

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

MINISTRY OF COMMUNICATIONS

THE GOVERNMENT OF THE PEOPLE'S REPUBLIC OF BANGLADESH

**THE STUDY  
ON  
CONSTRUCTION OF THE BRIDGE OVER THE RIVER RUPSA  
IN KHULNA  
(Phase 2)**

**TECHNICAL REPORT  
VOLUME 2 : BOX CULVERTS AND STAIR CASE**

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MARCH 2000

**PACIFIC CONSULTANTS INTERNATIONAL  
JAPAN OVERSEAS CONSULTANTS**

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**TECHNICAL REPORT  
TABLE OF CONTENTS**

VOLUME 1	BRIDGE
VOLUME 2	BOX CULVERTS, STAIR CASE AND ILLUMINATION
VOLUME 3	ROAD AND RIVER FACILITIES

## **2 -1. DESIGN OF BOX CULVERTS**

## Summary

A total of nine box culverts are designed at various location of the approach roads. Some of them are similar in consideration of box dimensions and number of vents. So analysis and design are made for culverts that are unique in consideration of span, height, number of vents, etc. The stations, number of vents, box dimensions, member (deck slab, side wall, interior wall, etc) dimensions, height of fill above deck slab, etc are presented in the following table.

Location	Alutala Khal	Aralia Khal	Narikalb- aria Khal	Karate Khal	Laurir Khal	Moyur Khal	Khetra Khal	Moriyut- sure Khal	Besar Khal
Station	2+219	2+760	3+660	4+436	4+643	4+882	5+266	5+496	8+860
Canal Bed Level									
SHWL	1.900	1.900	1.900	1.900	1.900	1.900	1.900	1.900	1.600
Free Board	0.300	0.300	1.800	0.300	1.800	1.800	1.800	0.300	1.800
Soffit Level	2.200	2.200	3.700	2.200	3.700	3.700	3.700	2.200	3.400
Invert Level	0.700	0.200	-1.050	0.200	0.200	-0.300	-0.300	0.200	-0.600
Deck Level	2.450	2.450	4.100	2.450	4.000	4.050	4.050	2.450	3.750
Fill Height	0.785	0.895	0.740	1.766	0.663	1.129	0.766	1.593	0.680
Formation Level	3.235	3.345	4.840	4.216	4.663	5.179	4.816	4.043	4.430
Height (m)	1.50	2.00	4.75	2.00	3.50	4.00	4.00	2.00	4.00
Span (m)	2.00	2.50	4.75	2.00	3.50	4.50	4.00	2.50	4.00
No. Vents	2	3	4	2	4	3	3	5	3
Skew Angle (deg)	-	20	-	-	20	-	10	-	-
Thickness (mm)									
Deck	250	250	400	250	325	350	350	250	350
Invert	250	250	400	250	325	350	350	250	350
Ext. Wall	250	250	400	250	325	350	350	250	350
Wing Wall	250	250	350	250	275	300	300	250	300
Int. Wall	250	250	300	250	275	300	300	250	300

Box culverts are designed using state of the art structural analysis and design software STAAD-III ver. 22.3a. Although wing wall will be built integrally with the box, mathematical models of box and wing wall are prepared separately taking due consideration of the continuity effect of wing wall with the box. The STAAD input files along with the typical requested output are presented herewith.

## Analysis and design of Box

A one-meter wide strip is considered for preparation of the mathematical model of boxes. Deck slabs are considered as single members for the entire span. Walls (both exterior and interior) are also considered as single member for the full height of the culvert. At the bottom slabs, four intermediate nodes are generated within each span to simulate soil-structure interaction by providing support with spring constants.

AASHTO-1996 designated loads like dead load (Section, 6-2-1), live loads (both truck and military loading) and surcharge loads are considered for analysis and design. These loads are

applied to the structure in such a way that their effects produce maximum stress on the structure. Primary loads are applied through Load Cases 1 to 13 and their combinations are applied through Load Cases 14 to 30. These combinations are made according to AASHTO load combinations (Table 3.22.1A).

### **Analysis and design of Wing wall**

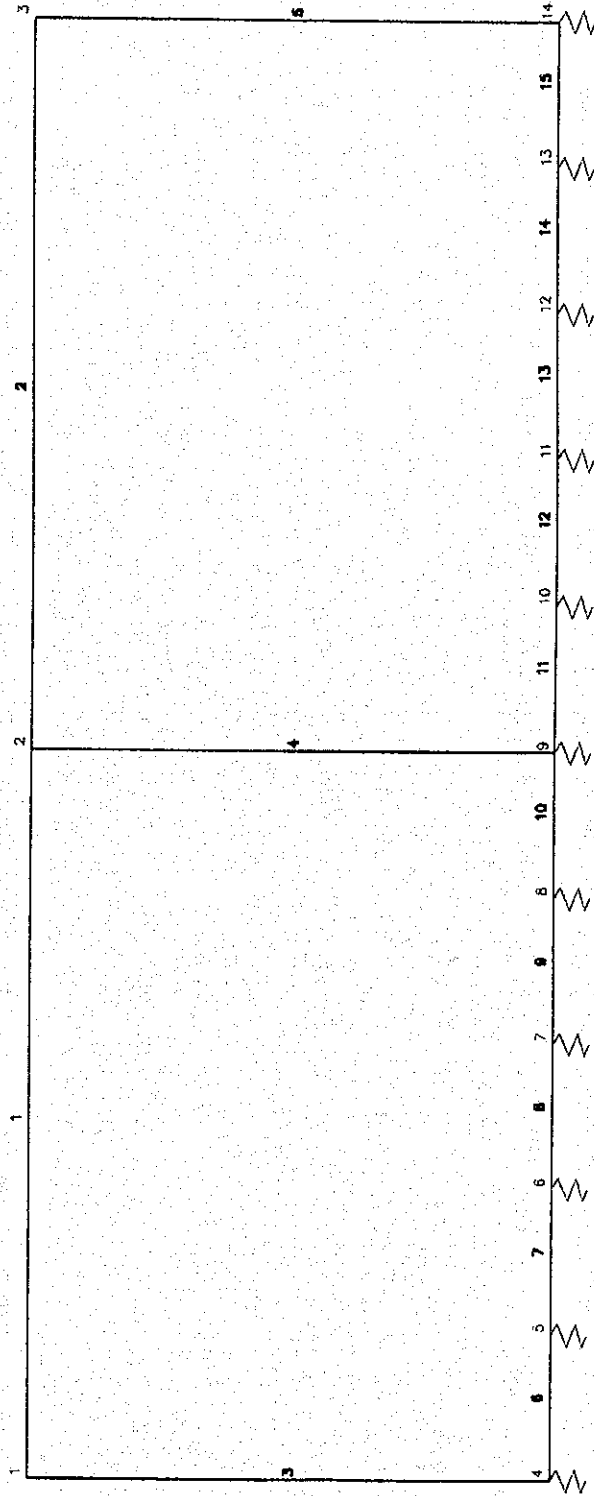
As stated earlier, wing walls are modeled separately from the box. Wing walls are modeled as combinations of horizontal and vertical discrete members. To take the continuity effect of the wing wall with the box, the nodes at the box end of the wing wall are considered as fixed support. The wing wall base is considered as a cantilever member fixed to the box culvert base.

**2-1-1 BOX CULVERT AT CH.3+219**

**(1) BOX CULVERT**



BOX CULVERT AT CH. 2+219



2 = JOINT NUMBER  
4 = MEMBER NUMBER

```

*****
*
*          S T A A D - III
*          Revision 22.3a
*          Proprietary Program of
*          Research Engineers, Inc.
*          Date=   FEB  7, 2000
*          Time=   15:12: 0
*
*          USER ID: Development Design Consultants L
*****

```

```

1. STAAD PLANE DESIGN OF 2 X 2 X 1.5 BOX CULVERT
2. UNIT METER KNS
3. JOINT COORD
4.  1  0.00  1.75  0.00
5.  2  2.25  1.75  0.00
6.  3  4.50  1.75  0.00
7.  4  0.00  0.00  0.00   14   4.50  0.00  0.00
8. MEMBER INCI
9.  1  1  2
10. 2  2  3
11. 3  4  1
12. 4  9  2
13. 5 14  3
14. 6  4  5  15
15. MEMBER PROPERTY
16. 1 2  PRIS  YD  0.250 ZD 1.0
17. 3 5  PRIS  YD  0.250 ZD 1.1
18. 4  PRIS  YD  0.250 ZD 1.2
19. 6 TO 15 PRIS  YD  0.250 ZD 1.3
20. MEMB OFFSET
21. 1 6  START  0.13  0.00  0.00
22. 1 10 END  -0.13  0.00  0.00
23. 3 4  START  0.00  0.13  0.00
24. 3 4  END  0.00  -0.13  0.00
25. 2  START  0.13  0.00  0.00
26. CONSTANT
27. E 23.667E6 ALL
28. DENSITY 23.56 ALL
29. SUPPORT
30. *5 TO 13 FIXED BUT MZ  KFY  900
31. *4 14 FIXED BUT MZ  KFY  450
32. *
33. 4 TO 14 FIXED BUT MZ  KFY  900
34. *
35. LOAD 1 : SELFWEIGHT
36. SELFWEIGHT Y -1
37. LOAD 2 : FILL WEIGHT
38. MEMBER LOAD
39. 1 2  UNI  GY  -14.80
40. LOAD 3 : BACK FILL (MINIMUM)
41. MEMBER LOAD
42. 3 TRAP  GX  12.54  4.29
43. 5 TRAP  GX  -12.54  -4.29
44. LOAD 4 : BACK FILL (MAXIMUM)
45. MEMBER LOAD
46. 3 TRAP  GX  16.42  12.41  1.33  1.75
47. 3 TRAP  GX  33.08  16.42  0.00  1.33
48. 5 TRAP  GX  -16.42  -12.41  1.33  1.75
49. 5 TRAP  GX  -33.08  -16.42  0.00  1.33
50. LOAD 5 : LL IN ALL SPANS
51. MEMBER LOAD
52. 1 UNI  GY  -51.95  0.44  1.81
53. 2 CON  GY  -0.01  0.00
54. LOAD 6 : LL IN SPAN 1
55. MEMBER LOAD
56. 1 UNI  GY  -51.95  0.44  1.81
57. LOAD 7 : LL IN SPAN 2

```

58. MEMBER LOAD  
 59. 2 UNI GY -51.95 0.44 1.81  
 60. LOAD 8 : MILITARY LOADING IN SPAN 1  
 61. MEMBER LOAD  
 62. 1 UNI GY -33.42 0.00 1.13  
 63. 1 UNI GY -33.42 1.13 2.25  
 64. LOAD 9 : MILITARY LOADING IN SPAN 2  
 65. MEMBER LOAD  
 66. 2 UNI GY -33.42 0.00 1.13  
 67. 2 UNI GY -33.42 1.13 2.25  
 68. LOAD 10 : LL IN SPAN 1 FOR MAX. SHEAR  
 69. MEMBER LOAD  
 70. 1 UNI GY -51.95 0.00 1.37  
 71. LOAD 11 : MILITARY LOADING IN SPAN 1 FOR MAX. SHEAR  
 72. MEMBER LOAD  
 73. 1 UNI GY -33.42 0.00 1.30  
 74. 1 UNI GY -33.42 1.30 2.25  
 75. \*  
 76. LOAD COMB 12  
 77. 1 1.3 2 1.3 4 1.3 10 2.171  
 78. LOAD COMB 13  
 79. 1 1.3 2 1.3 4 1.3 11 2.171  
 80. \*  
 81. LOAD COMB 14  
 82. 1 1.3 2 1.3 4 1.3 5 2.171  
 83. LOAD COMB 15  
 84. 1 1.3 2 1.3 4 1.3 6 2.171  
 85. LOAD COMB 16  
 86. 1 1.3 2 1.3 4 1.3 7 2.171  
 87. LOAD COMB 17  
 88. 1 1.3 2 1.3 4 1.3 8 2.171  
 89. LOAD COMB 18  
 90. 1 1.3 2 1.3 4 1.3 9 2.171  
 91. \*  
 92. LOAD COMB 19  
 93. 1 1.3 2 1.3 3 1.3 5 2.171  
 94. LOAD COMB 20  
 95. 1 1.3 2 1.3 3 1.3 6 2.171  
 96. LOAD COMB 21  
 97. 1 1.3 2 1.3 3 1.3 7 2.171  
 98. LOAD COMB 22  
 99. 1 1.3 2 1.3 3 1.3 8 2.171  
 100. LOAD COMB 23  
 101. 1 1.3 2 1.3 3 1.3 9 2.171  
 102. LOAD COMB 24  
 103. 1 1.3 4 1.3  
 104. \*  
 105. PERFORM ANALYSIS

PROBLEM STATISTICS

NUMBER OF JOINTS/MEMBER+ELEMENTS/SUPPORTS = 14/ 15/ 11  
 ORIGINAL/FINAL BAND-WIDTH = 11/ 2  
 TOTAL PRIMARY LOAD CASES = 11, TOTAL DEGREES OF FREEDOM = 31  
 SIZE OF STIFFNESS MATRIX = 248 DOUBLE PREC. WORDS  
 REQD/AVAIL. DISK SPACE = 12.04/ 224.4 MB, EXMEM = 1965.6 MB

\*\*WARNING\*\* LOAD BEYOND ITS LENGTH. FULL LENGTH ASSUMED. MEMB 3  
 \*\*WARNING\*\* LOAD BEYOND ITS LENGTH. FULL LENGTH ASSUMED. MEMB 3  
 \*\*WARNING\*\* LOAD BEYOND ITS LENGTH. FULL LENGTH ASSUMED. MEMB 3  
 \*\*WARNING\*\* LOAD BEYOND ITS LENGTH. FULL LENGTH ASSUMED. MEMB 3  
 \*\*WARNING\*\* LOAD BEYOND ITS LENGTH. FULL LENGTH ASSUMED. MEMB 3  
 \*\*WARNING\*\* LOAD BEYOND ITS LENGTH. FULL LENGTH ASSUMED. MEMB 1  
 \*\*WARNING\*\* LOAD BEYOND ITS LENGTH. FULL LENGTH ASSUMED. MEMB 2  
 \*\*WARNING\*\* LOAD BEYOND ITS LENGTH. FULL LENGTH ASSUMED. MEMB 1

```

++ Processing Element Stiffness Matrix.      15:12: 0
++ Processing Global Stiffness Matrix.      15:12: 0
++ Processing Triangular Factorization.     15:12: 0
++ Calculating Joint Displacements.         15:12: 0
++ Calculating Member Forces.             15:12: 0
    
```

```

106. LOAD LIST 12 TO 24
107. PRINT MAXFORCE ENVELOP LIST 1 TO 4 6 TO 12
    
```

MEMBER FORCE ENVELOPE

ALL UNITS ARE KNS METE

MAX AND MIN FORCE VALUES AMONGST ALL SECTION LOCATIONS

MEMB		FY/ FZ	DIST DIST	LD LD	MZ/ MY	DIST DIST	LD LD	FX	DIST	LD
1	MAX	116.61	.00	12	38.26	1.99	12			
		.00	.00	12	.00	.00	12	36.21 C	.00	14
	MIN	-119.46	1.99	20	-34.19	1.00	20			
		.00	1.99	24	.00	1.99	24	4.95 C	1.99	21
2	MAX	109.16	.00	23	39.27	.00	21			
		.00	.00	12	.00	.00	12	29.89 C	.00	16
	MIN	-107.23	2.12	16	-36.75	1.06	21			
		.00	2.12	24	.00	2.12	24	7.87 C	2.12	22
3	MAX	28.01	.00	16	33.34	1.49	14			
		.00	.00	12	.00	.00	12	129.18 C	.00	12
	MIN	-36.21	1.49	14	-4.72	.75	16			
		.00	1.49	24	.00	1.49	24	8.97 C	1.49	24
4	MAX	12.96	.00	15	19.80	1.49	21			
		.00	.00	12	.00	.00	12	169.29 C	.00	19
	MIN	-11.75	1.49	21	-21.39	1.49	15			
		.00	1.49	24	.00	1.49	24	13.25 C	1.49	24
6	MAX	-12.02	.00	24	18.05	.32	19			
		.00	.00	12	.00	.00	12	.00	.00	12
	MIN	-79.57	.32	12	-14.08	.00	12			
		.00	.32	24	.00	.32	24	.00	.32	24
7	MAX	-3.54	.00	21	26.05	.45	19			
		.00	.00	12	.00	.00	12	.00	.00	12
	MIN	-35.64	.45	12	-2.74	.00	24			
		.00	.45	24	.00	.45	24	.00	.45	24
8	MAX	20.00	.00	20	26.05	.00	19			
		.00	.00	12	.00	.00	12	.00	.00	12
	MIN	-4.62	.45	24	.32	.45	16			
		.00	.45	24	.00	.45	24	.00	.45	24
9	MAX	52.76	.00	19	23.12	.00	12			
		.00	.00	12	.00	.00	12	.00	.00	12
	MIN	.95	.45	24	-11.59	.45	21			
		.00	.45	24	.00	.45	24	.00	.45	24
10	MAX	82.82	.00	19	4.39	.00	12			
		.00	.00	12	.00	.00	12	.00	.00	12
	MIN	8.00	.32	24	-30.67	.32	19			
		.00	.32	24	.00	.32	24	.00	.32	24
11	MAX	-8.52	.00	24	1.70	.45	16			
		.00	.00	12	.00	.00	12	.00	.00	12
	MIN	-83.29	.45	21	-40.17	.00	19			

MEMB		FY/ FZ	DIST DIST	LD LD	MZ/ MY	DIST DIST	LD LD	FX	DIST	LD
12	MAX	-2.39	.00	24	23.56	.45	21			
		.00	.00	12	.00	.00	12	.00	.00	12
	MIN	-52.02	.45	23	-13.12	.00	19			
		.00	.45	24	.00	.45	24	.00	.45	24

