134.845	31	0	31	0	31	0	31	0	31
4		min	0	31	-5.445	31	0	31	0	31	0	31	0	31
5	P4-3E	max	0	31	135.622	31	0	31	0	31	0	31	0	31
6		min	0	31	-5.185	31	0	31	0	31	0	31	0	31
7	P3-3E	max	0	31	137.121	31	0	31	0	31	0	31	0	31
8		min	0	31	-7.835	31	0	31	0	31	0	31	0	31
9	P2-3E	max	0	31	162.682	31	0	31	0	31	0	31	0	31
10		min	0	31	-7.829	31	0	31	0	31	0	31	0	31
11	P1-3E	max	0	31	146.016	31	0	31	0	31	0	31	0	31
12		min	0	31	-12.206	31	0	31	0	31	0	31	0	31
13	P3-3C	max	0	31	161.361	31	0	31	0	31	0	31	0	31
14		min	0	31	-17.044	31	0	31	0	31	0	31	0	31
15	P2-3C	max	0	31	169.732	31	0	31	0	31	0	31	0	31
16		min	0	31	-8.846	31	0	31	0	31	0	31	0	31
17	P1-3C	max	0	31	168.891	31	0	31	0	31	0	31	0	31
18		min	0	31	-12.387	31	0	31	0	31	0	31	0	31
19	H3	max	0	31	87.225	31	0	31	0	31	0	31	0	31
20		min	0	31	-15.421	31	0	31	0	31	0	31	0	31
21	Totals:	max	0	31	200	31	0	31						
22		min	0	31	20	31	0	31						



21 West Superior Street, Suite 500
Duluth, Minnesota 55802
218 727-8446
Fax 218 727-8456
www.LHBcorp.com

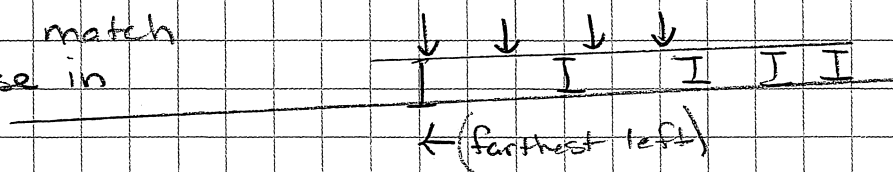
250 3rd Avenue North, Suite 450
Minneapolis, Minnesota 55401
612 338-2029
Fax 612 338-2088

3E.P2

PROJECT MDOT SS-69801N-Posting & Permit Trucks - Moment
PROJECT # 090147 DATE 3/22/10 BY jdf SHEET NO. _____ OF _____

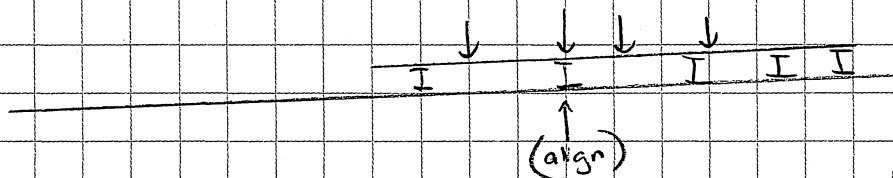
The truck location to cause maximum moment varies with the magnitudes of the trucks.

- When trucks match or are close in weight.



Case 1

- When one truck is heavier

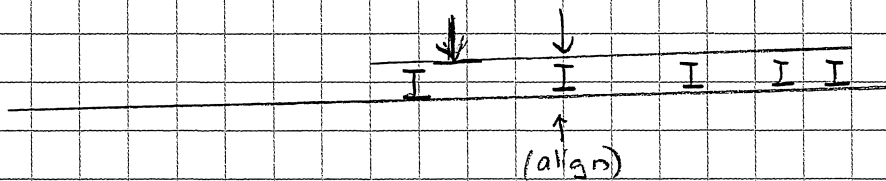


Case 2

Therefore the Type 3S2-40+5U7 and 3S3+5U7 are case ① while the rest of the posting and permit calculations are case ②.

Two lanes of trucks always controls moment, even w/ the 1.2 multiple presence factor with only one lane loaded.

The truck location when only one truck is used was determined.



Jennifer French

From: Gao, Yihong (DOT) [Yihong.Gao@state.mn.us]
Sent: Thursday, March 18, 2010 4:30 PM
To: Jon Siiter
Cc: Jennifer French; Johnson, Lowell (DOT); Dimaculangan, Moises (DOT)
Subject: RE: MnDOT SS - Bridge 69801 Design, Legal, and Permit Live Load Factors

Jon,
Yes, I think these live load factors are consistent with what we use for superstructures. As for next lane loading, I think we will still use full legal loads not taking 75% of the weight considering the truck weight could have up to 5% tolerance.

Thanks,

Yihong



Yihong Gao, PE
Bridge Rating Engineer
MnDOT Bridge Office
3485 Hadley Avenue N.
Oakdale, MN 55128-3307
TEL: 651-366-4492
EMAIL: yihong.gao@state.mn.us

From: Jon Siiter [mailto:Jon.Siiter@lhbcorp.com]
Sent: Wednesday, March 17, 2010 4:15 PM
To: Gao, Yihong (DOT)
Cc: Jennifer French
Subject: FW: MnDOT SS - Bridge 69801 Design, Legal, and Permit Live Load Factors

Yihong, please see attached e-mail for input we received from the author of the Manual for Bridge Evaluation. You will see that there are not explicit rules for load factors when rating piers. We believe the summary Jen gives below is appropriate, except that we would not be using 1.15 for any of the standard permit trucks since they are not single trip vehicles. Any input you may have or concurrence would be appreciated. Thanks.

From: Jennifer French
Sent: Wednesday, March 17, 2010 3:36 PM
To: Jon Siiter
Cc: Jennifer French
Subject: MnDOT SS - Bridge 69801 Design, Legal, and Permit Live Load Factors

Jon, I've contacted Bala Sivakumar who wrote the Manual for Bridge Evaluation. With his input (see the email string below), I propose the following Live Load Factors. Bala's credentials are located in the attached PDF.

- Design: Inventory of 1.75 and Operating of 1.35
- Legal/Posting: 1.35
- Permit for routine and multiple trips: 1.35
- Permit for single trips: 1.15 (using permit and legal trucks when not escorted, using only permit truck when escorted).

What are your thoughts?

Jen

From: Bala Sivakumar [mailto:bsivakumar@HNTB.com]
Sent: Wednesday, March 17, 2010 3:14 PM
To: Jennifer French
Subject: RE: MnDOT SS - Bridge 69801 Permit Load Factors

My comments below. Good luck

Bala Sivakumar, P.E.
Vice President
Director-Special Bridge Projects

HNTB Corporation
5 Penn Plaza
6th Floor
New York, NY 10001-1810

Tel (212) 594-9717
Direct (212) 915 9532
Fax (212) 947-4030
Mobile (201) 306-7852
www.hntb.com

From: Jennifer French [mailto:Jennifer.French@lhbcorp.com]
Sent: Wednesday, March 17, 2010 2:06 PM
To: Bala Sivakumar
Cc: Jennifer French
Subject: RE: MnDOT SS - Bridge 69801 Permit Load Factors

Bala, thank you for talking with me on the phone. As I mentioned, I will try to summarize our conversation here to verify that I have collected your thoughts correctly. A reply with any revisions would be appreciated.

Background:

- There have not been calibration studies for Substructure elements.
- Load Factors in the MBE pertain to longitudinal superstructure elements using LRFD distribution factors not lever rule.
- The MBE live load factors are calibrated based on the likelihood of side by side trucks, while a transverse substructure member would be affected more by direct loading and therefore is different.
- There is no guidance in the MBE for substructure review with legal or permit loads at this time. Planned for the future.
- Routine permits are not much different than heavy posting trucks in most states as they operate with no restrictions just like legal loads. For load rating purposes they may be considered the same – conservative assumption.
- Routine permits should be considered differently than special permits that operate in a more controlled fashion in terms of weight and number of trips.
- You (Bala) have been awarded a contract to review some of the issues I brought up below under an NCHRP 20-07 contract that will recalibrate LRFR load factors for permits for use with non LRFD distribution factor methods such as refined analysis .

Design Loading Recommendations:

- Use two lanes loaded with HL-93 loading.
- Use HL-93 loading with the 1.35 and 1.75 factors for operating and inventory, respectively.

Posting/Legal Truck Recommendations:

- Use one posting vehicle in one lane with one legal vehicle in the other.
- As the probability of loading is similar to HL-93 STRENGTH II case, use the comparable load factor of 1.35.

Routine Permit Truck Recommendations (and multiple trips):

- Use one permit truck in one lane with one legal vehicle in the other.
- Use the same load factor as for Posting trucks. Use load factor of 1.35.

Special Permit Truck Recommendations (single trips):

- Use one permit vehicle only or one permit vehicle in one lane with one legal vehicle in the other. A definite choice is not clear. Thoughts include:
 - Heavy permit truck in one lane with no truck in the second. This is most likely as the chance of a truck in the other lane is small. However this could be unconservative as a second truck could be occupying the second lane.
 - Heavy permit truck in one lane with legal truck in the second. Not likely, but possible.
 - Heavy permit truck in one lane with a 65 kip truck (approximately 80% of legal truck) in the second. More likely.
- Use a live load factor of 1.15 for these conditions. LRFR load factor for single trip special permits
- I (Jen) suggested using the 1.15 factor with a permit truck in one lane and legal truck in the other, and you (Bala) said that would be conservative and then suggested using the permit truck plus 80% of the legal truck loading.

I will be happy to send you a copy of this rating once it is completed as I understand you would like to use real-world design data for a project you have coming up. As mentioned in our conversation, I will have to ask MnDOT permission to send you this information.

Again, thank you for your time in reviewing my questions.

Jen

From: Jennifer French
Sent: Wednesday, March 17, 2010 11:20 AM
To: bsivakumar@hntb.com
Cc: Jennifer French
Subject: FW: MnDOT SS - Bridge 69801 Permit Load Factors

Bala, thank you for taking the time to consider this email. I called and left a message that I would be sending you this question.

I am rating a fracture critical integral steel box-beam pier cap at a highway interchange here in Duluth. I have been following the Manual for Bridge Evaluation F (First Edition/2008) as well as the AASHTO LRFD Bridge Design Specification (With revisions through 2009).

I am looking for some input/advice on what live load factors should be used for the permit and posting trucks when using LRFR for fracture critical piers (Substructure).

In section 6A.1.8.2 Substructures: It states "load rating of substructure elements should be done using the Strength I load combination and load factors of LRFD Design Article 3.4.1, including all...." To me this means that the live load factor would be 1.75 for design, legal, and permit ratings. Is this correct? If not, should we use the Tables in 6A.4.2.3 through 6A.4.2.5? I am concerned about using the values from these tables due to their values being based on the Lane Distribution Factors as all of my load distribution has been done using simple statics like the lever rule.

Some background on the pier cap:

- It was designed in 1966 using ASD.
- We have been requested to use LRFR for rating.

- It supports 2 lanes.
- Under design loads, the rating factor is below 1.0. (Using live load factors of 1.35 and 1.75)
- We will be designing a reinforcement scheme.
- The ADTT is 1050.
- When running the permit trucks, I have been instructed to run one permit truck with one legal truck in the other lane.
- When running the posting trucks, I have been instructed to run one posting truck with the worst legal truck in the other lane.

I appreciate your help. Please feel free to call me at the number below if you have questions.

Thanks,

Jen French

Jennifer French, PE (MN, MI)
Senior Structural Engineer
LHB
21 West Superior Street, Suite 500
Duluth, MN 55802
Direct Dial: 218-279-2461

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<u>Gamma DL</u>	1.29
<u>Mx DL</u>	
<u>(kip*ft)</u>	<u>Sx (in^3)</u>
3695	3133.5
	<u>Sy (in^3)</u>
	1116.68

				Multiple Presence Factor				Gamma DL				Single Trip Escorted			
				1.2								1.25			
Risa Girder				Risa Pier											
LC	Truck:	Total Truck Weight (kip)	Reaction at P2-3E (kip)	Wheel Load (kip)	LC	Truck Combination	Factored LL Reaction (kip)	Proportion of HL-93 CF to use	Truck Weight (kip)	Braking Force (kip) = 0.25*Truck	Proportion of HL-93 BF to use	Mx LL (kip*ft)	Mv LL (kip*ft)	RF: phi (s) = 0.85	RF: phi (s) = 0.95
20	PERMIT-STD-A-TRUCK	104	96.071	48.04	20	Std A	115.29	0.83	124.8	31.2	0.87	1690.605	237.947	1.54	1.97
21	PERMIT-STD-B-TRUCK	136	121.859	60.93	21	Std B	146.23	1.05	163.2	40.8	1.13	2144.041	309.058	1.21	1.55
22	PERMIT-STD-C-TRUCK	159	138.745	69.37	22	Std C	166.49	1.19	190.8	47.7	1.33	2440.664	363.758	1.06	1.36
23	PERMIT-P411-TRUCK	207	143.708	71.85	23	P411	172.45	1.24	248.4	62.1	1.73	2528.424	473.159	0.99	1.27
24	PERMIT-P413-TRUCK	255	152.921	76.46	24	P413	183.51	1.31	306	76.5	2.13	2690.003	582.56	0.91	1.17
25	PERMIT-STD-C152B	152.2	134.268	67.13	25	Std C152b	161.12	1.15	182.64	45.66	1.27	2361.747	347.348	1.10	1.40
26	PERMIT-STD-C174b	174	147.026	73.51	26	Std C174b	176.43	1.26	208.8	52.2	1.45	2586.254	396.578	1.00	1.28
27	PERMIT-STD-C198_23	198	153.833	76.92	27	Std C198_23	184.60	1.32	237.6	59.4	1.65	2706.33	451.279	0.94	1.21
28	PERMIT-STD-C214b	214	158.388	79.19	28	Std C214b	190.07	1.36	256.8	64.2	1.78	2786.268	486.834	0.91	1.16
29	PERMIT-STD-C237b	237.4	154.312	77.16	29	Std C237b	185.17	1.33	284.88	71.22	1.98	2715.173	541.535	0.92	1.17
30	PERMIT-STD-C256b	256	152.232	76.12	30	Std C256b	182.68	1.31	307.2	76.8	2.13	2678.436	582.56	0.92	1.17
31	PERMIT-STD-C200j	200	162.682	81.34	31	Std C200j	195.22	1.40	240	60	1.67	2862.124	456.749	0.90	1.15

* The myLL of 522.475 should have been 552.475. This would result in RF multiple trip of 0.67 and Single trip of 0.79. This value was not revised on the final rating form as it is minor.

✓
6/23/10

✓GJM
5/4/10

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

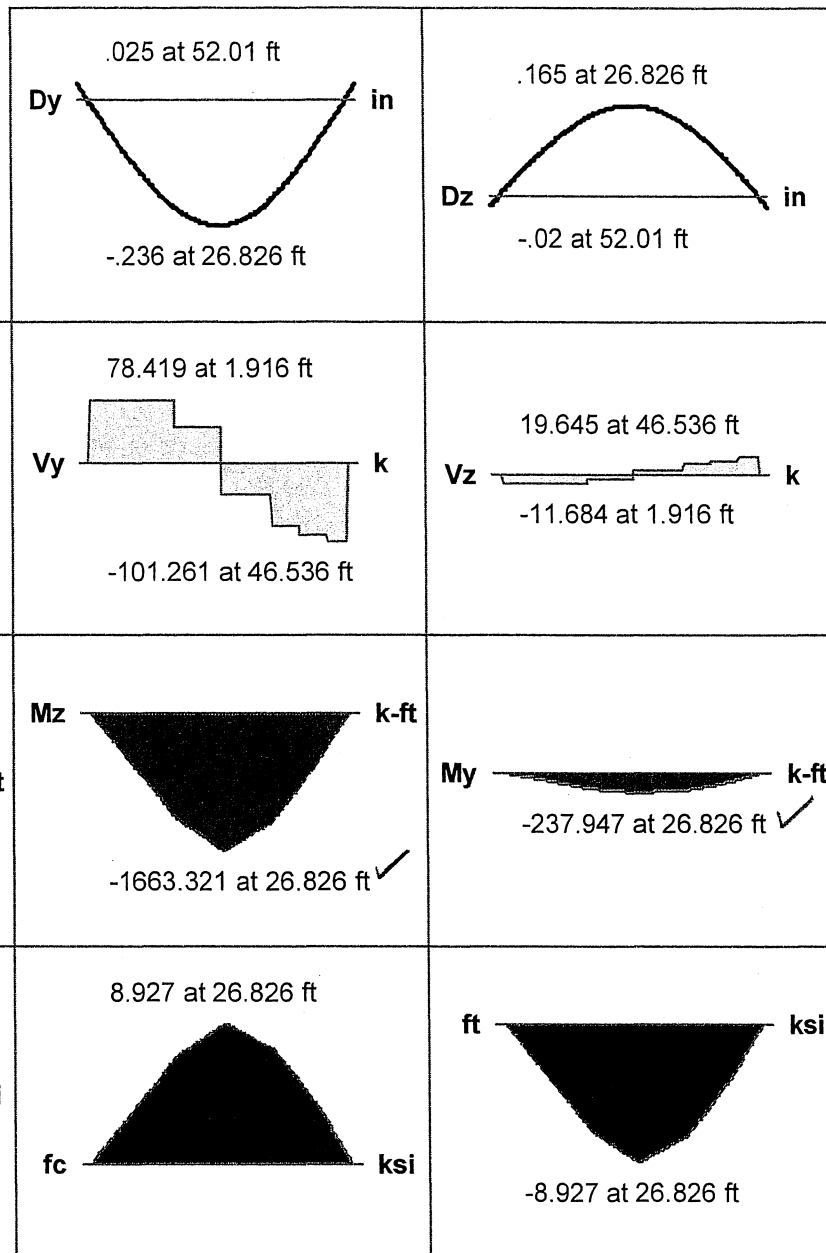
I Joint: **N1**

J Joint: **N4**

LC 5: Mom Type 3 + SU7

Code Check: **0.000 (bending)**

Report Based On 191 Sections



✓CSM
5/4/12

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

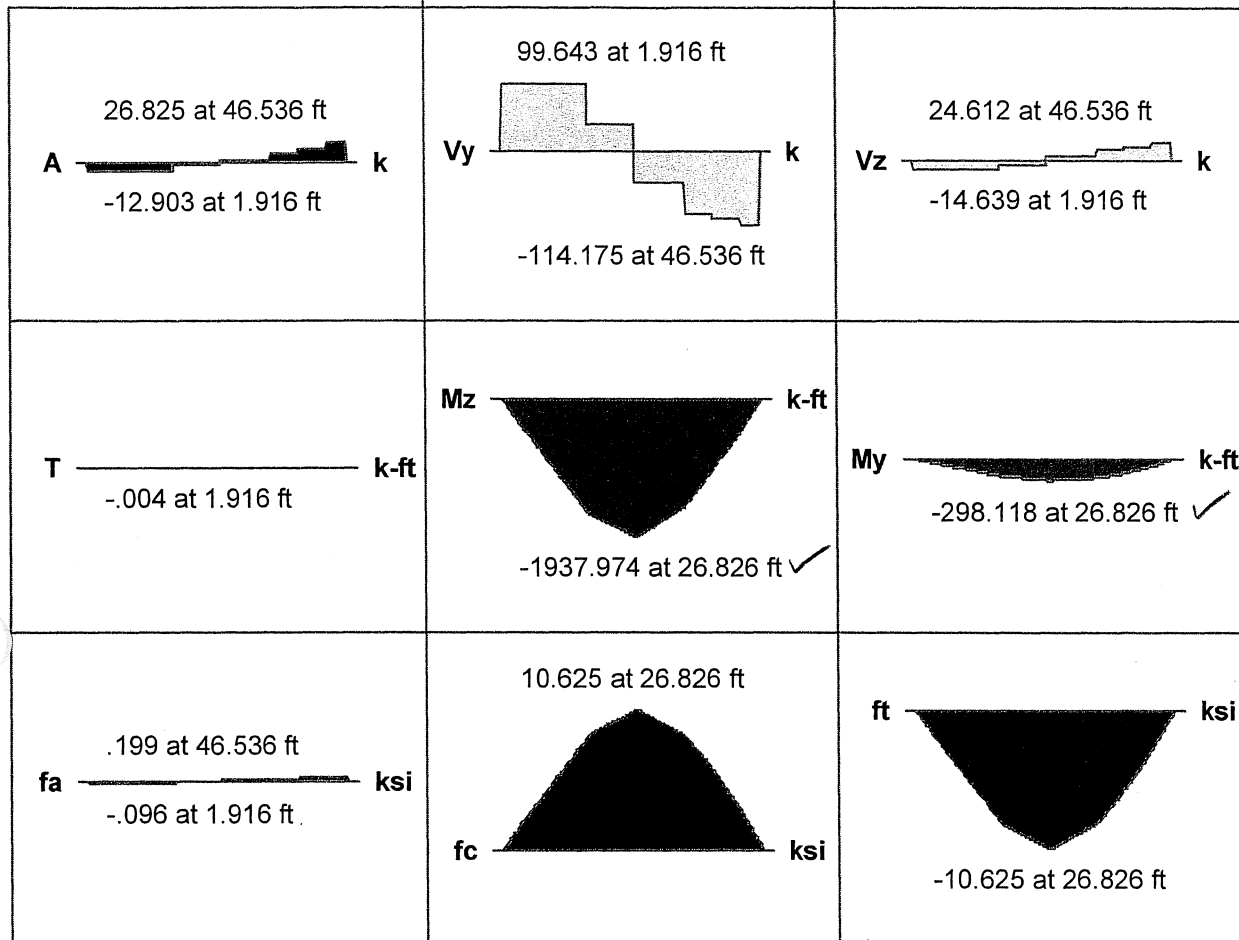
I Joint: **N1**

J Joint: **N4**

LC 6: Mom Type 3S2-40 + SU7

Code Check: **0.000 (bending)**

Report Based On 191 Sections



✓CSM
5/14/16

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

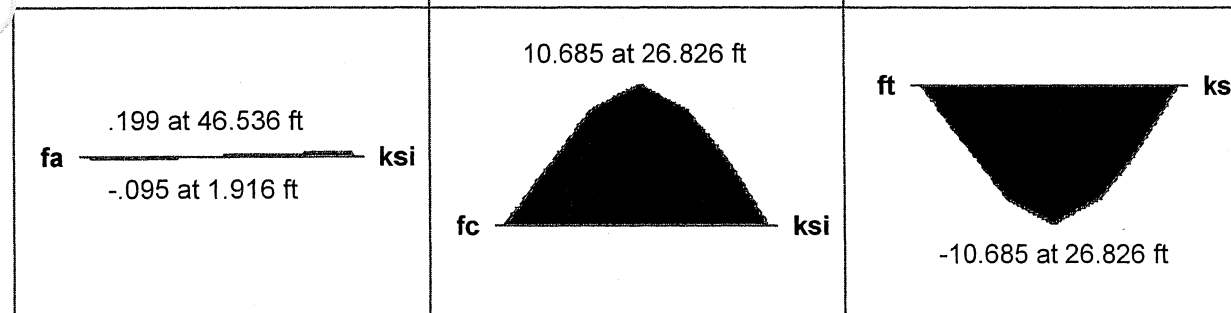
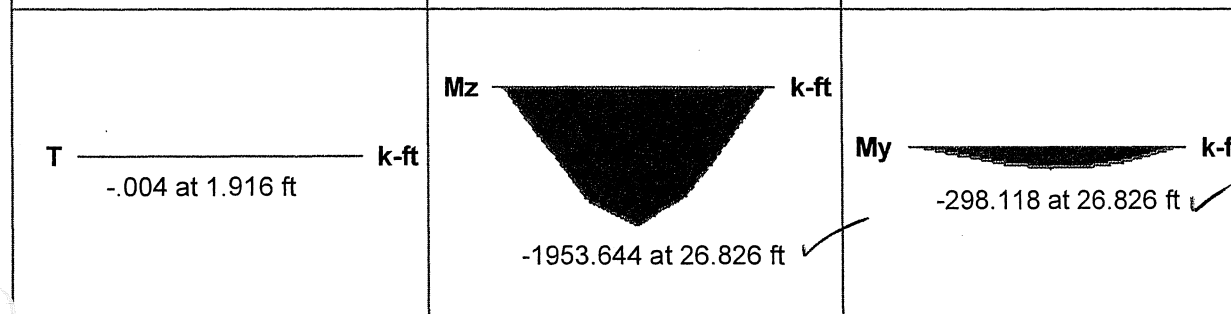
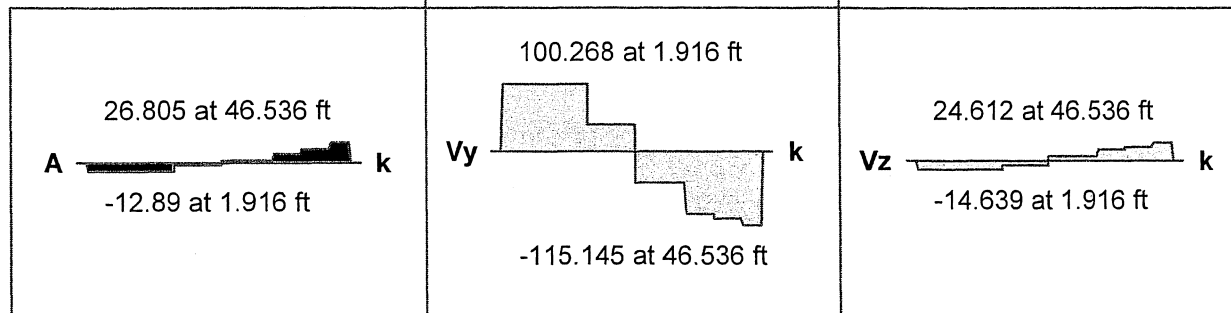
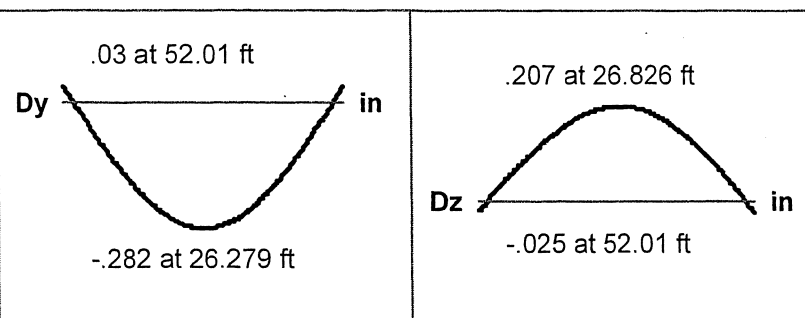
I Joint: **N1**

