LOCHNER

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA
SUBJECT: PRESTRESSED GIRDER ANALYSIS
BEAM REACTIONS

JMJ May-06
KBM Jun-06

HIGH LEVEL BENT 160

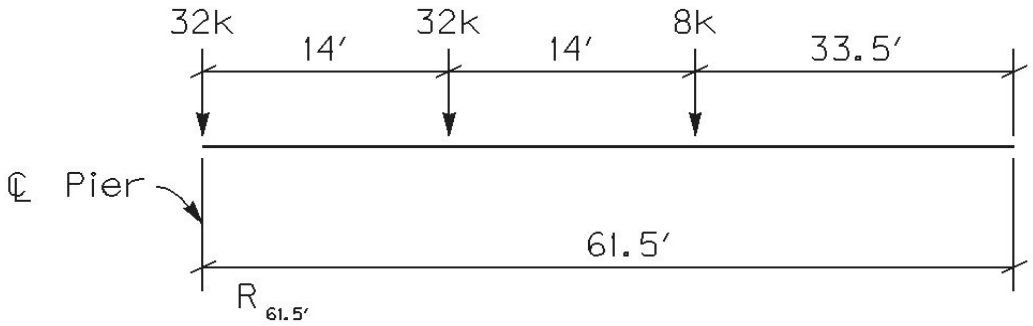
Beam No.	Self Wt.	Topping (Deck + Haunch)	DL - Precast	Interior Diaphragms	D.L.-Comp	Total D.L.
Exterior						
Span 160	17.40	23.30	0.70	1.00	3.30	45.70
Span 161	17.40	23.30	0.70	1.00	3.30	45.70
Totals	34.80	46.60	1.40	2.00	6.60	91.40
Interior						
Span 160	17.40	21.60	0.70	1.90	3.10	44.70
Span 161	17.40	21.60	0.70	1.90	3.10	44.70
Totals	34.80	43.20	1.40	3.80	6.20	89.40

H. W. LOCHNER, INC.

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA JMJ Jun-06
SUBJECT: HIGH LEVEL BENT ANALYSIS WDB Jun-06
HIGH LEVEL BENTS

LIVE LOAD (Bents 137, 142, 160)

HS-20 AXLE LOAD



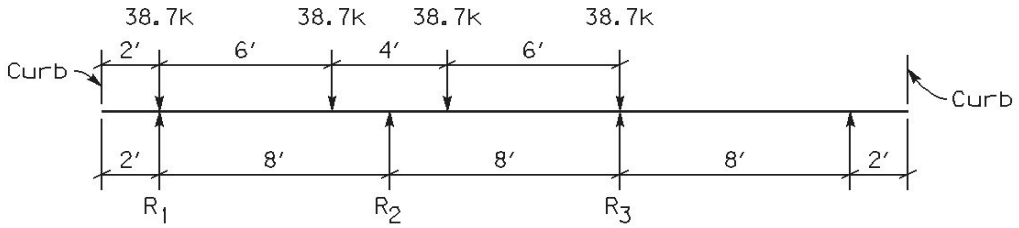
$R_{61.5}$ = 32 k + 32 k (47.5 / 61.5) + 8 k*(33.5 / 61.5) = 61.1 k

HS-20 WHEEL LOAD

$W_{61.5}$ = $R_{61.5}$ / 2 = 30.5 k

w/Impact = $30.5 * \left(\frac{50}{61.5 + 125} + 1\right)$ = 38.7 k

Max. NEGATIVE MOMENT



w/ Impact

R_1 = 38.7 + 38.7 * (2 / 8) = 48.4 k = R_3

R_2 = (38.7 + 38.7) * (6 / 8) = 58.1 k

w/o Impact

R_1 = 30.5 + 30.5 * (2 / 8) = 38.1 k = R_3

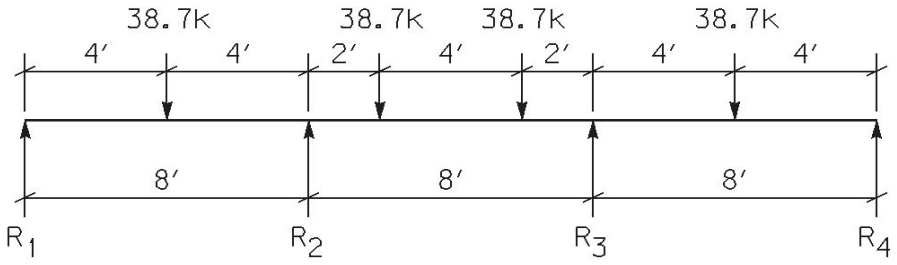
R_2 = (30.5 + 30.5) * (6 / 8) = 45.8 k

H. W. LOCHNER, INC.

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA JMJ Jun-06
SUBJECT: HIGH LEVEL BENT ANALYSIS WDB Jun-06
HIGH LEVEL BENTS

LIVE LOAD

MAX. POSITIVE MOMENT



$R_1 = R_4 =$ 38.7 * (4 / 8) = 19.4 k

$R_2 = R_3 =$ 19.4 + 38.7 * (6 / 8) + 38.7 * (2 / 8) = 58.1 k

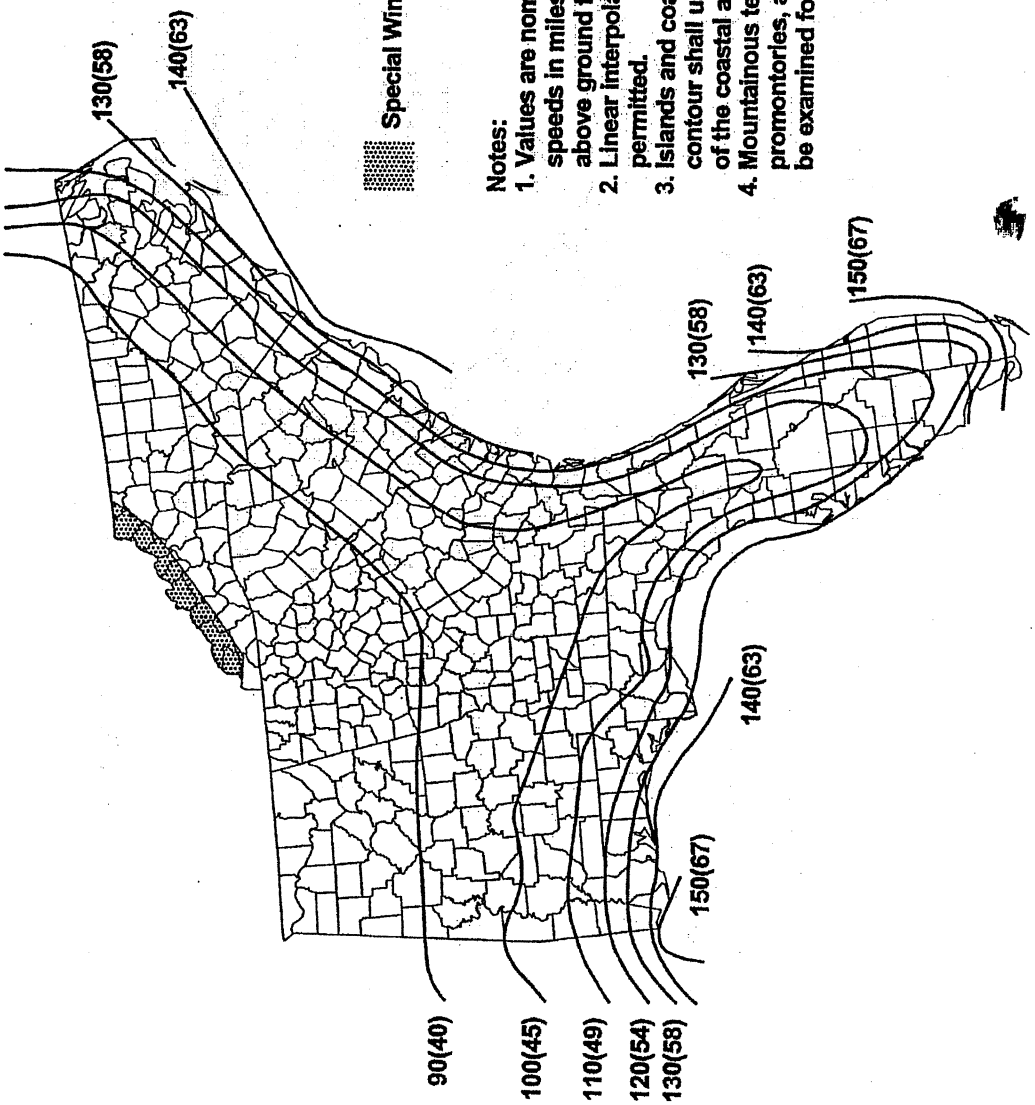


FIGURE 6-1b. Basic Wind Speed—Eastern Gulf of Mexico and Southeastern U.S. Hurricane Coastline

H. W. LOCHNER, INC.

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA JMJ May-06
SUBJECT: HIGH LEVEL BENT ANALYSIS WDB Jun-06
H.L.B. #160

Earth Loads

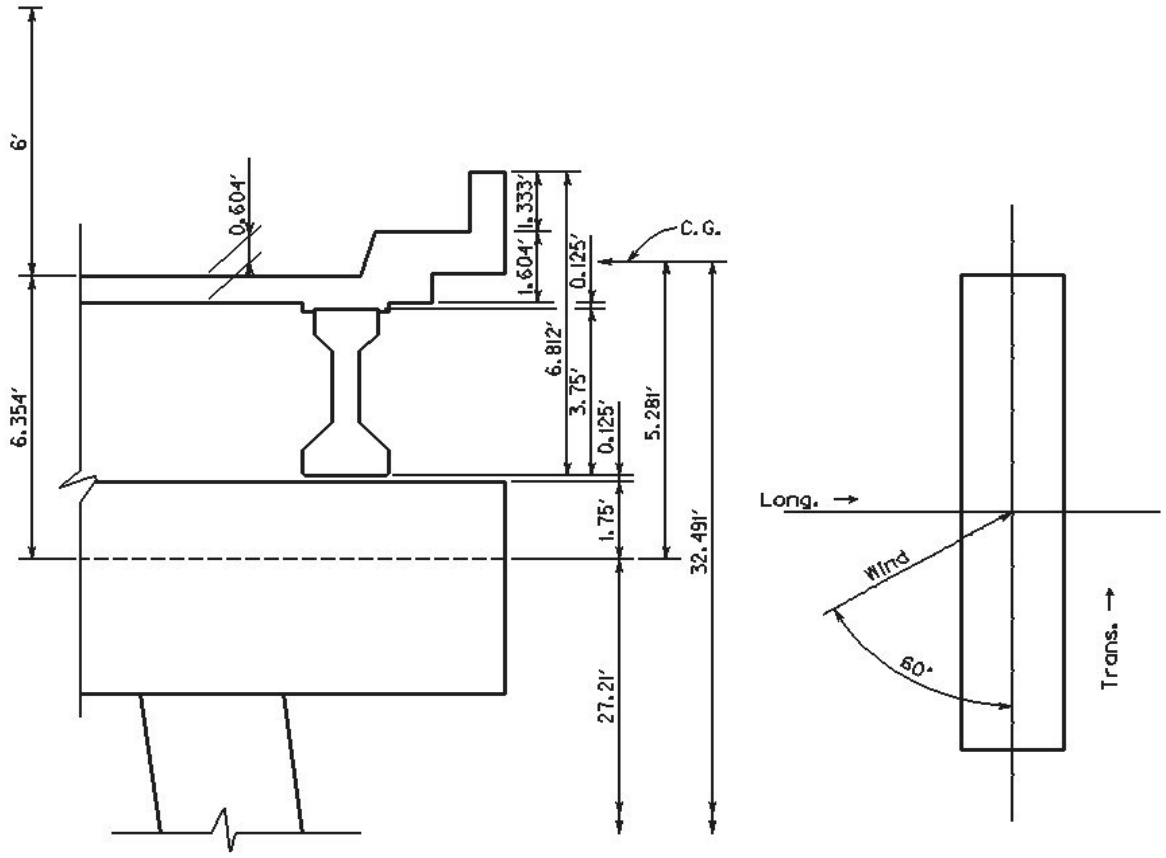
Assume No Earth Loading on Bents or Pile Cap.

Wind Loads (AASHTO 3.15)

Design Wind Speed = 130 MPH (Original Design Speed)

Ratio = (130)^2 / (100)^2 = 1.69

Wind on Superstructure (AASHTO 3.15.2.1)



Assume Wind @ 60° Skew

Long. = (0.019 k/Ft^2)(1.69 Ratio) = 0.032 k/Ft^2
Trans. = (0.017 k/Ft^2)(1.69 Ratio) = 0.029 k/Ft^2

Assume Adjacent Bents 144 & 146 Take 1/2 Load

Load Length =(61.500 + 61.5) / 2 = 61.500 Ft.

Long. Force = (0.032 k/Ft^2)(6.812 Ft.) (61.500 Ft.) = 13.406 k
Trans. Force = (0.029 k/Ft^2)(6.812 Ft.) (61.500 Ft.) = 12.149 k

Moment Factor

M_F = 32.491 / 27.21 = 1.194

Modify & Apply to Jt. 2 & 3

Long. Wind	= (	13.406	k)	* (	1.194	) /	2	=	8.003 k/Jt
Trans. Wind	= (	12.149	k)	* (	1.194	) /	2	=	7.253 k/Jt

Wind on Live Load (AASHTO 3.15.2.1.2)

Assume Wind @ 60° Skew & Apply @ 6' above Deck

Long.	=	(	0.038	k/Ft^2	)				
Trans.	=	(	0.034	k/Ft^2	)				
Long. Force	= (	0.038	k/Ft^2	) * (	61.500	Ft.)	=	2.337	k
Trans. Force	= (	0.034	k/Ft^2	) * (	61.500	Ft.)	=	2.091	k

Moment Factor = (27.210 Ft. + 6.354 Ft. + 6.000 Ft.) / 27.210 Ft. = 1.454

Modify & Apply to Jt. 2 & 3

Long. Wind	= (	2.337	k)	* (	1.454	) /	2.000	=	1.699 k/Jt
Trans. Wind	= (	2.091	k)	* (	1.454	) /	2.000	=	1.520 k/Jt

Wind on Superstructure

Wind Pressure =	0.040	k/Ft^2	*	1.690		=	0.068	k/Ft^2
Long. =	0.068	k/Ft^2	*	sin 60.000		=	0.059	k/Ft^2
Trans. =	0.068	k/Ft^2	*	cos 60.000		=	0.034	k/Ft^2

Cap

W_z =	0.059	k/Ft^2	*	3.500	Ft.	=	0.207	k/Ft	*on Members 1-3*
Wx =	0.034	k/Ft^2	*	3.500	Ft. * 3.000	=	0.357	k/Ft	*at Jt. 4*

Columns

Members 4 & 5

W_z =	0.059	k/Ft^2	*	3.000	Ft.	=	0.177	k/Ft
Wx =	0.034	k/Ft^2	*	3.097	Ft.	=	0.105	k/Ft

Members 7 & 8

W_z =	0.177	k/Ft						
Wx =	0.034	k/Ft^2	*	3.947	Ft.	=	0.134	k/Ft

Struts

Member 6

W_z =	0.059	k/Ft^2	*	5.000	Ft.	=	0.295	k/Ft

H. W. LOCHNER, INC.

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA — JMJ May-06
SUBJECT: HIGH LEVEL BENT ANALYSIS — WDB Jun-06
H.L.B. #160

Longitudinal Forces (AASHTO 3.9)

Lane Loading
2 Lanes, HS20, No Reduction (AASHTO 3.12.1)

LF = [(0.64 k/Ft * 61.500 ') + 18 k] * 2 Lanes * 0.05 = 5.736 k

Modify & Apply to Jts. 2 & 3

M_F = 1.454 *from Wind on L.L.*

Fz = (5.736 k * 1.454) / 2 = 4.170 k/Jt

Thermal Forces (AASHTO 3.16)

Longitudinal - Structure Free to move at Bents, No Long. Forces due to ΔT
Transverse

Assume 45^{o} ΔT
Thermal = 0.000006 (AASHTO 8.5.3)
Shrinkage = 0.0002 (AASHTO 8.5.4)

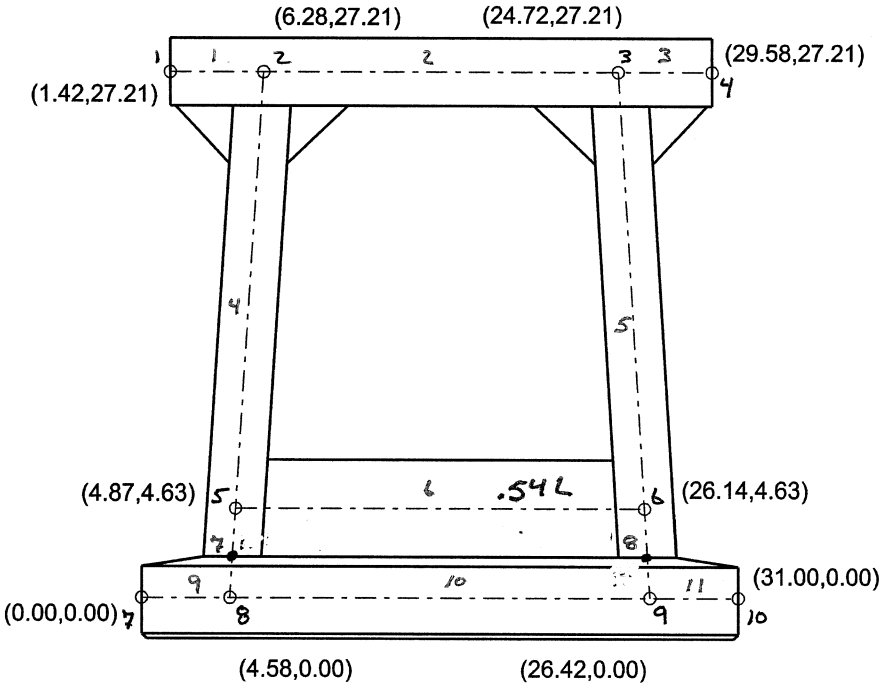
$$\text{Ratio} = \frac{S}{T^{*}\Delta T} = \frac{0.0002}{0.000006 * 45} = 0.7407$$ use 1.741

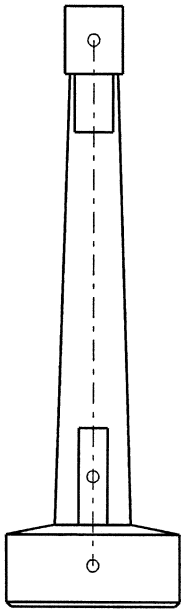
Stream Forces (AASHTO 3.18.1)

Tidal, Stream, & Surge Forces Beyond Scope

Seismic Loading (AASHTO 3.1)

Since Acceleration = 4 % --> SPC = A --> No Seismic Analysis Required





* ADD (3')(3')(2')(.150 K/FT³) = 2.7 K FOR CRUTCH.

BENT 160
SINGLE STRUT
PRESTRESSED GIRDER - PRESTRESSED GIRDER

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*****************************************************
*                                                   *
*          STAAD.Pro                                *
*          Version  2004    Bld 1002.US             *
*          Proprietary Program of                   *
*          Research Engineers,  Intl.               *
*          Date=    JUL 18, 2006                    *
*          Time=    10:16:59                        *
*                                                   *
*     USER ID: H.W. Lochner                         *
*****************************************************
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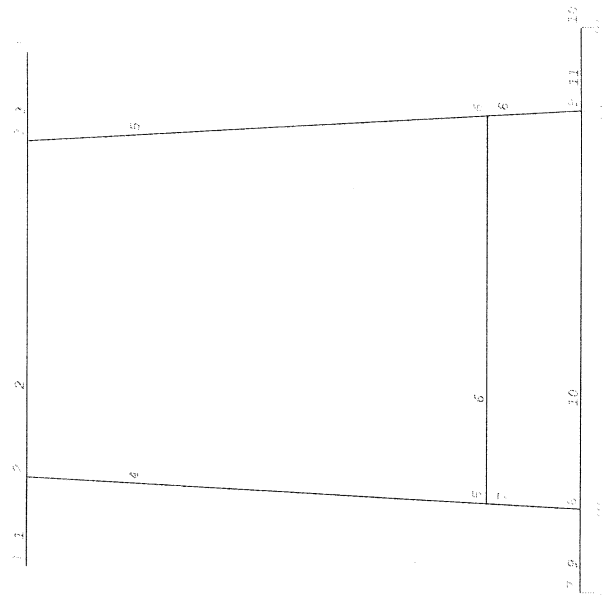
JMJ 7/06
WDB 7/06

```
    1. STAAD SPACE BONNER BRIDGE, HLB160
INPUT FILE: HLB160.STD
    2. START JOB INFORMATION
    3. JOB NAME BONNER BRIDGE
    4. JOB CLIENT NORTH CAROLINA
    5. ENGINEER NAME JMJ
    6. ENGINEER DATE MAY 2006
    7. END JOB INFORMATION
    8. INPUT WIDTH 72
    9. PAGE LENGTH 62
   10. UNIT FEET KIP
   11. JOINT COORDINATES
   12. 1 1.42 27.21 0; 2 6.28 27.21 0; 3 24.72 27.21 0; 4 29.58 27.21 0
   13. 5 4.87 4.63 0; 6 26.14 4.63 0; 7 0 0 0; 8 4.58 0 0; 9 26.42 0 0; 10 31.00 0 0
   14. MEMBER INCIDENCES
   15. 1 1 2; 2 2 3; 3 3 4; 4 2 5; 5 3 6; 6 5 6; 7 5 8; 8 6 9; 9 7 8; 10 8 9; 11 9 10
   16. DEFINE MATERIAL START
   17. ISOTROPIC CONCRETE
   18. E 453600
   19. POISSON 0.17
   20. DENSITY 0.14999
   21. ALPHA 5.5E-006
   22. DAMP 0.05
   23. END DEFINE MATERIAL
   24. MEMBER PROPERTY AMERICAN
   25. 1 TO 3 PRIS YD 3.5 ZD 3
   26. 4 5 PRIS YD 2.994 ZD 3.097
   27. 6 PRIS YD 5 ZD 1.5
   28. 7 8 PRIS YD 2.994 ZD 3.947
   29. 9 TO 11 PRIS YD 4.25 ZD 9
   30. CONSTANTS
   31. MATERIAL CONCRETE MEMB 1 TO 11
   32. SUPPORTS
   33. 7 TO 10 FIXED
   34. DRAW JOINT MEMBER SUPPORT
```

```
35. **
36. **DEAD LOAD
37. **
38. LOAD 2 DEAD
39. SELFWEIGHT Y -1
40. MEMBER LOAD
41. 1 CON GY -91.4 2.08
42. 2 CON GY -89.4 5.22
43. 2 CON GY -89.4 13.22
44. 3 CON GY -91.4 2.78
45. JOINT LOAD
46. 2 3 FY -2.7
47. **
48. **MAXIMUM NEGATIVE MOMENT
49. **
50. LOAD 11 LIVELOAD + IMPACT FOR JT. 2 MEM 1 AND 2
51. MEMBER LOAD
52. 1 CON Y -48.4 2.08
53. 2 CON Y -58.1 5.22
54. 2 CON Y -48.4 13.22
55. LOAD 12 LIVELOAD + IMPACT FOR JT. 3  MEM. 2 AND 3
56. MEMBER LOAD
57. 2 CON Y -48.4 5.22
58. 2 CON Y -58.1 13.22
59. 3 CON Y -48.4 2.78
60. **
61. **MAXIMUM POSITIVE MOMENT
62. **
63. LOAD 13 LIVELOAD + IMPACT  MEM 2
64. MEMBER LOAD
65. 1 CON Y -19.4 2.08
66. 2 CON Y -58.1 5.22
67. 2 CON Y -58.1 13.22
68. 3 CON Y -19.4 2.78
69. **
70. **LOADS ON FOOTINGS
71. **
72. LOAD 14 LIVELOAD NO IMPACT JT. 8
73. MEMBER LOAD
74. 1 CON Y -38.1 2.08
75. 2 CON Y -45.8 5.22
76. 2 CON Y -38.1 13.22
77. LOAD 15 LIVELOAD NO IMPACT FOR JT. 9
78. MEMBER LOAD
79. 2 CON Y -38.1 5.22
80. 2 CON Y -45.8 13.22
81. 3 CON Y -38.1 2.78
82. **
83. **WIND
84. **
85. LOAD 4 WIND
86. JOINT LOAD
87. 2 3 FX -7.253 FZ -8.003
88. 4 FX -0.357
89. MEMBER LOAD
90. 1 TO 3 UNI GZ -0.207
91. 4 5 7 8 UNI GZ -0.177
92. 4 5 UNI GX -0.105
93. 7 8 UNI GX -0.134
94. 6 UNI GZ -0.295
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95. **
96. LOAD 5 WIND ON LL
97. JOINT LOAD
98. 2 3 FX -1.520 FZ -1.699
99. **
100. LOAD 6 LONGITUDINAL FORCE
101. JOINT LOAD
102. 2 3 FZ -4.170
103. **
104. LOAD 7 TEMP LOAD
105. TEMPERATURE LOAD
106. 1 TO 11 TEMP -45
107. **
108. LOAD 8 STREAM LOAD
109. MEMBER LOAD
110. 9 TO 11 UNI GZ -0
111. **
112. LOAD COMB 10 GROUP 1
113. 8 1.0
114. LOAD COMB 20 GROUP 2
115. 4 1.0 8 1.0
116. LOAD COMB 30 GROUP 3
117. 4 0.3 5 1.0 6 1.0 8 1.0
118. LOAD COMB 40 GROUP 4
119. 7 1.74 8 1.0
120. LOAD COMB 50 GROUP 5
121. 4 1.0 7 1.74 8 1.0
122. LOAD COMB 60 GROUP 6
123. 4 0.3 5 1.0 6 1.0 7 1.74 8 1.0
124. LOAD COMB 100 USED TO DETERMINE LOCATION OF MAX FACTORED POSITIVE MOMENT
125. 2 1.0 13 1.67
126. PERFORM ANALYSIS


      P R O B L E M   S T A T I S T I C S
      -----------------------------------

 NUMBER OF JOINTS/MEMBER+ELEMENTS/SUPPORTS =    10/    11/     4
 ORIGINAL/FINAL BAND-WIDTH=     3/     3/    24 DOF
 TOTAL PRIMARY LOAD CASES =   11, TOTAL DEGREES OF FREEDOM =    36
 SIZE OF STIFFNESS MATRIX =        1 DOUBLE  KILO-WORDS
 REQRD/AVAIL. DISK SPACE  =     12.0/ 111379.3 MB


127. PRINT MEMBER FORCES LIST 2 4 5 7 8
```

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- KIP FEET

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
2	2	2	17.32	103.97	0.00	0.00	0.00	328.06
		3	-17.32	103.87	0.00	0.00	0.00	-327.12
	11	2	8.77	59.59	0.00	0.00	0.00	170.21
		3	-8.77	46.91	0.00	0.00	0.00	-92.12
	12	2	8.78	46.95	0.00	0.00	0.00	92.45
		3	-8.78	59.55	0.00	0.00	0.00	-169.86
	13	2	9.72	58.12	0.00	0.00	0.00	133.36
		3	-9.72	58.08	0.00	0.00	0.00	-133.02
	14	2	6.91	46.95	0.00	0.00	0.00	134.04
		3	-6.91	36.95	0.00	0.00	0.00	-72.58
	15	2	6.92	36.98	0.00	0.00	0.00	72.84
		3	-6.92	46.92	0.00	0.00	0.00	-133.77
	4	2	0.18	9.39	1.91	-0.02	3.18	86.55
		3	-0.18	-9.39	1.91	0.02	-3.21	86.55
	5	2	0.00	1.72	0.00	0.00	0.72	15.87
		3	0.00	-1.72	0.00	0.00	-0.73	15.87
	6	2	0.00	0.00	0.00	-0.01	1.78	0.00
		3	0.00	0.00	0.00	0.01	-1.79	0.00
	7	2	6.63	0.00	0.00	0.00	0.00	25.10
		3	-6.63	0.00	0.00	0.00	0.00	-25.12
	8	2	0.00	0.00	0.00	0.00	0.00	0.00
		3	0.00	0.00	0.00	0.00	0.00	0.00
	10	2	0.00	0.00	0.00	0.00	0.00	0.00
		3	0.00	0.00	0.00	0.00	0.00	0.00
	20	2	0.18	9.39	1.91	-0.02	3.18	86.55
		3	-0.18	-9.39	1.91	0.02	-3.21	86.55
	30	2	0.05	4.54	0.57	-0.01	3.45	41.83
		3	-0.05	-4.54	0.57	0.01	-3.48	41.84
	40	2	11.54	0.00	0.00	0.00	0.00	43.68
		3	-11.54	0.00	0.00	0.00	0.00	-43.70
	50	2	11.72	9.39	1.91	-0.02	3.18	130.23
		3	-11.72	-9.39	1.91	0.02	-3.21	42.85
	60	2	11.59	4.54	0.57	-0.01	3.45	85.52
		3	-11.59	-4.54	0.57	0.01	-3.48	-1.86
	100	2	33.56	201.03	0.00	0.00	0.00	550.76
		3	-33.56	200.87	0.00	0.00	0.00	-549.26
4	2	2	206.41	4.47	0.00	0.00	0.00	55.37
		5	-237.81	-2.51	0.00	0.00	0.00	23.56
	11	2	108.33	2.02	0.00	0.00	0.00	35.66
		5	-108.33	-2.02	0.00	0.00	0.00	10.05
	12	2	47.40	5.84	0.00	0.00	0.00	92.45
		5	-47.40	-5.84	0.00	0.00	0.00	39.60
	13	2	77.97	4.87	0.00	0.00	0.00	79.42
		5	-77.97	-4.87	0.00	0.00	0.00	30.84
	14	2	85.32	1.59	0.00	0.00	0.00	28.12
		5	-85.32	-1.59	0.00	0.00	0.00	7.92
	15	2	37.34	4.60	0.00	0.00	0.00	72.84
		5	-37.34	-4.60	0.00	0.00	0.00	31.21

V_{DL}

V_{LL+I}

— MAX. NEG. M_{DL}

— MAX. NEG. M_{LL+I}

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- KIP FEET

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	4	2	9.83	6.83	10.92	5.61	-0.37	86.55
		5	-9.98	-9.20	-14.92	-5.61	-291.98	94.79
	5	2	1.81	1.41	1.70	0.72	-0.05	15.87
		5	-1.81	-1.41	-1.70	-0.72	-38.40	16.02
	6	2	0.00	0.00	4.17	1.77	-0.12	0.00
		5	0.00	0.00	-4.17	-1.77	-94.24	0.00
	7	2	0.41	6.62	0.00	0.00	0.00	25.10
		5	-0.41	-6.62	0.00	0.00	0.00	124.65
	8	2	0.00	0.00	0.00	0.00	0.00	0.00
		5	0.00	0.00	0.00	0.00	0.00	0.00
	10	2	0.00	0.00	0.00	0.00	0.00	0.00
		5	0.00	0.00	0.00	0.00	0.00	0.00
	20	2	9.83	6.83	10.92	5.61	-0.37	86.55
		5	-9.98	-9.20	-14.92	-5.61	-291.98	94.79
	30	2	4.76	3.46	9.15	4.18	-0.28	41.83
		5	-4.81	-4.17	-10.35	-4.18	-220.23	44.45
	40	2	0.72	11.52	0.00	0.00	0.00	43.68
		5	-0.72	-11.52	0.00	0.00	0.00	216.90
	50	2	10.55	18.35	10.92	5.61	-0.37	130.23
		5	-10.70	-20.72	-14.92	-5.61	-291.98	311.69
	60	2	5.48	14.98	9.15	4.18	-0.28	85.52
		5	-5.52	-15.69	-10.35	-4.18	-220.23	261.35
	100	2	336.62	12.61	0.00	0.00	0.00	188.01
		5	-368.02	-10.65	0.00	0.00	0.00	75.07
5	2	3	206.31	4.38	0.00	0.00	0.00	54.43
		6	-237.71	-2.41	0.00	0.00	0.00	22.43
	11	3	47.37	5.81	0.00	0.00	0.00	92.12
		6	-47.37	-5.81	0.00	0.00	0.00	39.23
	12	3	108.29	1.99	0.00	0.00	0.00	35.31
		6	-108.29	-1.99	0.00	0.00	0.00	9.65
	13	3	77.94	4.84	0.00	0.00	0.00	79.09
		6	-77.94	-4.84	0.00	0.00	0.00	30.46
	14	3	37.31	4.57	0.00	0.00	0.00	72.58
		6	-37.31	-4.57	0.00	0.00	0.00	30.92
	15	3	85.29	1.57	0.00	0.00	0.00	27.85
		6	-85.29	-1.57	0.00	0.00	0.00	7.60
	4	3	-9.84	-6.83	-10.92	-5.65	0.34	-86.55
		6	9.98	9.20	14.92	5.65	291.92	-94.79
	5	3	-1.81	-1.41	-1.70	-0.73	0.04	-15.87
		6	1.81	1.41	1.70	0.73	38.39	-16.01
	6	3	0.00	0.00	-4.17	-1.79	0.11	0.00
		6	0.00	0.00	4.17	1.79	94.22	0.00
	7	3	0.42	6.62	0.00	0.00	0.00	25.12
		6	-0.42	-6.62	0.00	0.00	0.00	124.64
	8	3	0.00	0.00	0.00	0.00	0.00	0.00
		6	0.00	0.00	0.00	0.00	0.00	0.00
	10	3	0.00	0.00	0.00	0.00	0.00	0.00
		6	0.00	0.00	0.00	0.00	0.00	0.00
	20	3	-9.84	-6.83	-10.92	-5.65	0.34	-86.55
		6	9.98	9.20	14.92	5.65	291.92	-94.79