- 108. START CONC DESIGN
- 109. FC 25000.0
- 110. TRACK 2
- 111. MAXMAIN 20.
- 112. CLEAR 0.04
- 113. DESIGN BEAM 1 TO 4 6 TO 12

BEAM NO. 1 DESIGN RESULTS - FLEXURE

LEN - 1990. MM FY - 414. FC - 25. MPA, SIZE - 1000. X 250. MMS

LEVEL	HEIGHT (MM)	BAR INFO	FROM (MM)	TO (MM)	ANCHOR STA END
-------	----------------	----------	--------------	------------	-------------------

1	63.	2 - 20MM	0.	1990.	YES YES
-----					
CRITICAL POS MOMENT= 34.19 KN-MET AT 1990.MM, LOAD 20					
REQD STEEL= 624.MM2, ROW= .0033, ROWMX= .0194 ROWMN= .0033					
MAX/MIN/ACTUAL BAR SPACING= 878./ 45./ 878. MMS					
BASIC/REQD. DEVELOPMENT LENGTH = 493./ 594. MMS					
-----					
2	187.	2 - 20MM	0.	1261.	YES NO
-----					
CRITICAL NEG MOMENT= 26.23 KN-MET AT 0.MM, LOAD 14					
REQD STEEL= 624.MM2, ROW= .0033, ROWMX= .0194 ROWMN= .0033					
MAX/MIN/ACTUAL BAR SPACING= 878./ 45./ 878. MMS					
BASIC/REQD. DEVELOPMENT LENGTH = 493./ 598. MMS					
-----					
3	187.	2 - 20MM	314.	1990.	NO YES
-----					
CRITICAL NEG MOMENT= 38.26 KN-MET AT 1990.MM, LOAD 12					
REQD STEEL= 624.MM2, ROW= .0033, ROWMX= .0194 ROWMN= .0033					
MAX/MIN/ACTUAL BAR SPACING= 878./ 45./ 878. MMS					
BASIC/REQD. DEVELOPMENT LENGTH = 493./ 598. MMS					
-----					

REQUIRED REINF. STEEL SUMMARY :

SECTION ( MM )	REINF STEEL (+VE/-VE) (SQ. MM )	MOMENTS (+VE/-VE) (KNS-MET )	LOAD (+VE/-VE)
0.	3./ 393.	0./ 26.	21/ 14
166.	30./ 171.	2./ 12.	21/ 14
332.	231./ 28.	16./ 2.	12/ 24
497.	379./ 14.	25./ 1.	12/ 24
663.	470./ 3.	31./ 0.	12/ 24
829.	501./ 0.	33./ 0.	12/ 0
995.	516./ 8.	34./ 1.	20/ 16
1161.	484./ 41.	32./ 3.	19/ 16
1327.	395./ 85.	26./ 6.	14/ 21
1492.	253./ 146.	17./ 10.	14/ 21
1658.	56./ 218.	4./ 15.	14/ 21
1824.	0./ 351.	0./ 23.	0/ 12
1990.	0./ 579.	0./ 38.	0/ 12

BEAM NO. 1 DESIGN RESULTS - SHEAR

AT START SUPPORT - Vu= 90.83 KNS Vc= 153.28 KNS Vs= .00 KNS  
 PROVIDE 12 MM BARS AT 92. MM C/C FOR 415. MM  
 AT END SUPPORT - Vu= 104.98 KNS Vc= 153.28 KNS Vs= .00 KNS  
 PROVIDE 12 MM BARS AT 92. MM C/C FOR 746. MM

1J		1989X 999X 249		2J	
=====					
2No20cHc163.No20.T011990314.TO 1990           10*12c/c 92					
=====					
2#20		2#20		2#20	
oo	oo	oo	oo	oo	oo
oo	oo	oo	oo	oo	oo

BEAM NO. 2 DESIGN RESULTS - FLEXURE

LEN - 2120. MM FY - 414. FC - 25. MPA, SIZE - 1000. X 250. MMS

LEVEL	HEIGHT (MM)	BAR INFO	FROM (MM)	TO (MM)	ANCHOR STA	END
1	63.	2 - 20MM	0.	2120.	YES	YES
-----						
CRITICAL POS MOMENT= 36.75 KN-MET AT 1060.MM, LOAD 21						
REQD STEEL= 624.MM2, ROW= .0033, ROWMX= .0194 ROWMN= .0033						
MAX/MIN/ACTUAL BAR SPACING= 878./ 45./ 878. MMS						
BASIC/REQD. DEVELOPMENT LENGTH = 493./ 594. MMS						
-----						
2	187.	2 - 20MM	0.	1481.	YES	NO
-----						
CRITICAL NEG MOMENT= 39.27 KN-MET AT 0.MM, LOAD 21						
REQD STEEL= 624.MM2, ROW= .0033, ROWMX= .0194 ROWMN= .0033						
MAX/MIN/ACTUAL BAR SPACING= 878./ 45./ 878. MMS						
BASIC/REQD. DEVELOPMENT LENGTH = 493./ 598. MMS						
-----						
3	187.	2 - 20MM	904.	2120.	NO	YES
-----						
CRITICAL NEG MOMENT= 30.60 KN-MET AT 2120.MM, LOAD 16						
REQD STEEL= 624.MM2, ROW= .0033, ROWMX= .0194 ROWMN= .0033						
MAX/MIN/ACTUAL BAR SPACING= 878./ 45./ 878. MMS						
BASIC/REQD. DEVELOPMENT LENGTH = 493./ 598. MMS						
-----						

REQUIRED REINF. STEEL SUMMARY :

SECTION (MM)	REINF STEEL (+VE/-VE) (SQ. MM)	MOMENTS (+VE/-VE) (KNS-MET)	LOAD (+VE/-VE)
0.	0./ 595.	0./ 39.	0/ 21
177.	0./ 312.	0./ 21.	0/ 21
353.	28./ 214.	2./ 14.	18/ 12
530.	200./ 139.	14./ 9.	16/ 12
707.	381./ 77.	25./ 5.	16/ 12

SECTION ( MM )	REINF STEEL(+VE/-VE) (SQ. MM )		MOMENTS(+VE/-VE) (KNS-MET )		LOAD(+VE/-VE)	
883.	500./	28.	33./	2.	21/	12
1060.	556./	0.	37./	0.	21/	0
1237.	544./	0.	36./	0.	21/	0
1413.	464./	0.	31./	0.	21/	0
1590.	319./	10.	21./	1.	21/	24
1767.	111./	29.	8./	2.	21/	14
1943.	7./	179.	0./	12.	12/	16
2120.	0./	460.	0./	31.	0/	16

BEAM NO. 2 DESIGN RESULTS - SHEAR

AT START SUPPORT - Vu= 90.80 KNS Vc= 153.28 KNS Vs= .00 KNS  
 PROVIDE 12 MM BARS AT 92. MM C/C FOR 618. MM  
 AT END SUPPORT - Vu= 99.71 KNS Vc= 153.28 KNS Vs= .00 KNS  
 PROVIDE 12 MM BARS AT 92. MM C/C FOR 618. MM

2J		2119X 999X 249		3J	
=====					
2No20c/c163.		0.TO 2120		2No20 H 187. 904.TO 2120   8*12c/c 92	
=====					
2#20		2#20		2#20	
oo		oo		oo	
oo		oo		oo	

BEAM NO. 3 DESIGN RESULTS - FLEXURE

LEN - 1490. MM FY - 414. FC - 25. MPA, SIZE - 1100. X 250. MMS

LEVEL	HEIGHT (MM)	BAR INFO	FROM (MM)	TO (MM)	ANCHOR STA END	
1	59.	7 - 12MM	0.	1490.	YES	YES
-----						
CRITICAL POS MOMENT= 4.72 KN-MET AT 1490.MM, LOAD 16						
REQD STEEL= 701.MM2, ROW= .0033, ROWMX= .0194 ROWMN= .0033						
MAX/MIN/ACTUAL BAR SPACING= 986./ 37./ 164. MMS						
BASIC/REQD. DEVELOPMENT LENGTH = 177./ 318. MMS						
-----						
2	191.	7 - 12MM	0.	1490.	YES	YES
-----						
CRITICAL NEG MOMENT= 33.34 KN-MET AT 1490.MM, LOAD 14						
REQD STEEL= 701.MM2, ROW= .0033, ROWMX= .0194 ROWMN= .0033						
MAX/MIN/ACTUAL BAR SPACING= 986./ 37./ 164. MMS						
BASIC/REQD. DEVELOPMENT LENGTH = 177./ 359. MMS						
-----						

REQUIRED REINF. STEEL SUMMARY :

SECTION ( MM )	REINF STEEL(+VE/-VE) (SQ. MM )		MOMENTS(+VE/-VE) (KNS-MET )		LOAD(+VE/-VE)	
0.	0./	316.	0./	21.	0/	12

SECTION ( MM )	REINF STEEL (+VE/-VE) (SQ. MM )		MOMENTS (+VE/-VE) (KNS-MET )		LOAD (+VE/-VE)	
124.	0./	279.	0./	19.	0/	12
248.	7./	252.	0./	17.	24/	12
372.	33./	236.	2./	16.	24/	12
497.	53./	227.	4./	15.	16/	12
621.	65./	226.	4./	15.	16/	12
745.	70./	252.	5./	17.	16/	19
869.	67./	284.	5./	19.	16/	19
993.	57./	319.	4./	21.	16/	19
1117.	42./	356.	3./	24.	16/	19
1242.	21./	395.	1./	26.	16/	19
1366.	0./	435.	0./	29.	0/	14
1490.	0./	501.	0./	33.	0/	14

BEAM NO. 3 DESIGN RESULTS - SHEAR

AT START SUPPORT - Vu= 19.39 KNS Vc= 168.61 KNS Vs= .00 KNS  
STIRRUPS ARE NOT REQUIRED.  
AT END SUPPORT - Vu= 32.07 KNS Vc= 168.61 KNS Vs= .00 KNS  
STIRRUPS ARE NOT REQUIRED.

4J		1489X1099X 249		1J	
=====					
7No12 H 191.		0.TO 1490			
7No12 H 59.		0.TO 1490			
=====					
7#12	ooooooo	7#12	ooooooo	7#12	ooooooo
7#12	ooooooo	7#12	ooooooo	7#12	ooooooo

BEAM NO. 4 DESIGN RESULTS - FLEXURE

LEN - 1490. MM FY - 414. FC - 25. MPA, SIZE - 1200. X 250. MMS

LEVEL	HEIGHT (MM)	BAR INFO	FROM (MM)	TO (MM)	ANCHOR STA END	
1	59.	7 - 12MM	0.	1490.	YES	YES
-----						
CRITICAL POS MOMENT= 21.39 KN-MET AT 1490.MM, LOAD 15						
REQD STEEL= 765.MM2, ROW= .0033, ROWMX= .0194 ROWMN= .0033						
MAX/MIN/ACTUAL BAR SPACING= 1086./ 37./ 181. MMS						
BASIC/REQD. DEVELOPMENT LENGTH = 177./ 347. MMS						
-----						
2	191.	7 - 12MM	0.	1490.	YES	YES
-----						
CRITICAL NEG MOMENT= 19.80 KN-MET AT 1490.MM, LOAD 21						
REQD STEEL= 765.MM2, ROW= .0033, ROWMX= .0194 ROWMN= .0033						
MAX/MIN/ACTUAL BAR SPACING= 1086./ 37./ 181. MMS						
BASIC/REQD. DEVELOPMENT LENGTH = 177./ 359. MMS						
-----						

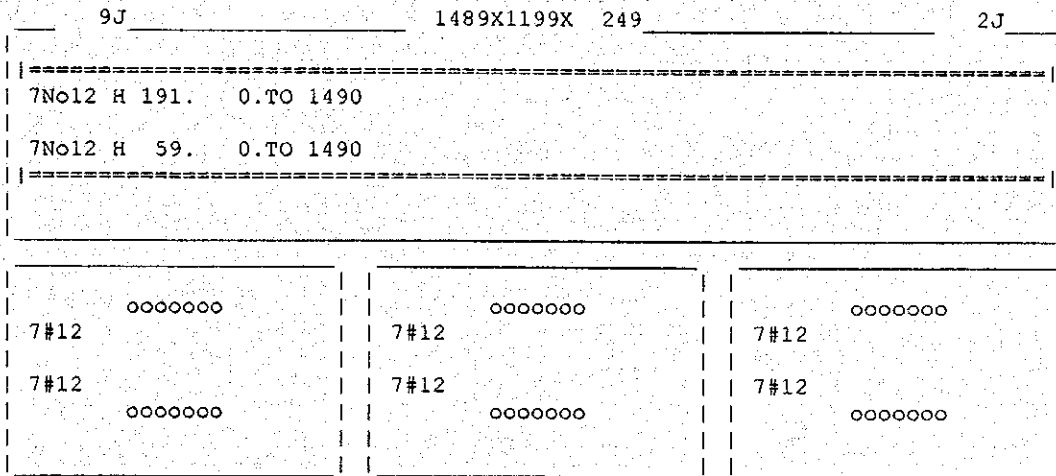


REQUIRED REINF. STEEL SUMMARY :

SECTION ( MM )	REINF STEEL (+VE/-VE) (SQ. MM )		MOMENTS (+VE/-VE) (KNS-MET )		LOAD (+VE/-VE)
0.	66./	52.	5./	4.	12/ 18
124.	82./	67.	6./	5.	12/ 18
248.	97./	82.	7./	6.	12/ 18
372.	112./	103.	8./	7.	12/ 16
497.	130./	124.	9./	8.	20/ 16
621.	153./	145.	10./	10.	20/ 16
745.	176./	166.	12./	11.	20/ 16
869.	200./	187.	13./	13.	20/ 16
993.	223./	208.	15./	14.	20/ 16
1117.	247./	230.	17./	15.	20/ 16
1242.	270./	251.	18./	17.	20/ 16
1366.	294./	272.	20./	18.	15/ 21
1490.	318./	294.	21./	20.	15/ 21

BEAM NO. 4 DESIGN RESULTS - SHEAR

AT START SUPPORT - Vu= 12.96 KNS Vc= 183.94 KNS Vs= .00 KNS  
 STIRRUPS ARE NOT REQUIRED.  
 AT END SUPPORT - Vu= 12.96 KNS Vc= 183.94 KNS Vs= .00 KNS  
 STIRRUPS ARE NOT REQUIRED.



BEAM NO. 6 DESIGN RESULTS - FLEXURE

LEN - 320. MM FY - 414. FC - 25. MPA, SIZE - 1300. X 250. MMS

LEVEL	HEIGHT (MM)	BAR INFO	FROM (MM)	TO (MM)	ANCHOR STA END
-------	----------------	----------	--------------	------------	-------------------

1	59.	8 - 12MM	0.	320.	YES YES
CRITICAL POS MOMENT= 14.08 KN-MET AT 320.MM, LOAD 12 REQD STEEL= 820.MM2, ROW= .0033, ROWMX= .0194 ROWMN= .0033 MAX/MIN/ACTUAL BAR SPACING= 1186./ 37./ 169. MMS BASIC/REQD. DEVELOPMENT LENGTH = 177./ 325. MMS					
2	191.	8 - 12MM	0.	320.	YES YES
CRITICAL NEG MOMENT= 18.05 KN-MET AT 320.MM, LOAD 19 REQD STEEL= 820.MM2, ROW= .0033, ROWMX= .0194 ROWMN= .0033 MAX/MIN/ACTUAL BAR SPACING= 1186./ 37./ 169. MMS BASIC/REQD. DEVELOPMENT LENGTH = 177./ 359. MMS					

REQUIRED REINF. STEEL SUMMARY :

SECTION ( MM )	REINF STEEL (+VE/-VE) (SQ. MM )		MOMENTS (+VE/-VE) (KNS-MET )		LOAD (+VE/-VE)
0.	208./	0.	14./	0.	12/ 0
27.	178./	20.	12./	1.	12/ 19
53.	148./	42.	10./	3.	12/ 19
80.	117./	63.	8./	4.	12/ 19
107.	87./	86.	6./	6.	12/ 19
133.	80./	108.	5./	7.	24/ 19
160.	74./	130.	5./	9.	24/ 19
187.	69./	153.	5./	10.	24/ 19
213.	63./	176.	4./	12.	24/ 19
240.	58./	198.	4./	13.	24/ 19
267.	52./	221.	4./	15.	24/ 19
293.	46./	245.	3./	16.	24/ 19
320.	40./	268.	3./	18.	24/ 19

B E A M N O . 6 D E S I G N R E S U L T S - S H E A R

AT START SUPPORT -  $V_u = 78.22$  KNS  $V_c = 199.27$  KNS  $V_s = .00$  KNS  
 STIRRUPS ARE NOT REQUIRED.  
 AT END SUPPORT -  $V_u = 77.74$  KNS  $V_c = 199.27$  KNS  $V_s = .00$  KNS  
 STIRRUPS ARE NOT REQUIRED.

