BRIDGE CAPACITY RATING

NEW YORK

DEPARTMENT OF TRANSPORTATION

LONG ISLAND EXPRESSWAY

OVER

CEMETARY ROAD UNDERPASS

September, 1998

RUST

Rust Environment
& Infrastructure

LONG ISLAND EXPRESSWAY
OVER
CEMETARY ROAD UNDERPASS

September 16, 1998

COMPUTATION INDEX

BRIDGE CAPACITY RATING

September 16, 1998

Summary

Reinforced Concrete Rigid Frame Rating Analysis - HS-20 Loading

Location	Inventory Rating (Tons)	Equivalent HS Loading (Tons)	Inventory Rating (Tons)	Equivalent HS Loading (Tons)
Abutment Face	38.8	HS 21.5	94.7	HS 52.6
1 / 8 th Point	87.0	HS 48.3	142.8	HS 79.3
1 / 4 Point	83.1	HS 46.2	120.0	HS 66.7
3 / 8 th Point	52.8	HS 29.3	84.6	HS 47.0
Crown	35.3	HS 19.6	69.6	HS 38.7

RUST Rust Environment & Infrastructure

CALCULATION SHEET

PAGE 1 OF ____

PROJECT NO. 19116

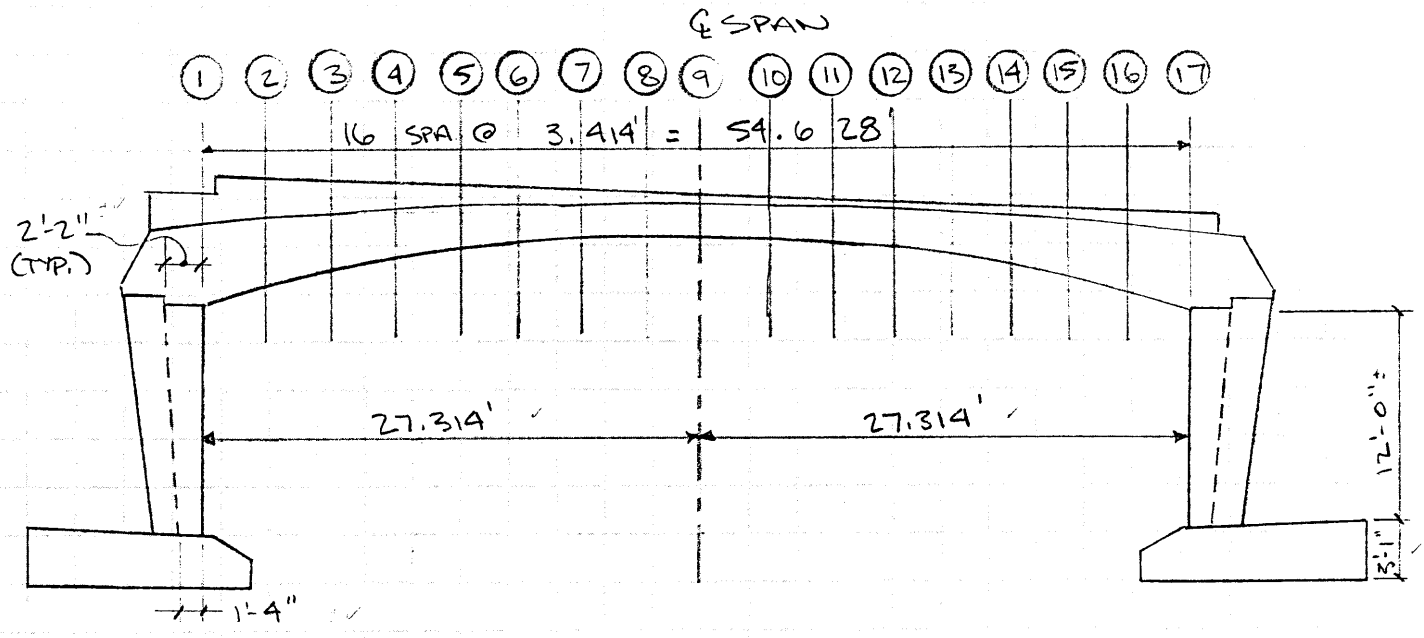
CLIENT N.Y. DOT SUBJECT CEMETERY

PROJECT L.I.E UNDERPASS

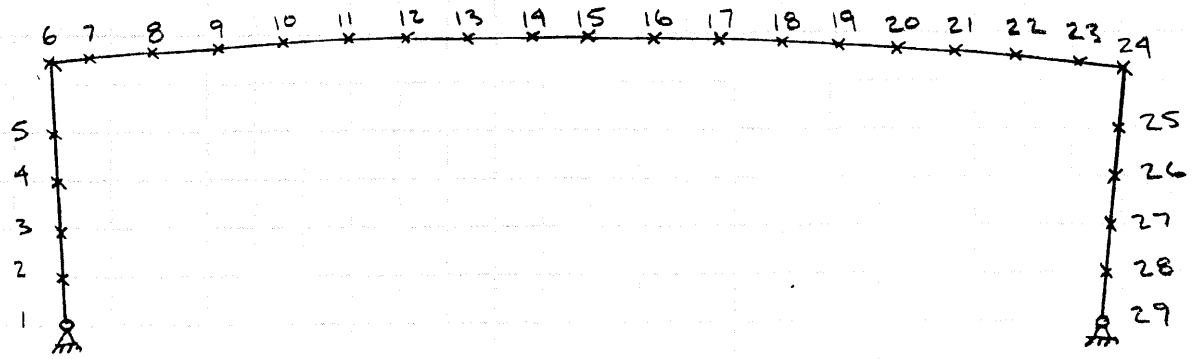
Prepared By WN Date 8/98

Reviewed By JM Date 8/98

Approved By ____ Date ____



COORDINATES FOR STAAD INPUT



JOINT #	X	Y	Z	JOINT #	X	Y	Z
1	0.0	0.0	0.0	16	32.06	17.09	0.0
2	-0.23	3.33	0.0	17	35.48	16.95	0.0
3	-0.43	6.33	0.0	18	38.89	16.88	0.0
4	-0.63	9.33	0.0	19	42.30	16.97	0.0
5	-0.83	12.33	0.0	20	45.72	16.20	0.0
6	-0.95	14.06	0.0	21	49.13	15.75	0.0
7	1.33	14.58	0.0	22	52.55	15.21	0.0
8	4.75	15.21	0.0	23	55.96	14.58	0.0
9	8.16	15.75	0.0	24	58.25	14.06	0.0
10	11.58	16.20	0.0	25	58.13	12.33	0.0
11	14.99	16.47	0.0	26	57.93	9.33	0.0
12	18.40	16.88	0.0	27	57.72	6.33	0.0
13	21.82	16.95	0.0	28	57.52	3.33	0.0
14	25.23	17.09	0.0	29	57.29	0	0.0
15	28.65	17.16	0.0				

CALCULATION SHEET

PAGE 3 OF ___

PROJECT NO. 19116

CLIENT N.Y. DOT SUBJECT CEMETERY

PROJECT L.I.E UNDERPASS

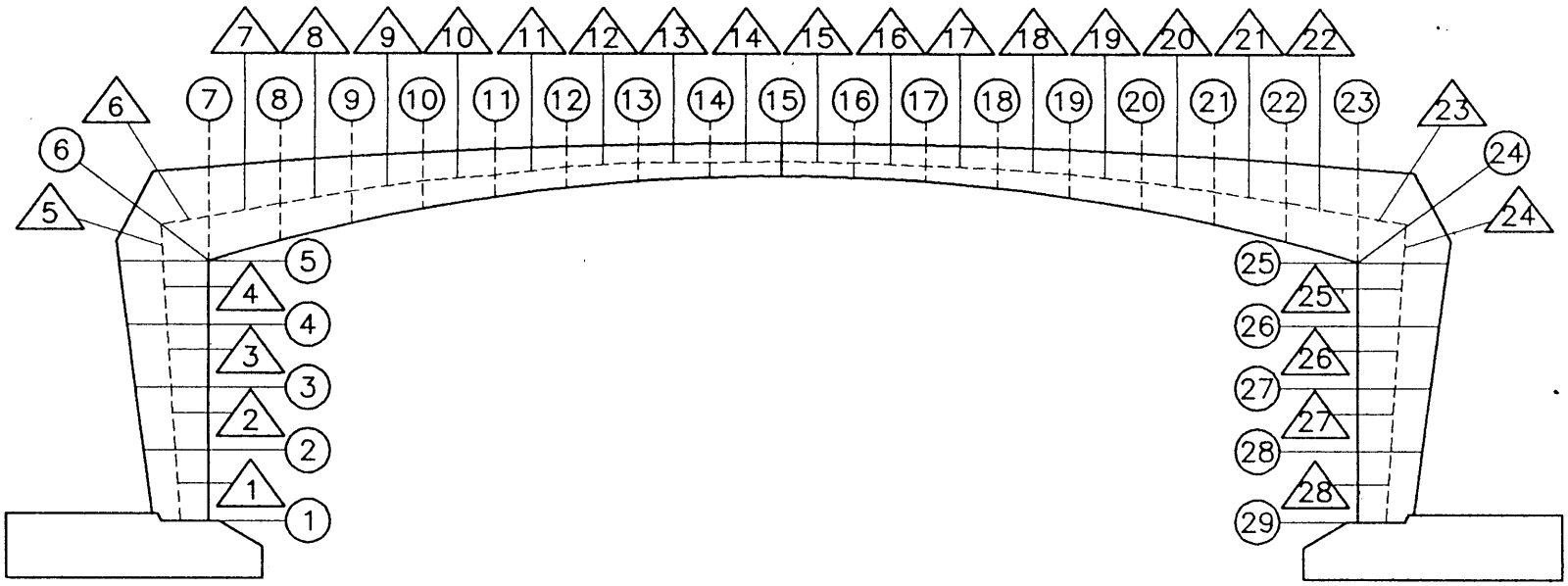
Prepared By WV Date 8/98

Reviewed By JM Date 8/98

Approved By ___ Date ___

SECTION PROPERTIES FOR 1'-0" STRIP OF BRIDGE.

JOINT #	AREA (FT^2)	WT / FT (KIP FT) @ .150 KIP/FT^2
1	2.62	0.393
2	3.07	0.461
3	3.47	0.052
4	3.88	0.582
5	4.28	0.642
6	4.42	0.663
7	4.50	0.675
8	3.80	0.570
9	3.20	0.480
10	2.70	0.405
11	2.30	0.345
12	1.98	0.297
13	1.76	0.264
14	1.63	0.245
15	1.58	0.237
16	1.63	0.245
17	1.76	0.264
18	1.98	0.297
19	2.30	0.345
20	2.70	0.405
21	3.20	0.480
22	3.80	0.570
23	4.50	0.675
24	4.42	0.663
25	4.28	0.642
26	3.88	0.582
27	3.47	0.052
28	3.07	0.461
29	2.62	0.393



7 MEMBER NUMBER

(5) JOINT NUMBER

CEMETERY ROAD UNDERPASS

LONG ISLAND EXPRESSWAY
QUEENS, NEW YORK

27-Aug-98

Page 5

Moments of Inertia

Joint #	Member #	b(ft.)	h(ft.)	Ix(in^4)	Average Ix(in^4)	J(in^4)	Average J(in^4)
1		1.00	2.62	31078		124310	
	1				40538		162153
2		1.00	3.07	49999		199995	
	2				61099		244396
3		1.00	3.47	72199		288797	
	3				86567		346267
4		1.00	3.88	100934		403737	
	4				118207		472829
5		1.00	4.28	135480		541920	
	5				142347		569389
6		1.00	4.42	149214		596857	
	6				153339		613357
7		1.00	4.50	157464		629856	
	7				126141		504566
8		1.00	3.80	94819		379275	
	8				75721		302884
9		1.00	3.20	56623		226492	
	9				45318		181271
10		1.00	2.70	34012		136049	
	10				27518		110074
11		1.00	2.30	21025		84098	
	11				17219		68876
12		1.00	1.98	13413		53654	
	12				11417		45668
13		1.00	1.76	9421		37683	
	13				8452		33808
14		1.00	1.63	7484		29934	
	14				7150		28599
15		1.00	1.58	6816		27263	
	15				7150		28599
16		1.00	1.63	7484		29934	
	16				8452		33808
17		1.00	1.76	9421		37683	
	17				11417		45668
18		1.00	1.98	13413		53654	
	18				17219		68876
19		1.00	2.30	21025		84098	
	19				27518		110074
20		1.00	2.70	34012		136049	
	20				45318		181271
21		1.00	3.20	56623		226492	
	21				75721		302884
22		1.00	3.80	94819		379275	
	22				126141		504566
23		1.00	4.50	157464		629856	
	23				153339		613357
24		1.00	4.42	149214		596857	
	24				142347		569389
25		1.00	4.28	135480		541920	
	25				118207		472829
26		1.00	3.88	100934		403737	
	26				86567		346267
27		1.00	3.47	72199		288797	
	27				61099		244396
28		1.00	3.07	49999		199995	
	28				40538		162153
29		1.00	2.62	31078		124310	

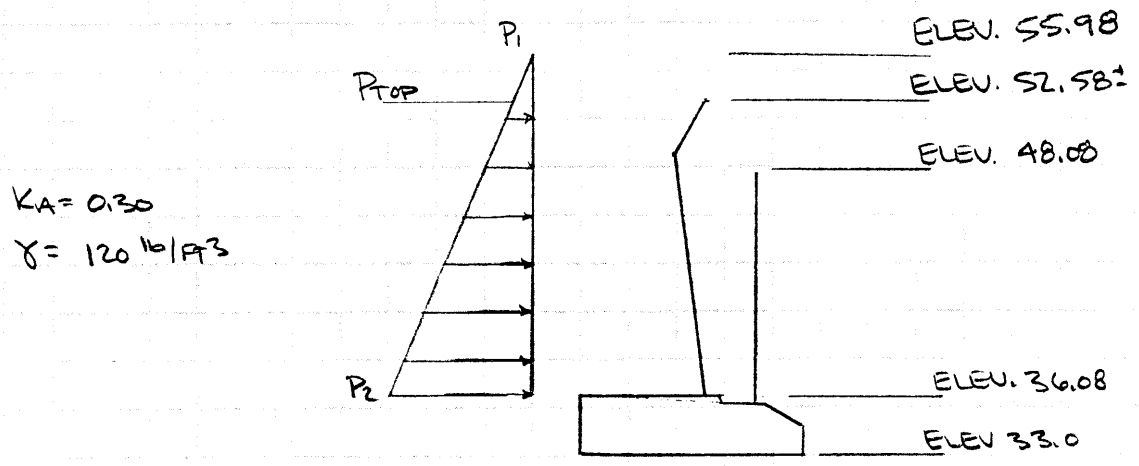
LONG ISLAND EXPRESSWAY
QUEENS, NEW YORK

19-Aug-98

Page 6

Joint #	Member #	AREA(ft.^2)	AREA(IN.^2)	Average AREA	WT.(lb/ft.)	Average WT.
1		2.62	377		0.393	
	1			410		0.43
2		3.07	442		0.461	
	2			471		0.49
3		3.47	500		0.521	
	3			529		0.55
4		3.88	559		0.582	
	4			588		0.61
5		4.28	616		0.642	
	5			626		0.65
6		4.42	636		0.663	
	6			642		0.67
7		4.50	648		0.675	
	7			598		0.62
8		3.80	547		0.570	
	8			504		0.53
9		3.20	461		0.480	
	9			425		0.44
10		2.70	389		0.405	
	10			360		0.38
11		2.30	331		0.345	
	11			308		0.32
12		1.98	285		0.297	
	12			269		0.28
13		1.76	253		0.264	
	13			244		0.25
14		1.63	235		0.245	
	14			231		0.24
15		1.58	228		0.237	
	15			231		0.24
16		1.63	235		0.245	
	16			244		0.25
17		1.76	253		0.264	
	17			269		0.28
18		1.98	285		0.297	
	18			308		0.32
19		2.30	331		0.345	
	19			360		0.38
20		2.70	389		0.405	
	20			425		0.44
21		3.20	461		0.480	
	21			504		0.53
22		3.80	547		0.570	
	22			598		0.62
23		4.50	648		0.675	
	23			642		0.67
24		4.42	636		0.663	
	24			626		0.65
25		4.28	616		0.642	
	25			588		0.61
26		3.88	559		0.582	
	26			529		0.55
27		3.47	500		0.521	
	27			471		0.49
28		3.07	442		0.461	
	28			410		0.43
29		2.62	377		0.393	

SOIL PRESSURE ON FRAME



$K_A = 0.30$

$\gamma = 120\ lb/FT^3$

$P_1 = 0$

$P_2 = K_A \gamma H = 0.30 \times 120\ lb/FT^3 \times 19.9' = 716.4\ lb/FT^2$

USE $1/2\ P_2$ AS PER AASHTO 3.20.2

$P_2 = 1/2\ (716\ lb/FT) = 358.2\ lb/FT$

APPLY TO BOTH SIDES

$P_{TOP\ OF\ FRAME} = \frac{358.2}{19.9} \times (19.9 - 16.5) = 61.2\ lb/FT$

CALCULATION SHEET

PAGE 8 OF ____

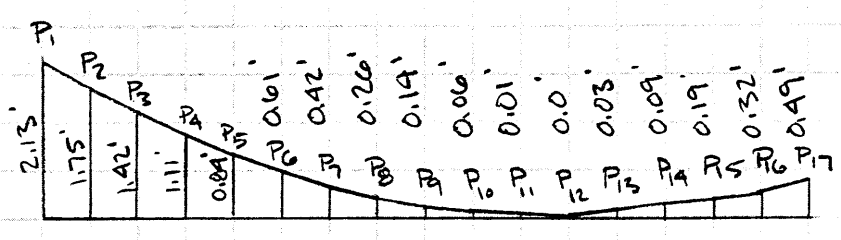
PROJECT NO. 19116

CLIENT N.Y. DOT SUBJECT CEMETERY ROAD Prepared By WV Date 8/98

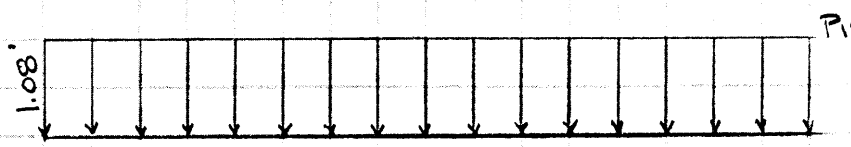
PROJECT ____ UNDERPASS Reviewed By JM Date 9/98

Approved By ____ Date ____

DEAD LOADS - FILL OVER ARCH + PAVEMENT



VARYING LOAD OVER ARCH



UNIFORM LOAD OVER ARCH

$P_1 = 150\ lb/ft^3 \times 2.13' \times 1.0' = 319.5\ lbs/ft$

$P_2 = 150\ lb/ft^3 \times 1.75' \times 1.0' = 262.5\ lbs/ft$

$P_3 = 150\ lb/ft^3 \times 1.42' \times 1.0' = 213.0\ lbs/ft$

$P_4 = 150\ lb/ft^3 \times 1.11' \times 1.0' = 166.5\ lbs/ft$

$P_5 = 150\ lb/ft^3 \times 0.84' \times 1.0' = 126.0\ lbs/ft$

$P_6 = 150\ lb/ft^3 \times 0.61' \times 1.0' = 91.5\ lbs/ft$

$P_7 = 150\ lb/ft^3 \times 0.42' \times 1.0' = 63.0\ lbs/ft$

$P_8 = 150\ lb/ft^3 \times 0.26' \times 1.0' = 39.0\ lbs/ft$

$P_9 = 150\ lb/ft^3 \times 0.14' \times 1.0' = 21.0\ lbs/ft$

$P_{10} = 150\ lb/ft^3 \times 0.06' \times 1.0' = 9.0\ lbs/ft$

$P_{11} = 150\ lb/ft^3 \times 0.01' \times 1.0' = 1.5\ lbs/ft$

$P_{12} = 150\ lb/ft^3 \times 0.0' \times 1.0' = 0$

$P_{13} = 150\ lb/ft^3 \times 0.03' \times 1.0' = 4.5\ lbs/ft$

$P_{14} = 150\ lb/ft^3 \times 0.09' \times 1.0' = 13.5\ lbs/ft$

$P_{15} = 150\ lb/ft^3 \times 0.19' \times 1.0' = 28.5\ lbs/ft$

$P_{16} = 150\ lb/ft^3 \times 0.32' \times 1.0' = 48.0\ lbs/ft$

$P_{17} = 150\ lb/ft^3 \times 0.49' \times 1.0' = 73.5\ lbs/ft$

$P_{18} = 150\ lb/ft^3 \times 1.08' \times 1.0' = 162.0\ lbs/ft$

CALCULATION SHEET

PAGE 9 OF ____

PROJECT NO. 1916

CLIENT NY DOT SUBJECT CEMETERY

PROJECT L.I.E UNDERPASS

Prepared By WW Date 8/98

Reviewed By JM Date 8/98

Approved By ____ Date ____

DEAD LOADS CONT.