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- KIP FEET

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	30	3	-4.76	-3.46	-9.14	-4.21	0.25	-41.84
		6	4.81	4.17	10.34	4.21	220.19	-44.45
	40	3	0.73	11.52	0.00	0.00	0.00	43.70
		6	-0.73	-11.52	0.00	0.00	0.00	216.87
	50	3	-9.11	4.69	-10.92	-5.65	0.34	-42.85
		6	9.26	-2.32	14.92	5.65	291.92	122.08
	60	3	-4.04	8.06	-9.14	-4.21	0.25	1.86
		6	4.08	-7.35	10.34	4.21	220.19	172.42
	100	3	336.46	12.47	0.00	0.00	0.00	186.51
		6	-367.87	-10.50	0.00	0.00	0.00	73.29
7	2	5	249.75	1.88	0.00	0.00	0.00	12.34
		8	-257.96	-1.36	0.00	0.00	0.00	-4.82
	11	5	106.59	-4.50	0.00	0.00	0.00	-16.05
		8	-106.59	4.50	0.00	0.00	0.00	-4.80
	12	5	48.31	-0.88	0.00	0.00	0.00	-17.40
		8	-48.31	0.88	0.00	0.00	0.00	13.33
	13	5	77.47	-3.24	0.00	0.00	0.00	-20.68
		8	-77.47	3.24	0.00	0.00	0.00	5.65
	14	5	83.95	-3.54	0.00	0.00	0.00	-12.65
		8	-83.95	3.54	0.00	0.00	0.00	-3.78
	15	5	38.05	-0.69	0.00	0.00	0.00	-13.72
		8	-38.05	0.69	0.00	0.00	0.00	10.50
	4	5	17.20	8.76	18.06	-4.29	292.59	-17.92
		8	-17.24	-9.38	-18.89	4.29	-378.30	59.99
	5	5	3.01	1.34	1.70	0.77	38.39	-3.31
		8	-3.01	-1.34	-1.70	-0.77	-46.28	9.51
	6	5	0.00	0.00	4.17	1.90	94.23	0.00
		8	0.00	0.00	-4.17	-1.90	-113.58	0.00
	7	5	-16.21	-258.67	0.00	0.00	0.00	-331.86
		8	16.21	258.67	0.00	0.00	0.00	-868.13
	8	5	0.00	0.00	0.00	0.00	0.00	0.00
		8	0.00	0.00	0.00	0.00	0.00	0.00
	10	5	0.00	0.00	0.00	0.00	0.00	0.00
		8	0.00	0.00	0.00	0.00	0.00	0.00
	20	5	17.20	8.76	18.06	-4.29	292.59	-17.92
		8	-17.24	-9.38	-18.89	4.29	-378.30	59.99
	30	5	8.16	3.96	11.29	1.39	220.40	-8.69
		8	-8.18	-4.15	-11.54	-1.39	-273.35	27.51
	40	5	-28.21	-450.09	0.00	0.00	0.00	-577.43
		8	28.21	450.09	0.00	0.00	0.00	-1510.55
	50	5	-11.01	-441.33	18.06	-4.29	292.59	-595.35
		8	10.97	440.71	-18.89	4.29	-378.30	-1450.56
	60	5	-20.04	-446.12	11.29	1.39	220.40	-586.12
		8	20.03	445.94	-11.54	-1.39	-273.35	-1483.04
	100	5	379.12	-3.54	0.00	0.00	0.00	-22.20
		8	-387.33	4.05	0.00	0.00	0.00	4.61
8	2	6	249.66	2.42	0.00	0.00	0.00	13.58
		9	-257.87	-1.92	0.00	0.00	0.00	-3.51
	11	6	48.28	-0.74	0.00	0.00	0.00	-17.05
		9	-48.28	0.74	0.00	0.00	0.00	13.63

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- KIP FEET

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	12	6	106.56	-4.30	0.00	0.00	0.00	-15.62
		9	-106.56	4.30	0.00	0.00	0.00	-4.32
	13	6	77.44	-3.07	0.00	0.00	0.00	-20.29
		9	-77.44	3.07	0.00	0.00	0.00	6.04
	14	6	38.02	-0.58	0.00	0.00	0.00	-13.44
		9	-38.02	0.58	0.00	0.00	0.00	10.74
	15	6	83.93	-3.39	0.00	0.00	0.00	-12.31
		9	-83.93	3.39	0.00	0.00	0.00	-3.40
	4	6	-17.18	-8.78	-18.05	4.95	-292.54	17.91
		9	17.21	9.40	18.88	-4.95	378.19	-60.05
	5	6	-3.00	-1.34	-1.70	-0.69	-38.39	3.31
		9	3.00	1.34	1.70	0.69	46.27	-9.52
	6	6	0.00	0.00	-4.17	-1.69	-94.22	0.00
		9	0.00	0.00	4.17	1.69	113.56	0.00
	7	6	-15.64	-258.71	0.00	0.00	0.00	-331.64
		9	15.64	258.71	0.00	0.00	0.00	-868.36
	8	6	0.00	0.00	0.00	0.00	0.00	0.00
		9	0.00	0.00	0.00	0.00	0.00	0.00
	10	6	0.00	0.00	0.00	0.00	0.00	0.00
		9	0.00	0.00	0.00	0.00	0.00	0.00
	20	6	-17.18	-8.78	-18.05	4.95	-292.54	17.91
		9	17.21	9.40	18.88	-4.95	378.19	-60.05
	30	6	-8.16	-3.97	-11.28	-0.89	-220.37	8.68
		9	8.17	4.16	11.53	0.89	273.28	-27.54
	40	6	-27.21	-450.15	0.00	0.00	0.00	-577.05
		9	27.21	450.15	0.00	0.00	0.00	-1510.94
	50	6	-44.38	-458.92	-18.05	4.95	-292.54	-559.14
		9	44.42	459.54	18.88	-4.95	378.19	-1570.99
	60	6	-35.36	-454.12	-11.28	-0.89	-220.37	-568.37
		9	35.37	454.31	11.53	0.89	273.28	-1538.48
	100	6	378.98	-2.71	0.00	0.00	0.00	-20.31
		9	-387.19	3.21	0.00	0.00	0.00	6.58

********** END OF LATEST ANALYSIS RESULT **********

128. SECTION 0.54 MEMB 7 8
129. PRINT MEMBER SECTION FORCES LIST 7 8

MEMBER FORCES AT INTERMEDIATE SECTIONS

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	SEC	SHEAR-Y	SHEAR-Z	MOM-Y	MOM-Z
7	2	0.54	1.60	0.00	0.00	7.98
	11	0.54	-4.50	0.00	0.00	-4.79
	12	0.54	-0.88	0.00	0.00	-15.20
	13	0.54	-3.24	0.00	0.00	-12.56
	14	0.54	-3.54	0.00	0.00	-3.77
	15	0.54	-0.69	0.00	0.00	-11.98
	4	0.54	9.09	18.51	338.40	-40.28
	5	0.54	1.34	1.70	42.65	-6.66
	6	0.54	0.00	4.17	104.68	0.00
	7	0.54	-258.67	0.00	0.00	316.14
	8	0.54	0.00	0.00	0.00	0.00
	10	0.54	0.00	0.00	0.00	0.00
	20	0.54	9.09	18.51	338.40	-40.28
	30	0.54	4.06	11.42	248.85	-18.75
	40	0.54	-450.09	0.00	0.00	550.08
	50	0.54	-440.99	18.51	338.40	509.80
	60	0.54	-446.02	11.42	248.85	531.34
	100	0.54	-3.81	0.00	0.00	-13.00
8	2	0.54	2.15	0.00	0.00	7.85
	11	0.54	-0.74	0.00	0.00	-15.20
	12	0.54	-4.30	0.00	0.00	-4.85
	13	0.54	-3.07	0.00	0.00	-12.60
	14	0.54	-0.58	0.00	0.00	-11.98
	15	0.54	-3.39	0.00	0.00	-3.82
	4	0.54	-9.11	-18.50	-338.32	40.31
	5	0.54	-1.34	-1.70	-42.64	6.66
	6	0.54	0.00	-4.17	-104.66	0.00
	7	0.54	-258.71	0.00	0.00	316.36
	8	0.54	0.00	0.00	0.00	0.00
	10	0.54	0.00	0.00	0.00	0.00
	20	0.54	-9.11	-18.50	-338.32	40.31
	30	0.54	-4.07	-11.42	-248.80	18.76
	40	0.54	-450.15	0.00	0.00	550.46
	50	0.54	-459.26	-18.50	-338.32	590.77
	60	0.54	-454.22	-11.42	-248.80	569.22
	100	0.54	-2.98	0.00	0.00	-13.18

********** END OF LATEST ANALYSIS RESULT **********

130. LOAD LIST 2 13 100
131. SECTION 0.49 0.5 0.51 MEMB 2
132. PRINT MEMBER SECTION FORCES LIST 2

MEMBER FORCES AT INTERMEDIATE SECTIONS

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	SEC	SHEAR-Y	SHEAR-Z	MOM-Y	MOM-Z	
2	2	0.49	0.34	0.00	0.00	-205.98	
		0.50	0.05	0.00	0.00	-206.02	- Max. Pos Mom
		0.51	-0.24	0.00	0.00	-206.00	
	13	0.49	0.02	0.00	0.00	-170.09	
		0.50	0.02	0.00	0.00	-170.09	- Max. Pos, M_LL+I
		0.51	0.02	0.00	0.00	-170.10	
	100	0.49	0.37	0.00	0.00	-490.03	
		0.50	0.08	0.00	0.00	-490.07	- Max Pos. Fact. M
		0.51	-0.21	0.00	0.00	-490.06	

********** END OF LATEST ANALYSIS RESULT **********

133. FINISH

********** END OF THE STAAD.Pro RUN **********

**** DATE= JUL 18,2006 TIME= 10:16:59 ****

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*        For questions on STAAD.Pro, please contact         *
*  Research Engineers Offices at the following locations    *
*                                                           *
*                  Telephone                Email           *
*  USA:       +1 (714)974-2500       support@reiusa.com      *
*  CANADA     +1 (905)632-4771       detech@odandetech.com   *
*  UK         +44(1454)207-000       support@reel.co.uk      *
*  FRANCE     +33(0)1 64551084       support@reel.co.uk      *
*  GERMANY    +49/931/40468-71       info@reig.de            *
*  NORWAY     +47 67 57 21 30        support@reel.co.uk      *
*  SINGAPORE +65 6225-6015/16        support@reiasia.net     *
*  INDIA      +91(033)2357-3575 support@calcutta.reiusa.com *
*  JAPAN      +81(03)5952-6500       eng-eye@crc.co.jp       *
*  CHINA      +86(411)363-1983       support@reiasia.net     *
*                                                           *
*  North America                   support@reiusa.com       *
*  Europe                          support@reel.co.uk       *
*  Asia                            support@reiasia.net      *
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H. W. LOCHNER, INC.

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA JMJ Jun-06
SUBJECT: HIGH LEVEL BENT ANALYSIS WDB Jun-06
HLB 160 MEM. 4 JT. 2

COLUMN LOADS

PMAX

HLB 160 MEMBER 4 JOINT 2

	GROUP 1 P	MY	MZ		GROUP 2 P	MY	MZ
DL	206.41	0.00	55.37	DL	206.41	0.00	55.37
LL	108.33	0.00	35.66	LL	0.00	0.00	0.00
GROUP 1	0.00	0.00	0.00	GROUP 2	9.83	-0.37	86.55
SERVICE	314.74	0.00	91.03	SERVICE	216.24	-0.37	141.92
STRENGTH	503.05	0.00	149.24	STRENGTH	281.11	-0.48	184.50

	GROUP 3 P	MY	MZ		GROUP 4 P	MY	MZ
DL	206.41	0.00	55.37	DL	206.41	0.00	55.37
LL	108.33	0.00	35.66	LL	108.33	0.00	35.66
GROUP 3	4.76	-0.28	41.83	GROUP 4	0.72	0.00	43.68
SERVICE	319.50	-0.28	132.86	SERVICE	315.46	0.00	134.71
STRENGTH	415.35	-0.36	172.72	STRENGTH	410.10	0.00	175.12

	GROUP 5 P	MY	MZ		GROUP 6 P	MY	MZ
DL	206.41	0.00	55.37	DL	206.41	0.00	55.37
LL	0.00	0.00	0.00	LL	108.33	0.00	35.66
GROUP 5	10.55	-0.37	130.23	GROUP 6	5.48	-0.28	85.52
SERVICE	216.96	-0.37	185.60	SERVICE	320.22	-0.28	176.55
STRENGTH	271.20	-0.46	232.00	STRENGTH	400.28	-0.35	220.69

SLENDERNESS EFFECTS IN COMPRESSION MEMBERS (AASHTO 8.16.5)

f'c = 3000 psi PHI = 0.70 W_C = 150 PCF

$E_C = W_C^{1.5} * 33 * f'c^{0.5}$ = 3320561 PSI Width of Rect. Col. = B = 35.928 In.
Depth of Rect. Col = D = 37.164 In.

$r_Y = 0.30*D$ = 11.15 In. L_Y = 17.833 Ft. K_Y = 2.0
$r_Z = 0.30*B$ = 10.78 In. L_Z = 20.833 Ft. K_Z = 1.2

I_{YY} = $B*D^3/12$ I_{YY} = 153681 In^4
I_{ZZ} = $D*B^3/12$ I_{ZZ} = 143628 In^5

K_YL_Y/r = 38.4 > 22 CONSIDER SLENDERNESS
K_ZL_Z/r = 27.8 > 22 CONSIDER SLENDERNESS

H. W. LOCHNER, INC.

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA — JMJ Jun-06
SUBJECT: HIGH LEVEL BENT ANALYSIS — WDB Jun-06
HLB 160 MEM. 4 JT. 2

SLENDERNESS EFFECTS IN RECTANGULAR COMPRESSION MEMBERS (AASHTO 8.16.5)

GROUP 1

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	37.164	38.4	0.00	0.00	0.000	503	10998	1.070	1.070	72	*
MZ	35.928	37.164	27.8	149.24	71.98	0.482	503	14114	1.054	1.054	157	

GROUP 2

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	37.164	38.4	0.48	0.00	0.000	281	10998	1.038	1.038	40	*
MZ	35.928	37.164	27.8	184.50	71.98	0.390	281	15049	1.027	1.027	190	

GROUP 3

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	37.164	38.4	0.36	0.00	0.000	415	10998	1.057	1.057	59	*
MZ	35.928	37.164	27.8	172.72	71.98	0.417	415	14767	1.042	1.042	180	

GROUP 4

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	37.164	38.4	0.00	0.00	0.000	410	10998	1.056	1.056	59	*
MZ	35.928	37.164	27.8	175.12	71.98	0.411	410	14827	1.041	1.041	182	

GROUP 5

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	37.164	38.4	0.46	0.00	0.000	271	10998	1.037	1.037	39	*
MZ	35.928	37.164	27.8	232.00	71.98	0.310	271	15967	1.025	1.025	238	

GROUP 6

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	37.164	38.4	0.35	0.00	0.000	400	10998	1.055	1.055	57	*
MZ	35.928	37.164	27.8	220.69	71.98	0.326	400	15776	1.038	1.038	229	

* MINIMUM MOMENT CONTROLS

H. W. LOCHNER, INC.

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA JMJ Jun-06
SUBJECT: HIGH LEVEL BENT ANALYSIS WDB Jun-06
HLB 160 MEM. 4 JT. 2

COLUMN LOADS

PMIN

HLB 160 MEMBER 4 JOINT 2

	GROUP 1				GROUP 2		
	P	MY	MZ		P	MY	MZ
DL	154.81	0.00	55.37	DL	154.81	0.00	55.37
LL	47.40	0.00	92.45	LL	0.00	0.00	0.00
GROUP 1	0.00	0.00	0.00	GROUP 2	9.83	-0.37	86.55
SERVICE	202.21	0.00	147.82	SERVICE	164.64	-0.37	141.92
STRENGTH	303.95	0.00	272.29	STRENGTH	214.03	-0.48	184.50

	GROUP 3				GROUP 4		
	P	MY	MZ		P	MY	MZ
DL	154.81	0.00	55.37	DL	154.81	0.00	55.37
LL	47.40	0.00	92.45	LL	47.40	0.00	92.45
GROUP 3	4.76	-0.28	41.83	GROUP 4	0.72	0.00	43.68
SERVICE	206.97	-0.28	189.65	SERVICE	202.93	0.00	191.50
STRENGTH	269.06	-0.36	246.55	STRENGTH	263.81	0.00	248.95

	GROUP 5				GROUP 6		
	P	MY	MZ		P	MY	MZ
DL	154.81	0.00	55.37	DL	154.81	0.00	55.37
LL	0.00	0.00	0.00	LL	47.40	0.00	92.45
GROUP 5	10.55	-0.37	130.23	GROUP 6	5.48	-0.28	85.52
SERVICE	165.36	-0.37	185.60	SERVICE	207.69	-0.28	233.34
STRENGTH	206.70	-0.46	232.00	STRENGTH	259.61	-0.35	291.68

SLENDERNESS EFFECTS IN COMPRESSION MEMBERS (AASHTO 8.16.5)

f'c = 3000 psi PHI = 0.70 W_C = 150 PCF

$E_C = W_C^{1.5} * 33 * f'c^{0.5}$ = 3320561 PSI Width of Rect. Col. = B = 35.928 In.

Depth of Rect. Col = D = 37.164 In.

$r_Y = 0.30*D$ = 11.15 In. L_Y = 17.833 Ft. K_Y = 2.0

$r_Z = 0.30*B$ = 10.78 In. L_Z = 20.833 Ft. K_Z = 1.2

I_{YY} = $B*D^3/12$ I_{YY} = 153681 In^4

I_{ZZ} = $D*B^3/12$ I_{ZZ} = 143628 In^5

$K_Y L_Y/r$ = 38.4 > 22 CONSIDER SLENDERNESS

$K_Z L_Z/r$ = 27.8 > 22 CONSIDER SLENDERNESS

H. W. LOCHNER, INC.

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA JMJ Jun-06
SUBJECT: HIGH LEVEL BENT ANALYSIS WDB Jun-06
HLB 160 MEM. 4 JT. 2

SLENDERNESS EFFECTS IN RECTANGULAR COMPRESSION MEMBERS (AASHTO 8.16.5)

GROUP 1

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	37.164	38.4	0.00	0.00	0.000	304	10998	1.041	1.041	43	*
MZ	35.928	37.164	27.8	272.29	71.98	0.264	304	16547	1.027	1.027	280	

GROUP 2

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	37.164	38.4	0.48	0.00	0.000	214	10998	1.029	1.029	31	*
MZ	35.928	37.164	27.8	184.50	71.98	0.390	214	15049	1.021	1.021	188	

GROUP 3

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	37.164	38.4	0.36	0.00	0.000	269	10998	1.036	1.036	38	*
MZ	35.928	37.164	27.8	246.55	71.98	0.292	269	16193	1.024	1.024	253	

GROUP 4

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	37.164	38.4	0.00	0.00	0.000	264	10998	1.035	1.035	38	*
MZ	35.928	37.164	27.8	248.95	71.98	0.289	264	16229	1.024	1.024	255	

GROUP 5

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	37.164	38.4	0.46	0.00	0.000	207	10998	1.028	1.028	30	*
MZ	35.928	37.164	27.8	232.00	71.98	0.310	207	15967	1.019	1.019	236	

GROUP 6

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	37.164	38.4	0.35	0.00	0.000	260	10998	1.035	1.035	37	*
MZ	35.928	37.164	27.8	291.68	71.98	0.247	260	16780	1.023	1.023	298	

* MINIMUM MOMENT CONTROLS

H. W. LOCHNER, INC.

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA — JMJ Jun-06
SUBJECT: HIGH LEVEL BENT ANALYSIS — WDB Jun-06
HLB 160 MEM. 4 JT. 5

COLUMN LOADS

PMAX

HLB 160 MEMBER 4 JOINT 5

	GROUP 1 P	GROUP 1 MY	GROUP 1 MZ
DL	-237.81	0.00	23.56
LL	-108.33	0.00	10.05
GROUP 1	0.00	0.00	0.00
SERVICE	-346.14	0.00	33.61
STRENGTH	-543.87	0.00	52.40

	GROUP 2 P	GROUP 2 MY	GROUP 2 MZ
DL	-237.81	0.00	23.56
LL	0.00	0.00	0.00
GROUP 2	-9.98	-291.98	94.79
SERVICE	-247.79	-291.98	118.35
STRENGTH	-322.13	-379.57	153.86

	GROUP 3 P	GROUP 3 MY	GROUP 3 MZ
DL	-237.81	0.00	23.56
LL	-108.33	0.00	10.05
GROUP 3	-4.81	-220.23	44.45
SERVICE	-350.95	-220.23	78.06
STRENGTH	-456.24	-286.30	101.48

	GROUP 4 P	GROUP 4 MY	GROUP 4 MZ
DL	-237.81	0.00	23.56
LL	-108.33	0.00	10.05
GROUP 4	-0.72	0.00	216.90
SERVICE	-346.86	0.00	250.51
STRENGTH	-450.92	0.00	325.66

	GROUP 5 P	GROUP 5 MY	GROUP 5 MZ
DL	-237.81	0.00	23.56
LL	0.00	0.00	0.00
GROUP 5	-10.70	-291.98	311.69
SERVICE	-248.51	-291.98	335.25
STRENGTH	-310.64	-364.98	419.06

	GROUP 6 P	GROUP 6 MY	GROUP 6 MZ
DL	-237.81	0.00	23.56
LL	-108.33	0.00	10.05
GROUP 6	-5.52	-220.23	261.35
SERVICE	-351.66	-220.23	294.96
STRENGTH	-439.58	-275.29	368.70

SLENDERNESS EFFECTS IN COMPRESSION MEMBERS (AASHTO 8.16.5)

f'c = 3000 psi PHI = 0.70 W_C = 150 PCF

$E_C = W_C^{1.5} * 33 * f'c^{0.5}$ = 3320561 PSI Width of Rect. Col. = B = 35.928 In.

Depth of Rect. Col = D = 37.164 In.

$r_Y = 0.30*D$ = 11.15 In. L_Y = 17.833 Ft. K_Y = 2.0

$r_Z = 0.30*B$ = 10.78 In. L_Z = 20.833 Ft. K_Z = 1.2

I_{YY} = $B*D^3/12$ I_{YY} = 153681 In^4

I_{ZZ} = $D*B^3/12$ I_{ZZ} = 143628 In^5

$K_Y L_Y/r$ = 38.4 > 22 CONSIDER SLENDERNESS

$K_Z L_Z/r$ = 27.8 > 22 CONSIDER SLENDERNESS

H. W. LOCHNER, INC.

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA — JMJ Jun-06
SUBJECT: HIGH LEVEL BENT ANALYSIS — WDB Jun-06
HLB 160 MEM. 4 JT. 5

SLENDERNESS EFFECTS IN RECTANGULAR COMPRESSION MEMBERS (AASHTO 8.16.5)

GROUP 1

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	37.164	38.4	0.00	0.00	0.000	544	10998	1.076	1.076	78	*
MZ	35.928	37.164	27.8	52.40	30.63	0.584	544	13204	1.063	1.063	76	*

GROUP 2

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips
MY	35.928	37.164	38.4	379.57	0.00	0.000	322	10998	1.044	1.044	396
MZ	35.928	37.164	27.8	153.86	30.63	0.199	322	17448	1.027	1.027	158

GROUP 3

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips
MY	35.928	37.164	38.4	286.30	0.00	0.000	456	10998	1.063	1.063	304
MZ	35.928	37.164	27.8	101.48	30.63	0.302	456	16071	1.042	1.042	106

GROUP 4

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	37.164	38.4	0.00	0.00	0.000	451	10998	1.062	1.062	64	*
MZ	35.928	37.164	27.8	325.66	30.63	0.094	451	19123	1.035	1.035	337	

GROUP 5

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips
MY	35.928	37.164	38.4	364.98	0.00	0.000	311	10998	1.042	1.042	380
MZ	35.928	37.164	27.8	419.06	30.63	0.073	311	19496	1.023	1.023	429

GROUP 6

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips
MY	35.928	37.164	38.4	275.29	0.00	0.000	440	10998	1.061	1.061	292
MZ	35.928	37.164	27.8	368.70	30.63	0.083	440	19316	1.034	1.034	381

* MINIMUM MOMENT CONTROLS

H. W. LOCHNER, INC.

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA — JMJ Jun-06
SUBJECT: HIGH LEVEL BENT ANALYSIS — WDB Jun-06
'HLB 160 MEM. 4 JT. 5

COLUMN LOADS

PMIN

HLB 160 MEMBER 4 JOINT 5

	GROUP 1 P	GROUP 1 MY	GROUP 1 MZ
DL	-178.36	0.00	23.56
LL	-47.40	0.00	39.60
GROUP 1	0.00	0.00	0.00
SERVICE	-225.76	0.00	63.16
STRENGTH	-334.56	0.00	116.43

	GROUP 2 P	GROUP 2 MY	GROUP 2 MZ
DL	-178.36	0.00	23.56
LL	0.00	0.00	0.00
GROUP 2	-9.98	-291.98	94.79
SERVICE	-188.34	-291.98	118.35
STRENGTH	-244.84	-379.57	153.86

	GROUP 3 P	GROUP 3 MY	GROUP 3 MZ
DL	-178.36	0.00	23.56
LL	-47.40	0.00	39.60
GROUP 3	-4.81	-220.23	44.45
SERVICE	-230.57	-220.23	107.61
STRENGTH	-299.74	-286.30	139.89

	GROUP 4 P	GROUP 4 MY	GROUP 4 MZ
DL	-178.36	0.00	23.56
LL	-47.40	0.00	39.60
GROUP 4	-0.72	0.00	216.90
SERVICE	-226.48	0.00	280.06
STRENGTH	-294.42	0.00	364.08

	GROUP 5 P	GROUP 5 MY	GROUP 5 MZ
DL	-178.36	0.00	23.56
LL	0.00	0.00	0.00
GROUP 5	-10.70	-291.98	311.69
SERVICE	-189.06	-291.98	335.25
STRENGTH	-236.32	-364.98	419.06

	GROUP 6 P	GROUP 6 MY	GROUP 6 MZ
DL	-178.36	0.00	23.56
LL	-47.40	0.00	39.60
GROUP 6	-5.52	-220.23	261.35
SERVICE	-231.28	-220.23	324.51
STRENGTH	-289.10	-275.29	405.64

SLENDERNESS EFFECTS IN COMPRESSION MEMBERS (AASHTO 8.16.5)

f'c = 3000 psi PHI = 0.70 W_C = 150 PCF

$E_C = W_C^{1.5} * 33 * f'c^{0.5}$ = 3320561 PSI Width of Rect. Col. = B = 35.928 In.

Depth of Rect. Col = D = 37.164 In.

$r_Y = 0.30*D$ = 11.15 In. L_Y = 17.833 Ft. K_Y = 2.0

$r_Z = 0.30*B$ = 10.78 In. L_Z = 20.833 Ft. K_Z = 1.2

I_{YY} = $B*D^3/12$ I_{YY} = 153681 In^4

I_{ZZ} = $D*B^3/12$ I_{ZZ} = 143628 In^5

$K_Y L_Y/r$ = 38.4 > 22 CONSIDER SLENDERNESS

$K_Z L_Z/r$ = 27.8 > 22 CONSIDER SLENDERNESS

H. W. LOCHNER, INC.

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA — JMJ Jun-06
SUBJECT: HIGH LEVEL BENT ANALYSIS — WDB Jun-06
HLB 160 MEM. 4 JT. 5

SLENDERNESS EFFECTS IN RECTANGULAR COMPRESSION MEMBERS (AASHTO 8.16.5)

GROUP 1

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	37.164	38.4	0.00	0.00	0.000	335	10998	1.045	1.045	48	*
MZ	35.928	37.164	27.8	116.43	30.63	0.263	335	16564	1.030	1.030	120	

GROUP 2

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips
MY	35.928	37.164	38.4	379.57	0.00	0.000	245	10998	1.033	1.033	392
MZ	35.928	37.164	27.8	153.86	30.63	0.199	245	17448	1.020	1.020	157

GROUP 3

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips
MY	35.928	37.164	38.4	286.30	0.00	0.000	300	10998	1.041	1.041	298
MZ	35.928	37.164	27.8	139.89	30.63	0.219	300	17163	1.026	1.026	143

GROUP 4

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	37.164	38.4	0.00	0.00	0.000	294	10998	1.040	1.040	42	*
MZ	35.928	37.164	27.8	364.08	30.63	0.084	294	19298	1.022	1.022	372	

GROUP 5

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips
MY	35.928	37.164	38.4	364.98	0.00	0.000	236	10998	1.032	1.032	377
MZ	35.928	37.164	27.8	419.06	30.63	0.073	236	19496	1.018	1.018	426

GROUP 6

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips
MY	35.928	37.164	38.4	275.29	0.00	0.000	289	10998	1.039	1.039	286
MZ	35.928	37.164	27.8	405.64	30.63	0.076	289	19452	1.022	1.022	414

* MINIMUM MOMENT CONTROLS

JMJ 7/06
WDB 7/06

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OOOOOOO    OOOOO    OOOOO    OOOOO    OOOOO   OO
OO    OO   OO  OO   OO  OO   OO  OO   OO  OO  OO
OO    OO   OO  OO   OO  OO   OO  OO   OO  OO  OO
OO    OO   OO       OO  OO   OO      OO  OO  OO
OO    OO   OO       OOOOOOO  OO      OO  OO  OO
OOOOOOO    OO  OO   OO  OO   OO  OO  OO  OO  OO
OO         OO  OO   OO  OO   OO  OO  OO  OO  OO
OO          OOOOO   OO  OO    OOOOO    OOOOO   OOOOO  (TM)
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==========
Computer program for the Strength Design of Reinforced Concrete Sections
==========

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BASED ON PLANS.

General Information:
====================
File Name: S:\DGN-ST\NORTHC~1\BONNER~1\ANALYSIS\PIERS\HLB160\PCACOL~1\M4PLAN.COL
Project: BONNER BRIDGE - OREGON INLET
Column: HLB #160 Engineer: JMJ
Code: ACI 318-95 Units: English

Run Option: Investigation Slenderness: Not considered
Run Axis: Biaxial Column Type: Structural

Material Properties:
====================
f'c = 3 ksi fy = 40 ksi
Ec = 3122.02 ksi Es = 29000 ksi
fc = 2.55 ksi Rupture strain = Infinity
Ultimate strain = 0.003 in/in
Beta1 = 0.85

Section:
========
Rectangular: Width = 36 in Depth = 37.2 in

Gross section area, Ag = 1339.2 in^2
Ix = 154437 in^4 Iy = 144634 in^4
Xo = 0 in Yo = 0 in

Reinforcement:
==============
Rebar Database: User-defined

Size	Diam (in)	Area (in^2)	Size	Diam (in)	Area (in^2)	Size	Diam (in)	Area (in^2)
# 1	0.00	0.00	# 3	0.38	0.11	# 4	0.50	0.20
# 5	0.63	0.31	# 6	0.75	0.44	# 7	0.88	0.60
# 8	1.00	0.79	# 9	1.13	1.00	# 10	1.27	1.27
# 11	1.41	1.56	# 14	1.69	2.25	# 18	2.26	4.00

Confinement: Tied; #1 ties with #9 bars, #1 with larger bars.
phi(a) = 0.8, phi(b) = 0.9, phi(c) = 0.7

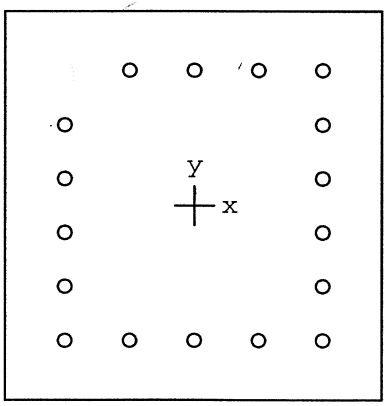
Layout: Rectangular
Pattern: Equal Bar Spacing (Cover to longitudinal reinforcement)
Total steel area, As = 28.08 in^2 at 2.10%
18 #11 Cover = 5 in

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
==========

No.	Pu kip	Mux k-ft	Muy k-ft	fMnx k-ft	fMny k-ft	fMn/Mu
1	503.0	72.0	157.0	514.2	1124.7	7.160
2	281.0	40.0	190.0	251.7	1196.4	6.297
3	415.0	59.0	180.0	376.1	1141.5	6.345
4	410.0	59.0	182.0	371.8	1140.4	6.269
5	271.0	39.0	238.0	198.8	1211.6	5.091
6	400.0	57.0	229.0	289.9	1169.6	5.106
7	304.0	43.0	280.0	186.9	1214.8	4.339
8	214.0	31.0	188.0	199.7	1203.8	6.404
9	269.0	38.0	253.0	183.0	1215.4	4.804
10	264.0	38.0	255.0	182.9	1214.8	4.765
11	207.0	30.0	236.0	153.0	1209.4	5.124
12	260.0	37.0	298.0	152.1	1219.2	4.091
13	544.0	78.0	76.0	872.7	852.5	11.202
14	322.0	396.0	158.0	1136.9	453.5	2.871
15	456.0	304.0	106.0	1160.5	406.4	3.819

16	451.0	64.0	337.0	229.8	1220.4	3.620
17	311.0	380.0	429.0	795.3	897.5	2.092
18	440.0	292.0	381.0	718.9	939.3	2.464
19	335.0	48.0	120.0	448.5	1119.7	9.333
20	245.0	392.0	157.0	1137.9	456.2	2.903
21	300.0	298.0	143.0	1097.9	526.6	3.684
22	294.0	42.0	372.0	138.5	1224.8	3.292
23	236.0	377.0	426.0	800.9	903.4	2.122
24	289.0	286.0	414.0	686.7	990.7	2.396

*** Program completed as requested! ***



36 x 37.2 in

Code: ACI 318-95

Units: English

Run axis: Biaxial

Run option: Investigation

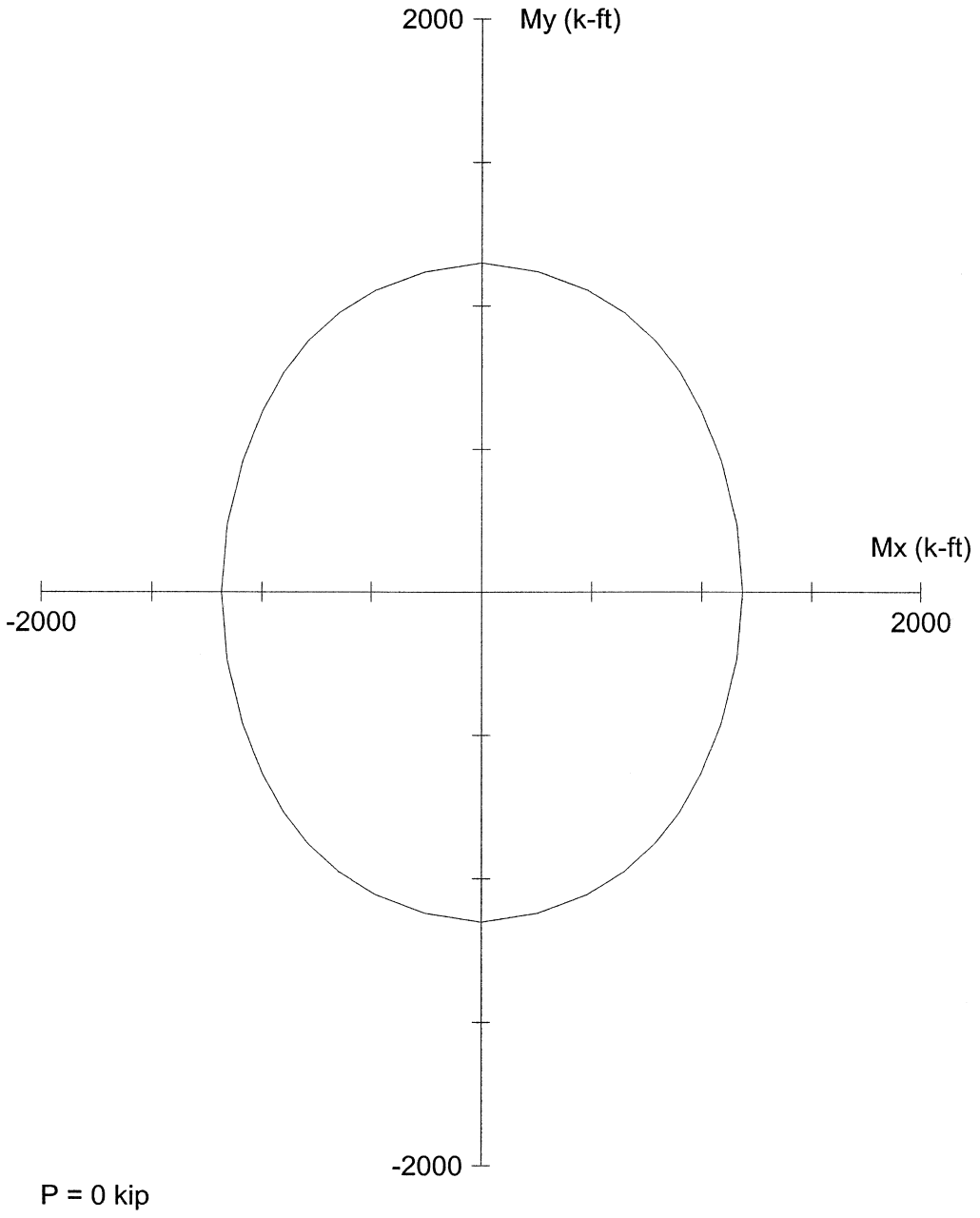
Slenderness: Not considered

(mn type: Structural

Bars: User-defined

Date: 07/19/06

Time: 13:15:17



PCACOL V3.00 (PCA 1999) - Licensed to: Licensee name not yet specified.