4J	319X1299X 249	5J
=====		
8No12 H 191.	0.TO 320	
8No12 H 59.	0.TO 320	
=====		
8#12	8#12	8#12
8#12	8#12	8#12
8#12	8#12	8#12
8#12	8#12	8#12

B E A M N O . 7 D E S I G N R E S U L T S - F L E X U R E

LEN - 450. MM FY - 414. FC - 25. MPA, SIZE - 1300. X 250. MMS

LEVEL	HEIGHT (MM)	BAR INFO	FROM (MM)	TO (MM)	ANCHOR STA END
-------	----------------	----------	--------------	------------	-------------------

1	59.	8 - 12MM	0.	450.	YES YES
---	-----	----------	----	------	---------

CRITICAL POS MOMENT=	2.74 KN-MET	AT	450.MM,	LOAD	24
REQD STEEL=	820.MM2,	ROW=	.0033,	ROWMX=	.0194 ROWMN=
MAX/MIN/ACTUAL BAR SPACING=	1186./	37./	169.	MMS	
BASIC/REQD. DEVELOPMENT LENGTH =	177./	325.	MMS		

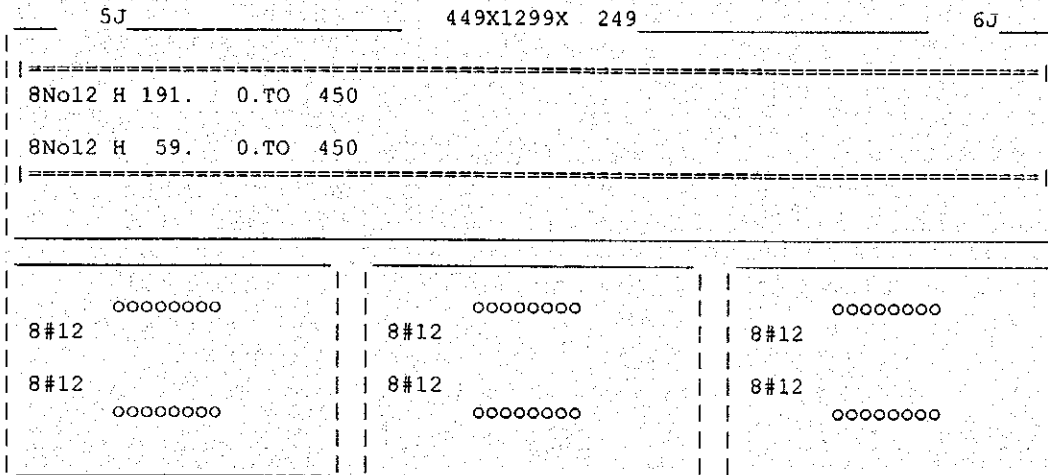
2	191.	8 - 12MM	0.	450.	YES	YES
-----						
CRITICAL NEG MOMENT= 26.05 KN-MET AT 450.MM, LOAD 19						
REQD STEEL= 820.MM2, ROW= .0033, ROWMX= .0194 ROWMN= .0033						
MAX/MIN/ACTUAL BAR SPACING= 1186./ 37./ 169. MMS						
BASIC/REQD. DEVELOPMENT LENGTH = 177./ 359. MMS						
-----						

REQUIRED REINF. STEEL SUMMARY :

SECTION ( MM )	REINF STEEL (+VE/-VE) (SQ. MM )	MOMENTS (+VE/-VE) (KNS-MET )	LOAD (+VE/-VE)
0.	40./ 268.	3./ 18.	24/ 19
37.	37./ 277.	3./ 19.	24/ 19
75.	34./ 286.	2./ 19.	24/ 19
112.	30./ 295.	2./ 20.	24/ 19
150.	26./ 305.	2./ 20.	24/ 19
187.	22./ 314.	2./ 21.	24/ 19
225.	18./ 324.	1./ 22.	24/ 19
262.	14./ 334.	1./ 22.	24/ 19
300.	9./ 345.	1./ 23.	24/ 19
337.	4./ 355.	0./ 24.	24/ 19
375.	0./ 366.	0./ 25.	0/ 19
412.	0./ 377.	0./ 25.	0/ 19
450.	0./ 389.	0./ 26.	0/ 19

BEAM NO. 7 DESIGN RESULTS - SHEAR

AT START SUPPORT - Vu= 33.00 KNS Vc= 199.27 KNS Vs= .00 KNS  
 STIRRUPS ARE NOT REQUIRED.  
 AT END SUPPORT - Vu= 33.80 KNS Vc= 199.27 KNS Vs= .00 KNS  
 STIRRUPS ARE NOT REQUIRED.



BEAM NO. 8 DESIGN RESULTS - FLEXURE

LEN - 450. MM FY - 414. FC - 25. MPA, SIZE - 1300. X 250. MMS

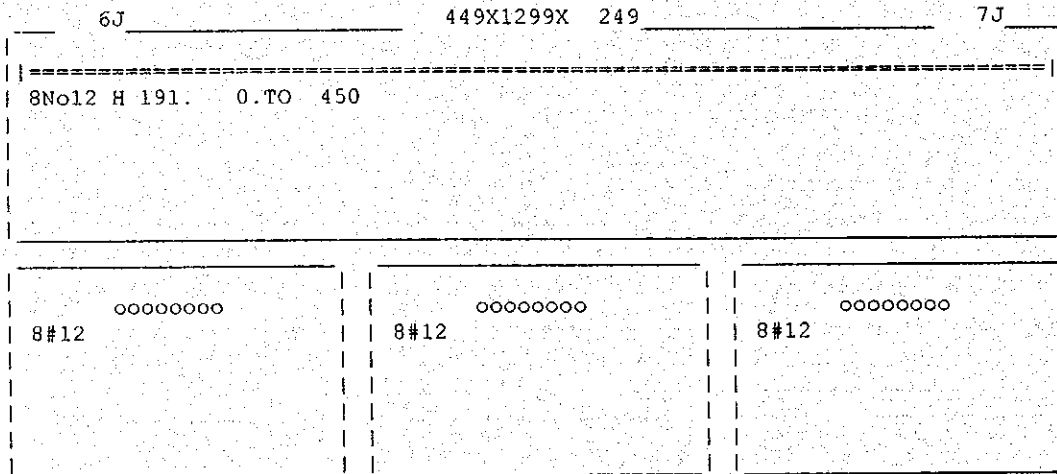
LEVEL	HEIGHT (MM)	BAR INFO	FROM (MM)	TO (MM)	ANCHOR STA END
1	191.	8 - 12MM	0.	450.	YES YES
-----					
CRITICAL NEG MOMENT= 26.05 KN-MET AT 0.MM, LOAD 19					
REQD STEEL= 820.MM2, ROW= .0033, ROWMX= .0194 ROWMN= .0033					
MAX/MIN/ACTUAL BAR SPACING= 1186./ 37./ 169. MMS					
BASIC/REQD. DEVELOPMENT LENGTH = 177./ 359. MMS					
-----					

REQUIRED REINF. STEEL SUMMARY :

SECTION ( MM )	REINF STEEL (+VE/-VE) (SQ. MM )	MOMENTS (+VE/-VE) (KNS-MET )	LOAD (+VE/-VE)
0.	0./ 389.	0./ 26.	0/ 19
37.	0./ 382.	0./ 26.	0/ 12
75.	0./ 377.	0./ 25.	0/ 12
112.	0./ 373.	0./ 25.	0/ 12
150.	0./ 369.	0./ 25.	0/ 12
187.	0./ 365.	0./ 24.	0/ 12
225.	0./ 361.	0./ 24.	0/ 12
262.	0./ 358.	0./ 24.	0/ 12
300.	0./ 355.	0./ 24.	0/ 12
337.	0./ 352.	0./ 24.	0/ 12
375.	0./ 349.	0./ 23.	0/ 12
412.	0./ 346.	0./ 23.	0/ 12
450.	0./ 344.	0./ 23.	0/ 12

BEAM NO. 8 DESIGN RESULTS - SHEAR

AT START SUPPORT - Vu= 18.17 KNS Vc= 199.27 KNS Vs= .00 KNS  
 STIRRUPS ARE NOT REQUIRED.  
 AT END SUPPORT - Vu= 17.36 KNS Vc= 199.27 KNS Vs= .00 KNS  
 STIRRUPS ARE NOT REQUIRED.



BEAM NO. 9 DESIGN RESULTS - FLEXURE

LEN - 450. MM FY - 414. FC - 25. MPA, SIZE - 1300. X 250. MMS

LEVEL	HEIGHT (MM)	BAR INFO	FROM (MM)	TO (MM)	ANCHOR STA END
-------	----------------	----------	--------------	------------	-------------------

1	59.	8 - 12MM	0.	450.	YES YES
CRITICAL POS MOMENT= 11.59 KN-MET AT 450.MM, LOAD 21 REQD STEEL= 820.MM2, ROW= .0033, ROWMX= .0194 ROWMN= .0033 MAX/MIN/ACTUAL BAR SPACING= 1186./ 37./ 169. MMS BASIC/REQD. DEVELOPMENT LENGTH = 177./ 325. MMS					

2	191.	8 - 12MM	0.	450.	YES	YES
-----						
CRITICAL NEG MOMENT= 23.12 KN-MET AT 0.MM, LOAD 12						
REQD STEEL= 820.MM2, ROW= .0033, ROWMX= .0194 ROWMN= .0033						
MAX/MIN/ACTUAL BAR SPACING= 1186./ 37./ 169. MMS						
BASIC/REQD. DEVELOPMENT LENGTH = 177./ 359. MMS						
-----						

REQUIRED REINF. STEEL SUMMARY :

SECTION ( MM )	REINF STEEL(+VE/-VE) (SQ. MM )	MOMENTS(+VE/-VE) (KNS-MET )	LOAD(+VE/-VE)
0.	0./	344.	0/ 23.
37.	10./	319.	1./ 21.
75.	25./	295.	2./ 20.
112.	40./	271.	3./ 18.
150.	54./	247.	4./ 17.
187.	68./	223.	5./ 15.
225.	83./	200.	6./ 14.
262.	98./	177.	7./ 12.
300.	113./	154.	8./ 10.
337.	128./	131.	9./ 9.
375.	143./	109.	10./ 7.
412.	157./	87.	11./ 6.
450.	171./	65.	12./ 4.

BEAM NO. 9 DESIGN RESULTS - SHEAR

AT START SUPPORT - Vu= 50.92 KNS Vc= 199.27 KNS Vs= .00 KNS  
 STIRRUPS ARE NOT REQUIRED.  
 AT END SUPPORT - Vu= 50.12 KNS Vc= 199.27 KNS Vs= .00 KNS  
 STIRRUPS ARE NOT REQUIRED.

7J	449X1299X	249	8J
-----			
8No12 H 191. 0.TO 450			
8No12 H 59. 0.TO 450			
-----			

8#12	oooooo	8#12	oooooo	8#12	oooooo
8#12	oooooo	8#12	oooooo	8#12	oooooo

BEAM NO. 10 DESIGN RESULTS - FLEXURE

LEN - 320. MM FY - 414. FC - 25. MPA, SIZE - 1300. X 250. MMS

LEVEL	HEIGHT (MM)	BAR INFO	FROM (MM)	TO (MM)	ANCHOR STA END
-------	----------------	----------	--------------	------------	-------------------

1	59.	8 - 12MM	0.	320.	YES YES
-----					
CRITICAL POS MOMENT= 30.67 KN-MET AT 320.MM, LOAD 19					
REQD STEEL= 820.MM2, ROW= .0033, ROWMX= .0194 ROWMN= .0033					
MAX/MIN/ACTUAL BAR SPACING= 1186./ 37./ 169. MMS					
BASIC/REQD. DEVELOPMENT LENGTH = 177./ 325. MMS					
-----					

2	191.	8 - 12MM	0.	320.	YES	YES
-----						
CRITICAL NEG MOMENT=		4.39 KN-MET	AT	0.MM,	LOAD	12
REQD STEEL=		820.MM2,	ROW=	.0033,	ROWMX=	.0194 ROWMN= .0033
MAX/MIN/ACTUAL BAR SPACING=		1186./	37./	169. MMS		
BASIC/REQD. DEVELOPMENT LENGTH =		177./	359. MMS			
-----						

REQUIRED REINF. STEEL SUMMARY :

SECTION ( MM )	REINF STEEL(+VE/-VE) (SQ. MM )		MOMENTS(+VE/-VE) (KNS-MET )		LOAD(+VE/-VE)	
0.	171./	65.	12./	4.	21/	12
27.	192./	35.	13./	2.	21/	12
53.	213./	6.	14./	0.	21/	12
80.	234./	0.	16./	0.	21/	0
107.	255./	0.	17./	0.	21/	0
133.	276./	0.	19./	0.	21/	0
160.	296./	0.	20./	0.	21/	0
187.	317./	0.	21./	0.	21/	0
213.	337./	0.	23./	0.	21/	0
240.	361./	0.	24./	0.	19/	0
267.	394./	0.	26./	0.	19/	0
293.	426./	0.	29./	0.	19/	0
320.	459./	0.	31./	0.	19/	0

BEAM NO. 10 DESIGN RESULTS - SHEAR

AT START SUPPORT - Vu= 80.98 KNS Vc= 199.27 KNS Vs= .00 KNS  
 STIRRUPS ARE NOT REQUIRED.  
 AT END SUPPORT - Vu= 81.47 KNS Vc= 199.27 KNS Vs= .00 KNS  
 STIRRUPS ARE NOT REQUIRED.

8J	319X1299X	249	9J
=====			
8No12 H	191.	0.TO	320
8No12 H	59.	0.TO	320
=====			

8#12	oooooooo	8#12	oooooooo	8#12	oooooooo
8#12	oooooooo	8#12	oooooooo	8#12	oooooooo

BEAM NO. 11 DESIGN RESULTS - FLEXURE

LEN - 450. MM FY - 414. FC - 25. MPA, SIZE - 1300. X 250. MMS

LEVEL	HEIGHT (MM)	BAR INFO	FROM (MM)	TO (MM)	ANCHOR STA END
1	59.	8 - 12MM	0.	450.	YES YES

-----						
CRITICAL POS MOMENT=		40.16 KN-MET	AT	0.MM,	LOAD	19
REQD STEEL=		820.MM2,	ROW=	.0033,	ROWMX=	.0194 ROWMN= .0033
MAX/MIN/ACTUAL BAR SPACING=		1186./	37./	169. MMS		
BASIC/REQD. DEVELOPMENT LENGTH =		177./	325. MMS			
-----						

2	191.	8 - 12MM	0.	450.	YES	YES
-----						
CRITICAL NEG MOMENT= 1.70 KN-MET AT 450.MM, LOAD 16						
REQD STEEL= 820.MM2, ROW= .0033, ROWMX= .0194 ROWMN= .0033						
MAX/MIN/ACTUAL BAR SPACING= 1186./ 37./ 169. MMS						
BASIC/REQD. DEVELOPMENT LENGTH = 177./ 359. MMS						
-----						

REQUIRED REINF. STEEL SUMMARY :

SECTION ( MM )	REINF STEEL(+VE/-VE) (SQ. MM )		MOMENTS (+VE/-VE) (KNS-MET )		LOAD (+VE/-VE)	
0.	604./	0.	40./	0.	19/	0
37.	571./	0.	38./	0.	19/	0
75.	537./	0.	36./	0.	19/	0
112.	503./	0.	34./	0.	19/	0
150.	469./	0.	31./	0.	19/	0
187.	435./	0.	29./	0.	19/	0
225.	401./	0.	27./	0.	19/	0
262.	367./	0.	25./	0.	19/	0
300.	333./	0.	22./	0.	19/	0
337.	298./	0.	20./	0.	19/	0
375.	264./	1.	18./	0.	19/	24
412.	229./	8.	15./	1.	19/	24
450.	194./	25.	13./	2.	19/	16

B E A M N O . 1 1 D E S I G N R E S U L T S - S H E A R

AT START SUPPORT - Vu= 80.65 KNS Vc= 199.27 KNS Vs= .00 KNS  
 STIRRUPS ARE NOT REQUIRED.  
 AT END SUPPORT - Vu= 81.45 KNS Vc= 199.27 KNS Vs= .00 KNS  
 STIRRUPS ARE NOT REQUIRED.

9J	449X1299X	249	10J
-----			
8No12 H 191.	0.TO	450	
8No12 H 59.	0.TO	450	
-----			
8#12	oooooo	8#12	oooooo
8#12	oooooo	8#12	oooooo
8#12	oooooo	8#12	oooooo
8#12	oooooo	8#12	oooooo

B E A M N O . 1 2 D E S I G N R E S U L T S - F L E X U R E

LEN - 450. MM FY - 414. FC - 25. MPA, SIZE - 1300. X 250. MMS

LEVEL	HEIGHT (MM)	BAR INFO	FROM (MM)	TO (MM)	ANCHOR STA	END
-------	-------------	----------	-----------	---------	------------	-----

1	59.	8 - 12MM	0.	450.	YES	YES
CRITICAL POS MOMENT= 13.12 KN-MET AT 450.MM, LOAD 19 REQD STEEL= 820.MM2, ROW= .0033, ROWMX= .0194 ROWMN= .0033 MAX/MIN/ACTUAL BAR SPACING= 1186./ 37./ 169. MMS BASIC/REQD. DEVELOPMENT LENGTH = 177./ 325. MMS						
2	191.	8 - 12MM	0.	450.	YES	YES
CRITICAL NEG MOMENT= 23.56 KN-MET AT 450.MM, LOAD 21 REQD STEEL= 820.MM2, ROW= .0033, ROWMX= .0194 ROWMN= .0033 MAX/MIN/ACTUAL BAR SPACING= 1186./ 37./ 169. MMS BASIC/REQD. DEVELOPMENT LENGTH = 177./ 359. MMS						

REQUIRED REINF. STEEL SUMMARY :

SECTION ( MM )	REINF STEEL(+VE/-VE) (SQ. MM )	MOMENTS (+VE/-VE) (KNS-MET )	LOAD (+VE/-VE)
0.	194./ 25.	13./ 2.	19/ 16
37.	175./ 50.	12./ 3.	19/ 16
75.	156./ 76.	11./ 5.	19/ 16
112.	137./ 102.	9./ 7.	19/ 16
150.	118./ 128.	8./ 9.	19/ 16
187.	99./ 154.	7./ 10.	19/ 16
225.	79./ 180.	5./ 12.	19/ 16
262.	59./ 207.	4./ 14.	19/ 16
300.	40./ 235.	3./ 16.	14/ 21
337.	21./ 264.	1./ 18.	15/ 21
375.	1./ 293.	0./ 20.	15/ 21
412.	0./ 322.	0./ 22.	0/ 21
450.	0./ 351.	0./ 24.	0/ 21

B E A M N O . 1 2 D E S I G N R E S U L T S - S H E A R

AT START SUPPORT - Vu= 49.38 KNS Vc= 199.27 KNS Vs= .00 KNS  
 STIRRUPS ARE NOT REQUIRED.  
 AT END SUPPORT - Vu= 50.19 KNS Vc= 199.27 KNS Vs= .00 KNS  
 STIRRUPS ARE NOT REQUIRED.