J Joint: **N4**

LC 7: Mom Type 3S3 +SU7

Code Check: **0.000 (bending)**

Report Based On 191 Sections



✓esm
5/14/10

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

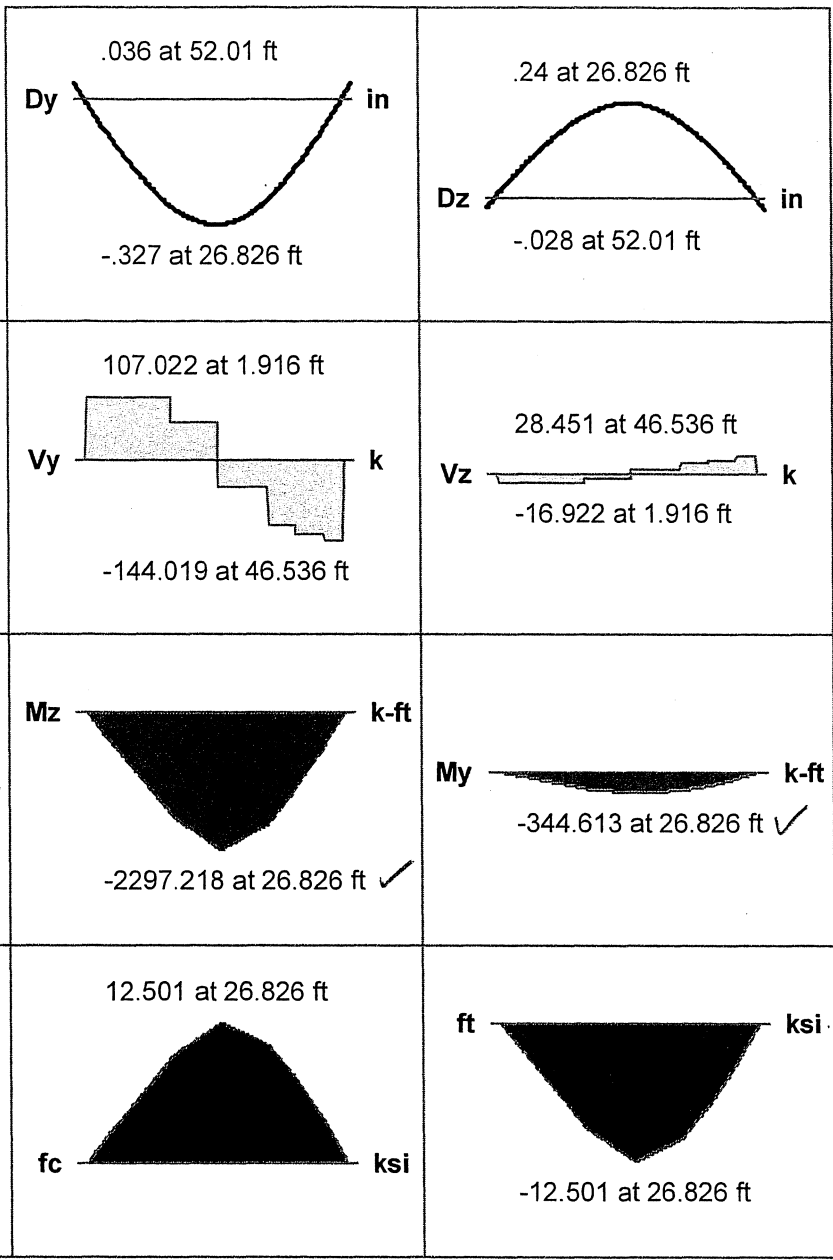
I Joint: **N1**

J Joint: **N4**

LC 8: Mom Std A + SU7

Code Check: **0.000 (bending)**

Report Based On 191 Sections



✓CJM
5/14/10

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

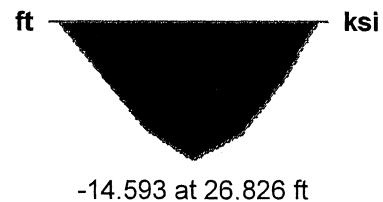
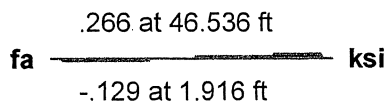
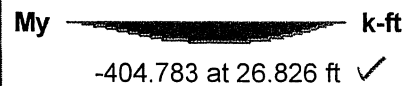
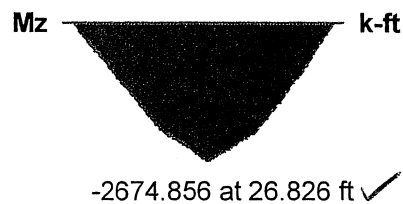
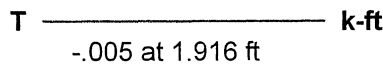
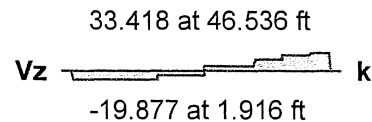
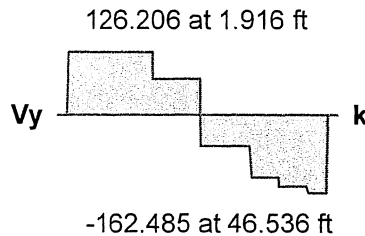
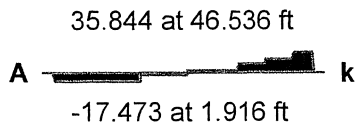
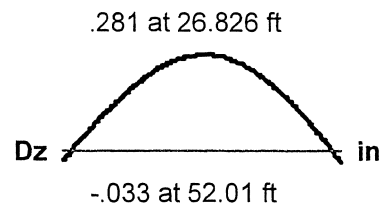
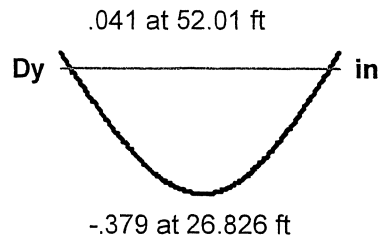
I Joint: **N1**

J Joint: **N4**

LC 9: Mom Std B + SU7

Code Check: **0.000 (bending)**

Report Based On 191 Sections



✓CSM
5/4/10

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

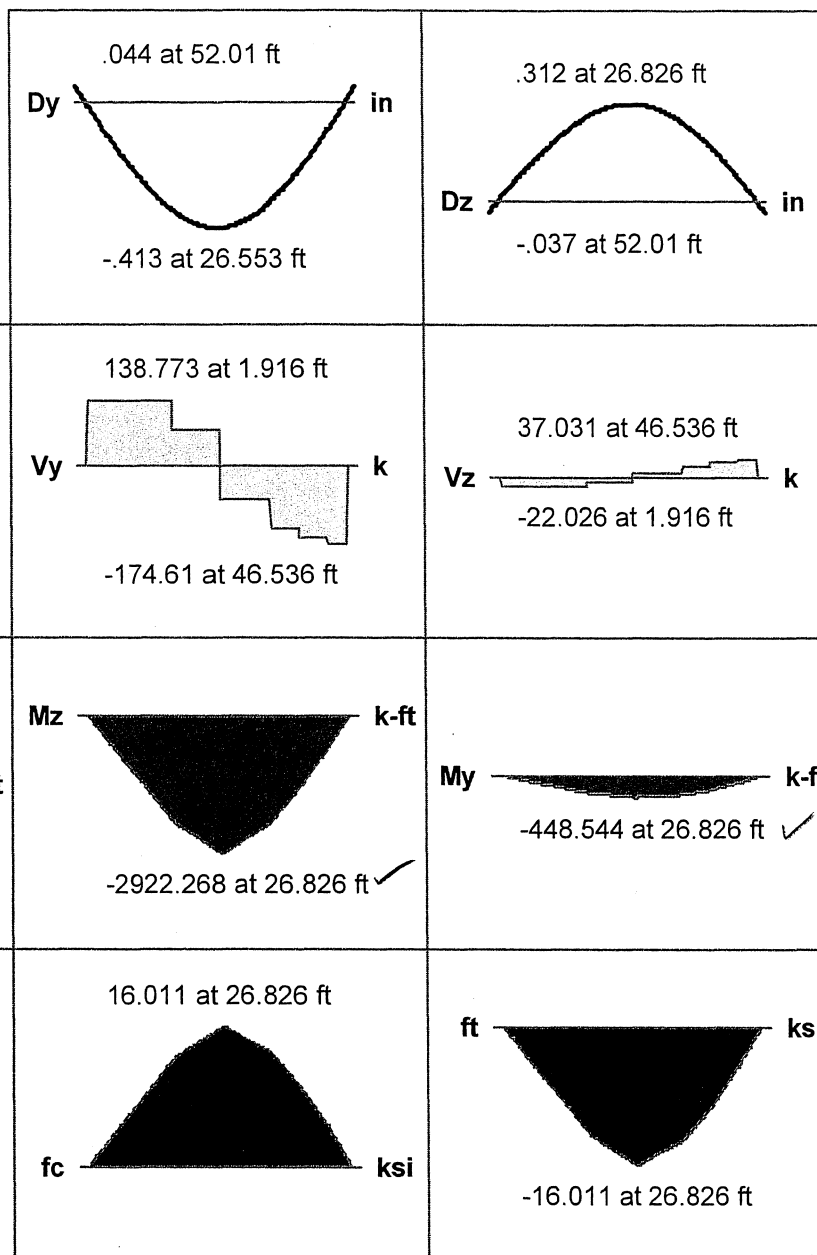
I Joint: **N1**

J Joint: **N4**

LC 10: Mom Std C +SU7

Code Check: **0.000 (bending)**

Report Based On 191 Sections



✓GJM
5/4/10

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

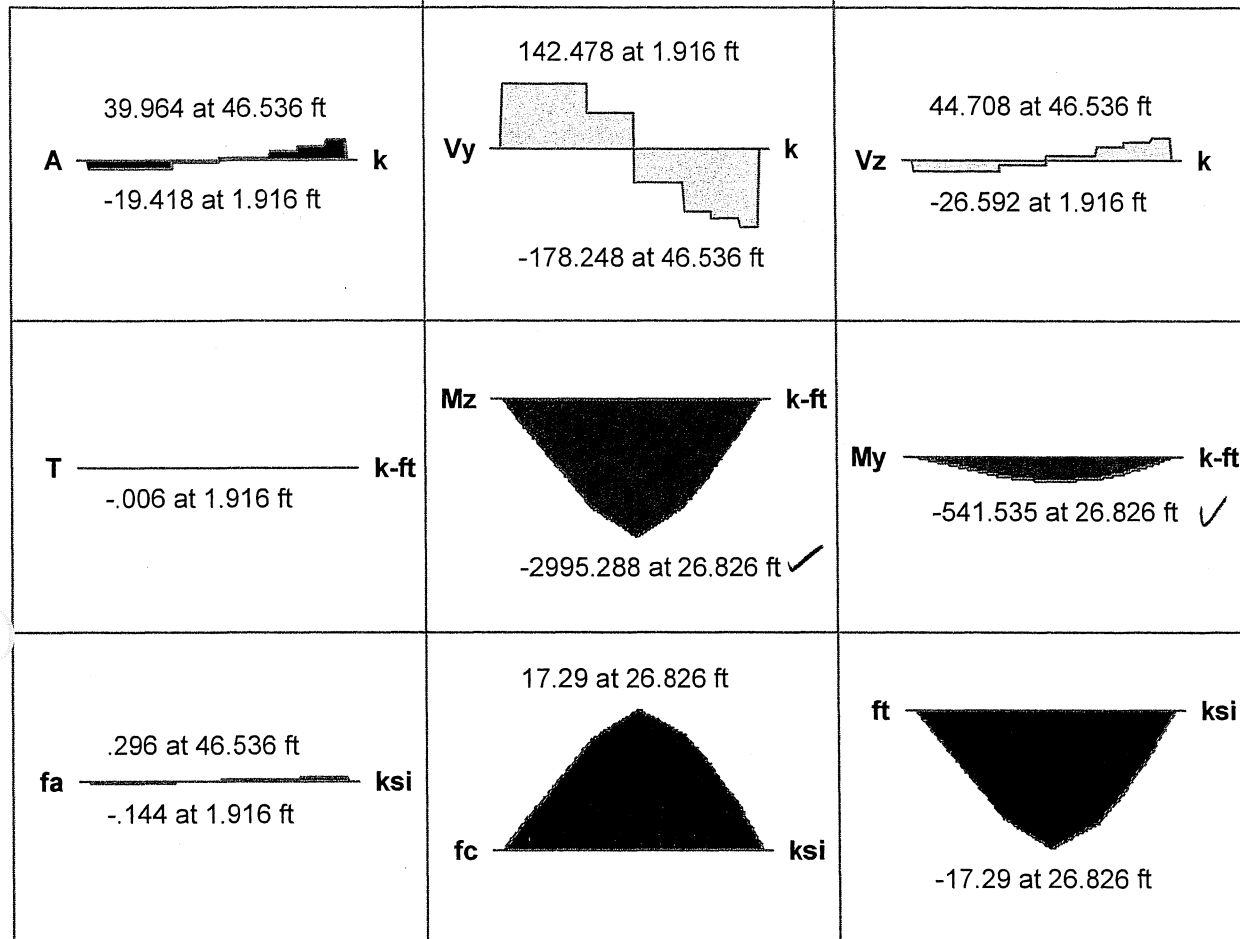
I Joint: **N1**

J Joint: **N4**

LC 11: Mom P411 + SU7

Code Check: **0.000 (bending)**

Report Based On 191 Sections



VCSM
5/11/10

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

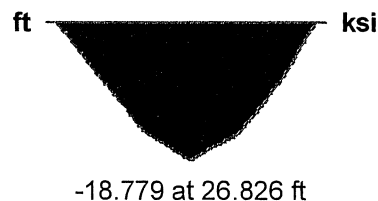
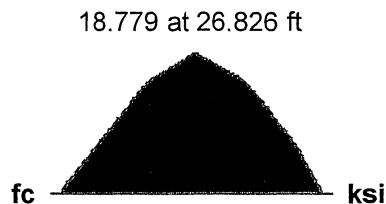
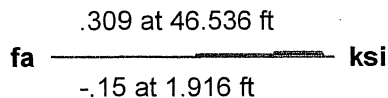
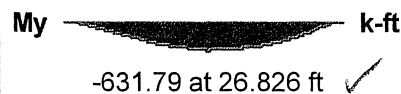
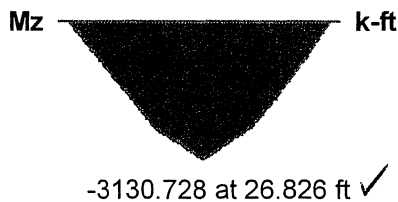
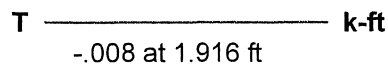
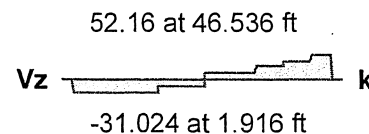
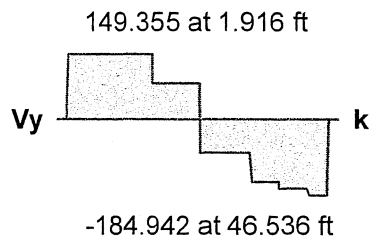
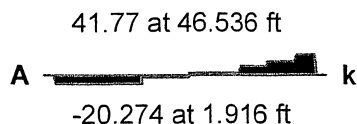
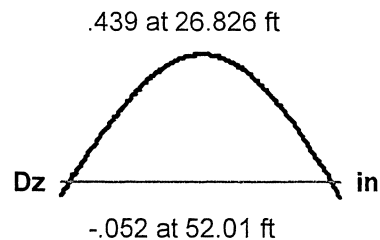
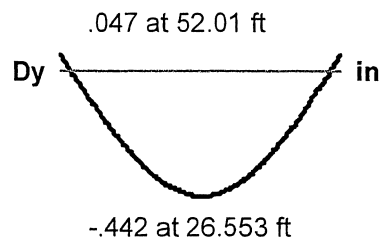
I Joint: **N1**

J Joint: **N4**

LC 12: Mom P413 + SU7

Code Check: **0.000 (bending)**

Report Based On 191 Sections



✓cam
5/19/10

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

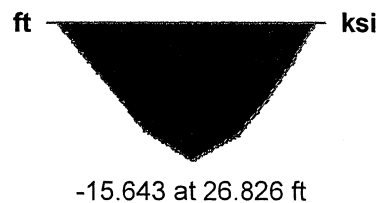
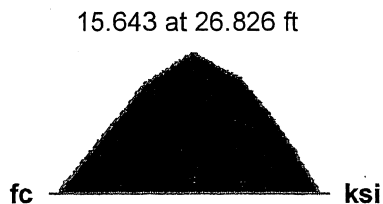
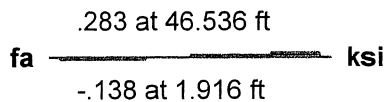
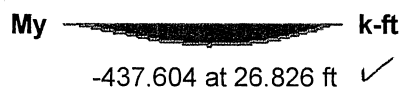
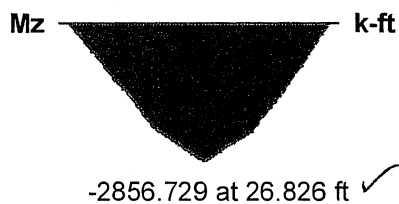
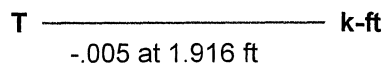
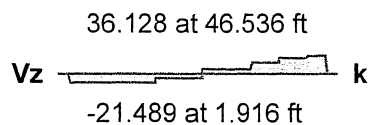
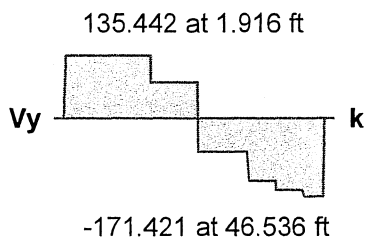
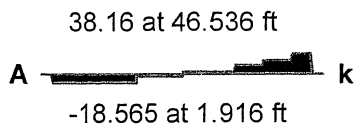
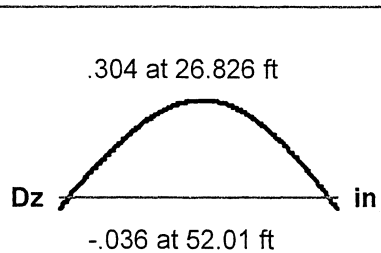
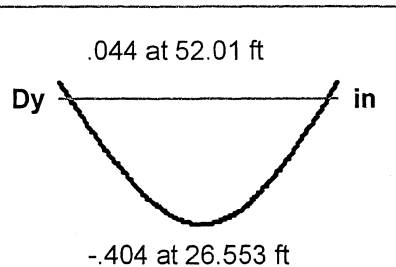
I Joint: **N1**

J Joint: **N4**

LC 13: Mom Std C152b + SU7

Code Check: **0.000 (bending)**

Report Based On 191 Sections



✓ 5/4/10

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

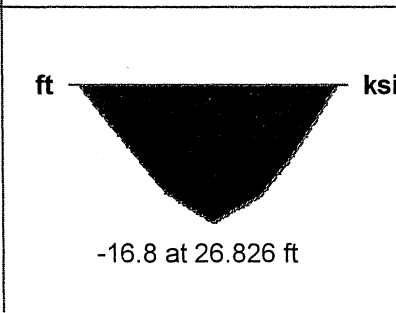
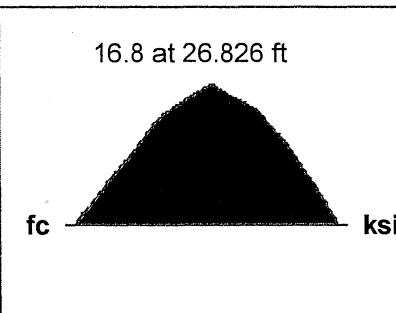
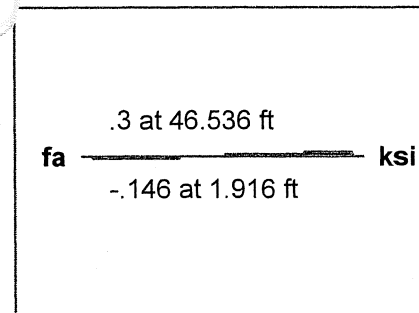
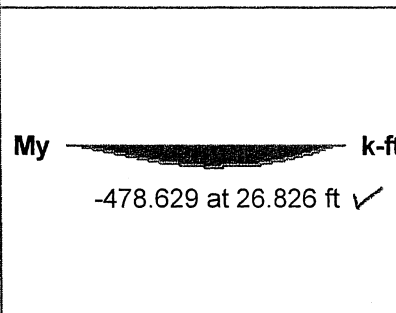
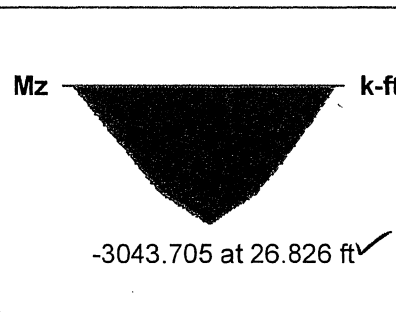
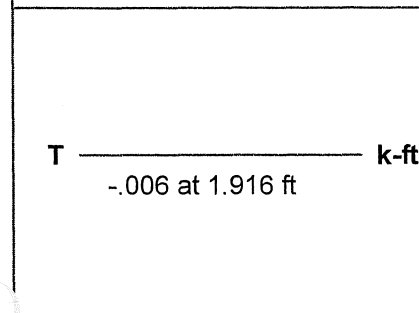
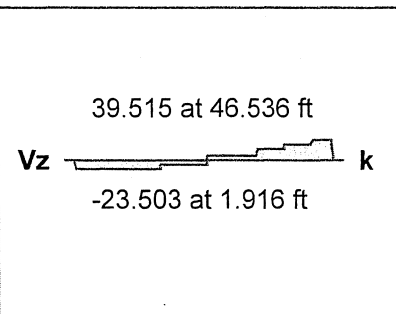
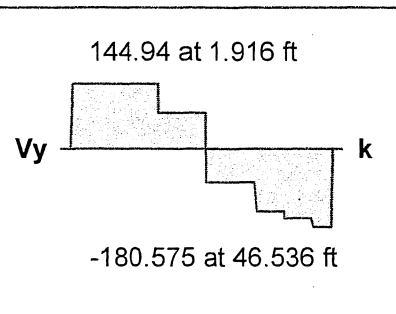
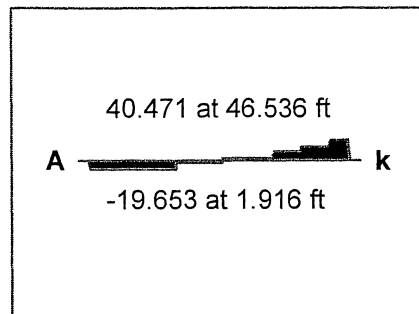
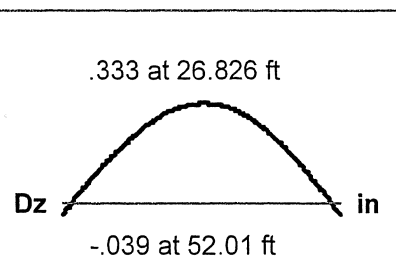
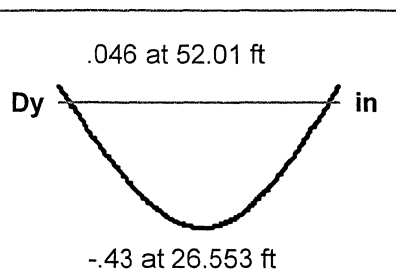
I Joint: **N1**

J Joint: **N4**

LC 14: Mom Std C174b + SU7

Code Check: **0.000 (bending)**

Report Based On 191 Sections



ksm
5/4/10

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

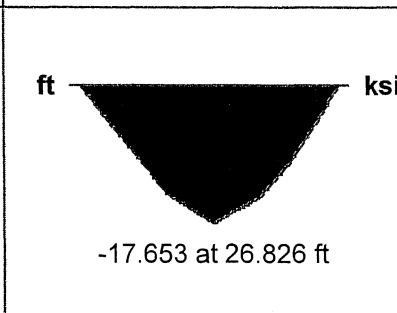
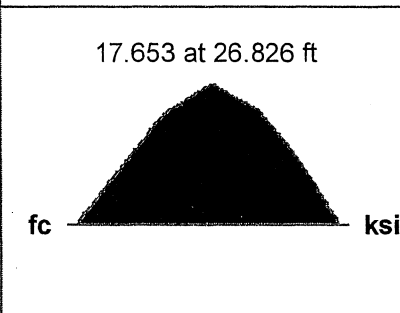
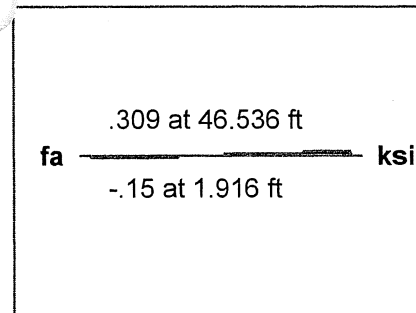
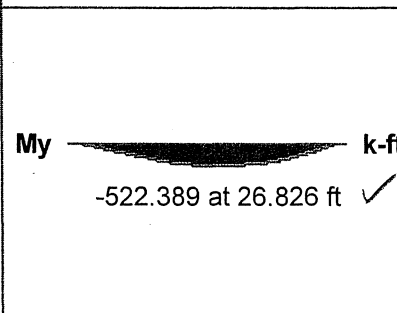
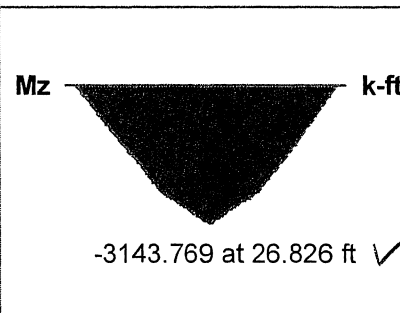
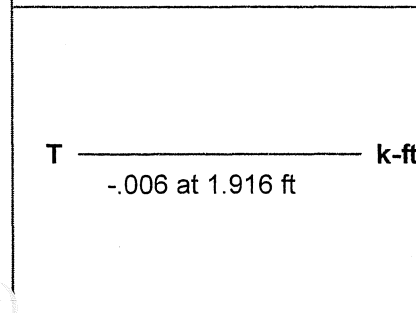
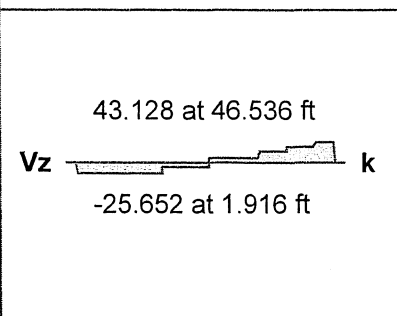
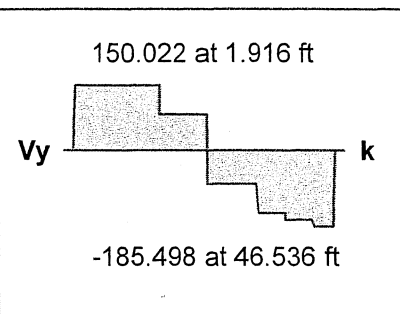
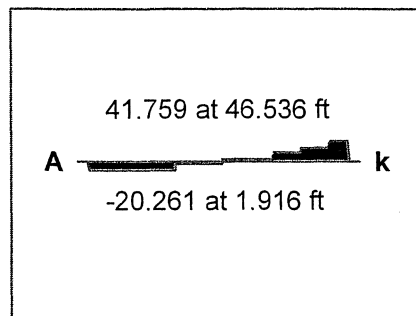
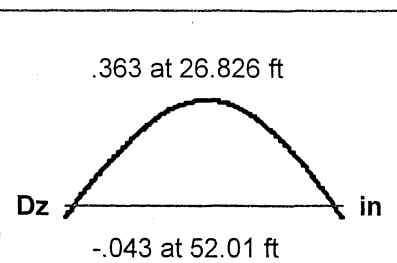
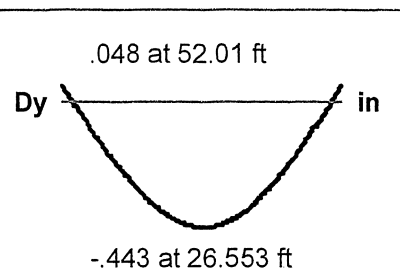
I Joint: **N1**