BARRIERS & SPLASH GUARD

MEDIAN = $(1' \times 3.5' + 1/2 \times 1.33' \times 3.5') \times 150\ lb/ft^3 = 795\#/FT$

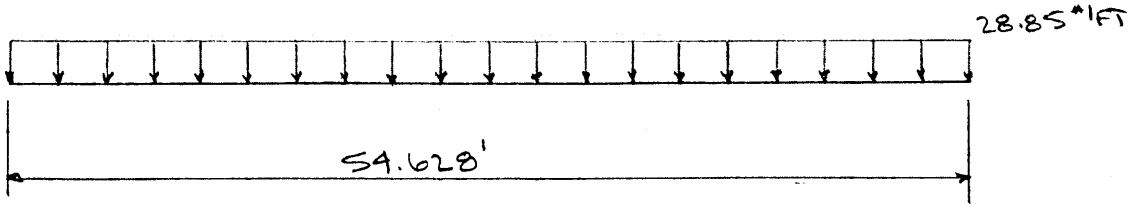
PARAPET FACING = $(1.10' \times 3.5' + 1/2 \times .67' \times 3.5') \times 2 \times 150\ lb/ft^3 = 1506\#/FT$

SPLASH GUARD = SAY = 19#/FT

TOTAL = 2320#/FT

DISTRIBUTE OVER ENTIRE WIDTH

$$\frac{2320\#/FT}{80.42'} = 28.85\#/FT / 1' \text{ WIDTH}$$

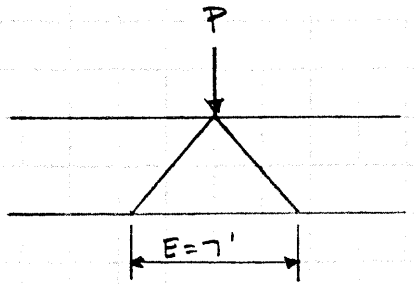


LIVE LOAD ANALYSIS

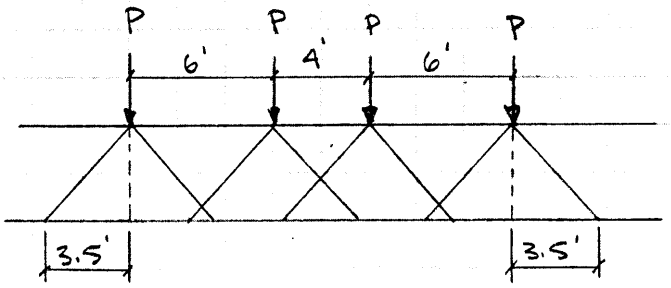
DISTRIBUTION FACTOR - AASHTO 3.24.3.2

$E = (4 + 0.06S) = 4 + 0.06(54.628') = 7.28'$ ∴

USE 7.0'

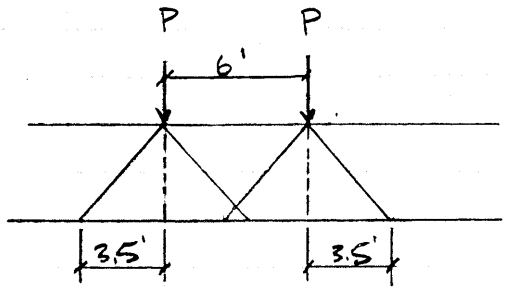


TWO TRUCKS



$D.F. = \frac{4P}{23'} = 0.174P$

ONE TRUCK

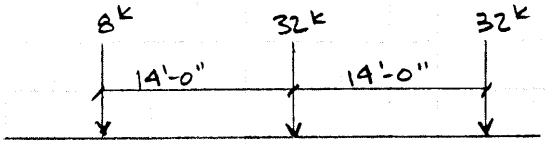


$D.F. = \frac{2P}{13} = 0.154P$

TWO TRUCKS CONTROL: USE 0.174P

LIVE LOAD ANALYSIS CONT.

HS20-44 TRUCK



IMPACT FOR JOINTS	I
7-14	10%
15-23	20%

DETERMINE MAXIMUM MOMENT AT FACE OF FRAME, JOINT 7. USING THE INFLUENCE LINE DEVELOPED FOR JOINT 7.

TRY TRUCK @ JOINT 15

			I	
32k x 8.20	=	262.4 1-k	1.2	314.9 1-k
32k x 5.54	=	177.3 1-k	1.2	212.8 1-k
8k x 4.90	=	39.2 1-k	1.1	43.1 1-k
		478.7 1-k		570.8 1-k

TRY TRUCK @ JOINT 14

			I	
32k x 7.91	=	253.1 1-k	1.1	278.4 1-k
32k x 6.60	=	211.2 1-k	1.2	253.4 1-k
8k x 3.54	=	28.3 1-k	1.1	31.1 1-k
		492.6 1-k		562.9 1-k

LIVE LOAD ANALYSIS CONT.

LL @ FACE

TRY TRUCK @ JOINT 13

			I	
$32^k \times 7.23$	=	$231.4^{1\text{-}k}$	1.1	$254.5^{1\text{-}k}$
$32^k \times 7.46$	=	$238.7^{1\text{-}k}$	1.2	$286.4^{1\text{-}k}$
$8^k \times 2.10$	=	$16.8^{1\text{-}k}$	1.1	$18.5^{1\text{-}k}$
		$486.9^{1\text{-}k}$		$559.4^{1\text{-}k}$

TRY TRUCK @ JOINT 16

			I	
$32^k \times 8.07$	=	$258.2^{1\text{-}k}$	1.2	$309.8^{1\text{-}k}$
$32^k \times 6.11$	=	$195.5^{1\text{-}k}$	1.1	$215.1^{1\text{-}k}$
$8^k \times 4.34$	=	$34.7^{1\text{-}k}$	1.2	$41.6^{1\text{-}k}$
		$488.4^{1\text{-}k}$		$566.5^{1\text{-}k}$

∴ TRUCK @ JOINT 15 CONTROLS $570.8^{1\text{-}k}$

(AXLE LOAD WHEEL LINE)

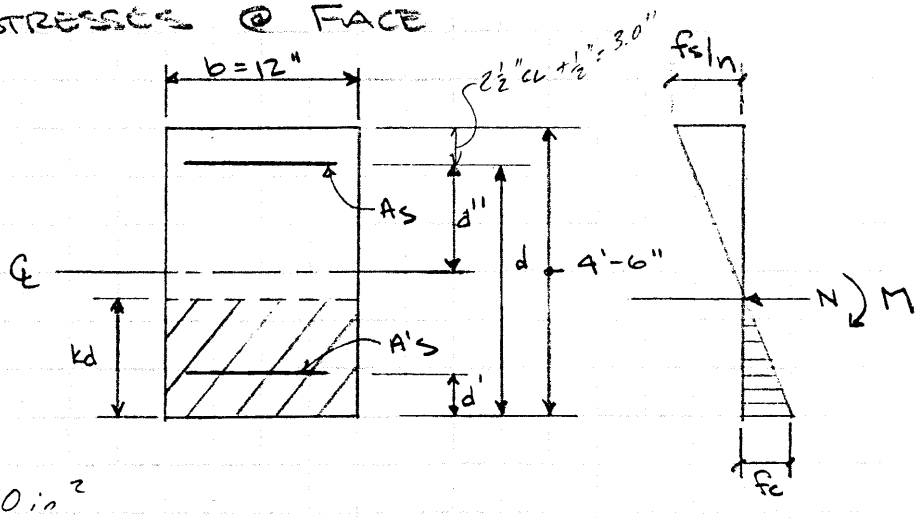
$M_{LL} = 570.8^{1\text{-}k} \times 0.174 \times 1/2 = 49.66^{1\text{-}k}$

AXIAL LIVE LOAD FORCE

$P = (32^k \times 0.70)^{\times 1.20} + (32^k \times 0.45)^{\times 1.20} + (8^k \times 0.57)^{\times 1.10} = 49.2^k$

$P_{LL} = 49.2^k \times 0.174 \times 1/2 = 4.28^k$

DEAD LOAD STRESSES @ FACE



$f'_c = 2500$ psi
$n = 12$
$b = 12$ in
$d = 51.0$ "
$d' = 2.875$"
$d'' = 24.0$ "
$M_{DL} = 152.65$ Ft-K
$P_{DL} = 17.13^{K}$
$A_s = 1"\square @ 5" O.C = 2.40\ in^2$
$A'_s = 3/4"\phi @ 10" O.C. = 0.53\ in^2$

$$e = \frac{12M}{N} + d'' = \frac{12 \times 152.65}{17.13} + 24 = 130.9\ in$$

$$e/d = 130.9/51 = 2.57 \qquad \text{Assume } j = 0.87$$

From Table 10a Reinforced Concrete Design Handbook $i \approx$ ~~1.44~~ or

$$i = \frac{1}{1 - \frac{jd}{e}} = \frac{1}{1 - \frac{0.87 \times 51}{130.9}} = 1.51 \checkmark$$

$$m = \frac{n A_s i}{bd} + \frac{(2n-1) A'_s}{bd} = \frac{12 \times 2.40 \times 1.51}{12 \times 51} + \frac{(23) \times 0.53}{12 \times 51}$$

$$m = 0.071 + 0.020 = 0.091$$

CALCULATION SHEET

PAGE 14 OF ____

PROJECT NO. 19116

CLIENT NY DOT SUBJECT CEMETARY ROAD Prepared By JM Date 5/98

PROJECT LIC UNDERPASS Reviewed By WV Date ____

Approved By ____ Date ____

DEAD LOAD STRESSES @ ABUTMENT FACE

$$\varrho = \frac{nA_{si}}{bd} + \frac{(2n-1)A'_s}{bd} \times \frac{d'}{d} = 0.071 + 0.020\left(\frac{2.875}{51}\right) = 0.072$$

$$K = \sqrt{m^2 + 2q} - m = \sqrt{(0.091)^2 + 2(0.072)} - 0.091 = 0.299$$

$$1/K \times \frac{(2n-1)A'_s}{bd} = \frac{1}{0.299}(0.020) = 0.067$$

$$1/K \times d'/d = \frac{1}{0.299}\left(\frac{2.875}{51}\right) = 0.189$$

From Table 12 $z \approx 0.32$

OR $$z = \frac{\frac{1}{6} + \frac{(2n-1)A'_s}{Kbd} \times \frac{d'}{Kd} \times \left(1 - \frac{d'}{Kd}\right)}{\frac{1}{2} \frac{(2n-1)A'_s}{Kbd} \times \left(1 - \frac{d'}{Kd}\right)} = \frac{\frac{1}{6} + \frac{0.020}{.299} \times 0.189\,(1 - 0.189)}{\frac{1}{2} + \frac{0.020}{.299} \times (1 - 0.189)}$$

$z = 0.319$

$$j = 1 - 2K = 1 - 0.319(0.299) = 0.905$$

Revised $$i = \frac{1}{1 - \frac{jd}{e}} = \frac{1}{1 - \frac{0.905 \times 51}{130.9}} = 1.545$$

$$f_s = \frac{17.4^{k} \times (1000^{\#/k})}{j A_s i} \times \frac{e}{d} = \frac{17,130}{0.905 \times 2.40 \times 1.545} \times 2.57 = 13,119 \text{ PSI}$$

$$f_c \quad \frac{f_s}{n} \times \frac{K}{1-K} = \frac{13119}{12} \times \frac{0.299}{1 - 0.299} = 466 \text{ PSI}$$

CALCULATION SHEET

PAGE 15 OF ____

PROJECT NO. 19116

CLIENT NY DOT SUBJECT CEMETERY ROAD Prepared By JM Date 8/98

PROJECT LIE UNDERPASS Reviewed By WV Date ____

Approved By ____ Date ____

STRESSES @ ABUTMENT FACE

BY INSPECTION STEEL STRESSES CONTROL

AVAILABLE LIVE LOAD CAPACITY @ ABUTMENT FACE

$f_s = 18,000 - 13119 = 4,881$ psi INVENTORY

$f_s = 25,000 - 13119 = 11,881$ psi OPERATING

LIVE LOAD STRESSES

$M_{LL+I} = 49.66$ ft-k $P = 4.28^k$

$e = 49.66 \times 12 / 4.28 + 24'' = 163.2$

Assume $j = 0.907$

$$i = \frac{1}{1 - \frac{0.907 \times 51}{163.2}} = 1.396$$

$$n = \frac{n A_{si}}{bd} + \frac{(2n-1)A'_s}{bd} = \frac{12 \times 2.40 \times 1.396}{12 \times 51} + \frac{(23)\,0.53}{12 \times 51}$$

$n = 0.0657 + 0.0200 = 0.0857$

$g = 0.0657 + 0.0200\left(\frac{2.875}{51}\right) = 0.0668$

$k = \sqrt{(0.0857)^2 + 2(0.0668)} - 0.0857 = 0.290$

$\frac{d'}{kd} = \frac{2.875}{.290 \times 51}$

$\frac{d'}{kd} = 0.194$

Rust Environment & Infrastructure

CALCULATION SHEET

PAGE 16 OF ____

PROJECT NO. 19116

CLIENT NY DOT

SUBJECT Cantilever Road Underpass

PROJECT LIC

Prepared By JM Date 8/98

Reviewed By WV. Date ____

Approved By ____ Date ____

$$z = \frac{\frac{1}{6} + \frac{0.0200}{0.290} \times 0.194\,(1-0.194)}{\frac{1}{2} + \frac{0.0200}{0.290} \times (1-0.194)} = 0.319$$

$$j = 1 - zk = 1 - 0.319\,(0.290) = 0.907$$

$$f_s = \frac{4280}{0.907 \times 2.40 \times 1.396} \times {}^{163.2}/_{51} = 4507 \text{ psi}$$

f_s Dead Load + Live Load = 13,119 + 4507 = 17626

17626 < 18,000 ∴ OK ✓

CALCULATION SHEET

PROJECT NO. 19116

CLIENT NY DOT SUBJECT Concrete Footing

PROJECT C/E Underpass

Prepared By JM Date 9/98

Reviewed By WV Date 9/98

Approved By _____ Date _____

Live Load @ 1/8 Point

$M_{LL} = (16^k \times 1.20(4.78 + 5.02) + 4^k \times 1.20(1.18)) \times 0.174 = 33.73$ ft-k

$P_{LL} = (16^k \times 1.20(0.66 + 0.52) + 4^k \times 1.20(0.12)) \times 0.174 = 4.04$

Dead Load Moment = ~~2~~ 61.35 ft-k

Axial Load = 13.73 k

Live Load @ 1/4 Point

M (positive) $= 16^{k}(4.28) \times 1.20 \times 0.174 = {}^{+}14.30$ Ft-K

$P = 16\ (0.38) \times 1.20 \times 0.174 = 1.27$ K

M (negative) $= 16^{k}(3.17 + 2.27) \times 1.2 \times 0.174 = {}^{-}18.17$ Ft-K

$16\ (0.63 + 0.33) \times 1.2 \times 0.174 = 3.21$ K

Dead Load Moment $= -6.38$ Ft-K @ 3/4 Point 15.12 Ft-K

Axial Load $= 12.98$ K @ 12.76 Ft-K

CALCULATION SHEET

PAGE 19 OF ___

PROJECT NO. 19116

CLIENT NY DOT SUBJECT CEMETARY PORT

PROJECT LIE UNDERPASS

Prepared By JM Date 9/98

Reviewed By WV Date 9/98

Approved By ___ Date ___

LIVE LOAD @ 3/8 POINT

$M_{LL(NEGATIVE)} = 16^{4} \times 1.20 \times I \; (-4.07 + -1.03) \times 0.174 = 17.04$ Ft-K

$P_{LL(NEGATIVE)} = 16^{4} \times 1.20 \; (-0.55 + -0.22) \times 0.174 = 2.57$ K

DEAD LOAD MOMENT = 20.09 Ft-K

AXIAL LOAD = 12.36

$M_{LL(POSITIVE)} = 16^{4} \times 1.20 \; (1.05 + 0.80) \times 0.174 = 6.18$ Ft-K

$P_{LL(POSITIVE)} = 16^{4} \times 1.20 \; (0.56 + 0.23) \times 0.174 = 2.64$ Ft-K

CALCULATION SHEET

PAGE 20 OF ___

PROJECT NO. 19116

CLIENT NY DOT SUBJECT CEMETARY ROAD

PROJECT LIE UNDER PASS

Prepared By JM Date 9/98

Reviewed By WJ Date 9/98

Approved By ___ Date ___

LIVE LOAD ANALYSIS @ CROWN

M_{LL} $16^k \times 1.20(0.40 + 3.89) + 4^k(0.40) \times 1.10 = 84.1$ (I)