10J	449X1299X 249	11J
8No12 H 191. 0.TO 450 8No12 H 59. 0.TO 450		
8#12	8#12	8#12
8#12	8#12	8#12

\*\*\*\*\*END OF BEAM DESIGN\*\*\*\*\*



114. END CONC DESIGN  
115. FINISH

\*\*\*\*\* END OF STAAD-III \*\*\*\*\*

\*\*\*\* DATE= FEB 7,2000 TIME= 15:12: 1 \*\*\*\*

\*\*\*\*\*  
\* For questions on STAAD-III, contact: \*  
\* Research Engineers, Inc at \*  
\* West Coast: Ph- (714) 974-2500 Fax- (714) 921-2543 \*  
\* East Coast: Ph- (508) 688-3626 Fax- (508) 685-7230 \*  
\*\*\*\*\*

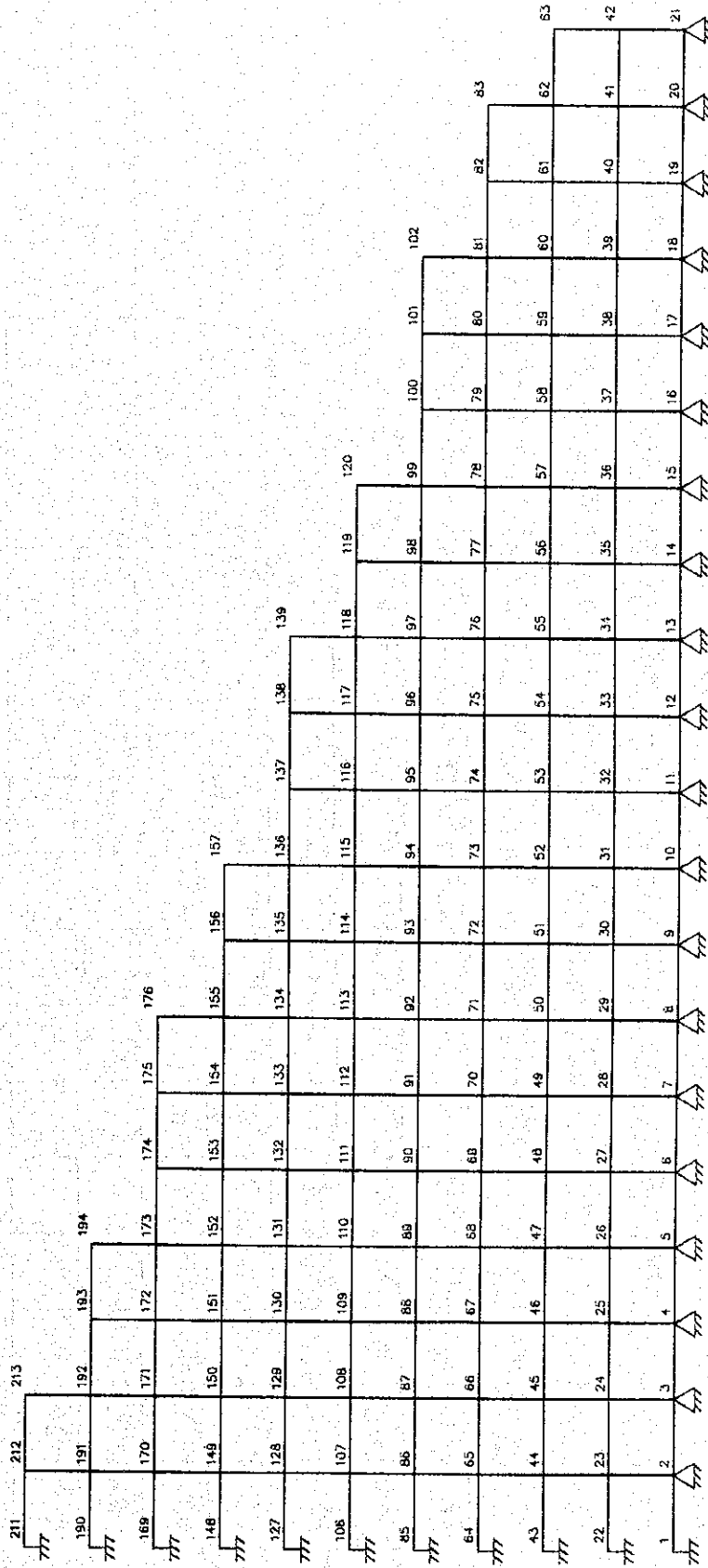


**2-1-1 BOX CULVERT AT CH.3+219**

**(2) WING WALL**

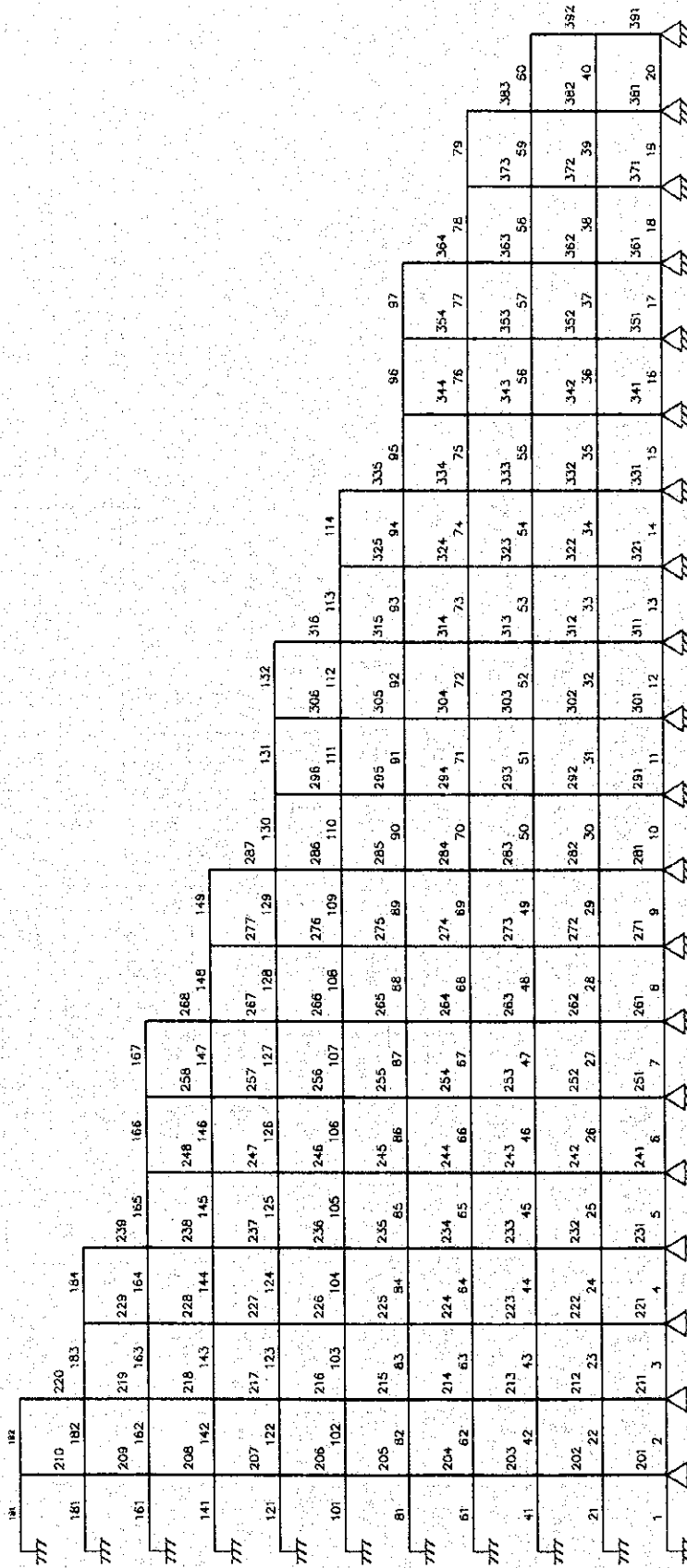


# WING WALL AT CH. 2+219



WING WALL WITH JOINT NUMBER

# WING WALL AT CH. 2+219



WING WALL WITH MEMBER NUMBER

```

*****
*
*          S T A A D - III
*          Revision 22.3a
*          Proprietary Program of
*          Research Engineers, Inc.
*          Date=   JAN 29, 2000
*          Time=   15: 9:31
*
*          USER ID: Development Design Consultants L
*****
    
```

```

1. STAAD SPACE
2. UNIT KNS METER
3. PAGE EJE
4. JOI COO
5.      1 0.000 0.000 0.000      21      6.70 0.000 0.000
6. R      2 0.000 0.000 0.295
7. 64      0.000 0.000 0.885      83      6.365 0.000 0.885
8. 85      0.000 0.000 1.180     102      5.695 0.000 1.180
9. 106     0.000 0.000 1.475     120      4.690 0.000 1.475
10. 127     0.000 0.000 1.770     139      4.020 0.000 1.770
11. 148     0.000 0.000 2.065     157      3.015 0.000 2.065
12. 169     0.000 0.000 2.360     176      2.345 0.000 2.360
13. 190     0.000 0.000 2.655     194      1.340 0.000 2.655
14. 211     0.000 0.000 2.950     213      0.670 0.000 2.950
16. MEM INC
17. *HORIZONTAL MEMBER
18. 1      1      2      20      1      1
19. R      2      20     21
20. 61     64     65     79      1      1
21. 81     85     86     97      1      1
22. 101    106    107    114     1      1
23. 121    127    128    132     1      1
24. 141    148    149    149     1      1
25. 161    169    170    167     1      1
26. 181    190    191    184     1      1
27. 191    211    212    192     1      1
28. *VERTICAL MEMBER (START WITH 301)
29. 201    2      23     210     1      21
30. R      1      10     1
31. 221    4      25     229     1      21
32. R      1      10     1
33. 241    6      27     248     1      21
34. R      2      10     1
35. 271    9      30     277     1      21
36. R      1      10     1
37. 291    11     32     296     1      21
38. R      2      10     1
39. 321    14     35     325     1      21
40. R      1      10     1
41. 341    16     37     344     1      21
42. R      2      10     1
43. 371    19     40     373     1      21
44. R      1      10     1
45. 391    21     42     392     1      21
47. MEM PRO
48. 1      TO     20     PRI     YD     1.500  ZD     0.25  IX     1E-06
49. 21     TO     40     PRI     YD     0.250  ZD     0.295 IX     1E-06
50. 41     TO     60     PRI     YD     0.250  ZD     0.295 IX     1E-06
51. 61     TO     79     PRI     YD     0.250  ZD     0.295 IX     1E-06
52. 81     TO     97     PRI     YD     0.250  ZD     0.295 IX     1E-06
53. 101    TO     114    PRI     YD     0.250  ZD     0.295 IX     1E-06
54. 121    TO     132    PRI     YD     0.250  ZD     0.295 IX     1E-06
55. 141    TO     149    PRI     YD     0.250  ZD     0.295 IX     1E-06
56. 161    TO     167    PRI     YD     0.250  ZD     0.295 IX     1E-06
57. 181    TO     184    PRI     YD     0.250  ZD     0.295 IX     1E-06
58. 191    TO     192    PRI     YD     0.250  ZD     0.295 IX     1E-06
59. *VERTICAL
    
```

60.	201	TO	210	PRI	YD	0.250	ZD	0.335	IX	1E-06					
61.	211	TO	220	PRI	YD	0.250	ZD	0.335	IX	1E-06					
62.	221	TO	229	PRI	YD	0.250	ZD	0.335	IX	1E-06					
63.	231	TO	239	PRI	YD	0.250	ZD	0.335	IX	1E-06					
64.	241	TO	248	PRI	YD	0.250	ZD	0.335	IX	1E-06					
65.	251	TO	258	PRI	YD	0.250	ZD	0.335	IX	1E-06					
66.	261	TO	268	PRI	YD	0.250	ZD	0.335	IX	1E-06					
67.	271	TO	277	PRI	YD	0.250	ZD	0.335	IX	1E-06					
68.	281	TO	287	PRI	YD	0.250	ZD	0.335	IX	1E-06					
69.	291	TO	296	PRI	YD	0.250	ZD	0.335	IX	1E-06					
70.	301	TO	306	PRI	YD	0.250	ZD	0.335	IX	1E-06					
71.	311	TO	316	PRI	YD	0.250	ZD	0.335	IX	1E-06					
72.	321	TO	325	PRI	YD	0.250	ZD	0.335	IX	1E-06					
73.	331	TO	335	PRI	YD	0.250	ZD	0.335	IX	1E-06					
74.	341	TO	344	PRI	YD	0.250	ZD	0.335	IX	1E-06					
75.	351	TO	354	PRI	YD	0.250	ZD	0.335	IX	1E-06					
76.	361	TO	364	PRI	YD	0.250	ZD	0.335	IX	1E-06					
77.	371	TO	373	PRI	YD	0.250	ZD	0.335	IX	1E-06					
78.	381	TO	383	PRI	YD	0.250	ZD	0.335	IX	1E-06					
79.	391	TO	392	PRI	YD	0.250	ZD	0.335	IX	1E-06					
81.	CONSTANTS														
82.	E	CONC													
83.	DEN	CONC													
85.	SUPPORT														
86.	1	22	43	64	85	106	127	148	169	190	211	FIXED			
87.	2	TO	21									FIXED	BUT	MZ	FY
89.	LOAD 1 : EARTH PRESSURE														
90.	JOINT LOAD														
91.	2	FY	-7.36												
92.	3	FY	-7.15												
93.	4	FY	-6.95												
94.	5	FY	-6.75												
95.	6	FY	-6.54												
96.	7	FY	-6.34												
97.	8	FY	-6.13												
98.	9	FY	-5.93												
99.	10	FY	-5.72												
100.	11	FY	0.00												
101.	12	FY	0.00												
102.	13	FY	0.00												
103.	14	FY	0.00												
104.	15	FY	0.00												
105.	16	FY	0.00												
106.	17	FY	0.00												
107.	18	FY	0.00												
108.	19	FY	0.00												
109.	20	FY	0.00												
110.	21	FY	0.00												
111.	23	FY	-4.62												
112.	24	FY	-4.46												
113.	25	FY	-4.31												
114.	26	FY	-4.16												
115.	27	FY	-4.01												
116.	28	FY	-3.86												
117.	29	FY	-3.71												
118.	30	FY	-3.55												
119.	31	FY	-3.40												
120.	32	FY	0.00												
121.	33	FY	0.00												
122.	34	FY	0.00												
123.	35	FY	0.00												
124.	36	FY	0.00												
125.	37	FY	0.00												
126.	38	FY	0.00												
127.	39	FY	0.00												
128.	40	FY	0.00												
129.	41	FY	0.00												
130.	42	FY	0.00												
131.	44	FY	-3.95												
132.	45	FY	-3.80												



133.	46	FY	-3.65
134.	47	FY	-3.50
135.	48	FY	-3.35
136.	49	FY	-3.19
137.	50	FY	-3.04
138.	51	FY	-2.89
139.	52	FY	-2.74
140.	53	FY	0.00
141.	54	FY	0.00
142.	55	FY	0.00
143.	56	FY	0.00
144.	57	FY	0.00
145.	58	FY	0.00
146.	59	FY	0.00
147.	60	FY	0.00
148.	61	FY	0.00
149.	62	FY	0.00
150.	63	FY	0.00
151.	65	FY	-3.29
152.	66	FY	-3.14
153.	67	FY	-2.99
154.	68	FY	-2.83
155.	69	FY	-2.68
156.	70	FY	-2.53
157.	71	FY	-2.38
158.	72	FY	-2.23
159.	73	FY	-2.08
160.	74	FY	0.00
161.	75	FY	0.00
162.	76	FY	0.00
163.	77	FY	0.00
164.	78	FY	0.00
165.	79	FY	0.00
166.	80	FY	0.00
167.	81	FY	0.00
168.	82	FY	0.00
169.	83	FY	0.00
170.	86	FY	-2.63
171.	87	FY	-2.47
172.	88	FY	-2.32
173.	89	FY	-2.17
174.	90	FY	-2.02
175.	91	FY	-1.87
176.	92	FY	-1.72
177.	93	FY	-1.56
178.	94	FY	-1.41
179.	95	FY	0.00
180.	96	FY	0.00
181.	97	FY	0.00
182.	98	FY	0.00
183.	99	FY	0.00
184.	100	FY	0.00
185.	101	FY	0.00
186.	102	FY	0.00
187.	107	FY	-1.96
188.	108	FY	-1.81
189.	109	FY	-1.66
190.	110	FY	-1.51
191.	111	FY	-1.36
192.	112	FY	-1.20
193.	113	FY	-1.05
194.	114	FY	-0.90
195.	115	FY	-0.75
196.	116	FY	0.00
197.	117	FY	0.00
198.	118	FY	0.00
199.	119	FY	0.00
200.	120	FY	0.00
201.	128	FY	-1.37
202.	129	FY	-1.21

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203.	130	FY	-1.06
204.	131	FY	-0.91
205.	132	FY	-0.76
206.	133	FY	-0.61
207.	134	FY	-0.46
208.	135	FY	-0.30
209.	136	FY	-0.15
210.	137	FY	0.00
211.	138	FY	0.00
212.	139	FY	0.00
213.	149	FY	-0.99
214.	150	FY	-0.83
215.	151	FY	-0.68
216.	152	FY	-0.53
217.	153	FY	-0.38
218.	154	FY	-0.23
219.	155	FY	-0.08
220.	156	FY	0.00
221.	157	FY	0.00
222.	170	FY	-0.61
223.	171	FY	-0.46
224.	172	FY	-0.30
225.	173	FY	-0.15
226.	174	FY	0.00
227.	175	FY	0.00
228.	176	FY	0.00
229.	191	FY	-0.23
230.	192	FY	-0.08
231.	193	FY	0.00
232.	194	FY	0.00
233.	212	FY	0.00
234.	213	FY	0.00