File: S:\DGN-ST\NORTHC~1\BONNER~1\ANALYSIS\PIERS\HLB160\PCACOL~1\M4PLAN.COL

Project: BONNER BRIDGE - OREGON INLET

Column: HLB #160		Engineer: JMJ	
f'c = 3 ksi	fy = 40 ksi	Ag = 1339.2 in^2	18 #11 bars
Ec = 3122 ksi	Es = 29000 ksi	As = 28.08 in^2	Rho = 2.10%
fc = 2.55 ksi	e_rup = Infinity	Xo = 0.00 in	Ix = 154437 in^4
ı = 0.003 in/in		Yo = 0.00 in	Iy = 144634 in^4
Beta1 = 0.85		Clear spacing = 3.75 in	Clear cover = 5.00 in
Confinement: Tied	phi(a) = 0.8, phi(b) = 0.9, phi(c) = 0.7		

JMJ 7/06
WDB 7/06

```
OOOOOOO    OOOOO    OOOOO    OOOOO    OOOOO   OO
OO    OO   OO  OO   OO  OO   OO  OO   OO  OO  OO
OO    OO   OO  OO   OO  OO   OO  OO   OO  OO  OO
OO    OO   OO       OO  OO   OO      OO  OO  OO
OO    OO   OO       OOOOOOO  OO      OO  OO  OO
OOOOOOO    OO  OO   OO  OO   OO  OO  OO  OO  OO
OO         OO  OO   OO  OO   OO  OO  OO  OO  OO
OO          OOOOO   OO  OO    OOOOO    OOOOO   OOOOO  (TM)
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==========
Computer program for the Strength Design of Reinforced Concrete Sections
==========

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50% cover loss

f'_c = 4400 psi

General Information:
====================
File Name: S:\DGN-ST\NORTHC~1\BONNER~1\ANALYSIS\PIERS\HLB160\PCACOL~1\M4ACT.COL
Project: BONNER BRIDGE - OREGON INLET
Column: HLB #160 Engineer: JMJ
Code: ACI 318-95 Units: English

Run Option: Investigation Slenderness: Not considered
Run Axis: Biaxial Column Type: Structural

Material Properties:
====================
f'c = 4.4 ksi fy = 40 ksi
Ec = 3780.96 ksi Es = 29000 ksi
fc = 3.74 ksi Rupture strain = Infinity
Ultimate strain = 0.003 in/in
Beta1 = 0.83

Section:
========
Rectangular: Width = 31 in Depth = 32.2 in

Gross section area, Ag = 998.2 in^2
Ix = 86247.8 in^4 Iy = 79939.2 in^4
Xo = 0 in Yo = 0 in

Reinforcement:
==============
Rebar Database: User-defined

Size	Diam (in)	Area (in^2)	Size	Diam (in)	Area (in^2)	Size	Diam (in)	Area (in^2)
# 1	0.00	0.00	# 3	0.38	0.11	# 4	0.50	0.20
# 5	0.63	0.31	# 6	0.75	0.44	# 7	0.88	0.60
# 8	1.00	0.79	# 9	1.13	1.00	# 10	1.27	1.27
# 11	1.41	1.56	# 14	1.69	2.25	# 18	2.26	4.00

Confinement: Tied; #1 ties with #9 bars, #1 with larger bars.
phi(a) = 0.8, phi(b) = 0.9, phi(c) = 0.7

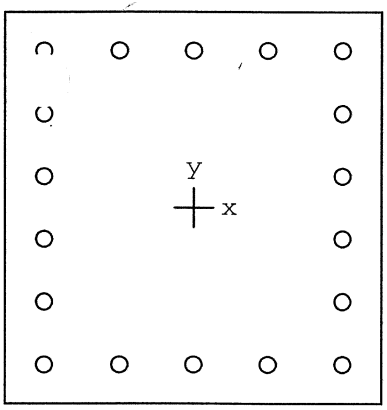
Layout: Rectangular
Pattern: Equal Bar Spacing (Cover to longitudinal reinforcement)
Total steel area, As = 28.08 in^2 at 2.81%
18 #11 Cover = 2.5 in

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
==========

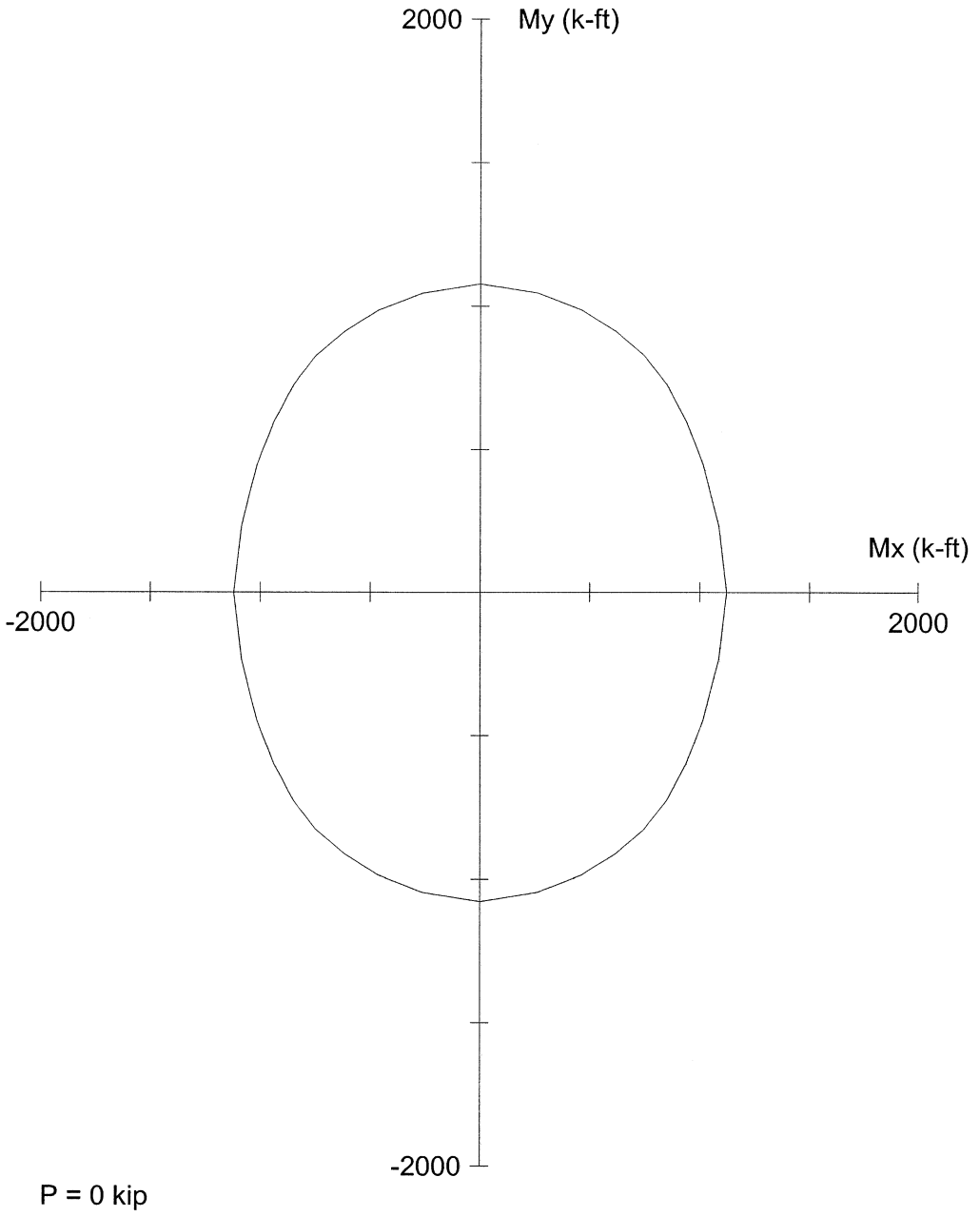
No.	Pu kip	Mux k-ft	Muy k-ft	fMnx k-ft	fMny k-ft	fMn/Mu
1	503.0	72.0	157.0	489.0	1062.9	6.774
2	281.0	40.0	190.0	239.9	1142.8	6.014
3	415.0	59.0	180.0	360.2	1097.8	6.099
4	410.0	59.0	182.0	356.6	1100.1	6.045
5	271.0	39.0	238.0	190.2	1154.8	4.853
6	400.0	57.0	229.0	281.3	1127.6	4.925
7	304.0	43.0	280.0	178.0	1161.8	4.149
8	214.0	31.0	188.0	189.7	1143.9	6.085
9	269.0	38.0	253.0	175.6	1157.4	4.576
10	264.0	38.0	255.0	172.4	1157.3	4.538
11	207.0	30.0	236.0	147.8	1150.4	4.875
12	260.0	37.0	298.0	143.8	1161.9	3.899
13	544.0	78.0	76.0	830.6	811.4	10.662
14	322.0	396.0	158.0	1087.9	435.7	2.749
15	456.0	304.0	106.0	1104.1	384.6	3.632

16	451.0	64.0	337.0	217.9	1148.1	3.407
17	311.0	380.0	429.0	765.4	863.2	2.013
18	440.0	292.0	381.0	684.0	893.0	2.343
19	335.0	48.0	120.0	430.3	1077.6	8.978
20	245.0	392.0	157.0	1084.8	433.2	2.766
21	300.0	298.0	143.0	1054.6	503.9	3.536
22	294.0	42.0	372.0	132.0	1169.4	3.144
23	236.0	377.0	426.0	765.9	865.3	2.031
24	289.0	286.0	414.0	657.2	952.3	2.300

*** Program completed as requested! ***



31 x 32.2 in



Code: ACI 318-95

Units: English

Run axis: Biaxial

Run option: Investigation

Slenderness: Not considered

mn type: Structural

Bars: User-defined

Date: 07/25/06

Time: 13:08:45

PCACOL V3.00 (PCA 1999) - Licensed to: Licensee name not yet specified.

File: S:\DGN-ST\NORTHC~1\BONNER~1\ANALYSIS\PIERS\HLB160\PCACOL~1\M4ACT.COL

Project: BONNER BRIDGE - OREGON INLET

Column: HLB #160		Engineer: JMJ	
f'c = 4.4 ksi	fy = 40 ksi	Ag = 998.2 in^2	18 #11 bars
Ec = 3781 ksi	Es = 29000 ksi	As = 28.08 in^2	Rho = 2.81%
fc = 3.74 ksi	e_rup = Infinity	Xo = 0.00 in	Ix = 86247.8 in^4
ı = 0.003 in/in		Yo = 0.00 in	Iy = 79939.2 in^4
Beta1 = 0.83		Clear spacing = 3.75 in	Clear cover = 2.50 in
Confinement: Tied	phi(a) = 0.8, phi(b) = 0.9, phi(c) = 0.7		

H. W. LOCHNER, INC.

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA — JMJ Jun-06
SUBJECT: HIGH LEVEL BENT ANALYSIS — WDB Jun-06
HLB 160 MEM. 5 JT. 3

COLUMN LOADS

PMAX

HLB 160 MEMBER 5 JOINT 3

	GROUP 1 P	MY	MZ		GROUP 2 P	MY	MZ
DL	206.31	0.00	54.43	DL	206.31	0.00	54.43
LL	108.29	0.00	35.31	LL	0.00	0.00	0.00
GROUP 1	0.00	0.00	0.00	GROUP 2	-9.84	0.34	-86.55
SERVICE	314.60	0.00	89.74	SERVICE	196.47	0.34	-32.12
STRENGTH	502.83	0.00	147.26	STRENGTH	255.41	0.44	-41.76

	GROUP 3 P	MY	MZ		GROUP 4 P	MY	MZ
DL	206.31	0.00	54.43	DL	206.31	0.00	54.43
LL	108.29	0.00	35.31	LL	108.29	0.00	35.31
GROUP 3	-4.76	0.25	-41.84	GROUP 4	0.73	0.00	43.70
SERVICE	309.84	0.25	47.90	SERVICE	315.33	0.00	133.44
STRENGTH	402.79	0.33	62.27	STRENGTH	409.93	0.00	173.47

	GROUP 5 P	MY	MZ		GROUP 6 P	MY	MZ
DL	206.31	0.00	54.43	DL	206.31	0.00	54.43
LL	0.00	0.00	0.00	LL	108.29	0.00	35.31
GROUP 5	-9.11	0.34	-42.85	GROUP 6	-4.04	0.25	1.86
SERVICE	197.20	0.34	11.58	SERVICE	310.56	0.25	91.60
STRENGTH	246.50	0.43	14.48	STRENGTH	388.20	0.31	114.50

SLENDERNESS EFFECTS IN COMPRESSION MEMBERS (AASHTO 8.16.5)

f'c = 3000 psi PHI = 0.70 W_C = 150 PCF

$E_C = W_C^{1.5} * 33 * f'c^{0.5}$ = 3320561 PSI Width of Rect. Col. = B = 35.928 In.

Depth of Rect. Col = D = 37.164 In.

$r_Y = 0.30*D$ = 11.15 In. L_Y = 17.833 Ft. K_Y = 2.0

$r_Z = 0.30*B$ = 10.78 In. L_Z = 20.833 Ft. K_Z = 1.2

I_{YY} = $B*D^3/12$ I_{YY} = 153681 In^4

I_{ZZ} = $D*B^3/12$ I_{ZZ} = 143628 In^5

K_YL_Y/r	=	38.4	>	22 CONSIDER SLENDERNESS
K_ZL_Z/r	=	27.8	>	22 CONSIDER SLENDERNESS

H. W. LOCHNER, INC.

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA — JMJ Jun-06
SUBJECT: HIGH LEVEL BENT ANALYSIS — WDB Jun-06
HLB 160 MEM. 5 JT. 3

SLENDERNESS EFFECTS IN RECTANGULAR COMPRESSION MEMBERS (AASHTO 8.16.5)

GROUP 1

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	37.164	38.4	0.00	0.00	0.000	503	10998	1.070	1.070	72	*
MZ	35.928	37.164	27.8	147.26	70.76	0.480	503	14131	1.054	1.054	155	

GROUP 2

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	37.164	38.4	0.44	0.00	0.000	255	10998	1.034	1.034	37	*
MZ	35.928	37.164	27.8	41.76	70.76	1.695	255	7764	1.049	1.049	44	

GROUP 3

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	37.164	38.4	0.33	0.00	0.000	403	10998	1.055	1.055	58	*
MZ	35.928	37.164	27.8	62.27	70.76	1.136	403	9793	1.062	1.062	66	

GROUP 4

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	37.164	38.4	0.00	0.00	0.000	410	10998	1.056	1.056	59	*
MZ	35.928	37.164	27.8	173.47	70.76	0.408	410	14860	1.041	1.041	181	

GROUP 5

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	37.164	38.4	0.43	0.00	0.000	247	10998	1.033	1.033	35	*
MZ	35.928	37.164	27.8	14.48	70.76	4.888	247	3553	1.110	1.110	34	*

GROUP 6

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	37.164	38.4	0.31	0.00	0.000	388	10998	1.053	1.053	55	*
MZ	35.928	37.164	27.8	114.50	70.76	0.618	388	12930	1.045	1.045	120	

* MINIMUM MOMENT CONTROLS

H. W. LOCHNER, INC.

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA JMJ Jun-06
SUBJECT: HIGH LEVEL BENT ANALYSIS WDB Jun-06
HLB 160 MEM. 5 JT. 3

COLUMN LOADS

PMIN

HLB 160 MEMBER 5 JOINT 3

	GROUP 1				GROUP 2		
	P	MY	MZ		P	MY	MZ
DL	154.73	0.00	54.43	DL	154.73	0.00	54.43
LL	47.37	0.00	92.12	LL	0.00	0.00	0.00
GROUP 1	0.00	0.00	0.00	GROUP 2	-9.84	0.34	-86.55
SERVICE	202.10	0.00	146.55	SERVICE	144.89	0.34	-32.12
STRENGTH	303.79	0.00	270.35	STRENGTH	188.36	0.44	-41.76

	GROUP 3				GROUP 4		
	P	MY	MZ		P	MY	MZ
DL	154.73	0.00	54.43	DL	154.73	0.00	54.43
LL	47.37	0.00	92.12	LL	47.37	0.00	92.12
GROUP 3	-4.76	0.25	-41.84	GROUP 4	0.73	0.00	43.70
SERVICE	197.34	0.25	104.71	SERVICE	202.83	0.00	190.25
STRENGTH	256.55	0.33	136.12	STRENGTH	263.68	0.00	247.33

	GROUP 5				GROUP 6		
	P	MY	MZ		P	MY	MZ
DL	154.73	0.00	54.43	DL	154.73	0.00	54.43
LL	0.00	0.00	0.00	LL	47.37	0.00	92.12
GROUP 5	-9.11	0.34	-42.85	GROUP 6	-4.04	0.25	1.86
SERVICE	145.62	0.34	11.58	SERVICE	198.06	0.25	148.41
STRENGTH	182.03	0.43	14.48	STRENGTH	247.58	0.31	185.51

SLENDERNESS EFFECTS IN COMPRESSION MEMBERS (AASHTO 8.16.5)

f'c = 3000 psi PHI = 0.70 W_C = 150 PCF

$E_C = W_C^{1.5} * 33 * f'c^{0.5}$ = 3320561 PSI Width of Rect. Col. = B = 35.928 In.

Depth of Rect. Col = D = 37.164 In.

$r_Y = 0.30*D$ = 11.15 In. L_Y = 17.833 Ft. K_Y = 2.0

$r_Z = 0.30*B$ = 10.78 In. L_Z = 20.833 Ft. K_Z = 1.2

I_{YY} = $B*D^3/12$ I_{YY} = 153681 In^4

I_{ZZ} = $D*B^3/12$ I_{ZZ} = 143628 In^5

$K_Y L_Y/r$ = 38.4 > 22 CONSIDER SLENDERNESS

$K_Z L_Z/r$ = 27.8 > 22 CONSIDER SLENDERNESS

H. W. LOCHNER, INC.

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA — JMJ Jun-06
SUBJECT: HIGH LEVEL BENT ANALYSIS — WDB Jun-06
HLB 160 MEM. 5 JT. 3

SLENDERNESS EFFECTS IN RECTANGULAR COMPRESSION MEMBERS (AASHTO 8.16.5)

GROUP 1

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	37.164	38.4	0.00	0.00	0.000	304	10998	1.041	1.041	43	*
MZ	35.928	37.164	27.8	270.35	70.76	0.262	304	16581	1.027	1.027	278	

GROUP 2

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	37.164	38.4	0.44	0.00	0.000	188	10998	1.025	1.025	27	*
MZ	35.928	37.164	27.8	41.76	70.76	1.695	188	7764	1.036	1.036	43	

GROUP 3

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	37.164	38.4	0.33	0.00	0.000	257	10998	1.034	1.034	37	*
MZ	35.928	37.164	27.8	136.12	70.76	0.520	257	13765	1.027	1.027	140	

GROUP 4

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	37.164	38.4	0.00	0.00	0.000	264	10998	1.035	1.035	38	*
MZ	35.928	37.164	27.8	247.33	70.76	0.286	264	16267	1.024	1.024	253	

GROUP 5

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	37.164	38.4	0.43	0.00	0.000	182	10998	1.024	1.024	26	*
MZ	35.928	37.164	27.8	14.48	70.76	4.888	182	3553	1.079	1.079	25	*

GROUP 6

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	37.164	38.4	0.31	0.00	0.000	248	10998	1.033	1.033	35	*
MZ	35.928	37.164	27.8	185.51	70.76	0.381	248	15145	1.024	1.024	190	

* MINIMUM MOMENT CONTROLS

H. W. LOCHNER, INC.

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA JMJ Jun-06
SUBJECT: HIGH LEVEL BENT ANALYSIS WDB Jun-06
HLB 160 MEM. 5 JT. 6

COLUMN LOADS

PMAX

HLB 160 MEMBER 5 JOINT 6

	GROUP 1				GROUP 2		
	P	MY	MZ		P	MY	MZ
DL	-237.71	0.00	22.43	DL	-237.71	0.00	22.43
LL	-108.29	0.00	9.65	LL	0.00	0.00	0.00
GROUP 1	0.00	0.00	0.00	GROUP 2	9.98	291.92	-94.79
SERVICE	-346.00	0.00	32.08	SERVICE	-227.73	291.92	-72.36
STRENGTH	-543.65	0.00	50.07	STRENGTH	-296.05	379.50	-94.07

	GROUP 3				GROUP 4		
	P	MY	MZ		P	MY	MZ
DL	-237.71	0.00	22.43	DL	-237.71	0.00	22.43
LL	-108.29	0.00	9.65	LL	-108.29	0.00	9.65
GROUP 3	4.81	220.19	-44.45	GROUP 4	-0.73	0.00	216.87
SERVICE	-341.19	220.19	-12.37	SERVICE	-346.73	0.00	248.95
STRENGTH	-443.55	286.25	-16.08	STRENGTH	-450.75	0.00	323.64

	GROUP 5				GROUP 6		
	P	MY	MZ		P	MY	MZ
DL	-237.71	0.00	22.43	DL	-237.71	0.00	22.43
LL	0.00	0.00	0.00	LL	-108.29	0.00	9.65
GROUP 5	9.26	291.92	122.08	GROUP 6	4.08	220.19	172.42
SERVICE	-228.45	291.92	144.51	SERVICE	-341.92	220.19	204.50
STRENGTH	-285.56	364.90	180.64	STRENGTH	-427.40	275.24	255.63

SLENDERNESS EFFECTS IN COMPRESSION MEMBERS (AASHTO 8.16.5)

f'c = 3000 psi PHI = 0.70 W_C = 150 PCF

$E_C = W_C^{1.5} * 33 * f'c^{0.5}$ = 3320561 PSI Width of Rect. Col. = B = 35.928 In.
Depth of Rect. Col. = D = 37.164 In.

$r_Y = 0.30*D$ = 11.15 In. L_Y = 17.833 Ft. K_Y = 2.0
$r_Z = 0.30*B$ = 10.78 In. L_Z = 20.833 Ft. K_Z = 1.2

I_{YY} = $B*D^3/12$ I_{YY} = 153681 In^4
I_{ZZ} = $D*B^3/12$ I_{ZZ} = 143628 In^5

$K_Y L_Y/r$ = 38.4 > 22 CONSIDER SLENDERNESS
$K_Z L_Z/r$ = 27.8 > 22 CONSIDER SLENDERNESS

H. W. LOCHNER, INC.

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA — JMJ Jun-06
SUBJECT: HIGH LEVEL BENT ANALYSIS — WDB Jun-06
HLB 160 MEM. 5 JT. 6

SLENDERNESS EFFECTS IN RECTANGULAR COMPRESSION MEMBERS (AASHTO 8.16.5)

GROUP 1

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	37.164	38.4	0.00	0.00	0.000	544	10998	1.076	1.076	78	*
MZ	35.928	37.164	27.8	50.07	29.16	0.582	544	13221	1.062	1.062	76	*

GROUP 2

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips
MY	35.928	37.164	38.4	379.50	0.00	0.000	296	10998	1.040	1.040	395
MZ	35.928	37.164	27.8	94.07	29.16	0.310	296	15971	1.027	1.027	97

GROUP 3

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	37.164	38.4	286.25	0.00	0.000	444	10998	1.061	1.061	304	
MZ	35.928	37.164	27.8	16.08	29.16	1.813	444	7437	1.093	1.093	62	*

GROUP 4

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	37.164	38.4	0.00	0.00	0.000	451	10998	1.062	1.062	64	*
MZ	35.928	37.164	27.8	323.64	29.16	0.090	451	19192	1.035	1.035	335	

GROUP 5

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips
MY	35.928	37.164	38.4	364.90	0.00	0.000	286	10998	1.039	1.039	379
MZ	35.928	37.164	27.8	180.64	29.16	0.161	286	18013	1.023	1.023	185

GROUP 6

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips
MY	35.928	37.164	38.4	275.24	0.00	0.000	427	10998	1.059	1.059	291
MZ	35.928	37.164	27.8	255.63	29.16	0.114	427	18779	1.034	1.034	264

* MINIMUM MOMENT CONTROLS

H. W. LOCHNER, INC.

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA JMJ Jun-06
SUBJECT: HIGH LEVEL BENT ANALYSIS WDB Jun-06
'HLB 160 MEM. 5 JT. 6

COLUMN LOADS

PMIN

HLB 160 MEMBER 5 JOINT 6

	GROUP 1 P	GROUP 1 MY	GROUP 1 MZ		GROUP 2 P	GROUP 2 MY	GROUP 2 MZ
DL	-178.28	0.00	22.43	DL	-178.28	0.00	22.43
LL	-47.37	0.00	39.23	LL	0.00	0.00	0.00
GROUP 1	0.00	0.00	0.00	GROUP 2	9.98	291.92	-94.79
SERVICE	-225.65	0.00	61.66	SERVICE	-168.30	291.92	-72.36
STRENGTH	-334.40	0.00	114.16	STRENGTH	-218.79	379.50	-94.07

	GROUP 3 P	GROUP 3 MY	GROUP 3 MZ		GROUP 4 P	GROUP 4 MY	GROUP 4 MZ
DL	-178.28	0.00	22.43	DL	-178.28	0.00	22.43
LL	-47.37	0.00	39.23	LL	-47.37	0.00	39.23
GROUP 3	4.81	220.19	-44.45	GROUP 4	-0.73	0.00	216.87
SERVICE	-220.84	220.19	17.21	SERVICE	-226.38	0.00	278.53
STRENGTH	-287.10	286.25	22.37	STRENGTH	-294.30	0.00	362.09

	GROUP 5 P	GROUP 5 MY	GROUP 5 MZ		GROUP 6 P	GROUP 6 MY	GROUP 6 MZ
DL	-178.28	0.00	22.43	DL	-178.28	0.00	22.43
LL	0.00	0.00	0.00	LL	-47.37	0.00	39.23
GROUP 5	9.26	291.92	122.08	GROUP 6	4.08	220.19	172.42
SERVICE	-169.02	291.92	144.51	SERVICE	-221.57	220.19	234.08
STRENGTH	-211.28	364.90	180.64	STRENGTH	-276.97	275.24	292.60

SLENDERNESS EFFECTS IN COMPRESSION MEMBERS (AASHTO 8.16.5)

f'c = 3000 psi PHI = 0.70 W_C = 150 PCF

$E_C = W_C^{1.5} * 33 * f'c^{0.5}$ = 3320561 PSI Width of Rect. Col. = B = 35.928 In.

Depth of Rect. Col = D = 37.164 In.

$r_Y = 0.30*D$ = 11.15 In. L_Y = 17.833 Ft. K_Y = 2.0

$r_Z = 0.30*B$ = 10.78 In. L_Z = 20.833 Ft. K_Z = 1.2

I_{YY} = $B*D^3/12$ I_{YY} = 153681 In^4

I_{ZZ} = $D*B^3/12$ I_{ZZ} = 143628 In^5

$K_Y L_Y/r$ = 38.4 > 22 CONSIDER SLENDERNESS

$K_Z L_Z/r$ = 27.8 > 22 CONSIDER SLENDERNESS

H. W. LOCHNER, INC.

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA — JMJ Jun-06
SUBJECT: HIGH LEVEL BENT ANALYSIS — WDB Jun-06
HLB 160 MEM. 5 JT. 6

SLENDERNESS EFFECTS IN RECTANGULAR COMPRESSION MEMBERS (AASHTO 8.16.5)

GROUP 1

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	37.164	38.4	0.00	0.00	0.000	334	10998	1.045	1.045	48	*
MZ	35.928	37.164	27.8	114.16	29.16	0.255	334	16664	1.030	1.030	118	

GROUP 2

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	37.164	38.4	379.50	0.00	0.000	219	10998	1.029	1.029	391	
MZ	35.928	37.164	27.8	94.07	29.16	0.310	219	15971	1.020	1.020	96	

GROUP 3

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	37.164	38.4	286.25	0.00	0.000	287	10998	1.039	1.039	297	
MZ	35.928	37.164	27.8	22.37	29.16	1.303	287	9083	1.047	1.047	40	*

GROUP 4

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	37.164	38.4	0.00	0.00	0.000	294	10998	1.040	1.040	42	*
MZ	35.928	37.164	27.8	362.09	29.16	0.081	294	19362	1.022	1.022	370	

GROUP 5

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips
MY	35.928	37.164	38.4	364.90	0.00	0.000	211	10998	1.028	1.028	375
MZ	35.928	37.164	27.8	180.64	29.16	0.161	211	18013	1.017	1.017	184

GROUP 6

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips
MY	35.928	37.164	38.4	275.24	0.00	0.000	277	10998	1.037	1.037	286
MZ	35.928	37.164	27.8	292.60	29.16	0.100	277	19025	1.021	1.021	299

* MINIMUM MOMENT CONTROLS

JMJ 7/06
WDB 7/06

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OOOOOOO    OOOOO    OOOOO    OOOOO    OOOOO   OO
OO    OO   OO  OO   OO  OO   OO  OO   OO  OO  OO
OO    OO   OO  OO   OO  OO   OO  OO   OO  OO  OO
OO    OO   OO       OO  OO   OO      OO  OO  OO
OO    OO   OO       OOOOOOO  OO      OO  OO  OO
OOOOOOO    OO  OO   OO  OO   OO  OO  OO  OO  OO
OO         OO  OO   OO  OO   OO  OO  OO  OO  OO
OO          OOOOO   OO  OO    OOOOO    OOOOO   OOOOO  (TM)
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==========
Computer program for the Strength Design of Reinforced Concrete Sections
==========

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BASED ON PLANS.

General Information:
====================
File Name: S:\DGN-ST\NORTHC~1\BONNER~1\ANALYSIS\PIERS\HLB160\PCACOL~1\M5PLAN.COL
Project: BONNER BRIDGE - OREGON INLET
Column: HLB #160 Engineer: JMJ
Code: ACI 318-95 Units: English

Run Option: Investigation Slenderness: Not considered
Run Axis: Biaxial Column Type: Structural

Material Properties:
====================
f'c = 3 ksi fy = 40 ksi
Ec = 3122.02 ksi Es = 29000 ksi
fc = 2.55 ksi Rupture strain = Infinity
Ultimate strain = 0.003 in/in
Beta1 = 0.85

Section:
========
Rectangular: Width = 36 in Depth = 37.2 in

Gross section area, Ag = 1339.2 in^2
Ix = 154437 in^4 Iy = 144634 in^4
Xo = 0 in Yo = 0 in

Reinforcement:
==============
Rebar Database: User-defined

Size	Diam (in)	Area (in^2)	Size	Diam (in)	Area (in^2)	Size	Diam (in)	Area (in^2)
# 1	0.00	0.00	# 3	0.38	0.11	# 4	0.50	0.20
# 5	0.63	0.31	# 6	0.75	0.44	# 7	0.88	0.60
# 8	1.00	0.79	# 9	1.13	1.00	# 10	1.27	1.27
# 11	1.41	1.56	# 14	1.69	2.25	# 18	2.26	4.00

Confinement: Tied; #1 ties with #9 bars, #1 with larger bars.
phi(a) = 0.8, phi(b) = 0.9, phi(c) = 0.7

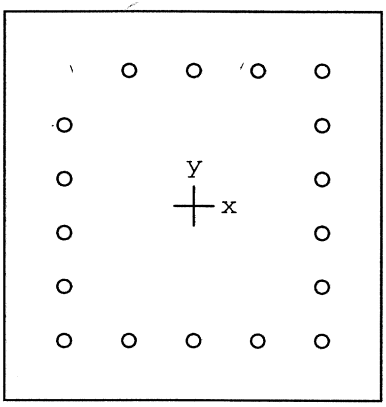
Layout: Rectangular
Pattern: Equal Bar Spacing (Cover to longitudinal reinforcement)
Total steel area, As = 28.08 in^2 at 2.10%
18 #11 Cover = 5 in

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
==========

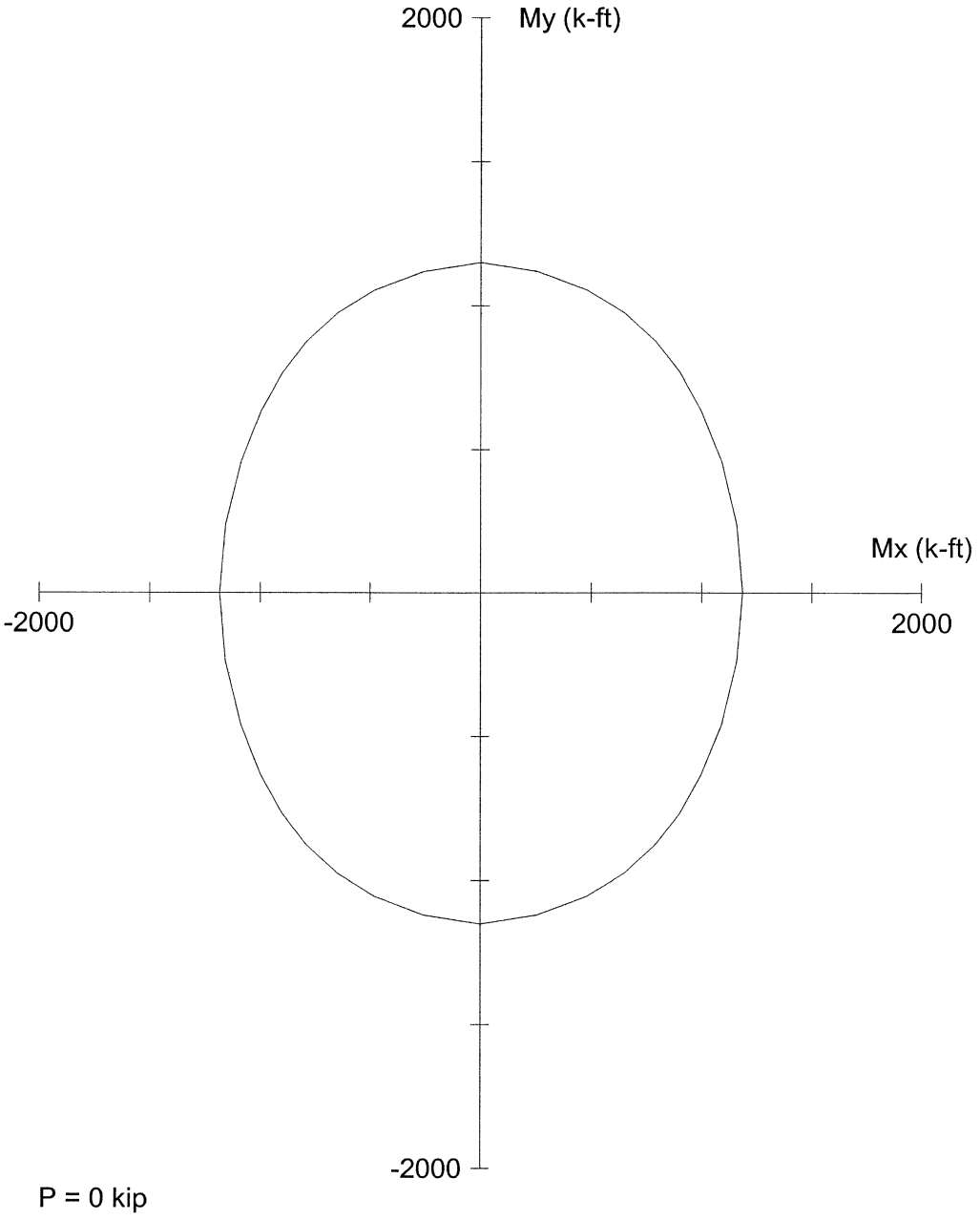
No.	Pu kip	Mux k-ft	Muy k-ft	fMnx k-ft	fMny k-ft	fMn/Mu
1	503.0	72.0	155.0	520.3	1120.9	7.231
2	255.0	37.0	44.0	777.6	923.1	20.995
3	403.0	58.0	66.0	766.9	875.5	13.246
4	410.0	59.0	181.0	373.5	1139.6	6.299
5	247.0	35.0	34.0	866.7	840.9	24.748
6	388.0	55.0	120.0	496.7	1079.2	9.000
7	304.0	43.0	278.0	188.2	1214.5	4.369
8	188.0	27.0	43.0	642.4	1022.5	23.783
9	257.0	37.0	140.0	310.5	1177.4	8.409
10	264.0	38.0	253.0	184.2	1214.6	4.802
11	182.0	26.0	25.0	871.6	837.2	33.506
12	248.0	35.0	190.0	221.1	1204.3	6.338
13	544.0	78.0	76.0	872.7	852.5	11.202
14	296.0	395.0	97.0	1205.2	296.5	3.051
15	444.0	304.0	62.0	1221.0	248.5	4.016

16	451.0	64.0	335.0	231.1	1220.0	3.641
17	286.0	379.0	185.0	1096.0	533.1	2.890
18	427.0	291.0	264.0	871.0	791.6	2.995
19	334.0	48.0	118.0	452.5	1117.9	9.467
20	219.0	391.0	96.0	1202.1	294.6	3.074
21	287.0	297.0	40.0	1242.1	166.6	4.182
22	294.0	42.0	370.0	139.3	1224.6	3.310
23	211.0	375.0	184.0	1095.6	537.5	2.921
24	277.0	286.0	299.0	833.2	869.7	2.911

*** Program completed as requested! ***



36 x 37.2 in



Code: ACI 318-95

Units: English

Run axis: Biaxial

Run option: Investigation

Slenderness: Not considered

mn type: Structural

Bars: User-defined

Date: 07/19/06

Time: 13:16:45

PCACOL V3.00 (PCA 1999) - Licensed to: Licensee name not yet specified.

File: S:\DGN-ST\NORTHC~1\BONNER~1\ANALYSIS\PIERS\HLB160\PCACOL~1\M5PLAN.COL

Project: BONNER BRIDGE - OREGON INLET

Column: HLB #160		Engineer: JMJ	
f'c = 3 ksi	fy = 40 ksi	Ag = 1339.2 in^2	18 #11 bars
Ec = 3122 ksi	Es = 29000 ksi	As = 28.08 in^2	Rho = 2.10%
fc = 2.55 ksi	e_rup = Infinity	Xo = 0.00 in	Ix = 154437 in^4
u = 0.003 in/in		Yo = 0.00 in	Iy = 144634 in^4
Beta1 = 0.85		Clear spacing = 3.75 in	Clear cover = 5.00 in
Confinement: Tied	phi(a) = 0.8, phi(b) = 0.9, phi(c) = 0.7		

JMJ 7/06
WOB 7/06