D.F. = 0.174

$M_{LL} = 84.1 \times 0.174 = 14.63$ Ft-K

AXIAL LOAD

$P = 16^k \times 1.2(0.62 + 0.41) + 4^k \times 1.10(0.41) = 21.58$

$P_{LL} = 21.58 \times 0.174 = 3.75^k$

DEAD LOAD MOMENT = 25.28 Ft-K AXIAL LOAD = 12.26 K

CALCULATION SHEET

PAGE 21 OF ____

PROJECT NO. 19116

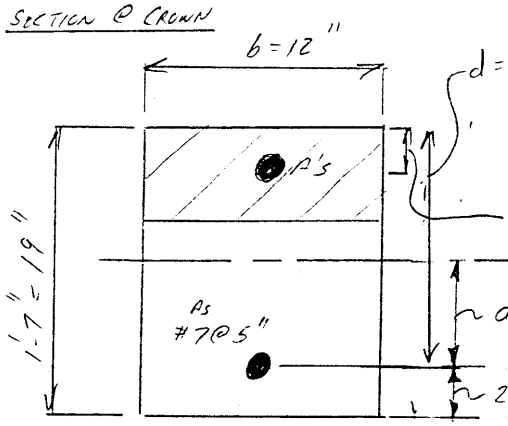
CLIENT NY DOT SUBJECT Connection Point

PROJECT LIC Prepared By JM Date 9/99

Reviewed By WV Date 9/99

Approved By ____ Date ____

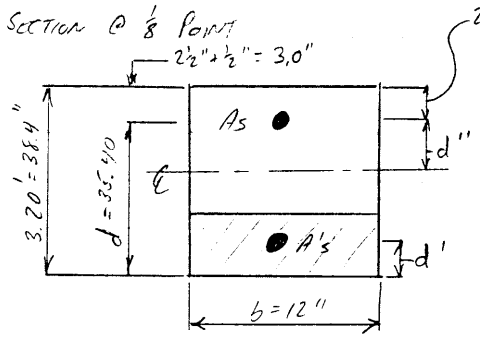
SECTION @ CROWN



As = #7@5" = 0.60 (12/5) = 1.44 in²

A's = #6@10" = .44 (12/10) = 0.53

SECTION @ ⅛ POINT



As = 1"# @ 5" o.c = 1.00 × 12/5 = 2.40 in²

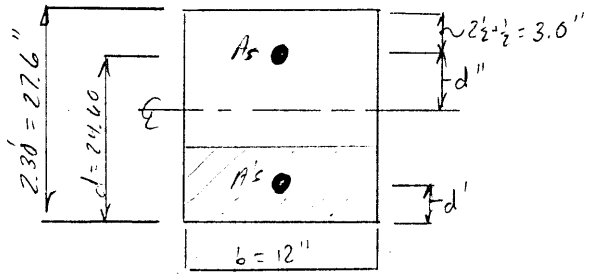
A's = #6 @ 10" o.c = 0.53 in²

d = 38.40 - 3.00 = 35.40 in

d' = 2.5 + .375 = 2.875

d" = 38.4/2 - (2.5 + 0.5) = 16.20 in

SECTION @ ¼ POINT



As = 1"# @ 10" o.c = 1.00 × (12/10) = 1.20

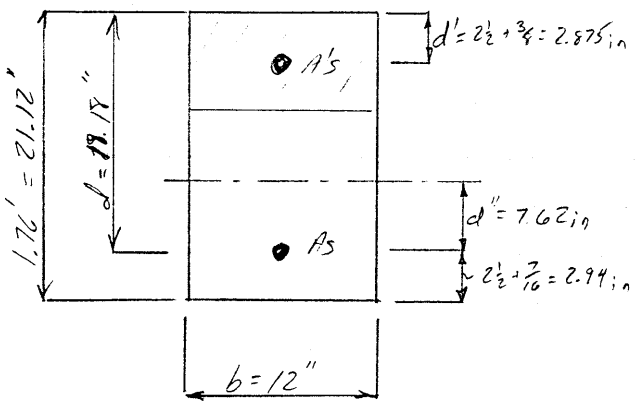
A's = #6 @ 10" o.c. = .44 (12/10) = 0.53

d = 27.60 - 3.0 = 24.60 in

d' = 2½" + ⅜" = 2.875 in

d" = ½ (27.60) - (3.0) = 10.80 in

SECTION @ 3/8 POINT (POSITIVE MOMENT)



A_s = #7 @ 5" O.C = 0.60 $(\frac{12}{5})$ = 1.44 in^2

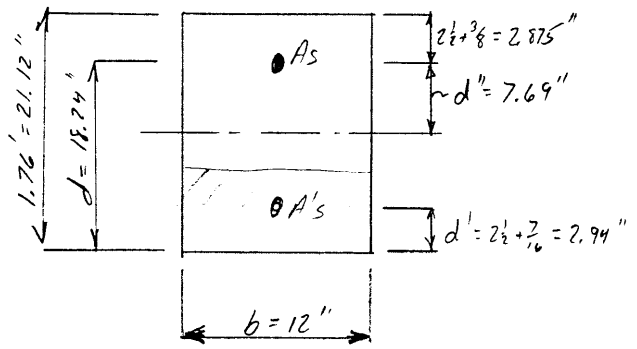
A'_s = #6 @ 10" O.C = 0.44 $(\frac{12}{10})$ = 0.53 in^2

d = 21.12 − 2.94 = 18.18 in

d' = 2½ + ⅜" = 2.875

d'' = ½ (21.12) − 2.94 = 7.62

SECTION @ 3/8 POINT (NEGATIVE MOMENT)



A_s = #6 @ 10" O.C = 0.53 in^2

A'_s = #7 @ 5" O.C = 1.44 in^2

d = 21.12 − 2.88 = 18.24 in

d' = 2½" + 7/16" = 2.94 in

d'' = ½ (21.12) − 2.88 = 7.69 in

CALCULATION SHEET

PROJECT NO. 19116

CLIENT NY DOT

SUBJECT CEMETARY ROAD UNDER PASS

PROJECT LIE

Prepared By JM Date 9/98

Reviewed By WV Date 9/98

Approved By _____ Date _____

RATING @ Abut Face

$\frac{18,000 - 13144}{4507} = 1.077$ × 36 Tons = 38.8 Tons INVENTORY

× HS20 = HS 21.5

$\frac{25,000 - 13144}{4507} = 2.631$ × 36 Tons = 94.7 Tons OPERATING

× HS20 = HS 52.6

RATING @ 1/8th POINT

$\frac{18,000 - 7087}{4515} = 2.417$ × 36 Tons = 87.0 Tons INVENTORY

× HS20 = HS 48.3

$\frac{25,000 - 7087}{4515} = 3.967$ × 36 Tons = 142.8 Tons OPERATING

× HS20 = HS 79.3

RATING @ 1/4 POINT

$\frac{18,000 - 2249}{6825} = 2.308$ × 36 Tons = 83.1 Tons INVENTORY

× HS20 = HS 46.2

$\frac{25,000 - 2249}{6825} = 3.333$ × 36 Tons = 120.0 Tons OPERATING

× HS20 = HS 66.7

CALCULATION SHEET

PROJECT NO. 19116

CLIENT NV DOT SUBJECT CEMENTAR Ramp

PROJECT [illegible] [illegible]

Prepared By JM Date 9/98

Reviewed By WV Date 9/98

Approved By _____ Date _____

RATING @ 3/8th Point (Positive Moment Analysis)

$\frac{18,000 - 6389}{7917} = 1.467 \times 36 \text{ Tons} = 52.8 \text{ Tons}$ INVENTORY

$\text{HS20} = \text{HS } 29.3$

$\frac{25,000 - 6389}{7917} = 2.351 \times 36 \text{ Tons} = 84.6 \text{ Tons}$ OPERATING

$\times \text{HS20} = \text{HS } 47.0$

RATING @ 3/8th POINT (Negative Moment Analysis)

$\frac{18,000 - (-15830)}{5921} =$

by inspection does not control 3/8th point

$\frac{25,000 - (-15830)}{5921} =$

Rating @ Crown

$\frac{18,000 - 10808}{7340} = 0.980 \times 36 \text{ Tons} = 35.3 \text{ Tons}$ INVENTORY

$\times \text{HS20} = \text{HS } 19.6 \text{ Tons}$

$\frac{25,000 - 10808}{7340} = 1.934 \times 36 \text{ Tons} = 69.6 \text{ Tons}$ OPERATING

$\times \text{HS20} = \text{HS } 38.7$

New York State Department of Transportation
Long Island Expressway Cemetary Road Underpass

09/02/98 25

WV 9/98

Reinforced concrete analysis/ w compression reinforcement
Combined bending and axial load
Member stresses at face of abutment
due to dead load

f'c =	2500	psi
n =	12	
b =	12.00	in
d =	51.00	in
d' =	2.88	in
d" =	24.00	in
M =	152.65	ft-k
P =	17.13	kip
As =	2.40	in ²
A's =	0.53	in ²

e = 12M / N + d" = 12 x 152.7 / 17.1 + 24.00 = 130.9

e / d = 130.9 / 51.00 = 2.57

Assume j = 0.903

i = 1 / 1 - j d/e = 1 / 1 - 0.903 x 51.00 / 130.9 = 1.54

m = n As i / b d + (2n - 1) A's / b d =

m = (12 x 2.4 x 1.54 / 12 x 51) +

(2 x 12 - 1) x 0.53 / 12 x 51

m = (0.073) + (0.020) = 0.093

q = n As i / b d + (2n - 1) A's / b d x d' / d

q = (12 x 2.4 x 1.54 / 12 x 51) +

(2 x 0.53 - 1) x 0.53 / 12 x 51 x 2.88 / 51

q = (0.073) + (0.020) x (0.056) = 0.074

$k = (m^2 + 2q)^{\wedge 1/2} - m$ 0.302

$$z = \frac{\frac{1}{6} + \frac{(2n-1)\,A's}{kbd} \times \frac{d'}{kd} \times \left(1 - \frac{d'}{kd}\right)}{\frac{1}{2} + \frac{(2n-1)\,A's}{kbd} \times \left(1 - \frac{d'}{kd}\right)} = \frac{0.177}{0.554} = 0.319$$

j = 1 - z k 1 - 0.319 x 0.302 = 0.903 check

i = (1/(1-(j d /e))) = 1.543

f_s = (P/j As i) e/d = 13144 psi

fc = fs / n (k /(1-k)) = 475 psi

New York State Department of Transportation
Long Island Expressway Cemetary Road Underpass

09/02/98 26
W.V 9/98

Reinforced concrete analysis/ w compression reinforcement
Combined bending and axial load
Member stresses at face of abutment
due to live load

f'c =	2500	psi	✓
n =	12		✓
b =	12.00	in	✓
d =	51.00	in	✓
d' =	2.88	in	✓
d" =	24.00	in	✓
M =	49.66	ft-k	✓
P =	4.28	kip	✓
As =	2.40	in^2	✓
A's =	0.53	in^2	✓

e = 12M / N + d" = 12 x 49.7 / 4.3 + 24.00 = 163.2

e / d = 163.2 / 51.00 = 3.20

Assume j = 0.907

i = 1 / 1 - j d/e = 1 / 1 - 0.907 x 51.00 / 163.2 = 1.40

m = n As i / b d + (2n - 1) A's / b d =

m = (12 x 2.4 x 1.4 / 12 x 51) +

(2 x 12 - 1) x 0.53 / 12 x 51

m = (0.066) + (0.020) = 0.086

q = n As i / b d + (2n - 1) A's / b d x d' / d

q = (12 x 2.4 x 1.4 / 12 x 51) +

(2 x 0.53 - 1) x 0.53 / 12 x 51 x 2.88 / 51

q = (0.066) + (0.020) x (0.056) = 0.067

$k = (m^2 + 2q)^{\wedge 1/2} - m$ 0.290

$$z = \frac{\frac{1}{6} + \frac{(2n-1)\,A's}{kbd} \times \frac{d'}{kd} \times \left(1 - \frac{d'}{kd}\right)}{\frac{1}{2} + \frac{(2n-1)\,A's}{kbd} \times \left(1 - \frac{d'}{kd}\right)} = \frac{0.177}{0.555} = 0.319$$

j = 1 - z k 1 - 0.319 x 0.290 = 0.907 check

i = (1/(1-(j d /e))) = 1.396

f_s = (P/j As i) e/d = 4507 psi

fc = fs / n (k /(1-k)) = 153 psi

New York State Department of Transportation
Long Island Expressway Cemetary Road Underpass

09/02/98 27

WV 9/1/98

Reinforced concrete analysis/ w compression reinforcement
Combined bending and axial load
Member stresses at 1 / 8 point
due to dead load

f'c =	2500	psi	✓
n =	12		✓
b =	12.00	in	✓
d =	35.40	in	✓
d' =	2.88	in	✓
d" =	16.20	in	✓
M =	61.35	ft-k	✓
P =	13.73	kip	✓
As =	2.40	in ²	✓
A's =	0.53	in ²	✓

e = 12M / N + d" = 12 x 61.4 / 13.7 + 16.20 = 69.8

e / d = 69.8 / 35.40 = 1.97

Assume j = 0.881

i = 1 / 1 - j d/e = 1 / 1 - 0.881 x 35.40 / 69.8 = 1.81

m = n As i / b d + (2n - 1) A's / b d =

m = (12 x 2.4 x 1.81 / 12 x 35.4) +

(2 x 12 - 1) x 0.53 / 12 x 35.4

m = (0.123) + (0.029) = 0.151

q = n As i / b d + (2n - 1) A's / b d x d' / d

q = (12 x 2.4 x 1.81 / 12 x 35.4) +

(2 x 0.53 - 1) x 0.53 / 12 x 35.4 x 2.88 / 35.4

q = (0.123) + (0.029) x (0.081) = 0.125

$k = (m^2 + 2q)^{\wedge 1/2} - m$ 0.371

$$z = \frac{\frac{1}{6} + \frac{(2n-1)\,A's}{kbd} \times \frac{d'}{kd} \times \left(1 - \frac{d'}{kd}\right)}{\frac{1}{2} + \frac{(2n-1)\,A's}{kbd} \times \left(1 - \frac{d'}{kd}\right)} = \frac{0.180}{0.560} = 0.321$$

j = 1 - z k 1 - 0.321 x 0.371 = 0.881 check

i = (1/(1-(j d /e))) = 1.807

f_s = (P/j As i) e/d = 7087 psi

fc = fs / n (k /(1-k)) = 348 psi

New York State Department of Transportation
Long Island Expressway Cemetary Road Underpass

09/02/98 28
WV 9198

Reinforced concrete analysis/ w compression reinforcement
Combined bending and axial load
Member stresses at 1 / 8 point
due to live load

f'c = 2500 psi ✓
n = 12 ✓
b = 12.00 in ✓
d = 35.40 in ✓
d' = 2.88 in ✓
d" = 16.20 in ✓
M = 33.73 ft-k ✓
P = 4.04 kip ✓
As = 2.40 in² ✓
A's = 0.53 in² ✓

e = 12M / N + d" = 12 x 33.7 / 4.0 + 16.20 = 116.4

e / d = 116.4 / 35.40 = 3.29

Assume j = 0.893

i = 1 / 1 - j d/e = 1 / 1 - 0.893 x 35.40 / 116.4 = 1.37

m = n As i / b d + (2n - 1) A's / b d =

m = (12 x 2.4 x 1.37 / 12 x 35.4) +

(2 x 12 - 1) x 0.53 / 12 x 35.4

m = (0.093) + (0.029) = 0.122

q = n As i / b d + (2n - 1) A's / b d x d' / d

q = (12 x 2.4 x 1.37 / 12 x 35.4) +

(2 x 0.53 - 1) x 0.53 / 12 x 35.4 x 2.88 / 35.4

q = (0.093) + (0.029) x (0.081) = 0.095

k = (m² + 2 q)^1/2 - m 0.332

$$z = \frac{\frac{1}{6} + \frac{(2n-1)\,A's}{kbd} \times \frac{d'}{kd} \times \left(1 - \frac{d'}{kd}\right)}{\frac{1}{2} + \frac{(2n-1)\,A's}{kbd} \times \left(1 - \frac{d'}{kd}\right)} = \frac{0.183}{0.565} = 0.323$$

j = 1 - z k 1 - 0.323 x 0.332 = 0.893 check

i = (1/(1-(j d /e))) = 1.373

f s = (P/j As i) e/d = 4515 psi

fc = fs / n (k /(1-k)) = 187 psi

New York State Department of Transportation
Long Island Expressway Cemetary Road Underpass

09/02/98 2a

WV 9/98

Reinforced concrete analysis/ w compression reinforcement
Combined bending and axial load
Member stresses at 1/4 point
due to dead load

f'c =	2500	psi	✓
n =	12		✓
b =	12.00	in	✓
d =	24.60	in	✓
d' =	2.88	in	✓
d" =	10.80	in	✓
M =	15.12	ft-k	✓
P =	12.76	kip	✓
As =	1.20	in ²	✓
A's =	0.53	in ²	✓

e = 12M / N + d" = 12 x 15.1 / 12.8 + 10.80 = 25.0

e / d = 25.0 / 24.60 = 1.02

Assume j = 0.839

i = 1 / 1 - j d/e = 1 / 1 - 0.839 x 24.60 / 25.0 = 5.71

m = n As i / b d + (2n - 1) A's / b d =

m = (12 x 1.2 x 5.71 / 12 x 24.6) +

(2 x 12 - 1) x 0.53 / 12 x 24.6

m = (0.279) + (0.041) = 0.320

q = n As i / b d + (2n - 1) A's / b d x d' / d

q = (12 x 1.2 x 5.71 / 12 x 24.6) +

(2 x 0.53 - 1) x 0.53 / 12 x 24.6 x 2.88 / 24.6

q = (0.279) + (0.041) x (0.117) = 0.283

k = (m ² + 2 q ^1/2 - m 0.498

$$z = \frac{\frac{1}{6} + \frac{(2n-1)\,A's}{kbd} \times \frac{d'}{kd} \times \left(1 - \frac{d'}{kd}\right)}{\frac{1}{2} + \frac{(2n-1)\,A's}{kbd} \times \left(1 - \frac{d'}{kd}\right)} = \frac{0.182}{0.563} = 0.322$$

j = 1 - z k 1 - 0.322 x 0.498 = 0.839 check

i = (1/(1-(j d /e))) = 5.728

f s = (P/j As i) e/d = 2249 psi

fc = fs / n (k /(1-k)) = 186 psi

W.V. 9/98

Reinforced concrete analysis/ w compression reinforcement
Combined bending and axial load
Member stresses at 1 / 4 point
due to live load

f'c =	2500	psi	✓
n =	12		✓
b =	12.00	in	✓
d =	24.60	in	✓
d' =	2.88	in	✓
d" =	10.80	in	✓
M =	18.17	ft-k	✓
P =	3.21	kip	✓
As =	1.20	in ²	✓
A's =	0.53	in ²	✓

e = 12M / N + d" = 12 x 18.2 / 3.2 + 10.80 = 78.7

e / d = 78.7 / 24.60 = 3.20

Assume j = 0.901

i = 1 / 1 - j d/e = 1 / 1 - 0.901 x 24.60 / 78.7 = 1.39

m = n As i / b d + (2n - 1) A's / b d =

m = (12 x 1.2 x 1.39 / 12 x 24.6) +

(2 x 12 - 1) x 0.53 / 12 x 24.6

m = (0.068) + (0.041) = 0.109

q = n As i / b d + (2n - 1) A's / b d x d' / d

q = (12 x 1.2 x 1.39 / 12 x 24.6) +

(2 x 0.53 - 1) x 0.53 / 12 x 24.6 x 2.88 / 24.6

q = (0.068) + (0.041) x (0.117) = 0.073

$k = (m^2 + 2q)^{\wedge 1/2} - m$ 0.288

$$z = \frac{\frac{1}{6} + \frac{(2n-1)\,A's}{kbd} \times \frac{d'}{kd} \times \left(1 - \frac{d'}{kd}\right)}{\frac{1}{2} + \frac{(2n-1)\,A's}{kbd} \times \left(1 - \frac{d'}{kd}\right)} = \frac{0.201}{0.585} = 0.344$$

j = 1 - z k 1 - 0.344 x 0.288 = 0.901 check

i = (1/(1-(j d /e))) = 1.392

f_s = (P/j As i) e/d = 6825 psi

fc = fs / n (k /(1-k)) = 230 psi

New York State Department of Transportation
Long Island Expressway Cemetary Road Underpass