236. PER ANA

PROBLEM STATISTICS

NUMBER OF JOINTS/MEMBER+ELEMENTS/SUPPORTS = 155/ 268/ 31  
 ORIGINAL/FINAL BAND-WIDTH = 21/ 9  
 TOTAL PRIMARY LOAD CASES = 1, TOTAL DEGREES OF FREEDOM = 784  
 SIZE OF STIFFNESS MATRIX = 43904 DOUBLE PREC. WORDS  
 REQRD/AVAIL. DISK SPACE = 12.59/ 243.8 MB, EXMEM = 1965.6 MB

++ Processing Element Stiffness Matrix. 15: 9:31  
 ++ Processing Global Stiffness Matrix. 15: 9:31  
 ++ Processing Triangular Factorization. 15: 9:31  
 ++ Calculating Joint Displacements. 15: 9:31  
 ++ Calculating Member Forces. 15: 9:31

237. PRINT MEM FORCES

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- KNS METE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
1	1	1	.00	139.58	.00	.00	.00	253.27
		2	.00	-139.58	.00	.00	.00	-206.51
2	1	2	.00	131.29	.00	.00	.00	206.51
		3	.00	-131.29	.00	.00	.00	-162.52
3	1	3	.00	118.08	.00	.00	.00	162.52
		4	.00	-118.08	.00	.00	.00	-122.97
4	1	4	.00	102.01	.00	.00	.00	122.96
		5	.00	-102.01	.00	.00	.00	-88.79
5	1	5	.00	84.69	.00	.00	.00	88.79
		6	.00	-84.69	.00	.00	.00	-60.42
6	1	6	.00	67.09	.00	.00	.00	60.42
		7	.00	-67.09	.00	.00	.00	-37.94
7	1	7	.00	49.88	.00	.00	.00	37.94
		8	.00	-49.88	.00	.00	.00	-21.23
8	1	8	.00	33.63	.00	.00	.00	21.23
		9	.00	-33.63	.00	.00	.00	-9.97
9	1	9	.00	18.89	.00	.00	.00	9.97
		10	.00	-18.89	.00	.00	.00	-3.64
10	1	10	.00	6.58	.00	.00	.00	3.64
		11	.00	-6.58	.00	.00	.00	-1.43
11	1	11	.00	3.19	.00	.00	.00	1.44
		12	.00	-3.19	.00	.00	.00	-.37
12	1	12	.00	1.66	.00	.00	.00	.37
		13	.00	-1.66	.00	.00	.00	.19
13	1	13	.00	.90	.00	.00	.00	-.19
		14	.00	-.90	.00	.00	.00	.49
14	1	14	.00	.38	.00	.00	.00	-.49
		15	.00	-.38	.00	.00	.00	.62

BOX CULVERT AT CH. 2+219 (WING WALL)

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
15	1	15	.00	-.01	.00	.00	.00	-.62
		16	.00	.01	.00	.00	.00	.62
16	1	16	.00	-.29	.00	.00	.00	-.62
		17	.00	.29	.00	.00	.00	.52
17	1	17	.00	-.44	.00	.00	.00	-.52
		18	.00	.44	.00	.00	.00	.37
18	1	18	.00	-.48	.00	.00	.00	-.37
		19	.00	.48	.00	.00	.00	.21
19	1	19	.00	-.38	.00	.00	.00	-.21
		20	.00	.38	.00	.00	.00	.08
20	1	20	.00	-.25	.00	.00	.00	-.08
		21	.00	.25	.00	.00	.00	.00
21	1	22	.00	6.83	.00	.00	.00	3.68
		23	.00	-6.83	.00	.00	.00	-1.39
22	1	23	.00	2.12	.00	.00	.00	1.39
		24	.00	-2.12	.00	.00	.00	-.68
23	1	24	.00	.82	.00	.00	.00	.68
		25	.00	-.82	.00	.00	.00	-.41
24	1	25	.00	.53	.00	.00	.00	.41
		26	.00	-.53	.00	.00	.00	-.23
25	1	26	.00	.41	.00	.00	.00	.23
		27	.00	-.41	.00	.00	.00	-.10
26	1	27	.00	.31	.00	.00	.00	.10
		28	.00	-.31	.00	.00	.00	.01
27	1	28	.00	.24	.00	.00	.00	-.01
		29	.00	-.24	.00	.00	.00	.09
28	1	29	.00	.18	.00	.00	.00	-.09
		30	.00	-.18	.00	.00	.00	.15
29	1	30	.00	.04	.00	.00	.00	-.15
		31	.00	-.04	.00	.00	.00	.16
30	1	31	.00	-.75	.00	.00	.00	-.16
		32	.00	.75	.00	.00	.00	-.09
31	1	32	.00	.02	.00	.00	.00	.09
		33	.00	-.02	.00	.00	.00	-.08
32	1	33	.00	.11	.00	.00	.00	.08
		34	.00	-.11	.00	.00	.00	-.05
33	1	34	.00	.08	.00	.00	.00	.05
		35	.00	-.08	.00	.00	.00	-.02
34	1	35	.00	.04	.00	.00	.00	.02
		36	.00	-.04	.00	.00	.00	-.01
35	1	36	.00	-.02	.00	.00	.00	.01
		37	.00	.02	.00	.00	.00	-.02
36	1	37	.00	-.03	.00	.00	.00	.02
		38	.00	.03	.00	.00	.00	-.03
37	1	38	.00	.03	.00	.00	.00	.03
		39	.00	-.03	.00	.00	.00	-.02

BOX CULVERT AT CH. 2+219 (WING WALL)

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
38	1	39	.00	-.04	.00	.00	.00	.02
		40	.00	.04	.00	.00	.00	-.03
39	1	40	.00	.05	.00	.00	.00	.03
		41	.00	-.05	.00	.00	.00	-.01
40	1	41	.00	.04	.00	.00	.00	.01
		42	.00	-.04	.00	.00	.00	.00
41	1	43	.00	7.12	.00	.00	.00	4.35
		44	.00	-7.12	.00	.00	.00	-1.97
42	1	44	.00	3.72	.00	.00	.00	1.97
		45	.00	-3.72	.00	.00	.00	-.72
43	1	45	.00	1.59	.00	.00	.00	.72
		46	.00	-1.59	.00	.00	.00	-.19
44	1	46	.00	.70	.00	.00	.00	.19
		47	.00	-.70	.00	.00	.00	.05
45	1	47	.00	.38	.00	.00	.00	-.05
		48	.00	-.38	.00	.00	.00	.17
46	1	48	.00	.24	.00	.00	.00	-.17
		49	.00	-.24	.00	.00	.00	.25
47	1	49	.00	.16	.00	.00	.00	-.25
		50	.00	-.16	.00	.00	.00	.31
48	1	50	.00	.07	.00	.00	.00	-.31
		51	.00	-.07	.00	.00	.00	.33
49	1	51	.00	-.22	.00	.00	.00	-.33
		52	.00	.22	.00	.00	.00	.26
50	1	52	.00	-1.11	.00	.00	.00	-.26
		53	.00	1.11	.00	.00	.00	-.11
51	1	53	.00	-.14	.00	.00	.00	.11
		54	.00	.14	.00	.00	.00	-.16
52	1	54	.00	.10	.00	.00	.00	.16
		55	.00	-.10	.00	.00	.00	-.13
53	1	55	.00	.12	.00	.00	.00	.13
		56	.00	-.12	.00	.00	.00	-.09
54	1	56	.00	.11	.00	.00	.00	.09
		57	.00	-.11	.00	.00	.00	-.05
55	1	57	.00	-.08	.00	.00	.00	.05
		58	.00	.08	.00	.00	.00	-.08
56	1	58	.00	-.10	.00	.00	.00	.08
		59	.00	.10	.00	.00	.00	-.11
57	1	59	.00	.09	.00	.00	.00	.11
		60	.00	-.09	.00	.00	.00	-.08
58	1	60	.00	-.01	.00	.00	.00	.08
		61	.00	.01	.00	.00	.00	-.08
59	1	61	.00	.04	.00	.00	.00	.08
		62	.00	-.04	.00	.00	.00	-.07
60	1	62	.00	.21	.00	.00	.00	.07
		63	.00	-.21	.00	.00	.00	.00

BOX CULVERT AT CH. 2+219 (WING WALL)

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
61	1	64	.00	7.50	.00	.00	.00	4.96
		65	.00	-7.50	.00	.00	.00	-2.45
62	1	65	.00	4.62	.00	.00	.00	2.45
		66	.00	-4.62	.00	.00	.00	-.90
63	1	66	.00	2.43	.00	.00	.00	.90
		67	.00	-2.43	.00	.00	.00	-.09
64	1	67	.00	1.11	.00	.00	.00	.09
		68	.00	-1.11	.00	.00	.00	.28
65	1	68	.00	.48	.00	.00	.00	-.28
		69	.00	-.48	.00	.00	.00	.44
66	1	69	.00	.22	.00	.00	.00	-.44
		70	.00	-.22	.00	.00	.00	.52
67	1	70	.00	.10	.00	.00	.00	-.52
		71	.00	-.10	.00	.00	.00	.55
68	1	71	.00	-.12	.00	.00	.00	-.55
		72	.00	.12	.00	.00	.00	.51
69	1	72	.00	-.47	.00	.00	.00	-.51
		73	.00	.47	.00	.00	.00	.35
70	1	73	.00	-1.09	.00	.00	.00	-.35
		74	.00	1.09	.00	.00	.00	-.01
71	1	74	.00	-.29	.00	.00	.00	.01
		75	.00	.29	.00	.00	.00	-.11
72	1	75	.00	-.11	.00	.00	.00	.11
		76	.00	.11	.00	.00	.00	-.14
73	1	76	.00	-.03	.00	.00	.00	.15
		77	.00	.03	.00	.00	.00	-.15
74	1	77	.00	.02	.00	.00	.00	.15
		78	.00	-.02	.00	.00	.00	-.15
75	1	78	.00	-.11	.00	.00	.00	.15
		79	.00	.11	.00	.00	.00	-.18
76	1	79	.00	-.03	.00	.00	.00	.18
		80	.00	.03	.00	.00	.00	-.19
77	1	80	.00	-.24	.00	.00	.00	.19
		81	.00	.24	.00	.00	.00	-.28
78	1	81	.00	-.53	.00	.00	.00	.28
		82	.00	.53	.00	.00	.00	-.10
79	1	82	.00	.29	.00	.00	.00	.10
		83	.00	-.29	.00	.00	.00	.00
81	1	85	.00	7.39	.00	.00	.00	5.27
		86	.00	-7.39	.00	.00	.00	-2.79
82	1	86	.00	4.96	.00	.00	.00	2.79
		87	.00	-4.96	.00	.00	.00	-1.13
83	1	87	.00	2.99	.00	.00	.00	1.13
		88	.00	-2.99	.00	.00	.00	-.13
84	1	88	.00	1.54	.00	.00	.00	.13
		89	.00	-1.54	.00	.00	.00	.39

## BOX CULVERT AT CH. 2+219 (WING WALL)

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
85	1	89	.00	.68	.00	.00	.00	-.39
		90	.00	-.68	.00	.00	.00	.62
86	1	90	.00	.26	.00	.00	.00	-.62
		91	.00	-.26	.00	.00	.00	.70
87	1	91	.00	.13	.00	.00	.00	-.70
		92	.00	-.13	.00	.00	.00	.75
88	1	92	.00	-.10	.00	.00	.00	-.75
		93	.00	.10	.00	.00	.00	.71
89	1	93	.00	-.67	.00	.00	.00	-.71
		94	.00	.67	.00	.00	.00	.49
90	1	94	.00	-.80	.00	.00	.00	-.49
		95	.00	.80	.00	.00	.00	.22
91	1	95	.00	-.41	.00	.00	.00	-.22
		96	.00	.41	.00	.00	.00	.08
92	1	96	.00	-.42	.00	.00	.00	-.08
		97	.00	.42	.00	.00	.00	-.06
93	1	97	.00	-.27	.00	.00	.00	.06
		98	.00	.27	.00	.00	.00	-.15
94	1	98	.00	-.78	.00	.00	.00	.15
		99	.00	.78	.00	.00	.00	-.41
95	1	99	.00	.22	.00	.00	.00	.41
		100	.00	-.22	.00	.00	.00	-.34
96	1	100	.00	.44	.00	.00	.00	.34
		101	.00	-.44	.00	.00	.00	-.19
97	1	101	.00	.56	.00	.00	.00	.19
		102	.00	-.56	.00	.00	.00	.00
101	1	106	.00	6.76	.00	.00	.00	5.24
		107	.00	-6.76	.00	.00	.00	-2.98
102	1	107	.00	4.80	.00	.00	.00	2.98
		108	.00	-4.80	.00	.00	.00	-1.37
103	1	108	.00	3.19	.00	.00	.00	1.37
		109	.00	-3.19	.00	.00	.00	-.30
104	1	109	.00	1.86	.00	.00	.00	.30
		110	.00	-1.86	.00	.00	.00	.32
105	1	110	.00	.90	.00	.00	.00	-.32
		111	.00	-.90	.00	.00	.00	.63
106	1	111	.00	.41	.00	.00	.00	-.63
		112	.00	-.41	.00	.00	.00	.76
107	1	112	.00	.22	.00	.00	.00	-.76
		113	.00	-.22	.00	.00	.00	.84
108	1	113	.00	.38	.00	.00	.00	-.84
		114	.00	-.38	.00	.00	.00	.97
109	1	114	.00	-.60	.00	.00	.00	-.97
		115	.00	.60	.00	.00	.00	.77
110	1	115	.00	-.60	.00	.00	.00	-.77
		116	.00	.60	.00	.00	.00	.56

BOX CULVERT AT CH. 2+219 (WING WALL)

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
111	1	116	.00	-.84	.00	.00	.00	-.56
		117	.00	.84	.00	.00	.00	.28
112	1	117	.00	-.28	.00	.00	.00	-.28
		118	.00	.28	.00	.00	.00	.19
113	1	118	.00	-.80	.00	.00	.00	-.19
		119	.00	.80	.00	.00	.00	-.08
114	1	119	.00	.23	.00	.00	.00	.08
		120	.00	-.23	.00	.00	.00	.00
121	1	127	.00	5.78	.00	.00	.00	4.94
		128	.00	-5.78	.00	.00	.00	-3.00
122	1	128	.00	4.26	.00	.00	.00	3.00
		129	.00	-4.26	.00	.00	.00	-1.57
123	1	129	.00	2.92	.00	.00	.00	1.58
		130	.00	-2.92	.00	.00	.00	-.60
124	1	130	.00	2.07	.00	.00	.00	.60
		131	.00	-2.07	.00	.00	.00	.10
125	1	131	.00	1.00	.00	.00	.00	-.10
		132	.00	-1.00	.00	.00	.00	.43
126	1	132	.00	.88	.00	.00	.00	-.43
		133	.00	-.88	.00	.00	.00	.73
127	1	133	.00	.36	.00	.00	.00	-.73
		134	.00	-.36	.00	.00	.00	.85
128	1	134	.00	.72	.00	.00	.00	-.85
		135	.00	-.72	.00	.00	.00	1.09
129	1	135	.00	1.54	.00	.00	.00	-1.09
		136	.00	-1.54	.00	.00	.00	1.61
130	1	136	.00	-2.23	.00	.00	.00	-1.61
		137	.00	2.23	.00	.00	.00	.86
131	1	137	.00	-1.52	.00	.00	.00	-.86
		138	.00	1.52	.00	.00	.00	.35
132	1	138	.00	-1.06	.00	.00	.00	-.35
		139	.00	1.06	.00	.00	.00	.00
141	1	148	.00	4.46	.00	.00	.00	4.40
		149	.00	-4.46	.00	.00	.00	-2.91
142	1	149	.00	3.60	.00	.00	.00	2.91
		150	.00	-3.60	.00	.00	.00	-1.70
143	1	150	.00	2.01	.00	.00	.00	1.70
		151	.00	-2.01	.00	.00	.00	-1.03
144	1	151	.00	2.11	.00	.00	.00	1.03
		152	.00	-2.11	.00	.00	.00	-.32
145	1	152	.00	1.14	.00	.00	.00	.32
		153	.00	-1.14	.00	.00	.00	.06
146	1	153	.00	1.55	.00	.00	.00	-.06
		154	.00	-1.55	.00	.00	.00	.58
147	1	154	.00	1.69	.00	.00	.00	-.58
		155	.00	-1.69	.00	.00	.00	1.14



BOX CULVERT AT CH. 2+219 (WING WALL)