J Joint: **N4**

LC 15: Mom Std C198_23 + SU7

Code Check: **0.000 (bending)**

Report Based On 191 Sections



✓ 5/4/10

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

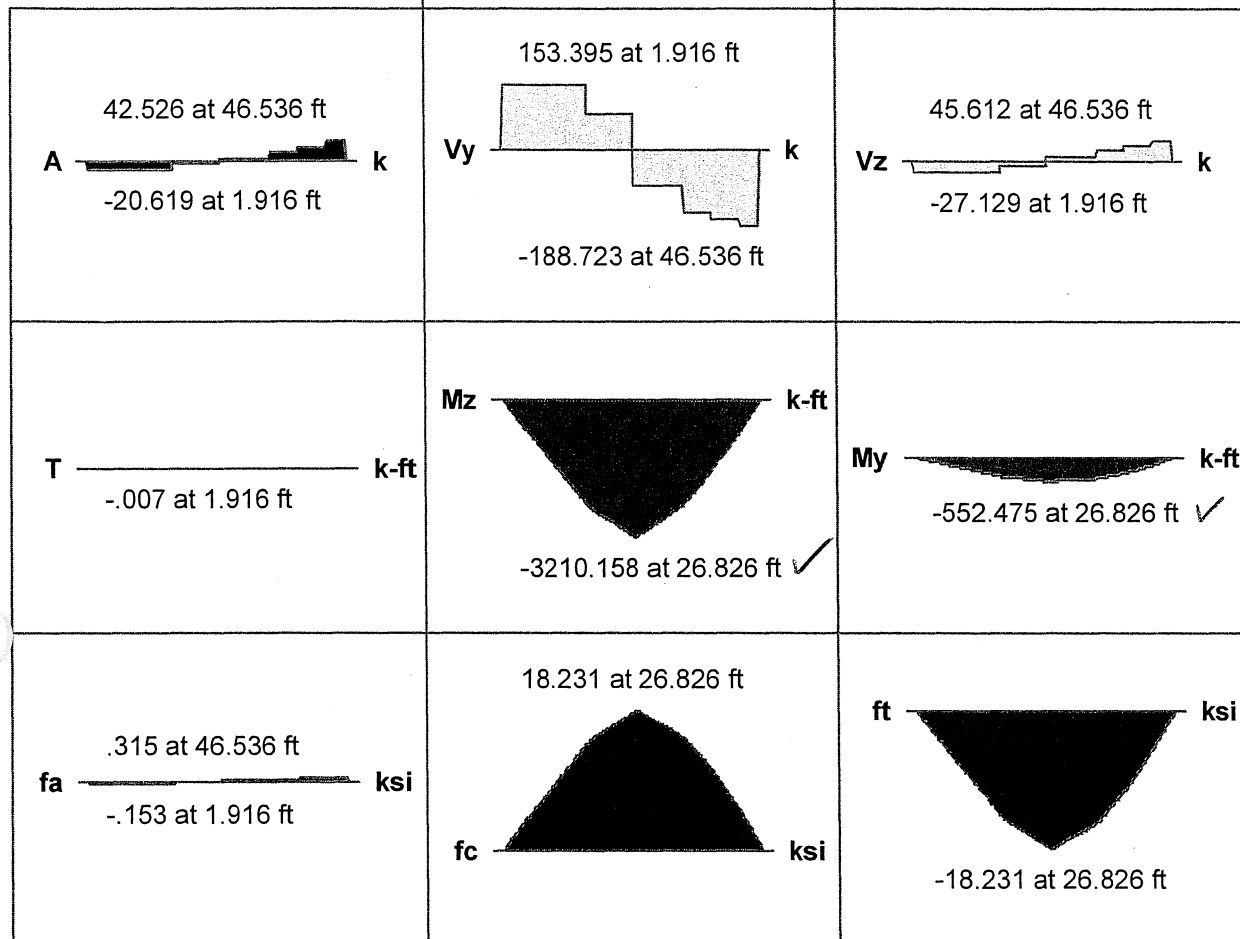
I Joint: **N1**

J Joint: **N4**

LC 16: Mom Std 214b + SU7

Code Check: **0.000 (bending)**

Report Based On 191 Sections



✓
5/4/10

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

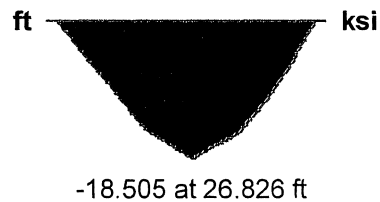
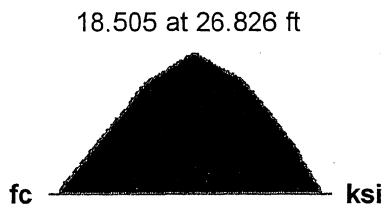
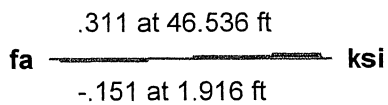
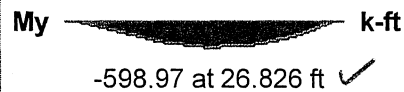
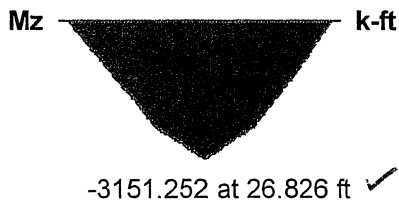
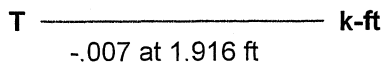
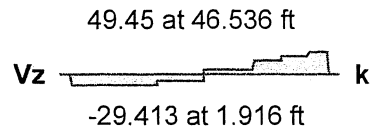
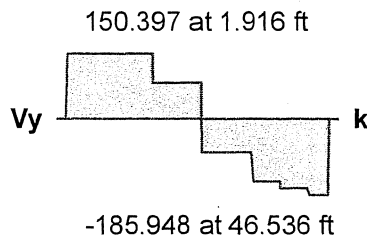
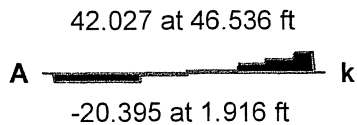
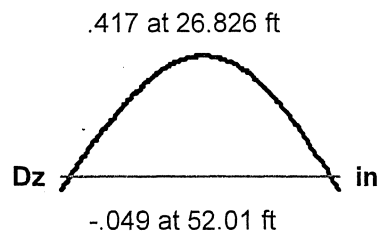
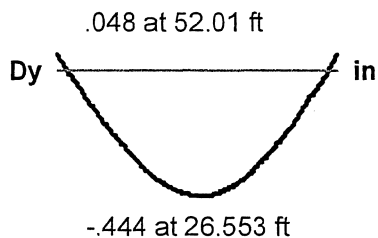
I Joint: **N1**

J Joint: **N4**

LC 17: Mom Std C237b + SU7

Code Check: **0.000 (bending)**

Report Based On 191 Sections



Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

I Joint: **N1**

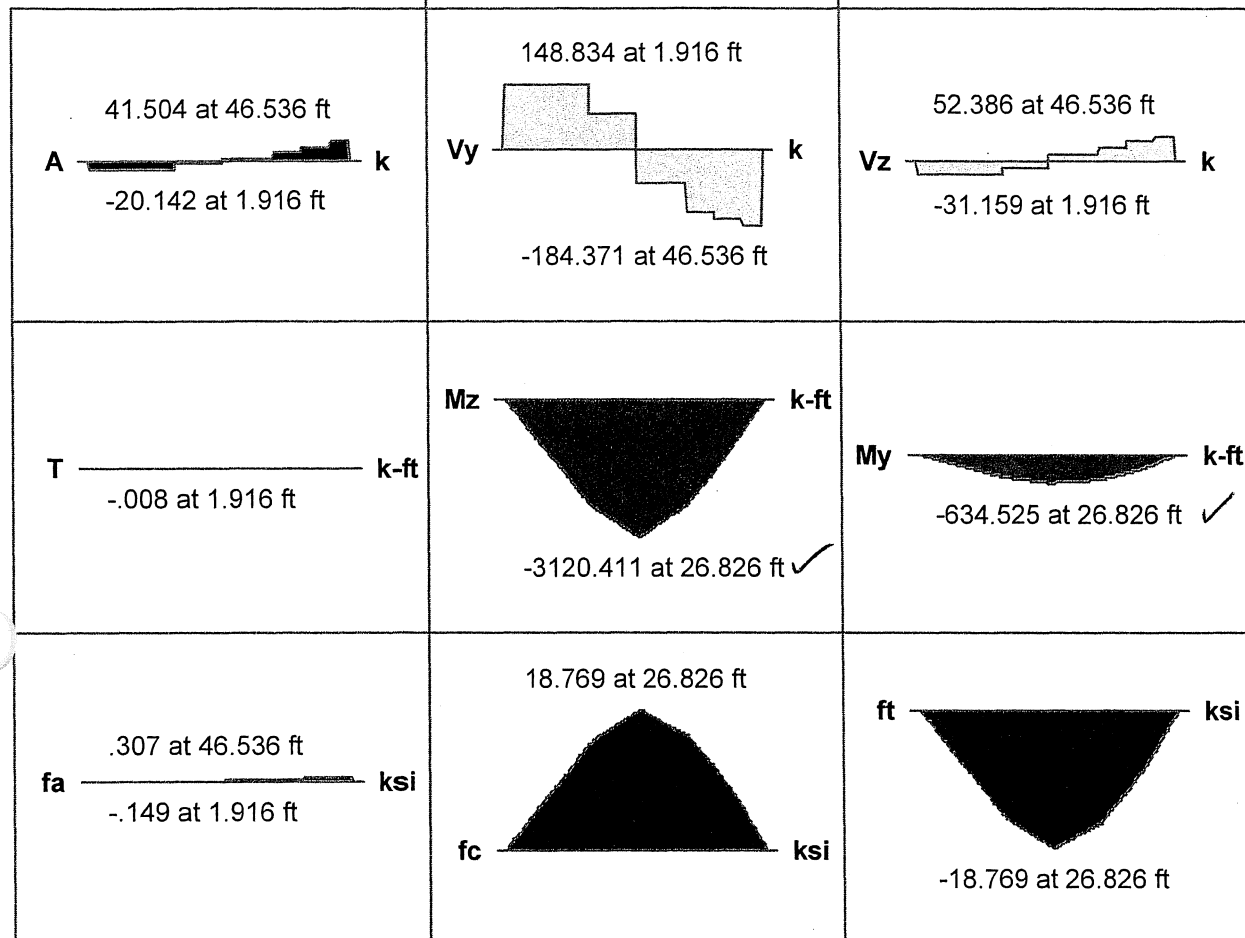
J Joint: **N4**

LC 18: Mom Std C256b + SU7

Code Check: **0.000 (bending)**

Report Based On 191 Sections

✓CSM
5/4/10



G-41

VCSM
5/4/10

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

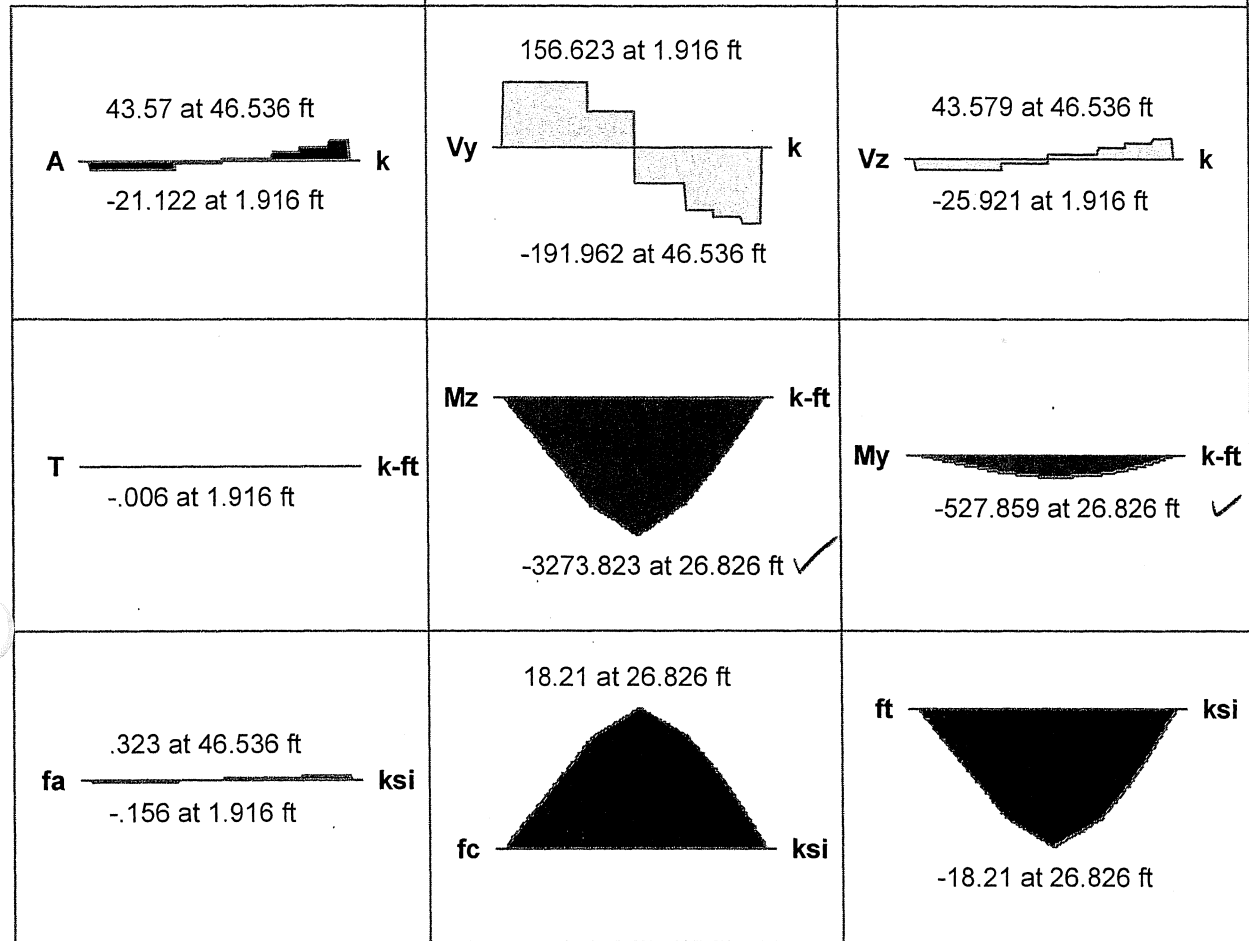
I Joint: **N1**

J Joint: **N4**

LC 19: Mom Std C200j + SU7

Code Check: **0.000 (bending)**

Report Based On 191 Sections



✓
5/4/10

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

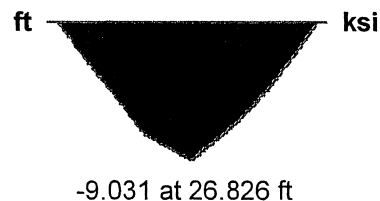
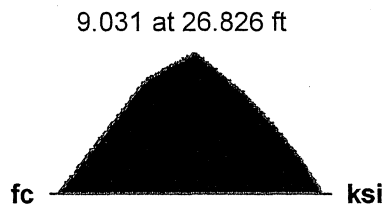
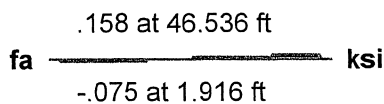
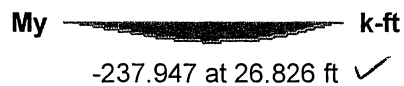
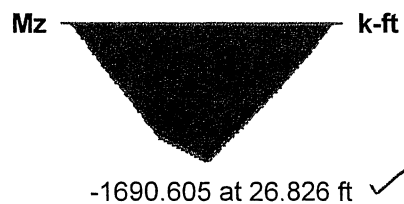
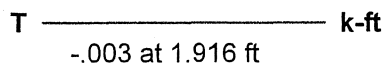
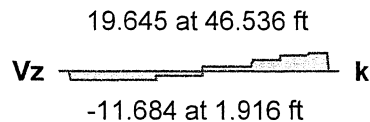
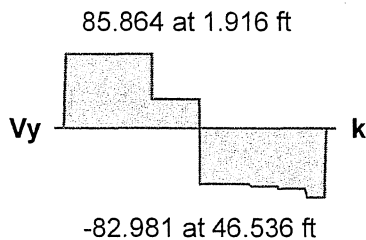
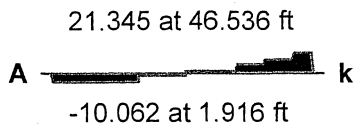
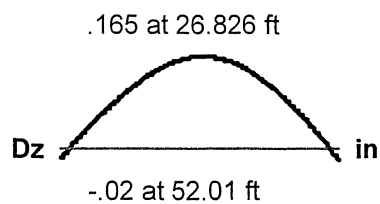
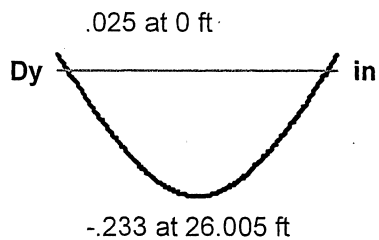
I Joint: **N1**

J Joint: **N4**

LC 20: Mom Std A

Code Check: **0.000 (bending)**

Report Based On 191 Sections



VCSM
5/4/10

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

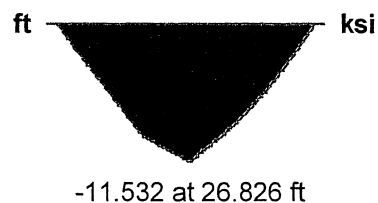
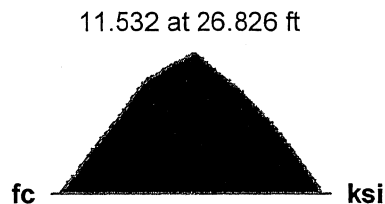
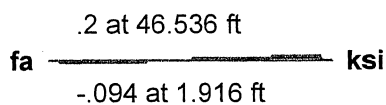
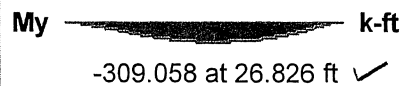
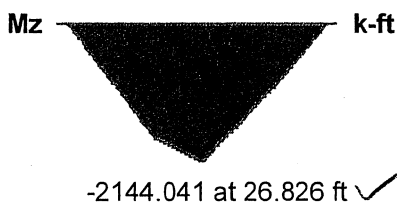
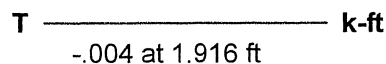
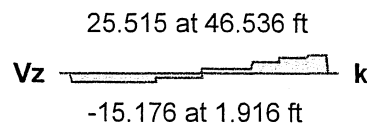
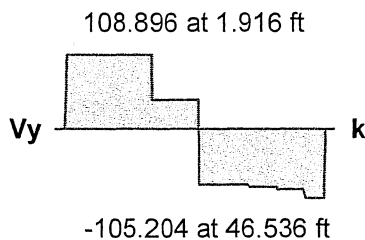
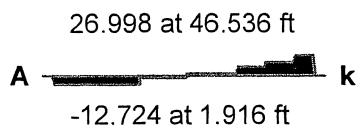
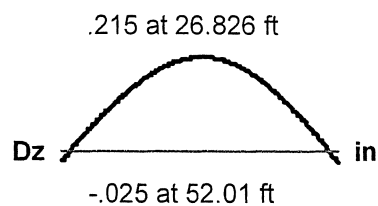
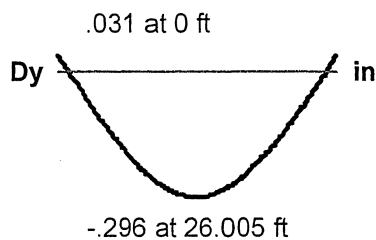
I Joint: **N1**

J Joint: **N4**

LC 21: Mom Std B

Code Check: **0.000 (bending)**

Report Based On 191 Sections



✓CSM
5/4/10

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

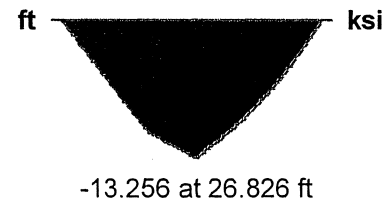
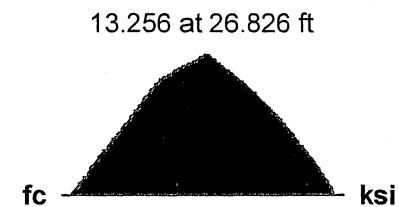
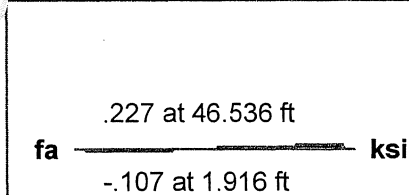
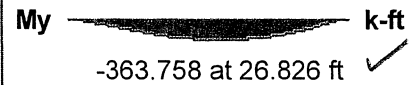
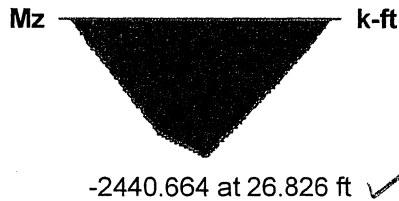
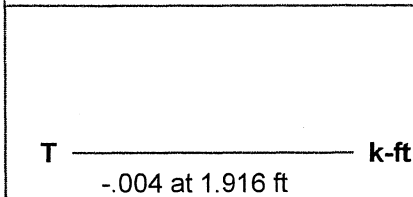
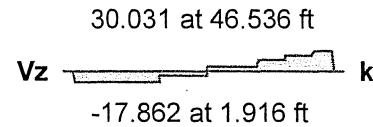
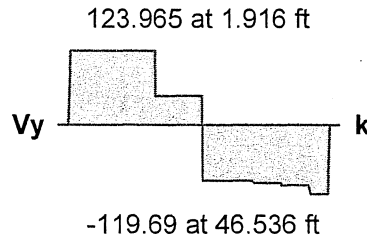
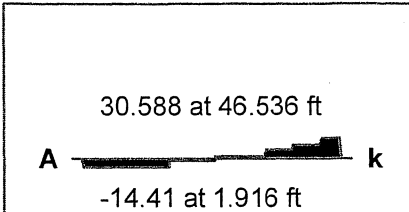
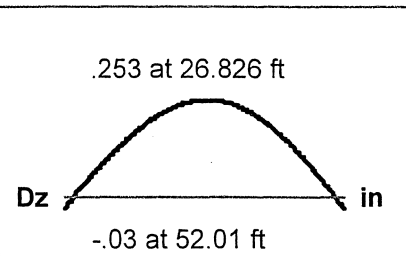
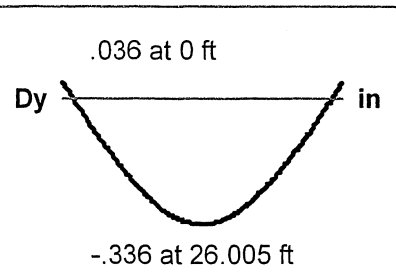
I Joint: **N1**

J Joint: **N4**

LC 22: Mom Std C

Code Check: **0.000 (bending)**

Report Based On 191 Sections



✓CSM
5/4/10

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

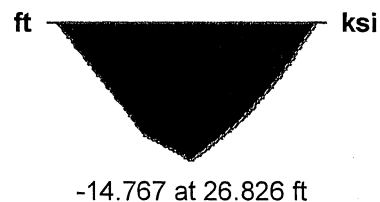
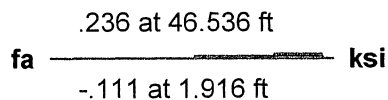
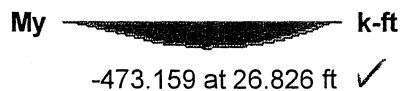
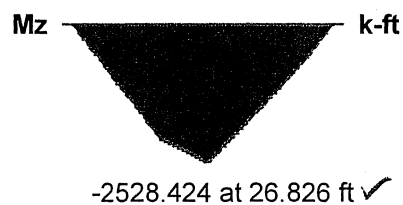
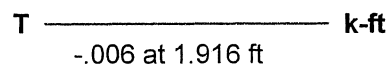
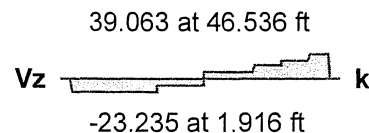
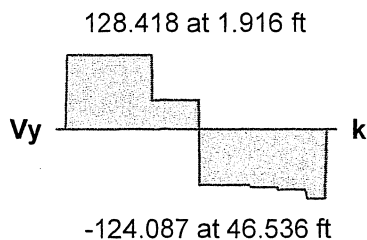
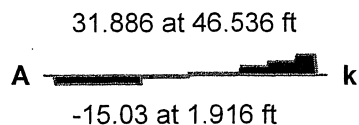
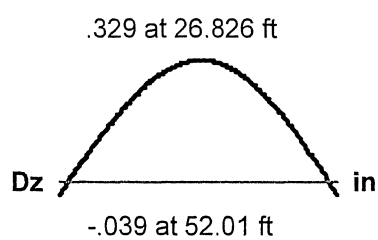
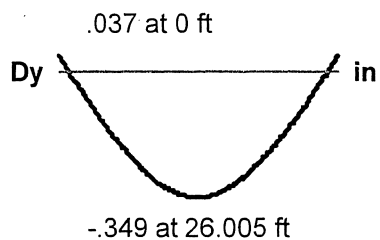
I Joint: **N1**