09/02/98 31

WV 9/98

Reinforced concrete analysis/ w compression reinforcement
Combined bending and axial load
Member stresses at 3 / 8 point
due to dead load

Positive Moment Analysis (Tension on Bottom)

f'c = 2500 psi ✓
n = 12 ✓
b = 12.00 in ✓
d = 18.18 in ✓
d' = 2.88 in ✓
d" = 7.62 in ✓
M = 20.09 ft-k ✓
P = 12.36 kip ✓
As = 1.44 in² ✓
A's = 0.53 in² ✓

e = 12M / N + d" = 12 x 20.1 / 12.4 + 7.62 = 27.1

e / d = 27.1 / 18.18 = 1.49

Assume j = 0.855

i = 1 / 1 - j d/e = 1 / 1 - 0.855 x 18.18 / 27.1 = 2.34

m = n As i / b d + (2n - 1) A's / b d =

m = (12 x 1.44 x 2.34 / 12 x 18.2) +

(2 x 12 - 1) x 0.53 / 12 x 18.2

m = (0.186) + (0.056) = 0.241

q = n As i / b d + (2n - 1) A's / b d x d' / d

q = (12 x 1.44 x 2.34 / 12 x 18.2) +

(2 x 0.53 - 1) x 0.53 / 12 x 18.2 x 2.88 / 18.2

q = (0.186) + (0.056) x (0.158) = 0.194

k = (m² + 2 q)^1/2 - m = 0.427

$$z = \frac{\frac{1}{6} + \frac{(2n-1)\,A's}{kbd} \times \frac{d'}{kd} \times \left(1 - \frac{d'}{kd}\right)}{\frac{1}{2} + \frac{(2n-1)\,A's}{kbd} \times \left(1 - \frac{d'}{kd}\right)} = \frac{0.197}{0.582} = 0.339$$

j = 1 - z k 1 - 0.339 x 0.427 = 0.855 check

i = (1/(1-(j d /e))) = 2.343

f s = (P/j As i) e/d = 6389 psi

fc = fs / n (k /(1-k)) = 397 psi

W.V. 9198

Reinforced concrete analysis/ w compression reinforcement
Combined bending and axial load
Member stresses at 3 / 8 point
due to live load

Positive Moment Analysis (Tension on Bottom)

f'c = 2500 psi ✓
n = 12 ✓
b = 12.00 in ✓
d = 18.18 in ✓
d' = 2.88 in ✓
d" = 7.62 in ✓
M = 17.04 ft-k ✓
P = 2.57 kip ✓
As = 1.44 in² ✓
A's = 0.53 in² ✓

e = 12M / N + d" = 12 x 17.0 / 2.6 + 7.62 = 87.2

e / d = 87.2 / 18.18 = 4.80

Assume j = 0.882

i = 1 / 1 - j d/e = 1 / 1 - 0.882 x 18.18 / 87.2 = 1.23

m = n As i / b d + (2n - 1) A's / b d =

m = (12 x 1.44 x 1.23 / 12 x 18.2) +

(2 x 12 - 1) x 0.53 / 12 x 18.2

m = (0.097) + (0.056) = 0.153

q = n As i / b d + (2n - 1) A's / b d x d' / d

q = (12 x 1.44 x 1.23 / 12 x 18.2) +

(2 x 0.53 - 1) x 0.53 / 12 x 18.2 x 2.88 / 18.2

q = (0.097) + (0.056) x (0.158) = 0.106

k = (m² + 2 q)^1/2 - m 0.332

$$z = \frac{\frac{1}{6} + \frac{(2n-1)\,A's}{kbd} \times \frac{d'}{kd} \times \left(1 - \frac{d'}{kd}\right)}{\frac{1}{2} + \frac{(2n-1)\,A's}{kbd} \times \left(1 - \frac{d'}{kd}\right)} = \frac{0.209}{0.588} = 0.355$$

j = 1 - z k 1 - 0.355 x 0.332 = 0.882 check

i = (1/(1-(j d /e))) = 1.225

f s = (P/j As i) e/d = 7917 psi

fc = fs / n (k /(1-k)) = 328 psi

New York State Department of Transportation
Long Island Expressway Cemetary Road Underpass

09/02/98 35

WV. 9198

Reinforced concrete analysis/ w compression reinforcement
Combined bending and axial load
Member stresses at crown
due to dead load

f'c =	2500	psi	✓
n =	12		✓
b =	12.00	in	✓
d =	16.06	in	✓
d' =	2.88	in	✓
d" =	6.56	in	✓
M =	25.28	ft-k	✓
P =	12.26	kip	✓
As =	1.44	in ²	✓
A's =	0.53	in ²	✓

e = 12M / N + d" = 12 x 25.3 / 12.3 + 6.56 = 31.3

e / d = 31.3 / 16.06 = 1.95

Assume j = 0.859

i = 1 / 1 - j d/e = 1 / 1 - 0.859 x 16.06 / 31.3 = 1.79

m = n As i / b d + (2n - 1) A's / b d =

m = (12 x 1.44 x 1.79 / 12 x 16.1) +

(2 x 12 - 1) x 0.53 / 12 x 16.1

m = (0.160) + (0.063) = 0.224

q = n As i / b d + (2n - 1) A's / b d x d' / d

q = (12 x 1.44 x 1.79 / 12 x 16.1) +

(2 x 0.53 - 1) x 0.53 / 12 x 16.1 x 2.88 / 16.1

q = (0.160) + (0.063) x (0.179) = 0.172

k = (m ² + 2 q ^1/2 - m 0.404

$$z = \frac{\frac{1}{6} + \frac{(2n-1)\,A's}{kbd} \times \frac{d'}{kd} \times \left(1 - \frac{d'}{kd}\right)}{\frac{1}{2} + \frac{(2n-1)\,A's}{kbd} \times \left(1 - \frac{d'}{kd}\right)} = \frac{0.205}{0.587} = 0.350$$