```
OOOOOOO    OOOOO    OOOOO    OOOOO    OOOOO   OO
OO    OO   OO  OO   OO  OO   OO  OO   OO  OO  OO
OO    OO   OO  OO   OO  OO   OO  OO   OO  OO  OO
OO    OO   OO       OO  OO   OO       OO  OO  OO
OO    OO   OO       OOOOOOO  OO       OO  OO  OO
OOOOOOO    OO  OO   OO  OO   OO  OO   OO  OO  OO
OO         OO  OO   OO  OO   OO  OO   OO  OO  OO
OO          OOOOO   OO  OO    OOOOO    OOOOO   OOOOO  (TM)
```

==========
Computer program for the Strength Design of Reinforced Concrete Sections
==========

Licensee stated above acknowledges that Portland Cement Association (PCA) is not and cannot be responsible for either the accuracy or adequacy of the material supplied as input for processing by the PCACOL(tm) computer program. Furthermore, PCA neither makes any warranty expressed nor implied with respect to the correctness of the output prepared by the PCACOL(tm) program. Although PCA has endeavored to produce PCACOL(tm) error free, the program is not and can't be certified infallible. The final and only responsibility for analysis, design and engineering documents is the licensees. Accordingly, PCA disclaims all responsibility in contract, negligence or other tort for any analysis, design or engineering documents prepared in connection with the use of the PCACOL(tm) program.

50% COVER LOSS
f'_c = 4400 PSI

General Information:
====================
File Name: S:\DGN-ST\NORTHC~1\BONNER~1\ANALYSIS\PIERS\HLB160\PCACOL~1\M5ACT.COL
Project: BONNER BRIDGE - OREGON INLET
Column: HLB #160 Engineer: JMJ
Code: ACI 318-95 Units: English

Run Option: Investigation Slenderness: Not considered
Run Axis: Biaxial Column Type: Structural

Material Properties:
====================
f'c = 4.4 ksi fy = 40 ksi
Ec = 3780.96 ksi Es = 29000 ksi
fc = 3.74 ksi Rupture strain = Infinity
Ultimate strain = 0.003 in/in
Beta1 = 0.83

Section:
========
Rectangular: Width = 31 in Depth = 32.2 in

Gross section area, Ag = 998.2 in^2
Ix = 86247.8 in^4 Iy = 79939.2 in^4
Xo = 0 in Yo = 0 in

Reinforcement:
==============
Rebar Database: User-defined

Size	Diam (in)	Area (in^2)	Size	Diam (in)	Area (in^2)	Size	Diam (in)	Area (in^2)
# 1	0.00	0.00	# 3	0.38	0.11	# 4	0.50	0.20
# 5	0.63	0.31	# 6	0.75	0.44	# 7	0.88	0.60
# 8	1.00	0.79	# 9	1.13	1.00	# 10	1.27	1.27
# 11	1.41	1.56	# 14	1.69	2.25	# 18	2.26	4.00

Confinement: Tied; #1 ties with #9 bars, #1 with larger bars.
phi(a) = 0.8, phi(b) = 0.9, phi(c) = 0.7

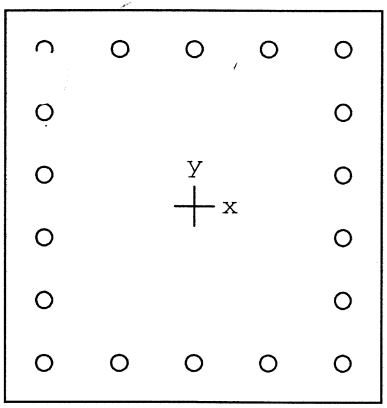
Layout: Rectangular
Pattern: Equal Bar Spacing (Cover to longitudinal reinforcement)
Total steel area, As = 28.08 in^2 at 2.81%
18 #11 Cover = 2.5 in

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
==========

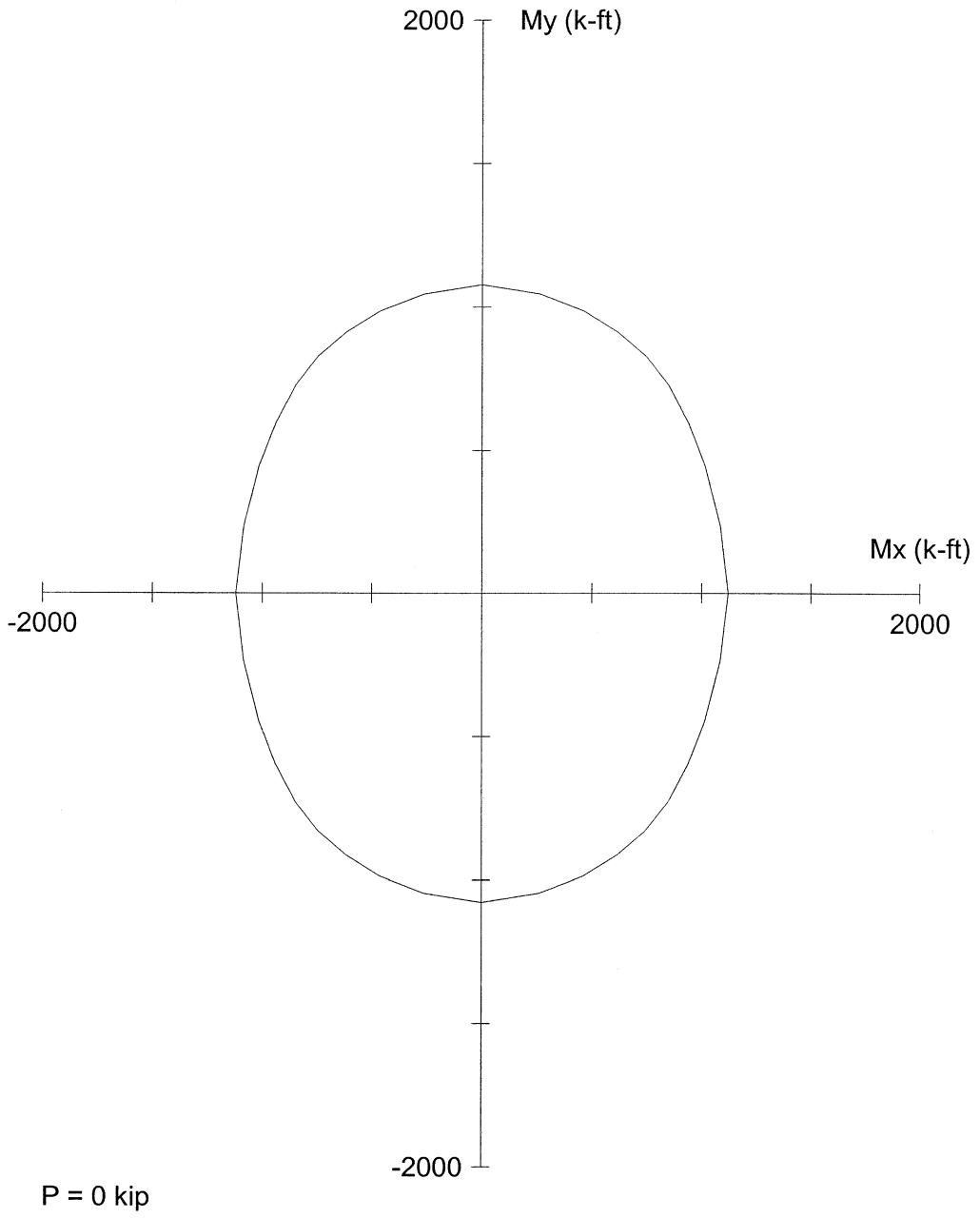
No.	Pu kip	Mux k-ft	Muy k-ft	fMnx k-ft	fMny k-ft	fMn/Mu
1	503.0	72.0	155.0	494.0	1060.3	6.844
2	255.0	37.0	44.0	744.2	884.9	20.113
3	403.0	58.0	66.0	749.7	855.2	12.944
4	410.0	59.0	181.0	358.4	1099.5	6.074
5	247.0	35.0	34.0	830.3	806.0	23.714
6	388.0	55.0	120.0	478.6	1046.0	8.714
7	304.0	43.0	278.0	179.3	1161.5	4.178
8	188.0	27.0	43.0	611.6	971.2	22.604
9	257.0	37.0	140.0	297.1	1122.0	8.015
10	264.0	38.0	253.0	173.8	1157.0	4.573
11	182.0	26.0	25.0	832.9	800.8	32.032
12	248.0	35.0	190.0	211.3	1146.4	6.034
13	544.0	78.0	76.0	830.6	811.4	10.662
14	296.0	395.0	97.0	1151.5	282.0	2.915
15	444.0	304.0	62.0	1154.9	235.4	3.799

16	451.0	64.0	335.0	219.1	1147.8	3.426
17	286.0	379.0	185.0	1049.7	512.4	2.770
18	427.0	291.0	264.0	833.7	757.2	2.866
19	334.0	48.0	118.0	435.3	1075.5	9.108
20	219.0	391.0	96.0	1139.3	280.1	2.914
21	287.0	297.0	40.0	1182.8	160.5	3.983
22	294.0	42.0	370.0	132.7	1169.3	3.160
23	211.0	375.0	184.0	1042.1	511.1	2.779
24	277.0	286.0	299.0	799.1	834.6	2.793

*** Program completed as requested! ***



31 x 32.2 in



Code: ACI 318-95

Units: English

Run axis: Biaxial

Run option: Investigation

Slenderness: Not considered

mn type: Structural

Bars: User-defined

Date: 07/25/06

Time: 13:08:58

PCACOL V3.00 (PCA 1999) - Licensed to: Licensee name not yet specified.

File: S:\DGN-ST\NORTHC~1\BONNER~1\ANALYSIS\PIERS\HLB160\PCACOL~1\M5ACT.COL

Project: BONNER BRIDGE - OREGON INLET

Column: HLB #160		Engineer: JMJ	
f'c = 4.4 ksi	fy = 40 ksi	Ag = 998.2 in^2	18 #11 bars
Ec = 3781 ksi	Es = 29000 ksi	As = 28.08 in^2	Rho = 2.81%
fc = 3.74 ksi	e_rup = Infinity	Xo = 0.00 in	Ix = 86247.8 in^4
ɹ = 0.003 in/in		Yo = 0.00 in	Iy = 79939.2 in^4
Beta1 = 0.83		Clear spacing = 3.75 in	Clear cover = 2.50 in
Confinement: Tied	phi(a) = 0.8, phi(b) = 0.9, phi(c) = 0.7		

H. W. LOCHNER, INC.

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA — JMJ Jun-06
SUBJECT: HIGH LEVEL BENT ANALYSIS — WDB Jun-06
HLB 160 MEM. 7 JT. 5

COLUMN LOADS

PMAX

HLB 160 MEMBER 7 JOINT 5

	GROUP 1 P	GROUP 1 MY	GROUP 1 MZ		GROUP 2 P	GROUP 2 MY	GROUP 2 MZ
DL	249.75	0.00	12.34	DL	249.75	0.00	12.34
LL	106.59	0.00	-16.05	LL	0.00	0.00	0.00
GROUP 1	0.00	0.00	0.00	GROUP 2	17.20	292.59	-17.92
SERVICE	356.34	0.00	-3.71	SERVICE	266.95	292.59	-5.58
STRENGTH	555.62	0.00	-18.73	STRENGTH	347.04	380.37	-7.25

	GROUP 3 P	GROUP 3 MY	GROUP 3 MZ		GROUP 4 P	GROUP 4 MY	GROUP 4 MZ
DL	249.75	0.00	12.34	DL	249.75	0.00	12.34
LL	106.59	0.00	-16.05	LL	106.59	0.00	-16.05
GROUP 3	8.16	220.40	-8.69	GROUP 4	-28.21	0.00	-577.43
SERVICE	364.50	220.40	-12.40	SERVICE	328.13	0.00	-581.14
STRENGTH	473.85	286.52	-16.12	STRENGTH	426.57	0.00	-755.48

	GROUP 5 P	GROUP 5 MY	GROUP 5 MZ		GROUP 6 P	GROUP 6 MY	GROUP 6 MZ
DL	249.75	0.00	12.34	DL	249.75	0.00	12.34
LL	0.00	0.00	0.00	LL	106.59	0.00	-16.05
GROUP 5	-11.01	292.59	-595.35	GROUP 6	-20.04	220.40	-586.12
SERVICE	238.74	292.59	-583.01	SERVICE	336.30	220.40	-589.83
STRENGTH	298.43	365.74	-728.76	STRENGTH	420.38	275.50	-737.29

SLENDERNESS EFFECTS IN COMPRESSION MEMBERS (AASHTO 8.16.5)

f'c = 3000 psi PHI = 0.70 W_C = 150 PCF

$E_C = W_C^{1.5} * 33 * f'c^{0.5}$ = 3320561 PSI Width of Rect. Col. = B = 35.928 In.

Depth of Rect. Col = D = 47.364 In.

$r_Y = 0.30*D$ = 14.21 In. L_Y = 0 Ft. K_Y = 2.0

$r_Z = 0.30*B$ = 10.78 In. L_Z = 2.5 Ft. K_Z = 1.2

I_{YY} = $B*D^3/12$ I_{YY} = 318124 In^4

I_{ZZ} = $D*B^3/12$ I_{ZZ} = 183049 In^5

$K_Y L_Y/r$	=	0.0	<	22 NO SLENDERNESS EFFECT
$K_Z L_Z/r$	=	3.3	<	22 NO SLENDERNESS EFFECT

H. W. LOCHNER, INC.

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA — JMJ Jun-06
SUBJECT: HIGH LEVEL BENT ANALYSIS — WDB Jun-06
HLB 160 MEM. 7 JT. 5

SLENDERNESS EFFECTS IN RECTANGULAR COMPRESSION MEMBERS (AASHTO 8.16.5)

GROUP 1

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	47.364	0.0	0.00	0.00	0.000	556	0	1.000	1.000	94	*
MZ	35.928	47.364	3.3	18.73	16.04	0.856	556	0	1.000	1.000	78	*

GROUP 2

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	47.364	0.0	380.37	0.00	0.000	347	0	1.000	1.000	380	
MZ	35.928	47.364	3.3	7.25	16.04	2.211	347	0	1.000	1.000	49	*

GROUP 3

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	47.364	0.0	286.52	0.00	0.000	474	0	1.000	1.000	287	
MZ	35.928	47.364	3.3	16.12	16.04	0.995	474	0	1.000	1.000	66	*

GROUP 4

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	47.364	0.0	0.00	0.00	0.000	427	0	1.000	1.000	72	*
MZ	35.928	47.364	3.3	755.48	16.04	0.021	427	0	1.000	1.000	755	

GROUP 5

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips
MY	35.928	47.364	0.0	365.74	0.00	0.000	298	0	1.000	1.000	366
MZ	35.928	47.364	3.3	728.76	16.04	0.022	298	0	1.000	1.000	729

GROUP 6

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips
MY	35.928	47.364	0.0	275.50	0.00	0.000	420	0	1.000	1.000	276
MZ	35.928	47.364	3.3	737.29	16.04	0.022	420	0	1.000	1.000	737

* MINIMUM MOMENT CONTROLS

H. W. LOCHNER, INC.

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA JMJ Jun-06
SUBJECT: HIGH LEVEL BENT ANALYSIS WDB Jun-06
HLB 160 MEM. 7 JT. 5

COLUMN LOADS

PMIN

HLB 160 MEMBER 7 JOINT 5

	GROUP 1 P	GROUP 1 MY	GROUP 1 MZ		GROUP 2 P	GROUP 2 MY	GROUP 2 MZ
DL	187.31	0.00	12.34	DL	187.31	0.00	12.34
LL	48.31	0.00	-17.40	LL	0.00	0.00	0.00
GROUP 1	0.00	0.00	0.00	GROUP 2	17.20	292.59	-17.92
SERVICE	235.62	0.00	-5.06	SERVICE	204.51	292.59	-5.58
STRENGTH	348.18	0.00	-21.66	STRENGTH	265.87	380.37	-7.25

	GROUP 3 P	GROUP 3 MY	GROUP 3 MZ		GROUP 4 P	GROUP 4 MY	GROUP 4 MZ
DL	187.31	0.00	12.34	DL	187.31	0.00	12.34
LL	48.31	0.00	-17.40	LL	48.31	0.00	-17.40
GROUP 3	8.16	220.40	-8.69	GROUP 4	-28.21	0.00	-577.43
SERVICE	243.78	220.40	-13.75	SERVICE	207.41	0.00	-582.49
STRENGTH	316.92	286.52	-17.88	STRENGTH	269.64	0.00	-757.24

	GROUP 5 P	GROUP 5 MY	GROUP 5 MZ		GROUP 6 P	GROUP 6 MY	GROUP 6 MZ
DL	187.31	0.00	12.34	DL	187.31	0.00	12.34
LL	0.00	0.00	0.00	LL	48.31	0.00	-17.40
GROUP 5	-11.01	292.59	-595.35	GROUP 6	-20.04	220.40	-586.12
SERVICE	176.30	292.59	-583.01	SERVICE	215.58	220.40	-591.18
STRENGTH	220.38	365.74	-728.76	STRENGTH	269.48	275.50	-738.98

SLENDERNESS EFFECTS IN COMPRESSION MEMBERS (AASHTO 8.16.5)

f'c = 3000 psi PHI = 0.70 W_C = 150 PCF

$E_C = W_C^{1.5} * 33 * f'c^{0.5}$ = 3320561 PSI Width of Rect. Col. = B = 35.928 In.
Depth of Rect. Col = D = 47.364 In.

$r_Y = 0.30*D$ = 14.21 In. L_Y = 0 Ft. K_Y = 2.0
$r_Z = 0.30*B$ = 10.78 In. L_Z = 2.5 Ft. K_Z = 1.2

I_{YY} = $B*D^3/12$ I_{YY} = 318124 In^4
I_{ZZ} = $D*B^3/12$ I_{ZZ} = 183049 In^5

$K_Y L_Y/r$	=	0.0	<	22	NO SLENDERNESS EFFECT
$K_Z L_Z/r$	=	3.3	<	22	NO SLENDERNESS EFFECT

H. W. LOCHNER, INC.

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA — JMJ Jun-06
SUBJECT: HIGH LEVEL BENT ANALYSIS — WDB Jun-06
HLB 160 MEM. 7 JT. 5

SLENDERNESS EFFECTS IN RECTANGULAR COMPRESSION MEMBERS (AASHTO 8.16.5)

GROUP 1

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	47.364	0.0	0.00	0.00	0.000	348	0	1.000	1.000	59	*
MZ	35.928	47.364	3.3	21.66	16.04	0.741	348	0	1.000	1.000	49	*

GROUP 2

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	47.364	0.0	380.37	0.00	0.000	266	0	1.000	1.000	380	
MZ	35.928	47.364	3.3	7.25	16.04	2.211	266	0	1.000	1.000	37	*

GROUP 3

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	47.364	0.0	286.52	0.00	0.000	317	0	1.000	1.000	287	
MZ	35.928	47.364	3.3	17.88	16.04	0.897	317	0	1.000	1.000	44	*

GROUP 4

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	47.364	0.0	0.00	0.00	0.000	270	0	1.000	1.000	45	*
MZ	35.928	47.364	3.3	757.24	16.04	0.021	270	0	1.000	1.000	757	

GROUP 5

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	47.364	0.0	365.74	0.00	0.000	220	0	1.000	1.000	366	
MZ	35.928	47.364	3.3	728.76	16.04	0.022	220	0	1.000	1.000	729	

GROUP 6

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	47.364	0.0	275.50	0.00	0.000	269	0	1.000	1.000	276	
MZ	35.928	47.364	3.3	738.98	16.04	0.022	269	0	1.000	1.000	739	

* MINIMUM MOMENT CONTROLS

H. W. LOCHNER, INC.

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA — JMJ Jun-06
SUBJECT: HIGH LEVEL BENT ANALYSIS — WDB Jun-06
HLB 160 MEM. 7 JT. FOOTING

COLUMN LOADS

PMAX

HLB 160 MEMBER 7 JOINT FOOTING

	GROUP 1 P	GROUP 1 MY	GROUP 1 MZ
DL	254.18	0.00	7.98
LL	106.59	0.00	-4.79
GROUP 1	0.00	0.00	0.00
SERVICE	360.77	0.00	3.19
STRENGTH	561.38	0.00	0.00

	GROUP 2 P	GROUP 2 MY	GROUP 2 MZ
DL	254.18	0.00	7.98
LL	0.00	0.00	0.00
GROUP 2	17.22	338.40	-40.28
SERVICE	271.40	338.40	-32.30
STRENGTH	352.82	439.92	-41.99

	GROUP 3 P	GROUP 3 MY	GROUP 3 MZ
DL	254.18	0.00	7.98
LL	106.59	0.00	-4.79
GROUP 3	8.17	248.85	-18.75
SERVICE	368.94	248.85	-15.56
STRENGTH	479.63	323.51	-20.23

	GROUP 4 P	GROUP 4 MY	GROUP 4 MZ
DL	254.18	0.00	7.98
LL	106.59	0.00	-4.79
GROUP 4	-28.21	0.00	550.08
SERVICE	332.56	0.00	553.27
STRENGTH	432.33	0.00	719.25

	GROUP 5 P	GROUP 5 MY	GROUP 5 MZ
DL	254.18	0.00	7.98
LL	0.00	0.00	0.00
GROUP 5	-10.99	338.40	509.80
SERVICE	243.19	338.40	517.78
STRENGTH	303.99	423.00	647.23

	GROUP 6 P	GROUP 6 MY	GROUP 6 MZ
DL	254.18	0.00	7.98
LL	106.59	0.00	-4.79
GROUP 6	-20.04	248.85	531.34
SERVICE	340.74	248.85	534.53
STRENGTH	425.92	311.06	668.16

SLENDERNESS EFFECTS IN COMPRESSION MEMBERS (AASHTO 8.16.5)

f'c = 3000 psi PHI = 0.70 W_C = 150 PCF

$E_C = W_C^{1.5} * 33 * f'c^{0.5}$ = 3320561 PSI Width of Rect. Col. = B = 35.928 In.

Depth of Rect. Col = D = 47.364 In.

$r_Y = 0.30*D$ = 14.21 In. L_Y = 0 Ft. K_Y = 2.0

$r_Z = 0.30*B$ = 10.78 In. L_Z = 2.5 Ft. K_Z = 1.2

I_{YY} = $B*D^3/12$ I_{YY} = 318124 In^4

I_{ZZ} = $D*B^3/12$ I_{ZZ} = 183049 In^5

$K_Y L_Y/r$	=	0.0	<	22	NO SLENDERNESS EFFECT
$K_Z L_Z/r$	=	3.3	<	22	NO SLENDERNESS EFFECT

H. W. LOCHNER, INC.

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA — JMJ Jun-06
SUBJECT: HIGH LEVEL BENT ANALYSIS — WDB Jun-06
HLB 160 MEM. 7 JT. FOOTING

SLENDERNESS EFFECTS IN RECTANGULAR COMPRESSION MEMBERS (AASHTO 8.16.5)

GROUP 1

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	47.364	0.0	0.00	0.00	0.000	561	0	1.000	1.000	95	*
MZ	35.928	47.364	3.3	0.00	10.37	########	561	0	1.000	1.000	78	*

GROUP 2

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	47.364	0.0	439.92	0.00	0.000	353	0	1.000	1.000	440	
MZ	35.928	47.364	3.3	41.99	10.37	0.247	353	0	1.000	1.000	49	*

GROUP 3

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	47.364	0.0	323.51	0.00	0.000	480	0	1.000	1.000	324	
MZ	35.928	47.364	3.3	20.23	10.37	0.513	480	0	1.000	1.000	67	*

GROUP 4

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	47.364	0.0	0.00	0.00	0.000	432	0	1.000	1.000	73	*
MZ	35.928	47.364	3.3	719.25	10.37	0.014	432	0	1.000	1.000	719	

GROUP 5

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	47.364	0.0	423.00	0.00	0.000	304	0	1.000	1.000	423	
MZ	35.928	47.364	3.3	647.23	10.37	0.016	304	0	1.000	1.000	647	

GROUP 6

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	47.364	0.0	311.06	0.00	0.000	426	0	1.000	1.000	311	
MZ	35.928	47.364	3.3	668.16	10.37	0.016	426	0	1.000	1.000	668	

* MINIMUM MOMENT CONTROLS

H. W. LOCHNER, INC.

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA — JMJ Jun-06
SUBJECT: HIGH LEVEL BENT ANALYSIS — WDB Jun-06
HLB 160 MEM. 7 JT. FOOTING

COLUMN LOADS

PMIN

HLB 160 MEMBER 7 JOINT FOOTING

	GROUP 1 P	GROUP 1 MY	GROUP 1 MZ		GROUP 2 P	GROUP 2 MY	GROUP 2 MZ
DL	190.64	0.00	7.98	DL	190.64	0.00	7.98
LL	48.31	0.00	-15.20	LL	0.00	0.00	0.00
GROUP 1	0.00	0.00	0.00	GROUP 2	17.22	338.40	-40.28
SERVICE	238.95	0.00	-7.22	SERVICE	207.86	338.40	-32.30
STRENGTH	352.50	0.00	-22.56	STRENGTH	270.21	439.92	-41.99

	GROUP 3 P	GROUP 3 MY	GROUP 3 MZ		GROUP 4 P	GROUP 4 MY	GROUP 4 MZ
DL	190.64	0.00	7.98	DL	190.64	0.00	7.98
LL	48.31	0.00	-15.20	LL	48.31	0.00	-15.20
GROUP 3	8.17	248.85	-18.75	GROUP 4	-28.21	0.00	550.08
SERVICE	247.12	248.85	-25.97	SERVICE	210.74	0.00	542.86
STRENGTH	321.25	323.51	-33.76	STRENGTH	273.96	0.00	705.72

	GROUP 5 P	GROUP 5 MY	GROUP 5 MZ		GROUP 6 P	GROUP 6 MY	GROUP 6 MZ
DL	190.64	0.00	7.98	DL	190.64	0.00	7.98
LL	0.00	0.00	0.00	LL	48.31	0.00	-15.20
GROUP 5	-10.99	338.40	509.80	GROUP 6	-20.04	248.85	531.34
SERVICE	179.65	338.40	517.78	SERVICE	218.91	248.85	524.12
STRENGTH	224.56	423.00	647.23	STRENGTH	273.64	311.06	655.15

SLENDERNESS EFFECTS IN COMPRESSION MEMBERS (AASHTO 8.16.5)

f'c = 3000 psi PHI = 0.70 W_C = 150 PCF

$E_C = W_C^{1.5} * 33 * f'c^{0.5}$ = 3320561 PSI Width of Rect. Col. = B = 35.928 In.

Depth of Rect. Col = D = 47.364 In.

$r_Y = 0.30*D$ = 14.21 In. L_Y = 0 Ft. K_Y = 2.0

$r_Z = 0.30*B$ = 10.78 In. L_Z = 2.5 Ft. K_Z = 1.2

I_{YY} = $B*D^3/12$ I_{YY} = 318124 In^4

I_{ZZ} = $D*B^3/12$ I_{ZZ} = 183049 In^5

$K_Y L_Y/r$	=	0.0	<	22	NO SLENDERNESS EFFECT
$K_Z L_Z/r$	=	3.3	<	22	NO SLENDERNESS EFFECT

H. W. LOCHNER, INC.

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA JMJ Jun-06
SUBJECT: HIGH LEVEL BENT ANALYSIS WDB Jun-06
HLB 160 MEM. 7 JT. FOOTING

SLENDERNESS EFFECTS IN RECTANGULAR COMPRESSION MEMBERS (AASHTO 8.16.5)

GROUP 1

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	47.364	0.0	0.00	0.00	0.000	353	0	1.000	1.000	59	*
MZ	35.928	47.364	3.3	22.56	10.37	0.460	353	0	1.000	1.000	49	*

GROUP 2

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips
MY	35.928	47.364	0.0	439.92	0.00	0.000	270	0	1.000	1.000	440
MZ	35.928	47.364	3.3	41.99	10.37	0.247	270	0	1.000	1.000	42

GROUP 3

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	47.364	0.0	323.51	0.00	0.000	321	0	1.000	1.000	324	
MZ	35.928	47.364	3.3	33.76	10.37	0.307	321	0	1.000	1.000	45	*

GROUP 4

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	47.364	0.0	0.00	0.00	0.000	274	0	1.000	1.000	46	*
MZ	35.928	47.364	3.3	705.72	10.37	0.015	274	0	1.000	1.000	706	

GROUP 5

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips
MY	35.928	47.364	0.0	423.00	0.00	0.000	225	0	1.000	1.000	423
MZ	35.928	47.364	3.3	647.23	10.37	0.016	225	0	1.000	1.000	647

GROUP 6

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips
MY	35.928	47.364	0.0	311.06	0.00	0.000	274	0	1.000	1.000	311
MZ	35.928	47.364	3.3	655.15	10.37	0.016	274	0	1.000	1.000	655

* MINIMUM MOMENT CONTROLS

JMS 7/06
WOB 7/06

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OOOOOOO    OOOOO    OOOOO    OOOOO    OOOOO   OO
OO    OO   OO  OO   OO  OO   OO  OO   OO  OO  OO
OO    OO   OO  OO   OO  OO   OO  OO   OO  OO  OO
OO    OO   OO       OO  OO   OO       OO  OO  OO
OO    OO   OO       OOOOOOO  OO       OO  OO  OO
OOOOOOO    OO  OO   OO  OO   OO  OO   OO  OO  OO
OO         OO  OO   OO  OO   OO  OO   OO  OO  OO
OO          OOOO    OO  OO    OOOO     OOOO   OOOO   (TM)
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Computer program for the Strength Design of Reinforced Concrete Sections
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BASED ON PLANS.

General Information:
==========
File Name: S:\DGN-ST\NORTHC~1\BONNER~1\ANALYSIS\PIERS\HLB160\PCACOL~1\M7PLAN.COL
Project: BONNER BRIDGE - OREGON INLET
Column: HLB #160 Engineer: JMJ
Code: ACI 318-95 Units: English

Run Option: Investigation Slenderness: Not considered
Run Axis: Biaxial Column Type: Structural

Material Properties:
==========
f'c = 3 ksi fy = 40 ksi
Ec = 3122.02 ksi Es = 29000 ksi
fc = 2.55 ksi Rupture strain = Infinity
Ultimate strain = 0.003 in/in
Beta1 = 0.85

Section:
========
Rectangular: Width = 36 in Depth = 47.4 in

Gross section area, Ag = 1706.4 in^2
Ix = 319489 in^4 Iy = 184291 in^4
Xo = 0 in Yo = 0 in

Reinforcement:
==========
Rebar Database: User-defined

Size	Diam (in)	Area (in^2)	Size	Diam (in)	Area (in^2)	Size	Diam (in)	Area (in^2)
# 1	0.00	0.00	# 3	0.38	0.11	# 4	0.50	0.20
# 5	0.63	0.31	# 6	0.75	0.44	# 7	0.88	0.60
# 8	1.00	0.79	# 9	1.13	1.00	# 10	1.27	1.27
# 11	1.41	1.56	# 14	1.69	2.25	# 18	2.26	4.00

Confinement: Tied; #1 ties with #9 bars, #1 with larger bars.
phi(a) = 0.8, phi(b) = 0.9, phi(c) = 0.7

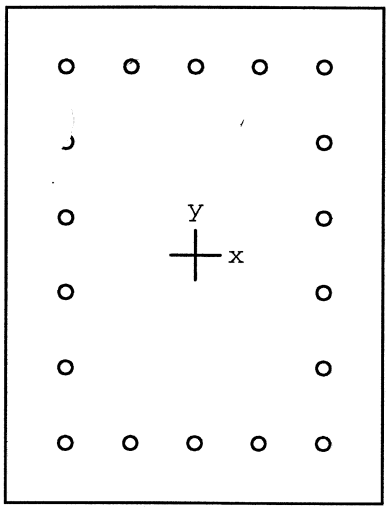
Layout: Rectangular
Pattern: Equal Bar Spacing (Cover to longitudinal reinforcement)
Total steel area, As = 28.08 in^2 at 1.65%
18 #11 Cover = 5 in

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
==========

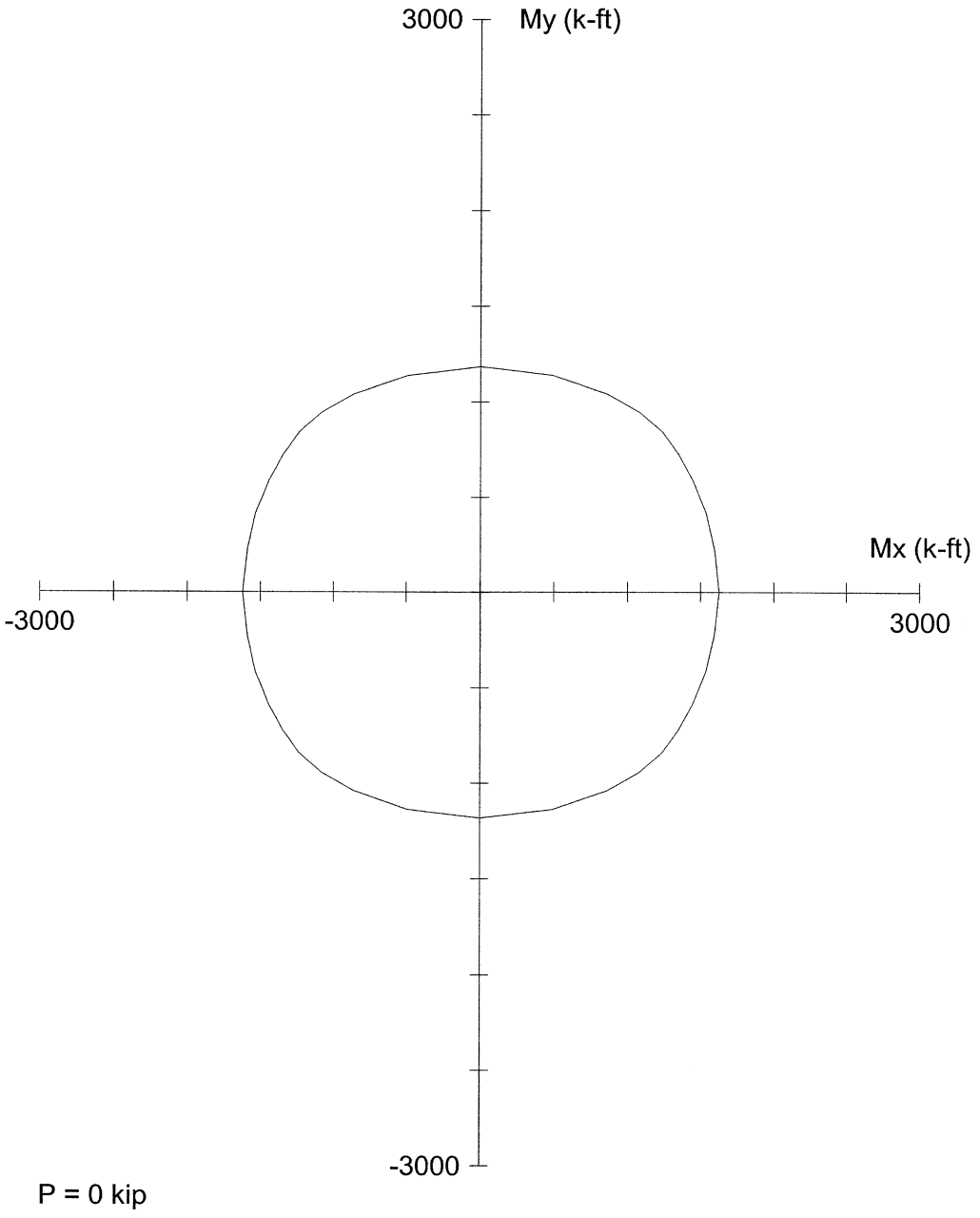
No.	Pu kip	Mux k-ft	Muy k-ft	fMnx k-ft	fMny k-ft	fMn/Mu
1	556.0	94.0	78.0	1200.1	995.5	12.765
2	347.0	380.0	49.0	1791.7	232.0	4.715
3	474.0	287.0	66.0	1737.9	396.7	6.053
4	427.0	72.0	755.0	130.2	1364.0	1.807
5	298.0	366.0	729.0	625.0	1244.6	1.707
6	420.0	276.0	737.0	486.9	1301.3	1.765
7	348.0	59.0	49.0	1197.0	992.6	20.275
8	266.0	380.0	37.0	1780.5	174.0	4.686
9	317.0	287.0	44.0	1768.9	270.3	6.163
10	270.0	45.0	757.0	79.8	1324.6	1.750
11	220.0	366.0	729.0	615.0	1221.2	1.676
12	269.0	276.0	739.0	477.2	1275.1	1.726
13	561.0	95.0	78.0	1210.3	991.7	12.730
14	353.0	440.0	49.0	1804.5	198.4	4.101
15	480.0	324.0	67.0	1756.1	361.2	5.419

16	432.0	73.0	719.0	138.0	1364.3	1.897
17	304.0	423.0	647.0	780.5	1198.4	1.850
18	426.0	311.0	668.0	595.0	1273.9	1.908
19	353.0	59.0	49.0	1196.3	993.4	20.275
20	270.0	440.0	42.0	1783.1	171.0	4.053
21	321.0	324.0	45.0	1778.1	247.8	5.488
22	274.0	46.0	706.0	87.9	1325.4	1.878
23	225.0	423.0	647.0	770.4	1174.9	1.818
24	274.0	311.0	655.0	590.1	1247.0	1.903

*** Program completed as requested! ***



36 x 47.4 in



P = 0 kip

Code: ACI 318-95

Units: English

Run axis: Biaxial

Run option: Investigation

Slenderness: Not considered

mn type: Structural

Bars: User-defined

Date: 07/19/06

Time: 13:17:25

PCACOL V3.00 (PCA 1999) - Licensed to: Licensee name not yet specified.

File: S:\DGN-ST\NORTHC~1\BONNER~1\ANALYSIS\PIERS\HLB160\PCACOL~1\M7PLAN.COL

Project: BONNER BRIDGE - OREGON INLET

Column: HLB #160		Engineer: JMJ	
f'c = 3 ksi	fy = 40 ksi	Ag = 1706.4 in^2	18 #11 bars
Ec = 3122 ksi	Es = 29000 ksi	As = 28.08 in^2	Rho = 1.65%
fc = 2.55 ksi	e_rup = Infinity	Xo = 0.00 in	Ix = 319489 in^4
= 0.003 in/in		Yo = 0.00 in	Iy = 184291 in^4
Beta1 = 0.85		Clear spacing = 4.74 in	Clear cover = 5.00 in
Confinement: Tied	phi(a) = 0.8, phi(b) = 0.9, phi(c) = 0.7		

[m] 7/06
W03 7/06