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
148	1	155	.00	-1.14	.00	.00	.00	-1.14
		156	.00	1.14	.00	.00	.00	.76
149	1	156	.00	-2.26	.00	.00	.00	-.76
		157	.00	2.26	.00	.00	.00	.00
161	1	169	.00	2.55	.00	.00	.00	3.62
		170	.00	-2.55	.00	.00	.00	-2.76
162	1	170	.00	2.85	.00	.00	.00	2.76
		171	.00	-2.85	.00	.00	.00	-1.81
163	1	171	.00	1.23	.00	.00	.00	1.81
		172	.00	-1.23	.00	.00	.00	-1.39
164	1	172	.00	.30	.00	.00	.00	1.39
		173	.00	-.30	.00	.00	.00	-1.29
165	1	173	.00	3.43	.00	.00	.00	1.30
		174	.00	-3.43	.00	.00	.00	-.15
166	1	174	.00	1.06	.00	.00	.00	.15
		175	.00	-1.06	.00	.00	.00	.21
167	1	175	.00	-.60	.00	.00	.00	-.20
		176	.00	.60	.00	.00	.00	.00
181	1	190	.00	1.10	.00	.00	.00	2.69
		191	.00	-1.10	.00	.00	.00	-2.32
182	1	191	.00	-.70	.00	.00	.00	2.32
		192	.00	.70	.00	.00	.00	-2.56
183	1	192	.00	4.27	.00	.00	.00	2.56
		193	.00	-4.27	.00	.00	.00	-1.13
184	1	193	.00	3.38	.00	.00	.00	1.13
		194	.00	-3.38	.00	.00	.00	.00
191	1	211	.00	2.88	.00	.00	.00	2.12
		212	.00	-2.88	.00	.00	.00	-1.16
192	1	212	.00	3.44	.00	.00	.00	1.16
		213	.00	-3.44	.00	.00	.00	.00
201	1	2	.00	.93	.00	.00	.00	.52
		23	.00	-.93	.00	.00	.00	-.24
202	1	23	.00	1.02	.00	.00	.00	.24
		44	.00	-1.02	.00	.00	.00	.06
203	1	44	.00	.48	.00	.00	.00	-.06
		65	.00	-.48	.00	.00	.00	.21
204	1	65	.00	.07	.00	.00	.00	-.21
		86	.00	-.07	.00	.00	.00	.23
205	1	86	.00	-.12	.00	.00	.00	-.23
		107	.00	.12	.00	.00	.00	.19
206	1	107	.00	-.13	.00	.00	.00	-.19
		128	.00	.13	.00	.00	.00	.15
207	1	128	.00	.03	.00	.00	.00	-.15
		149	.00	-.03	.00	.00	.00	.16
208	1	149	.00	-.10	.00	.00	.00	-.16
		170	.00	.10	.00	.00	.00	.13

BOX CULVERT AT CH. 2+219 (WING WALL)

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
209	1	170	.00	-1.01	.00	.00	.00	-.13
		191	.00	1.01	.00	.00	.00	-.16
210	1	191	.00	.57	.00	.00	.00	.17
		212	.00	-.57	.00	.00	.00	.00
211	1	3	.00	6.06	.00	.00	.00	2.40
		24	.00	-6.06	.00	.00	.00	-.61
212	1	24	.00	2.90	.00	.00	.00	.61
		45	.00	-2.90	.00	.00	.00	.25
213	1	45	.00	1.23	.00	.00	.00	-.25
		66	.00	-1.23	.00	.00	.00	.61
214	1	66	.00	.27	.00	.00	.00	-.61
		87	.00	-.27	.00	.00	.00	.69
215	1	87	.00	-.24	.00	.00	.00	-.69
		108	.00	.24	.00	.00	.00	.62
216	1	108	.00	-.43	.00	.00	.00	-.62
		129	.00	.43	.00	.00	.00	.49
217	1	129	.00	-.31	.00	.00	.00	-.49
		150	.00	.31	.00	.00	.00	.40
218	1	150	.00	.45	.00	.00	.00	-.40
		171	.00	-.45	.00	.00	.00	.54
219	1	171	.00	1.61	.00	.00	.00	-.54
		192	.00	-1.61	.00	.00	.00	1.01
220	1	192	.00	-3.44	.00	.00	.00	-1.01
		213	.00	3.44	.00	.00	.00	.00
221	1	4	.00	9.12	.00	.00	.00	3.93
		25	.00	-9.12	.00	.00	.00	-1.24
222	1	25	.00	5.10	.00	.00	.00	1.24
		46	.00	-5.10	.00	.00	.00	.26
223	1	46	.00	2.34	.00	.00	.00	-.26
		67	.00	-2.34	.00	.00	.00	.95
224	1	67	.00	.67	.00	.00	.00	-.95
		88	.00	-.67	.00	.00	.00	1.15
225	1	88	.00	-.20	.00	.00	.00	-1.15
		109	.00	.20	.00	.00	.00	1.09
226	1	109	.00	-.53	.00	.00	.00	-1.09
		130	.00	.53	.00	.00	.00	.93
227	1	130	.00	-.74	.00	.00	.00	-.93
		151	.00	.74	.00	.00	.00	.72
228	1	151	.00	-1.53	.00	.00	.00	-.72
		172	.00	1.53	.00	.00	.00	.26
229	1	172	.00	-.89	.00	.00	.00	-.26
		193	.00	.89	.00	.00	.00	.00
231	1	5	.00	10.58	.00	.00	.00	4.95
		26	.00	-10.58	.00	.00	.00	-1.83
232	1	26	.00	6.54	.00	.00	.00	1.83
		47	.00	-6.54	.00	.00	.00	.10

## BOX CULVERT AT CH. 2+219 (WING WALL)

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
233	1	47	.00	3.36	.00	.00	.00	-.10
		68	.00	-3.36	.00	.00	.00	1.09
234	1	68	.00	1.16	.00	.00	.00	-1.09
		89	.00	-1.16	.00	.00	.00	1.43
235	1	89	.00	-.15	.00	.00	.00	-1.43
		110	.00	.15	.00	.00	.00	1.39
236	1	110	.00	-.70	.00	.00	.00	-1.39
		131	.00	.70	.00	.00	.00	1.18
237	1	131	.00	-.54	.00	.00	.00	-1.18
		152	.00	.54	.00	.00	.00	1.02
238	1	152	.00	-.10	.00	.00	.00	-1.02
		173	.00	.10	.00	.00	.00	.99
239	1	173	.00	-3.38	.00	.00	.00	-1.00
		194	.00	3.38	.00	.00	.00	.00
241	1	6	.00	11.06	.00	.00	.00	5.50
		27	.00	-11.06	.00	.00	.00	-2.24
242	1	27	.00	7.14	.00	.00	.00	2.24
		48	.00	-7.14	.00	.00	.00	-.13
243	1	48	.00	3.93	.00	.00	.00	.13
		69	.00	-3.93	.00	.00	.00	1.03
244	1	69	.00	1.51	.00	.00	.00	-1.03
		90	.00	-1.51	.00	.00	.00	1.47
245	1	90	.00	-.09	.00	.00	.00	-1.47
		111	.00	.09	.00	.00	.00	1.45
246	1	111	.00	-.95	.00	.00	.00	-1.45
		132	.00	.95	.00	.00	.00	1.17
247	1	132	.00	-1.58	.00	.00	.00	-1.17
		153	.00	1.58	.00	.00	.00	.70
248	1	153	.00	-2.38	.00	.00	.00	-.70
		174	.00	2.38	.00	.00	.00	.00
251	1	7	.00	10.87	.00	.00	.00	5.65
		28	.00	-10.87	.00	.00	.00	-2.45
252	1	28	.00	7.08	.00	.00	.00	2.45
		49	.00	-7.08	.00	.00	.00	-.36
253	1	49	.00	3.97	.00	.00	.00	.36
		70	.00	-3.97	.00	.00	.00	.81
254	1	70	.00	1.56	.00	.00	.00	-.81
		91	.00	-1.56	.00	.00	.00	1.27
255	1	91	.00	-.18	.00	.00	.00	-1.27
		112	.00	.18	.00	.00	.00	1.22
256	1	112	.00	-1.19	.00	.00	.00	-1.22
		133	.00	1.19	.00	.00	.00	.87
257	1	133	.00	-1.29	.00	.00	.00	-.87
		154	.00	1.29	.00	.00	.00	.49
258	1	154	.00	-1.66	.00	.00	.00	-.49
		175	.00	1.66	.00	.00	.00	.00

BOX CULVERT AT CH. 2+219 (WING WALL)

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
261	1	8	.00	10.12	.00	.00	.00	5.45
		29	.00	-10.12	.00	.00	.00	-2.47
262	1	29	.00	6.47	.00	.00	.00	2.47
		50	.00	-6.47	.00	.00	.00	-.56
263	1	50	.00	3.53	.00	.00	.00	.56
		71	.00	-3.53	.00	.00	.00	.48
264	1	71	.00	1.37	.00	.00	.00	-.48
		92	.00	-1.37	.00	.00	.00	.89
265	1	92	.00	-.12	.00	.00	.00	-.89
		113	.00	.12	.00	.00	.00	.85
266	1	113	.00	-1.33	.00	.00	.00	-.85
		134	.00	1.33	.00	.00	.00	.46
267	1	134	.00	-2.14	.00	.00	.00	-.46
		155	.00	2.14	.00	.00	.00	-.17
268	1	155	.00	.60	.00	.00	.00	.18
		176	.00	-.60	.00	.00	.00	.00
271	1	9	.00	8.81	.00	.00	.00	4.92
		30	.00	-8.81	.00	.00	.00	-2.32
272	1	30	.00	5.39	.00	.00	.00	2.32
		51	.00	-5.39	.00	.00	.00	-.73
273	1	51	.00	2.79	.00	.00	.00	.73
		72	.00	-2.79	.00	.00	.00	.09
274	1	72	.00	.91	.00	.00	.00	-.09
		93	.00	-.91	.00	.00	.00	.36
275	1	93	.00	-.08	.00	.00	.00	-.36
		114	.00	.08	.00	.00	.00	.33
276	1	114	.00	-.01	.00	.00	.00	-.33
		135	.00	.01	.00	.00	.00	.33
277	1	135	.00	-1.13	.00	.00	.00	-.33
		156	.00	1.13	.00	.00	.00	.00
281	1	10	.00	6.59	.00	.00	.00	4.03
		31	.00	-6.59	.00	.00	.00	-2.09
282	1	31	.00	3.98	.00	.00	.00	2.09
		52	.00	-3.98	.00	.00	.00	-.91
283	1	52	.00	2.13	.00	.00	.00	.91
		73	.00	-2.13	.00	.00	.00	-.28
284	1	73	.00	.67	.00	.00	.00	.28
		94	.00	-.67	.00	.00	.00	-.09
285	1	94	.00	-.61	.00	.00	.00	.09
		115	.00	.61	.00	.00	.00	-.27
286	1	115	.00	-1.35	.00	.00	.00	.27
		136	.00	1.35	.00	.00	.00	-.66
287	1	136	.00	2.26	.00	.00	.00	.67
		157	.00	-2.26	.00	.00	.00	.00
291	1	11	.00	3.39	.00	.00	.00	2.86
		32	.00	-3.39	.00	.00	.00	-1.86

BOX CULVERT AT CH. 2+219 (WING WALL)

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
292	1	32	.00	2.62	.00	.00	.00	1.86
		53	.00	-2.62	.00	.00	.00	-1.09
293	1	53	.00	1.65	.00	.00	.00	1.09
		74	.00	-1.65	.00	.00	.00	-.60
294	1	74	.00	.86	.00	.00	.00	.60
		95	.00	-.86	.00	.00	.00	-.35
295	1	95	.00	.47	.00	.00	.00	.35
		116	.00	-.47	.00	.00	.00	-.21
296	1	116	.00	.70	.00	.00	.00	.21
		137	.00	-.70	.00	.00	.00	.00
301	1	12	.00	1.53	.00	.00	.00	1.96
		33	.00	-1.53	.00	.00	.00	-1.51
302	1	33	.00	1.44	.00	.00	.00	1.51
		54	.00	-1.44	.00	.00	.00	-1.09
303	1	54	.00	1.19	.00	.00	.00	1.09
		75	.00	-1.19	.00	.00	.00	-.74
304	1	75	.00	1.01	.00	.00	.00	.74
		96	.00	-1.01	.00	.00	.00	-.44
305	1	96	.00	1.02	.00	.00	.00	.44
		117	.00	-1.02	.00	.00	.00	-.14
306	1	117	.00	.46	.00	.00	.00	.14
		138	.00	-.46	.00	.00	.00	.00
311	1	13	.00	.77	.00	.00	.00	1.36
		34	.00	-.77	.00	.00	.00	-1.14
312	1	34	.00	.79	.00	.00	.00	1.14
		55	.00	-.79	.00	.00	.00	-.90
313	1	55	.00	.77	.00	.00	.00	.90
		76	.00	-.77	.00	.00	.00	-.67
314	1	76	.00	.69	.00	.00	.00	.67
		97	.00	-.69	.00	.00	.00	-.47
315	1	97	.00	.54	.00	.00	.00	.47
		118	.00	-.54	.00	.00	.00	-.31
316	1	118	.00	1.06	.00	.00	.00	.31
		139	.00	-1.06	.00	.00	.00	.00
321	1	14	.00	.51	.00	.00	.00	.94
		35	.00	-.51	.00	.00	.00	-.79
322	1	35	.00	.55	.00	.00	.00	.79
		56	.00	-.55	.00	.00	.00	-.63
323	1	56	.00	.56	.00	.00	.00	.62
		77	.00	-.56	.00	.00	.00	-.46
324	1	77	.00	.52	.00	.00	.00	.46
		98	.00	-.52	.00	.00	.00	-.30
331	1	15	.00	.39	.00	.00	.00	.60
		36	.00	-.39	.00	.00	.00	-.49
332	1	36	.00	.46	.00	.00	.00	.49
		57	.00	-.46	.00	.00	.00	-.35

BOX CULVERT AT CH. 2+219 (WING WALL)

MEMB ER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
333	1	57 78	.00 .00	.65 -.65	.00 .00	.00 .00	.00 .00	.35 -.16
334	1	78 99	.00 .00	.77 -.77	.00 .00	.00 .00	.00 .00	.16 .07
335	1	99 120	.00 .00	-.23 .23	.00 .00	.00 .00	.00 .00	-.07 .00
341	1	16 37	.00 .00	.27 -.27	.00 .00	.00 .00	.00 .00	.31 -.23
342	1	37 58	.00 .00	.28 -.28	.00 .00	.00 .00	.00 .00	.23 -.15
343	1	58 79	.00 .00	.30 -.30	.00 .00	.00 .00	.00 .00	.15 -.06
351	1	17 38	.00 .00	.16 -.16	.00 .00	.00 .00	.00 .00	.09 -.04
352	1	38 59	.00 .00	.10 -.10	.00 .00	.00 .00	.00 .00	.04 -.01
353	1	59 80	.00 .00	-.09 .09	.00 .00	.00 .00	.00 .00	.01 -.04
354	1	80 101	.00 .00	.12 -.12	.00 .00	.00 .00	.00 .00	.04 .00
361	1	18 39	.00 .00	.04 -.04	.00 .00	.00 .00	.00 .00	-.06 .07
362	1	39 60	.00 .00	.11 -.11	.00 .00	.00 .00	.00 .00	-.07 .10
363	1	60 81	.00 .00	.21 -.21	.00 .00	.00 .00	.00 .00	-.10 .17
364	1	81 102	.00 .00	-.56 .56	.00 .00	.00 .00	.00 .00	-.17 .00
371	1	19 40	.00 .00	-.10 .10	.00 .00	.00 .00	.00 .00	-.15 .12
372	1	40 61	.00 .00	-.18 .18	.00 .00	.00 .00	.00 .00	-.12 .07
373	1	61 82	.00 .00	-.23 .23	.00 .00	.00 .00	.00 .00	-.07 .00
381	1	20 41	.00 .00	-.13 .13	.00 .00	.00 .00	.00 .00	-.16 .12
382	1	41 62	.00 .00	-.12 .12	.00 .00	.00 .00	.00 .00	-.12 .09
383	1	62 83	.00 .00	-.29 .29	.00 .00	.00 .00	.00 .00	-.09 .00
391	1	21 42	.00 .00	-.25 .25	.00 .00	.00 .00	.00 .00	-.14 .06
392	1	42 63	.00 .00	-.21 .21	.00 .00	.00 .00	.00 .00	-.06 .00

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

240. START CON DESIGN

- 241. FC 25000
- 242. CLEAR 0.065
- 243. TRACK 1
- 244. MAXMAIN 25

245. DESIGN BEAM 141 TO 144 161 TO 164 251 TO 254 261 TO 264

=====

B E A M N O. 141 D E S I G N R E S U L T S - F L E X U R E

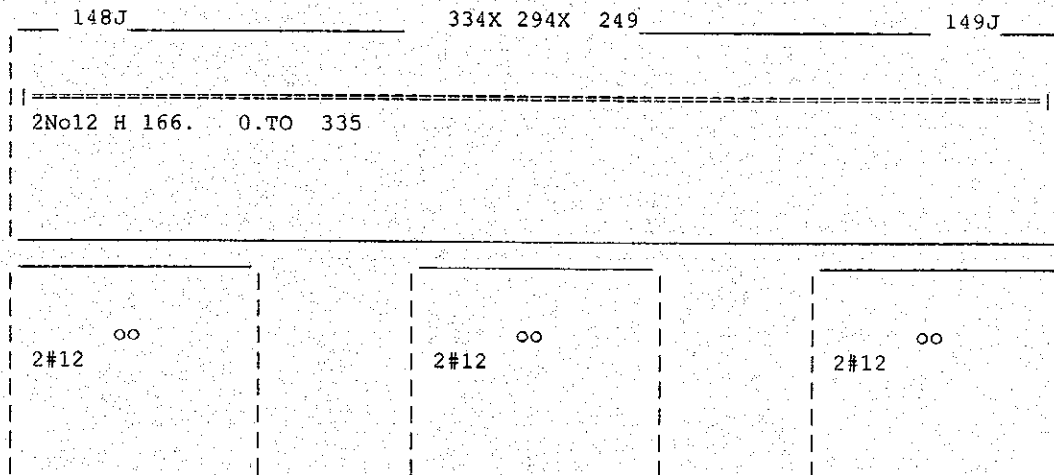
LEN - 335. MM FY - 414. FC - 25. MPA, SIZE - 295. X 250. MMS

LEVEL	HEIGHT (MM)	BAR INFO	FROM (MM)	TO (MM)	ANCHOR	
					STA	END

1	166.	2 - 12MM	0.	335.	YES	YES
CRITICAL NEG MOMENT= 4.40 KN-MET AT 0. MM, LOAD 1 REQD STEEL= 164. MM2, ROW= .0033, ROWMX= .0194 ROWMN= .0033 MAX/MIN/ACTUAL BAR SPACING= 181./ 37./ 181. MMS BASIC/REQD. DEVELOPMENT LENGTH = 177./ 359. MMS						

B E A M N O. 141 D E S I G N R E S U L T S - S H E A R

AT START SUPPORT - Vu= 4.46 KNS Vc= 39.09 KNS Vs= .00 KNS  
 STIRRUPS ARE NOT REQUIRED.  
 AT END SUPPORT - Vu= 4.46 KNS Vc= 39.09 KNS Vs= .00 KNS  
 STIRRUPS ARE NOT REQUIRED.