j = 1 - z k 1 - 0.350 x 0.404 = 0.859 check

i = (1/(1-(j d /e))) = 1.788

f s = (P/j As i) e/d = 10808 psi

fc = fs / n (k /(1-k)) = 609 psi

```
**************************************************
*                                                *
*           S T A A D - III                      *
*           Revision 22.3a                       *
*           Proprietary Program of               *
*           Research Engineers, Inc.             *
*           Date=    SEP  2, 1998                *
*           Time=    11: 3:50                    *
*                                                *
*      USER ID: Rust E & I                       *
**************************************************
```

```
 1. STAAD PLANE CEMETERY ROAD UNDERPASS
 2. INPUT WIDTH 72
 3. UNIT FEET KIP
 4. JOINT COORDINATES
 5. 1 0.0 0.0; 2 -0.23 3.33; 3 -0.43 6.33; 4 -0.63 9.33
 6. 5 -0.83 12.33; 6 -0.95 14.06; 7 1.33 14.58; 8 4.75 15.21
 7. 9 8.16 15.75; 10 11.58 16.20; 11 14.99 16.47; 12 18.40 16.88
 8. 13 21.82 16.95; 14 25.23 17.09; 15 28.65 17.16; 16 32.06 17.09
 9. 17 35.48 16.95; 18 38.89 16.88; 19 42.30 16.47; 20 45.72 16.20
10. 21 49.13 15.75; 22 52.55 15.21; 23 55.96 14.58; 24 58.25 14.06
11. 25 58.13 12.33; 26 57.93 9.33; 27 57.72 6.33; 28 57.52 3.33
12. 29 57.29 0.0
13. MEMBER INCIDENCE
14. 1 1 2; 2 2 3; 3 3 4; 4 4 5; 5 5 6; 6 6 7; 7 7 8; 8 8 9
15. 9 9 10; 10 10 11; 11 11 12; 12 12 13; 13 13 14; 14 14 15
16. 15 15 16; 16 16 17; 17 17 18; 18 18 19; 19 19 20; 20 20 21
17. 21 21 22; 22 22 23; 23 23 24; 24 24 25; 25 25 26; 26 26 27
18. 27 27 28; 28 28 29
19. UNIT INCHES KIP
20. MEMBER PROPERTY AMERICAN
21. 1 28 PRI AX 410. IX 40538.0 IZ 162153.0
22. 2 27 PRI AX 471. IX 61099.0 IZ 244396.0
23. 3 26 PRI AX 529. IX 86567.0 IZ 346267.0
24. 4 25 PRI AX 588. IX 118207.0 IZ 472829.0
25. 5 24 PRI AX 626. IX 142347.0 IZ 569389.0
26. 6 23 PRI AX 642. IX 153339.0 IZ 613357.0
27. 7 22 PRI AX 598. IX 126141.0 IZ 504566.0
28. 8 21 PRI AX 504. IX 75721.0 IZ 302884.0
29. 9 20 PRI AX 425. IX 45318.0 IZ 181271.0
30. 10 19 PRI AX 360. IX 27518.0 IZ 110074.0
31. 11 18 PRI AX 308. IX 17219.0 IZ 68876.0
32. 12 17 PRI AX 269. IX 11417.0 IZ 45668.0
33. 13 16 PRI AX 244. IX 8452.0 IZ 33808.0
34. 14 15 PRI AX 231. IX 7150.0 IZ 28599.0
35. CONSTANT
36. E CONCRETE ALL
37. UNIT FEET POUND
38. CONSTANT
39. DENSITY CONCRETE ALL
40. UNIT FEET KIP
41. SUPPORT
```

```
42. 1 29 PINNED
43. UNIT FEET POUND
44. DEFINE MOVING LOAD
45. TYPE 1 LOAD 8000.0 32000.0 32000.0 DISTANCE 14.0 14.0
46. LOAD 1
47. SELFWEIGHT Y -1.
48. LOAD 2
49. MEMBER LOAD
50. 6 TO 23 UNI GY -162.0
51. LOAD 3
52. MEMBER LOAD
53. 1 TRAP GX 358.2 298.8
54. 2 TRAP GX 298.8 239.4
55. 3 TRAP GX 239.4 180.0
56. 4 TRAP GX 180.0 120.6
57. 5 TRAP GX 120.6 61.2
58. LOAD 4
59. MEMBER LOAD
60. 28 TRAP GX -358.2 -298.8
61. 7 TRAP GX -298.8 -239.4
62. 26 TRAP GX -239.4 -180.0
63. 25 TRAP GX -180.0 -120.6
64. 24 TRAP GX -120.6 61.2
65. LOAD 5
66. MEMBER LOAD
67. 6 TRAP GY -322.5 -319.5
68. 7 TRAP GY -319.5 -262.5
69. 8 TRAP GY -262.5 -213.0
70. 9 TRAP GY -213.0 -166.5
71. 10 TRAP GY -166.5 -126.0
72. 11 TRAP GY -126.0 -91.5
73. 12 TRAP GY -91.5 -63.0
74. 13 TRAP GY -63.0 -39.0
75. 14 TRAP GY -39.0 -21.0
76. 15 TRAP GY -21.0 -9.0
77. 16 TRAP GY -9.0 1.5
78. 17 TRAP GY 1.5 -0.0
79. 18 TRAP GY -0.0 -4.5
80. 19 TRAP GY -4.5 -13.5
81. 20 TRAP GY -13.5 -28.5
82. 21 TRAP GY -28.5 -48.0
83. 22 TRAP GY -48.0 -73.5
84. 23 TRAP GY -73.5 -75.0
85. LOAD 6
86. MEMBER LOAD
87. 6 TO 23 UNI GY -28.9
88. LOAD COMB 7 TOTAL DEAD
89. 1 1. 2 1. 3 1. 4 1. 5 1. 6 1.
90. LOAD COMB 8 TOTAL DEAD-NO EARTH
91. 1 1. 2 1. 3 2. 4 2. 5 1. 6 1.
92. *LOAD GENERATION 20
93. *TYPE 1 -0.95 14.06 0.0 XINC 2.73 YRA 5.0
94. 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 = 29/ 28/ 2
ORIGINAL/FINAL BAND-WIDTH = 1/ 1
TOTAL PRIMARY LOAD CASES = 6, TOTAL DEGREES OF FREEDOM = 83
SIZE OF STIFFNESS MATRIX = 498 DOUBLE PREC. WORDS
REQRD/AVAIL. DISK SPACE = 12.05/ 369.3 MB, EXMEM = 1964.9 MB

++ Processing Element Stiffness Matrix. 11: 3:51
++ Processing Global Stiffness Matrix. 11: 3:52
++ Processing Triangular Factorization. 11: 3:52
++ Calculating Joint Displacements. 11: 3:52
++ Calculating Member Forces. 11: 3:52

95. PRINT MEMBER FORCES ALL

MEMBER END FORCES STRUCTURE TYPE = PLANE

ALL UNITS ARE -- POUN FEET

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
1	1	1	19129.59	7920.21	.00	.00	.00	-.01
		2	-17707.50	-7821.99	.00	.00	.00	26273.19
	2	1	4585.54	3723.80	.00	.00	.00	.01
		2	-4585.54	-3723.80	.00	.00	.00	12429.79
	3	1	-122.96	-2637.84	.00	.00	.00	.00
		2	198.51	1543.93	.00	.00	.00	-6924.17
	4	1	398.83	927.28	.00	.00	.00	-.01
		2	-398.83	-927.28	.00	.00	.00	3095.20
	5	1	3944.03	1456.12	.00	.00	.00	.00
		2	-3944.03	-1456.12	.00	.00	.00	4860.44
	6	1	818.04	664.31	.00	.00	.00	.00
		2	-818.04	-664.31	.00	.00	.00	2217.41
	7	1	28753.08	12053.88	.00	.00	.00	.00
		2	-27255.43	-13049.56	.00	.00	.00	41951.87
	8	1	29028.95	10343.32	.00	.00	.00	-.01
		2	-27455.74	-12432.91	.00	.00	.00	38122.90
2	1	2	17726.15	7779.63	.00	.00	.00	-26273.18
		3	-16254.37	-7681.51	.00	.00	.00	49516.36
	2	2	4594.43	3712.81	.00	.00	.00	-12429.76
		3	-4594.43	-3712.81	.00	.00	.00	23593.00
	3	2	-202.20	-1543.47	.00	.00	.00	6924.16
		3	256.02	736.17	.00	.00	.00	-10306.48
	4	2	401.05	926.32	.00	.00	.00	-3095.18
		3	-401.05	-926.32	.00	.00	.00	5880.33
	5	2	3947.50	1446.69	.00	.00	.00	-4860.41
		3	-3947.50	-1446.69	.00	.00	.00	9210.16
	6	2	819.62	662.35	.00	.00	.00	-2217.42
		3	-819.62	-662.35	.00	.00	.00	4208.87
	7	2	27286.55	12984.34	.00	.00	.00	-41951.80
		3	-25760.95	-13693.52	.00	.00	.00	82102.23
	8	2	27485.40	12367.19	.00	.00	.00	-38122.82
		3	-25905.97	-13883.68	.00	.00	.00	77676.07
3	1	3	16254.37	7681.58	.00	.00	.00	-49516.34
		4	-14601.35	-7571.38	.00	.00	.00	72446.38
	2	3	4594.43	3712.87	.00	.00	.00	-23592.92
		4	-4594.43	-3712.87	.00	.00	.00	34756.25
	3	3	-256.02	-736.12	.00	.00	.00	10306.58
		4	297.96	107.02	.00	.00	.00	-11529.37
	4	3	401.05	926.31	.00	.00	.00	-5880.30
		4	-401.05	-926.31	.00	.00	.00	8665.55
	5	3	3947.50	1446.72	.00	.00	.00	-9210.10
		4	-3947.50	-1446.72	.00	.00	.00	13559.89

MEMBER END FORCES STRUCTURE TYPE = PLANE

ALL UNITS ARE -- POUN FEET

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	6	3	819.62	662.35	.00	.00	.00	-4208.86
		4	-819.62	-662.35	.00	.00	.00	6200.33
	7	3	25760.96	13693.71	.00	.00	.00	-82101.94
		4	-24065.99	-14212.61	.00	.00	.00	124099.00
	8	3	25905.97	13883.90	.00	.00	.00	-77675.64
		4	-24169.07	-15031.90	.00	.00	.00	121235.20
4	1	4	14601.34	7571.44	.00	.00	.00	-72446.26
		5	-12763.96	-7448.95	.00	.00	.00	95026.59
	2	4	4594.43	3712.85	.00	.00	.00	-34756.16
		5	-4594.43	-3712.85	.00	.00	.00	45919.41
	3	4	-297.96	-107.11	.00	.00	.00	11529.34
		5	328.02	-343.79	.00	.00	.00	-11128.84
	4	4	401.05	926.32	.00	.00	.00	-8665.37
		5	-401.05	-926.32	.00	.00	.00	11450.54
	5	4	3947.50	1446.61	.00	.00	.00	-13559.80
		5	-3947.50	-1446.61	.00	.00	.00	17909.49
	6	4	819.62	662.36	.00	.00	.00	-6200.32
		5	-819.62	-662.36	.00	.00	.00	8191.79
	7	4	24065.99	14212.48	.00	.00	.00	-124098.60
		5	-22198.55	-14540.89	.00	.00	.00	167369.00
	8	4	24169.07	15031.70	.00	.00	.00	-121234.60
		5	-22271.57	-15811.01	.00	.00	.00	167690.70
5	1	5	12743.91	7483.62	.00	.00	.00	-95026.55
		6	-11615.88	-7405.37	.00	.00	.00	107935.50
	2	5	4584.45	3725.03	.00	.00	.00	-45919.25
		6	-4584.45	-3725.03	.00	.00	.00	52379.42
	3	5	-328.94	341.94	.00	.00	.00	11128.34
		6	339.85	-499.20	.00	.00	.00	-10383.55
	4	5	398.56	927.32	.00	.00	.00	-11450.83
		6	-398.56	-927.32	.00	.00	.00	13059.45
	5	5	3943.60	1457.08	.00	.00	.00	-17909.55
		6	-3943.60	-1457.08	.00	.00	.00	20437.08
	6	5	817.84	664.53	.00	.00	.00	-8191.81
		6	-817.84	-664.53	.00	.00	.00	9344.20
	7	5	22159.42	14599.53	.00	.00	.00	-167369.60
		6	-21020.48	-14678.54	.00	.00	.00	192772.10
	8	5	22229.04	15868.79	.00	.00	.00	-167692.10
		6	-21079.19	-16105.06	.00	.00	.00	195448.00
6	1	6	9109.11	10333.66	.00	.00	.00	107935.30
		7	-8761.38	-8809.01	.00	.00	.00	-85552.54
	2	6	4388.16	3954.42	.00	.00	.00	52379.32
		7	-4303.92	-3585.06	.00	.00	.00	-43563.50
	3	6	441.76	-412.96	.00	.00	.00	-10382.73
		7	-441.76	412.96	.00	.00	.00	9416.99

MEMBER END FORCES STRUCTURE TYPE = PLANE

ALL UNITS ARE -- POUN FEET

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	4	6	977.79	250.70	.00	.00	.00	13058.98
		7	-977.79	-250.70	.00	.00	.00	-12472.70
	5	6	2048.58	3671.19	.00	.00	.00	20436.54
		7	-1881.66	-2939.31	.00	.00	.00	-12708.29
	6	6	782.82	705.45	.00	.00	.00	9344.20
		7	-767.80	-639.56	.00	.00	.00	-7771.51
	7	6	17748.23	18502.47	.00	.00	.00	192771.70
		7	-17134.32	-15810.69	.00	.00	.00	-152651.50
	8	6	19167.78	18340.21	.00	.00	.00	195447.90
		7	-18553.87	-15648.43	.00	.00	.00	-155707.30
7	1	7	8383.17	9169.66	.00	.00	.00	85552.38
		8	-7990.76	-7039.42	.00	.00	.00	-57368.63
	2	7	4149.34	3762.95	.00	.00	.00	43563.39
		8	-4047.28	-3208.91	.00	.00	.00	-31441.11
	3	7	458.73	-394.06	.00	.00	.00	-9416.97
		8	-458.73	394.06	.00	.00	.00	8046.62
	4	7	966.42	291.52	.00	.00	.00	12472.70
		8	-46.10	-461.06	.00	.00	.00	-11153.38
	5	7	1756.37	3016.04	.00	.00	.00	12708.18
		8	-1573.04	-2020.82	.00	.00	.00	-4006.55
	6	7	740.22	671.29	.00	.00	.00	7771.50
		8	-722.02	-572.45	.00	.00	.00	-5608.93
	7	7	16454.26	16517.40	.00	.00	.00	152651.20
		8	-14837.92	-12908.60	.00	.00	.00	-101532.00
	8	7	17879.41	16414.87	.00	.00	.00	155706.90
		8	-15342.75	-12975.60	.00	.00	.00	-104638.70
8	1	8	7811.48	7237.90	.00	.00	.00	57368.85
		9	-7528.00	-5447.76	.00	.00	.00	-35469.99
	2	8	3965.42	3309.48	.00	.00	.00	31441.05
		9	-3877.94	-2757.06	.00	.00	.00	-20968.56
	3	8	468.50	-382.44	.00	.00	.00	-8046.66
		9	-468.50	382.44	.00	.00	.00	6726.35
	4	8	34.46	462.10	.00	.00	.00	11153.38
		9	-34.46	-462.10	.00	.00	.00	-9558.08
	5	8	1521.79	2059.70	.00	.00	.00	4006.71
		9	-1393.40	-1248.98	.00	.00	.00	1656.35
	6	8	707.41	590.41	.00	.00	.00	5608.94
		9	-691.81	-491.86	.00	.00	.00	-3740.68
	7	8	14509.06	13277.14	.00	.00	.00	101532.30
		9	-13994.11	-10025.31	.00	.00	.00	-61354.62
	8	8	15012.02	13356.80	.00	.00	.00	104639.00
		9	-14497.07	-10104.97	.00	.00	.00	-64186.35
9	1	9	7382.54	5643.35	.00	.00	.00	35470.19
		10	-7183.34	-4129.39	.00	.00	.00	-18614.97

MEMBER END FORCES STRUCTURE TYPE = PLANE

ALL UNITS ARE -- POUN FEET

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	2	9	3804.31	2857.85	.00	.00	.00	20968.55
		10	-3731.41	-2303.81	.00	.00	.00	-12066.03
	3	9	478.37	-369.99	.00	.00	.00	-6726.39
		10	-478.37	369.99	.00	.00	.00	5450.08
	4	9	22.35	462.82	.00	.00	.00	9558.05
		10	-22.35	-462.82	.00	.00	.00	-7961.60
	5	9	1360.18	1285.05	.00	.00	.00	-1656.23
		10	-1274.79	-636.10	.00	.00	.00	4924.11
	6	9	678.67	509.82	.00	.00	.00	3740.69
		10	-665.66	-410.98	.00	.00	.00	-2152.52
	7	9	13726.42	10388.90	.00	.00	.00	61354.86
		10	-13355.92	-7573.11	.00	.00	.00	-30420.92
	8	9	14227.14	10481.73	.00	.00	.00	64186.52
		10	-13856.64	-7665.94	.00	.00	.00	-32932.44
10	1	10	6959.84	4495.73	.00	.00	.00	18615.20
		11	-6858.60	-3217.06	.00	.00	.00	-5423.26
	2	10	3607.08	2493.95	.00	.00	.00	12065.97
		11	-3563.34	-1941.53	.00	.00	.00	-4479.84
	3	10	496.87	-344.73	.00	.00	.00	-5450.12
		11	-496.87	344.73	.00	.00	.00	4270.92
	4	10	-1.64	463.34	.00	.00	.00	7961.56
		11	1.64	-463.34	.00	.00	.00	-6376.62
	5	10	1240.11	701.27	.00	.00	.00	-4924.06
		11	-1200.62	-202.56	.00	.00	.00	6430.58
	6	10	643.49	444.91	.00	.00	.00	2152.52
		11	-635.68	-346.36	.00	.00	.00	-799.16
	7	10	12945.75	8254.48	.00	.00	.00	30421.05
		11	-12753.48	-5826.13	.00	.00	.00	-6377.38
	8	10	13440.99	8373.08	.00	.00	.00	32932.49
		11	-13248.71	-5944.73	.00	.00	.00	-8483.08
11	1	11	6983.67	2935.83	.00	.00	.00	5423.45
		12	-6852.13	-1841.86	.00	.00	.00	2780.95
	2	11	3639.30	1795.14	.00	.00	.00	4479.76
		12	-3572.88	-1242.72	.00	.00	.00	737.15
	3	11	482.47	-364.63	.00	.00	.00	-4270.93
		12	-482.47	364.63	.00	.00	.00	3018.61
	4	11	17.20	463.04	.00	.00	.00	6376.61
		12	-17.20	-463.04	.00	.00	.00	-4786.31
	5	11	1207.87	153.62	.00	.00	.00	-6430.57
		12	-1163.28	217.22	.00	.00	.00	6287.67
	6	11	649.23	320.25	.00	.00	.00	799.18
		12	-637.38	-221.70	.00	.00	.00	131.51
	7	11	12979.74	5303.25	.00	.00	.00	6377.50
		12	-12725.35	-3187.47	.00	.00	.00	8169.59
	8	11	13479.40	5401.66	.00	.00	.00	8483.18
		12	-13225.01	-3285.88	.00	.00	.00	6401.90

MEMBER END FORCES STRUCTURE TYPE = PLANE

ALL UNITS ARE -- POUN FEET

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
12	1	12	6636.04	2511.32	.00	.00	.00	-2780.86
		13	-6616.43	-1553.07	.00	.00	.00	9732.53
	2	12	3432.25	1590.47	.00	.00	.00	-737.11
		13	-3420.91	-1036.43	.00	.00	.00	5230.05
	3	12	516.19	-315.05	.00	.00	.00	-3018.61
		13	-516.19	315.05	.00	.00	.00	1940.89
	4	12	-28.77	462.46	.00	.00	.00	4786.29
		13	28.77	-462.46	.00	.00	.00	-3204.33
	5	12	1179.08	-100.97	.00	.00	.00	-6287.72
		13	-1173.67	365.16	.00	.00	.00	5462.63
	6	12	612.30	283.73	.00	.00	.00	-131.50
		13	-610.27	-184.89	.00	.00	.00	933.01
	7	12	12347.09	4431.95	.00	.00	.00	-8169.51
		13	-12308.70	-2556.63	.00	.00	.00	20094.78
	8	12	12834.51	4579.36	.00	.00	.00	-6401.83
		13	-12796.13	-2704.04	.00	.00	.00	18831.34
13	1	13	6646.97	1416.64	.00	.00	.00	-9732.49
		14	-6611.39	-549.98	.00	.00	.00	13088.34
	2	13	3441.50	965.85	.00	.00	.00	-5230.03
		14	-3418.82	-413.43	.00	.00	.00	7583.61
	3	13	509.61	-325.60	.00	.00	.00	-1940.89
		14	-509.61	325.60	.00	.00	.00	829.65
	4	13	-19.23	462.96	.00	.00	.00	3204.33
		14	19.23	-462.96	.00	.00	.00	-1624.33
	5	13	1165.92	-389.20	.00	.00	.00	-5462.70
		14	-1158.78	563.11	.00	.00	.00	3814.33
	6	13	613.95	172.30	.00	.00	.00	-933.01
		14	-609.90	-73.75	.00	.00	.00	1352.89
	7	13	12358.71	2302.94	.00	.00	.00	-20094.79
		14	-12289.27	-611.40	.00	.00	.00	25044.49
	8	13	12849.10	2440.29	.00	.00	.00	-18831.35
		14	-12779.65	-748.76	.00	.00	.00	24249.81
14	1	14	6598.68	685.77	.00	.00	.00	-13088.52
		15	-6581.84	137.12	.00	.00	.00	14027.01
	2	14	3409.59	483.68	.00	.00	.00	-7583.62
		15	-3398.25	70.36	.00	.00	.00	8290.46
	3	14	516.21	-315.05	.00	.00	.00	-829.65
		15	-516.21	315.05	.00	.00	.00	-248.06
	4	14	-28.75	462.46	.00	.00	.00	1624.33
		15	28.75	-462.46	.00	.00	.00	-42.38
	5	14	1170.11	-539.15	.00	.00	.00	-3814.33
		15	-1168.02	641.75	.00	.00	.00	1776.96
	6	14	608.25	86.28	.00	.00	.00	-1352.88
		15	-606.23	12.56	.00	.00	.00	1478.97

MEMBER END FORCES STRUCTURE TYPE = PLANE

ALL UNITS ARE -- POUN FEET

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	7	14	12274.10	863.99	.00	.00	.00	-25044.66
		15	-12241.80	714.38	.00	.00	.00	25282.97
	8	14	12761.56	1011.40	.00	.00	.00	-24249.97
		15	-12729.26	566.97	.00	.00	.00	24992.52
15	1	15	6581.92	132.78	.00	.00	.00	-14027.09
		16	-6598.77	687.70	.00	.00	.00	13080.94
	2	15	3398.28	68.90	.00	.00	.00	-8290.42
		16	-3409.62	483.52	.00	.00	.00	7583.44
	3	15	528.68	-293.64	.00	.00	.00	248.06
		16	-528.68	293.64	.00	.00	.00	-1249.58
	4	15	-47.67	460.90	.00	.00	.00	42.38
		16	47.67	-460.90	.00	.00	.00	1529.61
	5	15	1193.33	-593.35	.00	.00	.00	-1776.96
		16	-1194.38	644.51	.00	.00	.00	-345.66
	6	15	606.24	12.30	.00	.00	.00	-1478.97
		16	-608.26	86.25	.00	.00	.00	1352.85
	7	15	12260.79	-212.11	.00	.00	.00	-25282.99
		16	-12292.04	1734.71	.00	.00	.00	21951.59
	8	15	12741.80	-44.86	.00	.00	.00	-24992.55
		16	-12773.05	1567.45	.00	.00	.00	22231.62
16	1	16	6611.42	-552.99	.00	.00	.00	-13080.87
		17	-6647.00	1422.18	.00	.00	.00	9700.45
	2	16	3418.77	-413.87	.00	.00	.00	-7583.40
		17	-3441.45	967.91	.00	.00	.00	5218.57
	3	16	534.55	-282.79	.00	.00	.00	1249.58
		17	-534.55	282.79	.00	.00	.00	-2217.55
	4	16	-57.08	459.83	.00	.00	.00	-1529.61
		17	57.08	-459.83	.00	.00	.00	3103.53
	5	16	1207.28	-620.02	.00	.00	.00	345.67
		17	-1208.01	632.85	.00	.00	.00	-2500.14
	6	16	609.89	-73.84	.00	.00	.00	-1352.85
		17	-613.94	172.68	.00	.00	.00	930.95
	7	16	12324.83	-1483.69	.00	.00	.00	-21951.48
		17	-12387.87	3018.58	.00	.00	.00	14235.81
	8	16	12802.30	-1306.65	.00	.00	.00	-22231.50
		17	-12865.34	2841.55	.00	.00	.00	15121.79
17	1	17	6616.62	-1557.41	.00	.00	.00	-9700.37
		18	-6636.24	2512.86	.00	.00	.00	2759.31
	2	17	3421.00	-1037.89	.00	.00	.00	-5218.52
		18	-3432.34	1590.31	.00	.00	.00	736.60
	3	17	528.68	-293.63	.00	.00	.00	2217.55
		18	-528.68	293.63	.00	.00	.00	-3219.07
	4	17	-47.67	460.89	.00	.00	.00	-3103.54
		18	47.67	-460.89	.00	.00	.00	4675.51

MEMBER END FORCES STRUCTURE TYPE = PLANE

ALL UNITS ARE -- POUN FEET

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	5	17	1194.85	-657.34	.00	.00	.00	2500.15
		18	-1194.83	654.78	.00	.00	.00	-4736.33
	6	17	610.29	-185.17	.00	.00	.00	-930.97
		18	-612.31	283.71	.00	.00	.00	131.38
	7	17	12323.78	-3270.54	.00	.00	.00	-14235.70
		18	-12356.73	4874.40	.00	.00	.00	347.40
	8	17	12804.79	-3103.28	.00	.00	.00	-15121.69
		18	-12837.74	4707.14	.00	.00	.00	1803.85
18	1	18	6852.36	-1843.75	.00	.00	.00	-2759.35
		19	-6983.90	2937.72	.00	.00	.00	-5451.88
	2	18	3572.89	-1242.75	.00	.00	.00	-736.53
		19	-3639.31	1795.17	.00	.00	.00	-4480.60
	3	18	555.15	-239.87	.00	.00	.00	3219.06
		19	-555.15	239.87	.00	.00	.00	-4042.90
	4	18	-93.07	453.91	.00	.00	.00	-4675.50
		19	93.07	-453.91	.00	.00	.00	6234.51
	5	18	1253.77	-533.32	.00	.00	.00	4736.34
		19	-1254.70	540.99	.00	.00	.00	-6576.82
	6	18	637.38	-221.70	.00	.00	.00	-131.39
		19	-649.23	320.25	.00	.00	.00	-799.31
	7	18	12778.49	-3627.46	.00	.00	.00	-347.37
		19	-12989.21	5380.07	.00	.00	.00	-15116.99
	8	18	13240.56	-3413.42	.00	.00	.00	-1803.81
		19	-13451.29	5166.03	.00	.00	.00	-12925.38
19	1	19	6858.00	-3220.52	.00	.00	.00	5451.88
		20	-6959.25	4502.93	.00	.00	.00	-18700.35
	2	19	3562.91	-1942.53	.00	.00	.00	4480.46
		20	-3606.65	2496.57	.00	.00	.00	-12094.77
	3	19	544.88	-262.34	.00	.00	.00	4042.93
		20	-544.88	262.34	.00	.00	.00	-4942.95
	4	19	-74.44	457.35	.00	.00	.00	-6234.49
		20	74.44	-457.35	.00	.00	.00	7803.51
	5	19	1231.54	-591.81	.00	.00	.00	6576.83
		20	-1233.97	622.59	.00	.00	.00	-8651.11
	6	19	635.60	-346.52	.00	.00	.00	799.30
		20	-643.41	445.36	.00	.00	.00	-2157.64
	7	19	12758.49	-5906.37	.00	.00	.00	15116.91
		20	-12913.70	7872.44	.00	.00	.00	-38743.31
	8	19	13228.92	-5711.35	.00	.00	.00	12925.35
		20	-13384.14	7677.43	.00	.00	.00	-35882.76
20	1	20	7185.65	-4132.15	.00	.00	.00	18700.46
		21	-7384.85	5641.69	.00	.00	.00	-35509.62
	2	20	3732.50	-2304.05	.00	.00	.00	12094.83
		21	-3805.40	2856.46	.00	.00	.00	-20969.63

MEMBER END FORCES STRUCTURE TYPE = PLANE

ALL UNITS ARE -- POUN FEET

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	3	20	557.88	-233.44	.00	.00	.00	4942.96
		21	-557.88	233.44	.00	.00	.00	-5745.90
	4	20	-98.32	452.83	.00	.00	.00	-7803.44
		21	98.32	-452.83	.00	.00	.00	9360.95
	5	20	1264.89	-557.07	.00	.00	.00	8651.10
		21	-1274.34	628.68	.00	.00	.00	-10675.72
	6	20	665.86	-411.03	.00	.00	.00	2157.65
		21	-678.86	509.58	.00	.00	.00	-3740.89
	7	20	13308.45	-7184.91	.00	.00	.00	38743.57
		21	-13603.02	9417.03	.00	.00	.00	-67280.80
	8	20	13768.01	-6965.52	.00	.00	.00	35883.10
		21	-14062.57	9197.63	.00	.00	.00	-63665.74
21	1	21	7525.70	-5452.30	.00	.00	.00	35509.72
		22	-7809.18	7247.69	.00	.00	.00	-57495.72
	2	21	3876.72	-2758.93	.00	.00	.00	20969.57
		22	-3964.20	3312.97	.00	.00	.00	-31481.39
	3	21	563.64	-219.17	.00	.00	.00	5745.95
		22	-563.64	219.17	.00	.00	.00	-6504.82
	4	21	-109.76	450.15	.00	.00	.00	-9360.94
		22	109.76	-450.15	.00	.00	.00	10919.51
	5	21	1289.90	-596.14	.00	.00	.00	10675.71
		22	-1310.55	726.95	.00	.00	.00	-12946.90
	6	21	691.59	-492.17	.00	.00	.00	3740.89
		22	-707.19	591.01	.00	.00	.00	-5616.09
	7	21	13837.79	-9068.56	.00	.00	.00	67280.91
		22	-14245.02	11647.64	.00	.00	.00	-103125.40
	8	21	14291.68	-8837.58	.00	.00	.00	63665.91
		22	-14698.91	11416.66	.00	.00	.00	-98710.71
22	1	22	7995.60	-7041.58	.00	.00	.00	57495.90
		23	-8388.02	9165.60	.00	.00	.00	-85596.87
	2	22	4049.27	-3208.44	.00	.00	.00	31481.24
		23	-4151.33	3760.86	.00	.00	.00	-43565.05
	3	22	569.15	-204.42	.00	.00	.00	6504.84
		23	-569.15	204.42	.00	.00	.00	-7213.78
	4	22	-121.45	447.14	.00	.00	.00	-10919.64
		23	121.45	-447.14	.00	.00	.00	12470.12
	5	22	1329.06	-692.53	.00	.00	.00	12946.87
		23	-1367.33	899.68	.00	.00	.00	-15682.36
	6	22	722.37	-572.38	.00	.00	.00	5616.10
		23	-740.58	670.93	.00	.00	.00	-7771.78
	7	22	14544.00	-11272.21	.00	.00	.00	103125.30
		23	-15094.95	14254.34	.00	.00	.00	-147359.70
	8	22	14991.70	-11029.48	.00	.00	.00	98710.52
		23	-15542.66	14011.62	.00	.00	.00	-142103.40
23	1	23	8753.11	-8817.52	.00	.00	.00	85596.76
		24	-9100.84	10348.86	.00	.00	.00	-108101.80

MEMBER END FORCES STRUCTURE TYPE = PLANE

ALL UNITS ARE -- POUN FEET

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	2	23	4300.53	-3589.18	.00	.00	.00	43564.98
		24	-4384.77	3960.16	.00	.00	.00	-52429.24
	3	23	576.98	-181.06	.00	.00	.00	7213.70
		24	-576.98	181.06	.00	.00	.00	-7639.16
	4	23	-139.51	441.85	.00	.00	.00	-12470.34
		24	139.51	-441.85	.00	.00	.00	13507.72
	5	23	1402.74	-843.36	.00	.00	.00	15682.47
		24	-1441.35	1013.39	.00	.00	.00	-17861.89
	6	23	767.20	-640.31	.00	.00	.00	7771.77
		24	-782.22	706.49	.00	.00	.00	-9353.11
	7	23	15661.06	-13629.59	.00	.00	.00	147359.30
		24	-16146.65	15768.12	.00	.00	.00	-181877.50
	8	23	16098.53	-13368.80	.00	.00	.00	142102.70
		24	-16584.13	15507.33	.00	.00	.00	-176008.90
24	1	24	11622.73	-7405.53	.00	.00	.00	-108101.40
		25	-12750.77	7483.77	.00	.00	.00	95191.47
	2	24	4586.10	-3725.11	.00	.00	.00	-52429.08
		25	-4586.10	3725.11	.00	.00	.00	45969.27
	3	24	267.54	-541.65	.00	.00	.00	-7638.30
		25	-267.54	541.65	.00	.00	.00	6699.51
	4	24	-458.02	70.45	.00	.00	.00	13509.32
		25	454.46	-121.83	.00	.00	.00	-13294.56
	5	24	1222.60	-1269.66	.00	.00	.00	-17862.68
		25	-1222.60	1269.66	.00	.00	.00	15661.28
	6	24	818.14	-664.54	.00	.00	.00	-9353.08
		25	-818.14	664.54	.00	.00	.00	8200.70
	7	24	18059.09	-13536.04	.00	.00	.00	-181875.20
		25	-19190.69	13562.90	.00	.00	.00	158427.70
	8	24	17868.61	-14007.24	.00	.00	.00	-176004.20
		25	-19003.77	13982.72	.00	.00	.00	151832.60
25	1	25	12770.84	-7449.23	.00	.00	.00	-95191.50
		26	-14608.22	7571.72	.00	.00	.00	72610.01
	2	25	4596.09	-3712.92	.00	.00	.00	-45969.09
		26	-4596.09	3712.92	.00	.00	.00	34805.53
	3	25	268.99	-541.69	.00	.00	.00	-6698.69
		26	-268.99	541.69	.00	.00	.00	5070.20
	4	25	-454.79	120.37	.00	.00	.00	13296.35
		26	424.73	-571.27	.00	.00	.00	-12211.97
	5	25	1226.00	-1265.39	.00	.00	.00	-15661.42
		26	-1226.00	1265.39	.00	.00	.00	11856.92
	6	25	819.92	-662.36	.00	.00	.00	-8200.64
		26	-819.92	662.36	.00	.00	.00	6209.15
	7	25	19227.06	-13511.22	.00	.00	.00	-158425.00
		26	-21094.50	13182.81	.00	.00	.00	118339.80
	8	25	19041.27	-13932.54	.00	.00	.00	-151827.30
		26	-20938.77	13153.23	.00	.00	.00	111198.10

MEMBER END FORCES STRUCTURE TYPE = PLANE

ALL UNITS ARE -- POUN FEET

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
26	1	26	14583.01	-7620.25	.00	.00	.00	-72610.19
		27	-16236.03	7735.96	.00	.00	.00	49519.45
	2	26	4583.74	-3728.12	.00	.00	.00	-34805.52
		27	-4583.74	3728.12	.00	.00	.00	23593.74
	3	26	267.19	-542.53	.00	.00	.00	-5070.23
		27	-267.19	542.53	.00	.00	.00	3438.52
	4	26	-422.83	572.59	.00	.00	.00	12212.12
		27	378.79	-1201.69	.00	.00	.00	-9499.67
	5	26	1221.80	-1269.58	.00	.00	.00	-11856.70
		27	-1221.80	1269.58	.00	.00	.00	8038.87
	6	26	817.72	-665.09	.00	.00	.00	-6209.14
		27	-817.72	665.09	.00	.00	.00	4208.99
	7	26	21050.63	-13252.97	.00	.00	.00	-118339.70
		27	-22747.69	12739.58	.00	.00	.00	79299.91
	8	26	20895.00	-13222.91	.00	.00	.00	-111197.80
		27	-22636.09	12080.42	.00	.00	.00	73238.77
27	1	27	16261.60	-7682.00	.00	.00	.00	-49519.50
		28	-17733.38	7780.12	.00	.00	.00	26274.93
	2	27	4596.08	-3712.93	.00	.00	.00	-23593.72
		28	-4596.08	3712.93	.00	.00	.00	12430.17
	3	27	268.99	-541.64	.00	.00	.00	-3438.55
		28	-268.99	541.64	.00	.00	.00	1810.09
	4	27	-382.78	1200.36	.00	.00	.00	9499.67
		28	382.78	-1200.36	.00	.00	.00	-5890.61
	5	27	1226.00	-1265.48	.00	.00	.00	-8038.85
		28	-1226.00	1265.48	.00	.00	.00	4233.86
	6	27	819.92	-662.37	.00	.00	.00	-4209.00
		28	-819.92	662.37	.00	.00	.00	2217.48
	7	27	22789.82	-12664.06	.00	.00	.00	-79299.95
		28	-24261.60	12762.18	.00	.00	.00	41075.91
	8	27	22676.03	-12005.33	.00	.00	.00	-73238.83
		28	-24147.81	12103.46	.00	.00	.00	36995.39
28	1	28	17714.73	-7822.50	.00	.00	.00	-26274.92
		29	-19136.83	7920.73	.00	.00	.00	-.03
	2	28	4587.19	-3723.92	.00	.00	.00	-12430.18
		29	-4587.19	3723.92	.00	.00	.00	-.01
	3	28	267.70	-542.28	.00	.00	.00	-1810.07
		29	-267.70	542.28	.00	.00	.00	.01
	4	28	-379.90	1201.28	.00	.00	.00	5890.58
		29	304.35	-2295.19	.00	.00	.00	.01
	5	28	1222.97	-1268.42	.00	.00	.00	-4233.88
		29	-1222.97	1268.42	.00	.00	.00	.02
	6	28	818.33	-664.33	.00	.00	.00	-2217.48
		29	-818.33	664.33	.00	.00	.00	.00

MEMBER END FORCES STRUCTURE TYPE = PLANE

ALL UNITS ARE -- POUN FEET

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	7	28	24231.02	-12820.17	.00	.00	.00	-41075.96
		29	-25728.67	11824.49	.00	.00	.00	.00
	8	28	24118.81	-12161.17	.00	.00	.00	-36995.45
		29	-25692.02	10071.58	.00	.00	.00	.02

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

*** STAAD-III ERROR MESSAGE ***
NO END OR FINISH STATEMENT FOUND. RUN TERMINATED.

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

**** DATE= SEP 2,1998 TIME= 11: 3:52 ****