J Joint: **N4**

LC 23: Mom P411

Code Check: **0.000 (bending)**

Report Based On 191 Sections



VCSM
5/4/10

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

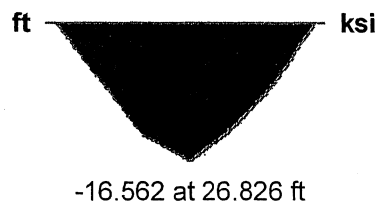
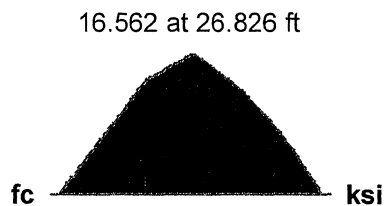
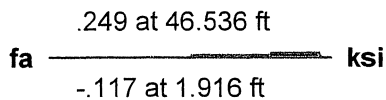
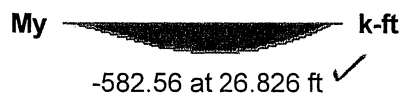
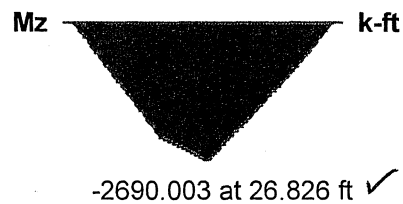
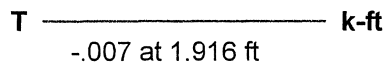
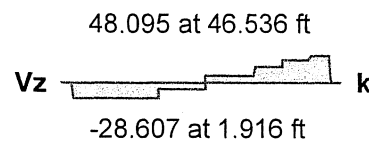
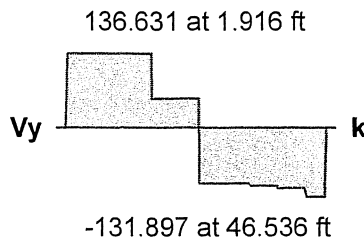
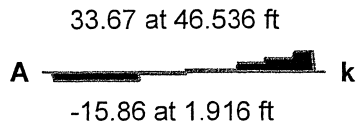
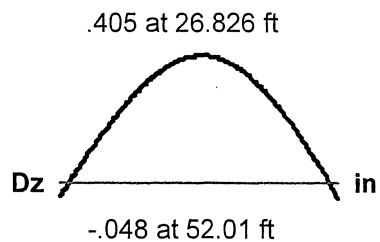
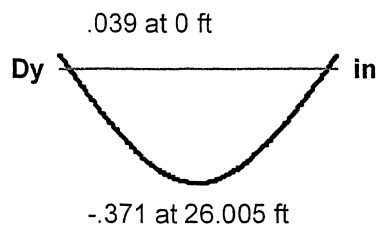
I Joint: **N1**

J Joint: **N4**

LC 24: Mom P413

Code Check: **0.000 (bending)**

Report Based On 191 Sections



VCSM
5/4/10

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

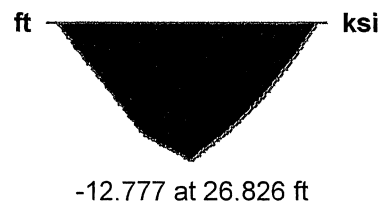
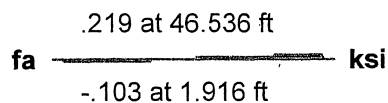
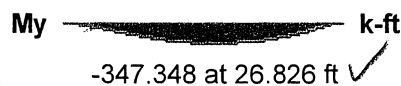
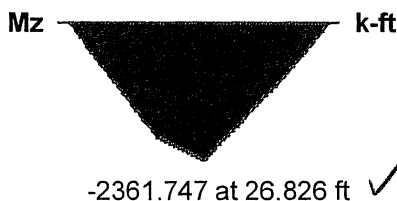
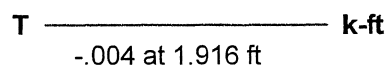
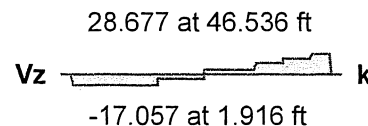
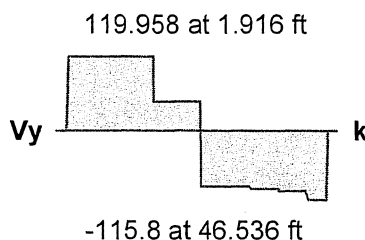
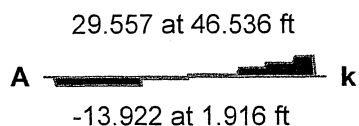
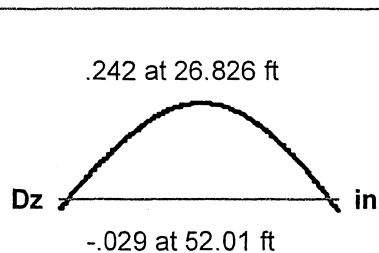
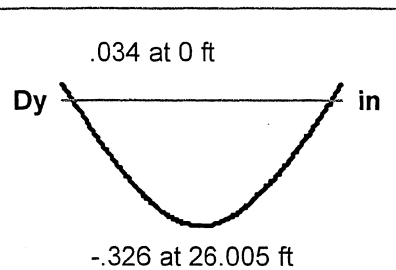
I Joint: **N1**

J Joint: **N4**

LC 25: Mom Std C152b

Code Check: **0.000 (bending)**

Report Based On 191 Sections



165M
5/4/10

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

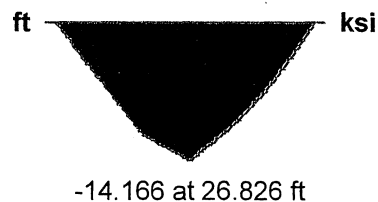
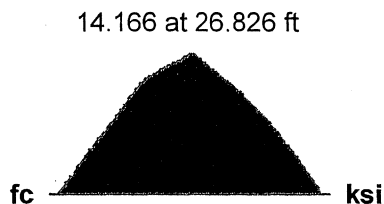
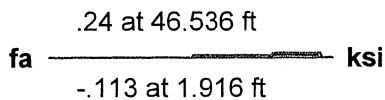
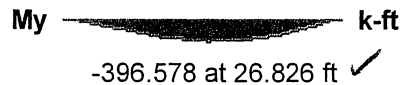
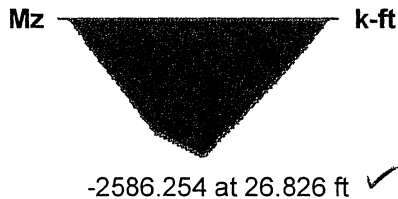
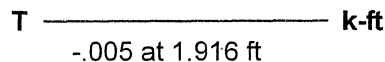
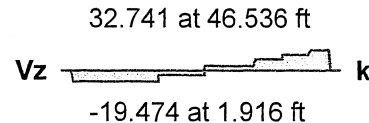
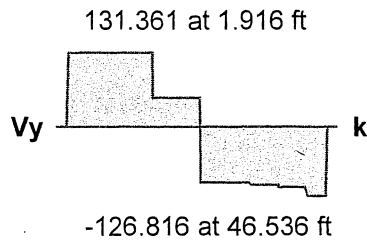
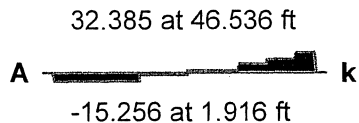
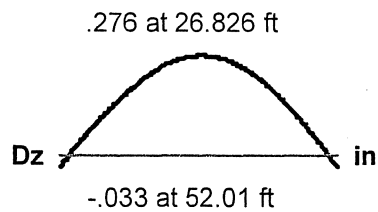
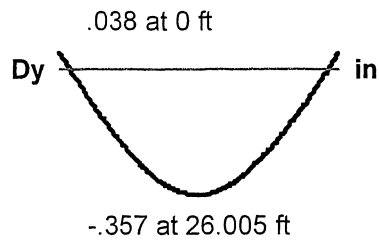
I Joint: **N1**

J Joint: **N4**

LC 26: Mom Std C174b

Code Check: **0.000 (bending)**

Report Based On 191 Sections



✓CSM
5/4/10

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

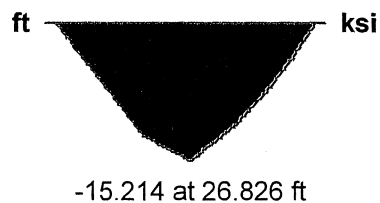
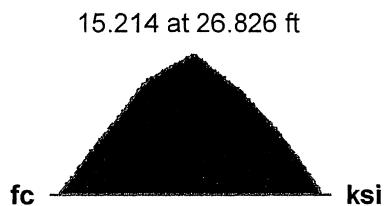
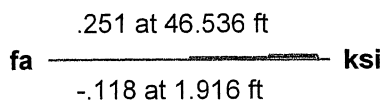
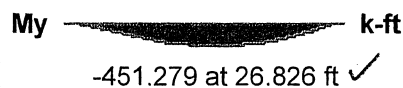
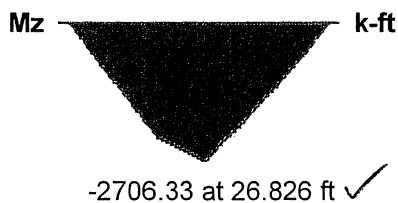
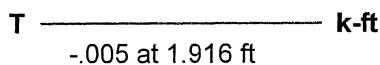
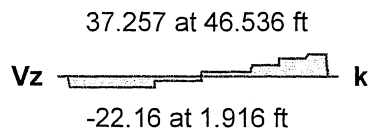
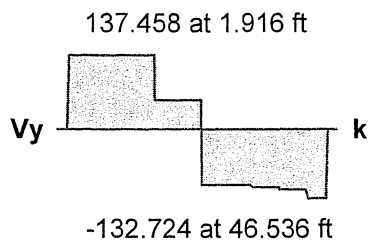
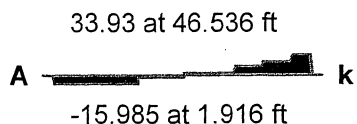
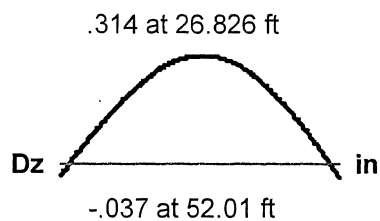
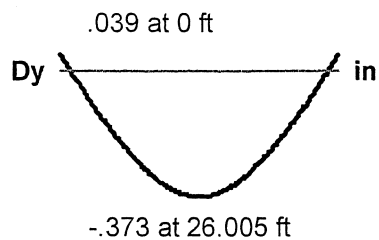
I Joint: **N1**

J Joint: **N4**

LC 27: Mom Std C198_23

Code Check: **0.000 (bending)**

Report Based On 191 Sections



G-50

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

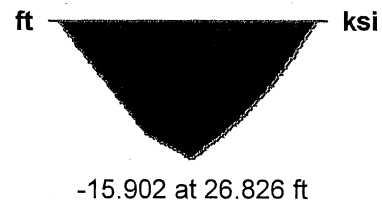
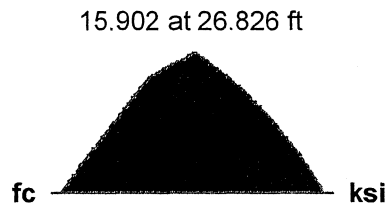
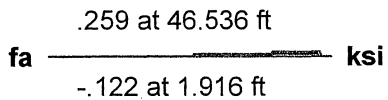
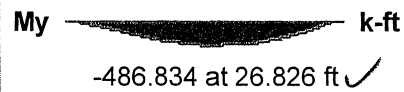
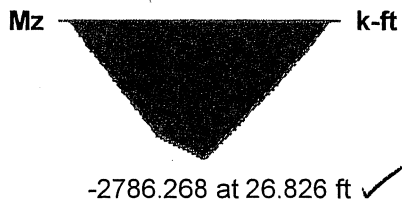
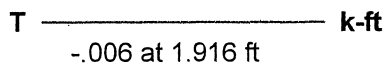
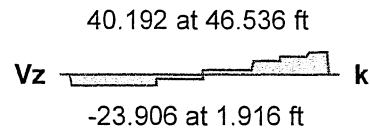
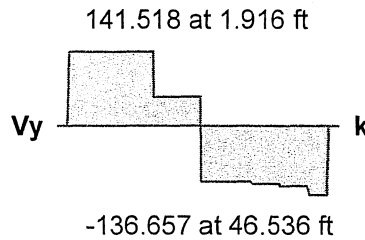
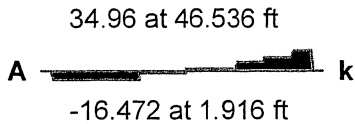
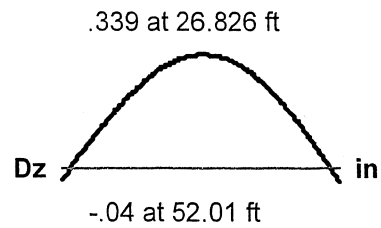
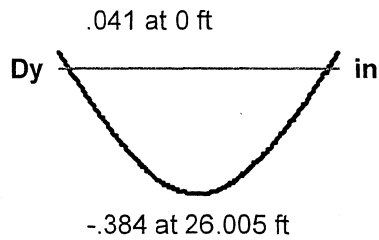
I Joint: **N1**

J Joint: **N4**

LC 28: Mom Std 214b

Code Check: **0.000 (bending)**

Report Based On 191 Sections



✓CSM
5/4/10

VCAM
studio

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

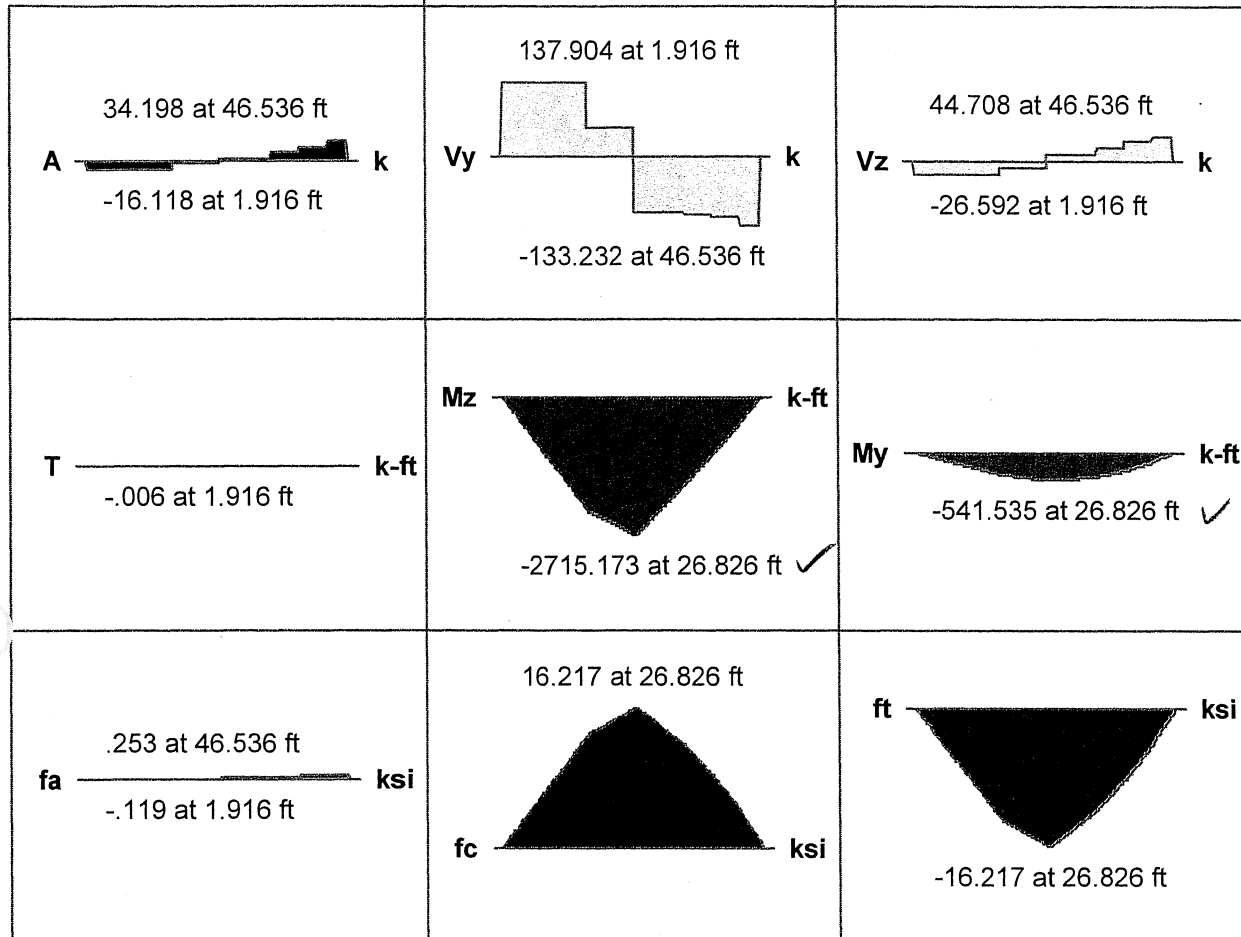
I Joint: **N1**

J Joint: **N4**

LC 29: Mom Std C237b

Code Check: **0.000 (bending)**

Report Based On 191 Sections



✓CSM
5/4/10

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

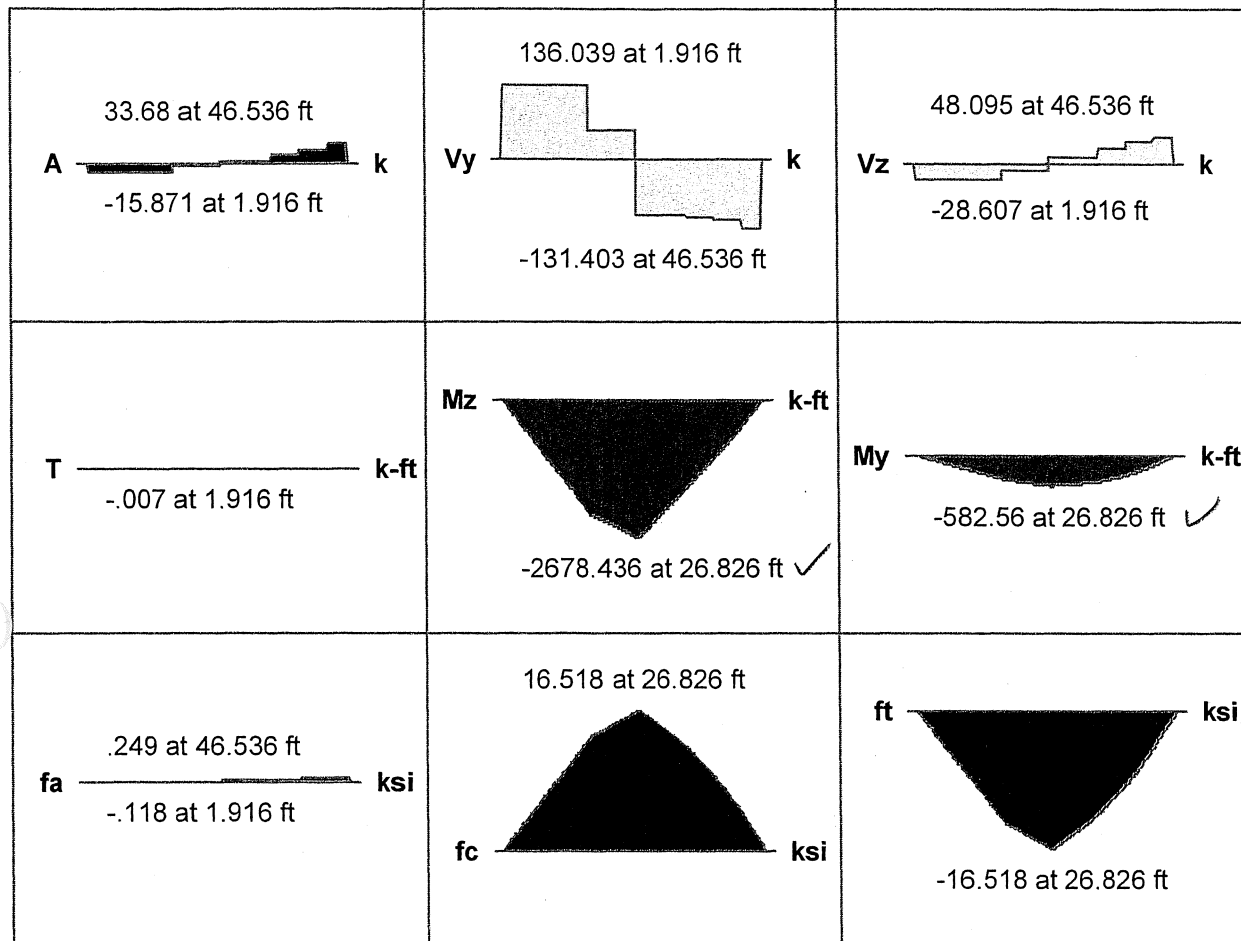
I Joint: **N1**

J Joint: **N4**

LC 30: Mom Std C256b

Code Check: **0.000 (bending)**

Report Based On 191 Sections



✓
5/14/10

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

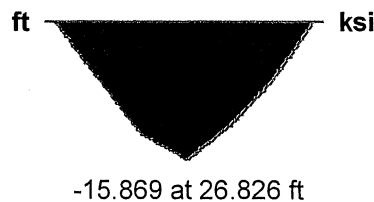
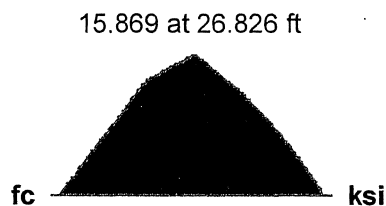
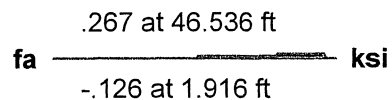
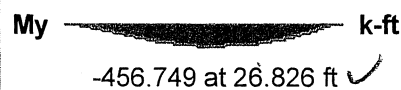
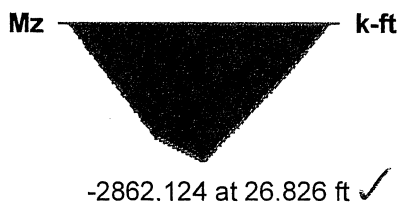
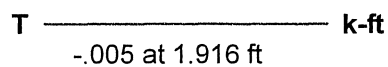
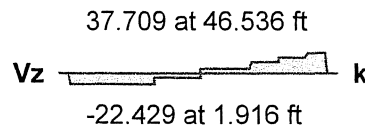
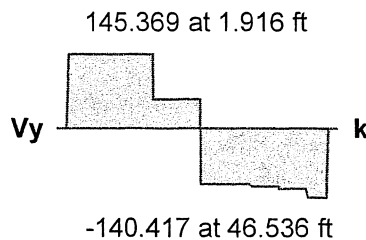
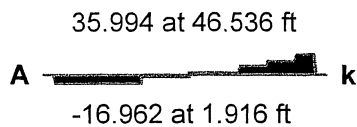
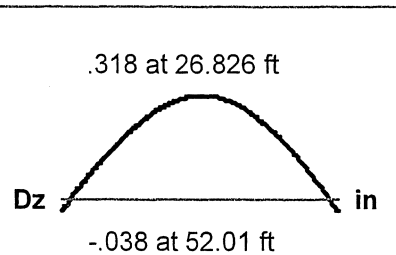
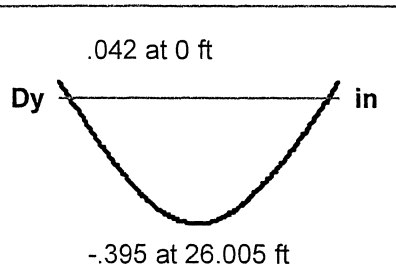
I Joint: **N1**

J Joint: **N4**

LC 31: Mom Std C200j

Code Check: **0.000 (bending)**

Report Based On 191 Sections



Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

I Joint: **N1**

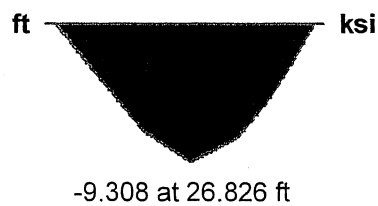
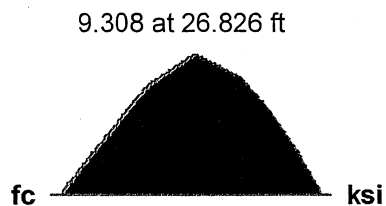
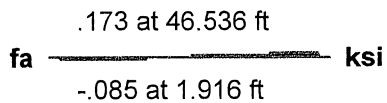
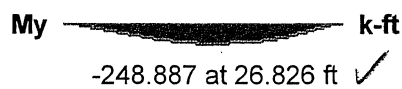
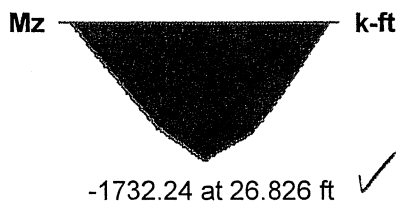
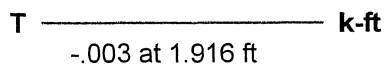
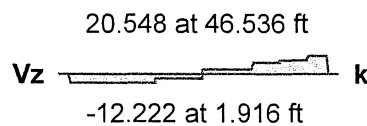
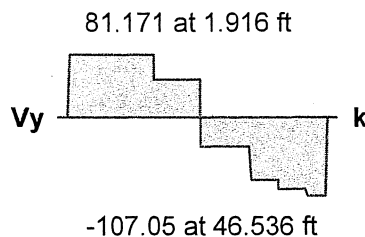
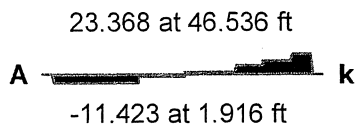
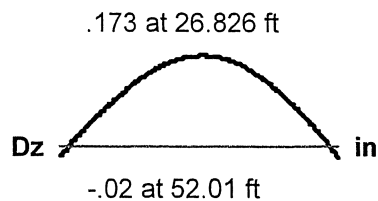
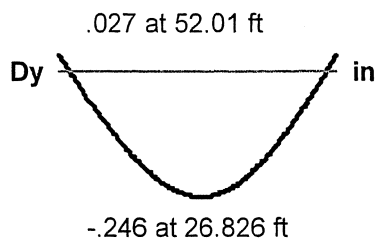
J Joint: **N4**