```
OOOOOOO    OOOOO    OOOOO    OOOOO    OOOOO   OO
OO    OO   OO  OO   OO  OO   OO  OO   OO  OO  OO
OO    OO   OO  OO   OO  OO   OO  OO   OO  OO  OO
OO    OO   OO       OO  OO   OO      OO  OO  OO
OO    OO   OO       OOOOOOO  OO      OO  OO  OO
OOOOOOO    OO  OO   OO  OO   OO  OO  OO  OO  OO
OO         OO  OO   OO  OO   OO  OO  OO  OO  OO
OO          OOOOO   OO  OO    OOOOO    OOOOO   OOOOO  (TM)
```

==========
Computer program for the Strength Design of Reinforced Concrete Sections
==========

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50% cover loss

f'_c = 4400 psi

General Information:
==========
File Name: S:\DGN-ST\NORTHC~1\BONNER~1\ANALYSIS\PIERS\HLB160\PCACOL~1\M7ACT.COL
Project: BONNER BRIDGE - OREGON INLET
Column: HLB #160 Engineer: JMJ
Code: ACI 318-95 Units: English

Run Option: Investigation Slenderness: Not considered
Run Axis: Biaxial Column Type: Structural

Material Properties:
==========
f'c = 4.4 ksi fy = 40 ksi
Ec = 3780.96 ksi Es = 29000 ksi
fc = 3.74 ksi Rupture strain = Infinity
Ultimate strain = 0.003 in/in
Beta1 = 0.83

Section:
========
Rectangular: Width = 31 in Depth = 42.4 in

Gross section area, Ag = 1314.4 in^2
Ix = 196915 in^4 Iy = 105262 in^4
Xo = 0 in Yo = 0 in

Reinforcement:
==========
Rebar Database: User-defined

Size	Diam (in)	Area (in^2)	Size	Diam (in)	Area (in^2)	Size	Diam (in)	Area (in^2)
# 1	0.00	0.00	# 3	0.38	0.11	# 4	0.50	0.20
# 5	0.63	0.31	# 6	0.75	0.44	# 7	0.88	0.60
# 8	1.00	0.79	# 9	1.13	1.00	# 10	1.27	1.27
# 11	1.41	1.56	# 14	1.69	2.25	# 18	2.26	4.00

Confinement: Tied; #1 ties with #9 bars, #1 with larger bars.
phi(a) = 0.8, phi(b) = 0.9, phi(c) = 0.7

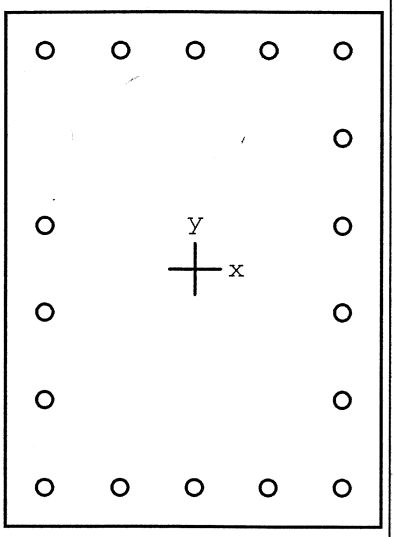
Layout: Rectangular
Pattern: Equal Bar Spacing (Cover to longitudinal reinforcement)
Total steel area, As = 28.08 in^2 at 2.14%
18 #11 Cover = 2.5 in

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
==========

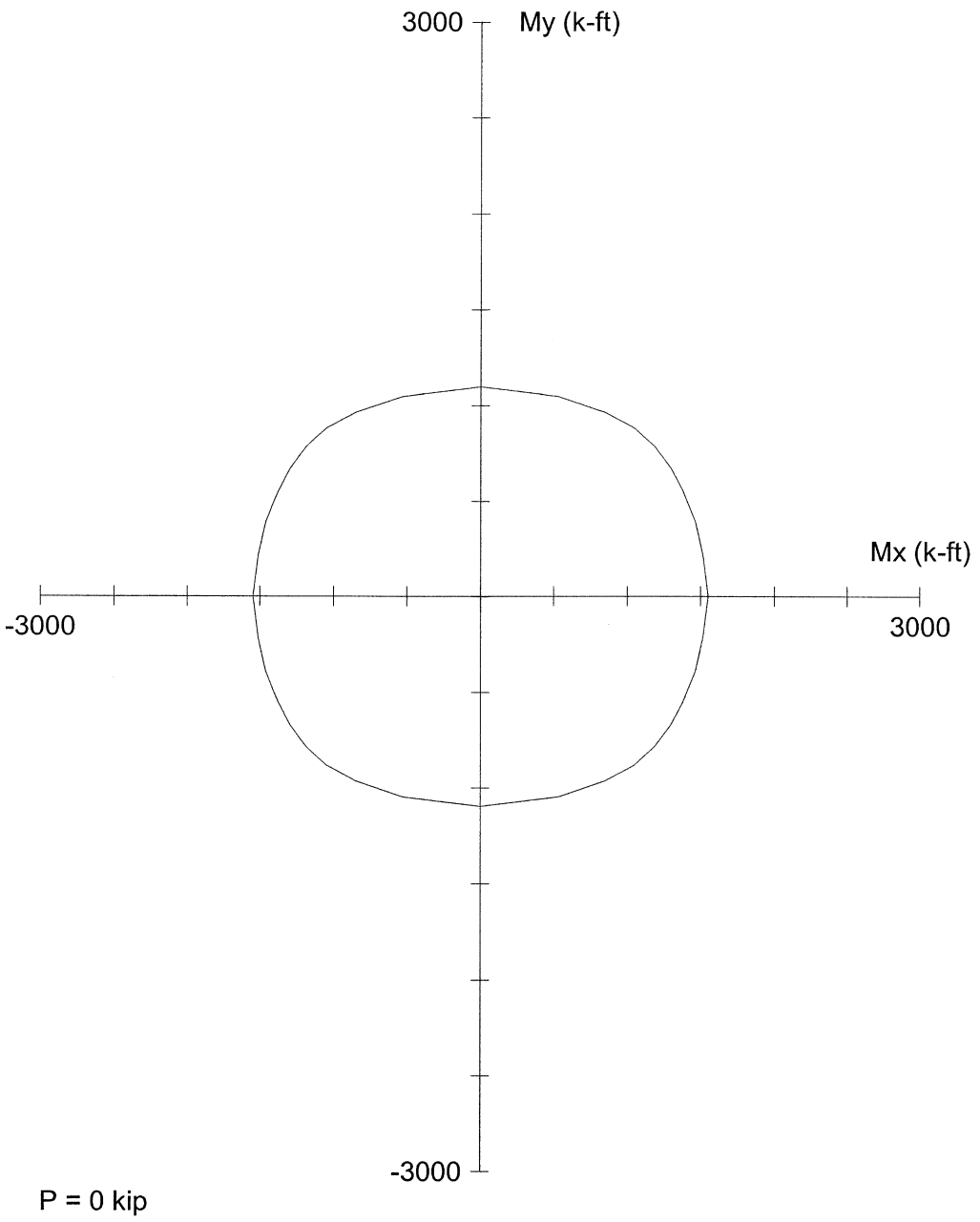
No.	Pu kip	Mux k-ft	Muy k-ft	fMnx k-ft	fMny k-ft	fMn/Mu
1	556.0	94.0	78.0	1168.0	967.6	12.417
2	347.0	380.0	49.0	1742.6	222.6	4.585
3	474.0	287.0	66.0	1714.1	392.8	5.972
4	427.0	72.0	755.0	124.5	1310.4	1.736
5	298.0	366.0	729.0	595.8	1183.7	1.625
6	420.0	276.0	737.0	469.5	1251.6	1.699
7	348.0	59.0	49.0	1162.9	965.9	19.711
8	266.0	380.0	37.0	1719.6	168.0	4.525
9	317.0	287.0	44.0	1716.1	261.5	5.978
10	270.0	45.0	757.0	73.3	1259.9	1.664
11	220.0	366.0	729.0	581.7	1157.0	1.587
12	269.0	276.0	739.0	453.2	1207.7	1.635
13	561.0	95.0	78.0	1174.8	962.2	12.354
14	353.0	440.0	49.0	1754.9	193.6	3.988
15	480.0	324.0	67.0	1734.3	356.6	5.352

16	432.0	73.0	719.0	132.5	1310.8	1.823
17	304.0	423.0	647.0	748.2	1140.4	1.764
18	426.0	311.0	668.0	572.5	1226.6	1.837
19	353.0	59.0	49.0	1162.2	967.2	19.715
20	270.0	440.0	42.0	1722.5	164.9	3.915
21	321.0	324.0	45.0	1726.0	238.5	5.327
22	274.0	46.0	706.0	82.7	1260.6	1.786
23	225.0	423.0	647.0	727.8	1115.8	1.723
24	274.0	311.0	655.0	561.8	1184.1	1.808

*** Program completed as requested! ***



31 x 42.4 in



P = 0 kip

Code: ACI 318-95

Units: English

Run axis: Biaxial

Run option: Investigation

Slenderness: Not considered

mn type: Structural

Bars: User-defined

Date: 07/25/06

Time: 13:09:19

PCACOL V3.00 (PCA 1999) - Licensed to: Licensee name not yet specified.

File: S:\DGN-ST\NORTHC~1\BONNER~1\ANALYSIS\PIERS\HLB160\PCACOL~1\M7ACT.COL

Project: BONNER BRIDGE - OREGON INLET

Column: HLB #160 Engineer: JMJ

f'c = 4.4 ksi	fy = 40 ksi	Ag = 1314.4 in^2	18 #11 bars
Ec = 3781 ksi	Es = 29000 ksi	As = 28.08 in^2	Rho = 2.14%
fc = 3.74 ksi	e_rup = Infinity	Xo = 0.00 in	Ix = 196915 in^4
ɹ = 0.003 in/in		Yo = 0.00 in	Iy = 105262 in^4
Beta1 = 0.83		Clear spacing = 4.74 in	Clear cover = 2.50 in

Confinement: Tied phi(a) = 0.8, phi(b) = 0.9, phi(c) = 0.7

H. W. LOCHNER, INC.

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA — JMJ Jun-06
SUBJECT: HIGH LEVEL BENT ANALYSIS — WDB Jun-06
HLB 160 MEM. 8 JT. 6

COLUMN LOADS

PMAX

HLB 160 MEMBER 8 JOINT 6

	GROUP 1 P	GROUP 1 MY	GROUP 1 MZ		GROUP 2 P	GROUP 2 MY	GROUP 2 MZ
DL	249.66	0.00	13.58	DL	249.66	0.00	13.58
LL	106.56	0.00	-15.62	LL	0.00	0.00	0.00
GROUP 1	0.00	0.00	0.00	GROUP 2	-17.18	-292.54	17.91
SERVICE	356.22	0.00	-2.04	SERVICE	232.48	-292.54	31.49
STRENGTH	555.44	0.00	-16.19	STRENGTH	302.22	-380.30	40.94

	GROUP 3 P	GROUP 3 MY	GROUP 3 MZ		GROUP 4 P	GROUP 4 MY	GROUP 4 MZ
DL	249.66	0.00	13.58	DL	249.66	0.00	13.58
LL	106.56	0.00	-15.62	LL	106.56	0.00	-15.62
GROUP 3	-8.16	-220.37	8.68	GROUP 4	-27.21	0.00	-577.05
SERVICE	348.06	-220.37	6.64	SERVICE	329.01	0.00	-579.09
STRENGTH	452.48	-286.48	8.63	STRENGTH	427.71	0.00	-752.82

	GROUP 5 P	GROUP 5 MY	GROUP 5 MZ		GROUP 6 P	GROUP 6 MY	GROUP 6 MZ
DL	249.66	0.00	13.58	DL	249.66	0.00	13.58
LL	0.00	0.00	0.00	LL	106.56	0.00	-15.62
GROUP 5	-44.38	-292.54	-559.14	GROUP 6	-35.36	-220.37	-568.37
SERVICE	205.28	-292.54	-545.56	SERVICE	320.86	-220.37	-570.41
STRENGTH	256.60	-365.68	-681.95	STRENGTH	401.08	-275.46	-713.01

SLENDERNESS EFFECTS IN COMPRESSION MEMBERS (AASHTO 8.16.5)

f'c = 3000 psi PHI = 0.70 W_C = 150 PCF

$E_C = W_C^{1.5} * 33 * f'c^{0.5}$ = 3320561 PSI Width of Rect. Col. = B = 35.928 In.

Depth of Rect. Col = D = 47.364 In.

$r_Y = 0.30*D$ = 14.21 In. L_Y = 0 Ft. K_Y = 2.0

$r_Z = 0.30*B$ = 10.78 In. L_Z = 2.5 Ft. K_Z = 1.2

I_{YY} = $B*D^3/12$ I_{YY} = 318124 In^4

I_{ZZ} = $D*B^3/12$ I_{ZZ} = 183049 In^5

K_YL_Y/r	=	0.0	<	22	NO SLENDERNESS EFFECT
K_ZL_Z/r	=	3.3	<	22	NO SLENDERNESS EFFECT

H. W. LOCHNER, INC.

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA — JMJ Jun-06
SUBJECT: HIGH LEVEL BENT ANALYSIS — WDB Jun-06
HLB 160 MEM. 8 JT. 6

SLENDERNESS EFFECTS IN RECTANGULAR COMPRESSION MEMBERS (AASHTO 8.16.5)

GROUP 1

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	47.364	0.0	0.00	0.00	0.000	555	0	1.000	1.000	94	*
MZ	35.928	47.364	3.3	16.19	17.65	1.090	555	0	1.000	1.000	78	*

GROUP 2

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	47.364	0.0	380.30	0.00	0.000	302	0	1.000	1.000	380	
MZ	35.928	47.364	3.3	40.94	17.65	0.431	302	0	1.000	1.000	42	*

GROUP 3

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	47.364	0.0	286.48	0.00	0.000	452	0	1.000	1.000	286	
MZ	35.928	47.364	3.3	8.63	17.65	2.045	452	0	1.000	1.000	63	*

GROUP 4

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	47.364	0.0	0.00	0.00	0.000	428	0	1.000	1.000	72	*
MZ	35.928	47.364	3.3	752.82	17.65	0.023	428	0	1.000	1.000	753	

GROUP 5

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	47.364	0.0	365.68	0.00	0.000	257	0	1.000	1.000	366	
MZ	35.928	47.364	3.3	681.95	17.65	0.026	257	0	1.000	1.000	682	

GROUP 6

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	47.364	0.0	275.46	0.00	0.000	401	0	1.000	1.000	275	
MZ	35.928	47.364	3.3	713.01	17.65	0.025	401	0	1.000	1.000	713	

* MINIMUM MOMENT CONTROLS

H. W. LOCHNER, INC.

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA JMJ Jun-06
SUBJECT: HIGH LEVEL BENT ANALYSIS WDB Jun-06
HLB 160 MEM. 8 JT. 6

COLUMN LOADS

PMIN

HLB 160 MEMBER 8 JOINT 6

	GROUP 1				GROUP 2		
	P	MY	MZ		P	MY	MZ
DL	187.25	0.00	13.58	DL	187.25	0.00	13.58
LL	48.28	0.00	-17.05	LL	0.00	0.00	0.00
GROUP 1	0.00	0.00	0.00	GROUP 2	-17.18	-292.54	17.91
SERVICE	235.53	0.00	-3.47	SERVICE	170.07	-292.54	31.49
STRENGTH	348.03	0.00	-19.29	STRENGTH	221.08	-380.30	40.94

	GROUP 3				GROUP 4		
	P	MY	MZ		P	MY	MZ
DL	187.25	0.00	13.58	DL	187.25	0.00	13.58
LL	48.28	0.00	-17.05	LL	48.28	0.00	-17.05
GROUP 3	-8.16	-220.37	8.68	GROUP 4	-27.21	0.00	-577.05
SERVICE	227.37	-220.37	5.21	SERVICE	208.32	0.00	-580.52
STRENGTH	295.57	-286.48	6.77	STRENGTH	270.81	0.00	-754.68

	GROUP 5				GROUP 6		
	P	MY	MZ		P	MY	MZ
DL	187.25	0.00	13.58	DL	187.25	0.00	13.58
LL	0.00	0.00	0.00	LL	48.28	0.00	-17.05
GROUP 5	-44.38	-292.54	-559.14	GROUP 6	-35.36	-220.37	-568.37
SERVICE	142.87	-292.54	-545.56	SERVICE	200.17	-220.37	-571.84
STRENGTH	178.58	-365.68	-681.95	STRENGTH	250.21	-275.46	-714.80

SLENDERNESS EFFECTS IN COMPRESSION MEMBERS (AASHTO 8.16.5)

f'c = 3000 psi PHI = 0.70 W_C = 150 PCF

$E_C = W_C^{1.5} * 33 * f'c^{0.5}$ = 3320561 PSI Width of Rect. Col. = B = 35.928 In.

Depth of Rect. Col = D = 47.364 In.

$r_Y = 0.30*D$ = 14.21 In. L_Y = 0 Ft. K_Y = 2.0

$r_Z = 0.30*B$ = 10.78 In. L_Z = 2.5 Ft. K_Z = 1.2

I_{YY} = $B*D^3/12$ I_{YY} = 318124 In^4

I_{ZZ} = $D*B^3/12$ I_{ZZ} = 183049 In^5

$K_Y L_Y/r$	=	0.0	<	22	NO SLENDERNESS EFFECT
$K_Z L_Z/r$	=	3.3	<	22	NO SLENDERNESS EFFECT

H. W. LOCHNER, INC.

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA — JMJ Jun-06
SUBJECT: HIGH LEVEL BENT ANALYSIS — WDB Jun-06
HLB 160 MEM. 8 JT. 6

SLENDERNESS EFFECTS IN RECTANGULAR COMPRESSION MEMBERS (AASHTO 8.16.5)

GROUP 1

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	47.364	0.0	0.00	0.00	0.000	348	0	1.000	1.000	59	*
MZ	35.928	47.364	3.3	19.29	17.65	0.915	348	0	1.000	1.000	49	*

GROUP 2

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	47.364	0.0	380.30	0.00	0.000	221	0	1.000	1.000	380	
MZ	35.928	47.364	3.3	40.94	17.65	0.431	221	0	1.000	1.000	41	

GROUP 3

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	47.364	0.0	286.48	0.00	0.000	296	0	1.000	1.000	286	
MZ	35.928	47.364	3.3	6.77	17.65	2.607	296	0	1.000	1.000	41	*

GROUP 4

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	47.364	0.0	0.00	0.00	0.000	271	0	1.000	1.000	46	*
MZ	35.928	47.364	3.3	754.68	17.65	0.023	271	0	1.000	1.000	755	

GROUP 5

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	47.364	0.0	365.68	0.00	0.000	179	0	1.000	1.000	366	
MZ	35.928	47.364	3.3	681.95	17.65	0.026	179	0	1.000	1.000	682	

GROUP 6

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	47.364	0.0	275.46	0.00	0.000	250	0	1.000	1.000	275	
MZ	35.928	47.364	3.3	714.80	17.65	0.025	250	0	1.000	1.000	715	

* MINIMUM MOMENT CONTROLS

H. W. LOCHNER, INC.

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA — JMJ Jun-06
SUBJECT: HIGH LEVEL BENT ANALYSIS — WDB Jun-06
HLB 160 MEM. 8 JT. FOOTING

COLUMN LOADS

PMAX

HLB 160 MEMBER 8 JOINT FOOTING

	GROUP 1 P	GROUP 1 MY	GROUP 1 MZ
DL	254.09	0.00	7.85
LL	106.56	0.00	-4.85
GROUP 1	0.00	0.00	0.00
SERVICE	360.65	0.00	3.00
STRENGTH	561.20	0.00	-0.30

	GROUP 2 P	GROUP 2 MY	GROUP 2 MZ
DL	254.09	0.00	7.85
LL	0.00	0.00	0.00
GROUP 2	-17.20	-338.32	40.31
SERVICE	236.90	-338.32	48.16
STRENGTH	307.97	-439.82	62.61

	GROUP 3 P	GROUP 3 MY	GROUP 3 MZ
DL	254.09	0.00	7.85
LL	106.56	0.00	-4.85
GROUP 3	-8.17	-248.80	18.76
SERVICE	352.49	-248.80	21.76
STRENGTH	458.23	-323.44	28.29

	GROUP 4 P	GROUP 4 MY	GROUP 4 MZ
DL	254.09	0.00	7.85
LL	106.56	0.00	-4.85
GROUP 4	-27.21	0.00	550.46
SERVICE	333.44	0.00	553.46
STRENGTH	433.48	0.00	719.50

	GROUP 5 P	GROUP 5 MY	GROUP 5 MZ
DL	254.09	0.00	7.85
LL	0.00	0.00	0.00
GROUP 5	-44.40	-338.32	590.77
SERVICE	209.69	-338.32	598.62
STRENGTH	262.12	-422.90	748.28

	GROUP 6 P	GROUP 6 MY	GROUP 6 MZ
DL	254.09	0.00	7.85
LL	106.56	0.00	-4.85
GROUP 6	-35.37	-248.80	569.22
SERVICE	325.29	-248.80	572.22
STRENGTH	406.61	-311.00	715.28

SLENDERNESS EFFECTS IN COMPRESSION MEMBERS (AASHTO 8.16.5)

f'c = 3000 psi PHI = 0.70 W_C = 150 PCF

$E_C = W_C^{1.5} * 33 * f'c^{0.5}$ = 3320561 PSI Width of Rect. Col. = B = 35.928 In.

Depth of Rect. Col = D = 47.364 In.

$r_Y = 0.30*D$ = 14.21 In. L_Y = 0 Ft. K_Y = 2.0

$r_Z = 0.30*B$ = 10.78 In. L_Z = 2.5 Ft. K_Z = 1.2

I_{YY} = $B*D^3/12$ I_{YY} = 318124 In^4

I_{ZZ} = $D*B^3/12$ I_{ZZ} = 183049 In^5

K_YL_Y/r	=	0.0	<	22	NO SLENDERNESS EFFECT
K_ZL_Z/r	=	3.3	<	22	NO SLENDERNESS EFFECT

H. W. LOCHNER, INC.

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA — JMJ Jun-06
SUBJECT: HIGH LEVEL BENT ANALYSIS — WDB Jun-06
HLB 160 MEM. 8 JT. FOOTING

SLENDERNESS EFFECTS IN RECTANGULAR COMPRESSION MEMBERS (AASHTO 8.16.5)

GROUP 1

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	47.364	0.0	0.00	0.00	0.000	561	0	1.000	1.000	95	*
MZ	35.928	47.364	3.3	0.30	10.21	33.643	561	0	1.000	1.000	78	*

GROUP 2

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips
MY	35.928	47.364	0.0	439.82	0.00	0.000	308	0	1.000	1.000	440
MZ	35.928	47.364	3.3	62.61	10.21	0.163	308	0	1.000	1.000	63

GROUP 3

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	47.364	0.0	323.44	0.00	0.000	458	0	1.000	1.000	323	
MZ	35.928	47.364	3.3	28.29	10.21	0.361	458	0	1.000	1.000	64	*

GROUP 4

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	47.364	0.0	0.00	0.00	0.000	433	0	1.000	1.000	73	*
MZ	35.928	47.364	3.3	719.50	10.21	0.014	433	0	1.000	1.000	719	

GROUP 5

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips
MY	35.928	47.364	0.0	422.90	0.00	0.000	262	0	1.000	1.000	423
MZ	35.928	47.364	3.3	748.28	10.21	0.014	262	0	1.000	1.000	748

GROUP 6

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips
MY	35.928	47.364	0.0	311.00	0.00	0.000	407	0	1.000	1.000	311
MZ	35.928	47.364	3.3	715.28	10.21	0.014	407	0	1.000	1.000	715

* MINIMUM MOMENT CONTROLS

H. W. LOCHNER, INC.

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA JMJ Jun-06
SUBJECT: HIGH LEVEL BENT ANALYSIS WDB Jun-06
HLB 160 MEM. 8 JT. FOOTING

COLUMN LOADS

PMIN

HLB 160 MEMBER 8 JOINT FOOTING

	GROUP 1 P	MY	MZ		GROUP 2 P	MY	MZ
DL	190.57	0.00	7.85	DL	190.57	0.00	7.85
LL	48.28	0.00	-15.20	LL	0.00	0.00	0.00
GROUP 1	0.00	0.00	0.00	GROUP 2	-17.20	-338.32	40.31
SERVICE	238.85	0.00	-7.35	SERVICE	173.38	-338.32	48.16
STRENGTH	352.35	0.00	-22.73	STRENGTH	225.39	-439.82	62.61

	GROUP 3 P	MY	MZ		GROUP 4 P	MY	MZ
DL	190.57	0.00	7.85	DL	190.57	0.00	7.85
LL	48.28	0.00	-15.20	LL	48.28	0.00	-15.20
GROUP 3	-8.17	-248.80	18.76	GROUP 4	-27.21	0.00	550.46
SERVICE	230.69	-248.80	11.41	SERVICE	211.64	0.00	543.11
STRENGTH	299.89	-323.44	14.83	STRENGTH	275.13	0.00	706.04

	GROUP 5 P	MY	MZ		GROUP 6 P	MY	MZ
DL	190.57	0.00	7.85	DL	190.57	0.00	7.85
LL	0.00	0.00	0.00	LL	48.28	0.00	-15.20
GROUP 5	-44.40	-338.32	590.77	GROUP 6	-35.37	-248.80	569.22
SERVICE	146.17	-338.32	598.62	SERVICE	203.49	-248.80	561.87
STRENGTH	182.71	-422.90	748.28	STRENGTH	254.36	-311.00	702.34

SLENDERNESS EFFECTS IN COMPRESSION MEMBERS (AASHTO 8.16.5)

f'c = 3000 psi PHI = 0.70 W_C = 150 PCF

$E_C = W_C^{1.5} * 33 * f'c^{0.5}$ = 3320561 PSI Width of Rect. Col. = B = 35.928 In.
Depth of Rect. Col = D = 47.364 In.

$r_Y = 0.30*D$ = 14.21 In. L_Y = 0 Ft. K_Y = 2.0
$r_Z = 0.30*B$ = 10.78 In. L_Z = 2.5 Ft. K_Z = 1.2

I_{YY} = $B*D^3/12$ I_{YY} = 318124 In^4
I_{ZZ} = $D*B^3/12$ I_{ZZ} = 183049 In^5

$K_Y L_Y/r$ = 0.0 < 22 NO SLENDERNESS EFFECT
$K_Z L_Z/r$ = 3.3 < 22 NO SLENDERNESS EFFECT

H. W. LOCHNER, INC.

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA — JMJ Jun-06
SUBJECT: HIGH LEVEL BENT ANALYSIS — WDB Jun-06
HLB 160 MEM. 8 JT. FOOTING

SLENDERNESS EFFECTS IN RECTANGULAR COMPRESSION MEMBERS (AASHTO 8.16.5)

GROUP 1

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	47.364	0.0	0.00	0.00	0.000	352	0	1.000	1.000	59	*
MZ	35.928	47.364	3.3	22.73	10.21	0.449	352	0	1.000	1.000	49	*

GROUP 2

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips
MY	35.928	47.364	0.0	439.82	0.00	0.000	225	0	1.000	1.000	440
MZ	35.928	47.364	3.3	62.61	10.21	0.163	225	0	1.000	1.000	63

GROUP 3

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	47.364	0.0	323.44	0.00	0.000	300	0	1.000	1.000	323	
MZ	35.928	47.364	3.3	14.83	10.21	0.688	300	0	1.000	1.000	42	*

GROUP 4

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C	
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips	
MY	35.928	47.364	0.0	0.00	0.00	0.000	275	0	1.000	1.000	46	*
MZ	35.928	47.364	3.3	706.04	10.21	0.014	275	0	1.000	1.000	706	

GROUP 5

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips
MY	35.928	47.364	0.0	422.90	0.00	0.000	183	0	1.000	1.000	423
MZ	35.928	47.364	3.3	748.28	10.21	0.014	183	0	1.000	1.000	748

GROUP 6

	B	D	KL/R	M_U	M_{DL}	B_D	P_U	P_C	δ_b	δ_s	M_C
	In.	In.		Ft. Kips	Ft. Kips		Kips	Kips			Ft. Kips
MY	35.928	47.364	0.0	311.00	0.00	0.000	254	0	1.000	1.000	311
MZ	35.928	47.364	3.3	702.34	10.21	0.015	254	0	1.000	1.000	702

* MINIMUM MOMENT CONTROLS

JMJ 7/06
WDB 7/06