```
*************************************************
*                                               *
*           S T A A D - III                     *
*           Revision 22.3a                      *
*           Proprietary Program of              *
*           Research Engineers, Inc.            *
*           Date=    AUG 28, 1998               *
*           Time=     8:23:29                   *
*                                               *
*      USER ID: Rust E & I                      *
*************************************************
```

```
 1. STAAD PLANE CEMETERY ROAD UNDERPASS
 2. INPUT WIDTH 72
 3. UNIT FEET KIP
 4. JOINT COORDINATES
 5. 1 0.0 0.0; 2 -0.23 3.33; 3 -0.43 6.33; 4 -0.63 9.33
 6. 5 -0.83 12.33; 6 -0.95 14.06; 7 1.33 14.58; 8 4.75 15.21
 7. 9 8.16 15.75; 10 11.58 16.20; 11 14.99 16.47; 12 18.40 16.88
 8. 13 21.82 17.09; 14 25.23 17.09; 15 28.65 17.16; 16 32.06 17.09
 9. 17 35.48 16.95; 18 38.89 16.88; 19 42.30 16.47; 20 45.72 16.20
10. 21 49.13 15.75; 22 52.55 15.21; 23 55.96 14.58; 24 58.25 14.06
11. 25 58.13 12.33; 26 57.93 9.33; 27 57.72 6.33; 28 57.52 3.33
12. 29 57.29 0.0
13. MEMBER INCIDENCE
14. 1 1 2; 2 2 3; 3 3 4; 4 4 5; 5 5 6; 6 6 7; 7 7 8; 8 8 9
15. 9 9 10; 10 10 11; 11 11 12; 12 12 13; 13 13 14; 14 14 15
16. 15 15 16; 16 16 17; 17 17 18; 18 18 19; 19 19 20; 20 20 21
17. 21 21 22; 22 22 23; 23 23 24; 24 24 25; 25 25 26; 26 26 27
18. 27 27 28; 28 28 29
19. UNIT INCHES KIP
20. MEMBER PROPERTY AMERICAN
21. 1 28 PRI AX 410. IX 281.52 IZ 1126.06
22. 2 27 PRI AX 471. IX 424.3 IZ 1697.19
23. 3 26 PRI AX 529. IX 601.16 IZ 2404.63
24. 4 25 PRI AX 588. IX 820.88 IZ 3283.53
25. 5 24 PRI AX 626. IX 988.52 IZ 3954.09
26. 6 23 PRI AX 642. IX 1064.86 IZ 4259.42
27. 7 22 PRI AX 598. IX 875.98 IZ 3503.93
28. 8 21 PRI AX 504. IX 525.84 IZ 2103.36
29. 9 20 PRI AX 425. IX 314.71 IZ 1258.82
30. 10 19 PRI AX 360. IX 191.1 IZ 764.4
31. 11 18 PRI AX 308. IX 119.58 IZ 478.31
32. 12 17 PRI AX 269. IX 79.29 IZ 317.14
33. 13 16 PRI AX 244. IX 58.7 IZ 234.78
34. 14 15 PRI AX 231. IX 49.65 IZ 198.6
35. CONSTANT
36. E CONCRETE ALL
37. UNIT FEET POUND
38. CONSTANT
39. DENSITY CONCRETE ALL
40. UNIT FEET KIP
41. SUPPORT
42. 1 29 PINNED
43. UNIT FEET POUND
44. LOAD 1
45. JOINT LOAD
46. 7 FY -1
47. LOAD 2
48. JOINT LOAD
```

```
 49. 8 FY -1
 50. LOAD 3
 51. JOINT LOAD
 52. 9 FY -1
 53. LOAD 4
 54. JOINT LOAD
 55. 10 FY -1
 56. LOAD 5
 57. JOINT LOAD
 58. 11 FY -1
 59. LOAD 6
 60. JOINT LOAD
 61. 12 FY -1
 62. LOAD 7
 63. JOINT LOAD
 64. 13 FY -1
 65. LOAD 8
 66. JOINT LOAD
 67. 14 FY -1
 68. LOAD 9
 69. JOINT LOAD
 70. 15 FY -1
 71. 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 =    29/   28/    2
   ORIGINAL/FINAL BAND-WIDTH =     1/    1
   TOTAL PRIMARY LOAD CASES  =     9, TOTAL DEGREES OF FREEDOM =    83
   SIZE OF STIFFNESS MATRIX =      498 DOUBLE PREC. WORDS
   REQRD/AVAIL. DISK SPACE =  12.05/  388.3 MB,  EXMEM = 1964.9 MB

++ Processing Element Stiffness Matrix.              8:23:30
++ Processing Global Stiffness Matrix.               8:23:30
++ Processing Triangular Factorization.              8:23:30
++ Calculating Joint Displacements.                  8:23:30
++ Calculating Member  Forces.                       8:23:31