LC 33: Mom SU4 + SU7

Code Check: **0.000 (bending)**

Report Based On 191 Sections

✓ JCM
6/23/10



Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

I Joint: **N1**

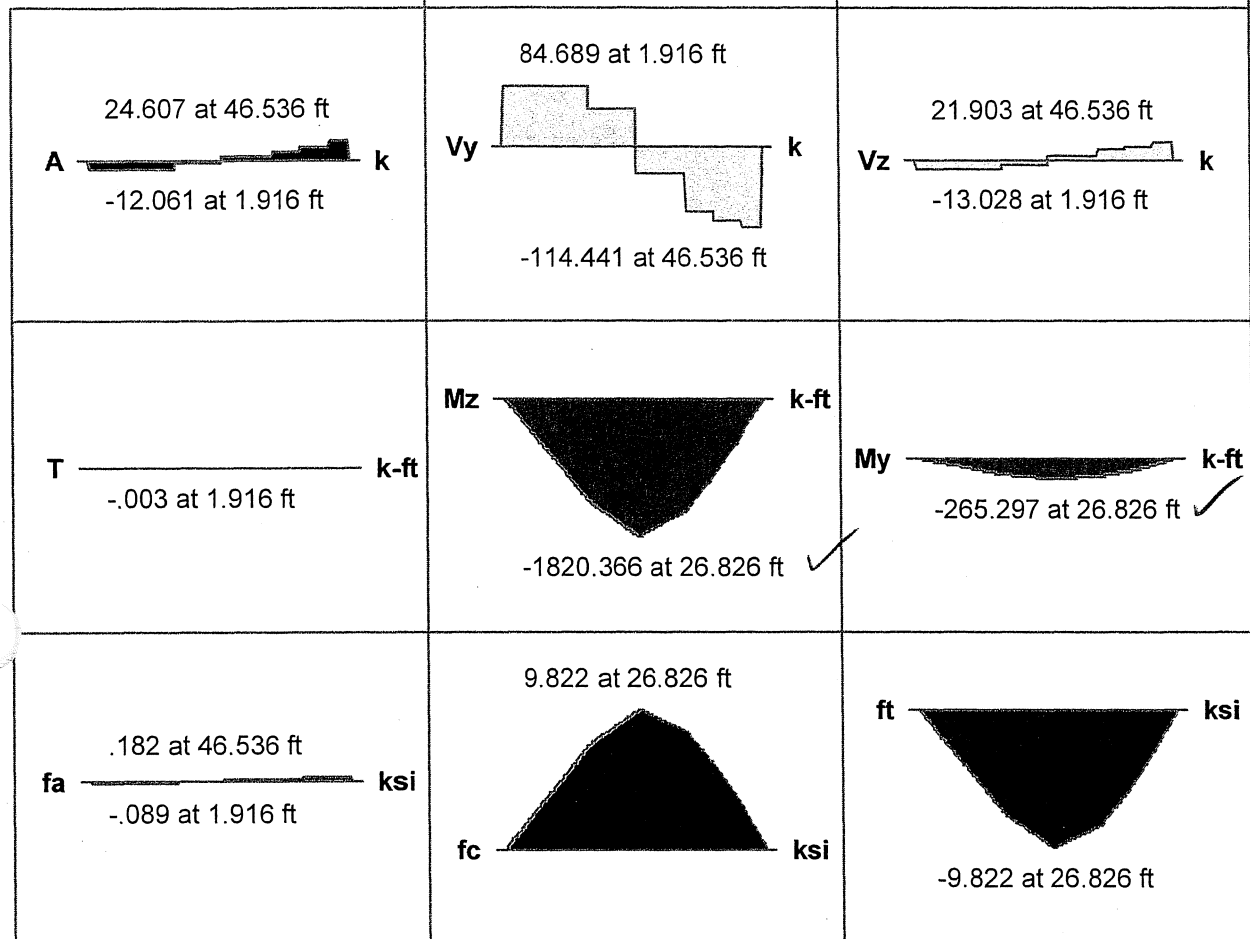
J Joint: **N4**

LC 34: Mom SU5 + SU7

Code Check: **0.000 (bending)**

Report Based On 191 Sections

✓ sum
C/23/10



Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

I Joint: **N1**

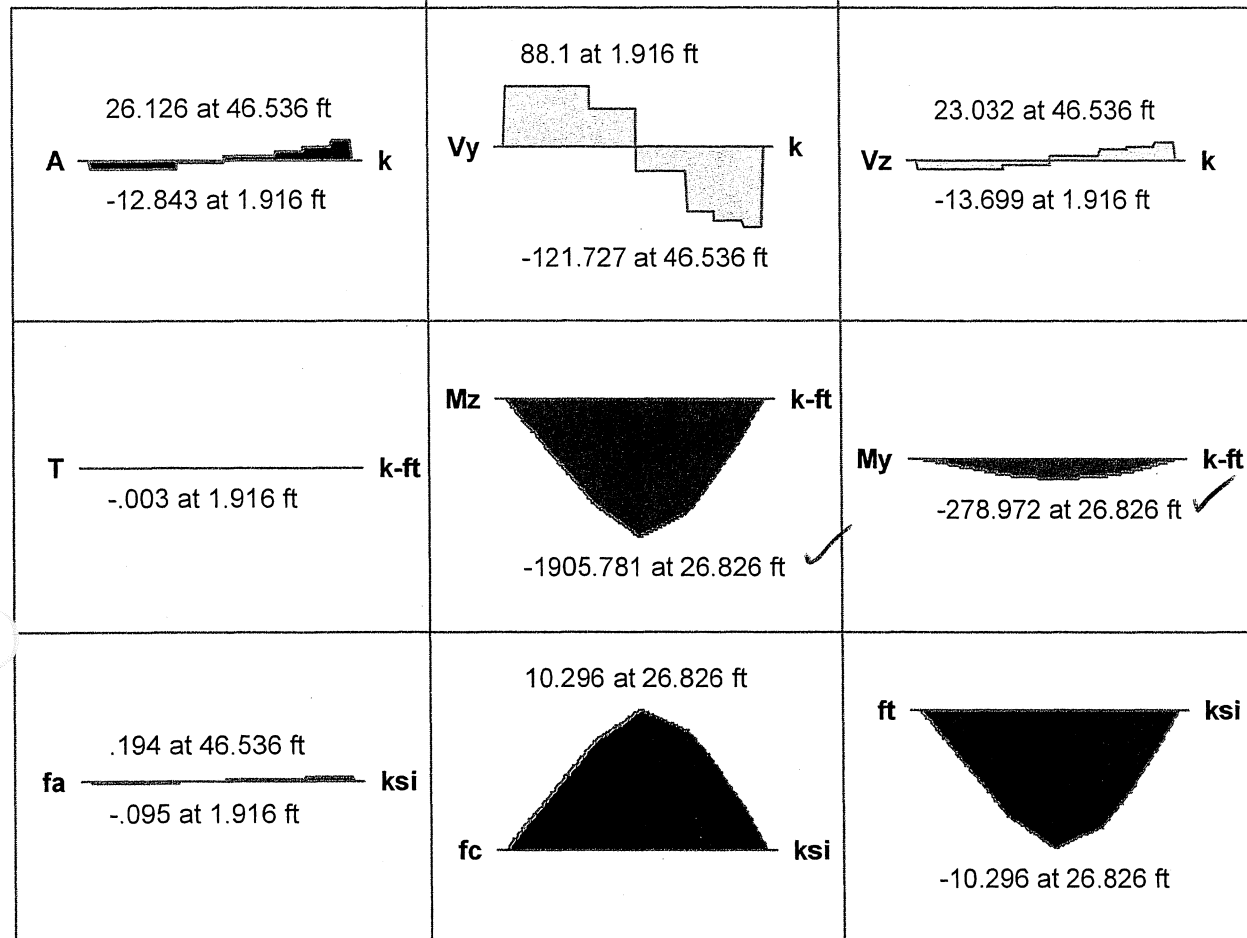
J Joint: **N4**

LC 35: Mom SU6 + SU7

Code Check: **0.000 (bending)**

Report Based On 191 Sections

✓CSM
6/23/10



VJW
6/23/10

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

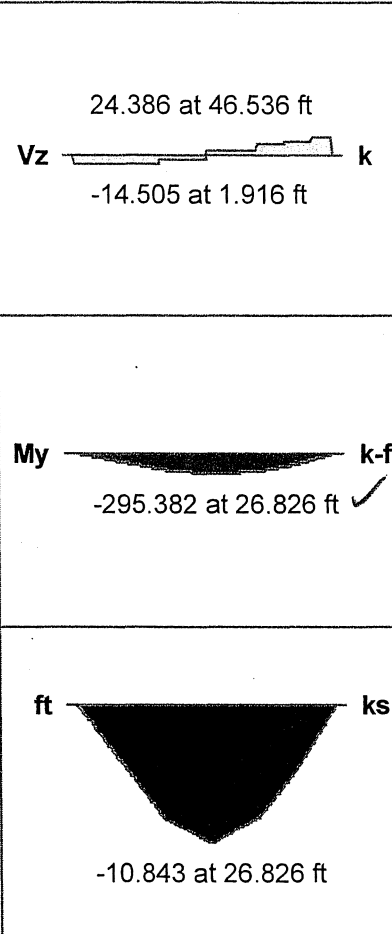
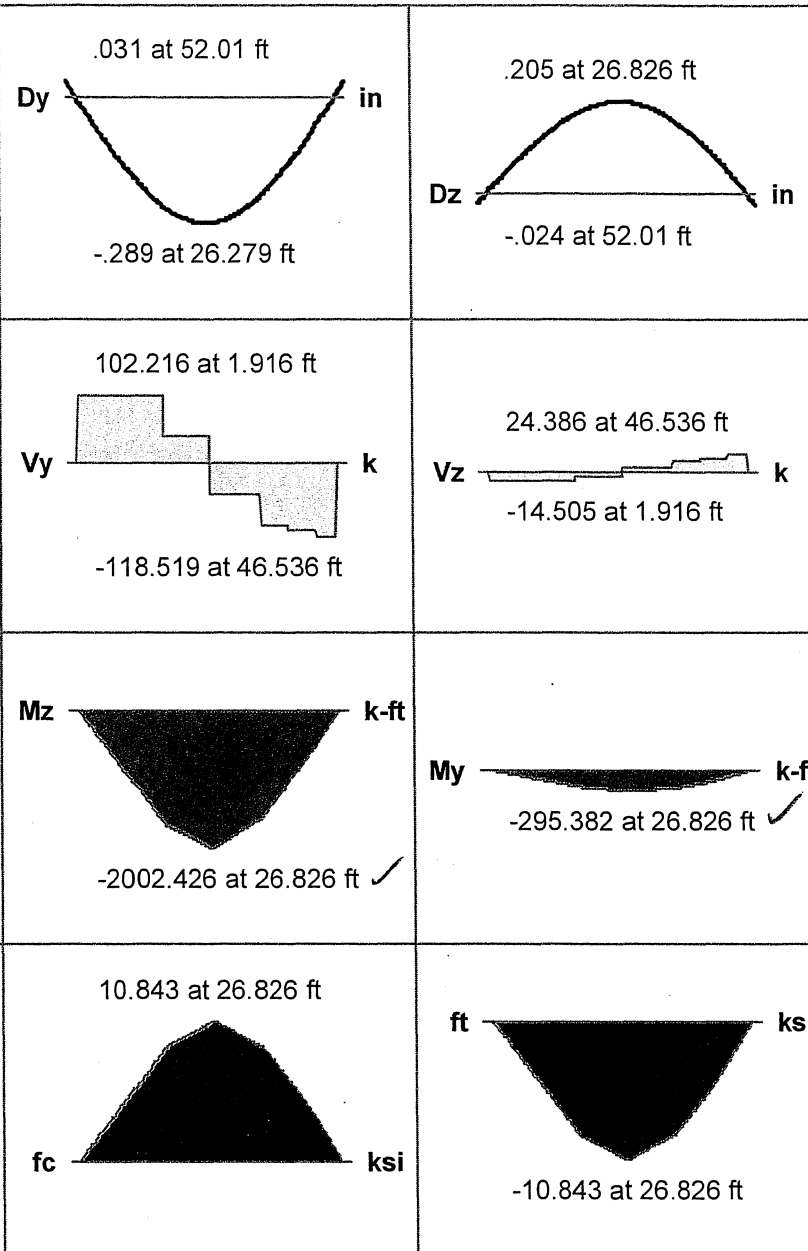
I Joint: **N1**

J Joint: **N4**

LC 36: Mom SU7 + SU7

Code Check: **0.000 (bending)**

Report Based On 191 Sections



Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

I Joint: **N1**

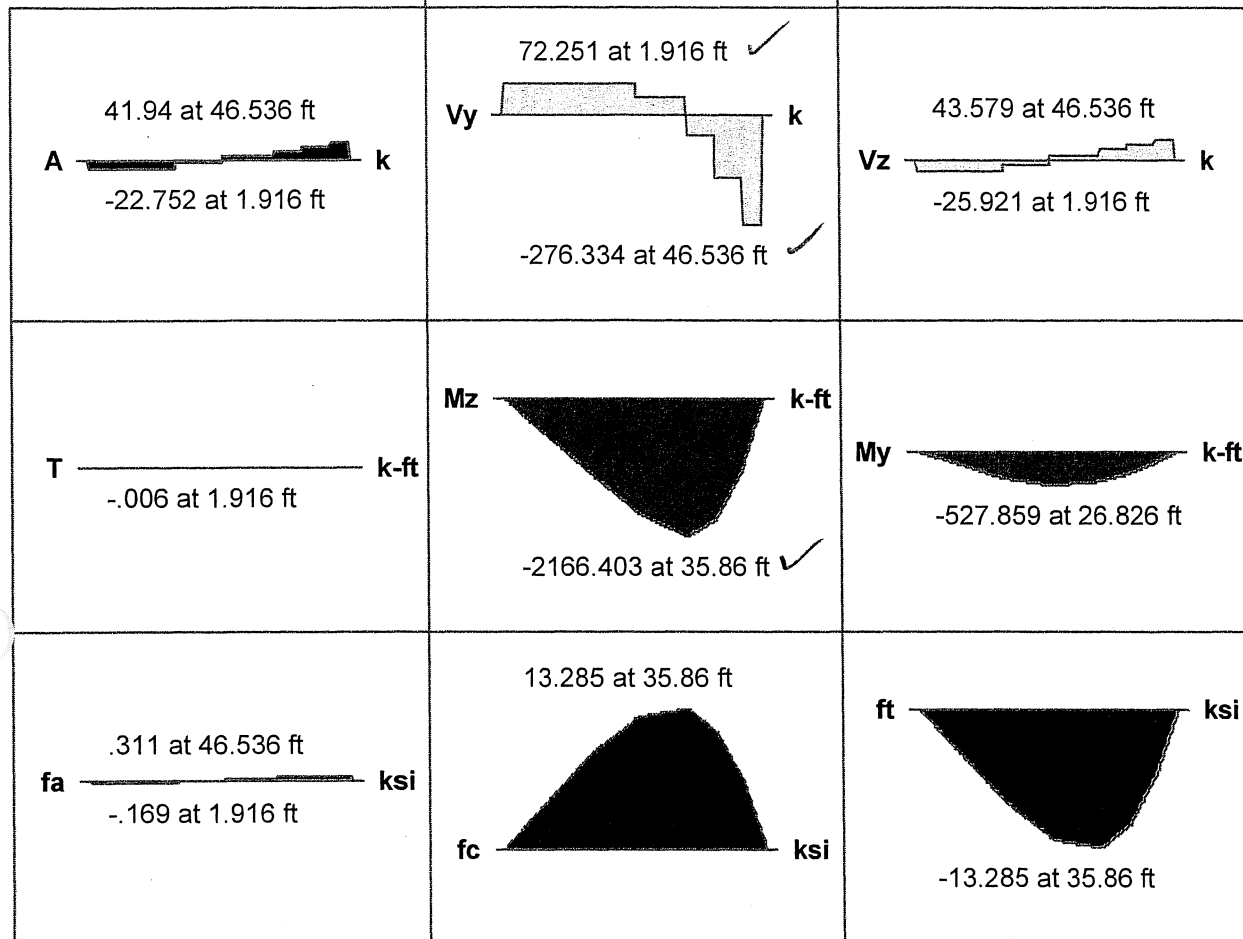
J Joint: **N4**

LC 32: Shr Std C200j + SU7

Code Check: **0.000 (bending)**

Report Based On 191 Sections

✓ 5/4/10



MnDOT Special Structures, 69801N
Pier Cap P2-3E Reactions under posting and permit load:
19-Mar-10

				HL-93 CF Pier		HL-93 Braking		Mx DL		phi (s) =		phi (s) =					
				Reaction (kip)		Force (Kip)		(kip*ft)		Sx (in^3)		0.85 0.95					
				139.6		36		3695		3133.5		96172 107487					
										Sy (in^3)							
										1116.68							
Risa				Risa													
Girder				Pier													
LC	Truck:	Total Truck	Reaction at	Wheel Load	LC	Truck Combination	Combined LL	Proportion	Combined Truck	Braking Force	Proportion	Mx LL	Mv LL	RF: phi (s)	RF: phi (s)	RF: phi (s)	RF: phi (s)
		Weight (kip)	P2-3E (kip)	(kip)			Reaction (kip)	of HL-93 CF	Weight (kip)	(kip) =	of HL-93 BF	(kip*ft)	(kip*ft)	= 0.85	= 0.95	= 0.85	= 0.95
								to use	0.25*Truck		to use						
13	POST-TYPE3UNIT	48	47.331	23.67	5	Type 3 + SU7	122.72	0.88	125.5	31.375	0.87	1651.375	237.947	1.34	1.71	1.58	2.01
14	POST-TYPE3S2-40UNIT	80	70.622	35.31	6	Type 3S2-40 + SU7	146.01	1.05	157.5	39.375	1.09	1923.721	298.118	1.14	1.46	1.34	1.71
15	POST-TYPE3S3UNIT	80	71.81	35.91	7	Type 3S3 + SU7	147.20	1.05	157.5	39.375	1.09	1938.542	298.118	1.13	1.45	1.33	1.70
16	POST-SU4-TRUCK	54	53.199	26.60													
17	POST-SU5-TRUCK	62	60.705	30.35													
18	POST-SU6-TRUCK	69.5	67.904	33.95													
19	POST-SU7-TRUCK	77.5	75.391	37.70													
20	PERMIT-STD-A-TRUCK	104	96.071	48.04	8	Std A + SU7	171.46	1.23	181.5	45.375	1.26	2280.522	344.613	0.97	1.23	1.13	1.45
21	PERMIT-STD-B-TRUCK	136	121.859	60.93	9	Std B + SU7	197.25	1.41	213.5	53.375	1.48	2655.716	404.783	0.83	1.06	0.97	1.24
22	PERMIT-STD-C-TRUCK	159	138.745	69.37	10	Std C +SU7	214.14	1.53	236.5	59.125	1.64	2901.498	448.544	0.76	0.97	0.89	1.14
23	PERMIT-P411-TRUCK	207	143.708	71.85	11	P411 + SU7	219.10	1.57	284.5	71.125	1.98	2973.976	541.535	0.72	0.92	0.85	1.08
24	PERMIT-P413-TRUCK	255	152.921	76.46	12	P413 + SU7	228.31	1.64	332.5	83.125	2.31	3108.466	631.79	0.68	0.87	0.80	1.02
25	PERMIT-STD-C152B	152.2	134.268	67.13	13	Std C152b + SU7	209.66	1.50	229.7	57.425	1.60	2836.367	437.604	0.77	0.99	0.91	1.16
26	PERMIT-STD-C174B	174	147.026	73.51	14	Std C174b + SU7	222.42	1.59	251.5	62.875	1.75	3022.122	478.629	0.72	0.93	0.85	1.09
27	PERMIT-STD-C198_23	198	153.833	76.92	15	Std C198_23 + SU7	229.22	1.64	275.5	68.875	1.91	3121.507	522.389	0.70	0.89	0.82	1.05
28	PERMIT-STD-C214B	214	158.388	79.19	16	Std C214b + SU7	233.78	1.67	291.5	72.875	2.02	3187.489	522.475	0.68	0.87	0.80	1.03
29	PERMIT-STD-C237B	237.4	154.312	77.16	17	Std C237b + SU7	229.70	1.65	314.9	78.725	2.19	3128.853	598.97	0.68	0.87	0.80	1.02
30	PERMIT-STD-C256B	256	152.232	76.12	18	Std C256b + SU7	227.62	1.63	333.5	83.375	2.32	3098.285	634.525	0.68	0.87	0.80	1.02
31	PERMIT-STD-C200J	200	162.682	81.34	19	Std C200j + SU7	238.07	1.71	277.5	69.375	1.93	3250.611	527.859	0.67	0.86	0.79	1.01

				Multiple Presence Factor						Single Trip Escorted					
				1.2				Gamma DL		1.25 Gamma LL		1.15			
Risa Girder		Total Truck Weight (kip)	Reaction at P2-3E (kip)	Wheel Load (kip)	Risa Pier	Truck Combination	Factored LL Reaction (kip)	Proportion of HL-93 CF to use	Truck Weight (kip)	Braking Force (kip) = 0.25*Truck	Proportion of HL-93 BF to use	Mx LL (kip*ft)	Mv LL (kip*ft)	RF: phi (s) = 0.85	RF: phi (s) = 0.95
LC	Truck:				LC										
20	PERMIT-STD-A-TRUCK	104	96.071	48.04	20	Std A	115.29	0.83	124.8	31.2	0.87	1679.338	237.947	1.55	1.98
21	PERMIT-STD-B-TRUCK	136	121.859	60.93	21	Std B	146.23	1.05	163.2	40.8	1.13	2129.788	309.058	1.22	1.56
22	PERMIT-STD-C-TRUCK	159	138.745	69.37	22	Std C	166.49	1.19	190.8	47.7	1.33	2424.51	363.758	1.07	1.36
23	PERMIT-P411-TRUCK	207	143.708	71.85	23	P411	172.45	1.24	248.4	62.1	1.73	2511.592	473.159	1.00	1.28
24	PERMIT-P413-TRUCK	255	152.921	76.46	24	P413	183.51	1.31	306	76.5	2.13	2672.22	582.56	0.92	1.17
25	PERMIT-STD-C152B	152.2	134.268	67.13	25	Std C152b	161.12	1.15	182.64	45.66	1.27	2346.136	347.348	1.11	1.41
26	PERMIT-STD-C174B	174	147.026	73.51	26	Std C174b	176.43	1.26	208.8	52.2	1.45	2569.15	396.578	1.00	1.28
27	PERMIT-STD-C198_23	198	153.833	76.92	27	Std C198_23	184.60	1.32	237.6	59.4	1.65	2688.412	451.279	0.95	1.21
28	PERMIT-STD-C214B	214	158.388	79.19	28	Std C214b	190.07	1.36	256.8	64.2	1.78	2767.807	486.834	0.92	1.17
29	PERMIT-STD-C237B	237.4	154.312	77.16	29	Std C237b	185.17	1.33	284.88	71.22	1.98	2697.119	541.535	0.92	1.18
30	PERMIT-STD-C256B	256	152.232	76.12	30	Std C256b	182.68	1.31	307.2	76.8	2.13	2660.654	582.56	0.92	1.18
31	PERMIT-STD-C200J	200	162.682	81.34	31	Std C200j	195.22	1.40	240	60	1.67	2843.119	456.749	0.90	1.15

69-60
5/12/10

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

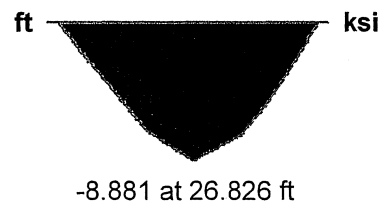
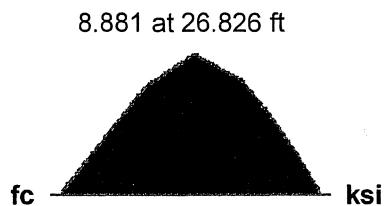
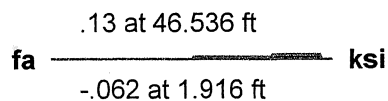
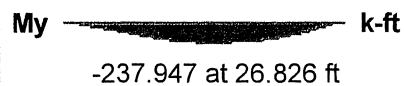
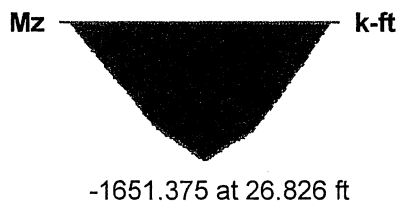
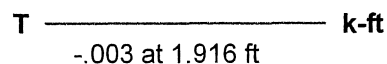
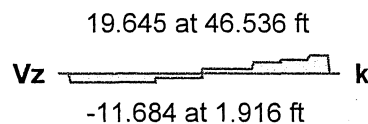
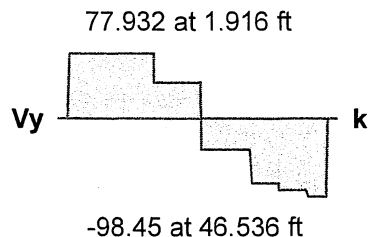
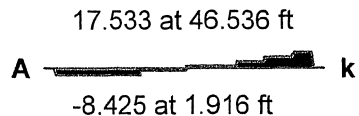
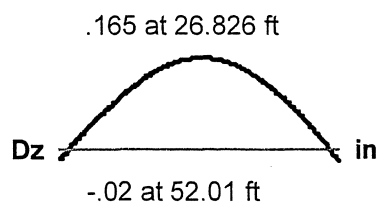
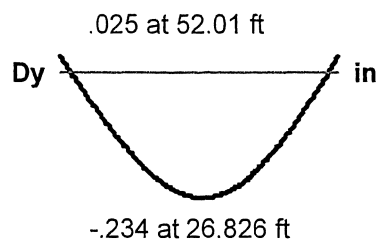
I Joint: **N1**

J Joint: **N4**

LC 5: Mom Type 3 + SU7

Code Check: **0.000 (bending)**

Report Based On 191 Sections



Two
Lanes

5/5/21/10

G-61

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

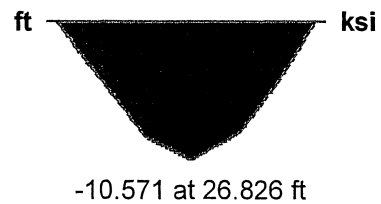
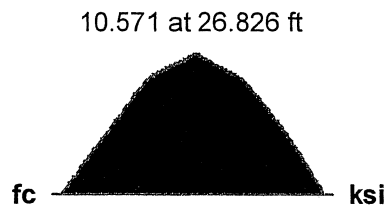
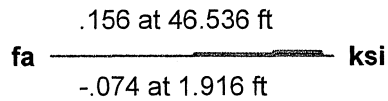
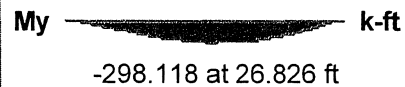
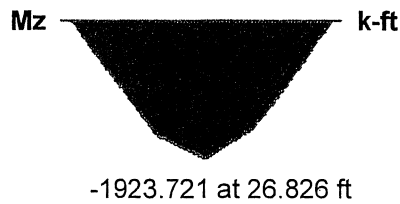
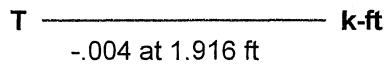
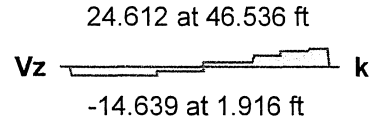
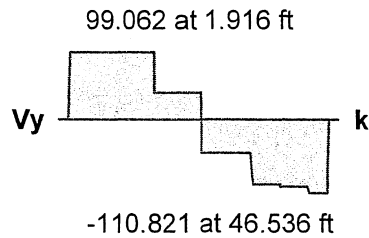
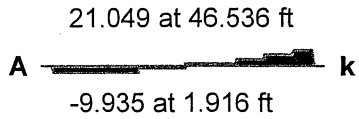
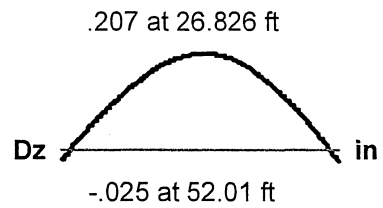
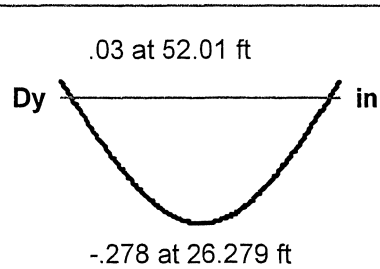
I Joint: **N1**