B E A M N O. 142 D E S I G N R E S U L T S - F L E X U R E

LEN - 335. MM FY - 414. FC - 25. MPA, SIZE - 295. X 250. MMS

LEVEL	HEIGHT (MM)	BAR INFO	FROM (MM)	TO (MM)	ANCHOR	
					STA	END

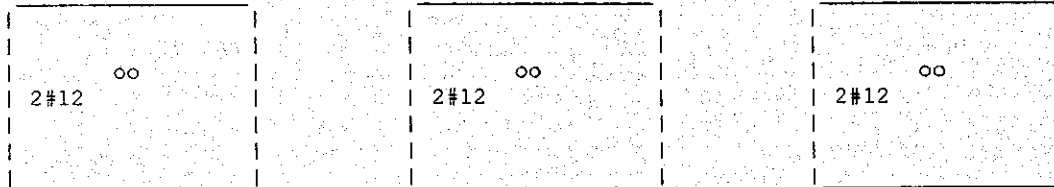
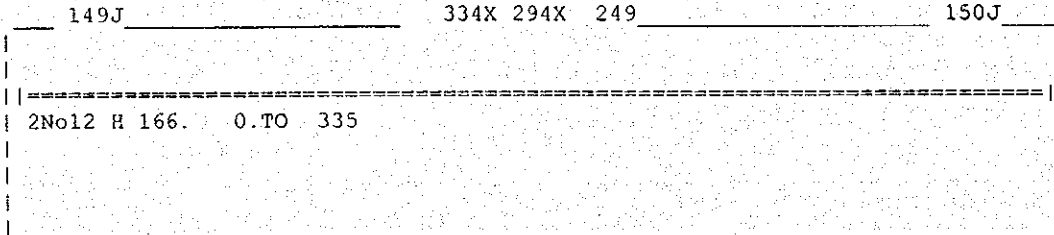
1	166.	2 - 12MM	0.	335.	YES	YES
---	------	----------	----	------	-----	-----

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CRITICAL NEG MOMENT=      2.91 KN-MET AT      0.MM, LOAD  1
REQD STEEL=      164.MM2, ROW= .0033, ROWMX= .0194 ROWMN= .0033
MAX/MIN/ACTUAL BAR SPACING=  181./  37./  181. MMS
BASIC/REQD. DEVELOPMENT LENGTH =  177./  359. MMS
-----
    
```

BEAM NO. 142 DESIGN RESULTS - SHEAR

AT START SUPPORT - Vu= 3.60 KNS Vc= 39.09 KNS Vs= .00 KNS  
 STIRRUPS ARE NOT REQUIRED.  
 AT END SUPPORT - Vu= 3.60 KNS Vc= 39.09 KNS Vs= .00 KNS  
 STIRRUPS ARE NOT REQUIRED.



BEAM NO. 143 DESIGN RESULTS - FLEXURE

LEN - 335. MM FY - 414. FC - 25. MPA, SIZE - 295. X 250. MMS

LEVEL	HEIGHT (MM)	BAR INFO	FROM (MM)	TO (MM)	ANCHOR STA	END
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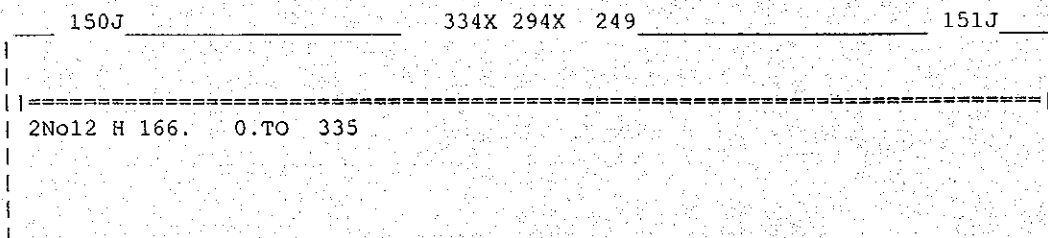
1	166.	2 - 12MM	0.	335.	YES	YES
---	------	----------	----	------	-----	-----

```

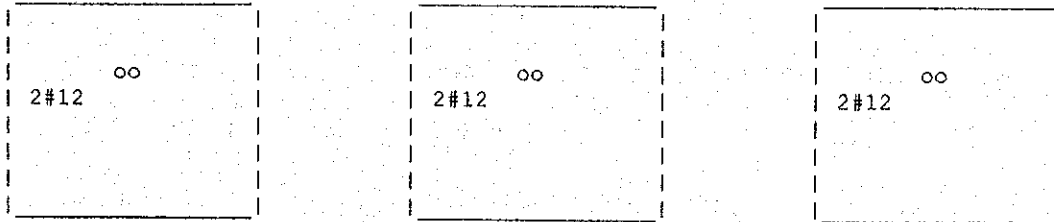
-----
CRITICAL NEG MOMENT=      1.70 KN-MET AT      0.MM, LOAD  1
REQD STEEL=      164.MM2, ROW= .0033, ROWMX= .0194 ROWMN= .0033
MAX/MIN/ACTUAL BAR SPACING=  181./  37./  181. MMS
BASIC/REQD. DEVELOPMENT LENGTH =  177./  359. MMS
-----
    
```

BEAM NO. 143 DESIGN RESULTS - SHEAR

AT START SUPPORT - Vu= 2.01 KNS Vc= 39.09 KNS Vs= .00 KNS  
 STIRRUPS ARE NOT REQUIRED.  
 AT END SUPPORT - Vu= 2.01 KNS Vc= 39.09 KNS Vs= .00 KNS  
 STIRRUPS ARE NOT REQUIRED.







BEAM NO. 144 DESIGN RESULTS - FLEXURE

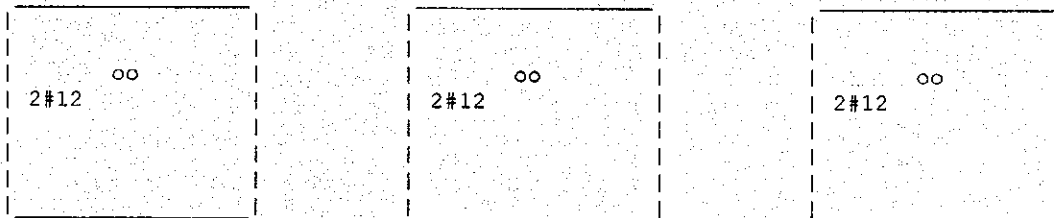
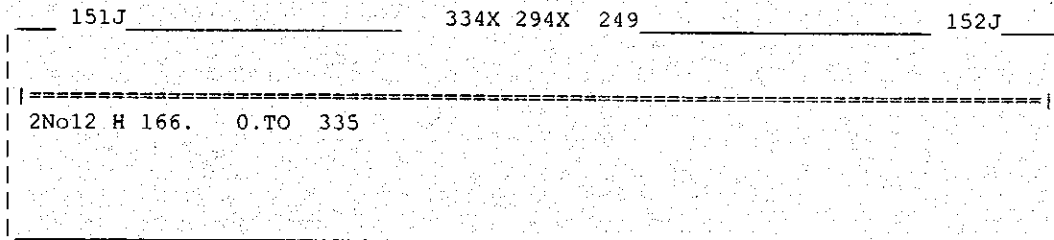
LEN - 335. MM FY - 414. FC - 25. MPA, SIZE - 295. X 250. MMS

LEVEL	HEIGHT (MM)	BAR INFO	FROM (MM)	TO (MM)	ANCHOR STA	ANCHOR END
-------	-------------	----------	-----------	---------	------------	------------

1	166.	2 - 12MM	0.	335.	YES	YES
CRITICAL NEG MOMENT= 1.03 KN-MET AT 0.MM, LOAD 1 REQD STEEL= 164.MM2, ROW= .0033, ROWMX= .0194 ROWMN= .0033 MAX/MIN/ACTUAL BAR SPACING= 181./ 37./ 181. MMS BASIC/REQD. DEVELOPMENT LENGTH = 177./ 359. MMS						

BEAM NO. 144 DESIGN RESULTS - SHEAR

AT START SUPPORT - Vu= 2.11 KNS Vc= 39.09 KNS Vs= .00 KNS  
 STIRRUPS ARE NOT REQUIRED.  
 AT END SUPPORT - Vu= 2.11 KNS Vc= 39.09 KNS Vs= .00 KNS  
 STIRRUPS ARE NOT REQUIRED.



BEAM NO. 161 DESIGN RESULTS - FLEXURE

LEN - 335. MM FY - 414. FC - 25. MPA, SIZE - 295. X 250. MMS

LEVEL	HEIGHT (MM)	BAR INFO	FROM (MM)	TO (MM)	ANCHOR STA	ANCHOR END
-------	-------------	----------	-----------	---------	------------	------------

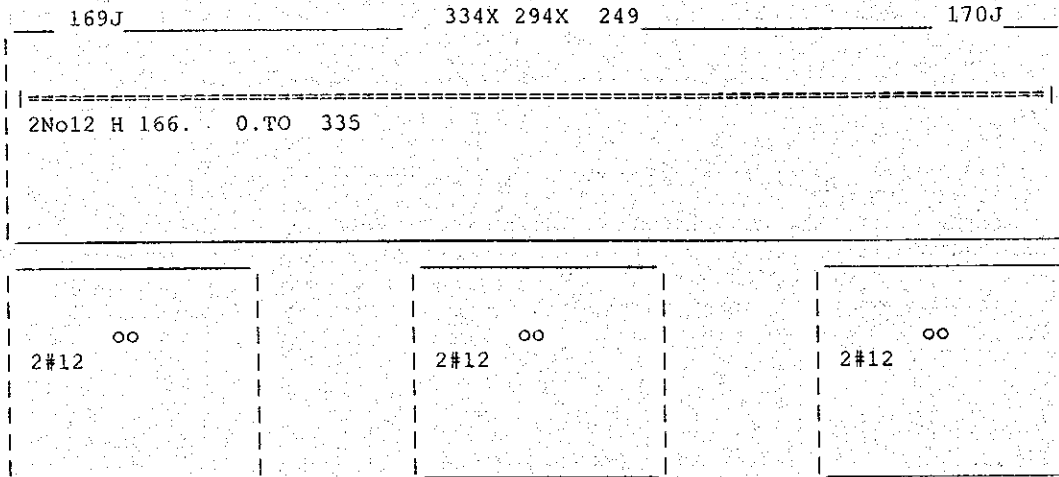
1	166.	2 - 12MM	0.	335.	YES	YES
---	------	----------	----	------	-----	-----

```

-----
CRITICAL NEG MOMENT=      3.62 KN-MET AT      0.MM, LOAD  1
REQD STEEL=      164.MM2, ROW= .0033, ROWMX= .0194 ROWMN= .0033
MAX/MIN/ACTUAL BAR SPACING=  181./  37./ 181. MMS
BASIC/REQD. DEVELOPMENT LENGTH =  177./ 359. MMS
-----
    
```

B E A M N O. 161 D E S I G N R E S U L T S - S H E A R

AT START SUPPORT - Vu= 2.55 KNS Vc= 39.09 KNS Vs= .00 KNS  
 STIRRUPS ARE NOT REQUIRED.  
 AT END SUPPORT - Vu= 2.55 KNS Vc= 39.09 KNS Vs= .00 KNS  
 STIRRUPS ARE NOT REQUIRED.



B E A M N O. 162 D E S I G N R E S U L T S - F L E X U R E

LEN - 335. MM FY - 414. FC - 25. MPA, SIZE - 295. X 250. MMS

LEVEL	HEIGHT (MM)	BAR INFO	FROM (MM)	TO (MM)	ANCHOR STA	ANCHOR END
-------	-------------	----------	-----------	---------	------------	------------

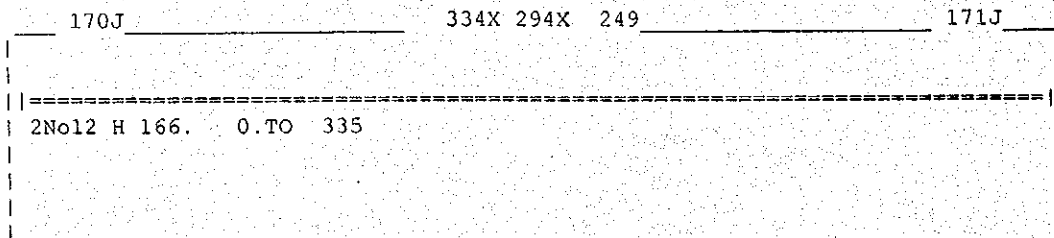
1	166.	2 - 12MM	0.	335.	YES	YES
---	------	----------	----	------	-----	-----

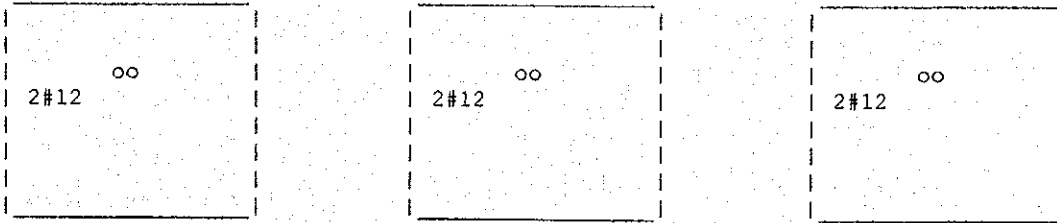
```

-----
CRITICAL NEG MOMENT=      2.76 KN-MET AT      0.MM, LOAD  1
REQD STEEL=      164.MM2, ROW= .0033, ROWMX= .0194 ROWMN= .0033
MAX/MIN/ACTUAL BAR SPACING=  181./  37./ 181. MMS
BASIC/REQD. DEVELOPMENT LENGTH =  177./ 359. MMS
-----
    
```

B E A M N O. 162 D E S I G N R E S U L T S - S H E A R

AT START SUPPORT - Vu= 2.85 KNS Vc= 39.09 KNS Vs= .00 KNS  
 STIRRUPS ARE NOT REQUIRED.  
 AT END SUPPORT - Vu= 2.85 KNS Vc= 39.09 KNS Vs= .00 KNS  
 STIRRUPS ARE NOT REQUIRED.





BEAM NO. 163 DESIGN RESULTS - FLEXURE

LEN - 335. MM FY - 414. FC - 25. MPA, SIZE - 295. X 250. MMS

LEVEL	HEIGHT (MM)	BAR INFO	FROM (MM)	TO (MM)	ANCHOR STA	ANCHOR END
-------	-------------	----------	-----------	---------	------------	------------

1	166.	2 - 12MM	0.	335.	YES	YES
---	------	----------	----	------	-----	-----

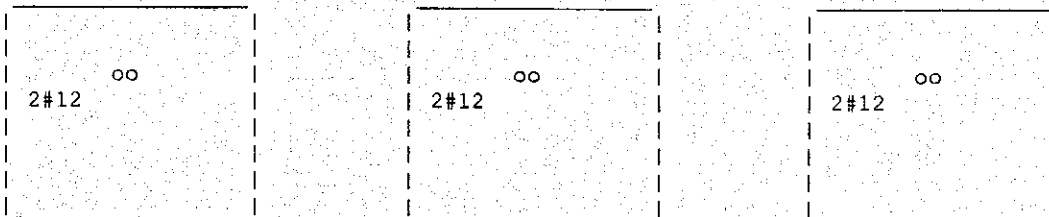
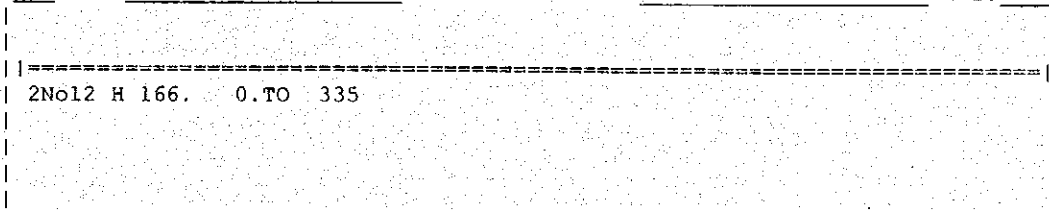
-----						
CRITICAL NEG MOMENT= 1.81 KN-MET AT 0.MM, LOAD 1						
REQD STEEL= 164.MM2, ROW= .0033, ROWMX= .0194 ROWMN= .0033						
MAX/MIN/ACTUAL BAR SPACING= 181./ 37./ 181. MMS						
BASIC/REQD. DEVELOPMENT LENGTH = 177./ 359. MMS						
-----						

BEAM NO. 163 DESIGN RESULTS - SHEAR

AT START SUPPORT - Vu= 1.23 KNS Vc= 39.09 KNS Vs= .00 KNS  
STIRRUPS ARE NOT REQUIRED.

AT END SUPPORT - Vu= 1.23 KNS Vc= 39.09 KNS Vs= .00 KNS  
STIRRUPS ARE NOT REQUIRED.

171J 334X 294X 249 172J



BEAM NO. 164 DESIGN RESULTS - FLEXURE

LEN - 335. MM FY - 414. FC - 25. MPA, SIZE - 295. X 250. MMS

LEVEL	HEIGHT (MM)	BAR INFO	FROM (MM)	TO (MM)	ANCHOR STA	ANCHOR END
-------	-------------	----------	-----------	---------	------------	------------

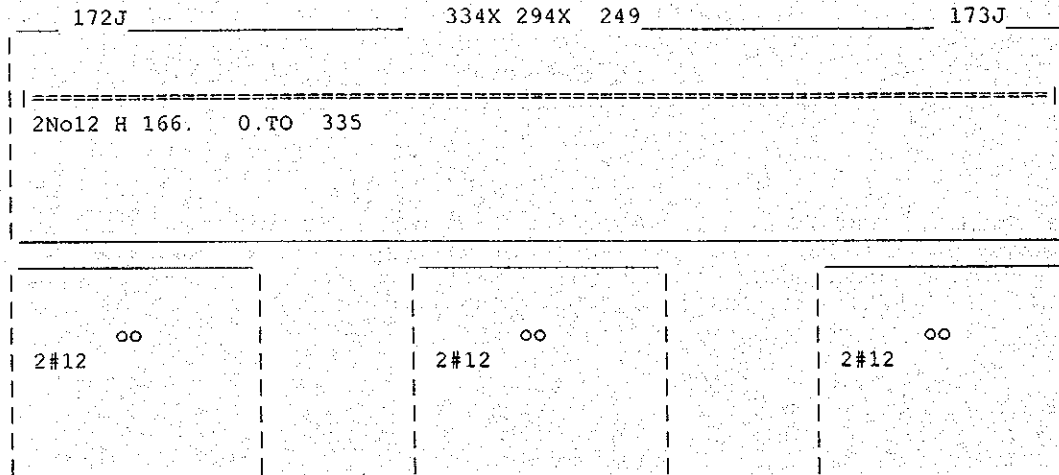
1	166.	2 - 12MM	0.	335.	YES	YES
---	------	----------	----	------	-----	-----