 72. PRINT MEMBER FORCES ALL
```

MEMBER END FORCES STRUCTURE TYPE = PLANE

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
1	1	1	.97	.11	.00	.00	.00	.00
		2	-.97	-.11	.00	.00	.00	.35
	2	1	.91	.20	.00	.00	.00	.00
		2	-.91	-.20	.00	.00	.00	.66
	3	1	.84	.29	.00	.00	.00	.00
		2	-.84	-.29	.00	.00	.00	.97
	4	1	.77	.38	.00	.00	.00	.00
		2	-.77	-.38	.00	.00	.00	1.27
	5	1	.71	.46	.00	.00	.00	.00
		2	-.71	-.46	.00	.00	.00	1.54
	6	1	.64	.54	.00	.00	.00	.00
		2	-.64	-.54	.00	.00	.00	1.79
	7	1	.58	.59	.00	.00	.00	.00
		2	-.58	-.59	.00	.00	.00	1.98
	8	1	.52	.63	.00	.00	.00	.00
		2	-.52	-.63	.00	.00	.00	2.10
	9	1	.46	.64	.00	.00	.00	.00
		2	-.46	-.64	.00	.00	.00	2.14
2	1	2	.97	.10	.00	.00	.00	-.35
		3	-.97	-.10	.00	.00	.00	.66
	2	2	.91	.20	.00	.00	.00	-.66
		3	-.91	-.20	.00	.00	.00	1.26
	3	2	.84	.29	.00	.00	.00	-.97
		3	-.84	-.29	.00	.00	.00	1.84
	4	2	.77	.38	.00	.00	.00	-1.27
		3	-.77	-.38	.00	.00	.00	2.40
	5	2	.71	.46	.00	.00	.00	-1.54
		3	-.71	-.46	.00	.00	.00	2.93
	6	2	.64	.53	.00	.00	.00	-1.79
		3	-.64	-.53	.00	.00	.00	3.39
	7	2	.58	.59	.00	.00	.00	-1.98
		3	-.58	-.59	.00	.00	.00	3.76
	8	2	.52	.63	.00	.00	.00	-2.10
		3	-.52	-.63	.00	.00	.00	4.00
	9	2	.46	.64	.00	.00	.00	-2.14
		3	-.46	-.64	.00	.00	.00	4.06
3	1	3	.97	.10	.00	.00	.00	-.66
		4	-.97	-.10	.00	.00	.00	.97
	2	3	.91	.20	.00	.00	.00	-1.26
		4	-.91	-.20	.00	.00	.00	1.85
	3	3	.84	.29	.00	.00	.00	-1.84
		4	-.84	-.29	.00	.00	.00	2.71
	4	3	.77	.38	.00	.00	.00	-2.40
		4	-.77	-.38	.00	.00	.00	3.54
	5	3	.71	.46	.00	.00	.00	-2.93
		4	-.71	-.46	.00	.00	.00	4.31
	6	3	.64	.53	.00	.00	.00	-3.39
		4	-.64	-.53	.00	.00	.00	4.99
	7	3	.58	.59	.00	.00	.00	-3.76
		4	-.58	-.59	.00	.00	.00	5.54
	8	3	.52	.63	.00	.00	.00	-4.00
		4	-.52	-.63	.00	.00	.00	5.89
	9	3	.46	.64	.00	.00	.00	-4.06
		4	-.46	-.64	.00	.00	.00	5.99

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
4	1	4	.97	.10	.00	.00	.00	-.97
		5	-.97	-.10	.00	.00	.00	1.28
	2	4	.91	.20	.00	.00	.00	-1.85
		5	-.91	-.20	.00	.00	.00	2.44
	3	4	.84	.29	.00	.00	.00	-2.71
		5	-.84	-.29	.00	.00	.00	3.58
	4	4	.77	.38	.00	.00	.00	-3.54
		5	-.77	-.38	.00	.00	.00	4.67
	5	4	.71	.46	.00	.00	.00	-4.31
		5	-.71	-.46	.00	.00	.00	5.69
	6	4	.64	.53	.00	.00	.00	-4.99
		5	-.64	-.53	.00	.00	.00	6.60
	7	4	.58	.59	.00	.00	.00	-5.54
		5	-.58	-.59	.00	.00	.00	7.32
	8	4	.52	.63	.00	.00	.00	-5.89
		5	-.52	-.63	.00	.00	.00	7.78
	9	4	.46	.64	.00	.00	.00	-5.99
		5	-.46	-.64	.00	.00	.00	7.91
5	1	5	.97	.11	.00	.00	.00	-1.28
		6	-.97	-.11	.00	.00	.00	1.46
	2	5	.91	.20	.00	.00	.00	-2.44
		6	-.91	-.20	.00	.00	.00	2.79
	3	5	.84	.29	.00	.00	.00	-3.58
		6	-.84	-.29	.00	.00	.00	4.08
	4	5	.77	.38	.00	.00	.00	-4.67
		6	-.77	-.38	.00	.00	.00	5.33
	5	5	.71	.46	.00	.00	.00	-5.69
		6	-.71	-.46	.00	.00	.00	6.50
	6	5	.64	.54	.00	.00	.00	-6.60
		6	-.64	-.54	.00	.00	.00	7.53
	7	5	.58	.59	.00	.00	.00	-7.32
		6	-.58	-.59	.00	.00	.00	8.35
	8	5	.52	.63	.00	.00	.00	-7.78
		6	-.52	-.63	.00	.00	.00	8.87
	9	5	.46	.64	.00	.00	.00	-7.91
		6	-.46	-.64	.00	.00	.00	9.02
6	1	6	.25	.94	.00	.00	.00	1.46
		7	-.25	-.94	.00	.00	.00	.75
	2	6	.34	.86	.00	.00	.00	2.79
		7	-.34	-.86	.00	.00	.00	-.77
	3	6	.42	.78	.00	.00	.00	4.08
		7	-.42	-.78	.00	.00	.00	-2.25
	4	6	.50	.71	.00	.00	.00	5.33
		7	-.50	-.71	.00	.00	.00	-3.68
	5	6	.57	.63	.00	.00	.00	6.50
		7	-.57	-.63	.00	.00	.00	-5.03
	6	6	.63	.55	.00	.00	.00	7.53
		7	-.63	-.55	.00	.00	.00	-6.23
	7	6	.68	.48	.00	.00	.00	8.35
		7	-.68	-.48	.00	.00	.00	-7.23
	8	6	.70	.41	.00	.00	.00	8.87
		7	-.70	-.41	.00	.00	.00	-7.91
	9	6	.70	.35	.00	.00	.00	9.02
		7	-.70	-.35	.00	.00	.00	-8.20

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
7	1	7	.03	-.03	.00	.00	.00	-.75
		8	-.03	.03	.00	.00	.00	.64
	2	7	.30	.88	.00	.00	.00	.77
		8	-.30	-.88	.00	.00	.00	2.28
	3	7	.38	.80	.00	.00	.00	2.25
		8	-.38	-.80	.00	.00	.00	.54
	4	7	.46	.73	.00	.00	.00	3.68
		8	-.46	-.73	.00	.00	.00	-1.16
	5	7	.54	.65	.00	.00	.00	5.03
		8	-.54	-.65	.00	.00	.00	-2.76
	6	7	.60	.58	.00	.00	.00	6.23
		8	-.60	-.58	.00	.00	.00	-4.22
	7	7	.65	.51	.00	.00	.00	7.23
		8	-.65	-.51	.00	.00	.00	-5.46
	8	7	.68	.44	.00	.00	.00	7.91
		8	-.68	-.44	.00	.00	.00	-6.37
	9	7	.69	.38	.00	.00	.00	8.20
		8	-.69	-.38	.00	.00	.00	-6.87
8	1	8	.03	-.03	.00	.00	.00	-.64
		9	-.03	.03	.00	.00	.00	.54
	2	8	.12	-.10	.00	.00	.00	-2.28
		9	-.12	.10	.00	.00	.00	1.93
	3	8	.36	.81	.00	.00	.00	-.54
		9	-.36	-.81	.00	.00	.00	3.34
	4	8	.45	.74	.00	.00	.00	1.16
		9	-.45	-.74	.00	.00	.00	1.39
	5	8	.52	.66	.00	.00	.00	2.76
		9	-.52	-.66	.00	.00	.00	-.47
	6	8	.59	.59	.00	.00	.00	4.22
		9	-.59	-.59	.00	.00	.00	-2.17
	7	8	.64	.53	.00	.00	.00	5.46
		9	-.64	-.53	.00	.00	.00	-3.64
	8	8	.67	.46	.00	.00	.00	6.37
		9	-.67	-.46	.00	.00	.00	-4.78
	9	8	.68	.40	.00	.00	.00	6.87
		9	-.68	-.40	.00	.00	.00	-5.49
9	1	9	.03	-.03	.00	.00	.00	-.54
		10	-.03	.03	.00	.00	.00	.45
	2	9	.12	-.10	.00	.00	.00	-1.93
		10	-.12	.10	.00	.00	.00	1.58
	3	9	.21	-.17	.00	.00	.00	-3.34
		10	-.21	.17	.00	.00	.00	2.75
	4	9	.43	.75	.00	.00	.00	-1.39
		10	-.43	-.75	.00	.00	.00	3.97
	5	9	.51	.68	.00	.00	.00	.47
		10	-.51	-.68	.00	.00	.00	1.87
	6	9	.57	.61	.00	.00	.00	2.17
		10	-.57	-.61	.00	.00	.00	-.07
	7	9	.63	.54	.00	.00	.00	3.64
		10	-.63	-.54	.00	.00	.00	-1.78
	8	9	.66	.48	.00	.00	.00	4.78
		10	-.66	-.48	.00	.00	.00	-3.13
	9	9	.67	.42	.00	.00	.00	5.49
		10	-.67	-.42	.00	.00	.00	-4.06

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
10	1	10	.04	-.03	.00	.00	.00	-.45
		11	-.04	.03	.00	.00	.00	.36
	2	10	.13	-.09	.00	.00	.00	-1.58
		11	-.13	.09	.00	.00	.00	1.26
	3	10	.22	-.16	.00	.00	.00	-2.75
		11	-.22	.16	.00	.00	.00	2.20
	4	10	.31	-.23	.00	.00	.00	-3.97
		11	-.31	.23	.00	.00	.00	3.19
	5	10	.47	.70	.00	.00	.00	-1.87
		11	-.47	-.70	.00	.00	.00	4.28
	6	10	.54	.64	.00	.00	.00	.07
		11	-.54	-.64	.00	.00	.00	2.11
	7	10	.60	.57	.00	.00	.00	1.78
		11	-.60	-.57	.00	.00	.00	.19
	8	10	.64	.51	.00	.00	.00	3.13
		11	-.64	-.51	.00	.00	.00	-1.38
	9	10	.65	.45	.00	.00	.00	4.06
		11	-.65	-.45	.00	.00	.00	-2.52
11	1	11	.03	-.03	.00	.00	.00	-.36
		12	-.03	.03	.00	.00	.00	.26
	2	11	.13	-.10	.00	.00	.00	-1.26
		12	-.13	.10	.00	.00	.00	.92
	3	11	.21	-.17	.00	.00	.00	-2.20
		12	-.21	.17	.00	.00	.00	1.62
	4	11	.30	-.24	.00	.00	.00	-3.19
		12	-.30	.24	.00	.00	.00	2.37
	5	11	.38	-.31	.00	.00	.00	-4.28
		12	-.38	.31	.00	.00	.00	3.22
	6	11	.57	.62	.00	.00	.00	-2.11
		12	-.57	-.62	.00	.00	.00	4.23
	7	11	.62	.55	.00	.00	.00	-.19
		12	-.62	-.55	.00	.00	.00	2.07
	8	11	.66	.48	.00	.00	.00	1.38
		12	-.66	-.48	.00	.00	.00	.28
	9	11	.66	.42	.00	.00	.00	2.52
		12	-.66	-.42	.00	.00	.00	-1.06
12	1	12	.04	-.03	.00	.00	.00	-.26
		13	-.04	.03	.00	.00	.00	.17
	2	12	.13	-.09	.00	.00	.00	-.92
		13	-.13	.09	.00	.00	.00	.61
	3	12	.22	-.16	.00	.00	.00	-1.62
		13	-.22	.16	.00	.00	.00	1.08
	4	12	.31	-.22	.00	.00	.00	-2.37
		13	-.31	.22	.00	.00	.00	1.61
	5	12	.40	-.29	.00	.00	.00	-3.22
		13	-.40	.29	.00	.00	.00	2.24
	6	12	.47	-.35	.00	.00	.00	-4.23
		13	-.47	.35	.00	.00	.00	3.03
	7	12	.59	.58	.00	.00	.00	-2.07
		13	-.59	-.58	.00	.00	.00	4.07
	8	12	.63	.52	.00	.00	.00	-.28
		13	-.63	-.52	.00	.00	.00	2.07
	9	12	.64	.46	.00	.00	.00	1.06
		13	-.64	-.46	.00	.00	.00	.52

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
13	1	13	.04	-.02	.00	.00	.00	-.17
		14	-.04	.02	.00	.00	.00	.10
	2	13	.14	-.08	.00	.00	.00	-.61
		14	-.14	.08	.00	.00	.00	.33
	3	13	.23	-.14	.00	.00	.00	-1.08
		14	-.23	.14	.00	.00	.00	.60
	4	13	.33	-.20	.00	.00	.00	-1.61
		14	-.33	.20	.00	.00	.00	.92
	5	13	.41	-.26	.00	.00	.00	-2.24
		14	-.41	.26	.00	.00	.00	1.35
	6	13	.49	-.32	.00	.00	.00	-3.03
		14	-.49	.32	.00	.00	.00	1.93
	7	13	.55	-.38	.00	.00	.00	-4.07
		14	-.55	.38	.00	.00	.00	2.77
	8	13	.59	.56	.00	.00	.00	-2.07
		14	-.59	-.56	.00	.00	.00	3.98
	9	13	.61	.50	.00	.00	.00	-.52
		14	-.61	-.50	.00	.00	.00	2.22
14	1	14	.04	-.02	.00	.00	.00	-.10
		15	-.04	.02	.00	.00	.00	.01
	2	14	.13	-.09	.00	.00	.00	-.33
		15	-.13	.09	.00	.00	.00	.04
	3	14	.23	-.15	.00	.00	.00	-.60
		15	-.23	.15	.00	.00	.00	.09
	4	14	.32	-.21	.00	.00	.00	-.92
		15	-.32	.21	.00	.00	.00	.21
	5	14	.41	-.27	.00	.00	.00	-1.35
		15	-.41	.27	.00	.00	.00	.42
	6	14	.48	-.33	.00	.00	.00	-1.93
		15	-.48	.33	.00	.00	.00	.80
	7	14	.54	-.39	.00	.00	.00	-2.77
		15	-.54	.39	.00	.00	.00	1.43
	8	14	.58	-.45	.00	.00	.00	-3.98
		15	-.58	.45	.00	.00	.00	2.43
	9	14	.62	.49	.00	.00	.00	-2.22
		15	-.62	-.49	.00	.00	.00	3.89
15	1	15	.04	-.02	.00	.00	.00	-.01
		16	-.04	.02	.00	.00	.00	-.06
	2	15	.14	-.08	.00	.00	.00	-.04
		16	-.14	.08	.00	.00	.00	-.24
	3	15	.24	-.14	.00	.00	.00	-.09
		16	-.24	.14	.00	.00	.00	-.38
	4	15	.33	-.20	.00	.00	.00	-.21
		16	-.33	.20	.00	.00	.00	-.46
	5	15	.42	-.25	.00	.00	.00	-.42
		16	-.42	.25	.00	.00	.00	-.44
	6	15	.50	-.31	.00	.00	.00	-.80
		16	-.50	.31	.00	.00	.00	-.26
	7	15	.56	-.37	.00	.00	.00	-1.43
		16	-.56	.37	.00	.00	.00	.17