J Joint: **N4**

LC 6: Mom Type 3S2-40 + SU7

Code Check: **0.000 (bending)**

Report Based On 191 Sections



65/2/10
G-62

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

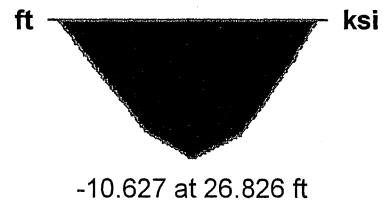
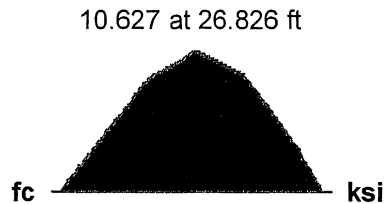
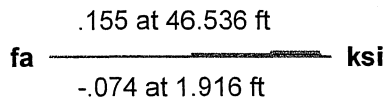
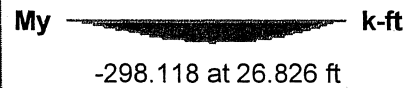
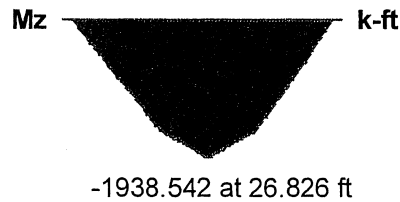
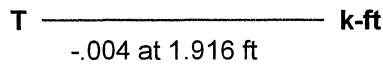
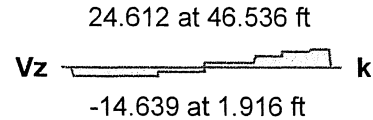
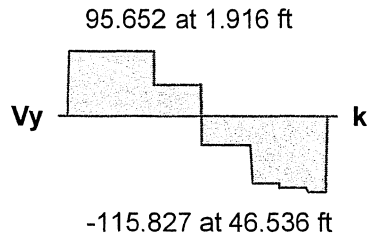
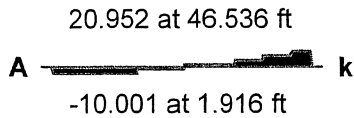
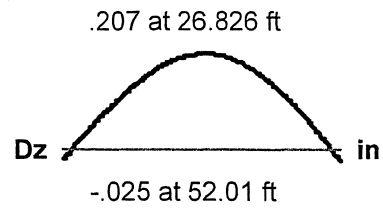
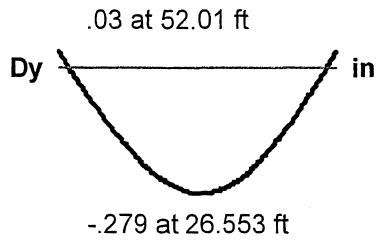
I Joint: **N1**

J Joint: **N4**

LC 7: Mom Type 3S3 +SU7

Code Check: **0.000 (bending)**

Report Based On 191 Sections



5/3/21/10
G-63

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

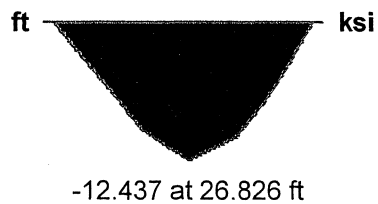
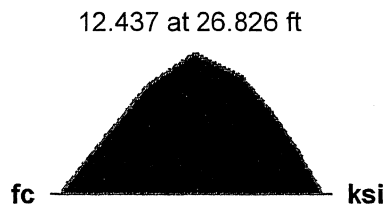
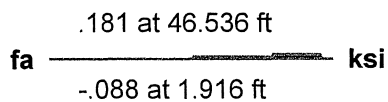
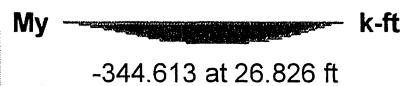
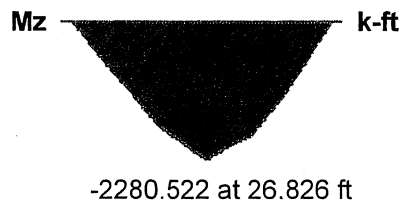
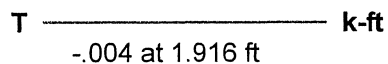
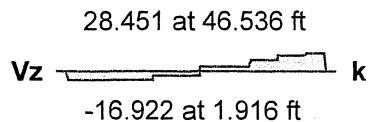
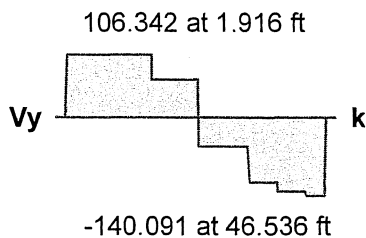
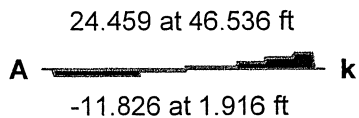
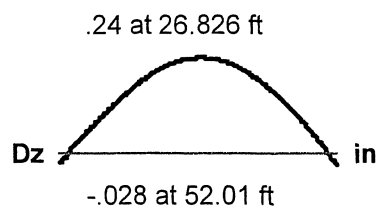
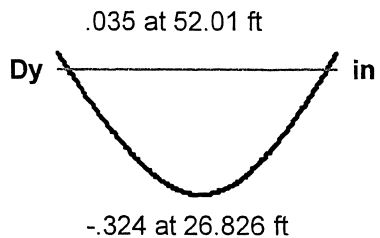
I Joint: **N1**

J Joint: **N4**

LC 8: Mom Std A + SU7

Code Check: **0.000 (bending)**

Report Based On 191 Sections



5/5/19
G-64

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

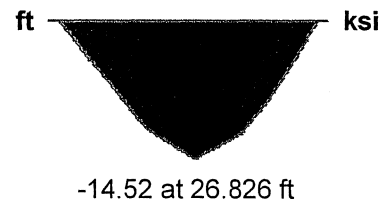
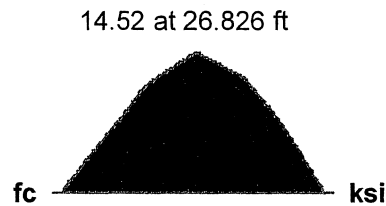
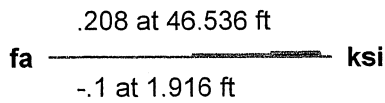
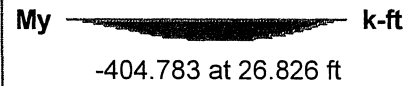
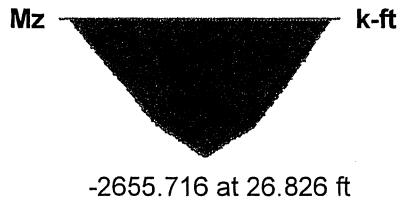
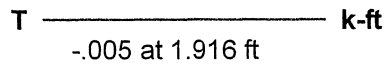
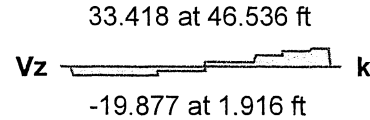
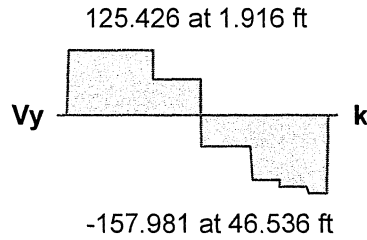
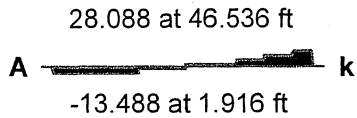
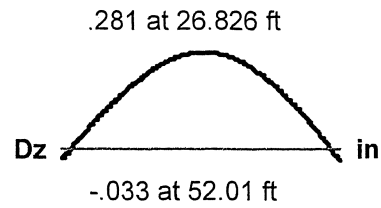
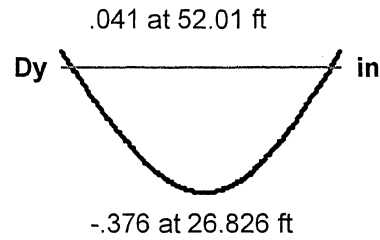
I Joint: **N1**

J Joint: **N4**

LC 9: Mom Std B + SU7

Code Check: **0.000 (bending)**

Report Based On 191 Sections



6/5/2011
G-65

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

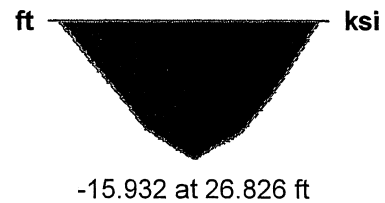
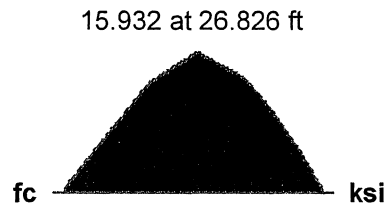
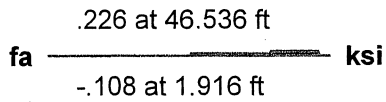
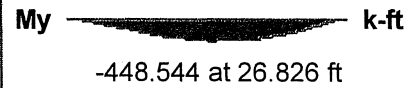
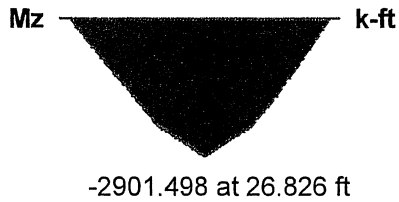
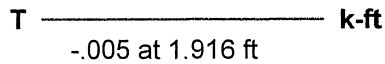
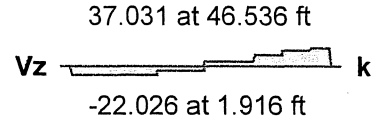
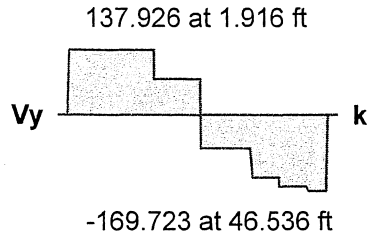
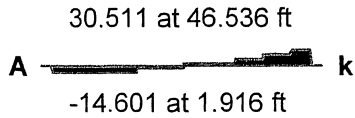
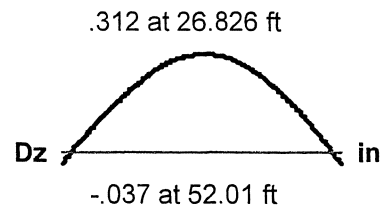
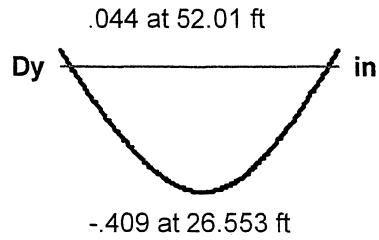
I Joint: **N1**

J Joint: **N4**

LC 10: Mom Std C +SU7

Code Check: **0.000 (bending)**

Report Based On 191 Sections



5/5/21/14
G-66

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

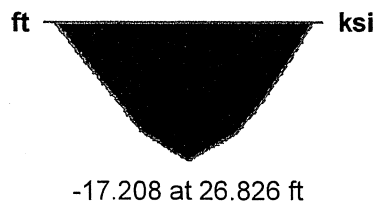
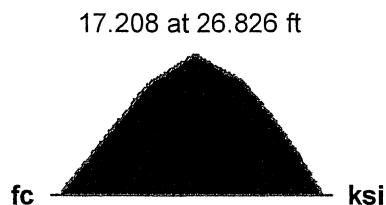
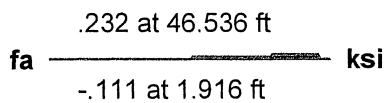
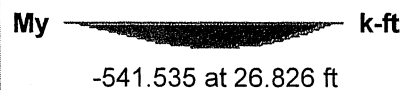
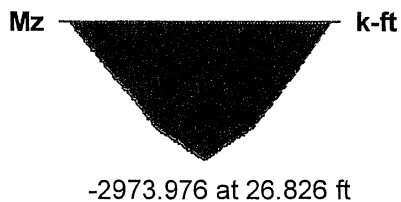
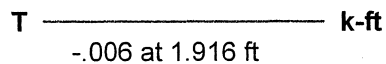
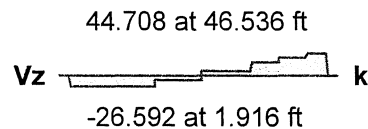
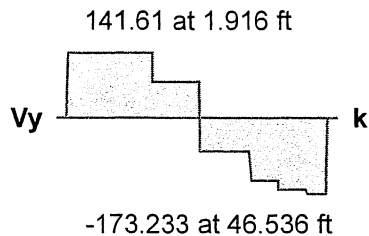
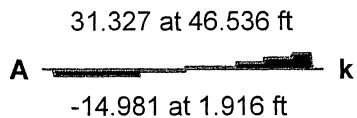
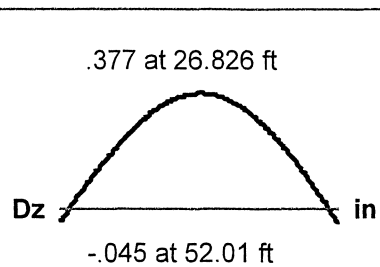
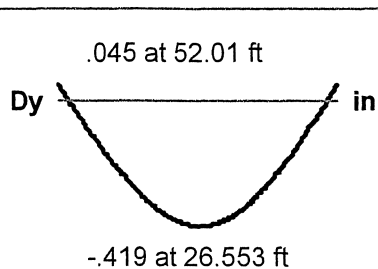
I Joint: **N1**

J Joint: **N4**

LC 11: Mom P411 + SU7

Code Check: **0.000 (bending)**

Report Based On 191 Sections



5/5/21/10
G-67

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

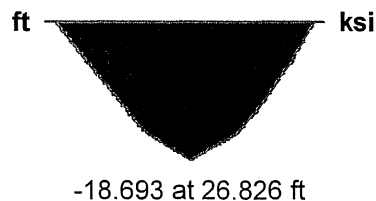
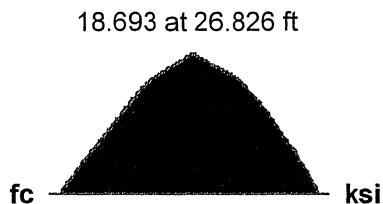
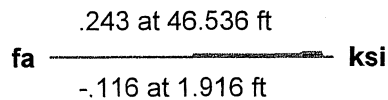
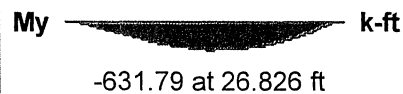
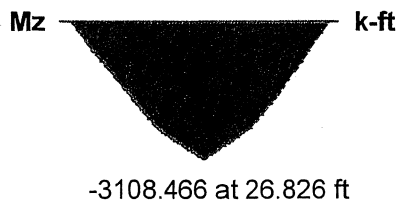
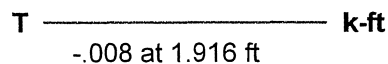
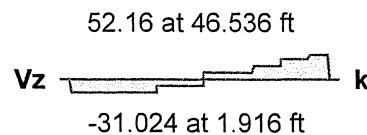
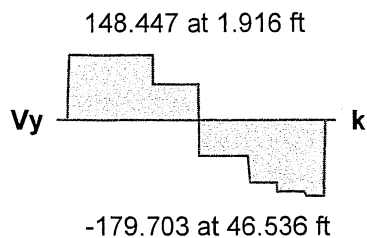
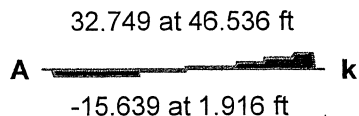
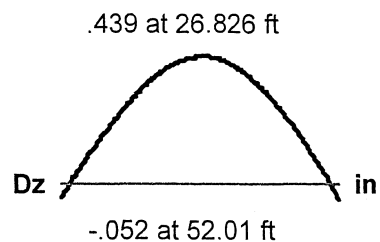
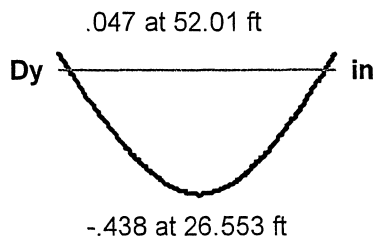
I Joint: **N1**

J Joint: **N4**

LC 12: Mom P413 + SU7

Code Check: **0.000 (bending)**

Report Based On 191 Sections



5/8/12/10
G-68

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

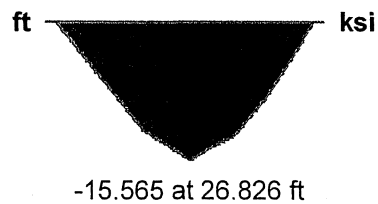
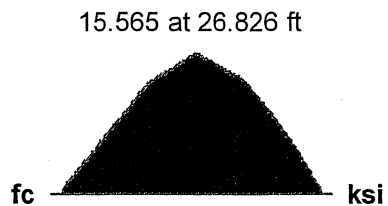
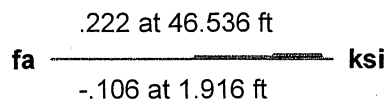
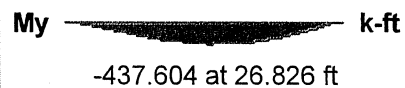
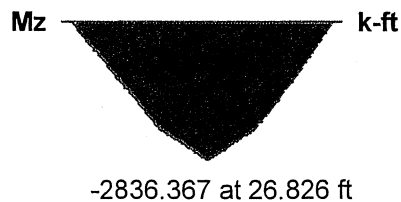
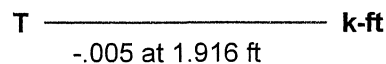
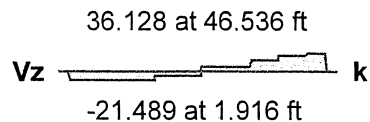
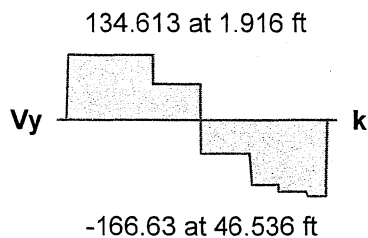
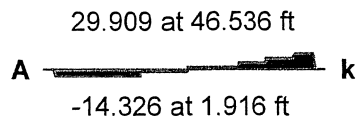
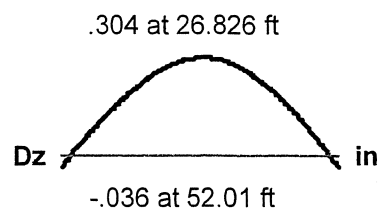
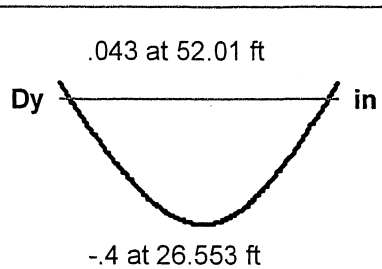
I Joint: **N1**

J Joint: **N4**

LC 13: Mom Std C152b + SU7

Code Check: **0.000 (bending)**

Report Based On 191 Sections



6/5/2012
G-69

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

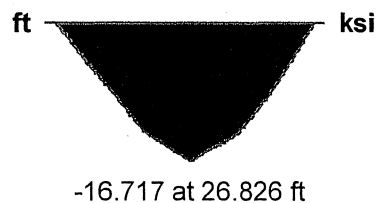
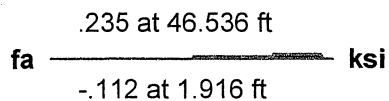
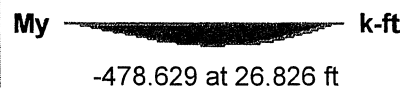
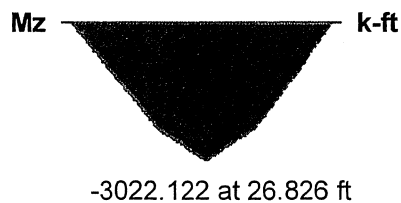
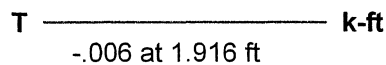
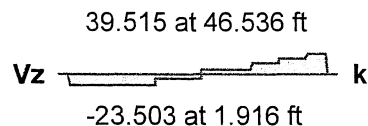
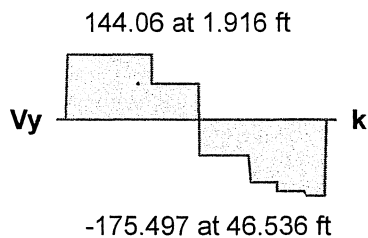
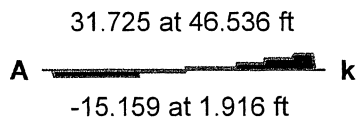
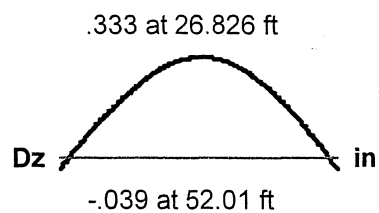
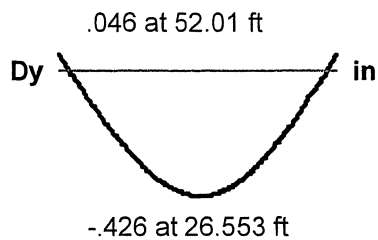
I Joint: **N1**

J Joint: **N4**

LC 14: Mom Std C174b + SU7

Code Check: **0.000 (bending)**

Report Based On 191 Sections



6-70

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

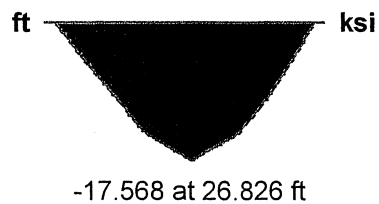
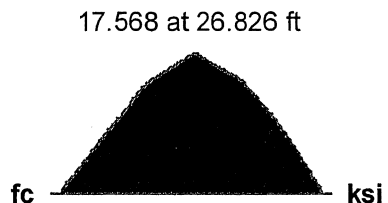
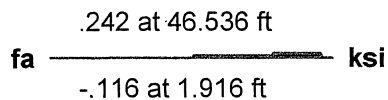
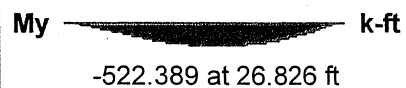
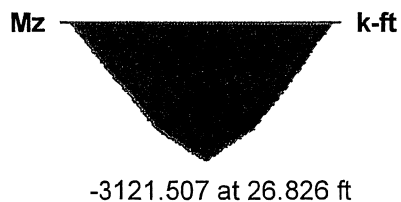
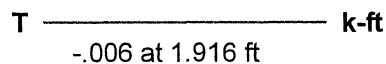
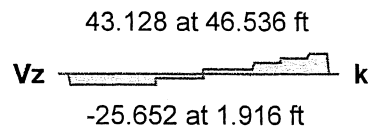
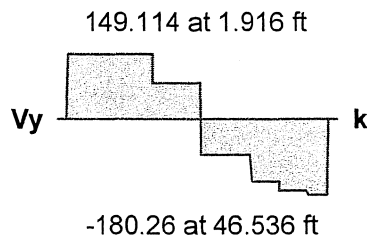
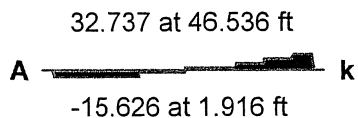
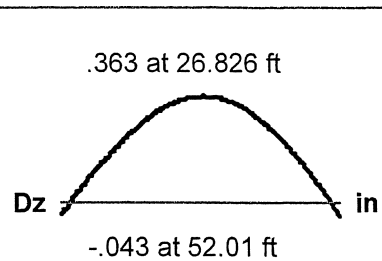
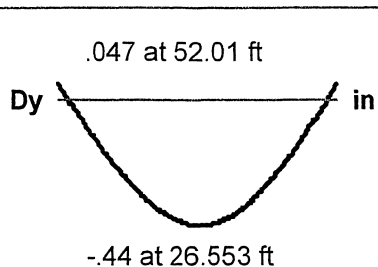
I Joint: **N1**

J Joint: **N4**

LC 15: Mom Std C198_23 + SU7

Code Check: **0.000 (bending)**

Report Based On 191 Sections



5/2/10

(5-71

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

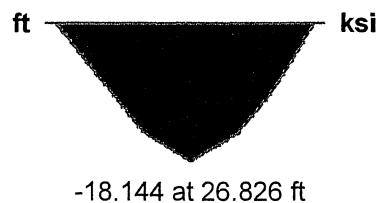
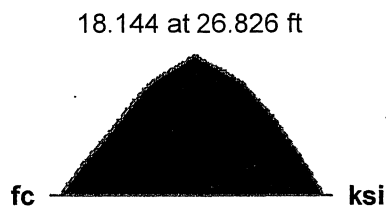
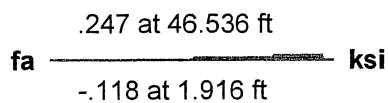
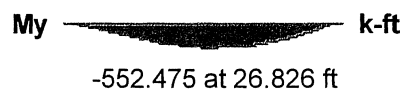
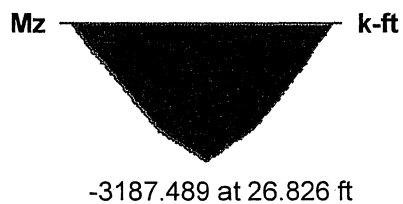
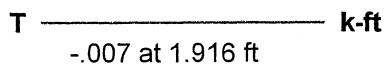
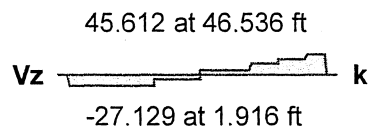
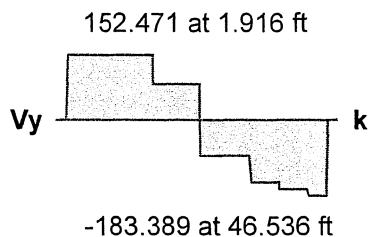
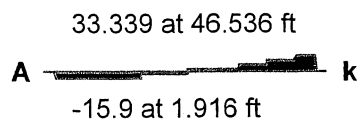
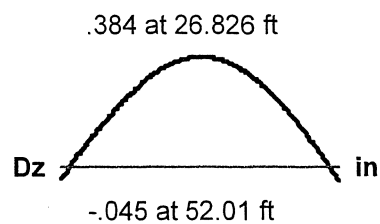
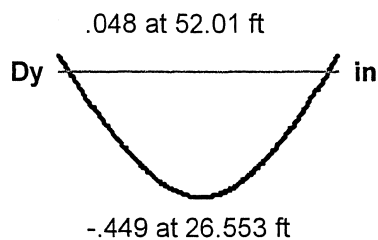
I Joint: **N1**