```
OOOOOOO    OOOOO    OOOOO    OOOOO    OOOOO   OO
OO    OO   OO  OO   OO  OO   OO  OO   OO  OO  OO
OO    OO   OO  OO   OO  OO   OO  OO   OO  OO  OO
OO    OO   OO       OO  OO   OO      OO  OO  OO
OO    OO   OO       OOOOOOO  OO      OO  OO  OO
OOOOOOO    OO  OO   OO  OO   OO  OO  OO  OO  OO
OO         OO  OO   OO  OO   OO  OO  OO  OO  OO
OO          OOOO    OO  OO    OOOO    OOOO   OOOO   (TM)
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==========
Computer program for the Strength Design of Reinforced Concrete Sections
==========

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BASED ON PLANS.

General Information:
==========
File Name: S:\DGN-ST\NORTHC~1\BONNER~1\ANALYSIS\PIERS\HLB160\PCACOL~1\M8PLAN.COL
Project: BONNER BRIDGE - OREGON INLET
Column: HLB #160 Engineer: JMJ
Code: ACI 318-95 Units: English

Run Option: Investigation Slenderness: Not considered
Run Axis: Biaxial Column Type: Structural

Material Properties:
==========
f'c = 3 ksi fy = 40 ksi
Ec = 3122.02 ksi Es = 29000 ksi
fc = 2.55 ksi Rupture strain = Infinity
Ultimate strain = 0.003 in/in
Beta1 = 0.85

Section:
========
Rectangular: Width = 36 in Depth = 47.4 in

Gross section area, Ag = 1706.4 in^2
Ix = 319489 in^4 Iy = 184291 in^4
Xo = 0 in Yo = 0 in

Reinforcement:
==========
Rebar Database: User-defined

Size	Diam (in)	Area (in^2)	Size	Diam (in)	Area (in^2)	Size	Diam (in)	Area (in^2)
# 1	0.00	0.00	# 3	0.38	0.11	# 4	0.50	0.20
# 5	0.63	0.31	# 6	0.75	0.44	# 7	0.88	0.60
# 8	1.00	0.79	# 9	1.13	1.00	# 10	1.27	1.27
# 11	1.41	1.56	# 14	1.69	2.25	# 18	2.26	4.00

Confinement: Tied; #1 ties with #9 bars, #1 with larger bars.
phi(a) = 0.8, phi(b) = 0.9, phi(c) = 0.7

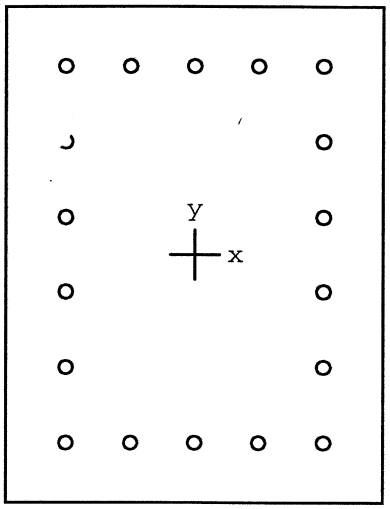
Layout: Rectangular
Pattern: Equal Bar Spacing (Cover to longitudinal reinforcement)
Total steel area, As = 28.08 in^2 at 1.65%
18 #11 Cover = 5 in

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
==========

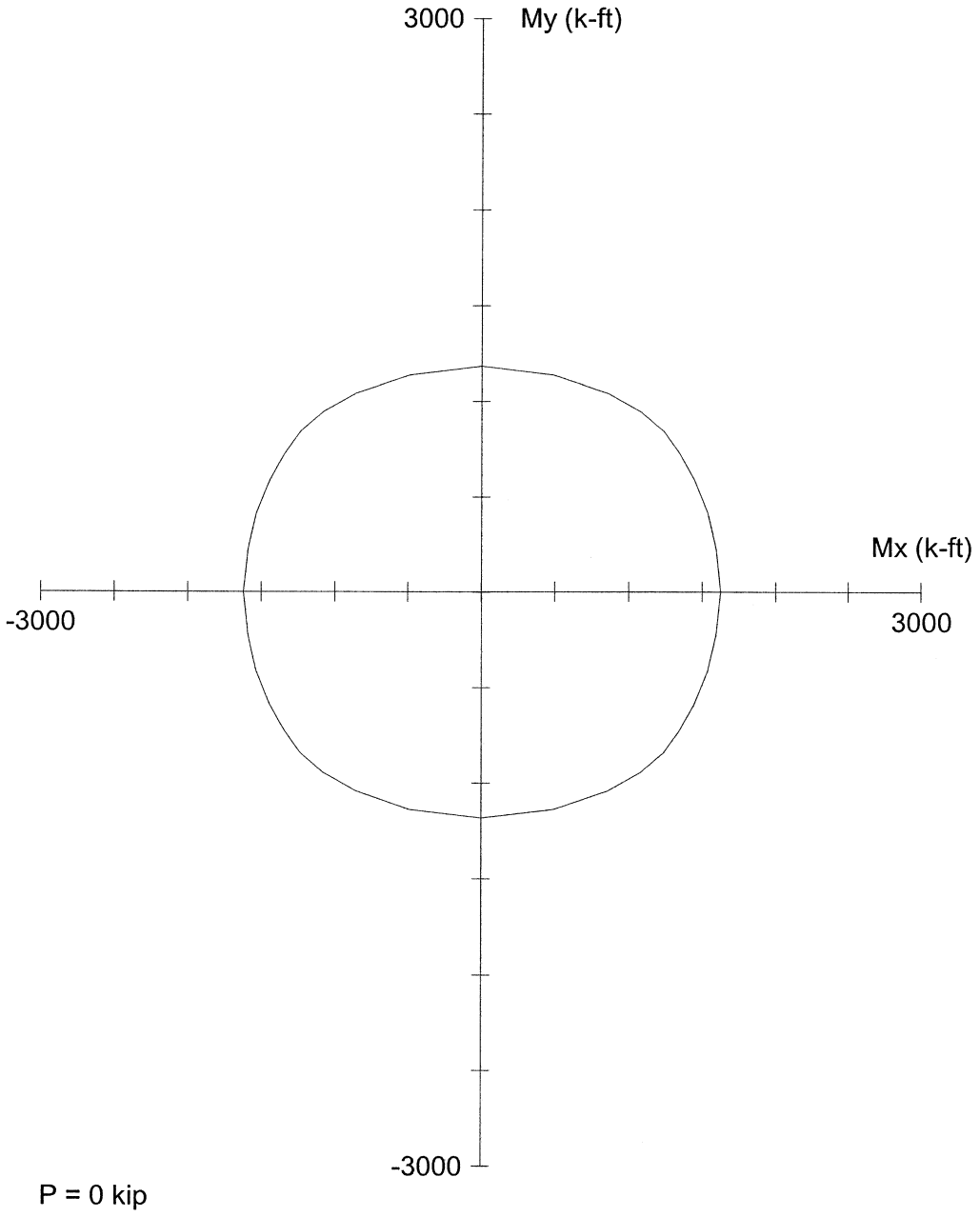
No.	Pu kip	Mux k-ft	Muy k-ft	fMnx k-ft	fMny k-ft	fMn/Mu
1	555.0	94.0	78.0	1199.9	995.0	12.762
2	302.0	380.0	42.0	1787.7	199.9	4.705
3	452.0	286.0	63.0	1745.7	384.6	6.104
4	428.0	72.0	753.0	130.9	1364.1	1.812
5	257.0	366.0	682.0	655.7	1222.6	1.792
6	401.0	275.0	713.0	501.3	1295.8	1.818
7	348.0	59.0	49.0	1197.0	992.6	20.275
8	221.0	380.0	41.0	1752.7	190.3	4.613
9	296.0	286.0	41.0	1766.9	254.9	6.179
10	271.0	46.0	755.0	79.9	1325.0	1.755
11	179.0	366.0	682.0	642.4	1196.7	1.755
12	250.0	275.0	715.0	486.4	1266.5	1.771
13	561.0	95.0	78.0	1210.3	991.7	12.730
14	308.0	440.0	63.0	1771.3	254.6	4.026
15	458.0	323.0	64.0	1763.3	350.6	5.460

16	433.0	73.0	719.0	138.5	1364.4	1.898
17	262.0	423.0	748.0	689.3	1214.3	1.625
18	407.0	311.0	715.0	556.7	1282.5	1.793
19	352.0	59.0	49.0	1196.4	993.3	20.275
20	225.0	440.0	63.0	1738.1	250.3	3.951
21	300.0	323.0	42.0	1775.7	233.7	5.499
22	275.0	46.0	706.0	88.3	1325.8	1.878
23	183.0	423.0	748.0	671.5	1189.7	1.590
24	254.0	311.0	702.0	554.7	1250.0	1.781

*** Program completed as requested! ***



36 x 47.4 in



P = 0 kip

Code: ACI 318-95

Units: English

Run axis: Biaxial

Run option: Investigation

Slenderness: Not considered

(mn type: Structural

Bars: User-defined

Date: 07/19/06

Time: 13:17:59

PCACOL V3.00 (PCA 1999) - Licensed to: Licensee name not yet specified.

File: S:\DGN-ST\NORTHC~1\BONNER~1\ANALYSIS\PIERS\HLB160\PCACOL~1\M8PLAN.COL

Project: BONNER BRIDGE - OREGON INLET

Column: HLB #160		Engineer: JMJ	
f'c = 3 ksi	fy = 40 ksi	Ag = 1706.4 in^2	18 #11 bars
Ec = 3122 ksi	Es = 29000 ksi	As = 28.08 in^2	Rho = 1.65%
fc = 2.55 ksi	e_rup = Infinity	Xo = 0.00 in	Ix = 319489 in^4
ɹ = 0.003 in/in		Yo = 0.00 in	Iy = 184291 in^4
Beta1 = 0.85		Clear spacing = 4.74 in	Clear cover = 5.00 in

Confinement: Tied phi(a) = 0.8, phi(b) = 0.9, phi(c) = 0.7

JMJ 7/06
WOB 7/06

```
OOOOOOO    OOOOO    OOOOO    OOOOO    OOOOO   OO
OO    OO   OO  OO   OO  OO   OO  OO   OO  OO  OO
OO    OO   OO  OO   OO  OO   OO  OO   OO  OO  OO
OO    OO   OO       OO  OO   OO      OO  OO  OO
OO    OO   OO       OOOOOOO  OO      OO  OO  OO
OOOOOOO    OO  OO   OO  OO   OO  OO  OO  OO  OO
OO         OO  OO   OO  OO   OO  OO  OO  OO  OO
OO          OOOO    OO  OO    OOOO    OOOO   OOOO   (TM)
```

==========
Computer program for the Strength Design of Reinforced Concrete Sections
==========

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50% COVER LOSS
f'_c = 4400 PSI

General Information:
==========
File Name: S:\DGN-ST\NORTHC~1\BONNER~1\ANALYSIS\PIERS\HLB160\PCACOL~1\M8ACT.COL
Project: BONNER BRIDGE - OREGON INLET
Column: HLB #160 Engineer: JMJ
Code: ACI 318-95 Units: English

Run Option: Investigation Slenderness: Not considered
Run Axis: Biaxial Column Type: Structural

Material Properties:
==========
f'c = 4.4 ksi fy = 40 ksi
Ec = 3780.96 ksi Es = 29000 ksi
fc = 3.74 ksi Rupture strain = Infinity
Ultimate strain = 0.003 in/in
Beta1 = 0.83

Section:
==========
Rectangular: Width = 31 in Depth = 42.4 in

Gross section area, Ag = 1314.4 in^2
Ix = 196915 in^4 Iy = 105262 in^4
Xo = 0 in Yo = 0 in

Reinforcement:
==========
Rebar Database: User-defined

Size	Diam (in)	Area (in^2)	Size	Diam (in)	Area (in^2)	Size	Diam (in)	Area (in^2)
# 1	0.00	0.00	# 3	0.38	0.11	# 4	0.50	0.20
# 5	0.63	0.31	# 6	0.75	0.44	# 7	0.88	0.60
# 8	1.00	0.79	# 9	1.13	1.00	# 10	1.27	1.27
# 11	1.41	1.56	# 14	1.69	2.25	# 18	2.26	4.00

Confinement: Tied; #1 ties with #9 bars, #1 with larger bars.
phi(a) = 0.8, phi(b) = 0.9, phi(c) = 0.7

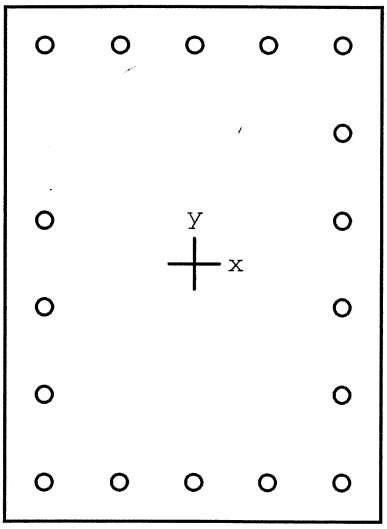
Layout: Rectangular
Pattern: Equal Bar Spacing (Cover to longitudinal reinforcement)
Total steel area, As = 28.08 in^2 at 2.14%
18 #11 Cover = 2.5 in

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
==========

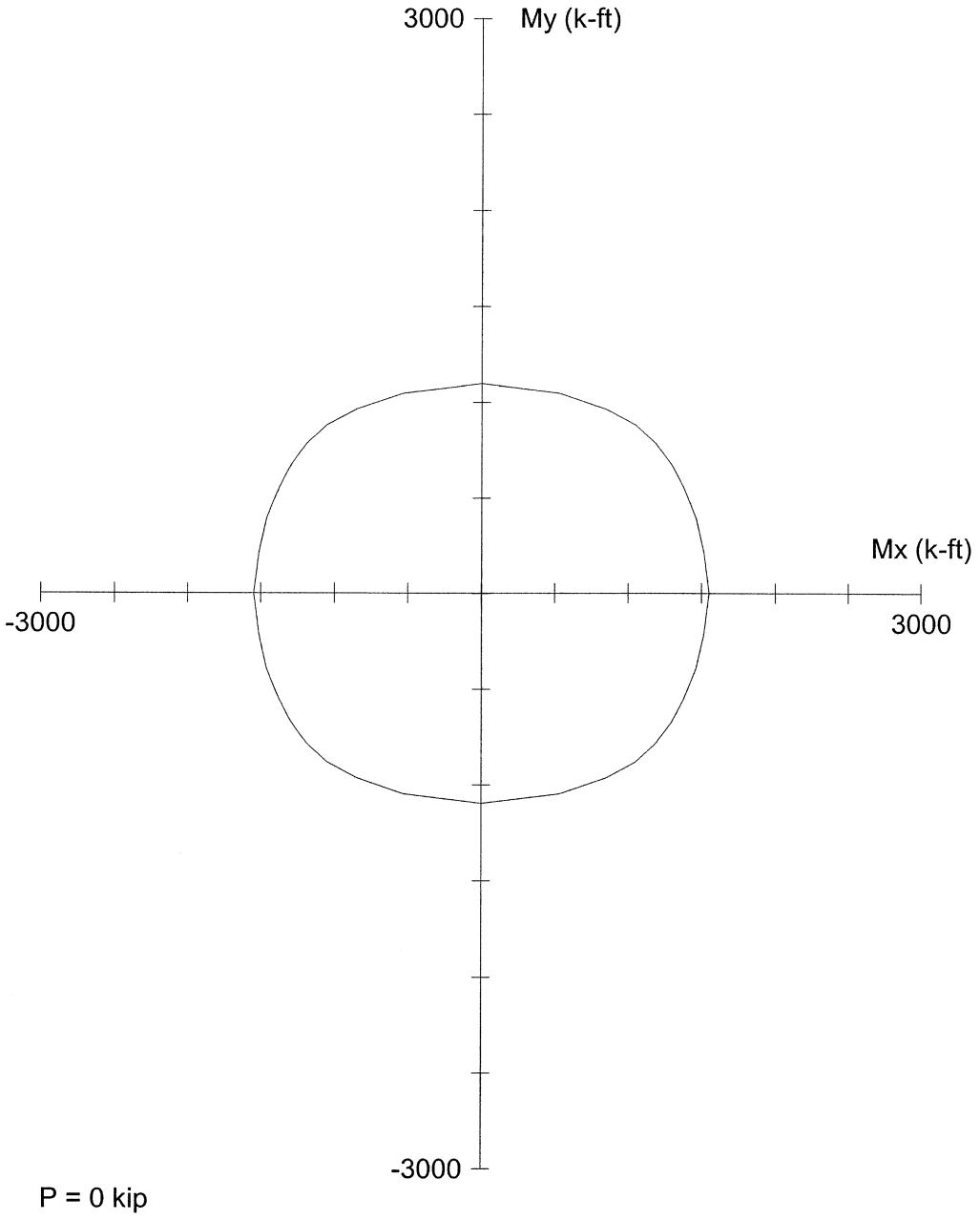
No.	Pu kip	Mux k-ft	Muy k-ft	fMnx k-ft	fMny k-ft	fMn/Mu
1	555.0	94.0	78.0	1168.3	967.5	12.419
2	302.0	380.0	42.0	1733.0	193.9	4.561
3	452.0	286.0	63.0	1718.1	379.4	6.008
4	428.0	72.0	753.0	125.2	1310.6	1.740
5	257.0	366.0	682.0	621.6	1160.8	1.701
6	401.0	275.0	713.0	481.8	1244.6	1.746
7	348.0	59.0	49.0	1162.9	965.9	19.711
8	221.0	380.0	41.0	1690.3	180.5	4.448
9	296.0	286.0	41.0	1712.4	245.0	5.987
10	271.0	46.0	755.0	76.5	1260.0	1.669
11	179.0	366.0	682.0	607.6	1131.9	1.660
12	250.0	275.0	715.0	461.3	1197.6	1.675
13	561.0	95.0	78.0	1174.8	962.2	12.354
14	308.0	440.0	63.0	1717.9	245.1	3.904
15	458.0	323.0	64.0	1736.4	342.2	5.375

16	433.0	73.0	719.0	133.0	1311.0	1.823
17	262.0	423.0	748.0	653.2	1153.6	1.543
18	407.0	311.0	715.0	536.8	1232.1	1.724
19	352.0	59.0	49.0	1162.3	966.9	19.714
20	225.0	440.0	63.0	1678.1	238.9	3.813
21	300.0	323.0	42.0	1721.9	223.4	5.331
22	275.0	46.0	706.0	83.1	1261.0	1.786
23	183.0	423.0	748.0	635.5	1125.6	1.504
24	254.0	311.0	702.0	525.1	1187.2	1.691

*** Program completed as requested! ***



31 x 42.4 in



P = 0 kip

Code: ACI 318-95

Units: English

Run axis: Biaxial

Run option: Investigation

Slenderness: Not considered

mn type: Structural

Bars: User-defined

Date: 07/25/06

Time: 13:09:32

PCACOL V3.00 (PCA 1999) - Licensed to: Licensee name not yet specified.

File: S:\DGN-ST\NORTHC~1\BONNER~1\ANALYSIS\PIERS\HLB160\PCACOL~1\M8ACT.COL

Project: BONNER BRIDGE - OREGON INLET

Column: HLB #160		Engineer: JMJ	
f'c = 4.4 ksi	fy = 40 ksi	Ag = 1314.4 in^2	18 #11 bars
Ec = 3781 ksi	Es = 29000 ksi	As = 28.08 in^2	Rho = 2.14%
fc = 3.74 ksi	e_rup = Infinity	Xo = 0.00 in	Ix = 196915 in^4
= 0.003 in/in		Yo = 0.00 in	Iy = 105262 in^4
Beta1 = 0.83		Clear spacing = 4.74 in	Clear cover = 2.50 in
Confinement: Tied	phi(a) = 0.8, phi(b) = 0.9, phi(c) = 0.7		

LOCHNER

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA
SUBJECT: HIGH LEVEL BENT #160
SUBJECT: TOP OF CAP - BASED ON PLAN DIMENSIONS

SHEET
JMJ Jun-06
KBM Jun-06

CONCRETE DESIGN - CAP

INPUT

Dead Load Moment	328.060	Ft. Kips	Working Stress Mom.		498.270	Ft. Kips
Live Load Moment	170.210	Ft. Kips	Load Factor Mom.		796.004	Ft. Kips
Avrg. Bar Clearance	3.625	In.	Z For Steel Dist.		170	
Cover	3.000	In.	f'c	=	3.000	Ksi
Width of Member (b)	36.000	In.	fy	=	40.000	Ksi
Depth of Member (h)	42.000	In.				

AREA OF STEEL

Bar Size	11		d_C =	4.330	In.
No. Bars	7		d_C' =	2.705	In.
A_S	10.93	Sq. In.	d =	37.670	In.

RESULTS

A	=	2.00 x 4.56 x 2.705	=	24.68		
f_S Allow	=	170.00 / (24.68 x 2.705)^.33	=	41.91	Ksi	36.00 Max
a	=	(10.93 x 40.00) / 0.85 x 3.00 x 36.00	=	4.763	In.	
jd	=	37.670 - 4.76 / 2.00	=	35.29		
f_S Act	=	(498.27 x 12.00) / 10.93 x 35.29	=	15.50	Ksi	
θM_N	=	0.90 x 10.93 x 40.00 x 35.29 / 12	=	1157.13	Ft. Kips	

AASHTO 8.17.1 Min. Reinforcement $\phi M_n > 1.2Mcr$ Mcr = fr Ig/yt

fr	=	$7.5 (f'c)^{1/2}$			=	0.411 Ksi
Ig	=	$1/12 * b * h^3$ = 222264 $In.^4$	yt = h/2		=	21.00 In.
Mcr	=	0.411 x 222264 / 21.00 / 12			=	362.32 Ft. Kips

AASHTO 8.17.1 **ϕM_n = 1157.13 > 1.2 Mcr = 434.78 OK**

f_S Act = 15.50 < f_S Allow = 36.00 OK

ϕM_n = 1157.13 > Mu = 796.00 OK

LOCHNER

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA
SUBJECT: HIGH LEVEL BENT #160
SUBJECT: BOTTOM OF CAP - BASED ON PLAN DIMENSIONS

SHEET
JMJ Jun-06
KBM Jun-06

CONCRETE DESIGN - CAP

INPUT

Dead Load Moment	206.020	Ft. Kips	Working Stress Mom.		376.110	Ft. Kips
Live Load Moment	170.090	Ft. Kips	Load Factor Mom.		637.091	Ft. Kips
Bar Clearance	3.625	In.	Z For Steel Dist.		170	
Cover	3.000	In.	f'c	=	3.000	Ksi
Width of Member (b)	36.00	In.	fy	=	40.000	Ksi
Depth of Member (h)	42.00	In.				

AREA OF STEEL

Bar Size	11		d_C =	4.330	In.
No. Bars	5		d_C' =	2.705	In.
A_S	7.81	Sq. In.	d =	37.670	In.

RESULTS

A	=	2.00 x 6.84 x 2.705	=	37.02		
f_S Allow	=	170.00 / (37.02 x 2.705)^.33	=	36.61	Ksi	36.00 Max
a	=	(7.81 x 40.00) / 0.85 x 3.00 x 36.00	=	3.402	In.	
jd	=	37.670 - 3.40 / 2.00	=	35.97		
f_S Act	=	(376.11 x 12.00) / 7.81 x 35.97	=	16.07	Ksi	
θM_N	=	0.90 x 7.81 x 40.00 x 35.97 / 12	=	842.46	Ft. Kips	

AASHTO 8.17.1 Min. Reinforcement $\phi M_n > 1.2Mcr$ Mcr = fr Ig/yt

fr	=	$7.5 (f'c)^{1/2}$			=	0.411 Ksi
Ig	=	$1/12 * b * h^3$ = 222264 $In.^4$	yt = h/2		=	21.00 In.
Mcr	=	0.411 x 222264 / 21.00 / 12			=	362.32 Ft. Kips

AASHTO 8.17.1 **ϕM_n = 842.46 > 1.2 Mcr = 434.78 OK**

f_S Act = 16.07 < f_S Allow = 36.00 OK

ϕM_n = 842.46 > Mu = 637.09 OK

LOCHNER

PROJECT:	BONNER BRIDGE - OREGON INLET NORTH CAROLINA	SHEET	
SUBJECT:	HIGH LEVEL BENT #160	JMJ	Jun-06
	SHEAR - BASED ON PLAN DIMENSIONS	KBM	Jun-06

SHEAR DESIGN - CAP COMPLETE

V_{DL} = 103.97 KIPS V_{LL} = 59.59 KIPS F_V = 40000 PSI

d = 37.67 INCHES b = 36.00 INCHES f'c = 3000 PSI

V@ d DIST. FROM FACE OF SUPPORT Col. Width = D = 3.00 FT

ASSUME FACE OF SUPPORT D/4 = 0.75 FT. FROM CENTER OF COL.

$d_{DIST.}$ = 37.67 / 12.00 + 0.750 = 3.89 FT. W_{DL} CAP= 1.575 KIPS/FT

V_{DL} = $V_{DL} - W_{DL} * d_{DIST}$ = 97.84

V_U = $1.3(V_{DL} +(1.67*V_{LL}))$ = 256.57

$V_U < q V_N$ $V_N = V_C + V_S$

$V_U < qV_C + qV_S$

$V_C = 2*(f'c)^{1/2}* b* d$ = 148.56 KIPS

$qV_S = V_U - qV_C$

$V_S = V_U/q - V_C$ = 153.29 KIPS

$V_S = A_V * F_V * d / S$

USE # 5 STIRRUPS A_S= 0.31 SQ. IN.

No. of Bars = 2

$A_V = 2 \times A_S$ = 2 * 0.307 = 0.61359232 SQ. IN.

$S = A_V * F_V * d / V_S$ = 6.0 INCHES

$S_{MIN} = A_V * F_V /50 * b$ = 20.45 INCHES

S_{ACT} = 6.00 INCHES **OK**

LOCHNER

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA
SUBJECT: HIGH LEVEL BENT #160
SUBJECT: TOP OF CAP - BASED ON FIELD DATA, ASSUME 50% COVER LOSS EVERYWHERE

SHEET
JMJ Jul-06
WDB Jul-06

CONCRETE DESIGN - CAP

INPUT

Dead Load Moment	328.060	Ft. Kips	Working Stress Mom.		498.270	Ft. Kips
Live Load Moment	170.210	Ft. Kips	Load Factor Mom.		796.004	Ft. Kips
Avrg. Bar Clearance	3.625	In.	Z For Steel Dist.		170	
Cover	3.000	In.	f'c	=	4.400	Ksi
Width of Member (b)	33.000	In.	fy	=	40.000	Ksi
Depth of Member (h)	42.000	In.				

AREA OF STEEL

Bar Size	11		d_C =	4.330	In.
No. Bars	7		d_C' =	2.705	In.
A_S	10.93	Sq. In.	d =	37.670	In.

RESULTS

A	=	2.00 x 4.06 x 2.705	=	21.98	
f_S Allow	=	170.00 / (21.98 x 2.705)^.33	=	43.56 Ksi	36.00 Max
a	=	(10.93 x 40.00) / 0.85 x 4.40 x 33.00	=	3.542 In.	
jd	=	37.670 - 3.54 / 2.00	=	35.90	
f_S Act	=	(498.27 x 12.00) / 10.93 x 35.90	=	15.24 Ksi	
θM_N	=	0.90 x 10.93 x 40.00 x 35.90 / 12	=	1177.14 Ft. Kips	

AASHTO 8.17.1 Min. Reinforcement $\phi M_n > 1.2Mcr$ Mcr = fr Ig/yt

fr	=	$7.5 (f'c)^{1/2}$			=	0.497	Ksi
Ig	=	$1/12 * b * h^3$	=	203742 $In.^4$	yt = h/2	=	21.00 In.
Mcr	=	0.497 x 203742 / 21.00 / 12				=	402.22 Ft. Kips

AASHTO 8.17.1 **ϕM_n = 1177.14 > 1.2 Mcr = 482.67 OK**

f_S Act = 15.24 < f_S Allow = 36.00 OK

ϕM_n = 1177.14 > Mu = 796.00 OK

LOCHNER

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA — SHEET — JMJ Jul-06
SUBJECT: HIGH LEVEL BENT #160 — WDB Jul-06
SUBJECT: BOTTOM OF CAP - BASED ON FIELD DATA, ASSUME 50% COVER LOSS EVERYWHERE

CONCRETE DESIGN - CAP

INPUT

Dead Load Moment	206.020	Ft. Kips	Working Stress Mom.		376.110	Ft. Kips
Live Load Moment	170.090	Ft. Kips	Load Factor Mom.		637.091	Ft. Kips
Bar Clearance	3.625	In.	Z For Steel Dist.		170	
Cover	3.000	In.	f'c	=	4.400	Ksi
Width of Member (b)	33.00	In.	fy	=	40.000	Ksi
Depth of Member (h)	42.00	In.				

AREA OF STEEL

Bar Size	11		d_C =	4.330	In.
No. Bars	5		d_C' =	2.705	In.
A_S	7.81	Sq. In.	d =	37.670	In.