```

-----
| CRITICAL NEG MOMENT=      1.39 KN-MET AT      0.MM, LOAD  1 |
| REQD STEEL=    164.MM2, ROW= .0033, ROWMX= .0194 ROWMN= .0033 |
| MAX/MIN/ACTUAL BAR SPACING=  181./  37./ 181. MMS |
| BASIC/REQD. DEVELOPMENT LENGTH =  177./  359. MMS |
-----
    
```

BEAM NO. 164 DESIGN RESULTS - SHEAR

AT START SUPPORT - Vu= .30 KNS Vc= 39.09 KNS Vs= .00 KNS  
 STIRRUPS ARE NOT REQUIRED.  
 AT END SUPPORT - Vu= .30 KNS Vc= 39.09 KNS Vs= .00 KNS  
 STIRRUPS ARE NOT REQUIRED.



BEAM NO. 251 DESIGN RESULTS - FLEXURE

LEN - 295. MM FY - 414. FC - 25. MPA, SIZE - 335. X 250. MMS

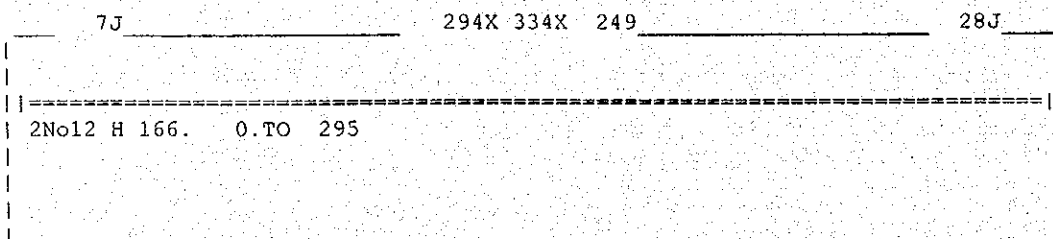
LEVEL	HEIGHT (MM)	BAR INFO	FROM (MM)	TO (MM)	ANCHOR STA	END
1	166.	2 - 12MM	0.	295.	YES	YES

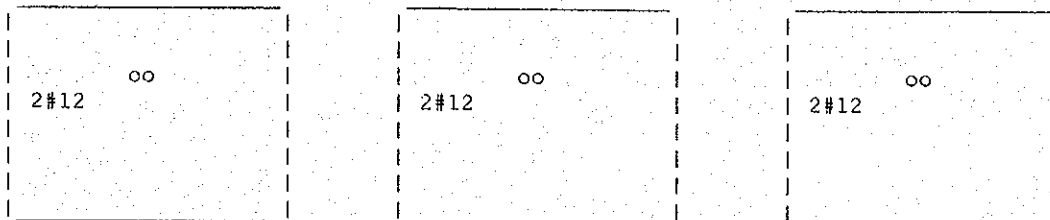
```

-----
| CRITICAL NEG MOMENT=      5.65 KN-MET AT      0.MM, LOAD  1 |
| REQD STEEL=    186.MM2, ROW= .0033, ROWMX= .0194 ROWMN= .0033 |
| MAX/MIN/ACTUAL BAR SPACING=  221./  37./ 221. MMS |
| BASIC/REQD. DEVELOPMENT LENGTH =  177./  359. MMS |
-----
    
```

BEAM NO. 251 DESIGN RESULTS - SHEAR

AT START SUPPORT - Vu= 10.87 KNS Vc= 44.40 KNS Vs= .00 KNS  
 STIRRUPS ARE NOT REQUIRED.  
 AT END SUPPORT - Vu= 10.87 KNS Vc= 44.40 KNS Vs= .00 KNS  
 STIRRUPS ARE NOT REQUIRED.





BEAM NO. 252 DESIGN RESULTS - FLEXURE

LEN - 295. MM FY - 414. FC - 25. MPA, SIZE - 335. X 250. MMS

LEVEL	HEIGHT (MM)	BAR INFO	FROM (MM)	TO (MM)	ANCHOR STA	END
-------	-------------	----------	-----------	---------	------------	-----

1	166.	2 - 12MM	0.	295.	YES	YES
---	------	----------	----	------	-----	-----

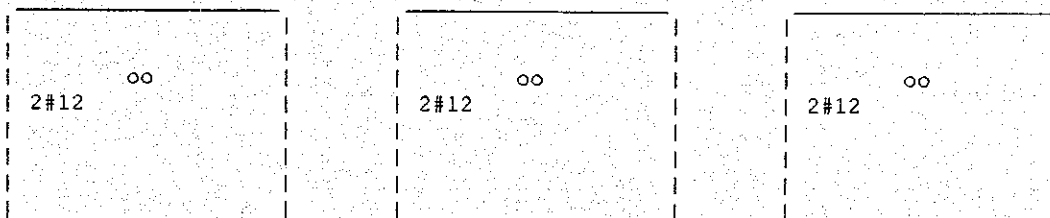
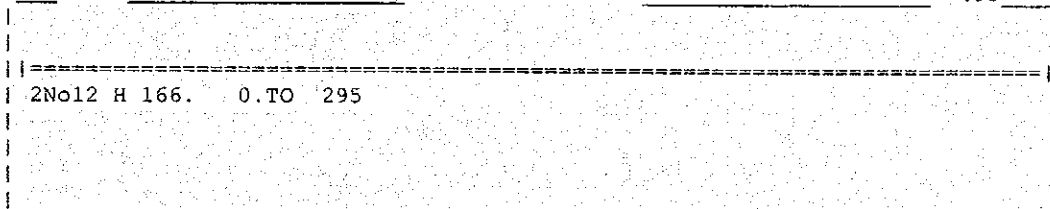
CRITICAL NEG MOMENT=	2.45 KN-MET	AT	0. MM,	LOAD	1
REQD STEEL=	186. MM <sup>2</sup> ,	ROW=	.0033,	ROWMX=	.0194
		ROWMN=	.0033		
MAX/MIN/ACTUAL BAR SPACING=	221./	37./	221. MMS		
BASIC/REQD. DEVELOPMENT LENGTH =	177./	359. MMS			

BEAM NO. 252 DESIGN RESULTS - SHEAR

AT START SUPPORT - Vu= 7.08 KNS Vc= 44.40 KNS Vs= .00 KNS  
STIRRUPS ARE NOT REQUIRED.

AT END SUPPORT - Vu= 7.08 KNS Vc= 44.40 KNS Vs= .00 KNS  
STIRRUPS ARE NOT REQUIRED.

28J \_\_\_\_\_ 294X 334X 249 \_\_\_\_\_ 49J



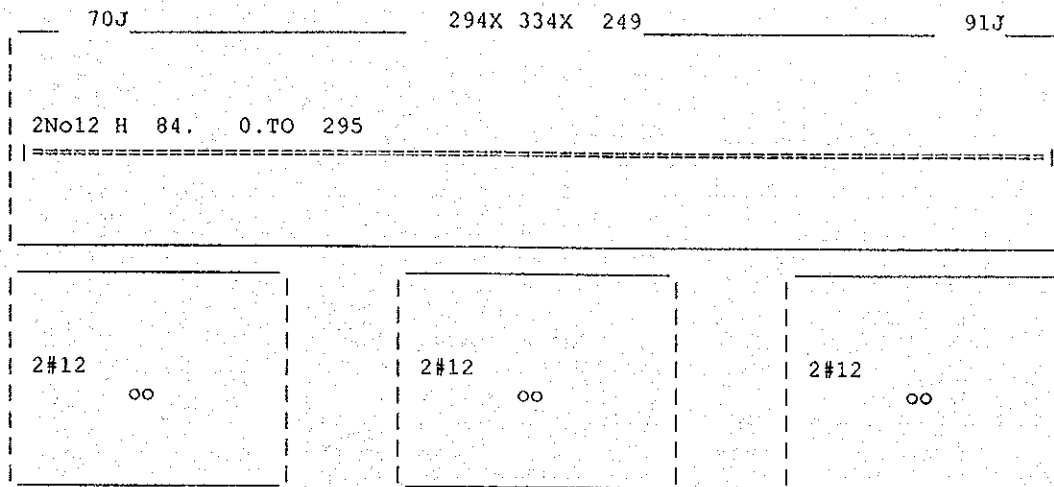
BEAM NO. 253 DESIGN RESULTS - FLEXURE

LEN - 295. MM FY - 414. FC - 25. MPA, SIZE - 335. X 250. MMS

LEVEL	HEIGHT (MM)	BAR INFO	FROM (MM)	TO (MM)	ANCHOR STA	END
-------	-------------	----------	-----------	---------	------------	-----

1	84.	2 - 12MM	0.	295.	YES	YES
---	-----	----------	----	------	-----	-----





BEAM NO. 261 DESIGN RESULTS - FLEXURE

LEN - 295. MM FY - 414. FC - 25. MPA, SIZE - 335. X 250. MMS

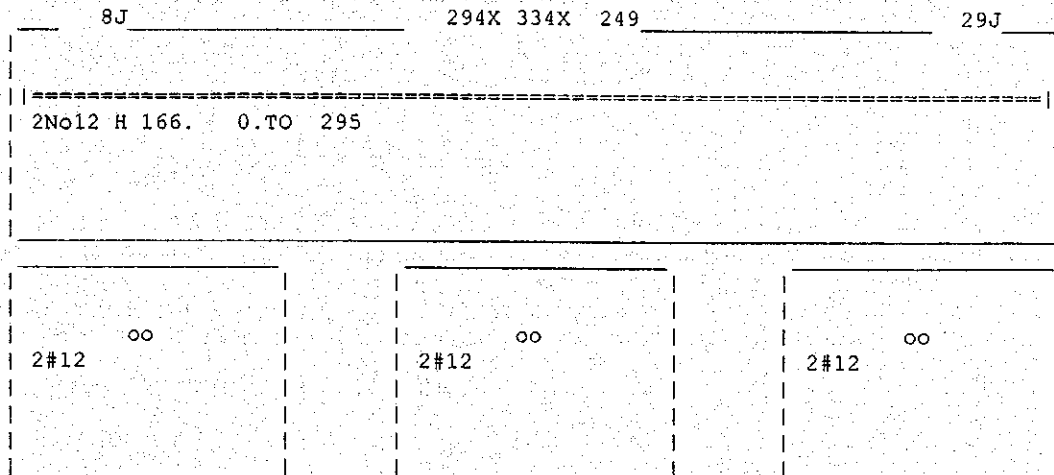
LEVEL	HEIGHT (MM)	BAR INFO	FROM (MM)	TO (MM)	ANCHOR STA	ANCHOR END
-------	-------------	----------	-----------	---------	------------	------------

1	166.	2 - 12MM	0.	295.	YES	YES
---	------	----------	----	------	-----	-----

CRITICAL NEG MOMENT= 5.45 KN-MET AT 0.MM, LOAD 1  
 REQD STEEL= 186.MM2, ROW= .0033, ROWMX= .0194 ROWMN= .0033  
 MAX/MIN/ACTUAL BAR SPACING= 221./ 37./ 221. MMS  
 BASIC/REQD. DEVELOPMENT LENGTH = 177./ 359. MMS

BEAM NO. 261 DESIGN RESULTS - SHEAR

AT START SUPPORT - Vu= 10.12 KNS Vc= 44.40 KNS Vs= .00 KNS  
 STIRRUPS ARE NOT REQUIRED.  
 AT END SUPPORT - Vu= 10.12 KNS Vc= 44.40 KNS Vs= .00 KNS  
 STIRRUPS ARE NOT REQUIRED.



BEAM NO. 262 DESIGN RESULTS - FLEXURE

LEN - 295. MM FY - 414. FC - 25. MPA, SIZE - 335. X 250. MMS

LEVEL	HEIGHT (MM)	BAR INFO	FROM (MM)	TO (MM)	ANCHOR STA	END
-------	-------------	----------	-----------	---------	------------	-----

1	166.	2 - 12MM	0.	295.	YES	YES
CRITICAL NEG MOMENT= 2.47 KN-MET AT 0.MM, LOAD 1 REQD STEEL= 186.MM2, ROW= .0033, ROWMX= .0194 ROWMN= .0033 MAX/MIN/ACTUAL BAR SPACING= 221./ 37./ 221. MMS BASIC/REQD. DEVELOPMENT LENGTH = 177./ 359. MMS						

BEAM NO. 262 DESIGN RESULTS - SHEAR

AT START SUPPORT - Vu= 6.47 KNS Vc= 44.40 KNS Vs= .00 KNS  
 STIRRUPS ARE NOT REQUIRED.  
 AT END SUPPORT - Vu= 6.47 KNS Vc= 44.40 KNS Vs= .00 KNS  
 STIRRUPS ARE NOT REQUIRED.

29J	294X 334X 249	50J
2No12 H 166. 0.TO 295		



BEAM NO. 263 DESIGN RESULTS - FLEXURE

LEN - 295. MM FY - 414. FC - 25. MPA, SIZE - 335. X 250. MMS

LEVEL	HEIGHT (MM)	BAR INFO	FROM (MM)	TO (MM)	ANCHOR STA	END
-------	-------------	----------	-----------	---------	------------	-----

1	84.	2 - 12MM	0.	295.	YES	YES
CRITICAL POS MOMENT= .48 KN-MET AT 295.MM, LOAD 1 REQD STEEL= 186.MM2, ROW= .0033, ROWMX= .0194 ROWMN= .0033 MAX/MIN/ACTUAL BAR SPACING= 221./ 37./ 221. MMS BASIC/REQD. DEVELOPMENT LENGTH = 177./ 295. MMS						
2	166.	2 - 12MM	0.	295.	YES	YES
CRITICAL NEG MOMENT= .56 KN-MET AT 0.MM, LOAD 1 REQD STEEL= 186.MM2, ROW= .0033, ROWMX= .0194 ROWMN= .0033 MAX/MIN/ACTUAL BAR SPACING= 221./ 37./ 221. MMS BASIC/REQD. DEVELOPMENT LENGTH = 177./ 359. MMS						



BEAM NO. 263 DESIGN RESULTS - SHEAR

AT START SUPPORT - Vu= 3.53 KNS Vc= 44.40 KNS Vs= .00 KNS  
 STIRRUPS ARE NOT REQUIRED.  
 AT END SUPPORT - Vu= 3.53 KNS Vc= 44.40 KNS Vs= .00 KNS  
 STIRRUPS ARE NOT REQUIRED.

50J		294X 334X 249		71J	
=====					
2No12 H 184. 0.TO 295					
=====					
2#12 ∞		2#12 ∞		2#12 ∞	
∞		∞		∞	

BEAM NO. 264 DESIGN RESULTS - FLEXURE

LEN - 295. MM FY - 414. FC - 25. MPA, SIZE - 335. X 250. MMS

LEVEL	HEIGHT (MM)	BAR INFO	FROM (MM)	TO (MM)	ANCHOR STA	END
1	84.	2 - 12MM	0.	295.	YES	YES

CRITICAL POS MOMENT= .89 KN-MET AT 295.MM, LOAD 1  
 REQD STEEL= 186.MM2, ROW= .0033, ROWMX= .0194 ROWMN= .0033  
 MAX/MIN/ACTUAL BAR SPACING= 221./ 37./ 221. MMS  
 BASIC/REQD. DEVELOPMENT LENGTH = 177./ 295. MMS

BEAM NO. 264 DESIGN RESULTS - SHEAR

AT START SUPPORT - Vu= 1.37 KNS Vc= 44.40 KNS Vs= .00 KNS  
 STIRRUPS ARE NOT REQUIRED.  
 AT END SUPPORT - Vu= 1.37 KNS Vc= 44.40 KNS Vs= .00 KNS  
 STIRRUPS ARE NOT REQUIRED.

71J		294X 334X 249		92J	
=====					
2No12 H 84. 0.TO 295					
=====					
2#12 ∞		2#12 ∞		2#12 ∞	
∞		∞		∞	

\*\*\*\*\*END OF BEAM DESIGN\*\*\*\*\*

249. END CON DESIGN  
250. FINISH

\*\*\*\*\* END OF STAAD-III \*\*\*\*\*

\*\*\*\* DATE= JAN 29,2000 TIME= 15: 9:32 \*\*\*\*

\*\*\*\*\*  
\* For questions on STAAD-III, contact: \*  
\* Research Engineers, Inc at \*  
\* West Coast: Ph- (714) 974-2500 Fax- (714) 921-2543 \*  
\* East Coast: Ph- (508) 688-3626 Fax- (508) 685-7230 \*  
\*\*\*\*\*