J Joint: **N4**

LC 16: Mom Std 214b + SU7

Code Check: **0.000 (bending)**

Report Based On 191 Sections



S 5/21/10
G-72

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

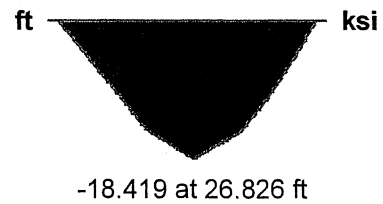
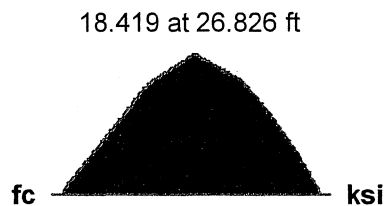
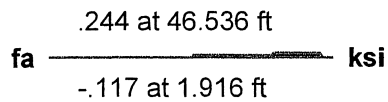
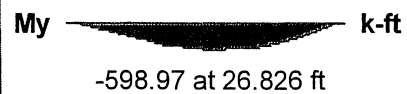
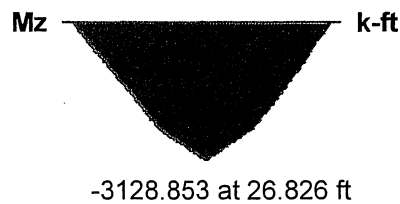
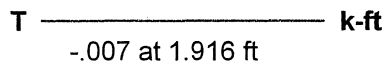
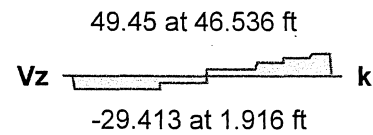
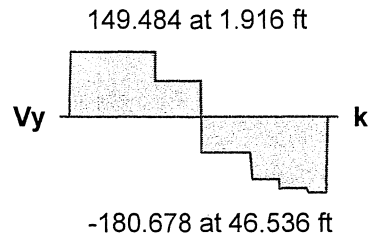
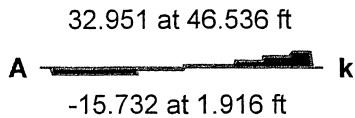
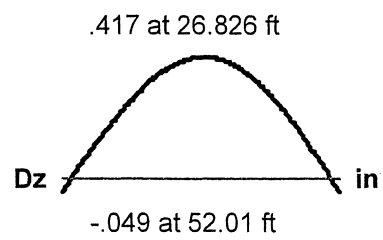
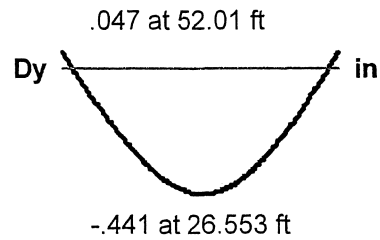
I Joint: **N1**

J Joint: **N4**

LC 17: Mom Std C237b + SU7

Code Check: **0.000 (bending)**

Report Based On 191 Sections



5/20/10
G-73

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

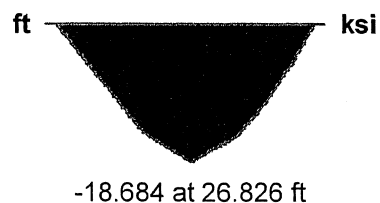
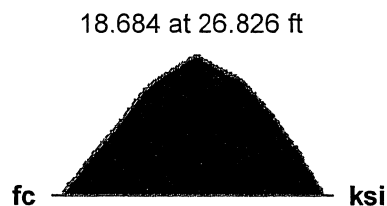
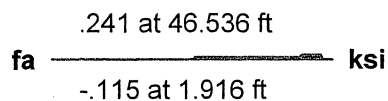
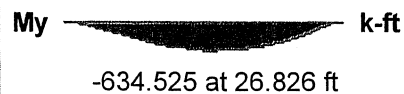
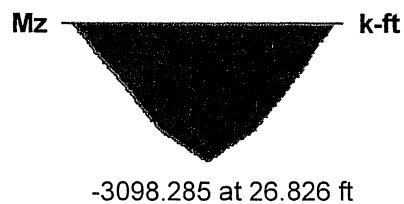
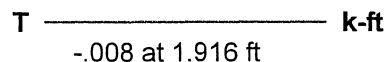
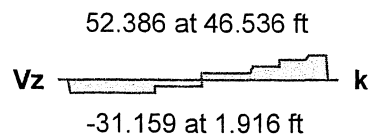
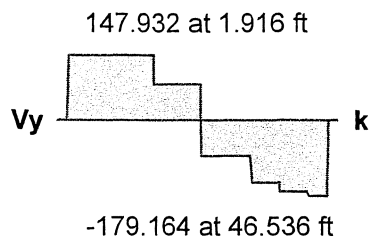
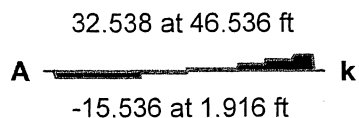
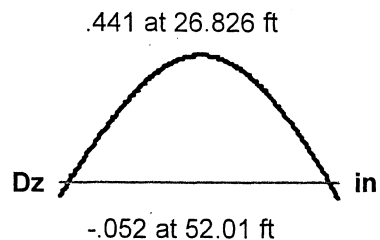
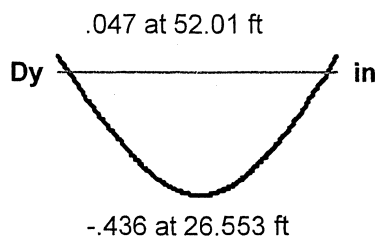
I Joint: **N1**

J Joint: **N4**

LC 18: Mom Std C256b + SU7

Code Check: **0.000 (bending)**

Report Based On 191 Sections



S 5/21/10
G-74

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

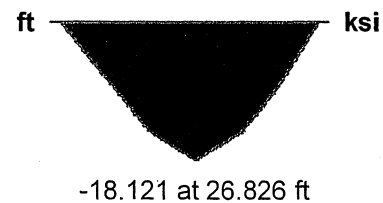
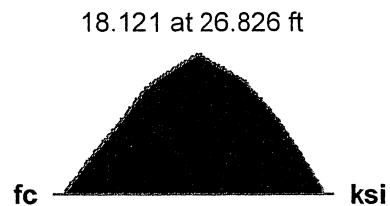
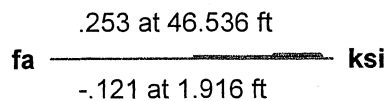
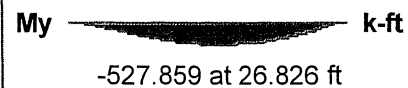
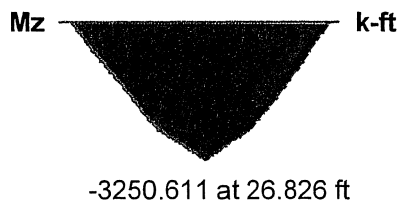
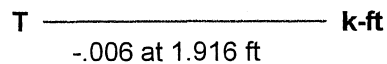
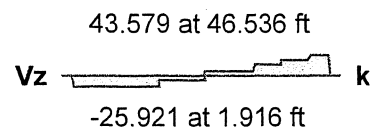
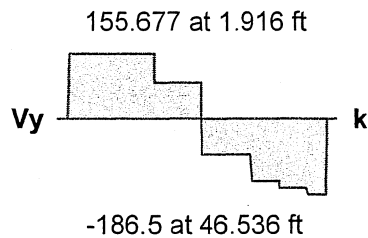
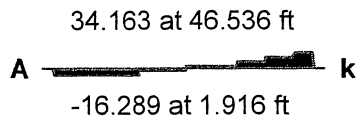
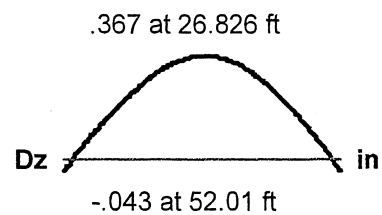
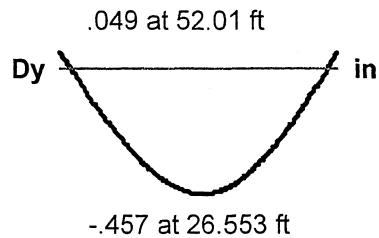
I Joint: **N1**

J Joint: **N4**

LC 19: Mom Std C200j + SU7

Code Check: **0.000 (bending)**

Report Based On 191 Sections



5/21/10
G-75

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

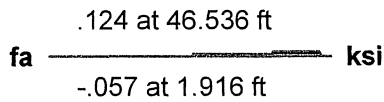
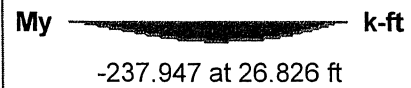
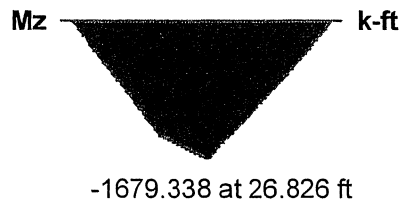
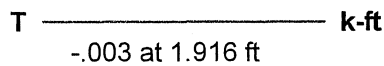
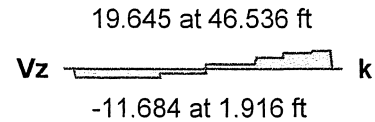
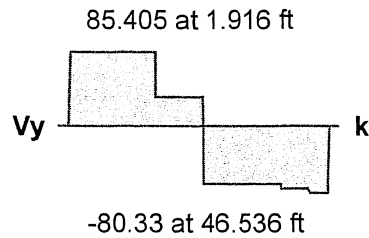
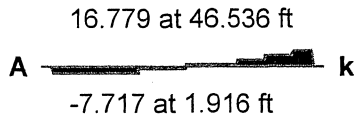
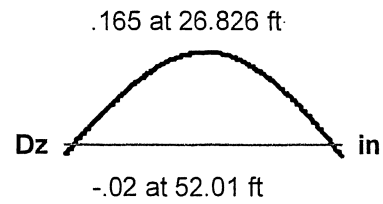
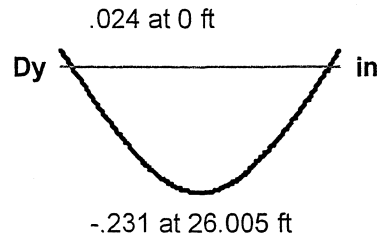
I Joint: **N1**

J Joint: **N4**

LC 20: Mom Std A

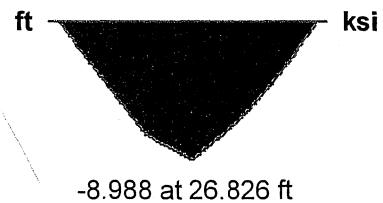
Code Check: **0.000 (bending)**

Report Based On 191 Sections



8.988 at 26

One Lane



5/21/10
G-76

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

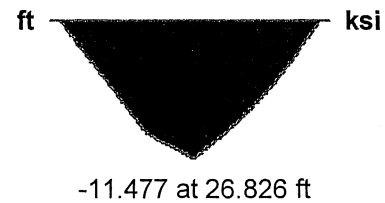
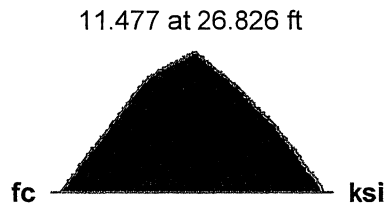
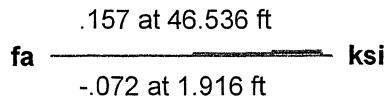
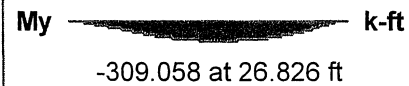
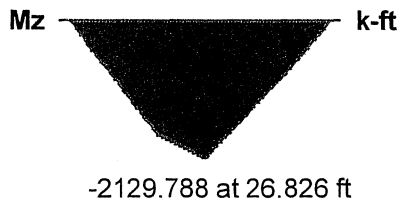
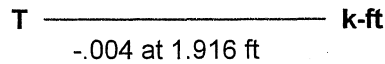
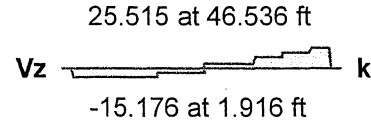
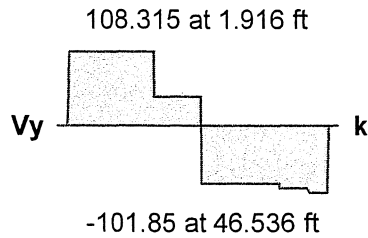
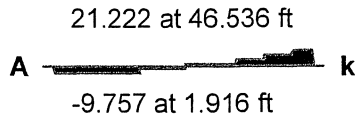
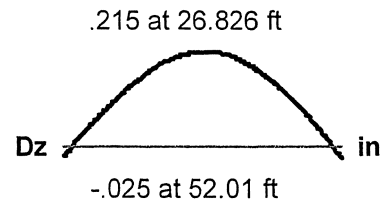
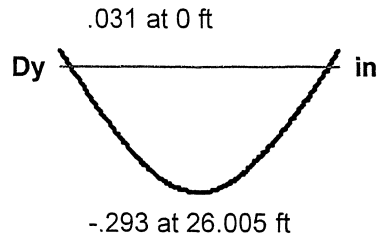
I Joint: **N1**

J Joint: **N4**

LC 21: Mom Std B

Code Check: **0.000 (bending)**

Report Based On 191 Sections



6/5/21/10
G-77

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

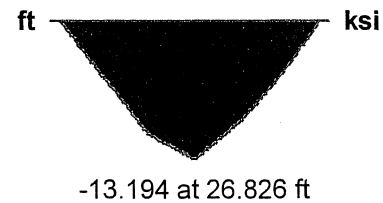
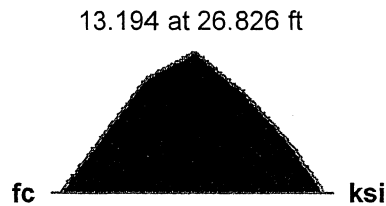
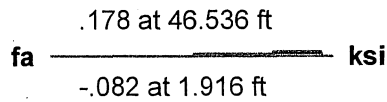
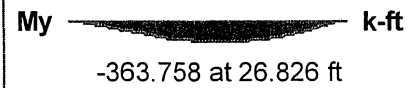
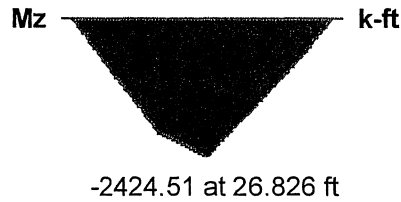
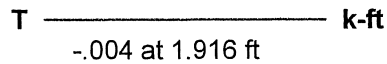
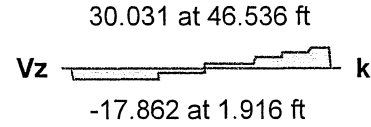
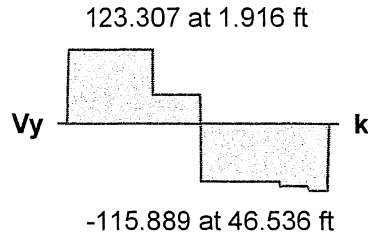
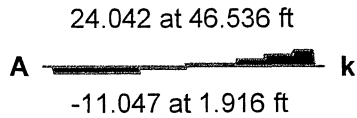
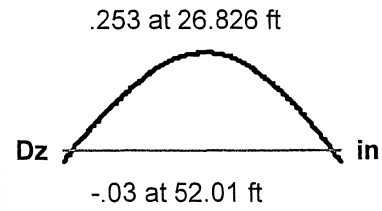
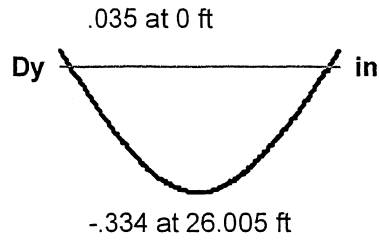
I Joint: **N1**

J Joint: **N4**

LC 22: Mom Std C

Code Check: **0.000 (bending)**

Report Based On 191 Sections



5/5/2010

G-78

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

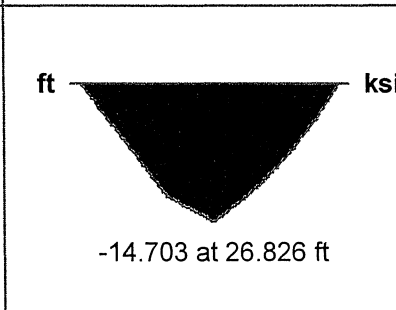
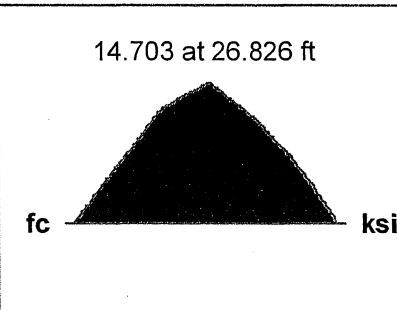
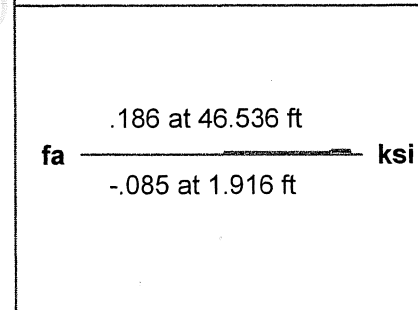
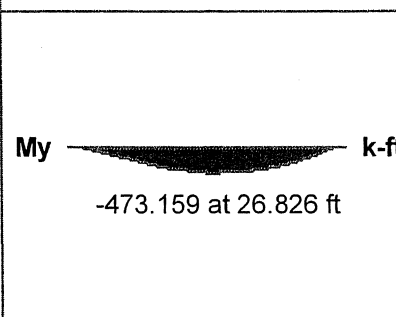
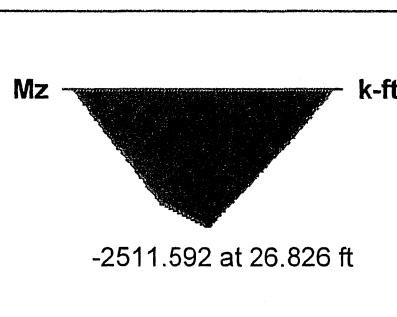
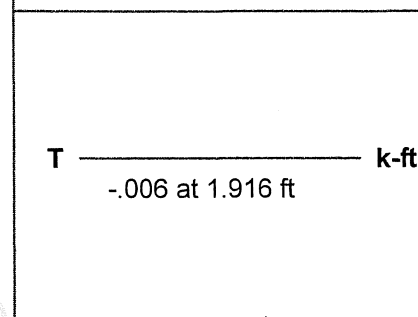
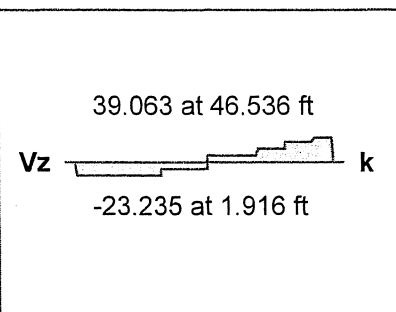
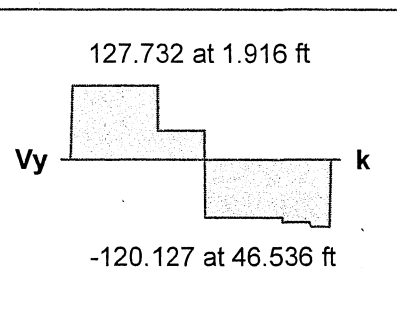
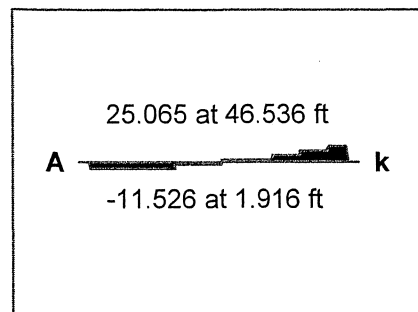
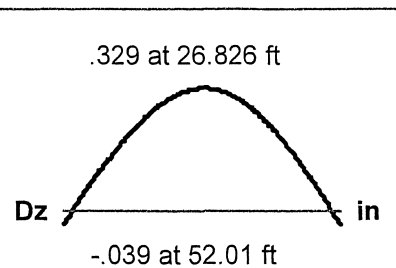
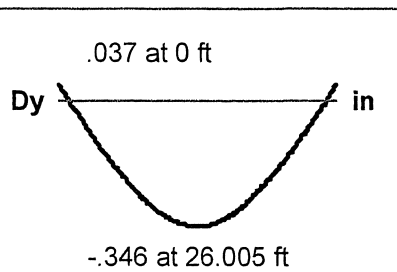
I Joint: **N1**

J Joint: **N4**

LC 23: Mom P411

Code Check: **0.000 (bending)**

Report Based On 191 Sections



6/3/10
G-79

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

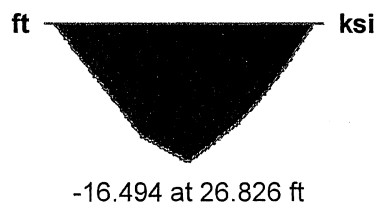
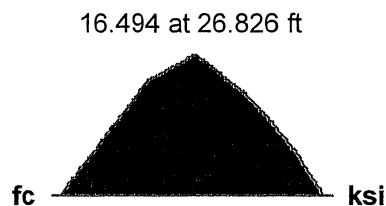
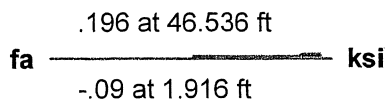
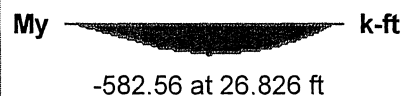
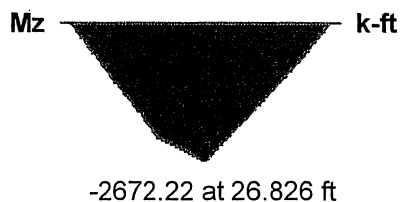
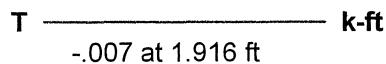
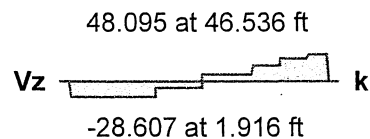
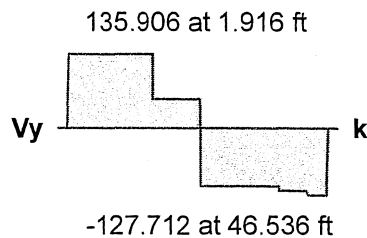
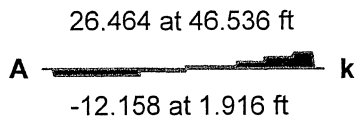
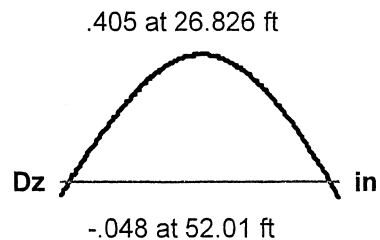
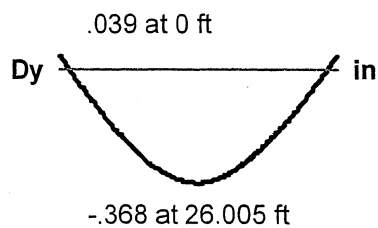
I Joint: **N1**

J Joint: **N4**

LC 24: Mom P413

Code Check: **0.000 (bending)**

Report Based On 191 Sections



5/24/12
G-80

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

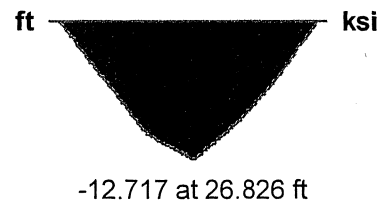
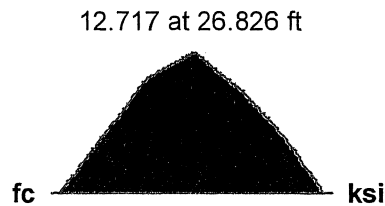
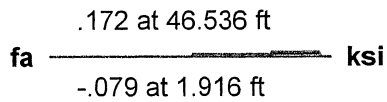
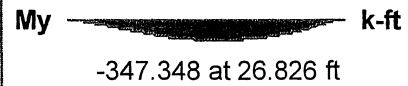
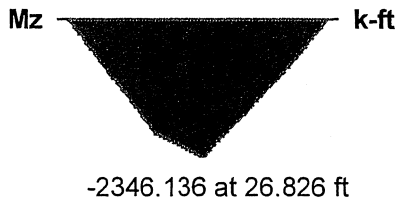
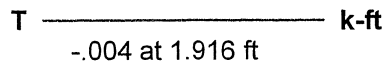
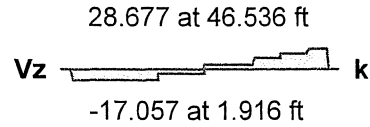
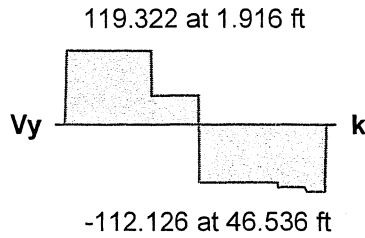
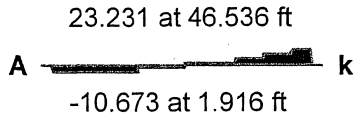
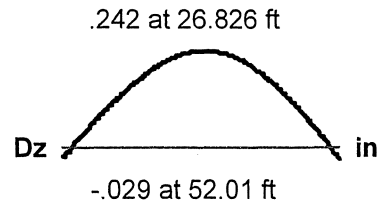
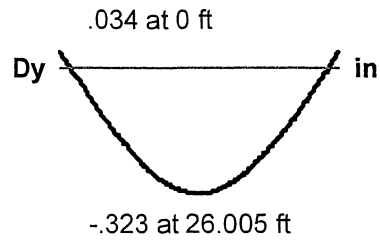
I Joint: **N1**