RESULTS

A	=	2.00 x 6.09 x 2.705	=	32.97	
f_S Allow	=	170.00 / (32.97 x 2.705)^.33	=	38.06 Ksi	36.00 Max
a	=	(7.81 x 40.00) / 0.85 x 4.40 x 33.00	=	2.530 In.	
jd	=	37.670 - 2.53 / 2.00	=	36.40	
f_S Act	=	(376.11 x 12.00) / 7.81 x 36.40	=	15.88 Ksi	
θM_N	=	0.90 x 7.81 x 40.00 x 36.40 / 12	=	852.67 Ft. Kips	

AASHTO 8.17.1 Min. Reinforcement $\phi M_n > 1.2Mcr$ Mcr = fr Ig/yt

fr	=	$7.5 (f'c)^{1/2}$		=	0.497 Ksi
Ig	=	$1/12 * b * h^3$ = 203742 $In.^4$	yt = h/2	=	21.00 In.
Mcr	=	0.497 x 203742 / 21.00 / 12		=	402.22 Ft. Kips

AASHTO 8.17.1 **ϕM_n = 852.67 > 1.2 Mcr = 482.67 OK**

f_S Act = 15.88 < f_S Allow = 36.00 OK

ϕM_n = 852.67 > Mu = 637.09 OK

LOCHNER

PROJECT:	BONNER BRIDGE - OREGON INLET NORTH CAROLINA	SHEET	
SUBJECT:	HIGH LEVEL BENT #160	JMJ	Jul-06
	SHEAR - BASED ON FIELD DATA, ASSUME 50% COVER LOSS EVERYWHERE	WDB	Jul-06

SHEAR DESIGN - CAP COMPLETE

V_{DL} = 103.97 KIPS V_{LL} = 59.59 KIPS F_V = 40000 PSI

d = 37.67 INCHES b = 33.00 INCHES f'c = 4400 PSI

V@ d DIST. FROM FACE OF SUPPORT Col. Width = D = 3.00 FT

ASSUME FACE OF SUPPORT D/4 = 0.75 FT. FROM CENTER OF COL.

$d_{DIST.}$ = 37.67 / 12.00 + 0.750 = 3.89 FT. W_{DL} CAP= 1.444 KIPS/FT

V_{DL} = V_{DL} - W_{DL} * d_{DIST} = 98.36

V_U = 1.3(V_{DL} +(1.67*V_{LL})) = 257.23

$V_U < q\,V_N$ $V_N = V_C + V_S$

$V_U < qV_C + qV_S$

V_C = 2*(f'c)^1/2* b* d = 164.92 KIPS

$qV_S = V_U - qV_C$

$V_S = V_U/q - V_C$ = 137.71 KIPS

$V_S = A_V * F_V * d / S$

USE # 5 STIRRUPS A_S= 0.31 SQ. IN.

No. of Bars = 2

$A_V = 2 \times A_S$ = 2 * 0.307 = 0.61359232 SQ. IN.

$S = A_V * F_V * d / V_S$ = 6.7 INCHES

$S_{MIN} = A_V * F_V /50 * b$ = 22.31 INCHES

S_{ACT} = 6.00 INCHES **OK**

H. W. LOCHNER, INC.

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA — JMJ Jun-06
SUBJECT: HIGH LEVEL BENT ANALYSIS — WDB Jun-06
HLB 160 MEM. 7 JT. FOOTING

FOOTING LOADS

PMIN

HLB 160 MEMBER 7 JOINT FOOTING

	GROUP 1 P	GROUP 1 MY	GROUP 1 MZ
DL	254.18	0.00	7.98
LL	38.05	0.00	-11.98
GROUP 1	0.00	0.00	0.00
SERVICE	292.23	0.00	-4.00
STRENGTH	412.88	0.00	-15.58

	GROUP 2 P	GROUP 2 MY	GROUP 2 MZ
DL	254.18	0.00	7.98
LL	0.00	0.00	0.00
GROUP 2	17.22	338.40	-40.28
SERVICE	271.40	338.40	-32.30
STRENGTH	352.82	439.92	-41.99

	GROUP 3 P	GROUP 3 MY	GROUP 3 MZ
DL	254.18	0.00	7.98
LL	38.05	0.00	-11.98
GROUP 3	8.17	248.85	-18.75
SERVICE	300.40	248.85	-22.75
STRENGTH	390.52	323.51	-29.58

	GROUP 4 P	GROUP 4 MY	GROUP 4 MZ
DL	254.18	0.00	7.98
LL	38.05	0.00	-11.98
GROUP 4	-28.21	0.00	550.08
SERVICE	264.02	0.00	546.08
STRENGTH	343.23	0.00	709.90

	GROUP 5 P	GROUP 5 MY	GROUP 5 MZ
DL	254.18	0.00	7.98
LL	0.00	0.00	0.00
GROUP 5	-10.99	338.40	509.80
SERVICE	243.19	338.40	517.78
STRENGTH	303.99	423.00	647.23

	GROUP 6 P	GROUP 6 MY	GROUP 6 MZ
DL	254.18	0.00	7.98
LL	38.05	0.00	-11.98
GROUP 6	-20.04	248.85	531.34
SERVICE	272.19	248.85	527.34
STRENGTH	340.24	311.06	659.18

H. W. LOCHNER, INC.

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA — JMJ Jun-06
SUBJECT: HIGH LEVEL BENT ANALYSIS — WDB Jun-06
HLB 160 MEM. 8 JT. FOOTING

FOOTING LOADS

PMAX

HLB 160 MEMBER 8 JOINT FOOTING

	GROUP 1 P	GROUP 1 MY	GROUP 1 MZ
DL	254.09	0.00	7.85
LL	83.93	0.00	-3.82
GROUP 1	0.00	0.00	0.00
SERVICE	338.02	0.00	4.03
STRENGTH	512.17	0.00	1.93

	GROUP 2 P	GROUP 2 MY	GROUP 2 MZ
DL	254.09	0.00	7.85
LL	0.00	0.00	0.00
GROUP 2	-17.20	-338.32	40.31
SERVICE	236.89	-338.32	48.16
STRENGTH	307.96	-439.82	62.61

	GROUP 3 P	GROUP 3 MY	GROUP 3 MZ
DL	254.09	0.00	7.85
LL	83.93	0.00	-3.82
GROUP 3	-8.17	-248.80	18.76
SERVICE	329.85	-248.80	22.79
STRENGTH	428.81	-323.44	29.63

	GROUP 4 P	GROUP 4 MY	GROUP 4 MZ
DL	254.09	0.00	7.85
LL	83.93	0.00	-3.82
GROUP 4	-27.21	0.00	550.46
SERVICE	310.81	0.00	554.49
STRENGTH	404.05	0.00	720.84

	GROUP 5 P	GROUP 5 MY	GROUP 5 MZ
DL	254.09	0.00	7.85
LL	0.00	0.00	0.00
GROUP 5	-44.40	-338.32	590.77
SERVICE	209.69	-338.32	598.62
STRENGTH	262.11	-422.90	748.28

	GROUP 6 P	GROUP 6 MY	GROUP 6 MZ
DL	254.09	0.00	7.85
LL	83.93	0.00	-3.82
GROUP 6	-35.37	-248.80	569.22
SERVICE	302.65	-248.80	573.25
STRENGTH	378.31	-311.00	716.56

H. W. Lochner, Inc. | PHONE: 859-224-4476 | SHEET 1 OF 9
1040 Monarch St. Suite 300 | Lexington, KY 40513 | JOB NO. HLB#160
PROGRAM: RC-PIER® v4.1.0 LEAP Software Inc., Tampa, Florida | BY JMJ DATE Jun/12/2006
PHONE : TOLL-FREE 1-800-451-5327 TAMPA AREA: 813-985-9170 | CKD.WDB DATE 7/06

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA

PROJECT DATA
============

Project : BONNER BRIDGE - OREGON INLET NORTH CAROLINA
User Job No.: HLB#160
State : North Carolina State Job No. :
Code : AASHTO STANDARD (17th Edition 2002)
Comments : Bonner Bridge HLB #160 - Load Groups 1-3 (For Ease of Checking) - Per Pla
n Dimensions

H. W. Lochner, Inc. PHONE: 859-224-4476
1040 Monarch St. Suite 300 Lexington, KY 40513

PROGRAM: RC-PIER® v4.1.0 LEAP Software Inc., Tampa, Florida
PHONE : TOLL-FREE 1-800-451-5327 TAMPA AREA: 813-985-9170

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA

LOADS
=====

Load Cases: 3

Loadcase ID: (L+In)1 Name: Group 1 Loadings
Multiplier = 1.000

Cap loads:

Type	Dir	Arm ft	Mag1 kip,kip/ft, kft	x1/L	Mag2 kip,kip/ft, kft	x2/L
Force	Y	0.00	-412.88	0.00	----	----
Force	Y	0.00	-512.17	1.00	----	----
Moment	Z	----	-15.58	0.00	----	----
Moment	Z	----	1.93	1.00	----	----

Loadcase ID: (L+Ip)1 Name: Group 2 Loadings
Multiplier = 1.000

Cap loads:

Type	Dir	Arm ft	Mag1 kip,kip/ft, kft	x1/L	Mag2 kip,kip/ft, kft	x2/L
Force	Y	0.00	-352.82	0.00	----	----
Force	Y	0.00	-307.96	1.00	----	----
Moment	X	----	-439.82	1.00	----	----
Moment	X	----	439.92	0.00	----	----
Moment	Z	----	-41.99	0.00	----	----
Moment	Z	----	62.61	1.00	----	----

Loadcase ID: W1 Name: Group 3 Loadings
Multiplier = 1.000

Cap loads:

Type	Dir	Arm ft	Mag1 kip,kip/ft, kft	x1/L	Mag2 kip,kip/ft, kft	x2/L
Force	Y	0.00	-390.52	0.00	----	----
Force	Y	0.00	-428.81	1.00	----	----
Moment	X	----	-323.44	1.00	----	----
Moment	X	----	323.51	0.00	----	----
Moment	Z	----	-29.58	0.00	----	----
Moment	Z	----	29.63	1.00	----	----

Selected load groups:

SERVICE GROUP I
SERVICE GROUP IB
SERVICE GROUP II

H. W. Lochner, Inc. PHONE: 859-224-4476 | SHEET 3 OF 9
1040 Monarch St. Suite 300 Lexington, KY 40513 | JOB NO. HLB#160
PROGRAM: RC-PIER® v4.1.0 LEAP Software Inc., Tampa, Florida | BY JMJ DATE Jun/12/2006
PHONE : TOLL-FREE 1-800-451-5327 TAMPA AREA: 813-985-9170 | CKD. WDB DATE 7/06

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA

COMBINED FOOTING DESIGN

Code: AASHTO STANDARD (17th Edition 2002) - Service Load Design
Units: US

Geometry:
=========
Name : 1
Shape : Rectangular, Type : Pile/Shaft Cap

Bf(X) = 31.00 ft, Hf(Z) = 9.00 ft, Thickness(Y) = 51.00 in

Footing concentric.
Columns located on the footing:
Column No. 1 at x = 0.00 ft, Round D = 12.00 in
Column No. 2 at x = 21.58 ft, Round D = 12.00 in

Ag = 279.00 ft^2, Ix = 62.50 ft^2, Iz = 985.00 ft^2

Surcharge = 0.00 ksf

Piles: Circular Size: 22.00 in Capacity: 100.00 kips

Design Parameters:
==================
f'c = 3000.00 psi fy = 40000.00 psi
Ec = 3320.6 ksi Es = 29000.0 ksi
Crack control factor z = 130.00 kips/in
Concrete Type : Normal Weight.

Pile Reactions, Service (Without the reduction of overstress allowance):
========================

Pile	Loc(X) ft	X in	Z in	Column Loads col#	comb	Ovs	P, kips	Mxx, kft	Mzz, kft	Pile Reac. kips
1	-2.70	24.0	30.0	1	1	1.000	-412.88	0.00	-19.67	95.47
				2	1	1.000	-512.17	0.00	1.95	
				1	4	1.250	390.52	-323.31	33.42	-58.53
				2	4	1.250	428.81	323.24	-29.65	
2	2.80	90.0	30.0	1	1	1.000	-412.88	0.00	-19.67	101.51*
				2	1	1.000	-512.17	0.00	1.95	
				1	4	1.250	390.52	-323.31	33.42	-60.82
				2	4	1.250	428.81	323.24	-29.65	
3	10.80	186.0	30.0	1	1	1.000	-412.88	0.00	-19.67	110.29*
				2	1	1.000	-512.17	0.00	1.95	
				1	4	1.250	390.52	-323.31	33.42	-64.15
				2	4	1.250	428.81	323.24	-29.65	
4	18.80	282.0	30.0	1	1	1.000	-412.88	0.00	-19.67	119.07*
				2	1	1.000	-512.17	0.00	1.95	
				1	4	1.250	390.52	-323.31	33.42	-67.48
				2	4	1.250	428.81	323.24	-29.65	
5	24.30	348.0	30.0	1	1	1.000	-412.88	0.00	-19.67	125.11*
				2	1	1.000	-512.17	0.00	1.95	
				1	4	1.250	390.52	-323.31	33.42	-69.77
				2	4	1.250	428.81	323.24	-29.65	
6	-2.70	24.0	-30.0	1	1	1.000	-412.88	0.00	-19.67	95.47
				2	1	1.000	-512.17	0.00	1.95	
				1	4	1.250	390.52	-323.31	33.42	-58.52

H. W. Lochner, Inc. PHONE: 859-224-4476 | SHEET 4 OF 9
1040 Monarch St. Suite 300 Lexington, KY 40513 | JOB NO. HLB#160
PROGRAM: RC-PIER® v4.1.0 LEAP Software Inc., Tampa, Florida | BY JMJ DATE Jun/12/2006
PHONE : TOLL-FREE 1-800-451-5327 TAMPA AREA: 813-985-9170 | CKD.WDE DATE 7/06

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA

				2	4	1.250	428.81	323.24	-29.65	
7	2.80	90.0	-30.0	1	1	1.000	-412.88	0.00	-19.67	101.51*
				2	1	1.000	-512.17	0.00	1.95	
				1	4	1.250	390.52	-323.31	33.42	-60.81
				2	4	1.250	428.81	323.24	-29.65	
8	10.80	186.0	-30.0	1	1	1.000	-412.88	0.00	-19.67	110.29*
				2	1	1.000	-512.17	0.00	1.95	
				1	4	1.250	390.52	-323.31	33.42	-64.14
				2	4	1.250	428.81	323.24	-29.65	
9	18.80	282.0	-30.0	1	1	1.000	-412.88	0.00	-19.67	119.07*
				2	1	1.000	-512.17	0.00	1.95	
				1	4	1.250	390.52	-323.31	33.42	-67.47
				2	4	1.250	428.81	323.24	-29.65	
10	24.30	348.0	-30.0	1	1	1.000	-412.88	0.00	-19.67	125.11*
				2	1	1.000	-512.17	0.00	1.95	
				1	4	1.250	390.52	-323.31	33.42	-69.76
				2	4	1.250	428.81	323.24	-29.65	

Pile Reactions, Service (After the reduction of overstress allowance):

Pile	Loc(X) ft	X in	Z in	Column Loads col#	comb	Ovs	P, kips	Mxx, kft	Mzz, kft	Pile Reac. kips
1	-2.70	24.0	30.0	1	1	1.000	-412.88	0.00	-19.67	95.47
				2	1	1.000	-512.17	0.00	1.95	
				1	4	1.250	390.52	-323.31	33.42	-46.82
				2	4	1.250	428.81	323.24	-29.65	
2	2.80	90.0	30.0	1	1	1.000	-412.88	0.00	-19.67	101.51*
				2	1	1.000	-512.17	0.00	1.95	
				1	4	1.250	390.52	-323.31	33.42	-48.66
				2	4	1.250	428.81	323.24	-29.65	
3	10.80	186.0	30.0	1	1	1.000	-412.88	0.00	-19.67	110.29*
				2	1	1.000	-512.17	0.00	1.95	
				1	4	1.250	390.52	-323.31	33.42	-51.32
				2	4	1.250	428.81	323.24	-29.65	
4	18.80	282.0	30.0	1	1	1.000	-412.88	0.00	-19.67	119.07*
				2	1	1.000	-512.17	0.00	1.95	
				1	4	1.250	390.52	-323.31	33.42	-53.98
				2	4	1.250	428.81	323.24	-29.65	
5	24.30	348.0	30.0	1	1	1.000	-412.88	0.00	-19.67	125.11*
				2	1	1.000	-512.17	0.00	1.95	
				1	4	1.250	390.52	-323.31	33.42	-55.82
				2	4	1.250	428.81	323.24	-29.65	
6	-2.70	24.0	-30.0	1	1	1.000	-412.88	0.00	-19.67	95.47
				2	1	1.000	-512.17	0.00	1.95	
				1	4	1.250	390.52	-323.31	33.42	-46.82
				2	4	1.250	428.81	323.24	-29.65	
7	2.80	90.0	-30.0	1	1	1.000	-412.88	0.00	-19.67	101.51*
				2	1	1.000	-512.17	0.00	1.95	
				1	4	1.250	390.52	-323.31	33.42	-48.65
				2	4	1.250	428.81	323.24	-29.65	
8	10.80	186.0	-30.0	1	1	1.000	-412.88	0.00	-19.67	110.29*
				2	1	1.000	-512.17	0.00	1.95	
				1	4	1.250	390.52	-323.31	33.42	-51.32
				2	4	1.250	428.81	323.24	-29.65	
9	18.80	282.0	-30.0	1	1	1.000	-412.88	0.00	-19.67	119.07*
				2	1	1.000	-512.17	0.00	1.95	
				1	4	1.250	390.52	-323.31	33.42	-53.98

H. W. Lochner, Inc. PHONE: 859-224-4476 | SHEET 5 OF 9
1040 Monarch St. Suite 300 Lexington, KY 40513 | JOB NO. HLB#160
PROGRAM: RC-PIER® v4.1.0 LEAP Software Inc., Tampa, Florida | BY JMJ DATE Jun/12/2006
PHONE : TOLL-FREE 1-800-451-5327 TAMPA AREA: 813-985-9170 | CKD.WDB DATE 7/06

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA

				2	4	1.250	428.81	323.24	-29.65	
10	24.30	348.0	-30.0	1	1	1.000	-412.88	0.00	-19.67	125.11*
				2	1	1.000	-512.17	0.00	1.95	
				1	4	1.250	390.52	-323.31	33.42	-55.81
				2	4	1.250	428.81	323.24	-29.65	

Note:
* Force in pile is greater than pile capacity.

Only max. force in piles is considered for design.
Pile coordinates X and Z are from the most left edge of the footing.

Max. Pile Reaction Used in Design: (without selfweight and surcharge)
==========

Working Stress pile reaction = 107.33 kips

Reinforcement Schedule:
==========:

Dir	Quantity	Size	Bar dist. in	As total in^2	From ft	To ft	Hook
X	13	# 8	44.38	10.27	0.50	30.50	None
X	12	# 6	22.13	5.28	0.50	30.50	Both
X	5	# 6	6.00	2.20	0.50	30.50	Both
Z	24	# 5	45.19	7.44	----	----	Both
Z	41	# 6	21.38	18.04	----	----	Both
Z	8	# 11	7.45	12.48	----	----	None
Z	24	# 5	5.31	7.44	----	----	Both

Flexure:
========

X direction

Loc ft	Mmax Mmin kft	Comb Comb	Asb_req Asb_req in^2	Asb_prv Asb_prv in^2	Asb_eff Asb_eff in^2	Ast_req Ast_req in^2	Ast_prv Ast_prv in^2	Ast_eff Ast_eff in^2
-4.70	0.0	1	0.00	0.00	0.00	0.00	0.00	0.00
	0.0	1	0.00	0.00	0.00	0.00	0.00	0.00
-4.23	0.0	1	0.00	0.00	0.00	0.00	0.00	0.00
	0.0	1	0.00	0.00	0.00	0.00	0.00	0.00
-3.75	0.0	1	0.00	7.48	3.65	0.00	10.27	3.76
	0.0	1	0.00	7.48	3.65	0.00	10.27	2.55
-3.24	0.0	1	0.00	7.48	7.48	0.00	10.27	8.06
	0.0	1	0.00	7.48	7.48	0.00	10.27	5.47
-2.81	0.0	1	0.00	7.48	7.48	0.00	10.27	10.27
	0.0	1	0.00	7.48	7.48	0.00	10.27	7.96
-2.34	78.3	1	1.92	7.48	7.48	0.00	10.27	10.27
	0.0	1	0.00	7.48	7.48	0.00	10.27	10.27
-1.86	179.9	1	4.47	7.48	7.48	0.00	10.27	10.27
	0.0	1	0.00	7.48	7.48	0.00	10.27	10.27
-1.39	281.4	1	7.08	7.48	7.48	0.00	10.27	10.27

H. W. Lochner, Inc. | PHONE: 859-224-4476 | SHEET 1 OF 9
1040 Monarch St. Suite 300 | Lexington, KY 40513 | JOB NO. HLB#160
PROGRAM: RC-PIER® v4.1.0 LEAP Software Inc., Tampa, Florida | BY JMJ DATE Jun/12/2006
PHONE : TOLL-FREE 1-800-451-5327 TAMPA AREA: 813-985-9170 | CKD. WDB DATE 7/06

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA

PROJECT DATA
============

Project : BONNER BRIDGE - OREGON INLET NORTH CAROLINA
User Job No.: HLB#160
State : North Carolina State Job No. :
Code : AASHTO STANDARD (17th Edition 2002)
Comments : Bonner Bridge HLB #160 - Load Groups 4-6 (For Ease of Checking) - Per Pla
n Dimensions

H. W. Lochner, Inc. PHONE: 859-224-4476
1040 Monarch St. Suite 300 Lexington, KY 40513
SHEET 2 OF 9
JOB NO. HLB#160
PROGRAM: RC-PIER® v4.1.0 LEAP Software Inc., Tampa, Florida
BY JMJ DATE Jun/12/2006
PHONE : TOLL-FREE 1-800-451-5327 TAMPA AREA: 813-985-9170
CKD. WDB DATE 7/06

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA

LOADS
=====

Load Cases: 3

Loadcase ID: (L+In)1 Name: Group 4 Loadings
Multiplier = 1.000

Cap loads:

Type	Dir	Arm ft	Mag1 kip,kip/ft, kft	x1/L	Mag2 kip,kip/ft, kft	x2/L
Force	Y	0.00	-343.23	0.00	----	----
Force	Y	0.00	-404.05	1.00	----	----
Moment	Z	----	709.90	0.00	----	----
Moment	Z	----	720.84	1.00	----	----

Loadcase ID: (L+Ip)1 Name: Group 5 Loadings
Multiplier = 1.000

Cap loads:

Type	Dir	Arm ft	Mag1 kip,kip/ft, kft	x1/L	Mag2 kip,kip/ft, kft	x2/L
Force	Y	0.00	-303.99	0.00	----	----
Force	Y	0.00	-262.11	1.00	----	----
Moment	X	----	-422.90	1.00	----	----
Moment	X	----	423.00	0.00	----	----
Moment	Z	----	647.23	0.00	----	----
Moment	Z	----	748.28	1.00	----	----

Loadcase ID: W1 Name: Group 6 Loadings
Multiplier = 1.000

Cap loads:

Type	Dir	Arm ft	Mag1 kip,kip/ft, kft	x1/L	Mag2 kip,kip/ft, kft	x2/L
Force	Y	0.00	-340.24	0.00	----	----
Force	Y	0.00	-378.31	1.00	----	----
Moment	X	----	-311.00	1.00	----	----
Moment	X	----	311.06	0.00	----	----
Moment	Z	----	659.18	0.00	----	----
Moment	Z	----	716.56	1.00	----	----

Selected load groups:

SERVICE GROUP I
SERVICE GROUP IB
SERVICE GROUP II

H. W. Lochner, Inc. PHONE: 859-224-4476 | SHEET 3 OF 9
1040 Monarch St. Suite 300 Lexington, KY 40513 | JOB NO. HLB#160
PROGRAM: RC-PIER® v4.1.0 LEAP Software Inc., Tampa, Florida | BY JMJ DATE Jun/12/2006
PHONE : TOLL-FREE 1-800-451-5327 TAMPA AREA: 813-985-9170 | CKD. WDB DATE 7/06

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA

COMBINED FOOTING DESIGN

Code: AASHTO STANDARD (17th Edition 2002) - Service Load Design
Units: US

Geometry:
=========
Name : 1
Shape : Rectangular, Type : Pile/Shaft Cap

Bf(X) = 31.00 ft, Hf(Z) = 9.00 ft, Thickness(Y) = 51.00 in

Footing concentric.
Columns located on the footing:
Column No. 1 at x = 0.00 ft, Round D = 12.00 in
Column No. 2 at x = 21.58 ft, Round D = 12.00 in

Ag = 279.00 ft^2, Ix = 62.50 ft^2, Iz = 985.00 ft^2

Surcharge = 0.00 ksf

Piles: Circular Size: 22.00 in Capacity: 100.00 kips

Design Parameters:
==================
f'c = 3000.00 psi fy = 40000.00 psi
Ec = 3320.6 ksi Es = 29000.0 ksi
Crack control factor z = 130.00 kips/in
Concrete Type : Normal Weight.

Pile Reactions, Service (Without the reduction of overstress allowance):
========================

Pile	Loc(X) ft	X in	Z in	Column Loads col#	comb	Ovs	P, kips	Mxx, kft	Mzz, kft	Pile Reac. kips
1	-2.70	24.0	30.0	1	1	1.000	-343.36	0.00	704.74	103.17*
				2	1	1.000	-403.92	0.00	719.76	
				1	4	1.250	340.36	-310.86	-654.16	-67.33
				2	4	1.250	378.19	310.80	-715.54	
2	2.80	90.0	30.0	1	1	1.000	-343.36	0.00	704.74	98.83
				2	1	1.000	-403.92	0.00	719.76	
				1	4	1.250	340.36	-310.86	-654.16	-61.93
				2	4	1.250	378.19	310.80	-715.54	
3	10.80	186.0	30.0	1	1	1.000	-343.36	0.00	704.74	92.51
				2	1	1.000	-403.92	0.00	719.76	
				1	4	1.250	340.36	-310.86	-654.16	-54.07
				2	4	1.250	378.19	310.80	-715.54	
4	18.80	282.0	30.0	1	1	1.000	-343.36	0.00	704.74	86.20
				2	1	1.000	-403.92	0.00	719.76	
				1	4	1.250	340.36	-310.86	-654.16	-46.21
				2	4	1.250	378.19	310.80	-715.54	
5	24.30	348.0	30.0	1	1	1.000	-343.36	0.00	704.74	81.86
				2	1	1.000	-403.92	0.00	719.76	
				1	4	1.250	340.36	-310.86	-654.16	-40.81
				2	4	1.250	378.19	310.80	-715.54	
6	-2.70	24.0	-30.0	1	1	1.000	-343.36	0.00	704.74	103.17*
				2	1	1.000	-403.92	0.00	719.76	
				1	4	1.250	340.36	-310.86	-654.16	-67.33

				2	4	1.250	378.19	310.80	-715.54	
7	2.80	90.0	-30.0	1	1	1.000	-343.36	0.00	704.74	98.83
				2	1	1.000	-403.92	0.00	719.76	
				1	4	1.250	340.36	-310.86	-654.16	-61.93
				2	4	1.250	378.19	310.80	-715.54	
8	10.80	186.0	-30.0	1	1	1.000	-343.36	0.00	704.74	92.51
				2	1	1.000	-403.92	0.00	719.76	
				1	4	1.250	340.36	-310.86	-654.16	-54.07
				2	4	1.250	378.19	310.80	-715.54	
9	18.80	282.0	-30.0	1	1	1.000	-343.36	0.00	704.74	86.20
				2	1	1.000	-403.92	0.00	719.76	
				1	4	1.250	340.36	-310.86	-654.16	-46.21
				2	4	1.250	378.19	310.80	-715.54	
10	24.30	348.0	-30.0	1	1	1.000	-343.36	0.00	704.74	81.86
				2	1	1.000	-403.92	0.00	719.76	
				1	4	1.250	340.36	-310.86	-654.16	-40.80
				2	4	1.250	378.19	310.80	-715.54	

Pile Reactions, Service (After the reduction of overstress allowance):
==========

Pile	Loc(X) ft	X in	Z in	Column Loads col#	comb	Ovs	P, kips	Mxx, kft	Mzz, kft	Pile Reac. kips
1	-2.70	24.0	30.0	1	1	1.000	-343.36	0.00	704.74	103.17*
				2	1	1.000	-403.92	0.00	719.76	
				1	4	1.250	340.36	-310.86	-654.16	-53.87
				2	4	1.250	378.19	310.80	-715.54	
2	2.80	90.0	30.0	1	1	1.000	-343.36	0.00	704.74	98.83
				2	1	1.000	-403.92	0.00	719.76	
				1	4	1.250	340.36	-310.86	-654.16	-49.54
				2	4	1.250	378.19	310.80	-715.54	
3	10.80	186.0	30.0	1	1	1.000	-343.36	0.00	704.74	92.51
				2	1	1.000	-403.92	0.00	719.76	
				1	4	1.250	340.36	-310.86	-654.16	-43.26
				2	4	1.250	378.19	310.80	-715.54	
4	18.80	282.0	30.0	1	1	1.000	-343.36	0.00	704.74	86.20
				2	1	1.000	-403.92	0.00	719.76	
				1	4	1.250	340.36	-310.86	-654.16	-36.97
				2	4	1.250	378.19	310.80	-715.54	
5	24.30	348.0	30.0	1	1	1.000	-343.36	0.00	704.74	81.86
				2	1	1.000	-403.92	0.00	719.76	
				1	4	1.250	340.36	-310.86	-654.16	-32.65
				2	4	1.250	378.19	310.80	-715.54	
6	-2.70	24.0	-30.0	1	1	1.000	-343.36	0.00	704.74	103.17*
				2	1	1.000	-403.92	0.00	719.76	
				1	4	1.250	340.36	-310.86	-654.16	-53.86
				2	4	1.250	378.19	310.80	-715.54	
7	2.80	90.0	-30.0	1	1	1.000	-343.36	0.00	704.74	98.83
				2	1	1.000	-403.92	0.00	719.76	
				1	4	1.250	340.36	-310.86	-654.16	-49.54
				2	4	1.250	378.19	310.80	-715.54	
8	10.80	186.0	-30.0	1	1	1.000	-343.36	0.00	704.74	92.51
				2	1	1.000	-403.92	0.00	719.76	
				1	4	1.250	340.36	-310.86	-654.16	-43.25
				2	4	1.250	378.19	310.80	-715.54	
9	18.80	282.0	-30.0	1	1	1.000	-343.36	0.00	704.74	86.20
				2	1	1.000	-403.92	0.00	719.76	
				1	4	1.250	340.36	-310.86	-654.16	-36.97

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA

				2	4	1.250	378.19	310.80	-715.54	
10	24.30	348.0	-30.0	1	1	1.000	-343.36	0.00	704.74	81.86
				2	1	1.000	-403.92	0.00	719.76	
				1	4	1.250	340.36	-310.86	-654.16	-32.64
				2	4	1.250	378.19	310.80	-715.54	

Note:
* Force in pile is greater than pile capacity.

Only max. force in piles is considered for design.
Pile coordinates X and Z are from the most left edge of the footing.

Max. Pile Reaction Used in Design: (without selfweight and surcharge)
==========

Working Stress pile reaction = 85.38 kips

Reinforcement Schedule:
==========:

Dir	Quantity	Size	Bar dist. in	As total in^2	From ft	To ft	Hook
X	13	# 8	44.38	10.27	0.50	30.50	None
X	12	# 6	22.13	5.28	0.50	30.50	Both
X	5	# 6	6.00	2.20	0.50	30.50	Both
Z	24	# 5	45.19	7.44	----	----	Both
Z	41	# 6	21.38	18.04	----	----	Both
Z	8	# 11	7.45	12.48	----	----	None
Z	24	# 5	5.31	7.44	----	----	Both

Flexure:
========

X direction

Loc ft	Mmax Mmin kft	Comb Comb	Asb_req Asb_req in^2	Asb_prv Asb_prv in^2	Asb_eff Asb_eff in^2	Ast_req Ast_req in^2	Ast_prv Ast_prv in^2	Ast_eff Ast_eff in^2
-4.70	0.0	1	0.00	0.00	0.00	0.00	0.00	0.00
	0.0	1	0.00	0.00	0.00	0.00	0.00	0.00
-4.23	0.0	1	0.00	0.00	0.00	0.00	0.00	0.00
	0.0	1	0.00	0.00	0.00	0.00	0.00	0.00
-3.75	0.0	1	0.00	7.48	3.65	0.00	10.27	3.76
	0.0	1	0.00	7.48	3.65	0.00	10.27	2.55
-3.24	0.0	1	0.00	7.48	7.48	0.00	10.27	8.06
	0.0	1	0.00	7.48	7.48	0.00	10.27	5.47
-2.81	0.0	1	0.00	7.48	7.48	0.00	10.27	10.27
	0.0	1	0.00	7.48	7.48	0.00	10.27	7.96
-2.34	62.3	1	1.52	7.48	7.48	0.00	10.27	10.27
	0.0	1	0.00	7.48	7.48	0.00	10.27	10.27
-1.86	143.1	1	3.54	7.48	7.48	0.00	10.27	10.27
	0.0	1	0.00	7.48	7.48	0.00	10.27	10.27
-1.39	223.9	1	5.60	7.48	7.48	0.00	10.27	10.27

H. W. Lochner, Inc. PHONE: 859-224-4476
1040 Monarch St. Suite 300 Lexington, KY 40513
SHEET 1 OF 8
JOB NO. HLB#160
PROGRAM: RC-PIER® v4.1.0 LEAP Software Inc., Tampa, Florida
BY JMJ DATE Jun/12/2006
PHONE : TOLL-FREE 1-800-451-5327 TAMPA AREA: 813-985-9170
CKD. DATE

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA

JMJ 7/06
NDB 7/06

PROJECT DATA
==========

Project : BONNER BRIDGE - OREGON INLET NORTH CAROLINA
User Job No.: HLB#160
State : North Carolina State Job No. :
Code : AASHTO STANDARD (17th Edition 2002)
Comments : Bonner Bridge HLB #160 - Load Groups 1-3 (For Ease of Checking) - Per Field Data, Assume Pile #4 Missing

H. W. Lochner, Inc. PHONE: 859-224-4476 | SHEET 2 OF 8
1040 Monarch St. Suite 300 Lexington, KY 40513 | JOB NO. HLB#160
PROGRAM: RC-PIER® v4.1.0 LEAP Software Inc., Tampa, Florida | BY JMJ DATE Jun/12/2006
PHONE : TOLL-FREE 1-800-451-5327 TAMPA AREA: 813-985-9170 | CKD. DATE

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA

LOADS
=====

Load Cases: 3

Loadcase ID: (L+In)1 Name: Group 1 Loadings
Multiplier = 1.000

Cap loads:

Type	Dir	Arm ft	Mag1 kip,kip/ft, kft	x1/L	Mag2 kip,kip/ft, kft	x2/L
Force	Y	0.00	-412.88	0.00	----	----
Force	Y	0.00	-512.17	1.00	----	----
Moment	Z	----	-15.58	0.00	----	----
Moment	Z	----	1.93	1.00	----	----

Loadcase ID: (L+Ip)1 Name: Group 2 Loadings
Multiplier = 1.000

Cap loads:

Type	Dir	Arm ft	Mag1 kip,kip/ft, kft	x1/L	Mag2 kip,kip/ft, kft	x2/L
Force	Y	0.00	-352.82	0.00	----	----
Force	Y	0.00	-307.96	1.00	----	----
Moment	X	----	-439.82	1.00	----	----
Moment	X	----	439.92	0.00	----	----
Moment	Z	----	-41.99	0.00	----	----
Moment	Z	----	62.61	1.00	----	----

Loadcase ID: W1 Name: Group 3 Loadings
Multiplier = 1.000

Cap loads:

Type	Dir	Arm ft	Mag1 kip,kip/ft, kft	x1/L	Mag2 kip,kip/ft, kft	x2/L
Force	Y	0.00	-390.52	0.00	----	----
Force	Y	0.00	-428.81	1.00	----	----
Moment	X	----	-323.44	1.00	----	----
Moment	X	----	323.51	0.00	----	----
Moment	Z	----	-29.58	0.00	----	----
Moment	Z	----	29.63	1.00	----	----

Selected load groups:

SERVICE GROUP I
SERVICE GROUP IB
SERVICE GROUP II

H. W. Lochner, Inc. PHONE: 859-224-4476 | SHEET 3 OF 8
1040 Monarch St. Suite 300 Lexington, KY 40513 | JOB NO. HLB#160
PROGRAM: RC-PIER® v4.1.0 LEAP Software Inc., Tampa, Florida | BY JMJ DATE Jun/12/2006
PHONE : TOLL-FREE 1-800-451-5327 TAMPA AREA: 813-985-9170 | CKD. DATE

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA

COMBINED FOOTING DESIGN

Code: AASHTO STANDARD (17th Edition 2002) - Service Load Design
Units: US

Geometry:
=========
Name : 1
Shape : Rectangular, Type : Pile/Shaft Cap

Bf(X) = 31.00 ft, Hf(Z) = 9.00 ft, Thickness(Y) = 51.00 in

Footing concentric.
Columns located on the footing:
Column No. 1 at x = 0.00 ft, Rectangular 36.00 in x 47.50 in
Column No. 2 at x = 21.58 ft, Rectangular 36.00 in x 47.50 in

Ag = 279.00 ft^2, Ix = 55.56 ft^2, Iz = 913.89 ft^2

Surcharge = 0.00 ksf

Piles: Circular Size: 22.00 in Capacity: 100.00 kips

Design Parameters:
==================
f'c = 4400.00 psi fy = 40000.00 psi
Ec = 4021.4 ksi Es = 29000.0 ksi
Crack control factor z = 130.00 kips/in
Concrete Type : Normal Weight.