	8	15	.60	-.43	.00	.00	.00	-2.43
		16	-.60	.43	.00	.00	.00	.97
	9	15	.62	-.49	.00	.00	.00	-3.89
		16	-.62	.49	.00	.00	.00	2.23

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
16	1	16	.04	-.02	.00	.00	.00	.06
		17	-.04	.02	.00	.00	.00	-.14
	2	16	.14	-.08	.00	.00	.00	.24
		17	-.14	.08	.00	.00	.00	-.50
	3	16	.24	-.13	.00	.00	.00	.38
		17	-.24	.13	.00	.00	.00	-.83
	4	16	.33	-.19	.00	.00	.00	.46
		17	-.33	.19	.00	.00	.00	-1.10
	5	16	.42	-.24	.00	.00	.00	.44
		17	-.42	.24	.00	.00	.00	-1.28
	6	16	.50	-.30	.00	.00	.00	.26
		17	-.50	.30	.00	.00	.00	-1.29
	7	16	.57	-.36	.00	.00	.00	-.17
		17	-.57	.36	.00	.00	.00	-1.05
	8	16	.61	-.42	.00	.00	.00	-.97
		17	-.61	.42	.00	.00	.00	-.45
	9	16	.63	-.47	.00	.00	.00	-2.23
		17	-.63	.47	.00	.00	.00	.60
17	1	17	.04	-.02	.00	.00	.00	.14
		18	-.04	.02	.00	.00	.00	-.21
	2	17	.14	-.08	.00	.00	.00	.50
		18	-.14	.08	.00	.00	.00	-.77
	3	17	.24	-.14	.00	.00	.00	.83
		18	-.24	.14	.00	.00	.00	-1.30
	4	17	.33	-.20	.00	.00	.00	1.10
		18	-.33	.20	.00	.00	.00	-1.77
	5	17	.42	-.25	.00	.00	.00	1.28
		18	-.42	.25	.00	.00	.00	-2.14
	6	17	.50	-.31	.00	.00	.00	1.29
		18	-.50	.31	.00	.00	.00	-2.35
	7	17	.56	-.37	.00	.00	.00	1.05
		18	-.56	.37	.00	.00	.00	-2.31
	8	17	.60	-.43	.00	.00	.00	.45
		18	-.60	.43	.00	.00	.00	-1.91
	9	17	.62	-.49	.00	.00	.00	-.60
		18	-.62	.49	.00	.00	.00	-1.06
18	1	18	.04	-.02	.00	.00	.00	.21
		19	-.04	.02	.00	.00	.00	-.28
	2	18	.15	-.07	.00	.00	.00	.77
		19	-.15	.07	.00	.00	.00	-1.00
	3	18	.25	-.11	.00	.00	.00	1.30
		19	-.25	.11	.00	.00	.00	-1.69
	4	18	.35	-.16	.00	.00	.00	1.77
		19	-.35	.16	.00	.00	.00	-2.33
	5	18	.44	-.21	.00	.00	.00	2.14
		19	-.44	.21	.00	.00	.00	-2.87
	6	18	.52	-.26	.00	.00	.00	2.35
		19	-.52	.26	.00	.00	.00	-3.25
	7	18	.59	-.31	.00	.00	.00	2.31
		19	-.59	.31	.00	.00	.00	-3.39
	8	18	.64	-.37	.00	.00	.00	1.91
		19	-.64	.37	.00	.00	.00	-3.17
	9	18	.66	-.42	.00	.00	.00	1.06
		19	-.66	.42	.00	.00	.00	-2.51

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
19	1	19	.04	-.02	.00	.00	.00	.28
		20	-.04	.02	.00	.00	.00	-.35
	2	19	.14	-.07	.00	.00	.00	1.00
		20	-.14	.07	.00	.00	.00	-1.25
	3	19	.24	-.12	.00	.00	.00	1.69
		20	-.24	.12	.00	.00	.00	-2.12
	4	19	.34	-.18	.00	.00	.00	2.33
		20	-.34	.18	.00	.00	.00	-2.93
	5	19	.43	-.23	.00	.00	.00	2.87
		20	-.43	.23	.00	.00	.00	-3.65
	6	19	.51	-.28	.00	.00	.00	3.25
		20	-.51	.28	.00	.00	.00	-4.21
	7	19	.58	-.34	.00	.00	.00	3.39
		20	-.58	.34	.00	.00	.00	-4.54
	8	19	.63	-.39	.00	.00	.00	3.17
		20	-.63	.39	.00	.00	.00	-4.52
	9	19	.65	-.45	.00	.00	.00	2.51
		20	-.65	.45	.00	.00	.00	-4.06
20	1	20	.04	-.02	.00	.00	.00	.35
		21	-.04	.02	.00	.00	.00	-.41
	2	20	.15	-.06	.00	.00	.00	1.25
		21	-.15	.06	.00	.00	.00	-1.47
	3	20	.25	-.11	.00	.00	.00	2.12
		21	-.25	.11	.00	.00	.00	-2.50
	4	20	.35	-.16	.00	.00	.00	2.93
		21	-.35	.16	.00	.00	.00	-3.47
	5	20	.44	-.21	.00	.00	.00	3.65
		21	-.44	.21	.00	.00	.00	-4.36
	6	20	.53	-.25	.00	.00	.00	4.21
		21	-.53	.25	.00	.00	.00	-5.09
	7	20	.60	-.31	.00	.00	.00	4.54
		21	-.60	.31	.00	.00	.00	-5.59
	8	20	.65	-.36	.00	.00	.00	4.52
		21	-.65	.36	.00	.00	.00	-5.75
	9	20	.67	-.42	.00	.00	.00	4.06
		21	-.67	.42	.00	.00	.00	-5.49
21	1	21	.04	-.02	.00	.00	.00	.41
		22	-.04	.02	.00	.00	.00	-.47
	2	21	.15	-.06	.00	.00	.00	1.47
		22	-.15	.06	.00	.00	.00	-1.68
	3	21	.25	-.10	.00	.00	.00	2.50
		22	-.25	.10	.00	.00	.00	-2.86
	4	21	.35	-.15	.00	.00	.00	3.47
		22	-.35	.15	.00	.00	.00	-3.99
	5	21	.45	-.19	.00	.00	.00	4.36
		22	-.45	.19	.00	.00	.00	-5.03
	6	21	.53	-.24	.00	.00	.00	5.09
		22	-.53	.24	.00	.00	.00	-5.92
	7	21	.60	-.29	.00	.00	.00	5.59
		22	-.60	.29	.00	.00	.00	-6.59
	8	21	.65	-.34	.00	.00	.00	5.75
		22	-.65	.34	.00	.00	.00	-6.94
	9	21	.68	-.40	.00	.00	.00	5.49
		22	-.68	.40	.00	.00	.00	-6.87

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
22	1	22	.04	-.02	.00	.00	.00	.47
		23	-.04	.02	.00	.00	.00	-.52
	2	22	.15	-.06	.00	.00	.00	1.68
		23	-.15	.06	.00	.00	.00	-1.88
	3	22	.25	-.10	.00	.00	.00	2.86
		23	-.25	.10	.00	.00	.00	-3.20
	4	22	.36	-.14	.00	.00	.00	3.99
		23	-.36	.14	.00	.00	.00	-4.47
	5	22	.45	-.18	.00	.00	.00	5.03
		23	-.45	.18	.00	.00	.00	-5.66
	6	22	.54	-.23	.00	.00	.00	5.92
		23	-.54	.23	.00	.00	.00	-6.71
	7	22	.61	-.27	.00	.00	.00	6.59
		23	-.61	.27	.00	.00	.00	-7.54
	8	22	.66	-.33	.00	.00	.00	6.94
		23	-.66	.33	.00	.00	.00	-8.07
	9	22	.69	-.38	.00	.00	.00	6.87
		23	-.69	.38	.00	.00	.00	-8.20
23	1	23	.04	-.01	.00	.00	.00	.52
		24	-.04	.01	.00	.00	.00	-.56
	2	23	.15	-.05	.00	.00	.00	1.88
		24	-.15	.05	.00	.00	.00	-2.00
	3	23	.26	-.09	.00	.00	.00	3.20
		24	-.26	.09	.00	.00	.00	-3.40
	4	23	.36	-.13	.00	.00	.00	4.47
		24	-.36	.13	.00	.00	.00	-4.77
	5	23	.46	-.16	.00	.00	.00	5.66
		24	-.46	.16	.00	.00	.00	-6.05
	6	23	.55	-.20	.00	.00	.00	6.71
		24	-.55	.20	.00	.00	.00	-7.19
	7	23	.62	-.25	.00	.00	.00	7.54
		24	-.62	.25	.00	.00	.00	-8.13
	8	23	.68	-.30	.00	.00	.00	8.07
		24	-.68	.30	.00	.00	.00	-8.77
	9	23	.70	-.35	.00	.00	.00	8.20
		24	-.70	.35	.00	.00	.00	-9.03
24	1	24	.02	-.04	.00	.00	.00	-.56
		25	-.02	.04	.00	.00	.00	.49
	2	24	.07	-.14	.00	.00	.00	-2.00
		25	-.07	.14	.00	.00	.00	1.75
	3	24	.13	-.24	.00	.00	.00	-3.40
		25	-.13	.24	.00	.00	.00	2.98
	4	24	.18	-.34	.00	.00	.00	-4.77
		25	-.18	.34	.00	.00	.00	4.18
	5	24	.23	-.43	.00	.00	.00	-6.05
		25	-.23	.43	.00	.00	.00	5.30
	6	24	.29	-.51	.00	.00	.00	-7.19
		25	-.29	.51	.00	.00	.00	6.31
	7	24	.34	-.58	.00	.00	.00	-8.13
		25	-.34	.58	.00	.00	.00	7.13
	8	24	.40	-.62	.00	.00	.00	-8.77
		25	-.40	.62	.00	.00	.00	7.69
	9	24	.46	-.64	.00	.00	.00	-9.03
		25	-.46	.64	.00	.00	.00	7.91

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
25	1	25	.02	-.04	.00	.00	.00	-.49
		26	-.02	.04	.00	.00	.00	.37
	2	25	.07	-.14	.00	.00	.00	-1.75
		26	-.07	.14	.00	.00	.00	1.32
	3	25	.13	-.24	.00	.00	.00	-2.98
		26	-.13	.24	.00	.00	.00	2.26
	4	25	.18	-.34	.00	.00	.00	-4.18
		26	-.18	.34	.00	.00	.00	3.16
	5	25	.23	-.43	.00	.00	.00	-5.30
		26	-.23	.43	.00	.00	.00	4.01
	6	25	.29	-.51	.00	.00	.00	-6.31
		26	-.29	.51	.00	.00	.00	4.77
	7	25	.34	-.58	.00	.00	.00	-7.13
		26	-.34	.58	.00	.00	.00	5.40
	8	25	.40	-.62	.00	.00	.00	-7.69
		26	-.40	.62	.00	.00	.00	5.82
	9	25	.46	-.64	.00	.00	.00	-7.91
		26	-.46	.64	.00	.00	.00	5.99
26	1	26	.02	-.04	.00	.00	.00	-.37
		27	-.02	.04	.00	.00	.00	.25
	2	26	.07	-.14	.00	.00	.00	-1.32
		27	-.07	.14	.00	.00	.00	.90
	3	26	.13	-.24	.00	.00	.00	-2.26
		27	-.13	.24	.00	.00	.00	1.53
	4	26	.18	-.34	.00	.00	.00	-3.16
		27	-.18	.34	.00	.00	.00	2.15
	5	26	.23	-.43	.00	.00	.00	-4.01
		27	-.23	.43	.00	.00	.00	2.72
	6	26	.29	-.51	.00	.00	.00	-4.77
		27	-.29	.51	.00	.00	.00	3.24
	7	26	.34	-.58	.00	.00	.00	-5.40
		27	-.34	.58	.00	.00	.00	3.66
	8	26	.40	-.62	.00	.00	.00	-5.82
		27	-.40	.62	.00	.00	.00	3.95
	9	26	.46	-.64	.00	.00	.00	-5.99
		27	-.46	.64	.00	.00	.00	4.06
27	1	27	.02	-.04	.00	.00	.00	-.25
		28	-.02	.04	.00	.00	.00	.13
	2	27	.07	-.14	.00	.00	.00	-.90
		28	-.07	.14	.00	.00	.00	.47
	3	27	.13	-.24	.00	.00	.00	-1.53
		28	-.13	.24	.00	.00	.00	.81
	4	27	.18	-.34	.00	.00	.00	-2.15
		28	-.18	.34	.00	.00	.00	1.13
	5	27	.23	-.43	.00	.00	.00	-2.72
		28	-.23	.43	.00	.00	.00	1.43
	6	27	.29	-.51	.00	.00	.00	-3.24
		28	-.29	.51	.00	.00	.00	1.70
	7	27	.34	-.58	.00	.00	.00	-3.66
		28	-.34	.58	.00	.00	.00	1.93
	8	27	.40	-.62	.00	.00	.00	-3.95
		28	-.40	.62	.00	.00	.00	2.08
	9	27	.46	-.64	.00	.00	.00	-4.06
		28	-.46	.64	.00	.00	.00	2.14

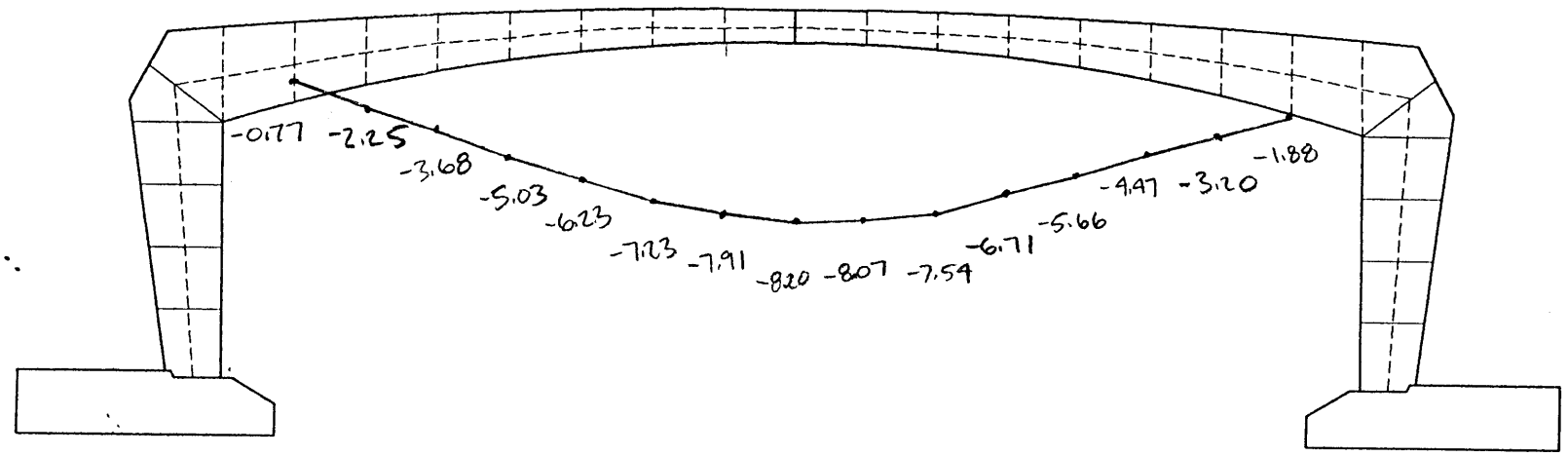
MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
28	1	28	.02	-.04	.00	.00	.00	-.13
		29	-.02	.04	.00	.00	.00	.00
	2	28	.07	-.14	.00	.00	.00	-.47
		29	-.07	.14	.00	.00	.00	.00
	3	28	.13	-.24	.00	.00	.00	-.81
		29	-.13	.24	.00	.00	.00	.00
	4	28	.18	-.34	.00	.00	.00	-1.13
		29	-.18	.34	.00	.00	.00	.00
	5	28	.23	-.43	.00	.00	.00	-1.43
		29	-.23	.43	.00	.00	.00	.00
	6	28	.29	-.51	.00	.00	.00	-1.70
		29	-.29	.51	.00	.00	.00	.00
	7	28	.34	-.58	.00	.00	.00	-1.93
		29	-.34	.58	.00	.00	.00	.00
	8	28	.40	-.62	.00	.00	.00	-2.08
		29	-.40	.62	.00	.00	.00	.00
	9	28	.46	-.64	.00	.00	.00	-2.14
		29	-.46	.64	.00	.00	.00	.00

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

*** STAAD-III ERROR MESSAGE ***
NO END OR FINISH STATEMENT FOUND. RUN TERMINATED.

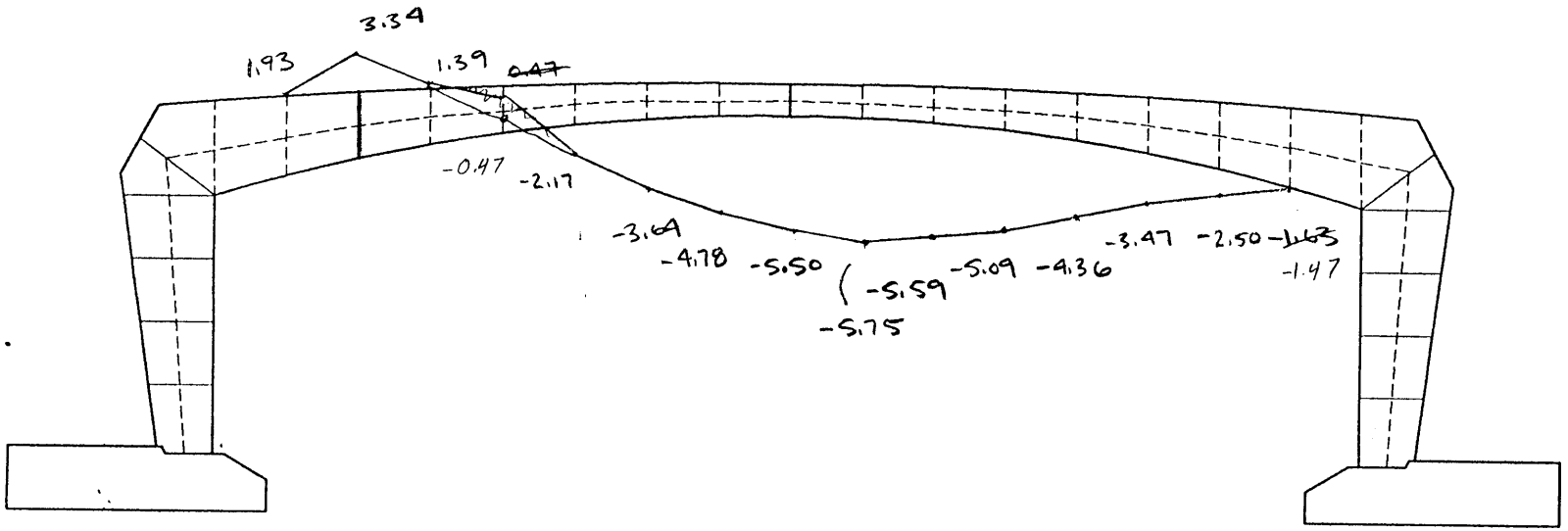
********** END OF STAAD-III **********

**** DATE= AUG 28,1998 TIME= 8:23:31 ****



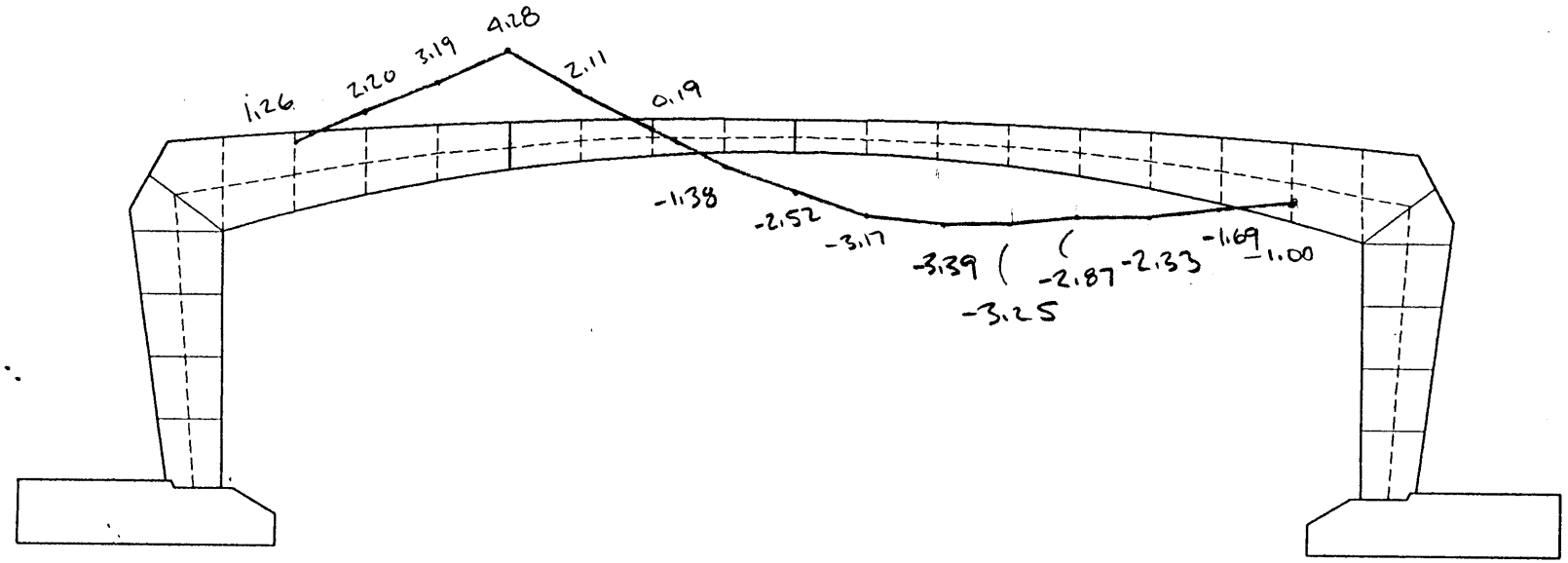
CEMETERY ROAD UNDERPASS

INFLUENCE LINE FOR JOINT 7 (FACE OF ABUTMENT)



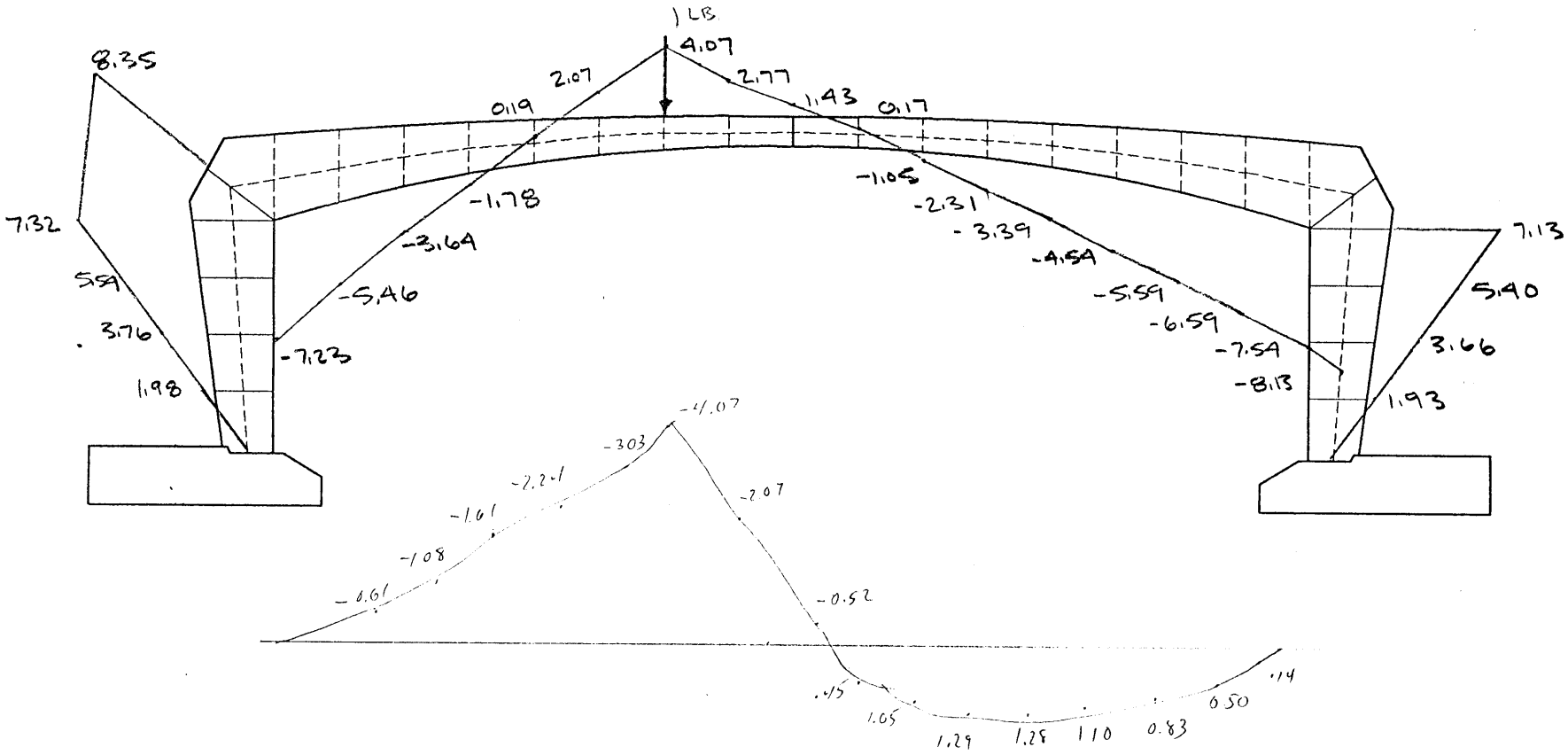
CEMETERY ROAD UNDERPASS

INFLUENCE LINE FOR JOINT 9 (1/8 th POINT)



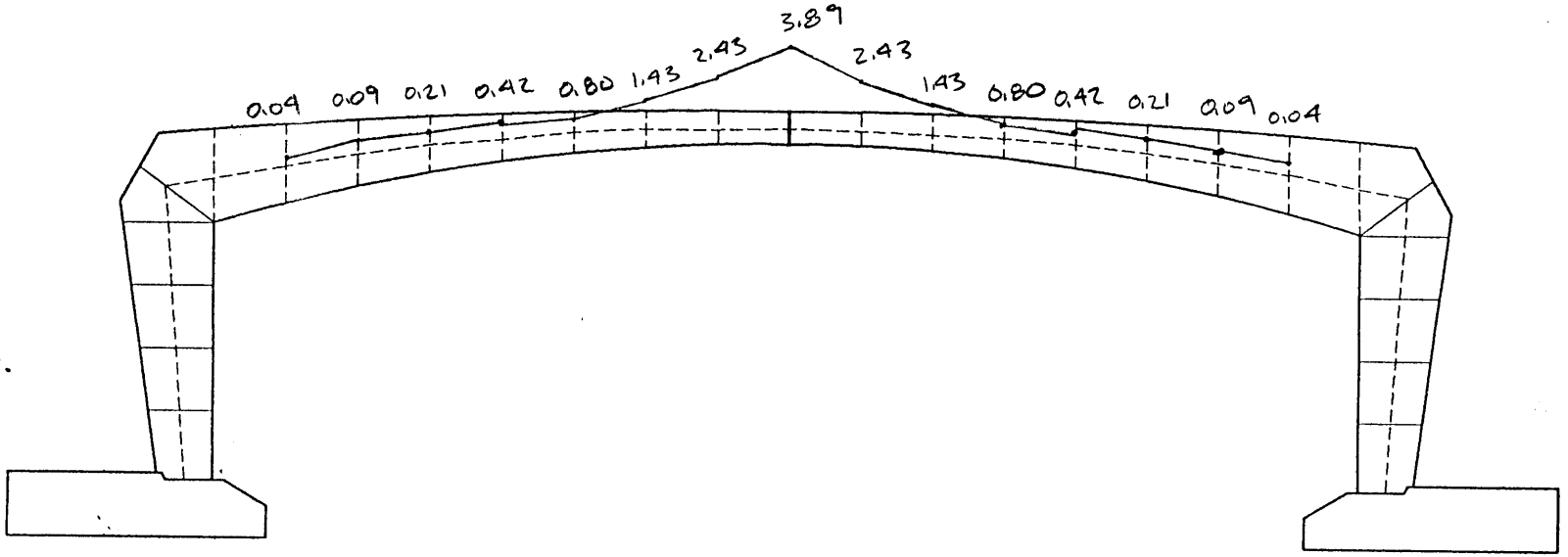
CEMETERY ROAD UNDERPASS

INFLUENCE LINE FOR JOINT 11 (1/4 POINT)



CEMETERY ROAD UNDERPASS

INFLUENCE LINE FOR JOINT 13 (3/8th POINT)



CEMETERY ROAD UNDERPASS

INFLUENCE LINE FOR JOINT 15 (CROWN)

(67)