J Joint: **N4**

LC 25: Mom Std C152b

Code Check: **0.000 (bending)**

Report Based On 191 Sections



5/21/10

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

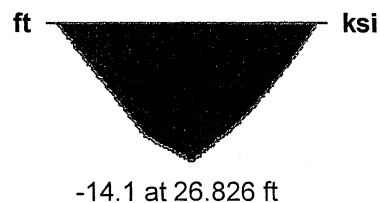
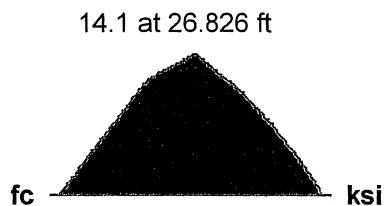
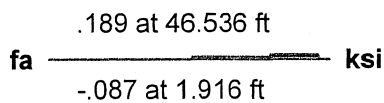
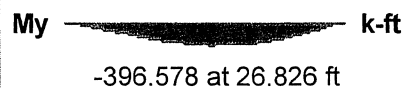
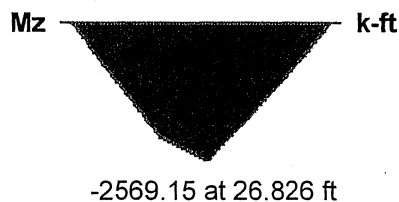
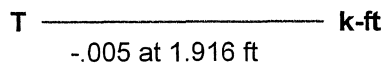
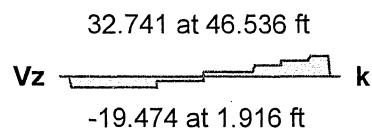
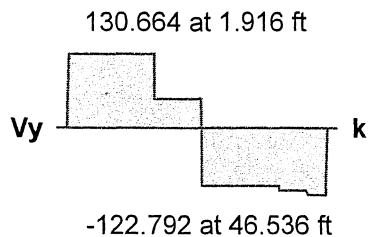
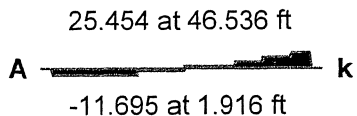
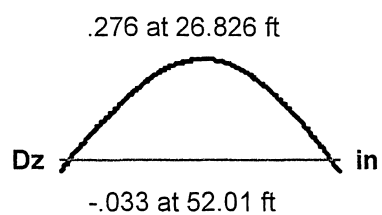
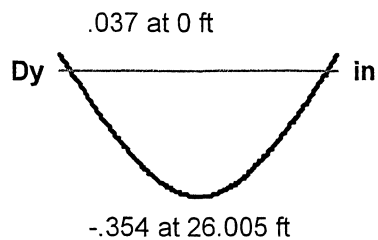
I Joint: **N1**

J Joint: **N4**

LC 26: Mom Std C174b

Code Check: **0.000 (bending)**

Report Based On 191 Sections



Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

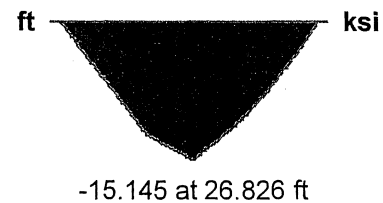
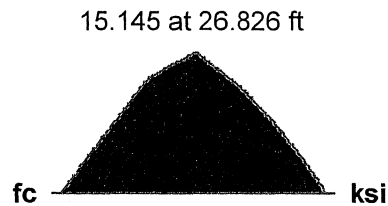
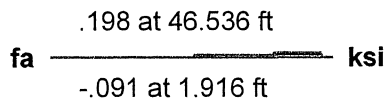
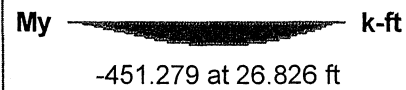
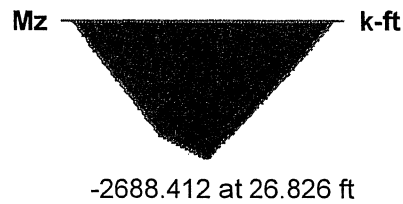
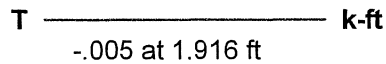
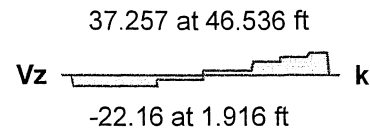
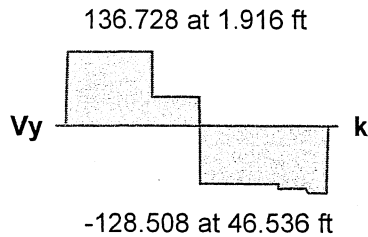
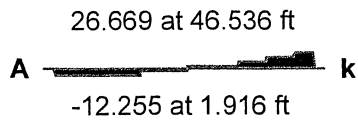
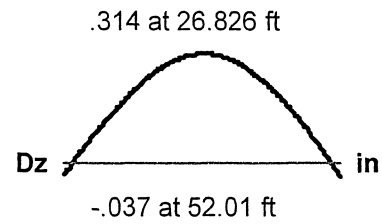
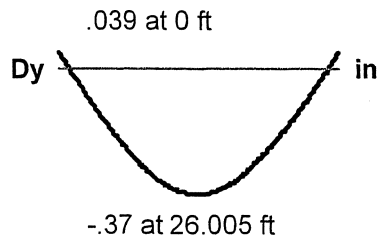
I Joint: **N1**

J Joint: **N4**

LC 27: Mom Std C198_23

Code Check: **0.000 (bending)**

Report Based On 191 Sections



5/2/10
G-83

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

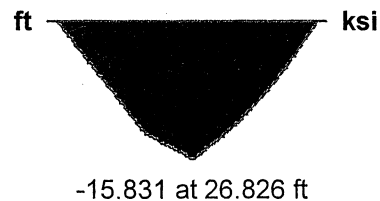
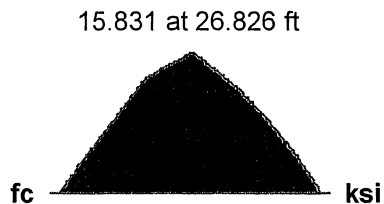
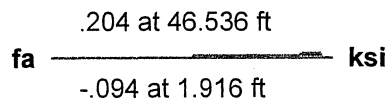
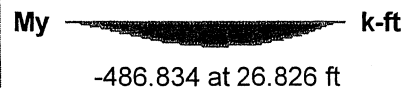
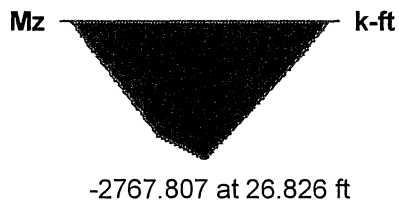
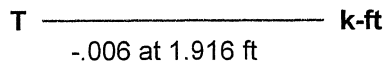
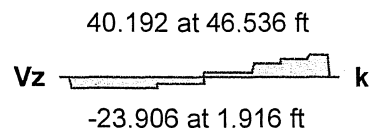
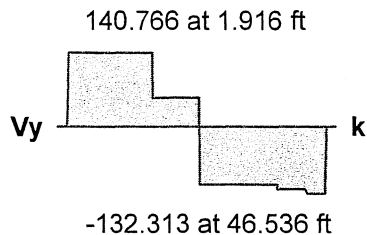
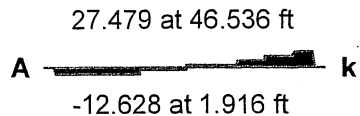
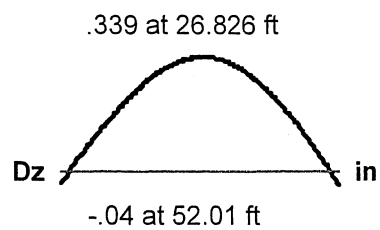
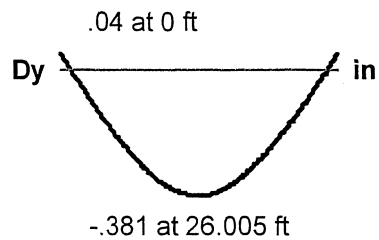
I Joint: **N1**

J Joint: **N4**

LC 28: Mom Std 214b

Code Check: **0.000 (bending)**

Report Based On 191 Sections



5/21/10

G-84

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

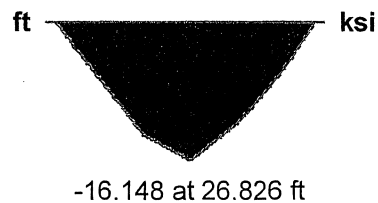
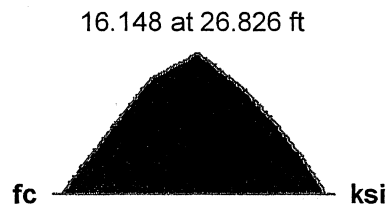
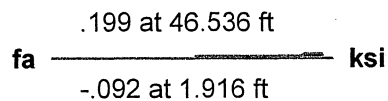
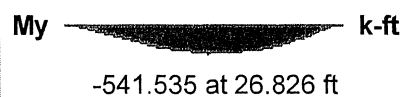
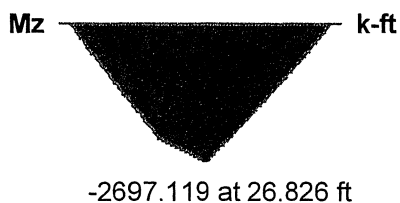
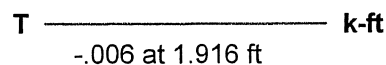
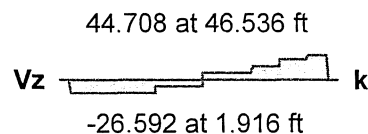
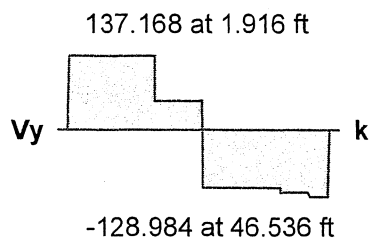
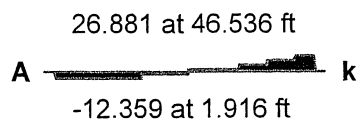
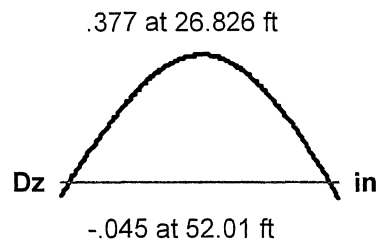
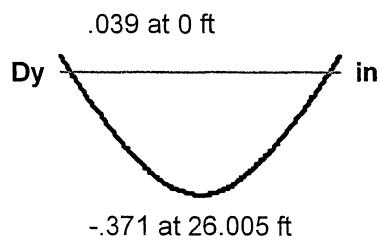
I Joint: **N1**

J Joint: **N4**

LC 29: Mom Std C237b

Code Check: **0.000 (bending)**

Report Based On 191 Sections



5/21/10

G-85

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

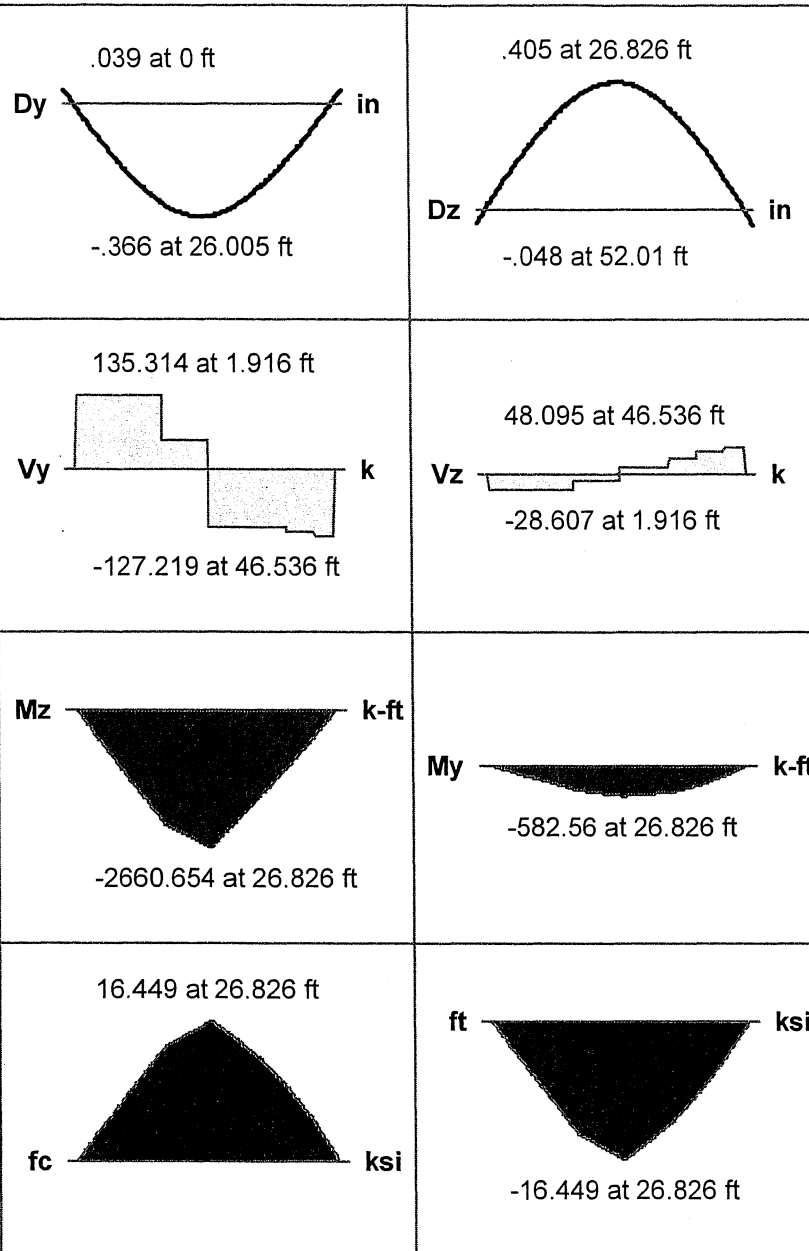
I Joint: **N1**

J Joint: **N4**

LC 30: Mom Std C256b

Code Check: **0.000 (bending)**

Report Based On 191 Sections



S 5/21/10
G-86

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

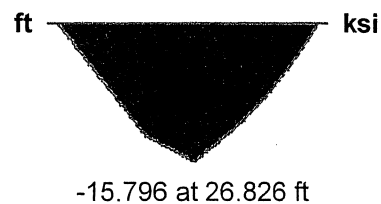
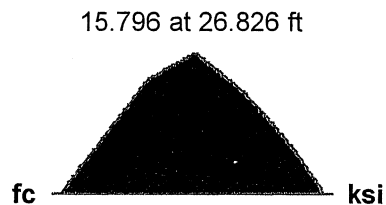
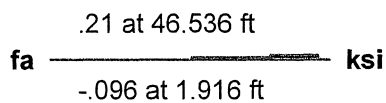
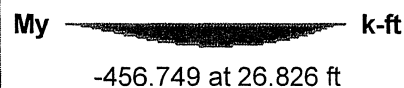
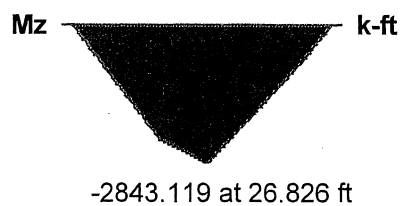
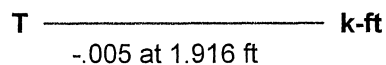
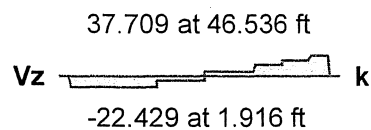
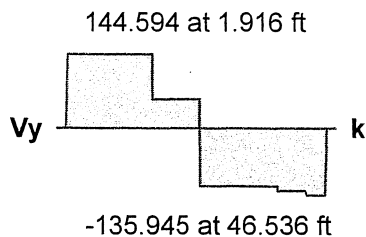
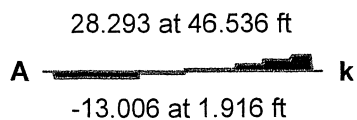
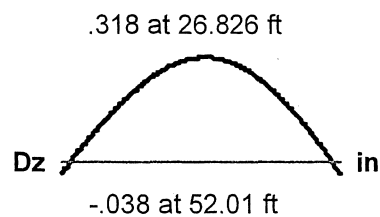
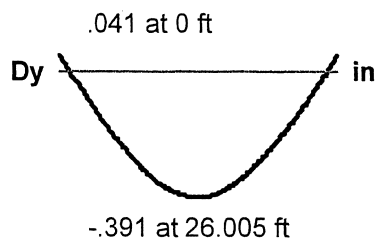
I Joint: **N1**

J Joint: **N4**

LC 31: Mom Std C200j

Code Check: **0.000 (bending)**

Report Based On 191 Sections



5/21/10

G-87

Beam: **M1**

Shape: **BR3E-P2-1**

Material: **A36 Steel**

Length: **52.01 ft**

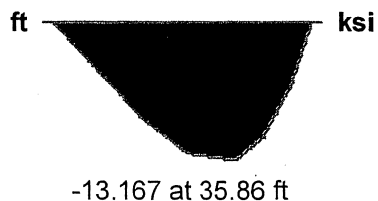
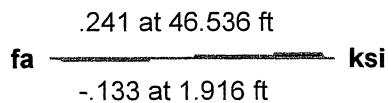
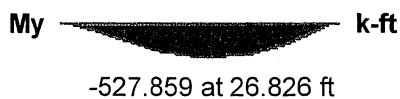
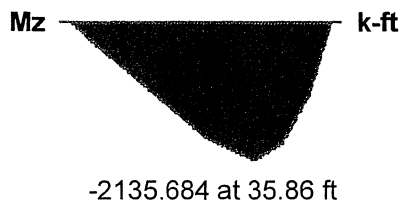
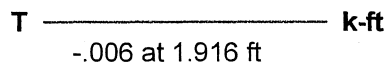
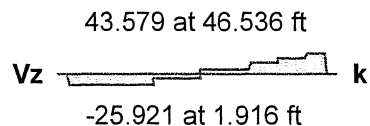
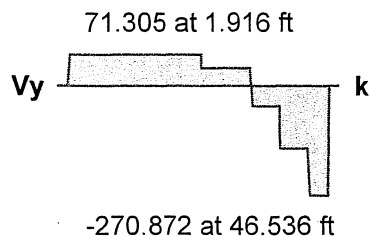
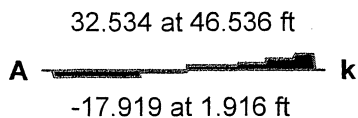
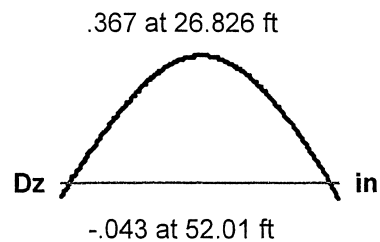
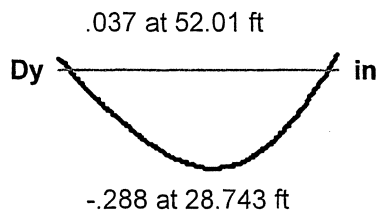
I Joint: **N1**

J Joint: **N4**

LC 32: Shr Std C200j + SU7

Code Check: **0.000 (bending)**

Report Based On 191 Sections



Max
Shear

8/5/21/10

G-88



21 West Superior Street, Suite 500
Duluth, Minnesota 55802
218 727-8446
Fax 218 727-8456
www.LHBcorp.com

250 3rd Avenue North, Suite 450
Minneapolis, Minnesota 55401
612 338-2029
Fax 612 338-2088

PROJECT Mn DOT SS-69801N - P2-3E - Posting / Permit Shear

PROJECT # 090147 DATE 4/14/10 BY jdj SHEET NO. 5/4/10 OF 5/4/10

Evaluate the Piercap for Shear with
Std C 200j + SU7 trucks w/ multiple trip factors
highest + Wheel Reaction.

$$V_{LL+IM}^{South} = \frac{276.3}{270.9} \text{ k.p.} \checkmark \quad \text{See Shear Std C 200j + SU7}$$
$$V_{LL+IM}^{North} = \frac{155.7}{156.6} \text{ k.p.} \checkmark \quad \text{See Mom Std C 200j + SU7}$$

$$V_{DL}^{South} = 329.1 \text{ k.p.} \checkmark$$
$$V_{DL}^{North} = 191.4 \text{ k.p.} \checkmark$$

South End Rating Factor.
 $R_n = 939.6 \text{ k}$

$$RF = \frac{1.03 \times 939.6 - 1.25 \times 329.1}{1.35 \times \frac{270.9}{276.3}} = 1.44 \quad 1.42 \checkmark$$

North End Rating Factor
 $R_n = 765.8 \text{ k}$

$$RF = \frac{1.03 \times 765.8 - 1.25 \times 191.4}{1.35 \times \frac{155.7}{156.6}} = 2.51 \quad 2.49 \checkmark$$

Since Flexure RF was 0.99, Flexure still controls.
0.67 ✓



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218 727-8446
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www.LHBcorp.com

250 3rd Avenue North, Suite 450
Minneapolis, Minnesota 55401
612 338-2029
Fax 612 338-2088

PROJECT MnDOT SS - 69801 N - P2-3E - Posting/Permit Stiffeners
PROJECT # 090147 DATE 4/15/10 BY jdf SHEET NO. _____ OF _____
✓CSM
5/14/10

Refer to the typical transverse stiffener check
and evaluate w/ Permit V_u 's.

- where $d_o = 23.56$, no change as it was assumed.
 $V_u > \phi V_{cr}$

- where $d_o = 39"$, at the north end.

$$V_u = 1.25 \times 191.4 + 1.75 \times \overset{156.6}{\cancel{155.7}} = \overset{513.3}{\cancel{511.7}} \text{ k} \checkmark$$

$$I_t \geq 8.06 + (14.73 - 8.06) \left[\frac{\overset{511.7}{\cancel{511.7}} - 232.1}{\cancel{765.3} - 232.1} \right] = 11.55 \text{ in}^4 \checkmark$$

$$I_t = 27 \text{ in}^4 > 11.55 \text{ in}^4 \text{ OK } \checkmark$$

Shear Stiffeners are OK for Permit & Posting

69801N-3E-P2
SUMMARY

FINAL RATING SUMMARY TABLE FOR PIER 69801N P2-3E						COMPLETED BY: JDF	CHECKED BY: CJM
(LRFR method, System factor $\phi_s = 0.85$)						DATE: 6-18-10	DATE: 6/23/10
	TRUCK	MULTIPLE-TRIP		SINGLE-TRIP		COMMENTS	
		RF	LOCATION	RF	LOCATION		
AASHTO	HL-93 INV	0.61	Girder B	N/A	N/A	Flexure Controls	
	HL-93 OP	0.79	Girder B	N/A	N/A	Flexure Controls	
Posting Vehicles	Type 3 +SU7	1.33	Girder B	N/A	N/A	Flexure Controls	
	Type 3S2-40 + SU7	1.13	Girder B	N/A	N/A	Flexure Controls	
	Type 3S3 + SU7	1.13	Girder B	N/A	N/A	Flexure Controls	
	SU4 + SU7	1.28	Girder B	N/A	N/A	Flexure Controls	
	SU5 + SU7	1.22	Girder B	N/A	N/A	Flexure Controls	
	SU6 + SU7	1.16	Girder B	N/A	N/A	Flexure Controls	
	SU7 + SU7	1.10	Girder B	N/A	N/A	Flexure Controls	
Permit Vehicles (Mix with traffic)	STD. A + SU7	0.96	Girder B	1.13	Girder B	Flexure Controls	
	STD. B + SU7	0.82	Girder B	0.97	Girder B	Flexure Controls	
	STD. C + SU7	0.75	Girder B	0.88	Girder B	Flexure Controls	
	P411 + SU7	0.72	Girder B	0.84	Girder B	Flexure Controls	
	P413 + SU7	0.68	Girder B	0.79	Girder B	Flexure Controls	
	C152b + SU7	0.77	Girder B	0.90	Girder B	Flexure Controls	
	C174b + SU7	0.72	Girder B	0.85	Girder B	Flexure Controls	
	C198_23 + SU7	0.69	Girder B	0.81	Girder B	Flexure Controls	
	C214b + SU7 0.67	0.68	Girder B 0.71	0.80	Girder B	Flexure Controls	
	C237b + SU7	0.68	Girder B	0.80	Girder B	Flexure Controls	
	C256b + SU7	0.68	Girder B	0.80	Girder B	Flexure Controls	
	C200j + SU7	0.67	Girder B	0.78	Girder B	Flexure Controls	
Permit Vehicles (Escorted with no other vehicles)	STD. A	N/A	N/A	1.54	Girder B	Flexure Controls Note: Only valid if merging traffic from adjacent bridge(s) is restricted.	
	STD. B	N/A	N/A	1.21	Girder B		
	STD. C	N/A	N/A	1.06	Girder B		
	P411	N/A	N/A	0.99	Girder B		
	P413	N/A	N/A	0.91	Girder B		
	C152b	N/A	N/A	1.10	Girder B		
	C174b	N/A	N/A	1.00	Girder B		
	C198_23	N/A	N/A	0.94	Girder B		
	C214b	N/A	N/A	0.91	Girder B		
	C237b	N/A	N/A	0.92	Girder B		
	C256b	N/A	N/A	0.92	Girder B		
	C200j	N/A	N/A	0.90	Girder B		

* Values were not revised on "Final" Rating form as it is minor.

H-1

CJM - 11/5/09



Supports

- Girder 1 - 1, 5, 10, 16, 25, 37, 44, 51, 56, 61, 68, 72, 76, 79, 86
- Girder 2 - 1, 5, 10
- Girder 3 - 2, 7, 12, 14
- Girder 4 - 1, 5, 10, 16, 25, 37, 44, 51, 56, 61
- Girder 5 - 1, 5, 10, 16, 22, 28, 34, 39, 45, 51, 56
- Girder 6 - 2, 8, 14, 19, 25, 31, 36, 41, 48, 52, 56, 59, 66
- Girder 7 - 6, 12, 18, 24, 29, 35, 41, 46, 51, 58, 62, 66, 74
- Girder 8 - 6, 13, 17, 20, 25, 29, 32, 37, 41, 45, 48
- Girder 9 - 1, 5, 10, 16, 22, 28, 35, 39, 42, 47, 51, 54, 59, 63, 67, 70
- Girder 10 - 1, 5, 10, 16, 22, 28, 35, 39, 42, 47, 51, 54, 59, 63, 67, 70

Pseudo Supports

- Girder 2 - 14
- Girder 3 - 1, 22
- Girder 5 - 57
- Girder 6 - 1
- Girder 7 - 1
- Girder 8 - 1