Pile Reactions, Service (Without the reduction of overstress allowance):
========================

Pile	Loc(X) ft	X in	Z in	Column Loads col#	comb	Ovs	P, kips	Mxx, kft	Mzz, kft	Pile Reac. kips
1	-2.70	24.0	30.0	1	1	1.000	-412.88	0.00	-19.68	128.10*
				2	1	1.000	-512.17	0.00	1.95	
				1	4	1.250	390.52	-323.36	33.43	-83.09
				2	4	1.250	428.81	323.29	-29.66	
2	2.80	90.0	30.0	1	1	1.000	-412.88	0.00	-19.68	129.22*
				2	1	1.000	-512.17	0.00	1.95	
				1	4	1.250	390.52	-323.36	33.43	-82.79
				2	4	1.250	428.81	323.29	-29.66	
3	10.80	186.0	30.0	1	1	1.000	-412.88	0.00	-19.68	130.85*
				2	1	1.000	-512.17	0.00	1.95	
				1	4	1.250	390.52	-323.36	33.43	-82.36
				2	4	1.250	428.81	323.29	-29.66	
4	18.80	282.0	30.0	1	1	1.000	-412.88	0.00	-19.68	132.47*
				2	1	1.000	-512.17	0.00	1.95	
				1	4	1.250	390.52	-323.36	33.43	-81.92
				2	4	1.250	428.81	323.29	-29.66	
5	24.30	348.0	30.0	1	1	1.000	-412.88	0.00	-19.68	133.59*
				2	1	1.000	-512.17	0.00	1.95	
				1	4	1.250	390.52	-323.36	33.43	-81.62
				2	4	1.250	428.81	323.29	-29.66	
6	-2.70	24.0	-30.0	1	1	1.000	-412.88	0.00	-19.68	109.02*
				2	1	1.000	-512.17	0.00	1.95	
				1	4	1.250	390.52	-323.36	33.43	-58.26

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA

				2	4	1.250	428.81	323.29	-29.66	
7	10.80	186.0	-30.0	1	1	1.000	-412.88	0.00	-19.68	111.76*
				2	1	1.000	-512.17	0.00	1.95	
				1	4	1.250	390.52	-323.36	33.43	-57.53
				2	4	1.250	428.81	323.29	-29.66	
8	18.80	282.0	-30.0	1	1	1.000	-412.88	0.00	-19.68	113.39*
				2	1	1.000	-512.17	0.00	1.95	
				1	4	1.250	390.52	-323.36	33.43	-57.09
				2	4	1.250	428.81	323.29	-29.66	
9	24.30	348.0	-30.0	1	1	1.000	-412.88	0.00	-19.68	114.51*
				2	1	1.000	-512.17	0.00	1.95	
				1	4	1.250	390.52	-323.36	33.43	-56.79
				2	4	1.250	428.81	323.29	-29.66	

Pile Reactions, Service (After the reduction of overstress allowance):

Pile	Loc(X) ft	X in	Z in	Column Loads col#	comb	Ovs	P, kips	Mxx, kft	Mzz, kft	Pile Reac. kips
1	-2.70	24.0	30.0	1	1	1.000	-412.88	0.00	-19.68	128.10*
				2	1	1.000	-512.17	0.00	1.95	
				1	4	1.250	390.52	-323.36	33.43	-66.47
				2	4	1.250	428.81	323.29	-29.66	
2	2.80	90.0	30.0	1	1	1.000	-412.88	0.00	-19.68	129.22*
				2	1	1.000	-512.17	0.00	1.95	
				1	4	1.250	390.52	-323.36	33.43	-66.23
				2	4	1.250	428.81	323.29	-29.66	
3	10.80	186.0	30.0	1	1	1.000	-412.88	0.00	-19.68	130.85*
				2	1	1.000	-512.17	0.00	1.95	
				1	4	1.250	390.52	-323.36	33.43	-65.89
				2	4	1.250	428.81	323.29	-29.66	
4	18.80	282.0	30.0	1	1	1.000	-412.88	0.00	-19.68	132.47*
				2	1	1.000	-512.17	0.00	1.95	
				1	4	1.250	390.52	-323.36	33.43	-65.54
				2	4	1.250	428.81	323.29	-29.66	
5	24.30	348.0	30.0	1	1	1.000	-412.88	0.00	-19.68	133.59*
				2	1	1.000	-512.17	0.00	1.95	
				1	4	1.250	390.52	-323.36	33.43	-65.30
				2	4	1.250	428.81	323.29	-29.66	
6	-2.70	24.0	-30.0	1	1	1.000	-412.88	0.00	-19.68	109.02*
				2	1	1.000	-512.17	0.00	1.95	
				1	4	1.250	390.52	-323.36	33.43	-46.61
				2	4	1.250	428.81	323.29	-29.66	
7	10.80	186.0	-30.0	1	1	1.000	-412.88	0.00	-19.68	111.76*
				2	1	1.000	-512.17	0.00	1.95	
				1	4	1.250	390.52	-323.36	33.43	-46.02
				2	4	1.250	428.81	323.29	-29.66	
8	18.80	282.0	-30.0	1	1	1.000	-412.88	0.00	-19.68	113.39*
				2	1	1.000	-512.17	0.00	1.95	
				1	4	1.250	390.52	-323.36	33.43	-45.68
				2	4	1.250	428.81	323.29	-29.66	
9	24.30	348.0	-30.0	1	1	1.000	-412.88	0.00	-19.68	114.51*
				2	1	1.000	-512.17	0.00	1.95	
				1	4	1.250	390.52	-323.36	33.43	-45.44
				2	4	1.250	428.81	323.29	-29.66	

Note:

H. W. Lochner, Inc. PHONE: 859-224-4476 | SHEET 5 OF 8
1040 Monarch St. Suite 300 Lexington, KY 40513 | JOB NO. HLB#160
PROGRAM: RC-PIER® v4.1.0 LEAP Software Inc., Tampa, Florida | BY JMJ DATE Jun/12/2006
PHONE : TOLL-FREE 1-800-451-5327 TAMPA AREA: 813-985-9170 | CKD. DATE

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA

* Force in pile is greater than pile capacity.

Only max. force in piles is considered for design.
Pile coordinates X and Z are from the most left edge of the footing.

Max. Pile Reaction Used in Design: (without selfweight and surcharge)

Working Stress pile reaction = 118.46 kips

Reinforcement Schedule:

Dir	Quantity	Size	Bar dist. in	As total in^2	From ft	To ft	Hook
X	13	# 8	44.38	10.27	0.50	30.50	None
X	12	# 6	22.13	5.28	0.50	30.50	Both
X	5	# 6	6.00	2.20	0.50	30.50	Both
Z	24	# 5	45.19	7.44	----	----	Both
Z	41	# 6	21.38	18.04	----	----	Both
Z	8	# 11	7.45	12.48	----	----	None
Z	24	# 5	5.31	7.44	----	----	Both

Flexure:

X direction

Loc ft	Mmax Mmin kft	Comb Comb	Asb_req Asb_req in^2	Asb_prv Asb_prv in^2	Asb_eff Asb_eff in^2	Ast_req Ast_req in^2	Ast_prv Ast_prv in^2	Ast_eff Ast_eff in^2
-4.70	0.0	1	0.00	0.00	0.00	0.00	0.00	0.00
	0.0	1	0.00	0.00	0.00	0.00	0.00	0.00
-4.34	0.0	1	0.00	0.00	0.00	0.00	0.00	0.00
	0.0	1	0.00	0.00	0.00	0.00	0.00	0.00
-4.30	0.0	1	0.00	0.00	0.00	0.00	0.00	0.00
	0.0	1	0.00	0.00	0.00	0.00	0.00	0.00
-3.63	0.0	1	0.00	7.48	5.62	0.00	10.27	5.79
	0.0	1	0.00	7.48	5.62	0.00	10.27	3.93
-3.28	0.0	1	0.00	7.48	7.48	0.00	10.27	9.42
	0.0	1	0.00	7.48	7.48	0.00	10.27	6.39
-2.92	0.0	1	0.00	7.48	7.48	0.00	10.27	10.27
	0.0	1	0.00	7.48	7.48	0.00	10.27	8.85
-2.57	31.6	1	0.76	7.48	7.48	0.00	10.27	10.27
	0.0	1	0.00	7.48	7.48	0.00	10.27	10.27
-2.21	115.8	1	2.85	7.48	7.48	0.00	10.27	10.27
	0.0	1	0.00	7.48	7.48	0.00	10.27	10.27
-1.86	200.1	1	4.97	7.48	7.48	0.00	10.27	10.27
	0.0	1	0.00	7.48	7.48	0.00	10.27	10.27
-1.50	284.3	1	7.12	7.48	7.48	0.00	10.27	10.27
	0.0	1	0.00	7.48	7.48	0.00	10.27	10.27
0.00	0.0	1	0.00	7.48	7.48	0.00	10.27	10.27
	0.0	1	0.00	7.48	7.48	0.00	10.27	10.27
1.50	262.0	1	6.54	7.48	7.48	0.00	10.27	10.27

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA

	0.0	1	0.00	7.48	7.48	0.00	10.27	10.27
4.30	0.0	1	0.00	7.48	7.48	0.00	10.27	10.27
	-265.7	1	0.00	7.48	7.48	4.97	10.27	10.27
6.15	0.0	1	0.00	7.48	7.48	0.00	10.27	10.27
	-511.6	1	0.00	7.48	7.48	9.71	10.27	10.27
8.47	0.0	1	0.00	7.48	7.48	0.00	10.27	10.27
	-821.4	1	0.00	7.48	7.48	15.80	10.27 *	10.27
10.79	0.0	1	0.00	7.48	7.48	0.00	10.27	10.27
	-1131.2	1	0.00	7.48	7.48	22.00	10.27 *	10.27
13.11	0.0	1	0.00	7.48	7.48	0.00	10.27	10.27
	-892.6	1	0.00	7.48	7.48	17.22	10.27 *	10.27
15.44	0.0	1	0.00	7.48	7.48	0.00	10.27	10.27
	-652.1	1	0.00	7.48	7.48	12.46	10.27 *	10.27
17.28	0.0	1	0.00	7.48	7.48	0.00	10.27	10.27
	-461.1	1	0.00	7.48	7.48	8.73	10.27	10.27
20.08	133.0	1	3.27	7.48	7.48	0.00	10.27	10.27
	0.0	1	0.00	7.48	7.48	0.00	10.27	10.27
21.58	0.0	1	0.00	7.48	7.48	0.00	10.27	10.27
	0.0	1	0.00	7.48	7.48	0.00	10.27	10.27
23.08	288.3	1	7.22	7.48	7.48	0.00	10.27	10.27
	0.0	1	0.00	7.48	7.48	0.00	10.27	10.27
23.44	203.6	1	5.06	7.48	7.48	0.00	10.27	10.27
	0.0	1	0.00	7.48	7.48	0.00	10.27	10.27
23.80	119.0	1	2.92	7.48	7.48	0.00	10.27	10.27
	0.0	1	0.00	7.48	7.48	0.00	10.27	10.27
24.16	34.3	1	0.83	7.48	7.48	0.00	10.27	10.27
	0.0	1	0.00	7.48	7.48	0.00	10.27	10.27
24.51	0.0	1	0.00	7.48	7.48	0.00	10.27	10.27
	0.0	1	0.00	7.48	7.48	0.00	10.27	8.92
24.87	0.0	1	0.00	7.48	7.48	0.00	10.27	9.50
	0.0	1	0.00	7.48	7.48	0.00	10.27	6.44
25.23	0.0	1	0.00	7.48	5.68	0.00	10.27	5.85
	0.0	1	0.00	7.48	5.68	0.00	10.27	3.97
25.59	0.0	1	0.00	7.48	2.13	0.00	10.27	2.20
	0.0	1	0.00	7.48	2.13	0.00	10.27	1.49
25.88	0.0	1	0.00	0.00	0.00	0.00	0.00	0.00
	0.0	1	0.00	0.00	0.00	0.00	0.00	0.00
26.30	0.0	1	0.00	0.00	0.00	0.00	0.00	0.00
	0.0	1	0.00	0.00	0.00	0.00	0.00	0.00

Z direction

Loc ft	Mmax kft	Comb	Asb_req in^2	Asb_prv in^2	Asb_eff in^2	Ast_req in^2	Ast_prv in^2	Ast_eff in^2
-1.98	246.8	1	5.40	37.96	37.96	0.00	7.44	7.44
1.98	308.5	1	6.77	37.96	37.96	0.00	7.44	7.44

Note:
* The provided reinforcement is not adequate, either less than required or larger than maximum allowed.

One Way Shear:
==========

Col	Dist ft	Comb	d in	V kips	Vc kips

H. W. Lochner, Inc. PHONE: 859-224-4476 | SHEET 7 OF 8
1040 Monarch St. Suite 300 Lexington, KY 40513 | JOB NO. HLB#160
PROGRAM: RC-PIER® v4.1.0 LEAP Software Inc., Tampa, Florida | BY JMJ DATE Jun/12/2006
PHONE : TOLL-FREE 1-800-451-5327 TAMPA AREA: 813-985-9170 | CKD. DATE

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA

X direction

1	-4.30	1	48.00	0.0	326.7
	4.30	1	33.62	133.4	228.8
2	17.28	1	33.62	103.6	228.8
	25.88	1	48.00	0.0	326.7

Z direction

Z	-5.09	----	------	Outside of Footing

Two Way Shear:
==========

#	Bo ft	Ao ft^2	Comb	Avg. d in	V kips	Vc kips
Columns:						
1	26.94	45.14	1	39.08	488.7	1508.6
2	26.94	45.14	1	39.08	577.4	1508.6
Piles - max:						
2	8.00	12.72	1	39.08	0.0	447.8
Piles - min:						
1	6.00	15.45	1	39.08	0.0	335.9

Note:
TWO WAY SHEAR IN FOOTING IS NOT DESIGNED AND STIRRUPS ARE NOT CONSIDERED.

H. W. Lochner, Inc. PHONE: 859-224-4476
1040 Monarch St. Suite 300 Lexington, KY 40513
SHEET 1 OF 8
JOB NO. HLB#160
BY JMJ DATE Jun/12/2006
CKD. DATE

PROGRAM: RC-PIER® v4.1.0 LEAP Software Inc., Tampa, Florida
PHONE : TOLL-FREE 1-800-451-5327 TAMPA AREA: 813-985-9170

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA

JMJ 7/06
WDB 7/06

PROJECT DATA
============

Project : BONNER BRIDGE - OREGON INLET NORTH CAROLINA
User Job No.: HLB#160
State : North Carolina State Job No. :
Code : AASHTO STANDARD (17th Edition 2002)
Comments : Bonner Bridge HLB #160 - Load Groups 4-6 (For Ease of Checking) - Per Field Data, Assume Pile #4 Missing

H. W. Lochner, Inc. PHONE: 859-224-4476 | SHEET 2 OF 8
1040 Monarch St. Suite 300 Lexington, KY 40513 | JOB NO. HLB#160
PROGRAM: RC-PIER® v4.1.0 LEAP Software Inc., Tampa, Florida | BY JMJ DATE Jun/12/2006
PHONE : TOLL-FREE 1-800-451-5327 TAMPA AREA: 813-985-9170 | CKD. DATE

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA

LOADS
=====

Load Cases: 3

Loadcase ID: (L+In)1 Name: Group 4 Loadings
Multiplier = 1.000

Cap loads:

Type	Dir	Arm ft	Mag1 kip,kip/ft, kft	x1/L	Mag2 kip,kip/ft, kft	x2/L
Force	Y	0.00	-343.23	0.00	----	----
Force	Y	0.00	-404.05	1.00	----	----
Moment	Z	----	709.90	0.00	----	----
Moment	Z	----	720.84	1.00	----	----

Loadcase ID: (L+Ip)1 Name: Group 5 Loadings
Multiplier = 1.000

Cap loads:

Type	Dir	Arm ft	Mag1 kip,kip/ft, kft	x1/L	Mag2 kip,kip/ft, kft	x2/L
Force	Y	0.00	-303.99	0.00	----	----
Force	Y	0.00	-262.11	1.00	----	----
Moment	X	----	-422.90	1.00	----	----
Moment	X	----	423.00	0.00	----	----
Moment	Z	----	647.23	0.00	----	----
Moment	Z	----	748.28	1.00	----	----

Loadcase ID: W1 Name: Group 6 Loadings
Multiplier = 1.000

Cap loads:

Type	Dir	Arm ft	Mag1 kip,kip/ft, kft	x1/L	Mag2 kip,kip/ft, kft	x2/L
Force	Y	0.00	-340.24	0.00	----	----
Force	Y	0.00	-378.31	1.00	----	----
Moment	X	----	-311.00	1.00	----	----
Moment	X	----	311.06	0.00	----	----
Moment	Z	----	659.18	0.00	----	----
Moment	Z	----	716.56	1.00	----	----

Selected load groups:

SERVICE GROUP I
SERVICE GROUP IB
SERVICE GROUP II

H. W. Lochner, Inc. PHONE: 859-224-4476 | SHEET 3 OF 8
1040 Monarch St. Suite 300 Lexington, KY 40513 | JOB NO. HLB#160
PROGRAM: RC-PIER® v4.1.0 LEAP Software Inc., Tampa, Florida | BY JMJ DATE Jun/12/2006
PHONE : TOLL-FREE 1-800-451-5327 TAMPA AREA: 813-985-9170 | CKD. DATE

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA

COMBINED FOOTING DESIGN

Code: AASHTO STANDARD (17th Edition 2002) - Service Load Design
Units: US

Geometry:
=========
Name : 1
Shape : Rectangular, Type : Pile/Shaft Cap

Bf(X) = 31.00 ft, Hf(Z) = 9.00 ft, Thickness(Y) = 51.00 in

Footing concentric.
Columns located on the footing:
Column No. 1 at x = 0.00 ft, Rectangular 36.00 in x 47.50 in
Column No. 2 at x = 21.58 ft, Rectangular 36.00 in x 47.50 in

Ag = 279.00 ft^2, Ix = 55.56 ft^2, Iz = 913.89 ft^2

Surcharge = 0.00 ksf

Piles: Circular Size: 22.00 in Capacity: 100.00 kips

Design Parameters:
==================
f'c = 4400.00 psi fy = 40000.00 psi
Ec = 4021.4 ksi Es = 29000.0 ksi
Crack control factor z = 130.00 kips/in
Concrete Type : Normal Weight.

Pile Reactions, Service (Without the reduction of overstress allowance):
========================

Pile	Loc(X) ft	X in	Z in	Column Loads col#	comb	Ovs	P, kips	Mxx, kft	Mzz, kft	Pile Reac. kips
1	-2.70	24.0	30.0	1	1	1.000	-343.32	0.00	705.15	132.04*
				2	1	1.000	-403.96	0.00	720.18	
				1	4	1.250	340.32	-310.92	-654.56	-90.16
				2	4	1.250	378.23	310.86	-715.95	
2	2.80	90.0	30.0	1	1	1.000	-343.32	0.00	705.15	122.70*
				2	1	1.000	-403.96	0.00	720.18	
				1	4	1.250	340.32	-310.92	-654.56	-81.96
				2	4	1.250	378.23	310.86	-715.95	
3	10.80	186.0	30.0	1	1	1.000	-343.32	0.00	705.15	109.12*
				2	1	1.000	-403.96	0.00	720.18	
				1	4	1.250	340.32	-310.92	-654.56	-70.04
				2	4	1.250	378.23	310.86	-715.95	
4	18.80	282.0	30.0	1	1	1.000	-343.32	0.00	705.15	95.54
				2	1	1.000	-403.96	0.00	720.18	
				1	4	1.250	340.32	-310.92	-654.56	-58.12
				2	4	1.250	378.23	310.86	-715.95	
5	24.30	348.0	30.0	1	1	1.000	-343.32	0.00	705.15	86.20
				2	1	1.000	-403.96	0.00	720.18	
				1	4	1.250	340.32	-310.92	-654.56	-49.92
				2	4	1.250	378.23	310.86	-715.95	
6	-2.70	24.0	-30.0	1	3	1.250	-340.32	310.92	654.56	121.28*
				2	3	1.250	-378.23	-310.86	715.95	
				1	4	1.250	340.32	-310.92	-654.56	-70.72

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA

				2	4	1.250	378.23	310.86	-715.95	
7	10.80	186.0	-30.0	1	1	1.000	-343.32	0.00	705.15	98.28
				2	1	1.000	-403.96	0.00	720.18	
				1	4	1.250	340.32	-310.92	-654.56	-50.60
				2	4	1.250	378.23	310.86	-715.95	
8	18.80	282.0	-30.0	1	1	1.000	-343.32	0.00	705.15	84.70
				2	1	1.000	-403.96	0.00	720.18	
				1	4	1.250	340.32	-310.92	-654.56	-38.68
				2	4	1.250	378.23	310.86	-715.95	
9	24.30	348.0	-30.0	1	1	1.000	-343.32	0.00	705.15	75.36
				2	1	1.000	-403.96	0.00	720.18	
				1	4	1.250	340.32	-310.92	-654.56	-30.49
				2	4	1.250	378.23	310.86	-715.95	

Pile Reactions, Service (After the reduction of overstress allowance):

Pile	Loc(X) ft	X in	Z in	Column Loads col#	comb	Ovs	P, kips	Mxx, kft	Mzz, kft	Pile Reac. kips
1	-2.70	24.0	30.0	1	1	1.000	-343.32	0.00	705.15	132.04*
				2	1	1.000	-403.96	0.00	720.18	
				1	4	1.250	340.32	-310.92	-654.56	-72.12
				2	4	1.250	378.23	310.86	-715.95	
2	2.80	90.0	30.0	1	1	1.000	-343.32	0.00	705.15	122.70*
				2	1	1.000	-403.96	0.00	720.18	
				1	4	1.250	340.32	-310.92	-654.56	-65.57
				2	4	1.250	378.23	310.86	-715.95	
3	10.80	186.0	30.0	1	1	1.000	-343.32	0.00	705.15	109.12*
				2	1	1.000	-403.96	0.00	720.18	
				1	4	1.250	340.32	-310.92	-654.56	-56.03
				2	4	1.250	378.23	310.86	-715.95	
4	18.80	282.0	30.0	1	1	1.000	-343.32	0.00	705.15	95.54
				2	1	1.000	-403.96	0.00	720.18	
				1	4	1.250	340.32	-310.92	-654.56	-46.49
				2	4	1.250	378.23	310.86	-715.95	
5	24.30	348.0	30.0	1	1	1.000	-343.32	0.00	705.15	86.20
				2	1	1.000	-403.96	0.00	720.18	
				1	4	1.250	340.32	-310.92	-654.56	-39.94
				2	4	1.250	378.23	310.86	-715.95	
6	-2.70	24.0	-30.0	1	1	1.000	-343.32	0.00	705.15	121.20*
				2	1	1.000	-403.96	0.00	720.18	
				1	4	1.250	340.32	-310.92	-654.56	-56.58
				2	4	1.250	378.23	310.86	-715.95	
7	10.80	186.0	-30.0	1	1	1.000	-343.32	0.00	705.15	98.28
				2	1	1.000	-403.96	0.00	720.18	
				1	4	1.250	340.32	-310.92	-654.56	-40.48
				2	4	1.250	378.23	310.86	-715.95	
8	18.80	282.0	-30.0	1	1	1.000	-343.32	0.00	705.15	84.70
				2	1	1.000	-403.96	0.00	720.18	
				1	4	1.250	340.32	-310.92	-654.56	-30.95
				2	4	1.250	378.23	310.86	-715.95	
9	24.30	348.0	-30.0	1	1	1.000	-343.32	0.00	705.15	75.36
				2	1	1.000	-403.96	0.00	720.18	
				1	4	1.250	340.32	-310.92	-654.56	-24.39
				2	4	1.250	378.23	310.86	-715.95	

Note:

H. W. Lochner, Inc. PHONE: 859-224-4476 | SHEET 5 OF 8
1040 Monarch St. Suite 300 Lexington, KY 40513 | JOB NO. HLB#160
PROGRAM: RC-PIER® v4.1.0 LEAP Software Inc., Tampa, Florida | BY JMJ DATE Jun/12/2006
PHONE : TOLL-FREE 1-800-451-5327 TAMPA AREA: 813-985-9170 | CKD. DATE

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA

* Force in pile is greater than pile capacity.

Only max. force in piles is considered for design.
Pile coordinates X and Z are from the most left edge of the footing.

Max. Pile Reaction Used in Design: (without selfweight and surcharge)
==========

Working Stress pile reaction = 111.60 kips

Reinforcement Schedule:
==========:

Dir	Quantity	Size	Bar dist. in	As total in^2	From ft	To ft	Hook
X	13	# 8	44.38	10.27	0.50	30.50	None
X	12	# 6	22.13	5.28	0.50	30.50	Both
X	5	# 6	6.00	2.20	0.50	30.50	Both
Z	24	# 5	45.19	7.44	----	----	Both
Z	41	# 6	21.38	18.04	----	----	Both
Z	8	# 11	7.45	12.48	----	----	None
Z	24	# 5	5.31	7.44	----	----	Both

Flexure:
========

X direction

Loc ft	Mmax Mmin kft	Comb Comb	Asb_req Asb_req in^2	Asb_prv Asb_prv in^2	Asb_eff Asb_eff in^2	Ast_req Ast_req in^2	Ast_prv Ast_prv in^2	Ast_eff Ast_eff in^2
-4.70	0.0	1	0.00	0.00	0.00	0.00	0.00	0.00
	0.0	1	0.00	0.00	0.00	0.00	0.00	0.00
-4.34	0.0	1	0.00	0.00	0.00	0.00	0.00	0.00
	0.0	1	0.00	0.00	0.00	0.00	0.00	0.00
-4.30	0.0	1	0.00	0.00	0.00	0.00	0.00	0.00
	0.0	1	0.00	0.00	0.00	0.00	0.00	0.00
-3.63	0.0	1	0.00	7.48	5.62	0.00	10.27	5.79
	0.0	1	0.00	7.48	5.62	0.00	10.27	3.93
-3.28	0.0	1	0.00	7.48	7.48	0.00	10.27	9.42
	0.0	1	0.00	7.48	7.48	0.00	10.27	6.39
-2.92	0.0	1	0.00	7.48	7.48	0.00	10.27	10.27
	0.0	1	0.00	7.48	7.48	0.00	10.27	8.85
-2.57	29.8	1	0.72	7.48	7.48	0.00	10.27	10.27
	0.0	1	0.00	7.48	7.48	0.00	10.27	10.27
-2.21	109.1	1	2.68	7.48	7.48	0.00	10.27	10.27
	0.0	1	0.00	7.48	7.48	0.00	10.27	10.27
-1.86	188.5	1	4.67	7.48	7.48	0.00	10.27	10.27
	0.0	1	0.00	7.48	7.48	0.00	10.27	10.27
-1.50	267.8	1	6.69	7.48	7.48	0.00	10.27	10.27
	0.0	1	0.00	7.48	7.48	0.00	10.27	10.27
0.00	0.0	1	0.00	7.48	7.48	0.00	10.27	10.27
	0.0	1	0.00	7.48	7.48	0.00	10.27	10.27
1.50	246.8	1	6.15	7.48	7.48	0.00	10.27	10.27

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA

	0.0	1	0.00	7.48	7.48	0.00	10.27	10.27
4.30	0.0	1	0.00	7.48	7.48	0.00	10.27	10.27
	-250.3	1	0.00	7.48	7.48	4.67	10.27	10.27
6.15	0.0	1	0.00	7.48	7.48	0.00	10.27	10.27
	-482.0	1	0.00	7.48	7.48	9.13	10.27	10.27
8.47	0.0	1	0.00	7.48	7.48	0.00	10.27	10.27
	-773.8	1	0.00	7.48	7.48	14.86	10.27 *	10.27
10.79	0.0	1	0.00	7.48	7.48	0.00	10.27	10.27
	-1065.7	1	0.00	7.48	7.48	20.68	10.27 *	10.27
13.11	0.0	1	0.00	7.48	7.48	0.00	10.27	10.27
	-840.9	1	0.00	7.48	7.48	16.19	10.27 *	10.27
15.44	0.0	1	0.00	7.48	7.48	0.00	10.27	10.27
	-614.3	1	0.00	7.48	7.48	11.72	10.27 *	10.27
17.28	0.0	1	0.00	7.48	7.48	0.00	10.27	10.27
	-434.4	1	0.00	7.48	7.48	8.21	10.27	10.27
20.08	125.3	1	3.08	7.48	7.48	0.00	10.27	10.27
	0.0	1	0.00	7.48	7.48	0.00	10.27	10.27
21.58	0.0	1	0.00	7.48	7.48	0.00	10.27	10.27
	0.0	1	0.00	7.48	7.48	0.00	10.27	10.27
23.08	271.6	1	6.79	7.48	7.48	0.00	10.27	10.27
	0.0	1	0.00	7.48	7.48	0.00	10.27	10.27
23.44	191.9	1	4.76	7.48	7.48	0.00	10.27	10.27
	0.0	1	0.00	7.48	7.48	0.00	10.27	10.27
23.80	112.1	1	2.75	7.48	7.48	0.00	10.27	10.27
	0.0	1	0.00	7.48	7.48	0.00	10.27	10.27
24.16	32.3	1	0.78	7.48	7.48	0.00	10.27	10.27
	0.0	1	0.00	7.48	7.48	0.00	10.27	10.27
24.51	0.0	1	0.00	7.48	7.48	0.00	10.27	10.27
	0.0	1	0.00	7.48	7.48	0.00	10.27	8.92
24.87	0.0	1	0.00	7.48	7.48	0.00	10.27	9.50
	0.0	1	0.00	7.48	7.48	0.00	10.27	6.44
25.23	0.0	1	0.00	7.48	5.68	0.00	10.27	5.85
	0.0	1	0.00	7.48	5.68	0.00	10.27	3.97
25.59	0.0	1	0.00	7.48	2.13	0.00	10.27	2.20
	0.0	1	0.00	7.48	2.13	0.00	10.27	1.49
25.88	0.0	1	0.00	0.00	0.00	0.00	0.00	0.00
	0.0	1	0.00	0.00	0.00	0.00	0.00	0.00
26.30	0.0	1	0.00	0.00	0.00	0.00	0.00	0.00
	0.0	1	0.00	0.00	0.00	0.00	0.00	0.00

Z direction

Loc ft	Mmax kft	Comb	Asb_req in^2	Asb_prv in^2	Asb_eff in^2	Ast_req in^2	Ast_prv in^2	Ast_eff in^2
-1.98	232.5	1	5.09	37.96	37.96	0.00	7.44	7.44
1.98	290.6	1	6.38	37.96	37.96	0.00	7.44	7.44

Note:
* The provided reinforcement is not adequate, either less than required or larger than maximum allowed.

One Way Shear:
==========

Col	Dist ft	Comb	d in	V kips	Vc kips

H. W. Lochner, Inc. PHONE: 859-224-4476 | SHEET 7 OF 8
1040 Monarch St. Suite 300 Lexington, KY 40513 | JOB NO. HLB#160
PROGRAM: RC-PIER® v4.1.0 LEAP Software Inc., Tampa, Florida | BY JMJ DATE Jun/12/2006
PHONE : TOLL-FREE 1-800-451-5327 TAMPA AREA: 813-985-9170 | CKD. DATE

PROJECT: BONNER BRIDGE - OREGON INLET NORTH CAROLINA

X direction

1	-4.30	1	48.00	0.0	326.7
	4.30	1	33.62	125.6	228.8
2	17.28	1	33.62	97.6	228.8
	25.88	1	48.00	0.0	326.7

Z direction

Z	-5.09	----	------	Outside of Footing

Two Way Shear:
==========

#	Bo ft	Ao ft^2	Comb	Avg. d in	V kips	Vc kips
Columns:						
1	26.94	45.14	1	39.08	460.4	1508.6
2	26.94	45.14	1	39.08	544.0	1508.6
Piles - max:						
2	8.00	12.72	1	39.08	0.0	447.8
Piles - min:						
1	6.00	15.45	1	39.08	0.0	335.9

Note:
TWO WAY SHEAR IN FOOTING IS NOT DESIGNED AND STIRRUPS ARE NOT CONSIDERED.